Digital Agri Hub

Summary of the 8th eConversation, 2nd series

Smart Farming: The Digital Revolution in Livestock Development

Collaborating organisations

Hosted on the Digitalisation for Agriculture or D4Ag dGroup, this eConversation has been organised by the Wageningen University and Research (WUR) and the Livestock Data for Decisions (LD4D) network and is run by the Digital Agri Hub.

eConversation framework:

The limited adoption of digital innovation in livestock production and management across low- and middle-income countries (LMICs) presents a multifaceted challenge, one that has critical implications for food security, economic growth, and sustainable development. In these regions, livestock farming is central to millions of smallholder farmers' livelihoods, providing food, income, and social capital.

In LMICs livestock production means different things. Cattle (for beef, for milk, drought power), small ruminants (again for meat, milk, wool, multipurpose), pigs and poultry. In LMICs livestock management systems differ as well: nomadic pastoralism, transhumance, sedentary mixed crop-cattle systems, free ranging or paddock based. Each differ in management and may require different digital solutions.

Livestock production is increasingly burdened by a variety of obstacles, from climate stressors and disease outbreaks to rising demand for animal products. Digital tools could offer solutions by enhancing efficiency in livestock management, improving animal welfare, and supporting environmental sustainability, yet adoption remains low, leaving smallholder farmers unable to benefit from the productivity and resilience that technology promises.

One key barrier is **limited access to affordable digital infrastructure and technology**. Advanced digital tools such as health-monitoring sensors, automated feeding systems, and blockchain for traceability often require significant upfront investment, which is frequently unaffordable for smallholder farmers. Even basic necessities like stable internet or smartphone connectivity remain limited in many rural areas. Without investment in rural digital infrastructure and affordable technology, access remains confined to wealthier farmers, further widening the inequality gap within the agricultural sector.

Some stats

Starting date: 3/2/2025

Closing date: 3/3/2025

Number of posts: 47

Number of contributors: 34

New members: 160

Digital literacy and technical training pose additional challenges. While mobile phones and simple digital solutions are increasingly available, many farmers lack the necessary digital skills or knowledge to use these tools effectively. With limited experience in data-driven farming practices, smallholders may struggle to interpret the data or adjust management practices, accordingly, making technology adoption both intimidating and impractical. Effective training programs tailored to the unique needs of smallholder farmers are necessary to bridge this digital skills gap and ensure that farmers can engage confidently with new technologies.

Furthermore, **insufficient local policies and support** inhibit digital innovation. In many low- and middle-income countries, agricultural policy and rural development programs may not prioritize digital agriculture, which limits funding, infrastructure investment, and incentives for digital tool adoption. When digital farming technologies are not embedded within broader agricultural policies, the lack of institutional support and accessible financing options hinders both adoption and scalability. Governmental and organizational support is essential to help smallholders navigate these barriers and incentivize the integration of digital tools in livestock production.

Finally, **concerns about long-term reliability and maintenance** of digital tools deter adoption. For smallholder livestock producers with limited financial flexibility, investing in unfamiliar technologies carries risks, especially if long-term technical support or repair services are unavailable. Farmers may fear dependency on external suppliers or worry about technology obsolescence, and without clear demonstrations of economic benefit, they may be hesitant to shift away from established practices. Localized case studies and pilot programs that showcase positive outcomes can help to build trust in digital tools, but these efforts require both coordination and consistent funding.

The following questions have been debated during the eConversation:

Questions	
Q1	Are you aware of any digital tools deployed by livestock producers in LMICs? If this is the case, is their deployment successful, in which sense and why?
Q2	What types of financial incentives or support mechanisms could effectively encourage livestock producers to adopt and scale up digital innovations? These could include actions by governments, NGOs and private companies.
Q3	What are some examples of good practice – or good principles – for digital inclusion, ensuring that women livestock keepers and people from marginalised groups can benefit from digital innovations in the livestock sector?
Q4	How can we address farmers' concerns about the sustainability and reliability of digital tools, and what steps can be taken to ensure these technologies offer long-term value?

Summary of the exchanges

Digital tools deployed by livestock producers
The first week of the eConversation invited participants to mention digital solutions deployed by livestock producers. Thanks to wealth of contributions a number of applications were mentioned. These included:

i. Mobile apps for financial management, milk quality monitoring, performance tracking, heat detection, feed calculators, climate change adaptation, and breeding management,
ii. Information hubs for digital livestock technologies,
iii. Training platforms for skill development,
iv. Lists of livestock-focused agricultural solutions.

Participants mentioned also digital platforms and solutions that go beyond production such as:

i. Support the supply chain, as in the case of gathering/cooling dairy products of cooperatives and farmers groups;
ii. Facilitating connections between producers and with and consumers like e-commerce platforms/market places such as Soko of iCow or, like in the case of Sosty solutions that allow investors /consumer to invest in projects of regenerative agriculture.

Some members cited also "downstream" solutions for pasture/rangeland assessment and management, including remote sensing-based services, for pastoralists or other form of community livestock management. *A list of solutions mentioned during the exchanges is found in section Cited applications.*

Factors enabling livestock producers to adopt and scale-up digital innovations

The second week focused on exploring financial incentives and supporting mechanisms that drive livestock producers to adopt and scale digital innovations. Worth mentioning is the contribution dome by Ibrahim Ahmed, co-founder and chief executive officer at Geljir Technologies.

Drawing on his experience with M-nomad and other market linkage initiatives he observed that incentives play a crucial role in scaling digital innovations for livestock producers. Ensuring reliable buyers, fair pricing, and seamless transactions not only encourages adoption but also enhances market access and profitability for pastoralist communities. He listed several financial incentives and support mechanisms which have successfully driven the uptake of digital market linkage solutions:

- **Association-Supported Digital Marketplaces:** Collaborations between industry associations and digital platforms have helped pastoralists access competitive markets. In Kenya, the Kenya Livestock Marketing Council (KLMC) partnered with M-nomad, a livestock trading platform, to promote digital trading among pastoralist communities.
- **NGO-Funded Digital Market Access Programs:** NGOs have played a pivotal role in facilitating the transition to digital marketplaces by providing financial and technical support. For example, SNV's Kenya Market-Led Dairy Program (KMDP) enabled dairy farmers to connect with buyer networks through digital trading platforms.
- **Private Sector-Supported Market Linkage Incentives:** Agritech startups have partnered with financial institutions to simplify transactions and reduce barriers to digital trading. Kenya's Twiga Foods, for instance, has effectively connected livestock and fresh produce farmers to urban markets through mobile payments and logistics solutions.
- **Cooperative-Based Digital Trading Platforms:** Some cooperatives have introduced digital livestock markets, offering financial incentives such as discounted transaction fees to early adopters. Ethiopia's Digital Agricultural Exchange (DAX) is a prime example, leveraging digital auctions to connect pastoralists with formal markets.
- **Livestock E-Commerce & Buyer Aggregation Models:** Digital platforms that aggregate buyers provide better pricing structures, sometimes guaranteeing minimum prices to attract early adopters. Nigeria's FarmCrowdy links livestock farmers to bulk buyers and financiers, while Kenya's M-nomad eliminates middlemen, increasing profits for smallholder pastoralists.

These initiatives demonstrate that well-structured market linkage incentives significantly drive digital adoption in the livestock sector. By creating reliable, efficient, and profitable digital trading ecosystems, they empower livestock producers with better market access, fairer pricing, and improved incomes.

The exchanges have provided fascinating insights from Himachal Pradesh (India), Somaliland, Cameroon, Kenya, and Ethiopia, focusing on smallholder farming, pastoralism, and nomadic approaches to livestock development.

Addressing livestock farmers' concerns about the sustainability and reliability of digital tools

Sustainable digital solutions may offer long-term value to livestock farmers in LMICs if digital tools are designed with farmers' needs in mind (aspect stressed by Abdela Edao, Ednah Karamagi and Gupta-jee), are supported by strong infrastructure and backed by policy frameworks.

As detailed by Abdela Edao, Doctor of Veterinary Medicine at Haramaya University in Ethiopia, below is a list of strategies which may address livestock farmers' concerns vis-à-vis the sustainability and reliability of digital tools:

- **Farmer-Centered Design & Capacity Building:** stressed that digital tools should be co-designed with farmers to ensure they meet practical needs and are user-friendly. Training and extension services must accompany digital solutions to improve adoption and long-term usability.
- **Infrastructure and Connectivity Improvements:** Many LMICs face internet and power challenges. Investing in offline-compatible solutions, mobile-based platforms, and solar-powered technologies can enhance accessibility. Strengthening rural connectivity and digital literacy is essential for sustained use.
- **Affordability and Financial Sustainability:** Offering flexible pricing models (e.g., subscription-based or pay-as-you-go models) can make digital tools more accessible. Public-

private partnerships can help subsidize costs, ensuring affordability for smallholder farmers.

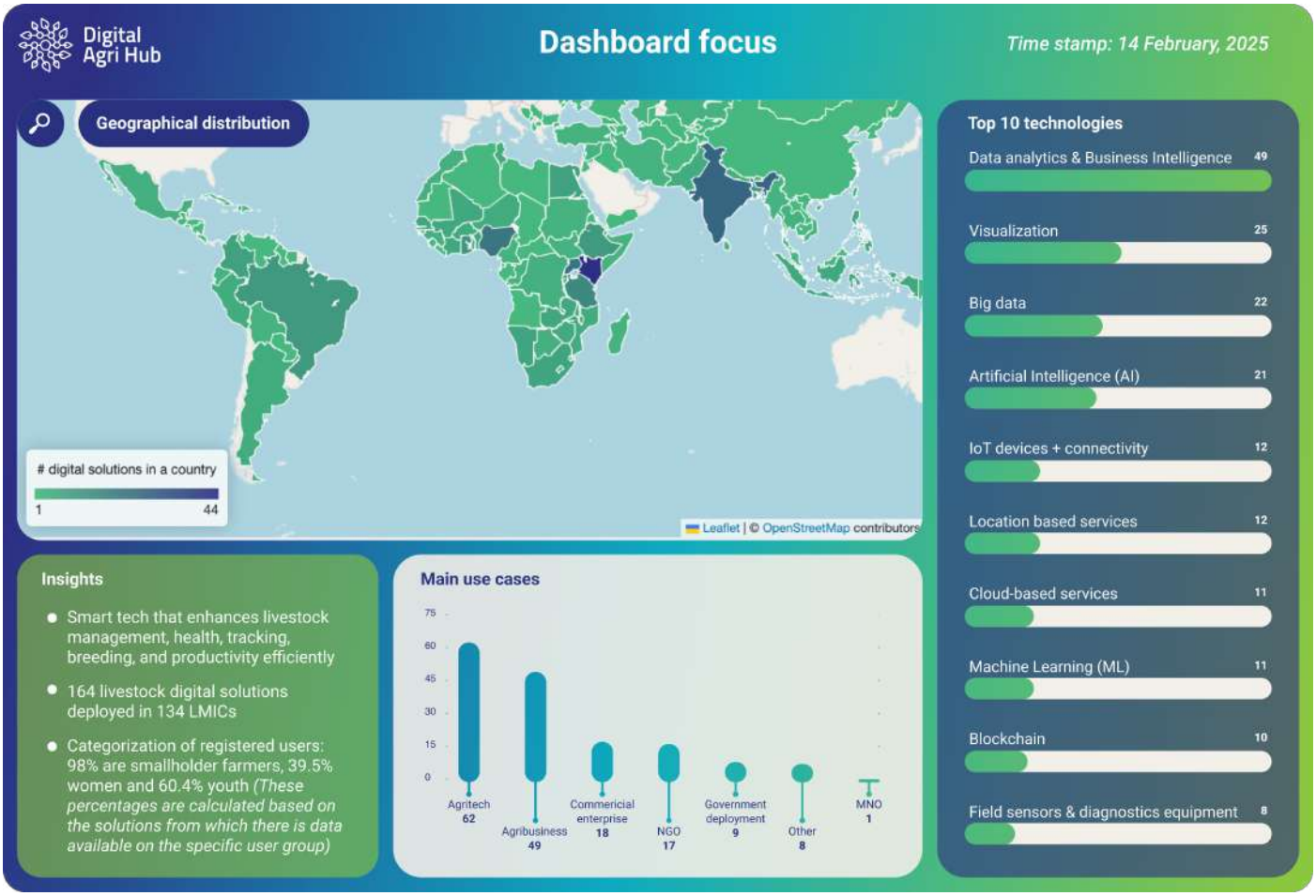
- **Data Ownership and Trust:** Farmers need assurance that their data is secure and will be used ethically. Transparent data governance policies and farmer-controlled data-sharing mechanisms are crucial. Engaging farmers in decision-making about data usage builds trust and encourages long-term engagement.
- **Integration with Existing Systems:** Digital tools should complement traditional livestock management practices rather than replace them. Linking digital tools with veterinary services, local cooperatives, and market access platforms enhances their value.
- **Monitoring and Continuous Improvement:** Regular feedback from farmers should be incorporated into tool updates to ensure relevance over time. Long-term impact assessments can help measure effectiveness and guide improvements.
- **Policy and Institutional Support:** Governments and livestock organizations should establish policies that promote the sustainable adoption of digital tools. Incentives for technology providers to develop solutions tailored to smallholder farmers can drive innovation.

Kenya's leading position in offering digital solutions for livestock management

Tomaso Ceccarelli, senior researcher, Global Food Security and Digital for Agriculture and coordinator of the Digital Agri Hub shared some records available on the Digital Agri Hub dashboard. These records point to the fact that among the top five, Kenya leads with 44 digital livestock solutions followed by India (26), Uganda (22), Nigeria (21), and Tanzania (15).

Discussants; listed the following potential reasons for Kenya's lead:

- **Cultural and Economic Significance of Livestock:** Cattle being a key production factor, asset, and collateral in Africa is certainly a valid observation. Livestock in many East African societies represents not just economic value but also cultural wealth and status. This deep integration of livestock in socioeconomic systems likely creates stronger demand for supportive technologies.



Dashboard focus for 14 February 2025

- **Development Aid and Investment Patterns:** East Africa, particularly Kenya, has been a focal point for agricultural development initiatives from international donors and NGOs. Kenya hosts regional offices for many international organizations and has a relatively favourable business environment that might attract more agtech startups and investments targeting livestock.
- **Mobile Technology Adoption and Infrastructure:** Kenya's pioneering role in mobile money (M-Pesa) established digital infrastructure and user familiarity with mobile technologies that could facilitate adoption of livestock-focused digital solutions. This existing digital ecosystem provides a foundation for specialized agricultural applications.
- **Policy Environment and Government Support:** The Kenyan government has implemented policies supporting digitalization in agriculture, potentially creating a more favourable environment for developing and scaling livestock technologies compared to other regions.
- **Regional Specialisation and Market Maturity:** The concentration in East Africa may indicate market maturity - solutions have had time to evolve based on real user feedback, potentially creating more sustainable business models. This aligns with your point about longevity contributing to these numbers.
- **Value Chain Differences:** Livestock value chains differ significantly between regions. East African pastoral systems may present unique challenges that have prompted more digital innovation compared to the mixed crop-livestock systems more common in parts of Asia.
- **Language and Regional Scaling:** Solutions developed in Kenya can potentially scale more easily to neighbouring countries like Uganda and Tanzania due to language similarities (Swahili) and comparable livestock systems, creating regional clusters of solutions.
- **Data Collection Considerations:** There might also be methodological factors - solutions in Kenya might be better documented or more visible to those maintaining the digital repository than those in other regions.

Recommendations resulting from the exchanges

The conversation on livestock development still continues. Over the past four weeks of the eConversation, we have gained valuable insights that offer important lessons for stakeholders across LMICs. However, there is still much to explore, including:

- **Lessons from Kenya's digital ecosystem** – How can other regions apply these innovations?
- **Adapting financial models** – How can we encourage wider digital adoption?
- **Gender inclusivity** – What further steps are needed to ensure equal participation?

The dialogue remains open as we collaborate to drive digital transformation in livestock development.

Are you interested in further exploring how digital innovations can support sustainable and inclusive livestock sector transformation? **Join LD4D Network** to take part in future discussions on this theme:
Become a Member of LD4D Community: https://livestockdata.org/become-member

Would you like to feature your digital solutions for livestock management and development on a primary resource base? Consider registering your company and offerings on the Digital Agri Hub database

Shared Resources

Cited literature:

- Gwaka L.T.2022. Computer Supported Livestock Systems: The Potential of Digital Platforms to Revitalise a Livestock System in Rural Zimbabwe. PACM on Human-Computer Interaction, Vol. 6, No. CSCW2, Article 360. Pages 1 – 28; https://doi.org/10.1145/355508
- Şeyda Özkan & Gregory Kohler. 2024. CCAC TEAP Report: Role of Digital (Extension) Services for Livestock on Tackling Methane Emissions. UNEP. https://www.ccacoalition.org/resources/ccac-teap-report-role-digital-extension-services-livestock-tackling-methane-emissions
- Makokha C., Jaquez C. and Reid E. 2022. Innovations for pastoralists and agro-pastoralists in fragile and conflict-affected settings. Proceedings of the ACM on Human-Computer Interaction, Scoping Paper. SPARC. https://www.sparc-knowledge.org/sites/default/files/documents/resources/Innovations%20010222%20V4.pdf

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- SNV. 2022. Addressing structural barriers to scale digitalisation for resilient food systems. SNV, Learning Brief D4Ag page 1-9. https://snv.org/assets/explore/download/090223%20SNV%20-%20Learning%20Brief%20D4Ag.pdf
- Alemayehu, S. et al. 2024. Policy Levers to Unlock Climate Finance in the Livestock Sector. A Guide for National Policymakers to Integrate Livestock in Climate Strategies. LD4D. https://livestockdata.org/sites/default/files/publications/policy-levers-to-unlock-climate-finance.pdf
- Wheelhouse N. et al. 2024. The Climate Investment Case for the Livestock Sector. Unlocking Opportunities for Effective Climate Action. Ld4D, https://livestockdata.org/sites/default/files/publications/the-climate-investment-case-for-the-livestock-sector_0.pdf
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- Kennady V. et al. 2023. Unlocking the potential of India's livestock sector through digital and financial services. ILRI News. https://www.ilri.org/news/unlocking-potential-indias-livestock-sector-through-digital-and-financial-services
- McCampbell et al. 2021. Good intentions in complex realities: Challenges for designing responsibly in digital agriculture in low-income countries. Sociologia Ruralis. 2022;62:279–304 https://doi.org/10.1111/soru.12359
- Elsäßer R. et al. 2021. Digitalizing the African livestock sector. Status quo and future trends for sustainable value chain development. GIZ. https://www.giz.de/de/downloads/giz2021-en-digitalizing-the-African-livestock-sector.pdf

Cited websites / webpages:

- SPARC Knowledge : A digital dashboard providing a summary of the various types of innovations available to pastoralists and R.S in dryland regions in SPARC focus countries
- Gender and Livestock Data Community of Practice: LD4D Community of Practice focused on improving understanding about collecting, analysing and interpreting livestock and gender data.
- Digital Agri Hub dashboard: An initiative run by Wageningen University and Research that collects, harmonises and publishes data on digital solutions and services that support small-scale producers in low- and middle-income countries worldwide.
- Digital Village Initiative Knowledge Exchange: DVI-KE is a regional platform and database of digital solutions, initiatives, and villages covering the whole of agrifood systems in Asia and the Pacific region
- Climate Finance for Livestock Development
- Gupta r. 2021. Van Gujjars: People of the forest or nowhere? Mongabay.
- PARI. 2012. On the road with India's nomadic pastoralists
- India Department of Animal Husbandry and Dairying. 2024. Basic Animal Husbandry Statistics
- Bhaikaka Krishi Kendra

Cited applications

- iCow a platform which has been developed in Kenya to assist dairy farmers and has evolves into a bundled service
- Betterfarm App - an app for smallholders farmers to build resilience to climate change
- Yielder - digital training, information and communication platform for agriculture
- CERES TAG - an animal tracking solution with grazing monitoring included
- BLRI Breeding Manager - digital tool for breeding management (available in English and Bangladeshi), offering a low cost, free of charge solution to farmers in LMICs
- BaKhabar Kissan (Pakistan) - digital agri advisory covering livestock.
- Inputi, Uganda – market linkage platform, including livestock inputs.
- E-Livestock Global (Zimbabwe) - blockchain-based traceability solution for livestock owners.
- Pula Advisors (East Africa) - digital insurance, incl. livestock insurance.

- Bank Alfalah (Pakistan) - digital agriculture financing product for smallholders incl. financing for buying livestock.
- Moofarm (India) - P2P digital advisory, including farming inputs, credit and cattle insurance.
- Emata (Uganda) - AI-powered credit scoring, enabling smallholder farmers in the dairy to access loans.
- Uzhavarbumi (India) - market linkage platform for dairy farmers.
- DigiCow (Kenya) – digital advisory for dairy farmers and digitisation of farm records.
- Stellaps (India) – IoT-enabled dairy supply chain digitalisation.
- Eggoz (India) – B2B market linkage platform connecting poultry farmers with retailers.
- ePoultry (Nigeria) - B2B market linkage platform for poultry farmers (includes data-driven input financing, digitised record keeping, technical support such as storage options and logistics support, and advisory).
- Pullus Africa Solutions (Nigeria) - market linkage platform for poultry farmers enabling access to premium markets, insurance, and finance
- Farmspeak (Nigeria) - AI-powered farm management app for poultry farmers incl. climate-smart monitoring.
- Agromukam (Bangladesh) – market linkage platform connecting farmers in poultry, cattle, fishery, agri sectors with input suppliers and buyers.
- eMsika (Zambia) - market linkages platform for farmers, agro-dealers and suppliers in the poultry sector.
- Chickin (Indonesia) - farm management app for small to medium poultry farmers, incl. insights to drive productivity and financial stability, IoT-based monitoring, and contract farming.
- mooON is a patented cattle health and farm management application suite designed to support farmers, dairy professionals, and dairy organizations
- SmartFarms app helps dairy farmers optimize their operations by providing access to real-time information, data management, and advisory services
- Jangolo
- Yellofarm: is an application for assistance with agricultural and agricultural products. Accessible via USSD au *282#, please consult the practices and alerts for optimizing your agricultural and agricultural exploitation practices. Since it is necessary to connect to the Internet, YelloFarm is accessible to all, but the zones are recovered.
- HPSPNF: Mobile App to registration for SPNF Farmers

Cited multimedia

- McCampbell M. "Trends, opportunities, and challenges in digital agriculture: Repeating cycles or iterative progress?"
- Digital Village Initiative Knowledge Exchange Platform Tutorial video. FAO.
- Shelton S.W. 2024. Digital inclusion in agroecology: closing digital divides beyond access barriers such as availability & affordability. This presentation was given at the "Training for digital inclusion in agroecology," workshop with the Agroecology Coalition and Agroecological TRANSITIONS Inclusive Digital Tools project (ATDT) on 10 December 2024
- People's Archive of Rural India. 2018. Sturdy cattle that sustain fragile communities: The Poda Thurupu cattle of Telangana