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EDITED BY JOHN MCINTIRE AND DELIA GRACE

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Co-published by CABI and the International Livestock Research Institute 2020.

ISBN-13: 978 1 78924 185 3 (hardback)
ILRI ISBN: 92-9146-586-3 (hardback)

CABI Commissioning editor: Alexandra Lainsbury
CABI Editorial assistant: Lauren Davies
CABI Production editor: James Bishop

Typeset by SPi, Pondicherry, India
Printed and bound in the UK by Bell and Bain Ltd, Glasgow

18 The Impact of ILRI Research on Gender

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Executive Summary

This chapter discusses the evolution of gender research at the International Livestock Research Institute (ILRI) and its predecessors[1], and in the context of CGIAR. It then reviews the impact of ILRI's gender research in a number of areas including development, science, capacity and policy.

Discrimination against women in access to skills, assets, employment, education and healthcare is costly in foregone output and in heightened inequality. Research at international agricultural research centres, although often ad hoc, has long sought to identify technical and policy measures to eliminate or reduce bias against women in agriculture. Specifically, research at ILRI has focused on gendered access to assets, such as livestock and land, and to technology needed to raise livestock and crop production. As livestock often provide a significant share of women's employment and income, and are often an asset they have control over, identifying gender-based biases through research can be a powerful tool to improve the condition of women and improve the sector as a whole. Gender research in livestock also enhances the effectiveness of interventions by increasing the relevance of livestock technologies and institutions to local communities by addressing needs, preferences, constraints and challenges of all farmers. Recent work also looks at how livestock can empower women by revealing social relationships and power dynamics in decision making that affect livestock interventions and how it is possible to build upon livestock as an asset for empowerment.

Research spending and Altmetrics on gender questions

The accounting of ILRI and its predecessors is insufficient to estimate the gender share of research and development spending at the three institutions. During the CGIAR Research Programme (CRP) on Livestock and Fish (2011–2017), this changed with the mandate of the CRP to spend 10% of its budget on gender. At the same time, there has been an increase in direct funding to projects on gender[2], but it is premature to estimate the impact of this funding.

ILRI's presence in the gender literature, as indicated by Altmetric (www.altmetric.com/; accessed 10 March 2020), is limited. The ILRI institutional database on the keyword 'gender' within Altmetrics has 1.0% of the Altmetrics global database; the rate is even lower for the keyword 'women'. The only major papers (over 100 citations) with specific notice of the work and output of women are the systems studies for Maasailand (Solomon Bekure *et al.*, 1991) and Borana (Coppock, 1994). There has been a recent increase in gender-specific articles produced by ILRI staff and partners, such as Galiè *et al.* (2019a) on the Women's Empowerment in Livestock Index (WELI), which had a download index of 1.9k by April 2019.

Scientific impact

Research on gender at ILCA began in the 1970s in the principal systems studies conducted by ILCA, notably those in Kaduna in Nigeria, Borana in Ethiopia, Maasailand in Kenya, and Niono and Macina in Mali. The main gender-related impacts of the systems studies were: (i) to identify gender bias in ownership of livestock, land and other assets; (ii) to identify gender bias in access to technology and advisory services; and (iii) to give methodological guidance on avoiding gender bias in the design and conduct of field investigations.

Recent scientific impacts of gender work at ILRI have included: (i) institutionalizing a strategic approach to avoid bias in experimental design and conduct; (ii) refining field methods to show potential gains from greater gender equity in the generation and application of field results; (iii) a paradigm shift among technical scientists to understand that women, as well as men, are members of their client groups and have their own demands and needs in terms of animal health services, feeds and forages, environment and genetics, as well as facing different constraints and challenges related to livestock; and (iv) developing indicators and an understanding of women's empowerment through livestock.

Development impacts

The following development impacts were identified:

- Defining beneficiary populations for technical changes in livestock investments, including

in dairy, in vaccination campaigns and in plant-breeding programmes.
- Adapting advisory services to the potentially different needs and constraints of female and male farmers in crop and livestock production.
- Strengthening personal and institutional capacities to enable ILRI, other CGIAR centres and several partners to do gender analysis in both pastoral and mixed farming systems.
- More efficient identification of target groups for campaigns to improve food safety.
- Identifying livestock assets as a means of women's empowerment.

Evolution of Gender Research at ILRI and its Predecessors

1970s–1980s

When ILCA opened in 1974, its aim was 'to integrate sociological, economic, and biological research and development related to livestock in Africa' (Waters-Bayer and Bayer, 2014). Despite its development objectives, ILCA did not systematically include gender in its early work. A review of gender-related impacts of CGIAR research criticized the methods and results of international agricultural research on gender issues more than a decade after most of the international agricultural research centres had been established (Jiggins, 1986).

ILCA social scientists working in field conditions (see Chapter 15, this volume) recognized the important roles of women in agriculture and sought to understand these roles within complex farming systems. What became the early, innovative, gender research focused on intra-household decision making, indigenous knowledge, farming systems, the roles of women and even the power and privilege aspects of extractive research (Waters-Bayer, 1985).

The ILCA Subhumid Zone Programme at Kaduna, Nigeria, was a pioneering effort in ILRI's evolution (von Kaufmann *et al.*, 1986). It studied the production systems of settled and seasonally transhumant agro-pastoralists to find ways of increasing crop and livestock production. Milk sellers were exclusively women in the rural markets in central Nigeria, as had been described in the drier areas of Nigeria and Niger (Dupire, 1960, 2018; Stenning, 1994; Hopen, 2018).

Waters-Bayer (1985), in the Kaduna study, looked at resource control and decision making in Fulani households, specifically at Fulani women's processing and marketing of milk products, and highlighted the ways in which these agro-pastoral women understood market forces and recognized the social and local political functions of their work. The research also explored the limits of Fulani women's knowledge of connections between the local, national and international economies. The study argued in favour of the participatory research to build on rural people's knowledge to enable them to understand and cope better with external influences on their activities and help them 'better defend their own interests against the macroplanning State'(Waters-Bayer, 1985).

In an effort to bring gender more to the forefront, in 1984, ILCA hosted a workshop on women in agriculture in West Africa, sponsored by the Ford Foundation. The conference covered a wide range of topics related to women in development and included an often-cited paper by Okali and Sumberg (1985), which focused on ownership patterns between women and men in small-ruminant production systems and the intra-household processes therein.

By the late 1980s, there had been a shift in ILCA's focus, and it began to emphasize more discipline-based research in animal health, nutrition and genetics, and stressed 'precise' measurement. This approach conflicted with ILCA's previous innovations in livestock systems research and development and its investments in social scientists. This new approach led to the removal of ILCA's social scientists, apart from economists (Romney and Minjauw, 2006; Waters-Bayer and Bayer, 2014), implying that some of the innovation and momentum on gender disappeared.

1990s–early 2000s: the merger and clash of cultures

The merger in 1995 of ILCA and the International Laboratory for Research on Animal Diseases (ILRAD)[3] into ILRI altered livestock systems research. ILRAD had little tradition of field-based research, apart from epidemiology, and

the influence of ILCA's systems work weakened after the merger. ILRI's nascent institutional culture tended to see the social sciences, which had been significant in the systems studies, as 'soft sciences'[4] and this included gender research at ILRI.

ILRI's work in the 1990s on smallholder livestock development later did open opportunities for gender work. CGIAR's Systemwide Livestock Programme was one such initiative, drawing attention to the importance of investing in mixed crop–livestock systems and indigenous livestock breeds and in community-based management of animal genetic resources (ILRI, 2014).

Again, in 1996, ILRI realigned its agenda to emphasize the importance of considering people as part of the livestock systems, which included women. The gender perspective of ILRI's research at the time focused on the roles of, and constraints to, productivity faced by women as agricultural producers. Specific studies of smallholder dairying on the Kenya Coast indicated that women operators were more productive than men, even where men owned cows where the woman operator received the bulk of the additional earnings. The Kenya Coast research also looked at the importance of targeting extension to women as well as to men to make technical advice more effective. Other research in Kenya focused on the importance of understanding women's and men's roles on trypanosomiasis; this yielded a recognition of the importance of understanding gender-differentiated willingness to adopt disease-control strategies (Echessah *et al.*, 1997). Research in Ethiopia involving the Ethiopian Institute of Agricultural Research (EIAR), the Ethiopian Health and Nutrition Research Institute (EHNRI) and ILRI looked at the impact of cross-bred cattle on men's and women's decision making around dairying income (Nicholson *et al.*, 1999).

In 1999, a study of 54 households in a semi-arid subregion of western Niger highlighted shifts in livestock ownership related to long-term economic and environmental changes (Turner, 1999). Turner found significant shifts away from cattle owned by men and towards sheep and goats owned by women over the period 1984–1994. To some extent, these shifts have gone unnoticed in the gender literature, yet they confirm the point, often made in the same literature, that separate survey and analytical approaches are needed to capture the importance of women's economic activities and the potential gains that can be realized by reducing bias against women in access to inputs and services.

2005–2010: institutionalizing a gender research agenda

In 2005, ILRI undertook a gender audit, which reviewed its understanding of gender analysis in research, its gender equity in the organization and its mainstreaming of a gender-based approach. The audit found a good-faith effort to improve gender equity and diversity in the workplace among staff and that management backed this effort. It noted that this effort had helped create a supportive environment for mainstreaming gender analysis in the ILRI's research programmes, as an understanding of gender in the workplace is known to facilitate the integration of gender in research.

In terms of gender analysis in research, the audit found that there was no policy on gender analysis in setting research priorities. It was noted that gender analysis in ILRI was discussed more than practised and that ILRI's strategy did not mention gender issues. The gender audit also found that, although there was an understanding of the importance of gender to this point, there had been little training of scientific staff, managers and students in gender analysis or integration. The institution had not yet instituted a unit or focal point to systematize gender in its programme, although some staff were considered to have expertise in gender analysis (Roothaert *et al.*, 2006). The audit therefore concluded that, while there was good understanding of what gender analysis is in the research capacity of ILRI staff, undertaking such analysis was limited (Roothaert *et al.*, 2006).

As a result of the audit, ILRI formed a task force in 2006 to develop a research agenda on women and livestock issues, but it was only in 2008 that the task force began to have meaningful dialogue with experts and partners (Njuki *et al.*, 2011). This was initiated through a global e-consultation, the Global Challenge Dialogue on Women and Livestock (Gonsalves, 2013). The consultation brought together major livestock players and proposed: (i) the production of a landmark document providing evidence of the feminization of the livestock sector throughout

the world; (ii) a plan for revitalizing a global women's and livestock alliance; (iii) a review of strategies used by research and development organizations to reach women; and (iv) plans for scaling out those strategies that have been successful in reaching women with livestock interventions (ILRI, 2012).

While gender analysis was not systematically integrated in ILRI's research, several projects included gender outcomes. Most projects were development oriented and included women as beneficiaries of the technologies without analysing the actual needs of the women involved. For example, the broad-bed maker tool in some mixed farming systems of the Ethiopian highlands (Rutherford, 2008), the Improving Productivity of Market Success (IPMS) of Ethiopian Farmers project (2008–2013) and the East Africa Dairy Development (EADD) were efforts to introduce interventions that included women as beneficiaries.

The EADD Phase 1 project in Kenya, Rwanda and Uganda (2008–2013) set out to double the dairy income of 179,000 smallholder families in 10 years. Its entry point was women as beneficiaries of training and as producers. In 2009, EADD set out to address this gap by developing a gender strategy, hiring a gender and youth coordinator in 2010, developing gender disaggregated data templates and a gender work plan and performance targets, and outlining strategies to include women in project activities. Although a development project, it did open up a new understanding of gender and the need to focus specifically on women (Baltenweck and Mutinda, 2013).

In 2009, ILRI established a new theme on 'Poverty, Gender and Impact'. This demonstrated a shift in its commitment to ensuring gender-responsive research by focusing on two components: (i) investigations where the research agenda has been set by scientists, such as forages or genetics, and gender considerations are integrated to study the subject more effectively; and (ii) strategic research where the subject is gender.

Important in the 2000s was ILRI's work developing a conceptual framework on livestock as a pathway out of poverty that had, at its core, the importance of assets, markets and other institutions (Kristjanson *et al.*, 2004). ILRI used this framework in a seminal literature review to discuss women and livestock as a pathway out of poverty for women (Kristjanson *et al.*, 2010). The authors hypothesized that livestock pathways out of poverty: (i) secure current and future assets; (ii) sustain and improve the productivity of agricultural systems in which livestock are important; and (iii) facilitate greater participation of the poor in livestock-related markets. Each of these brought a new attention to gender in its own right and to the importance of livestock as an asset for women.

2010 onward: from an ILRI gender strategy to CRP and beyond

In 2010, ILRI developed a common set of gender, livestock and livelihood indicators to help the centre measure the impacts that projects and other livestock interventions, such as markets and biotechnology, had on poverty, gender and equity (Njuki *et al.*, 2011). These indicators were developed for household-level surveys with the potential for adaptation for community-level focus group discussions.

Another turning point for institutionalizing gender approaches at ILRI came when the Institute produced its 'Strategy and plan of action to mainstream gender in ILRI' (ILRI, 2012). The strategy recognized ILRI's need to guide and design the consolidation of ILRI's expertise and gender resources, to engage stakeholders, and to ensure that men and women participate in and benefit from ILRI's research. It also emphasized the need for commitment from ILRI's board, management and staff and from its many other partners. ILRI's gender strategy represented a true shift over time from research that looked at women as components in farming systems research to a full gender and agricultural research theme including production, processing, markets, value chains and strategic gender research.

In 2014, ILRI introduced a new theme – Enabling Innovation – which focused on adaptive capacity and increased attention to gender. This continued the research of the Innovations Work Unit established in 2007, which, in part, also generated information and learning to empower women in livestock innovation (Waters-Bayer and Bayer, 2014). The Innovation Works Unit recognized women's key roles in livestock production, nutrition and health, noting that most resource-poor livestock keepers are women, and campaigning to keep gender issues at the

forefront of livestock research and development. This included a greater emphasis on the impact of technologies and policies on women and a greater awareness of gender issues overall.

A later shift in ILRI's gender research followed the development of the CRPs in 2010 and 2011. With the CRP on Livestock and Fish (2012–2016), ILRI recognized the need to consolidate the centre's gender expertise and resources to ensure that men and women participated in and benefited from CRP work. Gender was one of the programme's six themes along with animal health, genetics, feeds and forages, sustainable interventions and value-chain development (Galiè and Kantor, 2016; CGIAR, 2013).

The CRP on Livestock and Fish focused on gender relations and dynamics, access to and control of productive resources, and gender-transformative approaches. The CRP explored local meanings of livestock ownership across three CRP value-chain countries (Tanzania, Ethiopia and Nicaragua) (Galiè, 2015). The CRP developed an article reviewing tools developed in livestock and fish value chains (Farnworth *et al.*, 2015) and a policy brief looking at gender relationships and farmers' capacity to mitigate climate change (Gumucio and Rueda, 2015). To enhance the capacity of scientists to integrate gender in their work, the CRP on Livestock and Fish engaged the Royal Tropical Institute in the Netherlands, which, together with the ILRI gender scientists, coached them; this work led to the publication of findings from 14 gender-integrated livestock and fish research studies (Pyburn and van Eerdewijk, 2016).

In 2015, ILRI and Emory University in Georgia, USA, identified a mismatch between the limited attention to livestock issues in the WELI, which focused on agriculture in general (including livestock, crops and fish) and the importance of livestock in East Africa. The WELI was subsequently developed to explore how women's empowerment can be supported through livestock and to assess women's empowerment quantitatively, particularly in a case study of Tanzania (Galiè, 2018a).

Currently, ILRI's gender research work is focusing on: (i) animal health, through enhancing gendered capabilities to address threats through a gendered lens and engaging women in health services; (ii) feed and forages, through gender-sensitive forage interventions, gender dynamics in fodder seed innovation systems, and gender dynamics in forage conservations systems; (iii) genetics, through gender-sensitive community breeding of small ruminants (Marshall *et al.*, 2019); and (iv) the environment, through gender and land tenure for reduced land degradation, increased intensification, labour dynamics, gender norms, and gender and pastoralism (de Haan and Mulema, 2018).

Impacts of Gender Research at ILRI

The impacts of ILRI's gender work can be grouped by influences on: (i) scientific perspectives, methods and levels of analysis; (ii) farming systems and technologies; and (iii) empowerment.

Scientific perspectives, methods and level of analysis

Influence on scientific perspectives

Research by Waters-Bayer (1985) on agro-pastoral Fulani women in Nigeria and by Okali and Sumberg (1985) on women and small-ruminant production in the subhumid areas of southern Nigeria provided some early understanding on the intersection of gender and livestock production. Recently, gender research has gained ground in ILRI's work and moved from an issue relevant for studying other subjects such as breeding and animal health (integrated gender analysis) to a research topic in its own right (strategic gender research) and is thus part and parcel of understanding how rural households, value chains and livestock systems work, with its own research agenda. Similarly, gender equity through livestock is increasingly accepted as a goal of ILRI's work in its own right and a driver of change, rather than a secondary outcome of livestock interventions.

Methods

Mulema *et al.* (2019) undertook research in Ethiopia that demonstrated the significance of several empowerment indicators (e.g. cultural norms and women's inputs into production decisions; autonomy in plot management; membership of farmer groups; ability to speak in public, enhancing their participation in different stages;

access to information and extension services, education and land size) in influencing women's participation in different stages of agricultural research. This work contributed to the literature on women's empowerment in relation to agricultural research and to promoting the integration of proactive, holistic gender perspectives in research strategies.

ILRI has also developed indicators on gender, livestock and livelihoods to measure the impacts of livestock interventions at household and community levels (Njuki *et al.*, 2011). The women's empowerment in livestock-focused agriculture – the IMMANA project (2015–2018) – in Kenya, Uganda and Tanzania developed new metrics for women's empowerment and animal-source food intakes that are sensitive to maternal and child nutrition, and are relevant to different livestock value chains, including pork, dairy cattle and poultry.

The CRP on Livestock and Fish developed a set of tools for social and gender analysis for value chains (Kruijssen *et al.*, 2016). These tools, adapted from existing tools from other organizations, help users to explore gender relationships and the underlying causes of inequities. One helps users undertake a supplementary gender and social analysis when there is already an existing value-chain analysis, while the other helps users undertake a full value-chain analysis including underlying causes of gender inequality.

In 2016, the CRP on Livestock and Fish integrated gender into the Feed Assessment tool (FEAST), a participatory tool focused on feeds and forage and developed by scientists at ILRI, the Centro Internacional de Agricultura Tropical (CIAT) and the International Center for Agricultural Research in the Dry Areas (ICARDA). This supported researchers and practitioners in their research to surface the issues of gender relationships and how they affect livestock farming, particularly feeding practices and innovations (Lukuyu *et al.*, 2016). The resulting app has now been gendered into G-FEAST, which specifically looks at gendered preferences for forages.

Waithanji and Grace (2014) also developed a gender strategy to support mycotoxin control given that, in many regions, women are responsible for producing food for home consumption and may also have roles in feeding and caring for livestock. The strategy is an important tool for researchers working on mycotoxin control as it outlines a Theory of Change and research cycle approach as well as gender-responsive goals, objectives, research questions, activities and outcomes that can inform research and interventions in livestock health. The WELI has been found to be particularly useful for measuring the impact of livestock projects on women's empowerment over time. ILRI, together with Emory University, developed the WELI and piloted it in Tanzania in 2015 (Galiè *et al.*, 2019a). The WELI helps researchers and decision makers better understand which interventions work best for empowering rural women. Such evidence is important to fine-tune interventions and provide better empowering opportunities for rural women. The actual discussions on empowerment between rural women and men also provide value, opening spaces for individuals, communities and households to think about what empowerment means, who has access to more opportunities for empowerment, and how social and gender norms affect the ability of individuals to succeed.

Tavenner *et al.* (2018) analysed resources, decision making and labour dynamics in dairy farm households in western Kenya. This study found statistically significant differences in practices based on gender. The most divergent responses between men and women were decision making around the morning and evening milk sales. The authors argued that the choice of interviewee affected research findings because survey respondents may have different perceptions or valuation about 'who does what'.

Galiè *et al.* (2019b) discussed some of the difficulties encountered in adopting a mixed-method approach that results in contradictory quantitative and qualitative findings. The article discusses some reasons for this discrepancy including the different definitions, domains and indicators adopted by the two approaches when studying 'food security' 'nutrition security' and 'women's empowerment'. In addition, the qualitative study may have given space to a discussion on 'aspirational' versus 'actual' gender roles in guaranteeing food and nutrition security that quantitative and closed research questions may have not provided.

Gender at the landscape level

Gender work has typically been done at the household level and has studied intra-household

dynamics. To widen the impact of gender research, in 2017, the CRP on Livestock began work on gender at the landscape level through the development of national livestock master plans. New versions of such national master plans will guide investment towards women in the livestock sector (Shapiro *et al.*, 2015 for Ethiopia). There is also a move to integrate gender in modelling work and livestock sector analytics that underpin the national master plans. An ongoing project is developing a methodology to scale gender dynamics from the household and community levels to higher national and regional levels in the context of the feminization of agriculture (Galiè *et al.*, 2019d).

Farming systems and technologies

Institutions

Farnworth and Colverson (2015) found that rural advisory services operate in environments structured by gender relationships. In other words, women often have less-effective participation in community decisions, in value-chain networks and in innovation platforms. Because women are reached less often by advisory services, it is more costly for them to adopt new methods. The study concluded that advisory services should be seen as a facilitation system to tackle underlying gender relationships that constrain access and implementation rather than as a supposedly gender-neutral service.

Omondi *et al.* (2014) found that women were reluctant to participate in dairy hubs in Kenya because of their loss of control of income from milk sales, underscoring the importance of intra-household income distribution. The findings implied the need for evidence-based interventions and changes in structures that encourage women's participation, promote more equitable income distribution from dairying and/or compensate women's loss of income, without negative impacts on the stability of gender relationships within the households.

Basu *et al.* (2019) analysed approaches to women's participation adopted by the EADD by looking at how participation actually emerges in specific contexts through gendered negotiations with participatory development policies. The authors discussed how initiatives that include women construct new pathways for women's participation because of the ways that various participatory strategies relate to one another, rather than due to the efficacy of one strategy over another.

Fodder and forages

Work at ILRI and the Kenya Agricultural Research Institute (KARI) on smallholder dairying based on a fodder cut-and-carry system found that an integrated dairy development package had limited acceptance among farmers. A subsequent study looked at women's roles and labour, and found that women were more likely than men to adopt more of the package and demonstrated higher milk yields per lactating cow (11.5 litres/day) than male contact farmers (6.8 litres/day) (Mullins *et al.*, 1996). Although women faced increased workloads as dairy operators, they also perceived improvements in the welfare and long-term development benefits of their households through women's income going to school fees, books, and food purchases (Mullins *et al.*, 1996).

A study on a traditional Maasai forage conservation system (*ololili*) in Tanzania (Galiè, 2018a) found that the system relied heavily on women's labour when it was in use during the dry season, whereas livestock management involved both women and men. Women's and men's groups were found to have similar knowledge of local forage plants but ranked their importance differently. They also showed the same level of interest in intensifying forage growing in the *ololili*. At the same time, gender norms and dynamics were found to strongly affect the ability of women – mostly poor women, and widows in particular – to manage *ololili*. These social constraints in the governance of the *ololili*, if not addressed at the inset of any intensification intervention, were found to be likely to decrease the success of forage technology interventions because they limited the sustainability of the system.

Galiè (2018b) showed how a forage breeding intervention can enhance the empowerment of female farmers. The author demonstrated practical challenges faced by a breeding programme that aims to include gender considerations in its activities and showed how a lack of access to seed because of gender-discriminating

norms and practices at local and national levels can hinder progress towards empowerment. Ultimately, the article challenges assumptions that gender considerations be integrated in breeding programmes to enhance their effectiveness only, by showing the empowering potential of a gender-responsive programme to progress towards gender equality. The article also shows the importance of taking into account the wider context (e.g. socio-cultural, policy and seed systems) in which a breeding programme is implemented, to ensure its benefits reach both female and male farmers.

Animal health and food safety

Galiè (2017) studied smallholder livestock keepers in Tanzania and found that while men and women were both involved in animal health management and had similar knowledge of diseases, women faced more constraints than men in accessing livestock services, disease information and veterinary drugs because of restrictive norms on both their movement and their interactions with unrelated men, because of biases about their reliability in identifying diseases and paying for services, and because they had limited control over the household resources. The study suggested supporting women's groups as a way of enhancing women's control over livestock and revenues, and access to animal health information and income-generating opportunities. The study recommended enhancing the capacity of service providers in gender-responsive approaches and organizing community outreach activities that highlight the benefits of shared intra-household decision making. It recommended that research institutes include gender considerations when identifying priority species and diseases for research on animal medicines and assess which format (e.g. size or temperature sensitivity) increases the accessibility of animal medicines at local level.

Dione *et al.* (2016) explored how gender relationships affect African swine fever control protocols and how current male-centred approaches often disregard women's roles in pig husbandry. Specifically, the research looked at how women and men in Uganda perceive African swine fever and the factors affecting how they respond to it in efforts to encourage farmers to adopt improved husbandry practices and disease-control measures. The study noted that to control the disease, farmers require information and money for disinfectant as well as the agency to make decisions. It found that women work closely with livestock, often detecting the disease or symptoms. However, men typically make decisions, control household income, and have access to training and veterinary services.

Elsewhere, Kiama *et al.* (2016) conducted a qualitative study with male and female dairy farmers in Kenya on their awareness and perceptions of mycotoxins and how their risk of dietary exposure of mycotoxins is influenced by these. The gender analysis found that those responsible for mitigating risk of exposure are not always those with the knowledge of how to do so. It also pointed to the importance of extension services targeting women as they are the main handlers of food. The study found that farmers had a high level of awareness of the harm of eating mouldy food even though risk categories, awareness of mycotoxicosis and carcinogenic effects were generally low. Typically, women were more careful than men not to feed cattle spoilt maize and they were key decision makers in dairy cow diets and disposal of mouldy foods. Furthermore, while farmers agreed that hygienic handling was the most important method to enhance meat and milk safety, it was women who took more care in ensuring that this happened, while men were more likely to treat sick animals.

Kimani *et al.* (2012) investigated the gender and social determinants of the risk of exposure of *Cryptosporidium* spp. from urban dairying in Dagoretti, Nairobi. The study found that gender, age and household roles are all determinants in exposure to *Cryptosporidium* spp. For example, farm labourers and people aged 50–65 years had the most contact with cattle, while women had greater contact with raw milk and children had relatively higher consumption of raw milk. Women had more contact than men with cattle faeces. Age also played a factor, as older women had more contact than older men. Socio-economics was a partial factor, with those living in poverty consuming less milk than others, although their exposure to cattle was not affected. There was no significant gender difference in knowledge of cryptosporidiosis symptoms or other zoonotic diseases in the dairying sector; however, the level of education was a determining

factor in awareness, with those with higher levels of education more aware of the disease and factors affecting its transmission.

Jumba *et al.* (2016) illustrated that vaccines against East Coast fever, a major tick-borne disease of cattle and buffalo, can increase overall household productivity while making it more unequal. This resulted from an increase in women's labour on livestock at the same time as their husbands controlled income from increased livestock sales. As a consequence, women were sometimes reluctant to buy vaccines.

Working on contagious bovine pleuropneumonia (CBPP) in Kenya, Muindi *et al.* (2015) noted that women and men perceived the effects of, and were affected differently by, CBPP occurrence because of prevailing gender norms. While women perceived cattle mortality to be the greatest effect of CBPP because it caused food shortages and a decline in income from milk sales, men perceived reduced participation in cattle markets to be the greatest effect of CBPP occurrence. The findings pointed to the need to incorporate gender in animal health research to develop appropriate interventions to prevent or mitigate small-ruminant diseases. A related example is given by Wieland *et al.* (2016) in Ethiopia in a Participatory Epidemiology and Gender Project. This project provided insights about the differential veterinary knowledge of women and men in households keeping sheep and goats related to their gender-specific roles and about the need to target interventions, such as deworming, accordingly.

Research on 20 livestock and fish value chains found that the influence of gender on risk exposure and management is essential for improving food safety in informal markets (Grace *et al.*, 2015). Socially constructed gender roles were more important determinants of health risk than biological differences between men and women; variations in risk exposure were mainly due to gender-based differences in occupational exposure.

Genetics

Gender inequalities can affect the orientation and outcomes of programmes to improve livestock genetics. A study by Rijke (2017) focused on the gender capacities of national partners in the African Chicken Genetic Gains project. It measured gender capacities at organizational and staff levels of national and regional research institutes and assessed them in relation to the institutional and policy environment that enables or disables other capacities. On a scale of 1–5, the study found that core gender capacities are insufficiently to partially developed (2.4–2.9), pointing to the need to substantially improve the gender capacity of these organizations to support genetics research.

Other research by Mora Benard *et al.* (2016) in Nicaragua demonstrated gender disparities in milk production and breeding technologies (artificial insemination). Ramaswamy and Galiè (2018) studied gender trait preferences in poultry in Ethiopia and showed that women valued traits related to behaviour and feathers that breeding programmes usually neglect by focusing on meat yield and taste only. Women's preferred traits affected whether a breed was adopted by a household or not. The same study also showed that men respondents preferred traits related to productivity, health and marketing of chickens with a view to scaling up their poultry keeping to an intensive system for business. Women responders, in contrast, aspired to increase the scale of their poultry keeping within their household level only and therefore valued traits to increase productivity in extensive systems. Women were not interested in upgrading poultry to a business because of the high labour requirements (mostly their responsibility); their lack of land to keep chickens intensively or assets to make financial investments needed for intensification; and their loss of control over the benefits provided by chickens when, with intensification, men took on the marketing of the birds. The authors, therefore, recommend that, to increase adoption, poultry breeding programmes include gendered preferences for both traits and chicken-raising systems.

ILRI participates in the CGIAR Gender and Breeding Initiative, which seeks to build an approach that incorporates gender perspectives from the beginning of a breeding programme through implementation and impact assessment. The initiative is currently working on a toolbox that helps such incorporation. The toolbox will be used to assure the gender relevance of tools in the CGIAR Excellence in Breeding Platform (Liljander *et al.*, 2015), while supporting national agricultural research institutes and

other breeding programmes. As part of this initiative, Galiè *et al.* (2019a) analysed approaches to see what is effective in making a plant-breeding programme gender responsive. The authors argued that a programme needs to: (i) adapt its criteria to select farmers to host and evaluate trials to ensure women (who own smaller parcels of land than men or none at all) are involved; (ii) adapt its process to evaluate trials in ways that women can express their preferences (e.g. by using scoring systems that require little literacy or, for example, by creating a safe space for women to assess the crops and express openly their preferences; in a community with strong purdah practices, this may entail a women-only field trip and domestic space to discuss and score trials); (iii) expand the traits it considered for further breeding to include traits preferred by different groups of women and men; (iv) expand the crops it included in its portfolio (to include crops of interest to women and men); and (v) include both oral and visual information-sharing approaches to reach women who are often more illiterate than men. However, for a gender-responsive breeding programme to result in actual gender-equitable outcomes (e.g. producing seed that benefits both women and men), a coherent and comprehensive package of technological (e.g. improved seed) and institutional (e.g. policy and governance) solutions needs to be developed by multidisciplinary teams.

Environment

The EADD programme in Kenya examined sustainable milk intensification, climate change mitigation and gender dynamics in determinants of participation and in distribution of benefits (Tavenner *et al.*, 2018). Household surveys covered decision making, resources and labour dynamics in cattle-keeping households in Bomet, Nandi, Uasin Gishu and Kericho counties. While women and men reported similarly on some issues, they contested others. The research demonstrated the challenges of interpreting gender dynamics and addressing challenges in the dairy sector methodologically and programmatically.

Gumucio *et al.* (2015) looked at capacity and gender relationships in the context of mitigating climate change. Based on a review of silvopastoral production systems in Costa Rica, Colombia and Nicaragua, the work found that gender relationships affect the capacity of livestock producers to mitigate climate change. The study also demonstrated that women face certain limitations as agents of change compared with men due to gaps in access to, and control over, productive resources. Related work by Gumucio and Rueda (2015), derived from a review of 105 national policy documents in seven Latin American countries, concluded that development and environmental policies often failed to recognize women's roles as producers in the national economy.

Nutrition and food security

Galiè and de Haan (2019) highlighted the relevance of gender in policy pathways for food and nutrition security. Price *et al.* (2018) explored the linkages between women's empowerment and household nutrition in relation to livestock knowledge and looked at perceptions of women's empowerment from the perspective of female farmers in Tanzania. The study found that women perceived an increased ability to provide nutrition for their families if they had more control over livestock, income and agricultural resources. However, women were reluctant to describe the direct links between empowerment in livestock work and household nutrition, in part because they could not imagine that it would be possible to gain significant power over livestock within their societal constraints. Women frequently described opportunities for becoming empowered outside the livestock sector (i.e. in new crop agriculture or business) where gender norms were less entrenched than in livestock because they are less constrained by tradition.

Similarly, Galiè *et al.* (2019b) presented a mixed-methods study that examined the relationship between women's empowerment, household food insecurity, and maternal and child diet in two regions of Tanzania. Indicators across three domains of women's empowerment were scored and matched to a household food insecurity access scale. Qualitative research helped appreciate the gender dynamics affecting the empowerment–food security nexus in a forage conservation system. In cluster-adjusted regression analyses, scores from each domain were significantly associated with women's dietary diversity but not with household food security. All three empowerment domains were positively

associated with food security and nutrition in the qualitative analysis. The authors discussed some of the methodological challenges encountered when combining quantitative and qualitative methods and the implications of the findings.

Other research in rural Kenya examined how 'women's time use and decision-making patterns related to dairy income and consumption are associated with intensification' and found that 'children in high-intensity households received more milk than children in medium-intensity households' and that women in high-intensity households also spent less time on dairy activities than women in medium-intensity households. Although women seemed to be gaining control over evening milk sales, men appeared to be increasingly controlling total dairy income, a trend countered by the increase in reported joint decision making (Njuki *et al.*, 2015). Galiè *et al.* (2019b) confirmed this in their recent article on milk production.

Markets and value chains

Farnworth *et al.* (2015) examined current research to develop analytical frameworks and implementation guidelines to support gender analysis in livestock and fish value chains. Njuki and Sanginga (2013) carried out research on women and livestock and provided empirical evidence from different production systems in Kenya, Tanzania and Mozambique of the importance of livestock as an asset to women and their participation in livestock product markets. They explored intra-household income management and the economic benefits of livestock markets to women, focusing on how markets, products and women's participation in markets influence their livestock income.

From experience in the IPMS project in Ethiopia, Aregu *et al.* (2010) demonstrated that site-specific commodity-based gender analysis is essential for understanding the different roles of women and men in the production of specific commodities, marketing and decision making and their share in the benefits; in identifying potential barriers for women's and men's participation in market-led development initiatives and technology adoption; and in identifying what actions may be required by the project in order to overcome some of these barriers that limit women's participation in these particular commodities development initiatives. It helped to explore challenges and identify opportunities for promoting gender equality and women's empowerment through increasing women's access to skills, knowledge and assets and by increasing women's participation in market-oriented agricultural production and their control over the benefits.

Recent research on cattle and dairy market participation in Kenya demonstrated the advances in gender research in recent years to include attention to the gendered nature of market participation and privilege over dairy income (Tavenner and Crane, 2018). This research demonstrated the importance of considering the social trade-offs and the gendered costs of dairy commercialization in interventions aimed at redressing gender power imbalances. Elsewhere, recent work on milk trading in peri-urban Nairobi revealed strong gender-based constraints faced by women milk traders that result in milk business being more lucrative for men than for women (Galiè *et al.*, 2019c).

Similarly, market-oriented smallholder development in the dairy sector in Holetta in Ethiopia and Kiambu in Kenya contributed to the question of whether smallholder research results in women were losing control over income in the East African highlands and suggested the need for more robust understanding of the context in which gender roles and relationships exist and the subsequent impact on women's time use, participation in market-related livestock activities and benefits (Tangka *et al.*, 1999). McPeak and Doss (2006) also highlighted the importance of understanding gendered roles and relationships in producing and marketing dairy products through their research on mobile pastoralists in Kenya. They found that women had the right to sell milk, but men were responsible for the whole herd and where they would camp. If women's marketing objectives conflicted with men's herd-management objectives, then men used location to restrict women's access to markets.

A study on pork consumption in Uganda studied the reasons why pork consumption is lower for women than for men at pork joints (Mabwire, 2018). The study focused on two main possible reasons: the attributes of retailer outlets and gendered perceptions associated with pork consumption at joints. The study found hygiene

(of the outlet environment and the waiters and waitresses) to be the main attribute that women consider when eating at joints. It also found that the communities usually negatively label unaccompanied female pork consumers as 'lonely', 'single' or 'prostitutes'.

Empowerment

Empowerment through livestock is a new area of work for ILRI. It has meant a move away from simply ensuring that women can benefit from technologies developed by ILRI to one where the research is on how women can benefit from livestock based on their own needs and aspirations, and how they can potentially be empowered by livestock. Three initial areas of work have been understanding: (i) the concept of livestock ownership as part of empowerment; (ii) the links among food security, nutrition security and empowerment; and (iii) livestock as an asset for empowerment (Galiè and de Haan, 2018). The team has also engaged in developing new conceptualizations of empowerment based on fieldwork with livestock keepers (Galiè and Farnworth, 2019).

As empowerment is often also within a context, it has also meant increased engagement and research of gender-transformative approaches. Gender-transformative approaches aim to deepen social change by addressing some of the norms that constrict a particular group by determining, for example, what behaviour is acceptable for women and men (e.g. of a given ethic group, social status or age) or what resources and opportunities they are entitled to or can claim (Galiè and Kantor, 2016). Gender-transformative approaches are often contrasted to 'accommodative approaches'. Accommodative approaches recognize and respond to the specific needs and realities of men and women based on their existing roles and responsibilities as shaped by existing social and economic structures; they do not question the systemic barriers put up by the social context of people's lives (Cornwall and Edwards, 2010). Using both empowerment as an entry point and gender-transformative approaches is a new area of work for ILRI but an important one in understanding the potential for livestock to improve livelihoods.

Capacity development and partnerships

Working closely with scientists and partners has been the best approach to develop capacity on gender and to leverage that capacity for a larger impact. In 2013, in collaboration with Transition International, ILRI produced a gender capacity assessment tool to evaluate existing skills and gaps in partners' gender capacities and identify measures to address them. In 2015, the tool was implemented in four of the value-chain countries (Ethiopia, Nicaragua, Tanzania and Uganda) in the CRP on Livestock and Fish (ILRI, 2017). The ILRI gender team has engaged in addressing some of the identified gaps during capacity development workshops and through the use of a training manual. The team has also undertaken capacity development at national levels through, for example, close collaboration with the Ethiopia Institute of Agriculture Research (EIAR) and with the Food and Agriculture Organization of the United Nations (FAO) to develop an approach to building capacity at policy levels.

Under the CRP on Livestock and Fish, the gender team was embedded under different flagships to provide coaching to individual scientists and technicians. Doing so resulted in a cadre of researchers who had a more in-depth understanding of gender in their subject area and in the development of a book on how to integrate gender within different areas of livestock development (Pyburn and van Eerdewijk, 2016). It also resulted in the investment of a gender strategy for the African Chicken Genetic Gains project and the placement of a gender expert in the project to provide support in Ethiopia, Tanzania and Nigeria (Rijke, 2017).

Working together, EIAR, ILRI and ICARDA, together with the Ethiopian Agricultural Transformation Agency, began to integrate gender in agricultural programmes by sharing the gender capacity assessment methodology and tools developed by the CRP on Livestock and Fish (ILRI/ICARDA, 2017). The results and experiences from gender capacity assessment of the small-ruminant value-chain partners were also distributed through the Agricultural Transformation Agency to stimulate interest in and appreciation of the methodology and tools.

Policy impacts

A regional dairy development project was implemented in Kenya, Tanzania and Uganda by Heifer International with ILRI and other partners. One project objective was to increase women's participation in producers' organizations and in the dairy value chain (Pyburn and van Eerdewijk, 2016; Basu *et al.*, 2019). The project included two studies, one to assess women's roles in the dairy value chain beyond production, and the second to analyse the inclusion of women and youth in producer organizations. Both studies illustrated that in all three countries, participation of women was higher at the production links of the value chains and weaker at higher links. Participation of women in leadership positions in producer organizations, cooperatives and credit agencies was insignificant.

A study of a sheep value chain in Ethiopia identified gender-specific constraints for participation in the value chain (Wieland *et al.*, 2016). The results showed that men and women both faced constraints in terms of capital – social, financial, human, natural, political, cultural and physical – but women faced more severe constraints than men. Projects to support pro-poor value chains would therefore need to devise mechanisms to release women's capital constraints.

Another study in Tanzania showed that women and men had similar knowledge of animal disease management and its possible impact on food security (Galiè *et al.*, 2017). However, women faced more constraints than men in gaining access to veterinary services, information on diseases and animal drugs. The implications are that veterinary and extension services should give proper attention to different service constraints faced by men and women.

Quisumbing *et al.* (2013) assessed the impact of dairy value-chain interventions on gender issues, including ownership of assets, asset control and decision making, and time allocation. The study results indicated that value-chain interventions increased joint household assets of men and women. Value-chain interventions did not alter production decision making, although they did have an impact on intra-household decisions. The value-chain interventions also increased the time allocated to dairying, most of which was provided by women.

Improving data and statistics for policy

Of note is the contribution to science impacts of the development of the WELI, which helps quantify empowerment in a way whereby scientists can measure its changes over time. The WELI provides a common framework for determining the effectiveness of various interventions and can support decision makers and policy makers in measuring progress against the investments they make and can strengthen the integration of empowerment in development policies and programmes.

The Rural Household Multi-Indicator Survey (RHoMIS) framework produces standardized, coherent, cost-effective, quantitative, decision-relevant information to support efficient and impactful development programming for planning and monitoring investments in sustainable intensification across a range of rural contexts. RHoMIS captures information on farm productivity and practices, nutrition, food security, gender equity, climate and poverty (van Wijk *et al.*, 2016). The core set of data feeds into a global discussion on the success of sustainable intensification. RHoMIS includes a gender equity indicator, 'Gendered income over assets and foodstuffs' (van Wijk and Hammond, 2018), and since its inception in 2015, RHoMIS has been applied in 22 countries.

The Future

Based on ongoing work, the future of research on gender and livestock covers two different but equally important agendas (for further elaboration, see chapter on 'Conclusion: The Future of Research at ILRI', this volume):

- Improving the productivity and efficiency of the livestock sector by increasing the opportunities for women and men to engage in the livestock sector.
- Strengthening (economic) empowerment of women through livestock.

Research to inform and support this will be undertaken under the following themes:

- Conceptual framing of gender and livestock.
- Increasing options to engage equitably in the livestock sector and identifying

gender-specific interventions in ILRI's research for development.
- (Economic) empowerment through livestock and livestock as a business for women.
- Gendered empowerment and nutrition.
- Gender in livestock policy and at the landscape scale. This includes investment plans in the livestock sector (in Ethiopia and Namibia) that focus on gender at a broad scale rather than the household scale. From the perspective of modelling, the RHoMIS and GENNOVATE (a global comparative research initiative that addresses the question of how gender norms and agency influence men, women, and youth to adopt innovation in agriculture: https://gender.cgiar.org/themes/gennovate/; accessed 14 April 2020) initiatives provide potential for impact.

Notes

[1] ILRI refers to the International Livestock Centre for Africa (ILCA, 1974–1994) and the International Laboratory for Research on Animal Diseases (ILRAD, 1973–1994) unless specified otherwise. ILCA and ILRAD were merged to form ILRI in 1995.
[2] In terms of gender in the workplace at ILRI and the institution's inclusion of women among its scientists, the share of female scientists rose from an average of 22% in 1980–1986 to 32% in 2006–2011 (the most recent period before the arrival of the CRPs.).
[3] ILRAD's work on gender was limited to some aspects of its field epidemiology studies in East Africa after 1986.
[4] One experienced ILRI ecologist was said to have referred to gender as the 'really hard science'.

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Annex 1: Gender Research in CGIAR

CGIAR's efforts to address gender in international agricultural research began in the 1970s and have evolved across time and institutions. A recent evaluation of gender in CGIAR identified three phases of gender mainstreaming: a first phase in the 1990s, a second from the 1990s to 2011, and a third after 2010 (CGIAR/IEA, 2017). The recent CGIAR 2010–2015 Strategy and Results Framework provided the foundation for the first round of CRP proposals and identified gender inequality as a critical area directly affecting CGIAR's likelihood of success in achieving its four system-level outcomes of reducing rural poverty, increasing food security, improving nutrition and health, and the sustainable management of natural resources. This was a crucial step in acknowledging the importance of gender equity to the effectiveness of CGIAR research. The Consortium developed and adopted its first explicit Consortium Level Gender Strategy in 2011 and implemented this in 2012 alongside the first-generation CRPs, covering both gender mainstreaming in research and at the CGIAR workplace (CGIAR/IEA, 2017). Gender Research Coordinators were appointed in each CRP to lead the gender strategies, supported by a Senior Gender Adviser at the Consortium, and the wider Gender Network has provided the capacity to advance the process (CGIAR/IEA, 2017).

Several CGIAR programmes have focused on gender and have had wide influence across the centres. These include: (i) the Intra-household Research Programme (1992–2003), led by IFPRI; (ii) the CGIAR Gender Programme (1991–1999), led by CIAT, focusing in part on gender staffing as well as on gender analysis in research; (iii) the Participatory Research and Gender Analysis Programme (1997–2011), which was a system-wide programme until 2010 when it became a CIAT programme; and (iv) the Gender and Diversity Programme (1999–2012) hosted by the International Centre for Research on Agroforestry (ICRAF) (CGIAR/IEA, 2017). The Participatory Research and Gender Analysis Programme essentially moved gender analysis out of the Gender and Diversity Programme (Gurung and Menter, 2002) and focused on gender research primarily on crop and natural resource management research.

ILRI and its predecessors played an active part in the Consortium, although the focus and intensity of gender research changed over time. Gender efforts began with researcher-led intra-household approaches to farming systems research in the 1970s and 1980s. Reinvigorated efforts on gender in the 1990s were in part due to the influence of CGIAR's Gender and Diversity Programme and of the Systemwide Programme on Participatory Approaches and Gender Analysis. In the early 2000s, gender found growing attention, with a focus on poverty reduction and renewed interest in social sciences. The hiring of a Programme Leader in the latter part of the 2000s for a theme that included gender (Livelihoods, Gender and Institutions) and a new Gender Strategy helped institutionalize gender in ILRI. These efforts strengthened under the inter-centre research collaboration on the CRP on Livestock and Fish, followed by the more recent CRP on Livestock and were supported by gender strategies to guide more strategic research as well as gender-mainstreamed research and capacity strengthening.

ILCA had played an important role in early CGIAR research by highlighting women's roles in farming systems research. Notably, ILCA's research drew attention to the importance of women in pastoral livelihoods in East and West Africa and, importantly, contributed to the discourse on participatory versus extractive knowledge systems.