Gender, livestock and reducing greenhouse gas emissions in Costa Rica

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CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

Cathy Rozel Farnworth

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Photographs: Todd Rosenstock. World Agroforestry Centre (ICRAF).

Abstract

Costa Rica is developing a Nationally Appropriate Mitigation Action (NAMA) that will provide climate finance for best livestock management practices that generate climate change mitigation benefits. The LivestockPlus research project, implemented by the International Center for Tropical Agriculture (CIAT) and partners, seeks to inform the NAMA by providing scientific evidence for improved pasture and cattle management to sustainably improve yields while also reducing emissions. Women are a target beneficiary of the research, yet the relevance of gender to the project's aims has been unclear. A scoping exercise to identify opportunities to strengthen the gender component was therefore undertaken in 2015 using a case study in Costa Rica and a literature review. This exercise identified women's roles as (1) co-decision-makers with men in the household, (2) users of milk for making cheese (most households) and (3) farmers directly involved in livestock production activities under some circumstances. Girls, together with boys, frequently played a role in the daily care of animals, which may influence girls' capacities and willingness to become future farmers. The scoping exercise indicated opportunities for enhancing women's roles in the cattle value chain and more generally, supporting women's inclusion in (i) livestock and innovation for climate change mitigation, (ii) gender-responsive implementation of the NAMA, and (iii) capacity development.

The following priority actions are recommended for strengthening gender research in Costa Rica:

1. Create an umbrella strategy for all members of the LivestockPlus consortium to develop, coordinate and implement research on gender, livestock and mitigation. The strategy should examine opportunities to empower women in the cattle value chain (e.g., improve their role in participation and access to benefits related to cheese making) and include women in innovation processes, NAMA implementation and capacity building. The strategy should be responsive to the needs of both men and women farmers and stakeholders in the consortium.

2. Build synergies across the gender component of the project's research streams. This should include strengthening the gender component in value chain development, identifying the opportunities and constraints to women's effective participation in intermediary organizations; and improving among all streams the understanding of men and women's empowerment, with the aim of improving women's participation in decision making and access to benefits. Research on intermediary organisations, such as informal farmer organisations, Costa Rica's Livestock Development Corporation (CORFOGA http://corfoga.org) chapters, community-level organizations, women's groups, and private sector value chain partners is essential to identify and develop opportunities for women to participate in activities at the farm level and in value chains.

3. Conduct research on gender and youth on the 98 pilot farms informing Costa Rica's understanding of production systems and pilot work on NAMAs.

4. Engage women and youth in capacity development on the 98 pilot farms. Activities should equally include men to support intra-household decision-making processes around farm planning. Consider farmer field schools and household methodologies.

5. Establish effective and rapid data-sharing mechanisms among key decision makers and implementers to facilitate implementation of lessons learned.

Keywords

Climate change mitigation; low emissions development; NAMA; gender; livestock; value chains; pasture; Costa Rica.

The author

About the author

Cathy Rozel Farnworth is a gender specialist with 20 years of experience in gender analysis in agriculture in climate change adaptation and mitigation strategies, pro-poor and gender-equitable value chain development, food security and nutrition, participatory research methods, household methodologies, and in the measurement of quality of life. She has authored and edited numerous books and peer-reviewed publications.

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Contents

Acronyms

CATIE	Centre for Tropical Agricultural Research and Education
CCAFS	CGIAR Research Program for Climate Change, Agriculture and Food Security
CIAT	International Center for Tropical Agriculture
CORFOGA	Costa Rica Livestock Development Corporation
FFS	Farmer field school
HHM	Household methodology
ICRAF	World Agroforestry Centre
IDO	Intermediate Development Outcome (of the CGIAR)
MAG	Ministry of Agriculture and Livestock (Costa Rica)
NAMA	Nationally Appropriate Mitigation Action
SLO	Strategic Level Objective (of the CGIAR)
tCO_2e	Tonnes carbon dioxide equivalent
UNDP	United Nations Development Programme

1. Introduction

Costa Rica is developing a Nationally Appropriate Mitigation Action (NAMA) that will provide climate finance for best livestock management practices that generate climate change mitigation benefits. The NAMA represents an opportunity to create gender benefits and avoid negative impacts on women. There are important knowledge gaps on the gender implications of large-scale climate change mitigation strategies and on how women can be engaged in developing and implementing such strategies. Gender-equitable financing of the NAMA requires that the needs and priorities of women as well as men are identified and addressed.

The CGIAR Research Program for Climate Change, Agriculture and Food Security (CCAFS) is working to provide an evidence base for the development of the NAMA by supporting research on pasture improvement and improved livestock management to sustainably improve yields while also reducing emissions. This work is one element of the LivestockPlus project. LivestockPlus is implemented by a consortium of the International Center for Tropical Agriculture (CIAT) and partners.

One of the goals of the CCAFS program in LivestockPlus is to improve women's access to assets and strengthened roles in decision-making related to livestock. However, the relevance of gender in low emissions livestock systems and the Costa Rica NAMA has been unclear. For this reason, a scoping exercise to identify opportunities to address gender was undertaken in 2015. This was informed by a case study in Costa Rica and literature review. The scoping research assumed that gender equality in livestock value chain systems is a desirable outcome of the NAMA. It hypothesized that gender-equitable strategies are a critical component to effective implementation of the NAMA itself, particularly through securing livelihood co-benefits. This paper reports on the findings. The findings may be of interest to other research efforts to create gender equity in livestock systems of Latin America.

This report is structured as follows:

1. Introduction
2. Methodology
3. LivestockPlus and gender

4. Costa Rica Livestock NAMA
5. Scoping study findings on gender
6. Recommendations

Annex 1: Potential farm-level research questions and methods

Annex 2: Sample semi-structured questionnaire on livestock ownership and management

References

2. Methodology

The gender scoping study was carried out October 26-30, 2015, in conjunction with a broader LivestockPlus project scoping mission with Cristóbal Villanueva from the Centre for Tropical Agricultural Research and Education (CATIE), Jacobo Arango from CIAT, and Todd Rosenstock from the World Agroforestry Centre. Members of the scoping mission met the following people and organizations, among others, and made a field visit to two pilot farms in Huetar Norte.

Table 1. Persons met and interviewed during scoping mission

Organization	Role	Contact
Ministry of Agriculture and Livestock (MAG), San Jose and Huetar Norte	Coordinate and champion the livestock NAMA	Mauricio Chacón, Jorge Segura
Costa Rica's Livestock Development Corporation (CORFOGA)	Pilot project, technical and institutional support for producers	Luis Diego Obando Espinach, Marcus Fallas
National Institute for Innovation and Transfer of Agricultural Technology (INTA)	Technical support, greenhouse gas and carbon balance quantification	Sergio Abarca
United Nations Development Programme (UNDP)	Technical support to NAMA development, raise money to hire consultants	Agripina Jenkins
Centre for Tropical Agricultural Research and Education (CATIE)	Gender research, capacity development	Felicia Ramirez
International Center for Tropical Agriculture (CIAT)	Gender in NAMAs	Jennifer Twyman
World Agroforestry Centre (ICRAF)	Technical support on productivity, GHGs and carbon, and monitoring, reporting and verification (MRV)	Jenny Ordoñez

3. Costa Rica livestock NAMA

There are approximately 1.28 million head of cattle on 26,489 farms in Costa Rica. About 42% of the cows are reared for meat, 26% for milk, and 32% are dual purpose. Cattle graze on 1.04 million ha of pasture, which constitutes 43% of the country's agricultural land area and 20% of the total land area. Over 26,000 farmers, including smallholder farmers, report cattle rearing as their primary income generating activity (MAG 2015).

The agriculture and livestock sector is the second highest emitter nationally after energy. It is responsible for approximately 37% of national emissions (4,603,000 tCO2e), of which livestock represents 82%. Mitigation in a sector that represents around 30% of national emissions is a critical component to achieving the Carbon Neutrality country goal by 2021 (UNEP 2012).

In 2007, the Government of Costa Rica set the goal of being carbon neutral by 2021. Under the leadership of the Ministry of Agriculture and Livestock (MAG) and Ministry of the Environment and Energy (MINAE), public, private, and academic stakeholders established a partnership to create a livestock-centric NAMA. The livestock NAMA (known as *NAMA ganaderia* in Costa Rica) is now a cornerstone of Costa Rica's Low Carbon Strategy for the Livestock Sector and the country's Intended Nationally Determined Contribution (INDC). The Livestock NAMA aims to reduce 6 million tCO2e (tonnes carbon dioxide equivalent) of greenhouse gas (GHG) emissions within the next 15 years. This process has the potential to reduce the size of the herd and area dedicated to production to 70% and 60% of their current size, respectively. An additional 4 million tCO2e may be sequestered in biomass on farms.

The Government of Costa Rica selected four mitigation practices for piloting on 98 farms in the country's five regions. The mitigation practices are living fences, improved pasture, rotational grazing and nitrogen management. Additional practices for testing include improved silage, protein banks, and water and mineral use efficiency. The pilot farms act as test beds to evaluate the productivity and the economic, social, and environmental impacts of the selected mitigation practices. Costa Rica's Livestock Development Corporation (CORFOGA) in association with MAG is leading the process at both national and regional levels, and one pilot region receives additional agronomic support from the United Nations Development Programme (UNDP).

Table 2. Potential mitigation effects of focal practices in Costa Rica's Livestock NAMA

Improved practice	Methane (CH_4)	Above-ground biomass	Soil carbon	Nitrous oxide (N_2O)
Living fences		+, *	+, *	+/-
Improved pasture	+, *		+	
Rotational grazing	+		+/-	
Nitrogen management				+, *

+ reduction in emission or sequestration, +/- uncertain. * research currently ongoing

4. LivestockPlus project and gender

The LivestockPlus project addresses the research questions: What are the technical options for low emissions pasture development in Latin America and how can these be scaled up using NAMAs and other policies? These questions are being studied by the LivestockPlus consortium members CIAT, ICRAF, CATIE, MAG, the National University of Colombia, University of Cauca, and the University of the Llanos. Together, they will enable the development and implementation of NAMAs for low emissions pasture development in the cattle sector in Costa Rica and Colombia by providing technical support and through generating critical information and guidelines necessary to identify the best available mitigation options and support planning and policies for the scaling up of NAMAs. In Costa Rica, the livestock NAMA has been submitted to the United Nations Framework Convention on Climate Change registry for support. Implementation will depend on the availability of a donor and funding.

The consortium will produce scientific information requested by partners in government ministries to support the selected NAMA development actions to reduce emissions and develop guidelines for monitoring, reporting and verification (MRV). LivestockPlus will work with the pilot projects to provide information on value chains, socially inclusive development and capacity building, whilst also developing research products applicable to NAMA discussions regionally and globally. If successfully adopted, scaled-up practices under a NAMA are expected to reduce emissions by 10% and to improve cattle productivity by 20%, thus contributing towards both food security and climate change mitigation outcomes.

4.1. Gender in livestock and mitigation in Costa Rica

There is little peer-reviewed or grey literature describing the gender dynamics of livestock production in Costa Rica. No literature on gender and climate change mitigation in Costa Rica was found.

Key respondents provided useful information. For households active in livestock sector, anecdotal evidence suggests that women bear substantial responsibility for childcare and household tasks. The degree to which women work on livestock-related farm activities appears to vary considerably. Respondents suggested the level of women's participation may vary according to farm size (higher participation in small farms), off-farm opportunities (higher participation when men are working off farm), personal preferences, and the time required for childcare. Women are widely acknowledged to be strongly involved in artisanal cheese production for home consumption and sale in most households. Intra-household decision-making about farm and household management seems to partly depend on age, with younger couples reporting more equal participation. Male and female children are sometimes involved in farm work from an early age to enable them to see farming as a future career. Several respondents suggested that women are often involved in managing the data requirements for participation as pilot farms. One woman said she conducted all livestock-related activities until marriage.

CORFOGA and MAG, among other stakeholders in the NAMA, expressed a strong interest in anthropological studies on gender, youth and other socio-economic factors influencing farmer behaviour in relation to improving farm practices, as well as upon the development outcomes that may be expected to result from engagement. CORFUGA and MAG recognize that their understanding of the interactions between the human system – the producers – and the technical farm system is limited. They would be interested in finding out, for instance: How do farmers organise work and engage in decision-making on their farms – including inter-generationally, between neighbours and relatives, and more broadly? How are young people - including children - being engaged in farm work and decision-making and ultimately being motivated to remain in the agricultural sector? What are the locally prevailing inheritance practices? Given that the average age of farmers in Costa Rica is 53, understanding how to keep young people in the sector is of key interest.

Regarding mitigation practices, stakeholders would like to understand the factors encouraging farmers to adopt particular technologies and innovate. A colleague from CORFOGA argued that a great deal of attention is paid to improving the 'technical system' but that this is not the end goal. The question should rather be: in what ways does improving the technical system lead to improved human outcomes for all family members? And, what kinds of choices are farmers making at the outcome level?

Research needs are being partly met as follows:

1. CATIE has just commenced small-scale gender studies on the livestock sector in Costa Rica. A master's student is conducting qualitative research for her thesis on dairy farmers in 2015-2016.

2. CATIE is also conducting a quantitative survey using a phone application on 180 dairy farms to collect data on women's participation in decision-making, the number of hours they spend on field activities, their participation in artisanal cheese-making and more broadly in value chain activities, time spent on household maintenance, *etc.* Preliminary results are expected by early 2016.

CIAT, in LivestockPlus, is incorporating gender into a socio-economic survey that will collect data from 1,000 farms throughout the country during the first quarter of 2016. Results will characterize gender roles in farm activities and productivity.

4.2. Producer organizations

Livestock producers are organized in local chapters of a producers' organization. Data on women's membership in these is not freely available because CORFOGA does not maintain a centralized membership database from chapters to the national level. There seems to be no data on whether women take on leadership roles in chapters or if they participate actively to surface gender issues.

4.3. Capacity development

There do not appear to be specific strategies to target or involve women in training on mitigation practices or in the management of livestock production. Women reportedly do attend training courses, but participation rates are not known.

5. Recommendations

5.1. Develop a collaborative umbrella gender research strategy

An umbrella strategy could harmonise gender research efforts across the LivestockPlus consortium. The justification for this is that research planned by the LivestockPlus consortium is isolated across three work streams: value chains, empowerment and capacity building. While the third activity seeks to bring together findings from the first two, more synergies among the research streams, and partners, need to be developed and utilized. This could be called "Gender and Livestock Research Strategy."

CATIE staff suggested that the existing CATIE Gender Policy could form the starting point for the development of an umbrella Gender and Livestock Research Strategy for LivestockPlus and the Livestock NAMA. CATIE could build on this to co-develop the above-mentioned strategy in collaboration with CIAT and ICRAF, and partners such as MAG, CORFOGA, UNDP and others participating in the Livestock NAMA. It is important that the research questions of partners be identified and built into on-going research processes to ensure relevance and a sense of ownership by all stakeholders. Close collaboration will facilitate the coordination of gender with other socio-economic research work in the Livestock NAMA, as well as the analysis and eventual translation of research into implementable strategies.

The Gender and Livestock Research Strategy should also produce results for the CGIAR-CCAFS program objectives and intermediate development outcomes. It is recommended that they are incorporated into the strategy and into the indicators for impact assessment.

5.2. Strengthen elements of planned research activities

This section discusses LivestockPlus's initial gender-related research activities planned for 2015 and provides recommendations for strengthening them to establish a strong foundation for gender-research in the remaining years of the project. Some of the planned activities are experiencing delays and are expected to be completed in 2016.

Activity: Identification of best-fit mitigation options and development of low-cost greenhouse gas quantification methods to support NAMA implementation

- Expected research output for 2015: Detailed gender-disaggregated quantitative and qualitative data collection on 18 action farms (12 in Colombia and 6 in Costa Rica) will facilitate a better understanding of women's roles in production and processing activities (to be monitored over time).

- Expected gender or equity outcome for 2015 is that the detailed gender-disaggregated data collected on the selected farms in Costa Rica together with an analysis of the NAMA done in collaboration with a related CCAFS project will be used to support the Livestock NAMA.

The outcome story is vague because the data need to be collated and analysed before a story can be developed. It would be useful to develop a clearer expected trajectory for the analysis and implementation of research findings. Ideally, this qualitative work would be brought into synergy with the quantitative and qualitative value chain data and analysis.

Activity: Quantification of socio-economic impacts of low emissions pasture management in cattle production systems to identify mitigation options best fit for local circumstances, assessment of barriers and enabling conditions to scale up their use nationally

- Expected research output for 2015: Gender-disaggregated quantitative and qualitative data will be part of the socio-economic baseline data collected in 2015 and possibly 2016. This will include: a) data on the roles of women and youth in the cattle production systems and processes in related products (meat, milk, cheese, leather, etc.) from 2 regions of Costa Rica and 4 sub-regions of Colombia; and b) indicators of women's empowerment (i.e., ownership of land and cattle; decision-making in pasture management or feeding strategies; and decisions over use of income).

- Expected gender or equity outcome for 2015: The gender-disaggregated data collected in Costa Rica together with an analysis of the NAMA done in collaboration with a related CCAFS project will be used to support the livestock NAMA application to ensure that it does not increase gender inequalities (and ideally decreases gender inequalities) in the cattle sector.

The outcome story can be more positively phrased as an opportunity to develop and strengthen equity in livestock-based value chains. Multiple opportunities should emerge from the data on entry points for upgrading the value chains and thus provide co-benefits to implementing technical mitigation options. It may be useful to analyse the empowerment indicators in relation to the value chain work, thus bringing the two research streams together.

It will be particularly useful to build on the value chain findings to develop strategic recommendations for including youth and women when upgrading the value chains. There are many resources for this. KIT, Agri-ProFocus and IIRR (2012) provide an analytic framework for analysing value chains, together with case studies, methods and tools developed for different value chain actors and for different cultural environments. An associated, comprehensive toolkit and an online training package with e-modules has been produced by Senders et al. (2014).

To develop gender-equitable value chain strategies, close work with CORFOGA, value chain actors (including retailers), and value chain facilitators (including business development services and financial institutions) will be essential. Strategies for strengthening women roles' and inclusion in value chains are outlined below and should inform data collection and analysis (see KIT, Agri-ProFocus and IIRR 2012).

- Upgrading as a value chain actor. This is about a farmer doing what she does better. It is seeing her as a chain actor and involves recognition of women's economic contributions to the selected value chain. In the dairy value chain, for example, this could be improving cheese production. Research should assess women's current role in existing value chains and the constraints to improvements.
- Upgrading to new activity higher in value chain. This is about a farmer entering into activities further up the value chain, such as moving from cheese producer to marketing, and women making the choice to take up these activities themselves in light of their other responsibilities. Women gain the skills required to participate effectively in the value chain to gain new decision roles and access improved benefits. Research would examine potential roles for women in the value chain and the constraints and opportunities for making this happen.

- Upgrading by developing chain partnerships. This is about farmers building long-term alliances with buyers, and about female farmers expanding their networks and being recognized partners. Research would examine how to remove constraints for female farmers to participate in decision-making with partners: rules, regulations and policies become gender-sensitive. In dairy for example, this could be expanding partnerships with distributors to urban markets.

- Upgrading by developing ownership over the chain. This is about farmers becoming owners of chain enterprises, and about female farmers having the capacity and support to take up leadership roles. Research would examine the alliances, rules, regulations and policies and transition processes needed to support women's leadership. In cheese-making, this would be women having control over a vertically–integrated enterprise, from production through processing and distribution to consumers.

The proposed empowerment indicators are still being developed. It should be noted that simple terms like 'ownership' may be very complex. Galiè et al. (2015) showed that 'ownership' could be interpreted to mean: benefiting from livestock, sourcing livestock, decision-making, taking care of the animals, knowledge of resources, having full authority over the livestock, and carrying responsibility. Women and men often have different understandings. In the 2015 study, respondents in Nicaragua understood ownership to mean the legal rights of the household head in conjunction with informal rights of other household members, but they also had other, gender-differentiated understandings. Studies of empowerment in LivestockPlus should aim to elicit more understandings of empowerment that reflect their underlying, potentially complex, social relations and contexts. Differences between how women and men understand empowerment and their own goals for empowerment should be identified in discussion with farmers.

Qualitative research on additional key concepts is likely to be necessary, along with associated decision-making powers, roles and responsibilities.

Activity: Engagement and capacity building for NAMA implementation in Costa Rica and Colombia

- Expected research outputs for 2015: During the partner and next-user engagements, CCAFS gender-related work relevant to this project will be presented to increase

awareness of the importance of gender in development and implementation of NAMAs and capacity building around these topics.

- Expected gender or equity outcome for 2015: Actors involved in the development of the Costa Rica Livestock NAMA use their acquired knowledge about the role of gender to support the NAMA application in conjunction with a related CCAFS project.

It would be useful to build on this activity by developing a research and capacity development strand on gender in the intermediary institutions involved in implementing the Livestock NAMA. Understanding how gender and power relations operate within intermediary institutions and influence the gender equity of decision-making processes and activities will allow the Costa Rica Livestock NAMA to work effectively with these organisations to design interventions for gender-equitable targeting and capacity development of men and women livestock farmers and in associated value chain activities.

The rationale is that gender and power relations shape the ways in which individuals, households and communities use, allocate, manage, and invest in resources for productive use. Gender-based power relations and capabilities affect immediate and personal access to resources in households, on farms and in communities, and help shape how these resources are used. Gender relations and capabilities also influence the ability and willingness of intermediary livestock-related institutions to develop and deliver equitable and effective mitigation strategies. Relevant intermediary institutions include informal farmer organisations, CORFOGA chapters, community-level organizations, women's groups, private sector partners etc. Gendered power relationships played out in such forums largely determine the effectiveness of women's participation in managing productive resources and can contribute decisively to final development outcomes for women.

Research could evaluate the capabilities these institutions need to strengthen and promote gender-equitable benefits from selected technologies, interventions and approaches. The empirical evidence should be presented in an accessible style and format, including training modules, to help motivate decision-makers to shift institutional approaches and practices towards gender-equitable and inclusive outcomes.

5.3. Expand gender research to pilot farms

It is essential to understand how mitigation processes are being introduced, adapted and used in the 98 pilot farms. What are the relationships involved and the distribution of benefits? How are these innovation processes being perceived by women and men, and also young women and men (youth)? It will be useful to consider the enabling and constraining factors for innovation and their gender dimensions. The co-benefits, or potential harm, of any one of these technologies to women as well as men, including male and female youth, should be assessed. Ways to improve benefits, e.g., the selection of particular tree species that contribute to broader household goals such as a diversified food basket or live fences, or through strengthening equitable value chain participation, should be examined.

Annexes 1 and 2 provide starting points for research methods and questions. Gender researchers should develop gender questions in relation to specific mitigation practices together with agricultural scientists and other technical experts.

5.4. Begin capacity development of women and youth in pilot farms

Engaging women and youth successfully in capacity development activities in pilot farms is needed as soon as possible. It should not wait until gender research is completed and findings analysed since this could take many years. Capacity development activities should equally include men in order to support intra-household decision-making processes around farm planning. Two approaches are discussed below.

Gender-responsive farmer field schools

CATIE has developed gender modules for farmer field schools (FFS) - *El género en las escuelas de campo: cápsulaspara el aprendizaje y la inclusion* in Spanish - within the framework of Mesoamerican Agro-Environmental Programme (Ramirez et al. 2015). CATIE has expressed an interest in adapting the modules for the Livestock NAMA in Costa Rica. To date, CATIE has carried out training with 5,000 families in Nicaragua, Honduras and Guatemala on kitchen gardens and on the farm as an integrated system over the past two years. The FFS aim to improve household food security and nutrition. Each FFS consists of 15 to 20 families. One farm is used as a module farm. Each technical module includes one hour on gender issues. Local facilitators are trained to work with farmers. Women are also promoted in value chains and in associations in a non-prescriptive way (e.g., quotas are not

used). The project has learned that working on gender is a continual process and that it is difficult to secure results in the short-term. They have noted resistance from the target communities and from professional colleagues. However, good progress is being made. The gender elements of the FFS are organised as follows: Module 1: Concepts of gender and sex; Module 2: Division of labour by gender; Module 3: Gender equity; Module 4: Community development: gendered livelihood and community capitals (human capital); Module 5: Community development: gendered livelihood and community capitals (physical capital); Module 6: Power and control of over resources; Module 7: Participation and leadership; Module 8: My personal leadership; Module 9: Inclusive language.

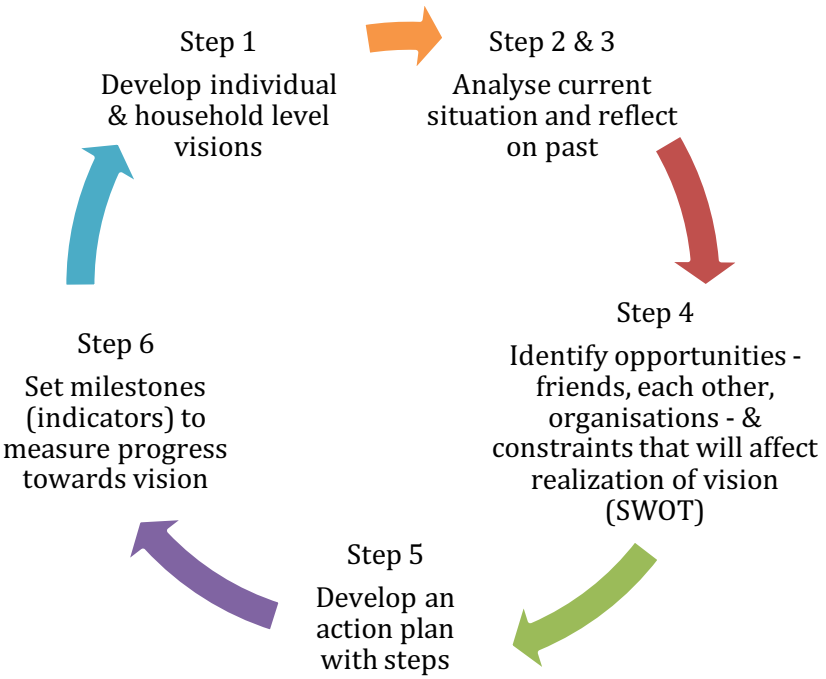
Household methodologies

It would be innovative and exciting to pilot a household methodology (HHM) in the LivestockPlus project. Almost all livestock production in Costa Rica takes place on smallholder farms. A HHM is an effective mechanism for engaging all household members to take charge of their own development processes. Several variations have been developed by donors and development organizations over the last decade, including the Swedish International Development Agency, the International Fund for Agricultural Development, and the United States Agency for International Development.

The formation of a "family vision," to which children and youth may contribute, enables the family to conceptualize and work towards a shared time-bound goal defined by themselves. In this case, the family vision could focus on a commercially successful livestock business that also implements mitigation actions. This business may also be a means to a higher-level vision, such as sending children to college, involving children in a viable farming enterprise and thus securing succession, or building an improved house.

HHMs do not seek to empower one group (women) at the seeming expense of the other (men). They adopt a "power with" rather than a "power to" approach and work to promote the understanding that unequal power relations between women and men can result in failures to make the best decisions possible. In this case, unequal power relations may be considered to contribute to an inability to effectively pursue "dairy as a business." Some HHMs rely on writing; others use visual methods. IFAD (2014) has developed a guide and several case studies for HHMs. HHMs typically follow six steps, as shown in Figure 1.

Figure 1. Steps to implement a household methodology.



The HHM cycle typically works as follows. First, encourage participants to develop individual visions. Then, bring family members together to present their visions. Ask them to develop household level visions for their futures (Step 1). Paying attention to developing women's individual visions prevents their visions from being "lost." The participants then establish and analyse their current situation in Step 2. In order to identify cause-effect linkages from the past to the current situation, the participants are asked to consider their starting points (perhaps after marriage) in Step 3. They then identify the opportunities that will enable them to realise their vision, and constraints they must overcome, in Step 4. Step 5 involves developing action plans for individual and household visions including detailed steps. In Step 6 participants create indicators (milestones) that they can track on a regular basis. These indicators are subjective and developed by the household. The project may add further objective indicators for tracking.

Based on a model developed by the Ministry of Agriculture, Irrigation and Water Development in Malawi, pilot HHM interventions could be structured as follows:

1. Train extension officers in the methodology. Extension officers then teach farmer "champions" (other terms can be used) selected from community members targeted for the intervention. These farmers must be members of a producer group.
2. Each champion should train at least three to five households in the methodology and to monitor those households monthly over a three-year period.
3. These households are then expected to train other households.
4. The extension officers should meet the original champions every quarter to track progress.
5. Prior to engagement, quality of life indicators including numbers of livestock (including, but not exclusively, dairy or beef cows), type of house, etc., for each household should be measured. Progress against the baseline should be monitored monthly by the champion together with the household, and quarterly by the extension officer.

The HHM toolkit is a powerful methodology for dairy and meat producer organisations to set gender-responsive visions, action plans, and indicators as well.

5.5. Develop effective and rapid data-sharing mechanisms

Data sharing and analysis mechanisms should be established to enable rapid dissemination of lessons learned to key actors to enable them to respond appropriately. These could include the presentation of gender data at multi-stakeholder meetings and the preparation of briefs on gender in livestock and mitigation innovation processes for each farm system (dairy, beef and dual purpose). Briefs should also provide recommendations for policy makers at local and national levels. Farmers should be involved in data analysis and dissemination discussion processes, for example through their producer groups. Agreements on how to share and use data are critical. Peer-reviewed publications are also essential to fill large gaps in information on gender in livestock systems in Latin America, and gender in livestock and mitigation innovation processes in general.

6. Conclusion

The preparation and implementation of a NAMA on livestock in Costa Rica has the potential to increase benefits to women. Women may benefit through their enhanced participation in the value chain, and their inclusion in the innovation process, in decisions about how the NAMA is to be implemented and in capacity building for livestock management. Women presently participate most consistently in the cattle value chain as cheese makers. This is currently primarily for home consumption although some is sold. Women also act as co-decision-makers for the household and sometimes work to varying extents in production activities on cattle farms.

Research on the opportunities for enhancing women's roles in value chains will help shape effective interventions. Research on inclusion should seek to improve women's roles in intermediary organizations supporting the NAMA and its implementation. Women's capacities may be enhanced through their inclusion in farmer field schools and the use of household methodologies that engage men and women in seeking better joint outcomes for the household, while ensuring benefits to women. These methods can be also used for producer organisations. Research on gender is impeded presently by a fragmented treatment of women across three different work streams and by different partners. Integrating this work with a common vision and framework for data collection, including indicators for tracking empowerment and successful outcomes for women will support more significant impacts. The major risk for women from the NAMA being implemented without attention to gender is the potential benefits forgone and that mitigation co-benefits may not be adequately developed.

Annex 1: Potential farm-level research questions and methods

Table 4. Potential farm-level research questions and methods

Tool	Purpose	Responsible/ Respondents
Literature review	Situate the planned gender x livestock x mitigation study by (i) providing background information about the case study area, and (ii) summarizing relevant findings from recent studies. Apart from research on gender and livestock systems at the household level, data should be secured on women's participation in farmer organizations, value chain platforms, etc.	CATIE, CIAT
Sampling frame	Devise sampling frame, including different farm typologies among pilot farms. Consider purposely including female-headed households or households with other characteristics of importance for equity. It may be worth considering controls - farms which are not involved in the pilots but which display common agro-ecological and socio-economic characteristics.	CATIE, CIAT, ICRAF, CORFOGA, MAG etc.
Research methodology	Agree on key gender research questions with major stakeholders. Develop qualitative questionnaire checklists. Pilot the questionnaires.	CATIE, CIAT, ICRAF, CORFOGA, MAG, etc.
Potential Methods		
Community profile	Provide social, economic, agricultural, and political background information about the community. In each case gender (and age) dimensions should be elicited. Topics may include: Inheritance dynamics Family formation norms and practices (e.g. collaboration between related households) Degree of social cohesion in community Means of social capital formation Formal and informal networks for labour exchange and knowledge-sharing in relation to agriculture Sources of information on livestock and farm management Opportunities and constraints for youth (male and female), women, and men for generating off-farm incomes Labour market trends and gender/age dimensions Market opportunities, etc. Household, and agricultural roles	One or two male, and one or two female key informants from research sites. Always conduct sex-segregated discussions.
Small group discussions	Focus on gender norms, assets and capacities for innovation in agriculture/natural resources management, and other assets and capacities. Can include some of the topics outlined under the 'Community Profile', and other topics. These may include: Understanding what ownership actually means in specific	Small-group discussions of 8-12 women, and 8-12 men, farmers. Always hold

	contexts. Ownership and decision-making over livestock (breed, size of herd, etc.) Ownership and decision-making over their products - milk, meat, etc. Decision-making around whether to sell livestock, involvement in sale Decision-making regarding how to spend income from sale of animals and their products Roles and responsibilities for feeding, watering, and milking Roles and responsibilities for monitoring animal health, mating, etc. Management of manure, if any Participation in capacity development Participation in producer and other value chain groups	discussions in sex-segregated groups. It should be noted that terms like "ownership" should be discussed and analysed carefully. Elicit understandings and definitions of empowerment from the respondents themselves.
Youth (and potentially children)	To understand gender norms, practices, and aspirations in shaping the willingness of youth to stay in agriculture/ livestock. May include: Educational opportunities and aspirations Perceptions of farming as a career Women's physical mobility and how this may shape access to economic opportunities Participation of young women and men in livestock and in farm management in relation to farm level decision-making, specific farm activities, specific questions about their involvement in the selected mitigation practices Participation in capacity development Participation in producer and other value chain groups	Small group discussions of 8-12 farmers. Always hold discussions in sex-segregated groups.
Individual life stories	To understand the life stories of selected men and women involved in the pilot farms. For example: How have gender norms, personal histories, personal agency, assets and capacities for innovation shaped their lives? Why do some households display rigid gender norms, and why are others more fluid?	Individual interviews. Select women and men in households with clear gender divisions of labour and decision-making, and households where women clearly engage strongly in on-farm activities.
Innovation pathways	To explore individual experiences with new agricultural practices and the role gender norms and agency play in innovation processes. Discussion can focus on innovation more broadly (for instance in relation to cheese production or innovation in farm practices) and then on the specific mitigation practices. Gender questions (roles, responsibility, decision-making) should be developed for each mitigation practice.	Individual interviews of recognized male and female innovators (one or two of each, always in sex-segregated groups)

Adapted from Badstue et al. 2014.

Annex 2: Sample semi-structured questionnaire on livestock ownership and management

Below are rough and ready questions presented here as starting points for further elaboration. As noted in the body of the working paper, terms like "ownership" should be discussed critically with respondents. Separate questions should be developed in relation to gender and mitigation practices with agronomists and other experts.

1. Ownership of dairy and beef animals
    a. Who is involved in the dairy/ beef value chains in your household?
    b. What are the objectives of each person who is involved?
    c. Who actually 'owns' the dairy/beef cow(s) (individual, household members, others e.g. kinship members)?
    d. Who is responsible for buying animals?
    e. Who decides whether to sell an animal?
    f. Can the person who sells the animal decide how to spend the money by themselves?
2. Ownership and management of animal products
    a. Who is responsible for managing each dairy/beef animal product (evening milk/morning milk, meat, hide, manure)?
    b. Do you process any products? If so, what products? Who is responsible?
    c. What do you use the animals' products for? (sale, home consumption, exchange with neighbours, payment in kind, etc.)
    d. If there are conflicting objectives on sale of products, use for home consumption, etc., among household members, how do you resolve these?
    e. If they cannot be resolved, what happens? Who decides?
3. Value chains and markets
    a. What and where are your main commercial markets for each product?
    b. Who takes the product to the market?
    c. Can the person who sells the products decide how to spend the money themselves?
    d. Do you receive any training on managing and developing milk, meat, or other cattle-related products for specific markets?

4. Producer organisation or cooperative
    a. Does the dairy/beef cooperative/organisation have special measures to support women, poorer cattle farmers, or young women/ men dairy farmers? If yes, what are they? (They could be credit, collateral arrangements, training, membership criteria including any specific arrangements for poorer candidates, payment or partly in kind arrangements to women/men, transparency around payments for milk, etc.)
    b. Do you think these measures are sufficient?
    c. Can you recommend any further measures for specific support to women, poorer dairy/beef farmers, or young women/men cattle farmers?
5. Knowledge platforms
    a. Where do you get your knowledge on dairy and beef from? (Radio? TV? Extension services? Innovation Platforms? ICTs such as mobile phone applications? Other local farmers/ neighbours? Husband or wife? Input suppliers?)
    b. Do you interact directly with extension agents (and other sources of knowledge)? If so, in what ways (farm visits, training courses ...)?
    c. If your spouse/partner is trained, does your spouse/partner then train you?
6. Mitigation practices
    a. A number of mitigation practices have been recommended, such as improved fertilization plans, improved pasture-feeding, pasturing, and live fences.
    b. Who in the household is told about, and/or trained, in these practices?
    c. Who in the household decides on whether to adopt these or other new practices?
    d. What do you think about each practice? What difference will (or is) each practice make to your workload? What other benefits, or problem, do you see with each practice?
        i. Improved fertilization plans?
        ii. Improved pasture feeding?
        iii. Pasturing?
        iv. Live fences?

7. Grazing and feeding practices
    a. Who is responsible for managing feeding cattle?
    b. Who decides on the way cattle should be fed? (pasturing, zero grazing, etc.)
    c. Regarding grazing, are the pastures common land? If so, are there differences in the access of women and men (female-headed households, young women, young men) to common land? If so, why?
    d. What supplementary feedstuffs do you use?
    e. Have you been trained in the relative benefits of each feedstuff? If so, by whom? [input supplier, extension worker, etc.]
    f. Do women and men (female-headed households, young women, young men) use different feedstuffs? If so, why?
    g. Who is responsible for feeding the animals?
    h. Who is responsible for bringing them water?
    i. What is your opinion of zero grazing as opposed to free grazing?
8. Breeding strategies
    a. Do women and men own or manage different breeds? If yes, what explains their preferences?
    b. Training on breeding and artificial insemination. Are women and men equally trained and can they equally access artificial insemination services?
9. Lactation cycle
    a. Who knows more about lactation cycles? Women or men?
    b. Whose responsibility is it to check this?
    c. Are women and men equally trained on lactation?
10. Manure
    a. Who collects manure? (Cleans out animal sheds?)
    b. What is manure currently used for, and by whom?
11. Diseases
    a. Who monitors animal health (women or men?)
    b. Do women and men equally seek veterinary assistance?
    c. Are women and men equally trained on animal health management?

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