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# Studying a gender responsive vaccine system: retrospective analysis of best methods

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This methodological paper introduces four projects, all of which aimed to increase women's engagement in and benefit from the livestock vaccine value chains of small ruminants and poultry by improving women's empowerment and supporting women's access to animal health services. All four projects used a mix of qualitative and quantitative research methods to understand the livestock vaccine system. Despite these shared aims, selected value chains, and research methods, the projects took different approaches to understanding the technical barriers for women's engagement and benefit, women's empowerment in the areas where they work, the policy landscape and implications, and gender norms of the societies where they work. The goal of this paper is to introduce the four projects, describe each project's distinct research approach, and compare across projects how various qualitative and quantitative research methods contributed to understanding four elements which we identified as necessary for a fully functioning, gender responsive vaccine system: technical aspects (acumen/flow/effectiveness), women's empowerment, policy environment, and gender norms.

KEYWORDS

**gender analysis, livestock vaccine value chains, research methods, animal vaccine systems, women's empowerment**

## 1 Introduction

Women's empowerment (WE) is increasingly at the center of international development policy—not just as a means to an end, but as an end in itself (Kabeer, 2003). Empowering women is heralded as essential to reducing poverty and improving the health and wellbeing of future generations. Women make up one half of the human population, yet they suffer gross inequalities: gender gaps in income and human capital persist despite rapid improvement in global living standards and educational attainment, and women continue to disproportionately bear the burden of unpaid care work and be subject to gender-based discrimination and violence (Marphatia and Moussié, 2013; Jayachandran, 2015; Cuberes and Teignier, 2016). Gender inequalities continue to limit agricultural and livestock productivity, in part due to social, cultural, and economic factors which prevent women from accessing the resources and benefits of research for development programs (Kantor et al., 2015; Quisumbing et al., 2015). Studies have shown that improved agricultural technologies have been limited in reaching women (Gebre et al., 2019). In the case of livestock, for example, animal vaccine systems reach men only, even in the case of vaccines for chicken and small ruminants – which are generally controlled

by women. Generally, women often cannot appropriately access the animal health inputs (e.g., vaccines, information, medicines) necessary to keep their animals healthy which in turn are necessary to secure nutrition for their family (e.g., Enahoro et al., 2021). Furthermore, the extent to which women can *use* these technologies to improve their lives is dependent on various socio-cultural, economic, and technical barriers that impede women's empowerment and gender equality in agricultural and livestock systems (FAO 2023: https://www.fao.org/3/CC5060EN/online/status-women-agrifood-systems-2023/chapter1.html). Gender norms are behind much of this gender-based discrimination in livestock. Gender norms are spoken and unspoken rules that establish what is appropriate for a woman or a man (across other individual characteristics such as age, ethnicity, and religion etc) to do, say, access, own, benefit, and claim in livestock (Galiè et al., 2022). They change by context. They affect the daily lives and life outcomes of each individual (Cislaghi and Heise, 2020). Yet, very little is known about gender norms, particularly in the context of livestock.

Livestock vaccine research for development has predominantly focused on the technical aspects of vaccine development, distribution, and adoption, with relatively limited attention paid to the socio-cultural circumstances that may affect vaccine adoption and utilization. Instances in which gender issues have been integrated into the research have been marginal at best. Yet, the limited sex-disaggregated data and gender analysis available have allowed to understand women's perceptions of vaccines or rates of vaccine adoption (Waithanji et al., 2015; Jumba et al., 2020).

In 2018, the Livestock Vaccine Innovation Fund (LVIF), which is a unique, multi-funder partnership between the Bill & Melinda Gates Foundation, Global Affairs Canada, and Canada's International Development Research Center (IDRC), issued a call to researchers for cutting-edge research that would inform agricultural and livestock health policies in low-and middle-income countries (LMIC). The call targeted women's strategic positioning to effectively participate in and benefit from animal health systems for increased livestock productivity and improved household food security. Four research projects across six countries were selected and initiated in 2019. Collectively, they aimed to strengthen the evidence base on how rural women in LMIC can better participate in and benefit from the livestock vaccine system and to address the myriad barriers women face in engaging the livestock system.

All four funded projects aimed to increase women's engagement in and benefit from the livestock vaccine value chains of small ruminants and poultry; each aimed to improve women's empowerment; and all used a mix of qualitative and quantitative research methods to understand the livestock vaccine system. Despite these shared aims, selected value chains, and research methods, the projects took very different approaches to understanding the technical barriers for women's engagement and benefit from animal health services and livestock value chains overall, women's empowerment in the areas where they work, the policy landscape and implications associated with women's empowerment, and gender norms in the societies where they work. The goal of this paper is to introduce the four projects, describe each project's distinct research approach, and compare across projects how various qualitative and quantitative research methods contributed to understanding four elements that we identified as necessary for a fully functioning, gender responsive vaccine system: technical aspects, women's empowerment, policy environment, and gender norms.

The paper is structured as follows: we provide a Background section to introduce the issue of gender-responsive animal vaccine systems, the LVIF program and the cohort of projects that were selected within the program, and the project's overall rationale for the approach chosen to deal with gender-responsive animal vaccine systems. In the Materials and Methods section we introduce the overall scientific methodological approach adopted by the four projects, the methodology adopted to write this article, and the four projects in detail. In the Results section we show how effective each method adopted by the project was to explore one of the four chosen key elements of a vaccine-responsive system. In the Discussion section we engage with the main learnings that emerged from the results: the value of mixed methods, best practices for qualitative research and challenges, opportunities for learning across the four projects. We then Conclude the article.

# 2 Background

## 2.1 Evidence

Women's empowerment within the livestock system has gained increasing traction, particularly in the fields of nutrition and food security. Women's empowerment is identified as an essential pathway from agriculture to nutrition, and specifically from livestock to nutrition (Ruel et al., 2018; Chen et al., 2021). The unique ways that livestock development supports women's empowerment, and *vice-versa*, have been highlighted, as well as the way their interaction contributes to both better livelihoods and increased gender equity (Njuki and Sanginga, 2013; Galiè et al., 2022). Yet, women continue to face numerous barriers to engaging in and benefiting from the livestock system, including the livestock vaccine system (Acosta et al., 2019; Dominguez-Salas et al., 2019; Mutua et al., 2019). Also, women have remained peripheral to research for development that focused on livestock; gender analysis and approaches have been used to understand women's roles and their potential to increase production and efficiency, but progress towards women's empowerment has not been the focus of research or development efforts (Njuki et al., 2013; Chanamuto and Hall, 2015).

## 2.2 Call for research

Recognizing the challenges and missed opportunities highlighted above, in 2018, women's empowerment was the entry point of a call for research with the goal of achieving gender-responsive vaccine systems. Specifically, LVIF aimed to increase women's participation in and benefit from livestock systems, focusing on women not only as users of vaccines but also as service providers, entrepreneurs, or other actors across the livestock vaccine value chain (LVVC). The latter includes vaccine manufacturing, distribution, extension services, awareness creation, training, microfinancing, business development support services, and vaccine utilization. The call aimed to fund research that filled four identified gaps with respect to women and livestock vaccines:

- Women's limited knowledge of diseases and the use and benefit of vaccines for improved livestock productivity;

- Inadequate information on socio-cultural, economic, and technical barriers that impede women's effective participation in and benefit from the vaccine supply chain;
- Lack of gender mapping and identification of gender-specific opportunities for women along the vaccine supply chain; and
- Inadequate tools for understanding and addressing barriers and opportunities for women livestock health and extension workers.

LVIF provided a research for development opportunity to: capture gender issues relevant to livestock vaccine systems; position women's empowerment as a leading rationale and pathway for access to animal vaccines; and develop methodologies combining "technical interventions" (such as, for example, the improvement of the cold chain) with "women's empowerment strategies". Importantly, LVIF provided a unique opportunity to compare methodological learnings on women's empowerment and animal health across four research for development projects in six LMIC. This was augmented by the fact that all projects chose to focus on the same species (chicken and goats) and adopted one quantitative tool but diverged in their choice of qualitative tools. The richness of methodological learnings and their performance in exploring our chosen research topics are the focus of this paper.

## 2.3 Funded projects

Building on their past experience and lessons learned on the integration of gender considerations into development research (Wong et al., 2018), IDRC funded a cohort of four projects.[1] Working in six countries (Kenya, Ghana, Nepal, Senegal, Uganda and Rwanda) and comprised of over 85 applied researchers, 80% of whom are women, the set of projects, which completed between and August of 2023, are tested gender focused women-centered models and interventions along the LVVC. Envisaged results include increased decision-making, increased access to and control over resources, enhanced voice and representation in development, increased representation in business and animal health, and increased delivery and use of livestock vaccines. In addition, the projects are creating knowledge and awareness of the institutional requirements for livestock vaccine delivery systems that are responsive to the needs of both women animal health service providers and women farmers. Finally, the projects are working at multiple levels, ranging from community engagement to national policy, to affect change.

## 2.4 The rationale of the project approaches

Through better understanding the impacts of gender, intersectionality, and other site/country specific characteristics (socio-economic, technical, political) in relation to women's entry into, effective participation in and benefits from the livestock vaccine system, and by testing ways to remove barriers faced by these women, the funded research aims to improve acceptance, access, and adoption of livestock vaccines. Simultaneously, improved access and uptake of livestock vaccines, and corresponding increases in animal production and productivity will enhance women's empowerment. As such, all four projects aim to improve women's empowerment, both as a goal in and of itself, and as a mechanism for creating an inclusive, equitable, and efficient livestock vaccine system that ultimately can reach both women and men livestock keepers.

Tackling complex issues like gender-inclusive livestock vaccine systems (and how to institutionalize them) requires a deliberate, systematic, and ongoing focus on change. It also requires commitment to solving essential problems that impact women and marginalized people. It requires going beyond gender analysis to address the social and gender norms, attitudes, behaviors, power relations, and social systems that underlie and entrench gender inequalities. This means engaging with the political dimensions of women's empowerment and requires rigorous effort and resources to achieve change. It also means engaging social scientists, rather than the technical experts who are typically engaged in vaccine research.

In the contexts chosen by the four projects, animals belonging to women and marginalized groups are less likely to be vaccinated. The four projects look at all of the factors that combine with norms and technological and logistical approaches to understand possible points of entry for changing this reality. Gender intersects with other factors (like age, caste, ethnicity, location) and is mediated through socio-cultural norms and practices (like who does the domestic chores, who makes decisions on different things) that ultimately prevent (many) women's animals from getting vaccinated. The research designs in all projects emphasize transforming social roles, relations and power dynamics at different nodes of the value chain among different actors.

All projects undertook gender-sensitive analysis: they explored women's disadvantaged access to animal health services by studying the gender dynamics and norms behind such disadvantage. All projects aimed to develop and test a model of animal vaccine system that responded to the identified gender-based disadvantage women faced. Finally, all projects adopted a transformative approach to respond to such disadvantage: they engaged with discussing, questioning and changing constraining gender norms at various levels, from the household all the way to policy making (e.g., Wong et al., 2019).

# 3 Materials and methods

## 3.1 The methods used by the projects

The cohort use some common approaches and tools, including prioritizing participatory approaches, involving community-as-partners, and network building approaches that encourage community resilience in the face of shocks. Through these networks, research teams and partners were able to support the communities in which

1 LVIF deliberately funded a cohort of projects. Members have come together at regular intervals to exchange and share learnings, aiding in generating comparable results that can have greater impact and policy influence, as well as creating opportunities for capacity building and learning activities. Members of the research teams have come together through Annual Learning Meetings, bi-monthly Community of Practice (CoP) meetings, and targeted skill workshops. Turn out to meetings was high (85–92%). Additional workshops and seminars were organized based on need and opportunity. Authors on this paper represent all four funded projects.

they operate throughout the challenges presented in 2020–2021 by the COVID-19 pandemic. All research teams used traditional research methods, such as interviews and focus group discussions, which target participants by gender and other important societal powerlines (e.g., caste and ethnicity, etc.), to highlight how gender and other social factors affect the access and use of livestock vaccines. Another shared approach is participatory stakeholder mapping to identify critical partners for the projects, their desired change, and the support required of each to bring about the desired change. Different actors map out their current roles in the LVVC, then discuss laws, regulations, culture and customs, attitudes, and expectations. Opportunities and barriers for different stakeholders to engage women in the LVVC are mapped and gender capacities assessed for each participant. The resulting maps highlight the different players in the LVVC in each country, what role they play and how they are linked (see McKune et al., 2021). A final research tool used across all four projects, but less widely used in other research, is the Women's Empowerment in Livestock Index (WELI) (Galiè et al., 2018; Ferrari and Galiè, 2020). The WELI is a survey tool designed to gather qualitative and quantitative data to evaluate and better understand which livestock interventions increase women's empowerment with the overall goal of contributing to a food secure and gender equitable future in rural communities where livestock farming is the main activity (Omondi et al., 2022).

Qualitative analysis in all projects was conducted as follows: fieldwork notes were reviewed regularly for constant comparison and triangulation. These and any audio recordings were translated and transcribed then checked for quality with the enumerators. Teams of scientists then coded the notes using a code book developed on the basis of each project research questions as well as new codes that emerged from the discussions themselves. Content analysis was used to identify patterns across the codes which were used to answer the research questions.

Other research approaches and tools are specific to the project(s). Three of the projects use Outcome Mapping, which is a participatory approach and set of tools that helps map specific stakeholders that a project or program intends to target, and monitors and measures the changes in behavior, actions, or relationships that can be influenced by a project or program (Gannaway et al., 2022). One of the projects uses a Social Learning process. This approach is used to raise awareness about social and gender constraints and allow different actors in the value chain to talk about them and come up with solutions. Research methods used within this approach include Photovoice, community gender dialogues, gender champions, focus meals, comics, and delivery of soft skills trainings. A full overview of methods used by each project is included as Table 1. Overall, the projects used a combination of international (the project research teams that led the fieldwork and analysis) and local expertise (the enumerators hired to conduct the fieldwork) to conduct the interviews. In one project, COVID-19 prevented the project research team from participating in the baseline fieldwork: the team had to train a local team of enumerators remotely. In the case of the other three projects both project research team and local enumerators conducted the fieldwork. The project research teams, including senior and junior researchers, analyzed the data and interpreted it together with the local partners and in consultation with the local enumerators.

## 3.2 The approach used for this article

As part of the collaborative cohort model, IDRC convened representatives from the four LVIF funded projects and facilitated a dialogue about methods – which ones worked, why, and for what purpose. The evidence that emerged informs this article. These facilitated sessions engaged participants in discussion about the key elements of a fully functioning, gender responsive livestock vaccine systems. The animal vaccine adoption literature recommends addressing four components to enhance animal vaccine adoption: technical considerations, policy components, involvement by the private sector (local and international), and innovation (Donadeu et al., 2019). IDRC has used findings from Gender at Work (Rao and Kelleher, 2005) to develop their gender strategy for animal vaccine systems, which includes four domains of change: consciousness and awareness raising; informal cultural norms and deep structures; formal policies, laws, and institutional arrangements; and access to resources (IDRC, Four Domains of Change, IDRC GESI Programming Framework, shared May 2022). While across the projects we engaged in all seven dimensions, in this paper we focus on the four elements that we considered to be key for a discussion on research methods: technical functioning, women's empowerment, policy components, and gender norms.

To explore how each project's methodology performed in exploring the four elements above, we undertook the following steps. We asked each project representative among our authors, to discuss with their project research teams (projects included also private and public sector and development partners that were not involved in research implementation) about their experience in applying the methodology when studying each of the four elements, and write them up. The guiding questions used for this discussion were: main definition used for each of the four elements being analyzed; most effective methods and approaches; drawbacks and lessons learnt on methods; what aspects need to be better understood in this topic; suggested improvements to the approaches adopted. Four other authors were then assigned one of the four elements and tasked to collect the write-ups from each team and summarize them. The authors then, identified patterns that emerged across these write-ups – in terms of what was common or different among tools and approaches and in relation to the topics explored – and developed the Results paragraphs. Our Results therefore show the methodologies used by the four projects to explore each of the four elements of a gender-responsive vaccine system. Finally, we looked for patterns across the four result sections and discussed their significance for an overall learning about the performance of these methodologies in our research. The learning that emerged rotated around 3 themes: the value of mixed methods methodologies; best practices for qualitative research; and opportunities for cross-project learning. This is what informs our Discussion section. Below we provide an overview of the four projects that is necessary to contextualize the methodologies they adopted.

# 4 The projects

In this section, each of the four funded projects is briefly described. Additional information is provided in Table 1.

TABLE 1 Methods used across four projects to examine women's empowerment in livestock vaccine value chains.

| Project *Country location and targeted vaccine value chain* | Research Tool | Type of research | Target audience for the method | Element of vaccine system evaluated *Technical (T); Women's empowerment (WE); Policy (P); Gender norms (GN)* | | | | Notes on overall project approach |
|---|---|---|---|---|---|---|---|---|
| | | | | T | WE | P | GN | |
| **SheVax**<br>Rwanda, Kenya, and Uganda<br>Rift Valley Fever/Newcastle Disease (ND) Rwanda<br>Peste des petits Ruminants (PPR)/ND-Uganda<br>Contagious Caprine Pleuropneumonia (CCPP)/ND-Kenya | Value chain analysis | Qualitative | National gov't, NGOs, Vet vax distributors manufacturers and retailers, deliverers banks (LVVC actors) | x | x | x | x | Testing two models for vaccine adoption: (1) A women centered private sector delivery (entrepreneurship) model (Training Animal Health service providers as entrepreneurs and service providers for livestock vaccine delivery) and (2) a demand creation model; (increasing access to livestock management, animal health, vaccine and gender information in order to increase demand for vaccines)<br>Also testing the effect of gender awareness and transformation activities with AHS providers/LVVC critical partners and farmers results in any changed behavior?<br>Capacity building among public and private veterinary services in both animal health and gender transformation.<br>Creating a systematic support network for women with support from critical partners such as govt, private sector |
| | Women's Empowerment in Livestock Index | Quantitative | Farmers-at the end user level | x | x | | | |
| | Outcome Mapping | Qualitative | Govt, LVVC actors | x | x | x | x | |
| | Focus Group Discussions | Qualitative | Women and men farmers | x | x | x | x | |
| | Key informant interviews, semi-structured | Qualitative | AHSPs, shop owners, govt, LVVC actors-vaccine manufacturers, distributors, deliverers | x | x | x | x | |
| | Focus meals | Qualitative | Farmers/agrovets | x | | | X | |
| | Jar voices | Qualitative | Farmers/agrovets | x | x | | | |
| | Vaxxer calendars | Qualitative | Farmers, local gov | x | x | x | | |
| | Photovax | Qualitative | Farmers, LVVC actors | x | x | x | X | |
| | VacZines | Qualitative | Farmers and LVVC actors | x | x | x | X | |
| | Comic books | Qualitative | farmers/children | x | | | x | |
| **GIVE**<br>Kenya<br>Contagious caprine Pleuropneumonia<br>Newcastle disease | Value chain analysis | Qualitative | LVVC actors | x | | x | | Testing two different vaccine delivery models (Demand driven model and a community vaccinator driven model) with targeted educational components of vaccine delivery and leveraging on the power of collectives to see which one best addresses gender-based constraints and social norms that prevent women from accessing, using, and benefiting from livestock vaccines. |
| | Participatory mapping | Qualitative | Farmers | x | x | | x | |
| | Focus group discussion | Qualitative | Farmers | x | x | | x | |
| | Semi-structured interviews | Qualitative | Farmers, LVVC actor, local government | x | x | x | x | |
| | Outcome mapping | Qualitative | Farmers, LVVC actors, local govt | x | x | x | x | |
| | Household survey | Quantitative | Farmers | x | x | | x | |
| | Gender analysis | Qualitative | Farmers | x | x | | x | |
| | Women's Empowerment in Livestock Index | Quantitative | Farmers | x | x | | | |

*(Continued)*





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TABLE 1 (Continued)

| Project *Country location and targeted vaccine value chain* | Research Tool | Type of research | Target audience for the method | Element of vaccine system evaluated *Technical (T); Women's empowerment (WE); Policy (P); Gender norms (GN)* | | | | Notes on overall project approach |
|---|---|---|---|---|---|---|---|---|
| | | | | T | WE | P | GN | |
| **Women REAR**<br>Ghana | Value chain analysis | Qualitative | Vet directorate, importers, distributors and retailers. | x | | x | | Testing two approaches for vaccine delivery—one gender accommodative and one gender transformative—by adapting CARE's Gender Transformative Farmer Field and Business School approach to facilitating women's sustained involvement in livestock vaccination. |
| | Rural Household Multi-Indicator Survey (RHoMIS) | Quantitative | 20 villages with 500 respondents | x | | | | |
| | Women's Empowerment in Livestock Index | Quantitative and qualitative | 20 villages with 493 women respondents and 92 men respondents (tot 585) | | x | | | |
| | Women's Empowerment in Livestock Business Index | Qualitative and quantitative | 21 women and 4 men (tot 25) | | x | | | |
| | Focus Group Discussions | Qualitative | 130 women and 71 men farmers (TOT 201) | x | x | x | x | |
| | Key Informant Interviews | Qualitative | 7 Women and 8 Men incl lead farmers, AHSP, mobile service providers (TOT 14: 7 men and 7 women) | x | | | x | |
| | Experiential learning | Qualitative | AHSPs, women farmers | x | | | x | |
| | Scaling scan | Qualitative | Staff, government (department of agriculture) | x | x | x | x | |
| | Outcome mapping (progress marker monitoring) | Qualitative | Women and men farmers | | x | | x | |
| | Voice messages to farmers | Qualitative | Women farmers | x | | | | |
| **LIVT**<br>Nepal, Senegal, and Uganda<br>Newcastle Disease<br>Peste des petits Ruminants | Value chain analysis | Qualitative | Key stakeholders at all nodes of livestock vaccine value chain (LVVC) | x | x | x | x | To develop and test a Gendered Intersectional Transformative Approach (GITA) to understanding and addressing issues of intersectionality on women's involvement in the livestock vaccine distribution chain. |
| | Gender analysis | Qualitative | n/a | x | x | x | x | |
| | Women's Empowerment in Livestock Index | Quantitative | Men and women pairs at >111 households per country | | x | | | |
| | Household Survey | Quantitative | >111 households per country | x | | | x | |
| | Semi-structured interviews | Qualitative | National level stakeholders, policy makers, key actors at all nodes of LVVC, community animal health workers | x | x | x | x | |
| | Focus Group Discussions | Qualitative | Community animal health workers and livestock holders | x | x | | x | |
| | Participant observation | Qualitative | Livestock holders | | x | | x | |





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## 4.1 GIVE

The Gender inclusive Vaccine Ecosystem (GIVE) project set out to test two different vaccine delivery models: a demand driven model and a community vaccinator driven model. The project targeted educational components of vaccine delivery and leveraged the power of collectives to see which model would best address the gender-based constraints and social norms that prevent women from accessing, using, and benefiting from livestock vaccines. This study was carried out in the Eastern part of Kenya and focused on indigenous chicken and small ruminant value chains. With a focus on Newcastle Disease (ND) and Contagious Caprine Pleuropneumonia (CCPP) vaccines, the project aimed to layer the benefits gained from poultry vaccinations to economic empowerment of women, by increasing their asset base and purchasing power, including purchase and ownership of small ruminants, and improvements of household nutrition. One unique aspect of this project was working with both men and women cooperatives/groups to leverage the power of collectives in access to resources and markets.

## 4.2 SHEVAX+

SHEVAX+ was a multi-country project carried out in Kenya, Rwanda and Uganda, which aimed to both empower women and formulate strategies to help them contribute to and benefit from livestock vaccines as entrepreneurs, service and product providers, and livestock owners. It set out to: (1) generate evidence and formulate strategies that help position women to effectively and efficiently contribute to and benefit from livestock vaccines; (2) enhance women's participation in livestock vaccine distribution, delivery, and use; (3) test gender focused models that target specific entry points for women along the LVVC; and (4) provide data and information that impact programmatic and policy interventions. The project focused on ND in poultry, and Rift Valley Fever (RVF), Peste des petits Ruminants (PPR), and CCPP in small ruminants. The overall goal was to improve household well-being (increase livestock productivity, food security, and livelihoods) through women's empowerment in and benefit from the LVVC, which entailed combined social and technical interventions. A scale up component involved testing two gender focused holistic scale up models: Model 1 was a women-centered private sector delivery model for vaccines; and, Model 2 was a demand creation model, to increase livestock vaccine adoption by women smallholder farmers. A training package for legally recognized vaccinators (varied by country, species, and mode) included technical information on goat and poultry management and health; business and leadership; participatory training; and, gender transformation. In addition, livestock sector leaders were targeted for training in gender awareness and transformation, through the Veterinary Faculty, District Veterinary officials, the private sector, and among male and female farmers.

## 4.3 LIVT

LIVT was another multi-country project, which aimed to examine gendered roles and relations in selected poultry and small ruminant value chains in Nepal, Senegal, and Uganda. This project used an intersectional approach to capacity development and developed gendered intersectional transformative approaches (GITA) with key stakeholders to increase women's participation in LVVCs. It set out to identify the main levers and constraints at each relevant node in each of the studied LVVCs and develop an analytical framework that would: (i) identify the most suitable intervention, (ii) point to appropriate modalities for implementation, and (iii) predict efficacy of corresponding interventions under given scenarios. To address these objectives, the project: (1) mapped intersectional and socio-cultural issues in the LVVC and (2) developed and implemented a training intervention with gendered intersectional transformative approaches, and increased engagement and empowerment of women in LVVC. A three-tier train-the-trainer model was developed to establish whether Training of Trainers (TOT) within the existing veterinary/animal health system on GITA for livestock increases women and men's knowledge about vaccines and vaccinations, would lead to more equitable decision-making within households, or enhance the levels of women's engagement and benefits from the VVC. This was with the goal of improved livelihoods, health and nutrition for women, men, and children.

## 4.4 Women rear

The aim of the *REAR* project was to influence practice and policy for a gender-responsive vaccine delivery system to address gaps in relation to several barriers, such as difficulty in access to vaccines, extension services, and information, and gender-blind vaccine delivery systems. It set out to achieve this by: (1) testing two approaches—one gender accommodative and one gender transformative—to develop the vaccine delivery system; (2) identifying institutional requirements for a vaccine delivery system that responds to the needs of both women animal health service providers and women farmers; and (3) identifying capacity needs and gender norms that need addressing for women to benefit from an improved vaccine delivery system. The project sought to provide comparative empirical evidence on the differential impact of gender transformative and accommodative approaches. Gender accommodative approaches recognize gender-based constraints and work around them without engaging with the gender norms that may be causing such constraints; gender transformative approaches, on the other hand, go further by engaging with and attempting to reduce or overcome gender-based constraints by changing constraining gender norms (McDougall et al., 2022). In relation to scaling the project sought to determine how the combination of a social approach (gender transformative approach) combined with a technological approach (strengthened vaccine delivery infrastructure) affects women farmers' access to vaccines, at scale. This involved working with a private company, Cowtribe, who runs a private vaccine delivery platform, to train female lead farmers from the Village Savings and Loans Associations to deliver the i-2 vaccine against ND to members of their groups, carry out PPR and ND i-2 campaigns and vaccinations focusing on NCD and PPR in Poultry and goats with an overall goal to institutionalize gender-responsive vaccine system for enhanced nutrition security and women's empowerment. In relation to scaling, the project sought to determine how the combination of a social combined with a technological approach affects women farmers' access to vaccines at scale.

# 5 Results of our cross-project analysis

## 5.1 Technical barriers

Delivery of vaccines in LMIC is complex and difficult, with numerous logistical barriers that impede delivery, particularly in rural, isolated communities. Successful operation of a gender responsive livestock vaccine system requires significant coordination of people, facilities, and supplies. For this work, we define these *technical barriers* to women's engagement in and benefit from the livestock vaccine value chain as any infrastructure, standard, or procedure that could limit accessibility and utilization of livestock vaccines by smallholder farmers, with particular attention given to women farmers.

Research teams engaged a variety of methods to understand these technical barriers, including literature review, outcome mapping, key informant interviews (KII), focus group discussions (FGD), in-depth interviews, and household surveys. One team used these methods to engage in experiential learning, particularly with implementing partners. Though projects used a mix of quantitative and qualitative research methods, the value of qualitative research to understanding technical barriers was highlighted by all research teams. Engaging actors across the value chain – from high level stakeholders (those with the power to create change), through institutional actors active in the value chain (private sector, NGO, and government actors), down to community level perspectives – qualitative research methods yielded important insights. Technical barriers that emerged across the four projects largely parallel those articulated in the literature on vaccine access in low-and middle-income countries (LMIC) (Campbell et al., 2018; Danton and Titus, 2018; Bikaako et al., 2022; Kyotos et al., 2022). These included a lack of cold chain, issues around vaccine dose/packaging size, lack of training, targeting of male heads of household (HOH), lack of information sharing, and a lack of women veterinary service providers.

Though qualitative methods do not appear to have revealed any new technical barriers, all research teams indicated that by exploring technical barriers through qualitative research they were able to better understand the socio-cultural mechanisms behind technical barriers. For example, through focus group discussions and other qualitative research methods across Nepal, Uganda, Senegal, Ghana, Rwanda and Kenya, the widely held belief that women are unable to handle and vaccinate large or small ruminants emerged consistently. In discussions with women and men, both described women's lack of strength and smaller size as a limitation to their ability to handle livestock in a way necessary for veterinary care. By using qualitative research to understand the vaccine value chain, gender norms that limit women's exposure to, comfort with, and interest in veterinary medicine, thereby affecting the pipeline of women *into* veterinary services, were revealed. In other examples from Kenya, qualitative research revealed significant use of and trust in traditional herbal remedies, as well as a generally held belief that indigenous chickens do not need to be vaccinated. Such context specific beliefs and practices, which can significantly limit vaccine seeking behaviors, emerged during qualitative research engagement with participants about the mechanisms behind technical barriers to vaccination. These realities likely would not have been captured without prior in-depth engagement with the farmers, allowing for modification and adaptation to how questions were asked and probed.

Limitations to utilizing such qualitative methods to understand the technical barriers surrounding livestock vaccine uptake are consistent with difficulties documented in the literature on any qualitative research: time and costs associated with data collection and proper analysis (Devers and Frankel, 2000; Flynn et al., 2018; Vindrola-Padros and Johnson, 2020). A number of teams documented the inexperience and/or cultural discomfort of data collectors asking "why" or probing sufficiently to fully understand the areas of inquiry. One team noted the distinct advantage of pairing an animal science/veterinary expert with an experienced social scientist during data collection. The team found this to be a major advantage to ensuring that: (1) the questions and engagement were technically sound; and (2) the research approach, probing, follow-up, and documentation were all conducted with rigor to garner the information sought. Important cross-learning between the two spaces occurred through such team composition. Finally, context-specific expectations around participant selection, engagement, and compensation for participation in what were widely perceived to be development projects, even when introduced explicitly as research projects, present a major barrier in quite a few contexts. When participation requires more time or follow-up, as is the case often with qualitative research, that barrier may be exacerbated.

Most research teams found that the methods used to understand technical barriers did improve their understanding. When asked what they would do differently next time, most teams' responses focused on refinement or increased reliance on qualitative methods. Specifically, teams mentioned more in-depth interviews and key informant interviews, better organization of data and coding, and more targeted recruitment and training of experienced qualitative data collectors to reflect gender, ethnicity, or caste of participants, particularly during focus group discussion.

## 5.2 Women's empowerment

Discussing and understanding local meanings of empowerment is important for projects that adopt women's empowerment as their goal, to appreciate locally valued conceptualizations and prioritized domains. This can help projects better shape their interventions to be locally relevant, and, also, it can help project staff and participants to come to a common understanding about the project goal. Equally important is to explore how project participants experienced changes in empowerment brought by the intervention to identify how such processes of change may play out for different people and further refine the interventions.

All four projects independently decided to adopt Kabeer's definition of empowerment at the project outset. This definition is also used by the UN and informs SDG5.[2] Such definition is associated with the ability to make strategic life choices where this ability was previously denied (Kabeer, 1999). All four projects explored the local conceptualizations of empowerment but with various foci: one project explored individual versus group conceptualizations; two explored conceptualizations of empowerment and disempowerment when applied to women and men, and when referring to livestock keepers

2 www.un.org

in particular; and one project focused on how gender intersects with other social markers (specifically caste, livelihood, and ethnicity) to shape conceptualizations of empowerment. On these bases, all the projects identified various domains of empowerment to support in their intervention and to explore further in the associated research. These domains included: access to and control over assets and resources (with a focus on animal vaccines; information); access to and control over opportunities (e.g., training and marketing); gender roles, responsibilities and time use; laws, policies, regulations; informal practices and norms; patterns of power and decision-making; and stability in one's family.

The methods used for exploring local perceptions of empowerment included FGD and KII (included in the WELI or separate), both of which were implemented with livestock keepers, animal health service providers, and policy makers, using various participatory and visual approaches. Changes in the empowerment of women and men livestock keepers were measured quantitatively through the WELI by all four projects. One project used the Women's Empowerment in Livestock Business (WELBI) in Ghana to measure changes in empowerment of livestock "agri-preneurs," rather than "livestock producers" which is the focus of WELI. Exploring local perceptions of empowerment (using the qualitative WELI as well as FGD) was found by all four projects to be important to identify local priorities for women's empowerment, to understand their nuances, and to gain insight on some of the norms associated with women's empowerment. Focus group discussions were a good approach to elicit various points of view and explore in-depth experiences of empowerment also as affected by intersectionality. They also helped highlight possible barriers to achieving the project's goal. In Senegal, for example, early efforts to conduct FGD revealed that any conversation introduced as one that would engage or address "gender" would be misconstrued as one engaging sexual identity. Key informant interviews were found by one project to importantly complement FGDs by allowing for some of the issues that emerged during FGDs to be explored more in depth and from an individual's perspective, in a private and "safe" space. Visual and pictorial tools utilized both by the facilitators and the respondents were found by the four projects to help effectively explore the status quo (e.g., gender division of labor and decision-making patterns) and highlight its gender-based disadvantage. One project found that by not explicitly challenging the norm that the husband is the *de-facto* decision-maker and head of the household, they were able to keep discussion open. One project found that designing qualitative research (FGDs in particular) in such a way as to control for important stratifications of social identity (race, ethnicity, caste, livelihood) allowed for important understanding about the different ways that these factors intersect with gender identity to limit or enhance empowerment. The WELI was then used to understand the distribution of empowerment quantitatively across these groups. Such a combination of methods was found to be very important by two projects, in particular, in terms of understanding how to advance women's empowerment through livestock. The qualitative component helped discuss local meanings and valued domains of empowerment, and experiences of how livestock could provide a pathway towards women's empowerment. The quantitative component then provided evidence of which pathways were effective in affecting change in which specific domains of empowerment. One project utilized the WELI to identify correlations between animal vaccines and domains of women's empowerment at baseline. This helped identify promising pathways to be supported through the project's intervention. Therefore, combining qualitative research methods with the quantitative WELI component was found to be important and complementary to understanding the quantitative findings.

Lack of familiarity with the term "empowerment", although an important research finding in itself, entailed some methodological difficulties. In one project, it was time consuming to get the respondents to familiarize themselves with the concept and come to an agreement about its local meaning. In other projects, the respondents conflated "gender and empowerment" with "income generating projects for women," and, despite the project team introducing a wider working definition of empowerment (Kabeer's), many project participants reverted to their original shared understanding of the term. The narrow definition by local policy makers and the short time frame of the project may have augmented this discrepancy between project and participants' view on empowerment. In yet another project, lack of familiarity and comfort with the term empowerment, by both project enumerators and respondents, resulted in enumerators shaping the exploration of local meanings of empowerment to reflect standard definitions (such as individuals' capability for self-determination) rather than eliciting local conceptualizations. This reduced the insights gained by the fieldwork and the ability to interpret the WELI results in the local context. COVID-19 was identified as the main reason for this drawback, as the research team was not able to engage in fieldwork and had to train a team of enumerators remotely and with poor internet connection. Low quality of qualitative findings, however, was also experienced by a project that conducted in-person training of enumerators. COVID-19 limited the number of participants who could attend trainings in a second project. This in turn limited the number of people who could be involved in each of the six project intervention sites where the trainings were conducted.

The WELI tool had just been developed when the projects started. This meant that its adoption required a lot of capacity building for the enumerators in implementation and for the researchers when coding and then computing the index. The length of the tool was identified as a problem by all projects, because participants lost interest over the period they were engaged, and the quality and validity of the responses may have been affected. Ethical considerations about the time burden of long interviews were also raised as an important concern by all research teams.

Local gender norms held by enumerators and respondents alike created errors in the identification of "spouse" and "main respondent" in the quantitative WELI (see section on gender norms). These norms also made it very difficult, particularly for young women enumerators, to ask some questions to older and male respondents. Social norms surrounding ethnicity held by both enumerators and the communities they engaged made discussions difficult to undertake in one project; problems arose when the team failed to recruit field teams representative of the ethnic group targeted.

The projects identified the following methodological considerations for improving empowerment research: how to better combine quantitative and qualitative tools; explore relational aspects of empowerment; link empowerment/gender norms; study women's empowerment in One Health; appreciate reasonable timeline for changes in empowerment. Other considerations identified by team members included the need for strategies to create a better perception

of empowerment among the rural populace and detach empowerment from just financial success; dynamics and role of collective action, including most effective ways to promote groups, without creating passivity/dependence on an outside facilitator; role of religion and how to best engage with religious leaders; how to engage with community norms vis-à-vis empowerment and deal, for example, with potential backlashes of interventions focused on women's empowerment; elements of supportive environment for empowerment, such as mentorship.

When asked about how to improve the research methods, tools, or approaches to better understand empowerment as an element of a fully functioning vaccine system, one project suggested that, given empowerment is locally and contextually perceived but globally and institutionally influenced, Action Learning may be a good approach to generate local solutions to empowerment while ensuring sustainability of the approaches adopted. The higher costs and expertise required to implement Action Learning often limit its use. Some staff from another project argued that the nature of the empowerment intervention needs to shape the type of methodology adopted: that not all projects need both quantitative and qualitative. Others from the same project, however, believed mixed tools to be an advantage regardless. Adopting a reduced version of the quantitative WELI was considered by all projects to be important for future research on women in livestock.

## 5.3 Gender norms

Norms are the societal rules that govern behavior, identity, and roles, determining what is acceptable within a group of people. Norms can be formal or informal, visible or invisible, explicit or implicit. Gender norms are norms shaped around perceptions of what it means to be a man or a woman at the intersection of other social characteristics (such as age, marital status, ethnicity, caste, religion, and education, etc.). Gender norms consequently play an important role in determining who does what in society and how, and thus can have important implications on the functioning and gender responsiveness of a vaccine system. Gender norms for example, can affect who can be an animal health service provider, who can be a vet, or who can run an agro-vet shop. They can also affect the access and use of resources needed for such jobs. Women's inability to ride a motorbike and use public means of transport, for example, *de facto* limits their ability to work as animal health service providers.

LVIF research teams engaged in a number of different methods to understand gender norms in the areas where they worked. Data collection methods included participant observation, FGD, KII, stakeholder mapping, and a suite of community based participatory research tools, including but not limited to a 24 h time use, power mapping of actors, gender tree of hopes and dreams, and access/control/benefit profiles. In some cases, norms that local staff could identify were used to explore how norms change, where they stick, and where the points of entry to change might be. In other cases, research tools, such as listing of gender stereotypes and folk sayings audio-recorded role-plays or vignettes where characters challenged the norms, were used as points of entry to explore participants' thoughts and reactions. Participants included men and women community members, lead farmers, animal health service providers (across scales, from community animal health workers, through private veterinarians), and other actors at higher nodes of the vaccine value chain (government officials within the state veterinary service, vaccine manufacturer, etc.).

The research methods yielded findings that were generally consistent with existing literature and revealed the gender norms and their resulting constraints on women's full engagement in the vaccine value chain (Njuki and Sanginga, 2013; Hillenbrand and Miruka, 2019; Galiè et al., 2022). Gender norms which emerged in multiple countries included the following: women do not physically/actively participate in the sale of livestock (must be done via a spouse or male household member); men are the head of household; women are responsible for domestic work; men are responsible for finances and women are financially dependent on men; women are not supposed to deal with livestock; women do not contact or call animal health services; women do not move around town independently particularly at night.

Certain methods allowed for different types of insight, with qualitative methods, including PRA, individual interviews, focus group discussion, and participant observation, emerging as the spaces in which important, otherwise missed insights and understanding about gender norms were gained. Examples include the use of participant observation, which allowed researchers in Kenya to understand the level of involvement and specific conditions under which men, women, girls, and boys participate in small ruminant husbandry and disease management tasks. PRA and in-depth interviews allowed teams an understanding not only of *what* norms exist, but how they change, and the role of men and collective action in changing local gender norms. Finally, in Ghana, in depth interviews allowed researchers to understand specific norms limiting women's engagement in veterinary services, including the perception that when menstruating, women have a negative effect on livestock fertility. These findings underscore the necessity of qualitative methods in understanding gender norms. While some, but not all, of these norms were known to the local team members, their exploration through qualitative research is an important component of approaches that attempt to create more conducive norms: awareness of the local cultural beliefs that affect women and men in livestock because of their gender is a necessary first step to change them.

The execution of qualitative research methods was easier in some areas than others; the major determinant being whether a participant was pressed for time. In rural areas at calendar moments when people were overall less time constrained, many were willing to sit and engage in lengthy in-depth interviews. Such discussions are essential to distill gender norms that are not immediately identified by respondents as such and need lengthy conversations. Moreover, men and women in many of the study areas engage in activities separately, in some areas because of religious tradition, in others simply because of gender norms. Thus, separating men and women for FGD, PRA, or other research methodologies was appropriate and easily achieved. Multiple teams noted that the community/communal tradition of much of sub-Saharan African and South Asia yields a level of comfort in dialogue in a group setting that likely facilitated discussion and engagement about what "should" happen. These methods worked well in these contexts to understand the collective experience or attitude. This reality underscores two additional findings. First, there is a significant need

to proactively investigate and utilize other intersectional factors, such as ethnicity or caste, to disaggregate participant groups and ensure they are comfortable interacting and expressing their viewpoints in the presence of others. Second, while the group settings and cultural norms around the collective create a support environment for understanding what people are "supposed" to do, one-on-one methods, such as in-depth interviews may be better tools for seeing how people work around norms. This type of "deviant behavior" was less forthcoming through group methods.

Barriers to implementing the methods most effective to understanding gender norms were time, expertise, and cost associated with robust qualitative data. Other identified barriers included COVID-19 restrictions on in-person or group gatherings, as well as limited mobility of farmers bringing animals to market/vaccination, where recruitment was originally planned. Finally, it is not always easy to distill norms from a conversation or interview. Respondents are often not aware of norms (in the nature of norms, they are "naturalized" behaviors that become invisible) and therefore it is not possible to simply ask what norms characterize a community. Rather, a conversation needs to get started that sparks reactions to "unusual or unacceptable behaviors", followed by a discussion of whether that norm is social or gender related, and, finally, the discussion of what processes keep those norms in place or allow for change. All researchers heavily prioritized and valued qualitative research methods for inquiry into this element of the vaccine system, but all teams also collected quantitative data using the WELI. No one used methods they saw as ineffective, but teams were able to articulate the strengths of each, outlined above.

While the aim of this section is to understand the use of various research methods to study gender norms, we must also reflect on how these very norms may affect research itself. Perhaps not surprisingly, *all* of the research teams indicated that gender norms affected the utility of certain methods, though to varying degrees. While some teams indicated that the gender norms in their research areas affected the research methods' utility "to some degree"; most indicated a much more decisive role, underscoring that "norms affect everything we do," and that they "absolutely" and "immensely" affect the utility of certain methods. Gender norms determine who will be available and when to engage in research activities. Norms may prevent certain respondents from talking openly about an issue or may simply determine who is engaged. For example, where household members are asked "who is the livestock keeper in your household or the livestock owner," norms may dictate that women be neither, and, consequently, both women and men respondents may indicate that man in the household is both the livestock keeper and owner of the livestock, no matter the variability in practice that may exist. Similarly, the ability to respond to certain questions may be limited by gender norms. For example, in Senegal, the idea that a "spouse" might not be the wife, but the spouse (husband) of targeted women, caused significant confusion among trained data collectors and then participants because of the deeply rooted local gender norm that dictates men are head of household and women are (their) spouse. Other gender norms may limit the utility of certain research methods by eroding trust or openness between the researcher and the participant. For example, when asking about sensitive questions, if gender or other intersectional features (age, caste, ethnicity, etc.) dictate the (in)appropriateness of posing certain questions, then doing so, even as part of a standardized instrument, may limit further engagement by the participant. Awareness of gender norms, going into the research as well as iteratively as they are better understood, is necessary in order for the researcher to ask the question differently and/or probe to explore experienced realities beyond the norm. This requires a high level of praxis and awareness of positionality on the part of the researcher.

## 5.4 Policy

Policy was identified as the final of four essential elements of a gender-responsive animal vaccine system. By this, we are referencing the policies that enable both the technical elements of vaccine production and distribution, as well as those that enable women to engage equitably within the system. As such, much of the research of the four teams into policy focused on identification of both enabling policies as well as policy barriers to women's participation in the VVC. Therefore, this section examines the effectiveness of various research methods used to identify existing legal codes, such as laws guaranteeing gender equality, and to understand how they are implemented and enforced by stakeholders (within and outside the government).

Research teams utilized a variety of methods to identify and understand the policies in each of their countries including literature review, stakeholder workshops, KII, in-depth interviews, and FGD. All four projects began with a literature review of official documents, laws, policies, strategic plans, and available reports and published papers. The "gray literature" of government and NGO project reports was important given that much of what was valuable to understanding the system was not published. Additional qualitative methods were used to understand the complex policy environment, which often spread across multiple ministries, from national to local levels. Most projects used stakeholder workshops or engagement meetings to map policy environment; the gatherings included policy makers, veterinary service providers, relevant shop owners, farmers, and vaccine producers, importers, and deliverers. In all countries, official policies were clarified through engagement with government officials at different levels on a continuous basis during project implementation, as well as through interviews and FGD with actors across the LVVC.

All projects agreed that mixed methods provide a fuller picture of the situation on the ground rather than any one method alone. While desk review of literature and unpublished reports was useful in understanding stated policies, it was through surveys, interviews, and FGDs that projects came to understand the actual regulatory landscape in which the animal vaccine system works. All parties appreciated the use of stakeholder meetings as a research method that facilitated dialogue among those working at different levels of the livestock VVC and the ministry responsible for gender equality—groups who otherwise may have very minimal contact. These stakeholder meetings resembled Innovation Platforms (IPs), or intentional meetings for stakeholders in a particular commodity or value chain to improve function through innovation and increased coordination for mutual benefit.

In terms of challenges, all projects noted challenges specific to collecting data from or engaging in the implementation of programming/training with government officials, especially on gender and social dimensions of a livestock value chain. The time

commitment required for repeated rounds of qualitative research with government officials resulted in research fatigue and a reluctance to continue. In addition, many officials hold extremely busy schedules, and this, combined with the expectation of per diems by officials when engaged in stakeholder meetings, trainings, or other non-research related project activities, further limited government engagement. The normative nature of payment or tangible benefit in exchange for engagement with an international, donor supported project, beyond the compensation allocated and approved for research engagement, created budgetary challenges across projects.

Another challenge was an overall reluctance to exposing failure in the existing system. Cultures varied in how free stakeholders felt to share information on shortfalls, or their comfort with the appearance of criticism or contradiction of national narratives. Veterinary vaccines are highly regulated, with official mandates to prevent infectious disease in livestock, and all countries have national laws ensuring gender equality and women's empowerment. Where the government controls production and access to vaccines, but the demand for vaccine outstrips supply, data are difficult to glean. National reports and rhetoric go to great lengths to paint a positive picture of the current situation. Repeated visits were required with government officials across ministries and levels to tease out which policies covered which animal species; where, when, and why policies are implemented; and when gender disaggregated data are collected or used. Some requests, such as those for the number of vaccines received or used by veterinarians, were simply ignored.

Some projects noted that qualitative methods were incredibly useful for understanding the situation but generated too much data for adequate analysis and comparison, given the size and composition of the team. There were other constraints to collecting qualitative data, stemming mostly from a lack of familiarity with participatory and qualitative research methods. This created barriers for team members from disciplines more traditionally associated with animal vaccines, such as animal science, livestock production, and veterinary medicine. In addition, asking "why" questions was seen as rude in some cultures, such as, for example, Rwanda, where hierarchy is valued, and authorities are not supposed to be questioned.

Research methods employed by the research teams did allow them to understand the enabling policies as well as the policy barriers to a gender-responsive animal vaccine system. Teams valued the mixed-methods approach, using document and literature review, as well as iterative, adaptive, and persistent field methods to understand gaps between policy design and implementation/reality of what was happening on the ground. Drawbacks to using qualitative research included cost and time required, which, while true for the methods in general, were exacerbated in understanding policy, as very often the research participants were government officials.

# 6 Discussion

In this article we analyzed the effectiveness of research methodologies adopted by four LVIF projects that aimed to develop best models for a gender-responsive animal vaccine system in LMIC. Our analysis focused on the way the adopted methodologies and related tools allowed a satisfactory exploration of the four elements that we identified as essential for understanding and developing a gender-responsive animal vaccine system, namely: technical barriers, women's empowerment, gender norms and policy. In that analysis, several categories of tools emerged: new tools that were used to explore issues that were relatively well established (e.g., pictures to explore technical barriers); standard tools that were utilized to study new issues (e.g., FGDs to explore gender norms) and; standard tools that provided new insights on relatively known issues (e.g., FGDs revealing the social mechanisms and gender dynamics behind known technical barriers).

Our discussion is organized around four themes: a. the value of mixed methods methodologies; b. best practices for qualitative research; c. challenges in implementation; d. opportunities for cross-project learning. We discuss each theme below. While we recognize that these themes are relevant for gender analysis in agricultural research more broadly and, in some cases, are simply best research practices or constraints for most research for development, they emerge from and are thus situated in research on livestock vaccine systems, and therefore should be interpreted in that context.

## 6.1 The value of mixed methods methodologies

All teams emphasized that the adoption of both qualitative and quantitative approaches was key. Indeed, mixed methods approaches have been hailed as valuable for understanding the contextual significance of both concepts, such as women empowerment, and processes, such as decision-making. In our research, it was through qualitative methods that the limited agency of women to exercise their voice in shaping final decisions become apparent. This is also demonstrated in other studies (Bonis-Profumo et al., 2022). The potential of mixed methods lies in opening pathways for broader improvements in women empowerment research for development projects in livestock, to elicit unknown realities and advance new initiatives in underexplored areas, including the role of men in nutrition-sensitive programs and the impact of stereotypical gender norms on men and women.

Qualitative approaches are essential for identifying socio-cultural mechanisms behind choice and change (Neale, 2021). They are necessary to explore the complexity of human experiences (with a gender lens, in particular). Such insights are the basis on which sustainable solutions to development challenges can be identified. Specifically, FGD are rich and provide in-depth perspectives that are important in identifying the locally specific pathways needed to achieve gender-transformative development (Rubin, 2016). On the other hand, innovative methods, such as participatory approaches including the use of pictures, play more than double pronged roles: they provide blended research approaches to accommodate women's practical needs, so that women with less formal education can be included in the studies; they create awareness on implicit gender constrains in technology; and, they instigate discussions that challenge gender stereotypes in livestock (Kingery et al., 2016). This supports findings from other gender transformative research which leverages the use of art and pictures to facilitate dialogue and engagement of complex evolving concepts, such as empowerment (McOmber et al., 2021).

Qualitative insights can be freshly interpreted when complemented by quantitative data, which, contrary to qualitative findings, show the relevance of a given issue in the wider population,

the frequency of occurrence, and its size/scope (Maxwell, 2021). Mixed methods entail collaboration between quantitative and qualitative researchers who design complementary studies that, together, provide a fuller response to the question(s) being explored, and an approach to solving identified problems. For example, quantitative evidence can show what gender norms most negatively affects women's access to animal health services across the project areas, and qualitative findings can reveal how that norm is reproduced and why so that effective solutions to change the norm can be found. The LVIF projects highlighted another necessary complementarity for mixed research teams: that of combining social and technical scientists who, together, can better explore the ways in which technologies (such as animal vaccines) interact with local cultures and social systems. Gender researchers, in particular, are needed to explore the complex interplay between technologies and gender dynamics and norms. Clearly, the studies show, gender-based disadvantage is hindering progress in livestock development towards food and nutrition security, and gender equality. Qualitative tools can be used to explore how gender dynamics interact with vaccine systems at various levels from the household to the community, and quantitative tools can identify how widespread or structural gender-based disadvantage is.

Skill, personal characteristics, positionality, and knowledge of local contexts of the researcher together with the varied characteristics of respondents – which affect their availability, ability and willingness to engage in interviews – are key considerations to take into account when using a mixed methods approach in gender responsive livestock vaccine studies.

## 6.2 Best practices for qualitative research

Qualitative analysis processes must deal with the tension of on the one hand, being less formalized than quantitative approaches, and on the other, the need to be equally rigorous (Daniel, 2019). Qualitative analysis as a tool to explore new issues, various and different perspectives, and power dynamics, among others, entails flexibility and adaptability in the approach as new findings emerge and need to be understood. Flexible approaches, however, need also to be scientifically rigorous. Key considerations for rigorous qualitative analysis emerging from the LVIF projects (particularly the norms work) pertain to the selection criteria for FGD participants. FGDs need to create constructive dialogues that allow different perspectives and experiences to emerge. Two key criteria for participant selection for FGDs are: diversity and power dynamics. Diversity allows different perspectives to emerge and sparks interesting discussion. Such perspectives, however, will only emerge if power dynamics among participants allow it. Care needs to be taken to avoid power dynamics that stifle the conversation by silencing some participants, e.g., through the presence of more authoritative figures in the room. Gender dynamics are recognized as strong determinants of power dynamics for example, where the voices of younger women are silenced by the presence of older men: often single-sex FGDs are preferable. Other considerations for FGD participant composition are variable in relation to the issue being explored. For example, discussions on access to livestock services in Nepal, may be best organized by gender and caste, in order to give space to all to share the challenges that they face, comfortably.

Another practice for qualitative research emerging from LVIF work on norms, is the importance of capitalizing on the complementarities between group and individual discussions. The differences between these two formats needs to be leveraged to obtain the most complete picture of the issue being analyzed. FGDs are group meetings meant to elicit different perspectives, stimulate rich discussion and show agreement and disagreement among participants. Individual interviews, on the other hand, engage a person with key information about the topic to share sometimes very personal perspectives, or an out-of-the-box (or private) experience that may not come out in a group set-up. Organizing FGDs and IIs (i.e., logistics and interview questions) with these different aims in mind, is crucial. Similarly, reporting the findings should reflect the strengths of each approach. FGD findings need to report and discuss agreement and disagreement in the group and the reasons behind the different perspectives. IIs can report on the lived experiences of an individual in order to show their personal view.

The LVIF experience highlighted the importance of approaching research discussions with intellectual curiosity. Careful navigation was required of the researchers both for discussions on the effectiveness of the national vaccine system and those around norms and empowerment. This included avoiding direct challenges to the system in place. In the case of norms, two more considerations emerged. The direct participation of the researcher as an observer in a community revealed patterns of behavior affected by gender norms that were not apparent in the discussion. This illustrates the value of participatory observation for understanding gender norms. Finally, the importance of self-reflexivity was reinforced in this analysis. Researchers and facilitators carrying out the research risked transferring their own gender norms into the research they undertook (e.g., in considering and classifying someone as the spouse or main respondent). This not only affects the findings, but also reproduces gender norms through the research itself. The importance of self-reflexivity also emerged in the work on empowerment. For example, when exploring local meanings of empowerment, in some cases the researchers and facilitators reverted to using their own definitions, thereby missing the importance of creating an interview process that allowed local views to emerge. The importance of self-reflexivity in qualitative research has been discussed widely given the importance of a researcher's preconceptions and biases when co-creating narratives with the respondents and when interpreting the data (Johnson et al., 2020; Neale, 2021).

## 6.3 Challenges in implementation

Fieldwork challenges highlighted by all the teams included: length in time, high costs, limited expertise available, *per diem* expectations of participants, and COVID-19. Long qualitative or quantitative surveys raise issues related both to the quality of findings (Ambler et al., 2021) and the ethics of the time burden on respondents. Some tools, particularly in early iterations, are long: it is through implementation that researchers can find ways to shorten them. However, the process of tool improvement should not be shouldered by respondents. Compensating respondents for their time (particularly for tools under development) is a possible solution. Compensation was, however, also a contested issue in project discussions. Such discussion goes beyond the scope of this

paper as it pertains to broader debates on national and international research, with guidelines often provided by both international donors and governments. That said, it merits noting, as it remains contentious. Time also emerged as a necessary for trust building, collective thinking, and change with communities. Time is also an issue in the context of the self-reflexivity of researchers and practitioners. Despite its many negative health consequences, COVID-19 unexpectedly provided the opportunity for research teams to rely on local enumerators (only) and in the process, strengthen local capacities for gender analysis. However, the in-person absence of research teams at enumerator training and in fieldwork may have reduced the quality of responses. Moving forward, balancing these pros and cons to both develop local capacity and ensure quality is critical to address concerns as to lack of local expertise in gender analysis.

### 6.4 Opportunities for cross-project learning

Across the four projects, the utilization of similar tools to study different topics and of different tools for the same topic, lead to the emergence of various dichotomies in our analysis. In some cases, the four projects adopted one tool – such as the WELI – to study the same topic (e.g., women's empowerment) across geographies, and in other cases adopted different tools to study the same topic (e.g., policy). The tension and complementarity between "universal" and "local" is one such dichotomy. Comparison of the performance of these tools vis-à-vis the topic and the local context showed us that some research challenges are universal for example, how to enquire about "norms". Approaches to methodological solutions can also be universal for example, utilizing a locally known norm as an entry point to explore other norms. However, the operationalization of these solutions is likely to be context specific (e.g., what locally known norm to pick for the discussion). In this article, we identify methodological lessons that can be extrapolated elsewhere (as they are), and other lessons as to how a given methodology/tool needs to be adapted to the local context in order to be effective.

On the same line, one important learning from this paper is that the adoption of the same tool across projects and geographies allows, on the one hand, meta-analysis across projects which can provide answers to a "universal question" such as, for example, "what are the key characteristics of a gender-responsive animal vaccine system?" This very standardization, on the other hand, also allows the identification of local specificity of some aspects of the same question "what are the characteristics of a gender-responsive animal vaccine system that are necessary for its success in a given context?" Project specific tools or tools adapted by each project to the local context, are thus essential to provide details on the peculiarities of a given aspect. They contribute to answering research questions such as, "why are these context specific characteristics for a gender-responsive animal vaccine system necessary and how can they be integrated in an intervention".

In gender research for development, concepts such as empowerment and gender norms need to be looked at from a double prism: both as concepts for exploration in research as well as concepts that can influence the research process. This requires research teams to be innovative in selecting from a conglomerate of methods (as was done in these LVIF projects), and customizing methods to specific cultural contexts. Insights about the local specificity of some issues, gleaned from the application of standardized tools, are in turn useful for improving them. Exploratory tools such as the WELI rely on the findings they produce, in order to continue improvement of the tool. In other words, an *exploratory* tool can only keep improving when it produces findings on the topic it is constructed to understand; and then integrates that learning. In addition, in the case of the WELI, the utilization of the tool within LVIF, contributed to the tool development team realizing that empowerment is "a process of change" rather than "a status of being" (see Galiè, 2013), and that the WELI needs to both adapt its content to changing circumstances and be implemented in ways that capture "processes of change" rather than "provide a snapshot of a situation": a finding that supports recommendations provided by Galiè et al. (2018). This must be balanced against the need to maintain some degree of standardization to allow comparisons across time and space. Moreover, locally specific findings must be relevant across multiple sites in order to influence changes in a standardized tool. Drawing the boundaries of "sites" is complex, given that they could be based on myriad typologies, such as livestock systems, agro-geological system, socio-cultural system, geo-political systems, etc.

This issue of "how universal is universal" is particularly important when scaling an intervention to larger populations (e.g., more producers) or across levels in the same population (e.g., from producers to the whole value chain). In our findings, "scaling" seemed to amplify tensions between universal versus local methodological approaches, particularly in relation to women's empowerment. Scaling approaches to enhance women's empowerment need to take into account not only the local context (including gender norms), but also the individual nature of aspirations for self-determination. In cases when this tension is resolved in operationalizing empowerment interventions, how can standardized methodological tools – necessary in projects with large numbers of stakeholders where developing targeted tools may be inefficient – reflect such complex compromises between standardized and localized?

This query requires drawing lessons and best practice in the application of existing tools such as WEAI that endeavor to provide standardized metrics on women empowerment across the globe and varying contexts. However, the application of WEAI for international comparability also recognizes that varied cultural contexts influence the standardization metrics of empowerment, while acknowledging that data from a standardized tool could inform which sociocultural or contextual factors have the greatest effect on measures of empowerment (Colverson et al., 2020). The issue of standardization and localization would benefit from mixed methods and the triangulation of methods realized by the LVIF projects, which highlight the necessity of using more than one tool and including diverse aspects (e.g., social) to address factors important for livestock vaccine interventions, or other complex global problems.

## 7 Conclusion

This paper presents four projects that were funded to develop recommendations for a gender-responsive animal vaccine system, and assesses the methods each has used to engage in its respective research. By investigating the performance of such research methods and tools

vis-a-vis the goal of developing a gender-responsive animal vaccine system, this paper aims: to help identify best approaches for understanding a livestock vaccine system through a gender lens; provide insight into the pros, cons, and nuances of each approach in various contexts; and, point to possible research gaps identified in our collective work.

Reflecting on the original intention behind funding these four projects, we consider whether the methodologies adopted did justice to the choice of the LVIF funders to prioritize social and gender sciences as an entry point for improving animal vaccine systems. Though results of the projects themselves are not included in this article, our analysis indicates that crucial understanding and insights were gleaned through the use of both gender-sensitive qualitative and quantitative methodologies. These insights helped improve the animal vaccine system, given the central role of gender dynamics in affecting the system's effectiveness. By engaging gender experts who understood livestock and small holder systems, the research provided a broader understanding of gender dynamics in livestock and in smallholder systems.

However, important synergies came from collaboration between technical and social scientists in the data collection processes – an important lesson for those interested in understanding how to leverage the livestock system for other development outcomes, including food security, nutritional outcomes, or economic growth and development. The depth and breadth of similar yet varying data gathered from across the four projects provides a unique opportunity for comparison of how these four areas – technical barriers, women's empowerment, gender norms, and policy – contribute to or hinder a gender-responsive animal vaccine system across different scales, while appreciating the specific contexts in which they apply. The robust evidence base generated will be useful to inform and influence interventions for inclusive equitable and efficient livestock vaccines as well as enhanced women's empowerment (Omondi et al., 2022).

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

## Author contributions

AG, RP, SB, SM, and BM: conceptualization. AG, RP, SB, SM, BM, and WB: methodology, and writing – review and editing. AG, SB, SM, BM, and WB: formal analysis. AG, SB, and SM: investigation. AG, SB, SM, and BM: writing – original draft preparation. AG and SB: funding acquisition.

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## Conflict of interest

BM was employed by Miller Consulting.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note



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