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Gender-inclusive business models in livestock value chains in low- and middle-income countries: What can we learn from the literature?

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Gender inequality is one of the key challenges of the twentyfirst century. Gender equality is one of the sustainable development goals (SDGs) and getting a more equal society is increasingly seen as supporting the achievement of the other SDGs. At the same time, the question remains: how to support gender equality in practice? This paper looks at gender-inclusive business models in the livestock sector. Such models can contribute to women's economic empowerment (an intermediate indicator toward gender equality) directly by addressing barriers to women's participation in livestock markets, or indirectly by involving them as implicit beneficiaries where such businesses provide services or products in circumstances where women face constraints such as poor access to inputs. A review of the literature was conducted to assess inclusive business models that are successful in increasing women's participation in livestock or livestock products marketing and its associated benefits and outcomes, focusing on low- and middle-income countries. The review included peer-reviewed publications, gray literature, and websites from non-government organizations that implement inclusive business models. A literature search was conducted using Google scholar and Research4Life databases for publications since 2010. Websites from development and international organizations implementing inclusive business models were also searched. Data from included records were extracted according to a pre-defined extraction form. A total of 29 studies were included. Results from the review show scarcity of literature and lack of research rigor in the few studies that document outcomes associated with inclusive business models. The few studies on gender-inclusive business models are mainly on collective action and contract farming to support women and men farmers to access markets, inputs, and services. Tangible benefits for women involved are reported, including women empowerment and change in gender norms to some extent.

KEYWORDS

inclusive business models, livestock value chains, women empowerment, low-and middle-income countries, reach, benefit, transform norms, gender

Introduction

Poverty and gender equality continue to be major challenges worldwide, particularly in the developing world. Although recent decades have seen significant reductions in poverty and food insecurity, the COVID-19 pandemic has reversed some of these gains. For the agricultural sector in general and livestock in particular, there are many trade-offs between the different goals of sustainability, economic growth, social and gender equity, and environmental concerns (Salmon et al., 2018). Inclusive business models (IBMs) aim at balancing economic interests and equity objectives in agricultural value chains and are based on the principle that there are mutual benefits for poor farmers and the business community (FAO, 2015). The “inclusive” element of the IBM concept refers to integrating the less advantaged (for example, smallholder groups, and small enterprises) to equally benefit from agricultural value chains. The models are intended to circumvent existing market failures and the inefficiencies that limit the poor and disadvantaged from accessing input markets and profitable output markets for their produce.

Varying business models, approaches, and innovations, using different terminologies about IBMs, have been implemented by researchers and development partners. Some of the terminologies used to depict IBMs include the following: Making Markets Work for the Poor; Business Linking Smallholder Farmers and Small Companies; Opportunities for the Majority; Inclusive Market Development Concept; the Pro-poor Value Chain Development Concept; the Win-Win Profit Approach (Naguib et al., 2013). Despite the diverse contextualization of the IBM concept, some consensus has been reached on what constitutes an inclusive business model (FAO, 2013). The business model is considered more inclusive when it is accessible to farmers with fewer assets, particularly women and minority groups; uses trading practices according to the needs of smallholders that provide benefits such as profit, stable market outlets, shared risks, access to services and finance; does not create dependency on any one value chain or buyer and provides profitable diversified market options for smallholders; builds the capacity of farmers and farmer groups according to market needs; uses transparent platforms and forums to identify and solve problems. Inclusive business models typically focus on building the capacity and resilience of local systems, leveraging the incentives and resources of the private sector, ensuring the beneficial inclusion of marginalized actors in the value chain, and stimulating change and innovation in market systems.

The private sector, ranging from small local businesses to large international corporations, is widely recognized as having a critical role to play in contributing to poverty reduction, by largely making their businesses inclusive. The inclusive element addresses the challenge of linking commodity-dependent smallholders and small actors to markets by stimulating local business model partnerships which include benefits for

smallholder groups and small value chain actors (FAO, 2015). Supporting these business models and strengthening market linkages between smallholder producers and buyers can improve the overall competitiveness of a value chain and reduce poverty. Most smallholder producers have poor access to markets for their products due to numerous costs that vary with gender, such as transaction costs; output prices; turnover; uncertainty; cooperation and collective initiatives; and labor and capital investment (Verhaegen and Van Huylenbroeck, 2001).

Although IBMs in agricultural value chains have been widely promoted by development partners (Jordan-kirwan, 2019; for example FAO CARE, 2019; Jordan-kirwan, 2019), most of the studies have focused on the crop sector. By contrast, there is minimal evidence on how the models may enhance women’s participation in livestock markets, despite the gender-related constraints associated with livestock production and marketing. These constraints include limited mobility; time poverty; lack of access to assets that would facilitate their participation, such as transport, communication assets, and bank accounts; and lack of access to market information (Sanginga et al., 2013). These gender-based constraints are known to limit women’s participation more in farm-gate markets rather than markets outside their homes. This is a common phenomenon for most women in low- and middle-income countries. Failure to address these constraints not only undermines the potential of agricultural value chains to contribute to economic and social progress but also perpetuates gender inequalities and poverty (Bamber and Staritz, 2016). Women’s participation in markets has been found to diminish even further as vertical integration of markets occurs, and as markets move away from sites of production and the value chain becomes more complex with multiple actors (Pionetti et al., 2011).

The IBMs—particularly those that are gender-sensitive—have great potential to contribute to women’s economic empowerment directly or indirectly. They can contribute directly by increasing the participation of women in markets and addressing gender-related barriers to participation. Some of the gender-based constraints are associated with deeply rooted gender norms and practices. For instance, women in low-income communities, are often perceived as caregivers and homemakers, rather than successful entrepreneurs. In some communities, they face mobility restrictions and are not expected to move around and interact with clients, especially men (Asian Development Bank, 2016). Some cultures perpetuate low agencies and rights for women as they are not allowed to make decisions for themselves. There are high levels of illiteracy among poor rural women, which constrains their involvement in businesses. Other studies have highlighted women’s limited participation in training or extension services, with men being these usually invited to such capacity-strengthening opportunities, or those able to attend (World Bank, 2014).

The IBMs can also contribute indirectly by involving women as implicit beneficiaries of inclusive business models where such businesses provide services or products in areas where women bear specific disadvantages such as poor access to inputs. In the latter case, IBM creates tangible benefits for women but does not necessarily address their empowerment specifically. The few IBMs that focus on the livestock sector have tended to be gender blind, yet men and women may gain differently from such efforts as they face different constraints. For instance, a private-public partnership model in a pastoral community in Kenya, run under the auspices of the ministries of livestock and social services and involving both male and female livestock traders, resulted in the establishment of livestock markets closer to the community (Were, 2009). This effort resulted in benefits not only for women but for men, as well as for the local community and the region in terms of increased trade and revenue from livestock sales. Having livestock markets in proximity to their homes resulted in increased participation of women in livestock markets in a community that discouraged women to engage in the livestock trade, partly because the markets were too far and challenging social norms restricting women's economic participation.

Most IBMs are implemented by development programs or the private sector and tend not to integrate rigorous monitoring and evaluation systems. This results in a lack of quality evidence on livelihood outcomes due to a lack of rigor in the experimental designs. In this paper, a conceptual framework on gender-inclusive business models in livestock value chains is presented and used to situate and analyze key livestock gender IBM studies. This review allows documentation of various gender-inclusive business models and approaches that have enhanced the participation of women in livestock marketing, and their effects on women's empowerment and livelihoods. Evidence from this review will enable the identification of best practices to guide interventions aimed at promoting gender-inclusive business models in livestock value chains. We define gender-inclusive business models in this paper as pro-poor, equitable, and profitable business activities that integrate women in livestock value chains and/or address specific gender-based constraints to enhance women's participation in the value chain while generating positive gender outcomes.

Conceptual framework

There are numerous conceptual frameworks for IBMs (Seville et al., 2011; FAO, 2015) with FAO (2008) categorizing them into four main models: producer-driven, buyer-driven, public-sector-driven, or intermediary-driven. While these models are a useful categorization, Chamberlain and Anseeuw (2017) highlight the need to combine them into "hybrid entities" during implementation. More recently, authors like German et al. (2020) have questioned the validity of the concept of IBM, given reduced government support to smallholder

farmers and the increasing complexity of value chains, and since agribusinesses tend to be more exclusive than inclusive. Another gap in the IBM literature is the extent to which outcomes or impacts are tracked, rather than assumed. Chege et al. (2014) for example expand the analysis of impacts of contract farming—sales to supermarkets—beyond a change in productivity and income and look at human nutrition and women's control over income, showing trade-offs.

There are far fewer studies looking at gender-inclusive business models. KIT et al. (2012) present an innovative framework, looking at the interactions between chain governance and chain activities, and analyses the interventions using the lens of agencies (women's capacities) and structures (women's opportunities). The sequence of interventions is also important. Thorpe et al. (2017) focus on the "most marginalized" and thorough literature review and key informant interviews (KIIs) and come up with 5 entry points, with the first entry point being similar to the KIT's first activities on supporting women's capacities (women's agencies).

Rubin et al. (2010) and Johnson et al. (2018) identify three levels of women's engagement in agricultural development projects that can also be applied to business models, namely reach, benefit and empowerment. Projects that focus on reach, emphasize engaging women in project activities and seek to reduce barriers to participation, with the indicator being limited to the number of women involved in project activities. Those that focus on benefiting women consider gendered needs, preferences, and constraints to ensure that women benefit from project activities; the indicators of interest are more complex, including changes in women's income or capacities. Finally, projects looking at empowering women involve strengthening their ability to make strategic life choices (Johnson et al., 2018). Indicators of empowerment include control over income or women's ability to make major household decisions, for example on children's education. These 3 categories [or 4 in Rubin et al. (2010), in addition to "performance"] are comparable to the criteria for evaluating IBMs in Asian Development Bank (2016): their reach, quality (in terms of effects the business has on low-income people), their financial sustainability and systemic impact and innovation, which for gender-inclusive approaches would be looking at women empowerment. Looking at sustainability and replication, a fourth category "transform gender norms" is added by Stoian et al. (2018). While the search strategy did not limit inclusion to papers using these indicators, these three levels were used to categorize the outcomes using the Johnson et al. (2018) framework.

For our analysis that focuses on gender IBMs in livestock value chains, we use the categorization of IBMs from Kaminski et al. (2020) and FAO (2015) and we combine it with the gender outcome levels from Johnson. Following KIT et al. (2012) we identify the interventions on agencies and/or structures, as these will allow us to identify clear entry points and possibly their sequence. Table 1A gives

TABLE 1A Examples of buyer-driven gender-inclusive business models, and reported gender outcomes.

Type of IBMs	General description	Gender outcomes
Contract farming	An example of this model is Hilltribe Organics (HTO) that contracts hill tribe farmers that live in the mountain ranges in the Chiang Rai province of Thailand to produce free-range organic eggs which are sold in premium markets both domestically and abroad. HTO provides layer day-old chicks, feed, technical assistance, and veterinary services for free, and farmers are required to build the chicken coop to keep the birds. The HTO then buys the eggs from the farmers at a premium price (Thorpe et al., 2017).	The gender outcomes are reach and benefit: 50% of the contracted farmers are women. Two-thirds of chicken farmers had more than doubled their incomes through this business model.
Micro-franchising	This model implemented by CARE focuses on building an input micro-franchise network in rural areas in Bangladesh to provide quality services and inputs to dairy farmers at an affordable price (Brooks and Ali, 2015).	The gender outcomes from this model are reach, benefit and empowerment. Several women dairy farmers had increased access to inputs and reported improved milk production. More than 150 input shops were established serving about 40,000 clients. Several women were involved as franchisees and benefited from the business opportunity. The networks and training received by the women franchisees has resulted in their empowerment thereby enhancing women's agency.
Joint ventures	An example of this model is the <i>Laiterie du Berger</i> (Senegal) that collects milk from pastoralists and process it into yogurts. It is a private family-based company that got financial support from a variety of partners: The impact of the enterprise on the communities is reported in Wane et al. (2017).	The gender outcomes are reach and benefit. The description in Wane et al. (2017) shows that the company adjusted their milk collection method to ensure that individual women in polygamous households were able to deliver milk from their cows—and get income—even though it would have been more efficient to collect the entire household milk in one container.

examples of development projects and initiatives that have focused on buyer-driven IBMs in livestock and the associated gender outcomes using the categorization by Kaminski et al. (2020).

In addition, Tables 1B,C provide examples of initiatives that have focused on producer-driven and intermediary-driven IBMs, respectively.

The same structure is used to analyze the papers selected from the literature review described in the next section.

Methodology

The methodology for the review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). The review included the following key aspects: (a) formulating a research question, (b) Population, Intervention, Comparison, Outcome (PICO) framework to develop literature search strategies, and eligibility criteria definition (c) identification of relevant studies, (d) selection of studies, (e) data extraction, and (f) data synthesis and reporting the results. The protocol, in particular the research question and the conceptual framework, benefited from

suggestions from livestock and gender experts during an in-house seminar. A broader stakeholders' consultation was not possible to organize at the time of the study.

Research question

The key research question was “Which business models or approaches in agricultural value chains, with a focus on livestock, are successful in increasing women's participation and benefits from livestock in particular?”

Inclusion and exclusion criteria

The setting of the review included low- and middle-income countries (LMICs) as defined by the World Bank income categorization (World Bank, 2021). The population was small-scale and agro-pastoral agricultural households, with a focus on livestock-keeping households or other value chain actors involved in the livestock business. The interventions analyzed comprised business models aimed at increasing women's participation and benefits from livestock activities, by value chain actors themselves—for example,

TABLE 1B Examples of producers-driven gender-inclusive business models, and reported gender outcomes.

Type of IBMs	General description	Gender outcomes
Farmer-owned businesses	This model consists in working with farmers groups, to facilitate events like trainings and increasing farmers' bargaining position by marketing higher quantities. It builds on collective action. This is the approach promoted by Farm Africa in Kenya for dairy goats, where groups of about 25 farmers are trained on various aspects of goat rearing as well as group dynamics (Peacock and Hastings, 2011).	The gender outcomes are reach and benefit—women were targeted to be group members and the authors report that women's control of economic assets has improved as they can control the income from the sale of milk.
Tenant farming sharecropping	This model involves a landholder contracting part of the land to small-scale farmers to grow fodder, and/or provide inputs (seeds) and expertise. The landholder may also be in charge of selling the fodder. Such arrangements are in place in Central province in Kenya (personal communication).	Women farmers may be targeted by the landholder but no assessment is available.

TABLE 1C Examples of intermediary-driven gender-inclusive business models, and reported gender outcomes.

Type of IBMs	General description	Gender outcomes
Public-private partnerships	TangaFresh started in 1996 in the Tanga Region, Tanzania. It is a joint venture between the Tanzania Dairy Cooperative Union and cooperation from Friesland, Netherlands. A Dutch impact investor has also invested in TangaFresh in 2007 and 2020. https://www.africaglobalfunds.com/news/private-equity/deals/dob-equity-makes-follow-on-investment-in-tanga-fresh/	No gender-specific activities have been reported.
Certification	A systematic review of certification schemes for agricultural production in LMICs identified only one example of livestock product in such schemes—honey in Chile—(Becchetti and Castriota, 2008; Oya et al., 2017).	No gender-specific activities have been reported.
Sales agent model	An example of this model comes from Pakistan. It involves women intermediaries or sales agents who enjoy greater mobility based on accepted norms—based on their age, marital and/or economic positions. They are targeted for agri-entrepreneurial training. The women sales agents purchase milk from women producers and sell it to retailers and other buyers in higher-value markets (MEDA, 2020).	The gender outcomes are reach and benefit. Women were the main target and the average monthly income for women sales agents increased 20 times and 6 times for women dairy farmers. As part of the value added, the women sales agents train the women dairy producers in livestock management and care.

livestock buyers seeking to include more women in their supply chains or women groups looking for new markets, or development agencies such as an NGO creating linkages between a women's group and a marketing firm. The gender outcomes of interest, therefore, refer to the types of project approaches as described in Johnson et al. (2018): reach, benefit, and empowerment.

Papers included in the search included primary empirical research work, providing a comparison either before and after the interventions, and/or with and without intervention. Publications included peer-reviewed publications and gray

literature, including websites from NGOs that implement business inclusive approaches. Papers identified by the searches were screened for inclusion in the analysis. The inclusion criteria were guided by the following questions: (a) is there a business model/approach for livestock implemented (or tested)? (b) was gender-disaggregated data collected, does the approach differ between women and men, or was the target women only? (c) did the intervention take place in an LMIC? If the paper met the three inclusion criteria, the paper was included. Exclusion criteria included systematic reviews, study protocols, studies that did not include livestock business models,

TABLE 2 Data extraction template.

Item	Description
Authors and title of publication	Authors names and title of publication
Year of publication	Before 2010 2010–2015 2016–2021
Type of publication and url	Peer reviewed journal paper Report Working paper Project brief
Countries	Central Asia South Asia Southeast Asia East Africa West Africa South Africa
Livestock species	Camels Dual-purpose cattle Small ruminants Poultry
Population targeted	Smallholder farmers Pastoralists Agro-pastoralists Minority communities
Sample size	Sample size covered by study
Type of business model (and description)	Buyer-driven Producer-driven Intermediary-driven Public private partnerships
Intervention design	With and without Before and after Others
Outcomes (and indicators)	Assets Women's agency Women's reach Access to inputs and services Access to output markets Food security and nutrition Livestock productivity Improved income
Type of evaluation	Quantitative Qualitative Mixed
Intervention on women's agency and structure	Description

and those that were not in an LMIC setting. Studies that did not report sex-disaggregated data or a gender approach were also excluded. Literature published before 2010 was also excluded.

Information sources and search strategy

The main sources of information were Google scholar and Research4Life databases. Research4Life includes AGORA, HINARI, ARDI, and OARE databases as well as Scopus which was made available in 2012 (<https://www.research4life.org/press-releases/research4life-greatly-expands-peer-reviewed-research-available-to-developing-world/>). The search strategies included the combination of the following terms: women or gender; livestock or animal, business linkages or business approaches, and focus on Africa and Asia. The following search terms and combinations were used: [(gender) OR (women)] AND [(livestock marketing) OR (animal marketing)] AND [(business approach) OR (business linkage) OR (business model)] AND [(Africa) OR (Asia)].

Google scholar search resulted in 2,190 hits. Only the first 980 papers, about half of the papers were available and therefore screened. The Research4Life database search was restricted to the following disciplines in the search engine: agriculture, applied sciences, economics, social sciences, women's studies, social welfare and social work, and business. It included articles published since 2010. The search yielded 2,262 hits. Only the first 500 articles were available and therefore screened.

The following websites from development and international organizations were also searched: CARE, SNV, MercyCorps, Heifer International Bangladesh and Nepal, FAO, Asian Development Bank, and the Mennonite Economic Development Associates (MEDA), as these organizations have a track record of implementing livestock development projects. In addition, 20 papers identified by [Liverpool-Tasie et al. \(2020\)](#) that included gender considerations in the agricultural value chains were also considered in the search. The same inclusion and exclusion criteria were applied.

Study selection

Duplicates of papers identified by the searches were removed before data extraction. The titles and abstracts of the papers were screened based on the inclusion criteria. Full texts of papers that met the inclusion criteria were retrieved and then checked for eligibility through complete reading. The process of screening and selecting papers was conducted independently by three reviewers. In cases of discrepancies regarding the inclusion or exclusion of a paper, the review team discussed and resolved

through consensus. A table containing the list of excluded studies and reasons for exclusion was prepared and submitted as [Supplementary material 1](#).

Data extraction

Data extraction for each paper was conducted by an independent data extractor and then reviewed by someone else. Data extraction was done using a pre-piloted template developed in the Excel program. The template was tested by the team using a small sample of 5 papers and calibrated prior to utilization. The parameters covered in the data extraction template are presented in [Table 2](#).

Data analysis

Data were analyzed using simple descriptive statistics, specifically frequencies and means in Excel. The conceptual framework presented in section introduction was used to synthesize the selected papers.

Results

A total of 1,480 papers were identified from the two databases, namely Research4Life and Google Scholar, and duplicates were removed. A total of 1,302 papers were excluded, based on titles and abstracts screening. At that level, three criteria were used, without recording the reason(s) for rejection due to the high number of papers: whether the paper analyzed a business model for livestock? Whether the paper reported gender-disaggregated data or a gender approach; and whether the intervention takes place in an LMIC? The number of papers assessed for eligibility based on the full text was 178, with the reasons provided on the PRISMA chart in [Figure 1](#). The process resulted in a total of 29 cases presented in 25 papers. The papers have been submitted as [Supplementary material 2](#).

Publication types and IBMs

A total of ten different IBMs were identified. The two dominant types were producers-driven, specifically farmers' owned businesses (18 studies), and contract farming (3 studies) which is categorized under buyer-driven models. The 29 studies were reclassified into three types: farmers' businesses (including farmers-owned businesses and those combining entrepreneurship and public-private partnerships - PPP); contract farming; and all the other cases (micro-franchising, with or without PPP, micro-financing, sales agent model, Joint venture, and PPP). Overall, the analysis includes 20 studies of farmers' owned businesses, 3 studies of contract

farming, and 6 studies of other types. From the review, results showed that combinations of IBMs were often used—there were 3 combinations: two with farmers-owned businesses (one combined with PPP on poultry; and one with entrepreneurs on dairy); and one with micro-franchising and PPP on poultry, each represented by one paper.

In terms of the publication types, about the same number of peer-reviewed articles (11) and reports (13) were identified, with five briefs providing limited but sufficient details for the analysis. The publication types are presented in [Figure 2](#). While being cautious due to the small number of studies, two out of the three studies on contract farming were published in journal articles, compared to six out of 20 for farmers' businesses. Contract farming models have been promoted as inclusive models by various authors ([Thorpe et al., 2017](#); [Beesabathuni et al., 2018](#)), possibly more by academics and researchers rather than development agencies, the latter disseminating their work more in reports and briefs.

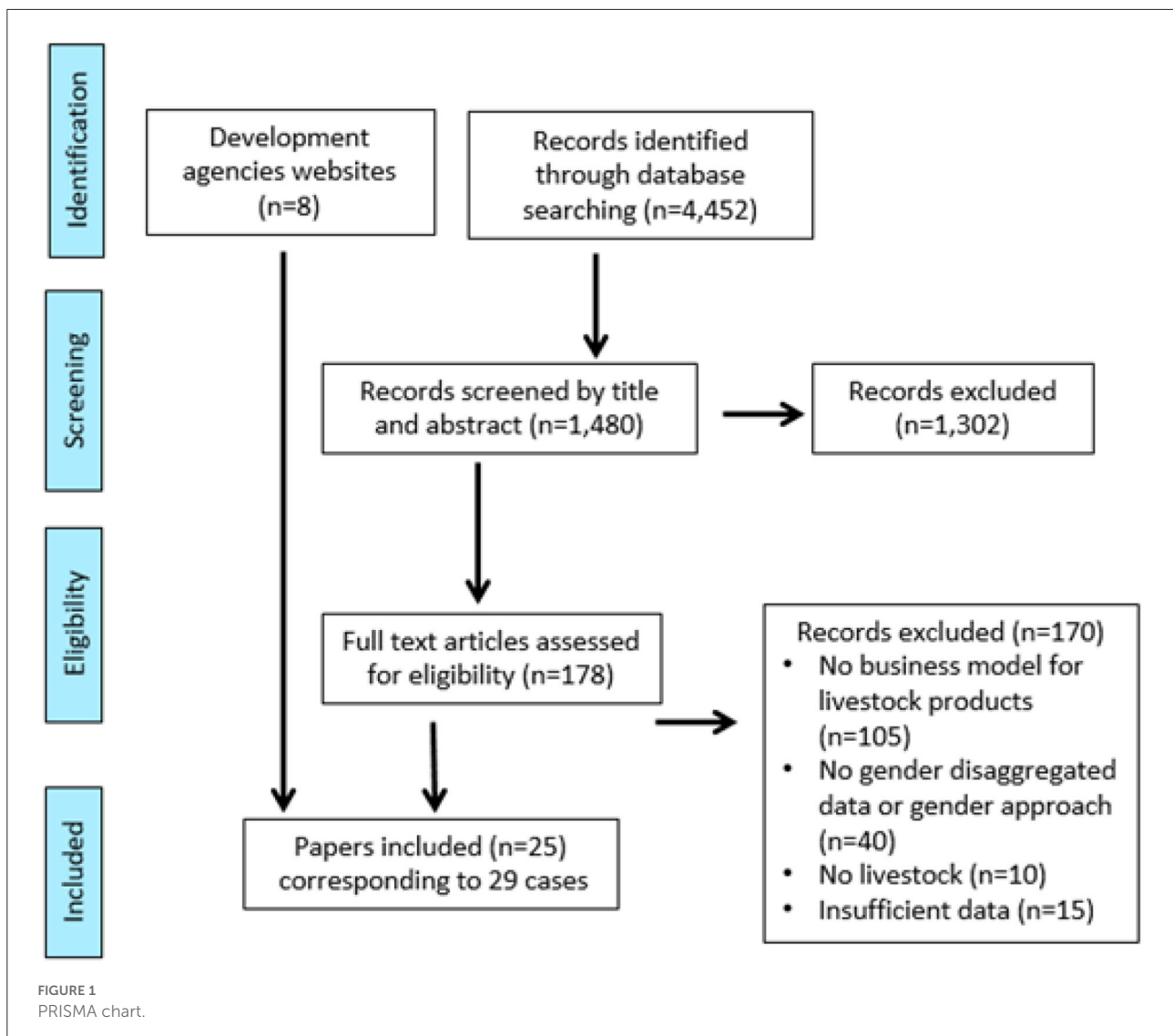
In terms of years of publication, it is worth noting that the three studies on contract farming were very recent, all having been published after 2016.

Most of the IBMs focused on dairy cows. Thirteen of the studies focused on dairy, 8 on poultry, 5 on multiple species, and 3 on small ruminants ([Figure 3](#)). The 3 studies that focused on small ruminants used farmers' owned business models while for the multiple species, different IBMs were identified. For dairy, the most common type of IBM was a farmer-owned business, illustrating the need for collective action for milk—a product sold daily, highly perishable, and of high value.

In terms of geography, East Africa was the region with the highest number of studies (11) followed by South Asia (10). Farmers-owned businesses were also the only type of IBM that covered all species and was the dominant IBM type in the two regions. Contract farming models only dealt with poultry, possibly due to the short production cycle. Of note is that pigs were not represented in all the studies despite also being livestock species with a short production cycle.

Publication types and gender outcomes

As per the inclusion criteria, all publications included at least one “gender reach” outcome, either through models that reach women by integrating them into the livestock value chains or enhancing women's participation in the livestock value chains by addressing specific gender-based constraints such as access to inputs. There were 4 studies (out of 29) that only focused on women being reached without an assessment of the benefits derived from the business models. The ones that indicated the benefits derived from the business model in addition to reaching women or transforming gender norms documented several other benefits such as improved livestock productivity, increased profits or income from livestock, and improved nutrition. A total of 25 papers included an indicator of “benefit” in terms of



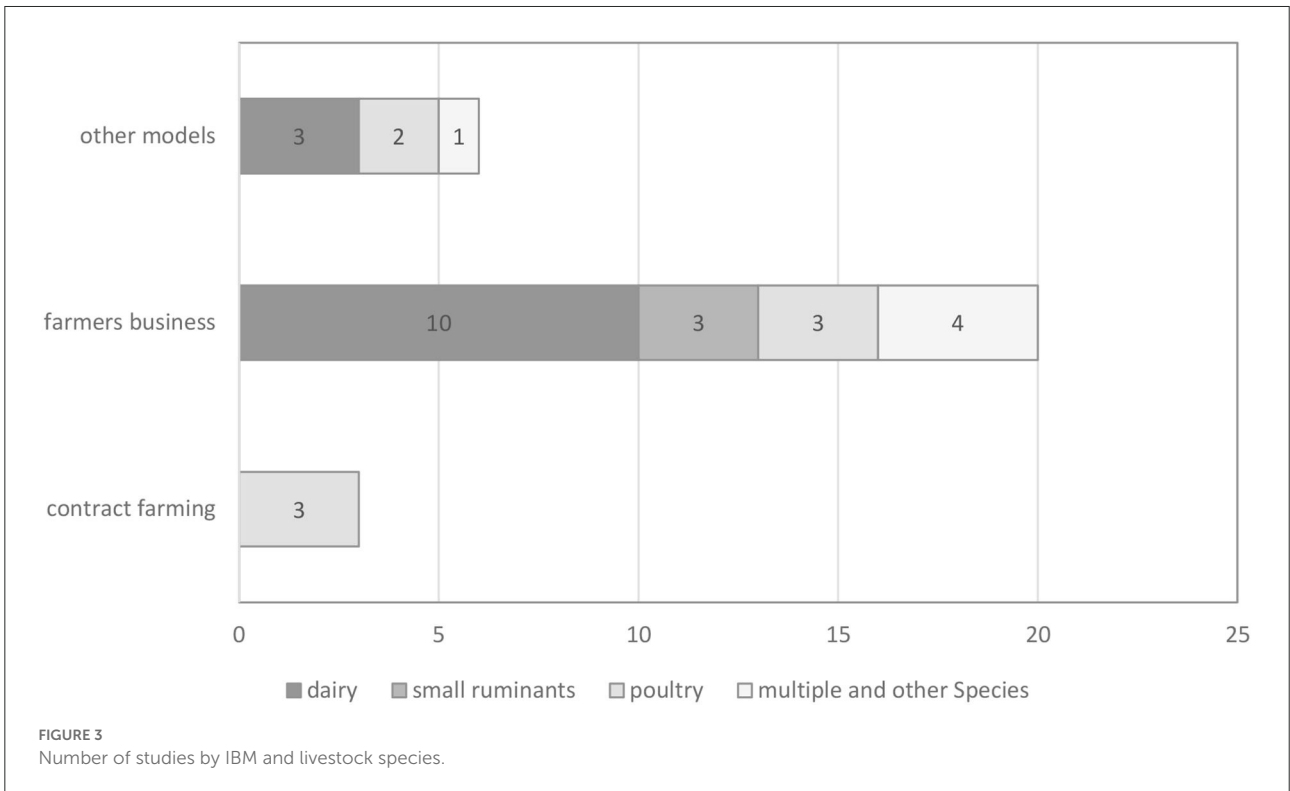
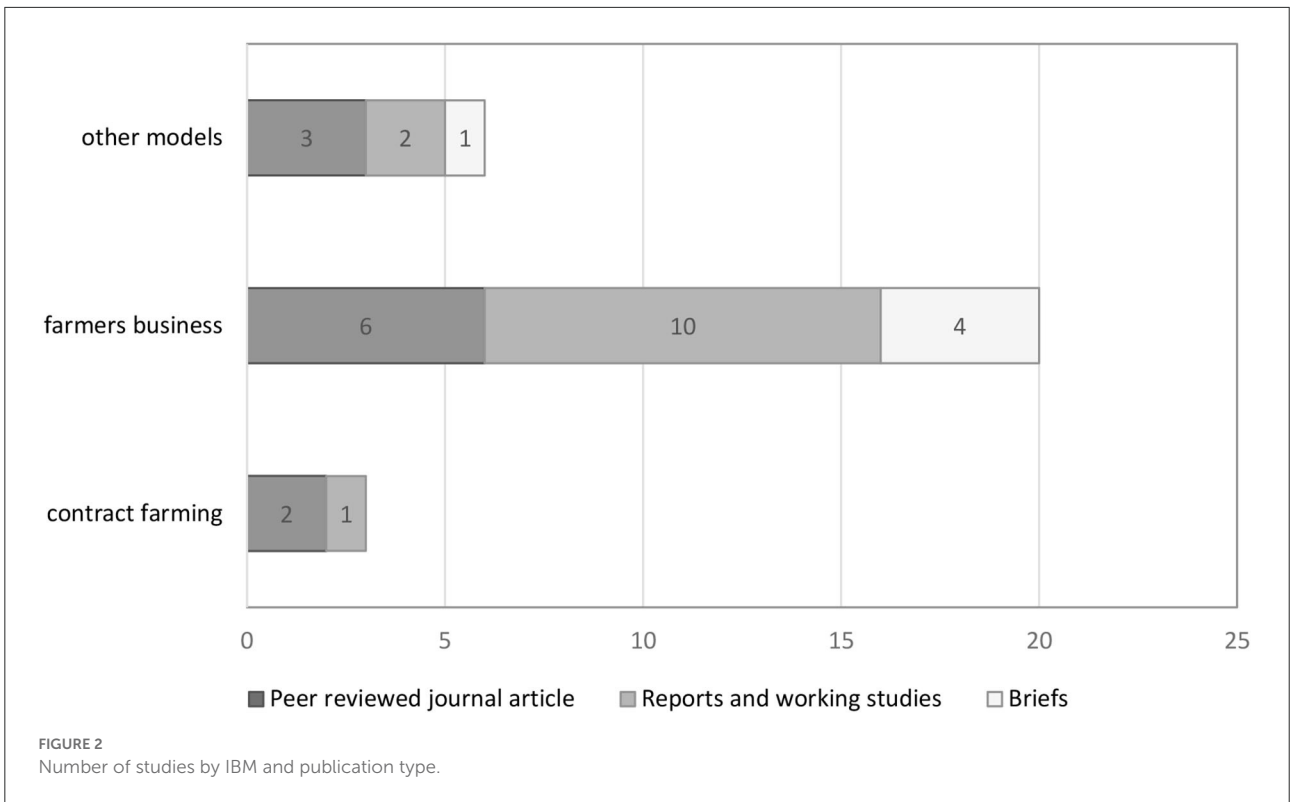
change in livestock productivity or income (Figure 4). Almost half of the publications addressed women's empowerment and very few, only 5 out of 29, considered the transformation of norms. The publications that addressed transforming norms discussed the outcomes from business models that integrated gender interventions.

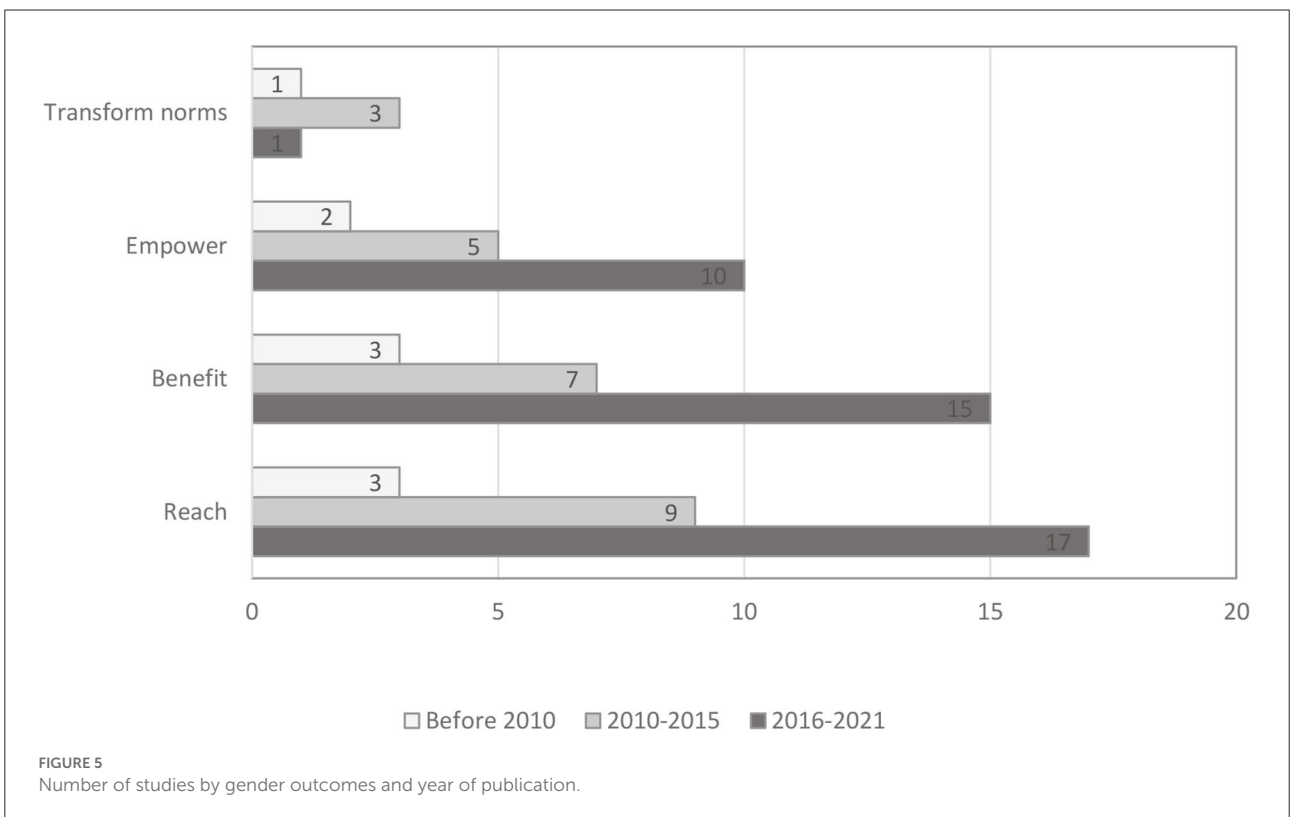
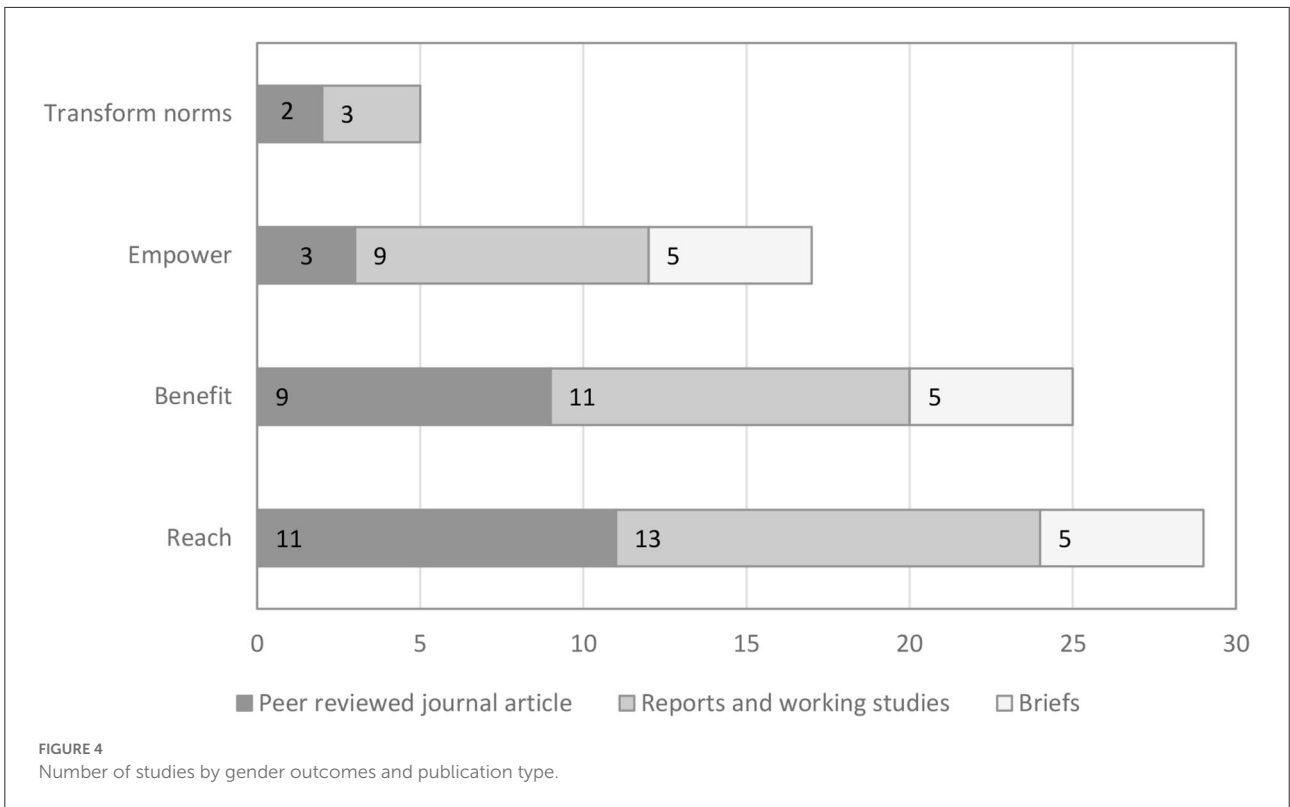
For instance (Brooks and Ali, 2015) show how a value chain intervention included gender awareness training specifically targeting men and sensitizing communities about women's contribution to the dairy value chain in Bangladesh and the need for them to be supported without obstacles. This resulted in not only an improvement in women's agency and empowerment illustrated through improved confidence and decision-making over income from dairy but also catalyzed support from men in easing women's labor burden. Studies such as Ravichandran et al. (2021) assessed whether women-only dairy cooperatives or mixed-gender dairy cooperatives result in women empowerment and transformation of norms in India.

The results show that women-only cooperative structures at the village level are not strong enough to withstand, let alone transform, disempowering gender and caste norms.

More than half the papers that considered gender outcomes were published between 2016 and 2021 (Figure 5). Overall, there were very few articles that documented the transformation of norms. Tracking and documentation of gender outcomes associated with inclusive business models seem to be nascent and only recently gaining interest in development science.

In terms of livestock species, dairy interventions comprised the highest proportion of studies that documented gender outcomes. For instance, 40 and 59% of the benefit and empower gender outcomes, respectively, were from dairy (Figure 6). Poultry interventions comprised 28% of the reach and benefit gender outcomes. More dairy interventions were associated with studies on the transformation of norms compared to the other livestock species.





The few studies that focused on interventions for the transformation of norms were from South Asia and East Africa (Figure 7). Most of the studies that focused on empowerment and benefit outcomes were from South Asia while for reach most were from East Africa.

Gender outcomes and indicators

A summary of the gender outcomes, indicators, and the number of studies are presented in Table 3. Few studies provided quantitative information on the indicators. All the studies resulted in reach outcome for women, though only 55% quantified the proportion of women reached. Most of the studies, about 72%, reported a change in income from livestock because of the IBMs, though few quantified the change. Other benefits from IBMs included changes in livestock productivity, and access to inputs and services, among others. Studies such as Farm Africa (2002) enhanced access to credit for women by offering credit without collateral. The indicators for empowerment included change in decision-making over livestock income, increased employment opportunities, mobility, and leadership positions for women. Women empowerment resulted in livelihood outcomes such as investment in child education, and health care, and in some cases, such as Boros and Mcleod (2015) reduced child marriages. A detailed description of the IBMs, the gender outcomes, and the livestock species covered are presented in Supplementary material 3.

Inclusive business models and gender outcomes

The farmer-owned business was the dominant IBM and resulted in benefit outcomes and women empowerment (Table 4). Among the eighteen farmer-owned business models, only four of them resulted in reach outcomes for women and no additional benefits. Only 5 IBM studies showed a transformation of norms and were coupled with training in either leadership, entrepreneurship, or gender issues. One of the studies resulting in a transformation of norms was associated with a private-public partnership model and 3 were either purely farmer-owned businesses or a combination of farmer-owned businesses with another model.

The IBM studies and the beneficial outcomes are presented in Table 5 while Table 6 shows the studies associated with empowerment and transformation of norms. The different IBMs as identified in the 29 included studies are listed in the first row of both papers and are driving the change in the outcomes. The buyer-driven models, specifically contract farming and joint-ventures, resulted in benefits associated with income, livestock productivity, and access to inputs and services

but not women empowerment or transformation of norms. The joint ventures model study, which focused on pastoral systems, resulted in changes in the production system with women and children remaining in semi-permanent encampments with lactating dairy cows, where they receive animal feeds from the dairy cooperative to sustain milk production, whereas the men of the community continued the nomadic pastoral practices. In two studies, the farmer-driven business models resulted in improved access to financial credit for women through savings and credit groups. However, one study showed no change in credit access for women.

The farmer-owned businesses resulted in various benefit outcomes as well as women empowerment. The sales agent model resulted in employment opportunities, particularly for women who already enjoyed greater mobility in their culture due to age, marital and economic positions (MEDA, 2020). The studies reveal existing strong socio-cultural norms that hinder women from benefiting from IBMs. For instance, the Brooks and Ali (2015) study on Krishi Utsho micro franchising model shows that few women took advantage of the franchisee opportunity. This was largely due to the strong social norms preventing women from working in public, and in part due to lack of access to appropriate education or finance. Sarwar (2018) in their study on farmer-led businesses through self-help groups in Bangladesh show that while the meetings have improved collective decisions and actions and have contributed to women's ability to have access to income, the women in the groups are yet to take the major responsibility for trade since gendered norms and patriarchal attitude still prevails in the targeted communities.

Only 9 studies out of 29 reported some weaknesses of the studied IBM, either as limited or negative gender outcomes. A total of five studies cite restrictive gender norms (including mobility and leadership) to explain low women's participation in group meetings or training. In two studies, authors acknowledge that gender outcomes were not fully achieved as the interventions promoted activities falling in men's traditional domain (one on livestock trade and one on loans acquisition) that could not be lifted. Limited control over milk income by women was mentioned in two studies. One study reported a negative impact, related to the increased workload for women. The remaining 20 studies did not provide any information on possible shortcomings or negative effects on gender outcomes.

Discussion

The livestock sector offers opportunities for improved livelihoods for millions of small- and medium-scale farmers in low- and medium-income countries. Besides providing income and animal-source foods and constituting a store of wealth

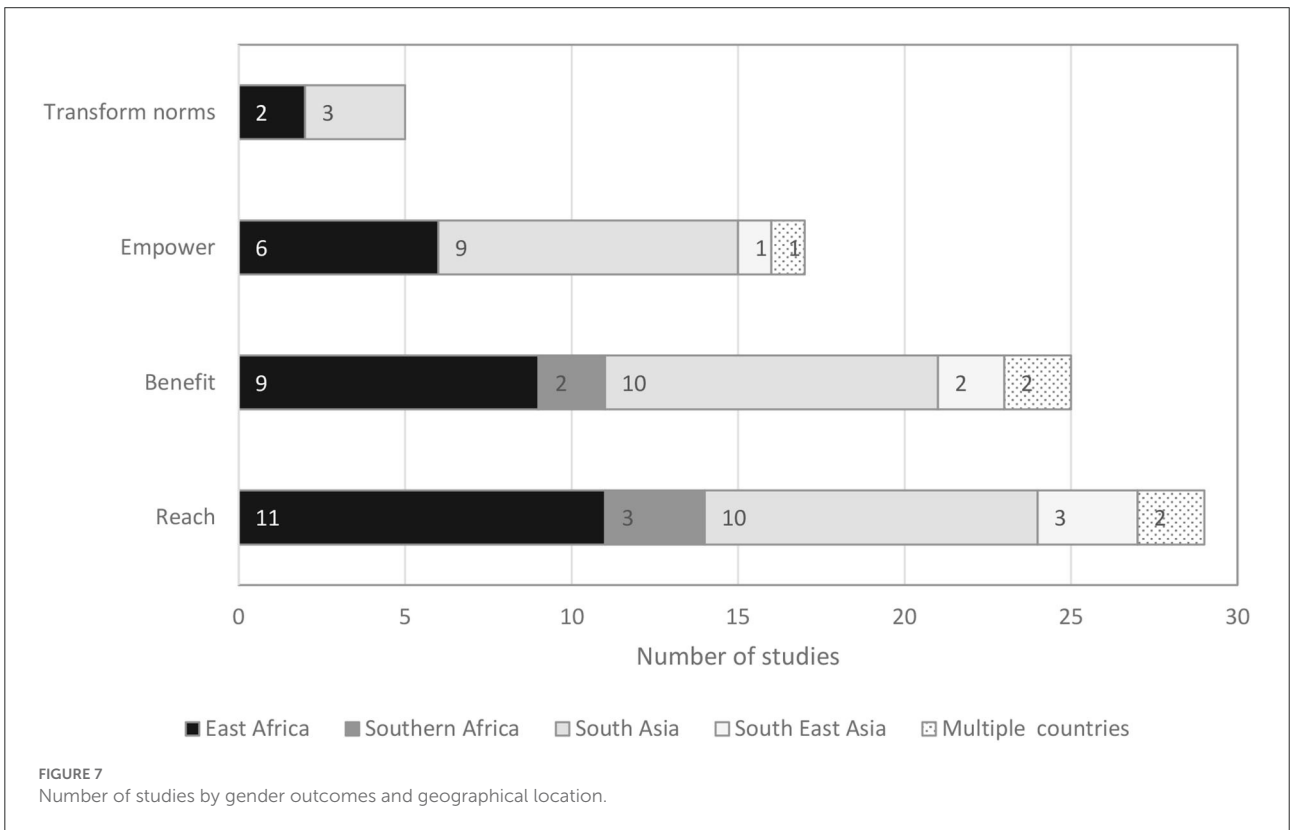
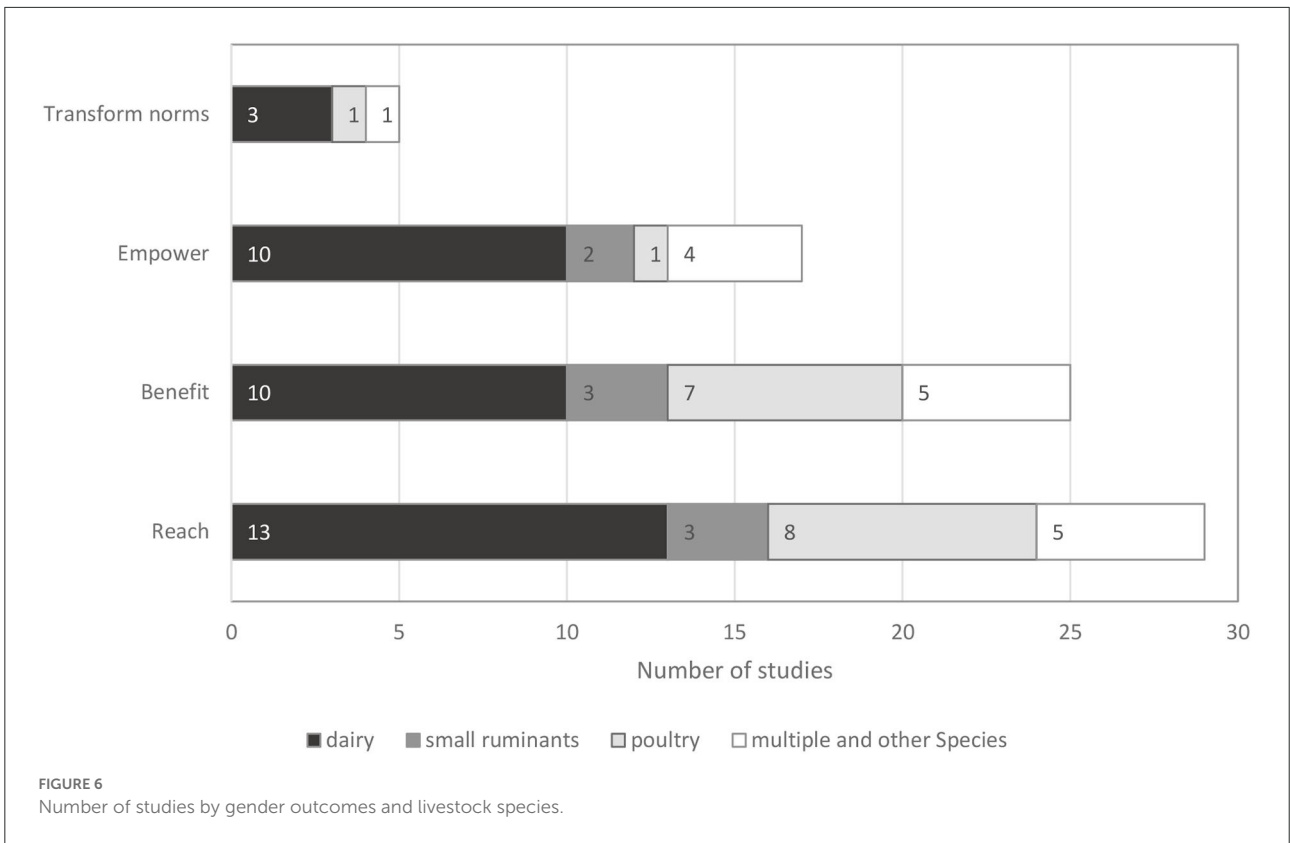


TABLE 3 Details on gender outcomes.

Gender outcomes	Indicators	Number of studies	Range
Reach (29 studies)	% Women participating	29	13 studies with no quantification 16 studies: 22–100%, out of which 2 focus on women only
Benefits (25 studies)	Change in income or margins—for livestock	21	Only 9 studies reporting a %; 30–1,000%
	Change in livestock productivity	10	8 studies have quantitative data: 14% – –1,000%
	Change in access to inputs and services	14	Only 2 with data; 22 % — 62%
	Change in access to output markets	6	No quantitative data
	Change in food and nutrition	7	3 studies with data; 15–36%
	Change in assets	3	1 paper reports an increase in the number of cows; 42–52%
	Other	7	Reduced child marriage Spending on health care and education Credit to women without collateral
Empowerment (17 studies)	Change in decision making- over income	8	Some studies report women's increased control over income while 1 study adds that specific expenses (children education) were prioritized
	Increased employment opportunities for women	5	Employment opportunities were possible at markets, milk processing or self-employment
	Other indicators: mobility, bargaining power, leadership, skills, WEAI	13	1 study used the WEAI 2 studies report an increase in % of women in a leadership position: a 13% increase from 34% at the start; and a 6% increase from 24%
Norms (5 studies)	Various	5	Shared (women and men) household responsibilities - 1 study Women involved in the marketing of livestock and participate in value chain activities - 2 studies Women able to be group leaders - 1 study Women were able to eat chicken and eggs, yet they were initially culturally not allowed – 1 study

to their owners, livestock is also a pathway toward women's empowerment and progress toward gender equality. This paper looks at the specific case of business models and approaches for livestock and livestock products that can reach small-scale and agropastoral households, and potentially women, and those supporting progress on women empowerment or contributing to changes in gender norms. Out of nearly 1,500 screened papers, a total of 29 studies were included in our analysis as meeting the criteria of reporting a business model for livestock and having a gender outcome. In comparison, a similar review conducted for the aquaculture sector identified

36 papers, although the criteria were broader (Kaminski et al., 2020). Out of these 29 studies, 25 also reported a benefit for the women involved (e.g., a change in livestock income controlled by women), while 17 studies included a measure of women empowerment and 5 a change in gender norms. As for the agricultural sector with the WEAI tool, the livestock sector now has a tool to measure women empowerment (Galiè et al., 2019), and with more projects using the tool, more and better data will be available. While the number of studies identified is limited, important lessons can be drawn from this review.

TABLE 4 Numbers of studies on inclusive business models by gender outcome.

IBM category	IBM type	Gender outcomes			
		Reach	Benefit	Empower	Transform norms
Buyer-driven	Contract farming	3	3		
	Micro-franchising	1	1	1	
	Joint ventures	1	1		
Producer-driven	Farmers-owned business	18	14	12	2
Intermediary-driven	Sales agent model	1	1	1	
	Micro-financing	1	1	1	
	PPP	1	1	1	1
Combined IBMs	Farmer-owned business+ entrepreneurs	1	1	1	1
	Micro-franchising + PPP	1	1		
	Farmers-owned business + PPP	1	1		1
Total		29	25	17	5

First, while many recognize the potential for the livestock sector to contribute to progress toward women empowerment and gender equality, the evidence is scarce, and only about a third of the studies were published in peer-reviewed journals. Most of the evidence is documented in reports and project briefs, which raises questions about the quality of the analysis and the ability to learn lessons beyond projects.

Second, despite the limited number of studies, it is promising to see that more than half, 17 out of the 29 studies, do not stop at simple gender-outcome indicators (like reach and benefits) but also report women empowerment outcomes, mainly changes in women's decision making and control over income, and/or change in the agency. As [Johnson et al. \(2018\)](#) note, it is important for projects to include appropriate gender outcomes to be able to build the evidence base on factors driving women empowerment.

Third, the literature focuses on a particular type of IBM, the farmers "owned models of collective action (including cooperatives) that are used to support farmers" access to markets, inputs, and services, with 18 papers describing this approach. It is important to note that there are important variations within that type of IBM in terms of inclusiveness, see for example the case of dairy cooperatives in [Mwambi et al. \(2020\)](#) for Kenya and [Ravichandran et al. \(2021\)](#) for India. In other sectors, cooperatives are also a vehicle to progress toward gender equality, as detailed by [Lecoutere \(2017\)](#) for Uganda, in the case of the rice and cassava sector in Uganda ([Theeuwen et al., 2021](#)) and multipurpose cooperative in Nepal ([Sharma and Shahi, 2022](#)). Contract farming is the second most described IBM, with only 3 papers. Dairy and poultry interventions are the most common livestock species used in the included IBMs and more dairy interventions were associated with studies on the transformation of norms compared to the other livestock species. There is, therefore,

a need to expand research to other types of IBMs and livestock species.

Fourth, the review has highlighted the need to conduct more rigorous studies, as some papers lack rigorous methods for measuring and tracking women's empowerment systematically (e.g., leadership positions or decisions over livestock or income). In addition, because many of the studies were published in reports or briefs, a major limitation of this paper is the underreporting of negative effects or no effects. Indeed only 9 studies out of 29 studies reported some weaknesses of the studied IBM.

Other limitations to our study need to be noted. First, the search terms and string, while including key terms, is narrow and did not include possible synonyms, including species name (e.g., poultry). Secondly, only papers in English were searched, which limited the identification of papers from various regions (Latin America, West Africa, and parts of Asia). Thirdly, the small number of papers included did not allow us to conduct a meta-analysis, resulting in a descriptive analysis, with no possibility to contrast IBMs by type, region, species, or outcomes.

Conclusions

Gender research in livestock has long focused on how gender differences and norms affect livestock development, for example how women and men differentiated access to information affects the uptake of livestock innovations. It is increasingly recognized that the relationship is also the other way round, how progress toward gender equality and women empowerment can be achieved through livestock development. This study focused on gender-inclusive business models literature and approaches that enhance the participation of women in the livestock sector, the benefits they derive, and progress toward

TABLE 5 Type of inclusive business model (IBM) and associated benefit outcomes.

Gender outcomes	Buyer-driven IBM			Producer-driven IBM	Intermediary-driven IBM			Combined IBMs		
	Contract farming	Micro franchising	Joint ventures	Farmers-owned businesses	Public Private Partnerships (PPP)	Sales agent model	Micro - financing	Farmer-owned businesses + entrepreneurs	Farmer-owned business + PPP	Micro franchising + PPP
Women reached	•••	•	•	••••••••••••••••••••		•	•	•	•	•
Change in income	•••		•	••••••••••	•	•	•	•	•	•
Change in access to inputs and services	••	•		••••••••			•	•		•
Change in livestock productivity			•	••••••		•		•		•
Change in household nutrition status				••••••					•	
Change in access to output markets				••••	•		•			
Change in access to loans				••Φ						
Change in the production system			•							
Change in assets				•••						

Key: • represents the number of studies reporting the outcome; Φ represents studies reporting no change effects associated with the outcome; Blanks show that the outcome is not reported in the study.

women empowerment. Through a wide literature search, only 29 studies were identified and included in the analysis showing the scarcity of published literature in this field, and the few available lack rigor for measuring and tracking gender outcomes. The few studies report gender-outcome indicators and women empowerment outcomes associated with the IBMs, revealing the need for more rigorous studies to inform such interventions. The most common IBMs relate to farmers' collective action, with a focus on dairy and poultry businesses. About 40% (12 out of 29) of the studies limit their analysis to reach (i.e., number of women involved) and benefit (i.e., income change from participating), with the majority of papers,

therefore, extending to women empowerment and/or gender norms outcomes. Increased control over income and decision-making is the dominant indicator; studies also refer to women's increased mobility, involvement in livestock marketing (a role usually reserved for men), taking up leadership positions in cooperatives, enhanced decision-making, and joint household responsibilities with men not only helping in livestock activities but also participate in household activities. As a government, development practitioners, and the society at large are looking for practical ways to progress toward gender equality, this paper shows that livestock offers such opportunities mainly through collective action but also contract farming and a variety of

TABLE 6 Type of inclusive business model (IBM) and gender outcomes associated with empowerment and transformation of norms.

Gender outcomes	Buyer-driven IBM			Producer-driven IBM	Intermediary-driven IBM			Combined IBMs		
	Contract farming	Micro franchising	Joint ventures	Farmers-owned businesses	Public-Private Partnerships (PPP)	Sales agent model	Micro financing	Farmer-owned businesses + entrepreneurs	Farmer-owned business + PPP	Micro franchising + PPP
Changes in women's decision-making and control over income				●●●●●ΦΦ				●		
Changes in women's agency				●●●●●●●●		●	●			
Changes in women's employment opportunities				●	●	●				
Changes in women's participation in livestock marketing				Φ	●					
Opportunities for women business expansion in value chains							●			
Freedom in mobility to pursue income-generating activities				●●Φ				●Φ		
Joint responsibilities with men in the household and non-household activities								●		
Changes in women in leadership positions				●ΦΦΦ						

Key: ● represents the number of studies reporting the outcome; Φ represents studies reporting no change or negative effects associated with the outcome; Blanks show that the outcome is not reported in the study.

less common business models that may be worth testing and implementing in various livestock communities. Researchers and implementers should be encouraged to collaborate and implement “research in development” activities (Baltenweck et al., 2019), to strengthen research quality and rigor, in real-world situations. This would also include reporting possible negative effects of IBMs’ interventions, on which valuable lessons can be learned.

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

IB and EO conceived the study. IB, EO, and JN searched and reviewed the literature and extracted data. EO and JN analyzed the data. IB and EO drafted the manuscript and JN generated the references. All authors listed have made a substantial contribution to the work and have approved this submission for publication.

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partnership that unites organizations engaged in research for a food-secure future.

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Conflict of interest

The 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.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/frsus.2022.958251/full#supplementary-material>

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