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Women's empowerment in livestock production and household food and nutrition security - Insights from Bangladesh

by Fatema Sarker, Thomas Daum, and Regina Birner

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Authors: Fatema Sarker, Thomas Daum and Regina Birner

Affiliated institution: Hans-Ruthenberg-Institute of Agricultural Science in the Tropics, University of Hohenheim, Wollgrasweg 43, 70599 Stuttgart, Germany

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Abstract

Livestock interventions in low and middle-income countries promise to empower women and contribute to household food and nutrition security, but little information is available on the condition under which such optimal outcomes can be achieved. Besides, many studies gloss over how prevailing gender norms accelerate or impede livestock interventions' success in such countries. This study seeks to fill part of this knowledge gap through a qualitative analysis of the linkage between different livestock interventions, women empowerment, and food and nutrition security in Bangladesh, a country with embedded patriarchal norms. Using gendered focus group discussions, including participatory impact diagrams with 231 livestock farmers, revealed that women who managed small ruminants and low-yielding local cow breeds were more empowered and capable of addressing their household's food and nutritional needs than their peers with access to cross-bred livestock. Contrary to expectation, such women also had a better bargaining power over intra-household expenditure than those managing large and improved ruminant breeds. The findings lessen the mainstream understanding that investments in high-yielding breed lead to women empowerment and better nutritional outcomes in rural areas. In general, women empowerment improves food and nutrition security within household members through increased decision-making power and control over the income from livestock. Overall the findings indicate that there are no blueprints for livestock intervention that are optimal from a gender and food and nutrition perspective but that case-specific knowledge is required because household and gender dynamics vary across contexts.

Introduction

Increasing women's engagement in livestock management is seen as one strategy to empower women (Bain et al., 2020). Livestock development can improve households' income (Herrero et al., 2013), food and nutrition security (Varijakshapanicker et al., 2019), and resilience to shocks (Dumas et al., 2018). While women expend most labor on taking care of livestock in the developing world (FAO, 2011; Bain et al., 2018), limited engagement in livestock management – often due to social and cultural norms - often hinder them from benefitting from livestock production (Ransom & Bain, 2011; Mwaseba & Kaarhus, 2015). Livestock development projects increasingly have the twin objectives to harness the potentials of a livestock revolution – while simultaneously empowering women. The latter may not only enhance the wellbeing of women but also reinforce household food and nutrition security, and, subsequently, health (Blumberg, 1988; Malapit et al., 2015; Kurz & Johnson-Welch, 2000). Yet, while development projects increasingly aim to increase women's engagement in livestock management, little evidence exists on the linkages between livestock interventions, women's empowerment, and food and nutrition security.

Studies on livestock interventions from different contexts find highly diverse outcomes, suggesting that both the type of livestock intervention as well as local socio-cultural and economic frame conditions play a role. Janzen et al. (2018) found that the Heifer International

program on "Smallholders in Livestock Value Chain" in Nepal enhanced women empowerment but detected not changes in assets, income, and food security. Studying the "East Africa Dairy Development" program of Heifer International, which seeks to develop and integrate smallholder farmers into local milk value chains, Bain et al. (2018) criticized the program for putting an unequal work burden on women. Studying the "Small Ruminant Collaborative Research Support Program" in Peru, Bolivia, Indonesia, and Kenya, Valdivia (2001) found that the program helped women to control assets (small ruminants).

Studies exploring the role of women's empowerment to realize the food and nutrition security potentials of livestock projects, commonly suggest that women's empowerment is positively related to a better food and nutrition situation for the family, in particular children (Sraboni & Quisumbing, 2018; Sraboni et al., 2014; Bhagowalia, et al., 2012; Fan & Pandya-Lorch, 2017; Malapit & Quisumbing, 2015). Studying the *More Milk in Tanzania* "MoreMilkiT" project, which aims to improve livelihood and food security of pastoralists through strengthening the dairy sector, (Alessandra Galiè et al., 2019) find that women's control over assets and income are positively linked to household food nutrition security due to their increased capability to buy nutritious food. However, while they find evidence for this using qualitative data, they could not confirm this using a quantitative approach, this may be due to the context-specific, complex nature of this relationship. Another study on the same MoreMilkiT project by Galiè et al. (2019b) found that women's empowerment in livestock has a positive relation with household nutrition but household nutrition is still poor due to a lack of equitable workloads, limited control of resources, and low decision-making power of women. In areas with unequal gender roles, livestock projects can raise the work burden of women who have no agency on time use (Bain et al., 2018) while men enjoy the benefits as free riders (Dumas et al., 2018). So far, most studies have identified the linkages between women's empowerment and food and nutrition security in the livestock production system from a purely quantitative perspective and often focused on Africa. Since gender dynamics are geographically diverse (Nazneen, et al., 2019) and have context-specific implications, qualitative analysis is pivotal to understand the dynamics (Rao et al., 2019).

This study analyzes the linkages between women's empowerment and food and nutrition security in rural households practicing crop-livestock farming in Bangladesh. The country has made some progress reducing hunger, however, access to enough food and nutrients remains a problem (Osmani et al., 2016). The country has a high share of children suffering from wasting, stunting, underweight, and low birth weight, and it is characterized by a high prevalence of anemia and low Body Mass Index (BMI) among women (Unicef, 2013; NIPORT & ICF, 2020). Bangladesh is characterized by patriarchy, religious prejudices, superstitions, knowledge gaps, and limited access of women to productive resources (Deb et al., 2015).

Sustainable development demands uplifting women's power within and beyond households through a change in the existing unequal power relations. Ignoring the men's perspectives of women empowerment, overlooking their participation in women-targeted developmental initiatives, addressing the traditional ideologies of gender counting men are bread earners and women as the homemakers, any gender empowerment study is not comprehensive. It is

imperative to include men in elucidating linkages between women empowerment and household nutrition in livestock production systems. This study contributes to the existing literature in two broad areas answering the following questions in qualitative analysis.

- How do men and women perceive the contribution of livestock resources to household food nutrition in the local context?
- How does women's empowerment fortify the relationship between livestock intervention and family food and nutrition security?

Theoretical framework

Concept of women empowerment

The concept of empowerment, which derives from the labyrinthine word 'power' has many connotations. The pioneering researcher on the concept of 'power', Dahl (1957), has defined the term as 'power over', a narrow definition. According to this view, person X has power over person Y to the extent that X can get Y to do something that Y would not otherwise do, by exercising control or superiority. Rowlands (1995) has studied the 'power over' concept from a feminist perspective, arguing that gender empowerment is linked with domination and subordination. Rowlands identified two additional categories of power, which are important for gender empowerment: 'power to'- which is the boosting of one's capability so that the person can overcome past oppressions and meet goals and 'power within from'- which is the ability to know the inner strength and self-worth.

Kabeer (1999) conceptualizes women empowerment as the increase in women's capacity (agency) to choose from existing alternatives (resources) that have the potential to improve their existing situations (achievements). In this view, decision-making ability and control over resources are the core of empowerment. Most of today's development interventions follow a similar understanding of empowerment. Alkire et al. (2013) have developed the Women Empowerment in Agriculture Index (WEAI). The WEAI encompasses five dimensions of empowerment: 1) decision making about agricultural production, 2) access to and decision-making power about productive resources, 3) control on the use of income, 4) leadership in the community and 5) decisions on time allocation. Galiè et al. (2019) have developed a Women Empowerment in Livestock Index (WELI) adjusting the WEAI to measure empowerment in livestock. WELI contains one new dimension related to food and nutrition. Moreover, rather than leadership in the community, WELI contains a dimension on access to and control of opportunities (access to market, training, to non-farm income opportunities). The decisions on time allocation on WEAI is only focus on the satisfaction on the time available for leisure activities. But in WELI focuses more broadly on the extent and control of work time which includes time allocation on productive and domestic tasks, share of income-generating tasks of total workload and the authority to distribute the farm and household tasks.

Gender Dynamics in Livestock Intervention and Household Nutrition

Figure 1 shows a framework with two major pathways between livestock interventions (e.g., gifts of animals, loans of animals, training on livestock keeping practices) and food and

nutrition security. In this case, livestock interventions may both shape women empowerment but women empowerment also shaped the link between livestock intervention and food and nutrition security. The framework builds on several notable frameworks on the linkages between agriculture, women empowerment, and food and nutrition security. Kadiyala et al. (2014) show gender division of labor in agriculture, intra-household decision-making power has influences on agriculture nutrition pathways. Johnston et al. (2018) argue that agricultural interventions can affect women's time-use and, subsequently, nutritional outcomes. Dumas et al. (2018) have constructed a framework to link women's livestock ownership to household welfare through the outcome of food security and nutrition.

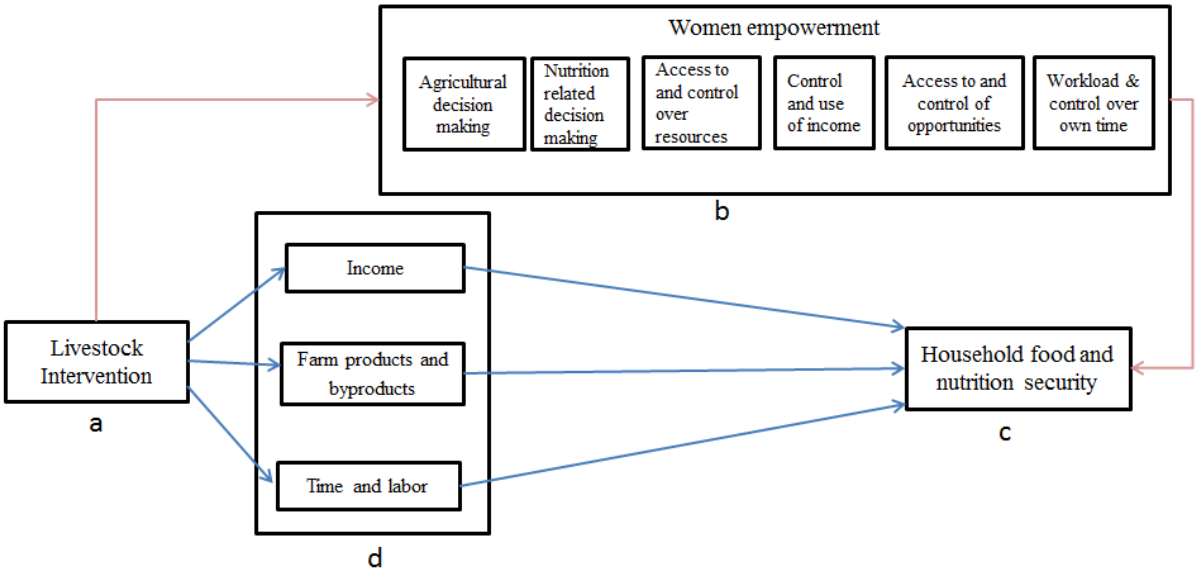


Figure 1: Conceptual framework of gender dynamics and household food nutrition linkages in the livestock production system

The first linkage (a→d→c) is that livestock interventions directly affect household food and nutrition security through changes in income, the consumption and use of livestock products and by-products, and changes in time use and labor burden. Income from livestock is believed to contribute to household food and nutrition security (Ashley et al., 2018). Moreover, livestock interventions can have a positive influence on household food and nutrition security as livestock provides quality protein and micronutrients (Smith et al., 2013), which are essential for household nutrition in developing countries (Adesogan et al., 2020; Dasi et al., 2019). Income from the sales of livestock and its products can also be invested into crop production and the animal's manure can also affect farm yields. Time and labor allocated to livestock can also affect a household's food and nutrition security (Dominguez-Salas et al., 2019).

As existing gender norms suggest that women are responsible for caregiving and food preparation, empowered women who have more access and control over resources and

decision-making within and outside households can better reinforce the household nutritional outcomes. The dimensions of women's empowerment described by Galiè et al. (2019), can affect the second linkage (a→b→c in Fig. 1) the relationship between livestock interventions and household nutrition through six pathways: 1) women with a greater say in livestock production can ensure that the benefits from livestock intervention (i.e. livestock products) are channeled to all family members at the household. The livestock production decisions are related to the decisions about the livestock species, type of breeding strategies, responsibilities for animal health and feeding. 2) women with nutrition-related decision making 3) women with greater say in resource allocation 4) women with more control over the income derived from the sale of livestock and its products can ensure that food purchases are equitably distributed within the household 5) women with increased access to and control of opportunities (ex., access to training or information) 6) Women with greater say can also decide on their labor and time, which can improve their health and give them time better to take care of children and other family members and prepare more nutritious food.

Materials and Methods

Study context

In Bangladesh, most livestock production and dairy intensification efforts are concentrated in specific areas – often referred to as milk-pockets of the country (Islam, Kundu, & Sarder, 2021). The Northwest and Southwest have received much less attention (Quisumbing et al., 2013). In these areas, rural households mostly keep cows small in size and low yielding (Alam, 1995). These areas have been neglected because they have traditionally focused on rice and potato production (Southwest) and vegetables (Northwest) (BBS, 2020; Tisdell et al., 2019). However, with population growth, land fragmentation, and crop production being adversely affected by changing climatic conditions (Lázár et al., 2015), livestock has become more critical to these areas as well (Aravindakshan et al., 2020).

Several governmental and non-governmental initiatives focusing on the livestock sector are implemented in these areas, including the "Feed the Future Livestock Production for Improved Nutrition" (LPIN) by USAID in the Southwest and the "Achieving Sustainable Livelihood through Goat and Beef Value Chain Intervention" (ASL) by Heifer International in the Northwest. LPIN (2015-2020) aims to improve livestock production through interventions in feeding practices and promote behavioral change towards increased livestock consumption. ASL (2017-2021) aims to expand and diversify household incomes by intervening in the goat and beef value chains, organizing women-led cooperatives and strengthening cooperation between farmers and local stakeholders. The present study has been conducted in these two project locations to assess the gender dynamism in the livestock production systems and its impact on food security and nutrition between October 2019 and March 2020. These regions were selected considering the emerging importance of livestock to households and potential consequential changes in gender roles and food security and nutrition.

Study design and data collection methods

The study followed a qualitative case study approach. 23 focus group discussions (FGDs) were conducted, comprising of 13 female groups and 10 male groups with 8-12 participants in the two different project locations (see Table 1). In total, 134 female and 97 male participants were interviewed. The selection of participants was made randomly. The FGDs focused on empowerment, food and nutrition security and livestock keeping practices. With full consent from all of the participants, the conversations were audio-recorded and caution was taken to maintain confidentiality. For assuring the quality of the response, the FGDs were arranged in isolation from the opposite gender and a substantial number of follow-up discussions were conducted with the potential participants individually after the FGDs for clarification and triangulation. The female and male participants were from different households to prevent internal information sharing among the spouses before the focus group discussion. In addition to the FGDs, semi-structured key informant interviews were conducted with the government livestock officers in the region, gender experts from the projects, local livestock service providers, and dealers of feed and fodder to get a comprehensive overview of the gender dynamics in livestock farming.

The data collection process through the FGDs is split up into four inter-reliant parts: Firstly, the introductory discussion about the connotation, significance, implications of women empowerment in livestock guided by a pre-prepared semi-structured interview schedule with follow-up questions was conducted to understand the local women's and men's perceptions of women empowerment in livestock. Secondly, after this discussion, a participatory impact diagram (PID) was applied to collect data on the perception of the men and women on the contribution of livestock to household food and nutrition security (see detailed discussion in the next section). Then again, the discussion was forwarded further with appropriate prompts to collect data on the effects of women's empowerment in livestock on household food and nutrition security. The lead questions were adopted from the six pathways through which women's empowerment reinforces household food and nutrition security mentioned in the conceptual frameworks to facilitate this part of the discussion. Thirdly, the net-mapping exercise was conducted to triangulate data from the discussion on the role of men and women on the household food and nutrition-related decision-making (see detailed discussion in the next section). It was conducted to clarify the findings from the discussion since there were slipups regarding the roles and responsibilities of men and women in acquiring, accessing, processing, distributing, and consuming nutritious food. Finally, drawing exercises were conducted to apprehend the food nutritional knowledge of the participants and intake of different food groups.

Table 1: Number of FGDs in the selected project areas

Project	Number of FGDs conducted		Total number of participants	
	Female	Male	Female	Male
LPIN	9	6	93	58
HI	4	4	41	39
Total	13	10	134	97

Study tools used in FGDs

During the FGDs, three different research tools were used to facilitate discussion: participatory impact diagram, net mapping, and drawing exercise.

Participatory impact diagram (PID)

Participatory impact diagram (PID) is a tool to evaluate the positive and negative sides of any intervention developed by Kariuki & Njuki (2013). This tool helps to get the factual view of the participants through visualizations. In this study, PIDs were applied to explore the perception of men and women in the livestock farming households about the contribution of livestock resources to the food and nutrition security of the households. A big piece of paper was used to capture the perception of all participants. A simplified picture of cattle was drawn in the center and the paper was divided into two equal sides. The participants were then asked the guiding question: *'What do you perceive as positive effects of livestock on household food and nutrition security?'*. The answers were drawn on the one side of the line and participants were asked if there is any derived outcome from the immediate outcomes. All of them were drawn and weighted according to the participants' number on agreeing or disagreeing on any of the benefits. On the other side of the paper, the same process was repeated with the question - *What do you perceive as negative effects of livestock on household food and nutrition security?'*. A total of 15 PID exercises from two of the study locations were applied in gender-disaggregated groups. Considering that, with a total number of 15 PID exercises from two of the study locations, the level of saturation was reached, so it was not applied with all of the FGDs.

Net mapping

Net mapping is the unique approach of mapping the actors involved in a process as well as their influence on the process outcome developed by Schiffer & Waale (2008). This approach was used to understand the influence of different actors on the household's food access, preparation, distribution, and consumption. Different separate net maps were drawn with the participants; then based on the given information, the net maps are accumulated. The questions were asked like; a) who is responsible for accessing the food within the household? b) who is the most responsible one to the least responsible? Similarly, a) who decides food preparation? b) who decides the distribution of cooked food? c) who provides money for accessing food? d) who provides labor/attempts to access food? The net mapping exercise was conducted to understand the extent of contribution of women in households' food access, distribution, and consumption and recognition of women's contribution by men and how women's role in nutrition decision is essential for household nutrition security through consumption of livestock products.

Drawing exercise

Drawing exercises were conducted to apprehend the food nutritional knowledge of the participants and intake of different food groups. Firstly, the facilitator showed the picture of different food groups commonly consumed in the community includes; grains, pulses, nuts, dairy, egg, meat, poultry, fish, leafy vegetables, other vegetables, and fruits based on (FAO and FHI 360, 2016) to facilitate the drawing and give orientation to the food groups. The participants were asked to think about their food intake in the last 24 hours and to draw their

proportionate intake of food on a paper. The participants drew their own food intake in a symbolic round shape plate in the form of a pie chart with the assumption to get an idea of the amount of different food consumption by each participant on a piece of supplied paper. But the assumption was not practical since to get the idea of proportion needs apparent professional drawing. Then only the items mentioned in the individual picture are counted according to the above-mentioned nine food groups. This exercise was carried out in 8 FGDs of a total of 83 female and 6 FGDs of a total of 49 male participants. The reason for choosing this method was to maintain confidentiality despite discussing in the group so that the participants do not feel reluctant to talk about the exact information of taking the type of foods. Instead of asking directly, the exercise was done to avoid social desirability biases and to maintain confidentiality within the discussion too.

Participants' characteristics

Table 2 and Table 3 overview the demographic and livestock ownership among the participants, showing that participants in both project areas have similar characteristics and household's livestock ownership patterns are largely the same – except for goats, which are more common in HI. Poultry was not considered, and apart no other types of livestock are owned in the study areas.

Table 2. Characteristics of participants in FGDs at two project locations

Project	LPIN		HI	
	Female	Male	Female	Male
Gender				
Number of participants	93	58	41	39
Average age (In years)	35	41	35	38
Education (Schooling years)	5.5	6.5	6	6.5

Table 3. Households' owned livestock resources reported by the participants at two project locations

Type of Livestock (Average number of animals)	Reported livestock resources owned by households of female and male participants of FGDs			
	LPIN Female	LPIN Male	HI Female	HI Male
Cow	3	2	3	3
Calf	1	1	1	1
Bull	1	2	1	1
Goat	1	1	4	4.5

Results

Perceived contributions of livestock to household food and nutrition security

The participants in the participatory impact diagram (PID) exercises mentioned that livestock resources enhance their household nutrition security by direct and indirect income from

livestock, livestock products, and livestock by-products. On the other hand, household nutrition is hampered by the drudgery of their tasks, limited availability of free time, and delayed food intake. Examples of an actual PID on the impacts of livestock on the household's food and nutrition security as perceived by the female and male participants are represented in Figure 3 and Figure 4, respectively.

Figure 2 shows 12 women's collective portrayal of perceived livestock-nutrition linkages. Participants mention getting milk (12/12), getting offspring (12/12), manure (12/12), fuel sticks (6/12), and meat (5/12) as benefits. Income from selling milk is used to purchase medicine, children's tiffin, and other nutritious foods for the family, which contribute to household nutrition. Using cow dung as the manure in the crop or vegetable field, the participants reported increased yield. The households benefited from the sale of livestock and also from consumption. For some occasions, the participants slaughtered animals and had the meat, which leads to increased household nutrition. Fuel sticks made from cow-dung and jute-stick are utilized for clean cooking and also sometimes earned money from the sale. On the negative side, the female participants mentioned having less leisure time (12/12), which leads to mental stress; and hard work (10/12), leading to delayed food consumption (10/12) and physical stress for them. Both psychological and physical stress negatively impact nutritional outcomes.

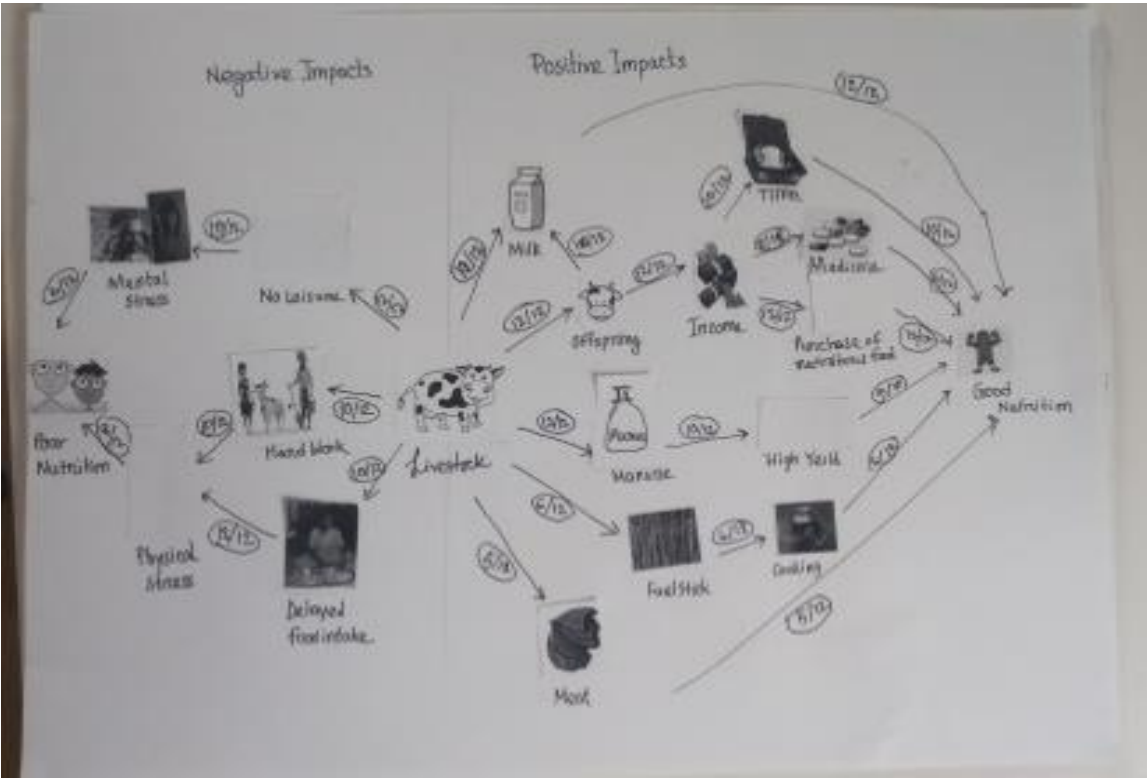


Figure 3: Women's perception of the contribution of livestock resources at household nutrition captured in PID

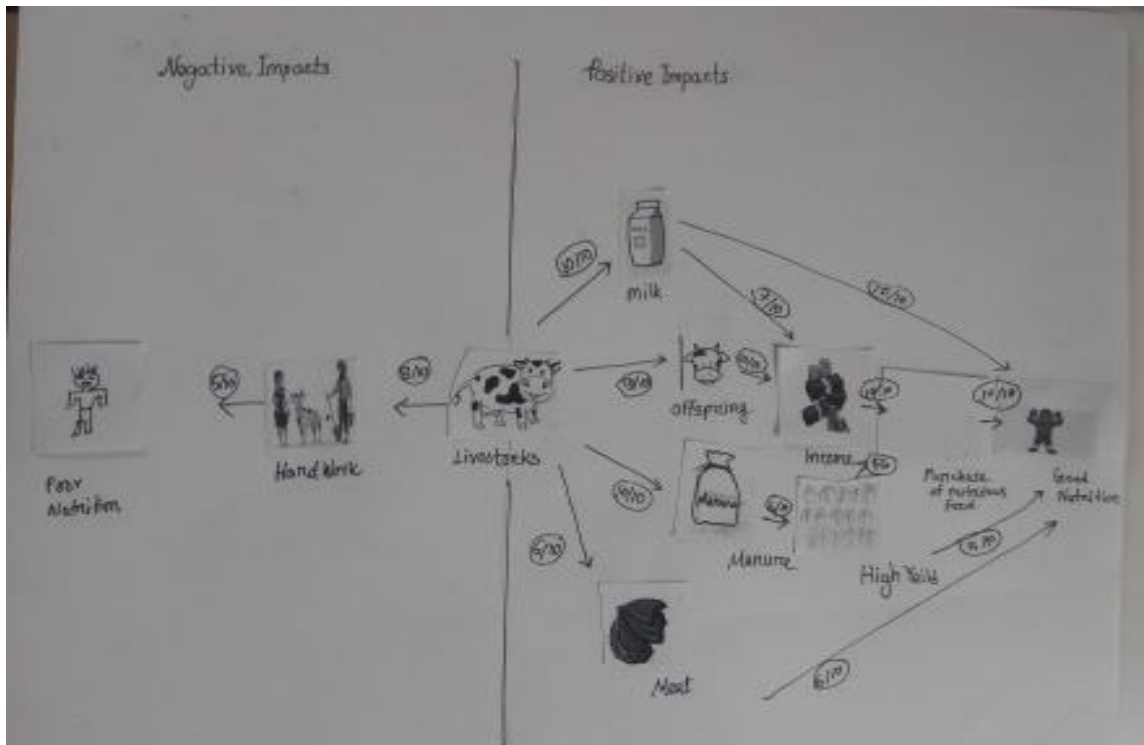


Figure 2: Men's perception of the contribution of livestock resources at household nutrition captured in PID

Figure 3, drawn with 10 men in the community, depicts their views on the effects of the livestock intervention on household nutrition. All participants identified getting milk (10/10), meat (6/10), offspring (9/10), and manure (10/10) as the benefits of livestock. Besides income generation, milk and meat directly contribute to nutrition. When calves are kept, they give milk in the future, and selling them generates income. Manure application in the crop field leads to higher yields and contributes to income and household consumption. On the negative side, 8 men out of 10 mentioned that their work had been increased due to having livestock, leaving less free time, which weakened them physically.

The findings from all 15 PID exercises from two of the study locations are presented in Table 3 and Table 4, showing the immediate impacts and derived impacts of livestock on household food nutrition. The participants identified three 'M'- milk, meat, and manure, as the vital output of livestock keeping and recognized hard work that affects their wellbeing as the negative side of livestock resources at the households.

However, according to the well-known proverb, "only the wearer knows where the shoe pinches," there are differences in the perceptions of livestock contribution on nutrition by men and women. While male participants' perception about the importance of milk is limited to the concern of purity, women perceived more practically the importance of milk as one of the main meals since she is responsible for food preparation and distribution. More female participants, as compared with men, were conscious about using income from selling the left

amount of milk after consumption and the associated benefits like children's tiffin, education, medicine.

In both female and male group discussions, participants perceived meat as a nutritious food that is occasionally available. The slaughtering of goats is more common than the cows or bulls on any special occasion like *Eid*. Still, the male group identified how they could arrange and access meat, suggesting that income control or freedom in movement gives them the advantage to control purchasing nutritious food.

The offspring are valuable for nutrition in two ways – a future source of income and a future source of milk production in the household. Women emphasized continuous household access to milk as the benefit of livestock, guaranteeing nutrition security of the household. The men highlighted the selling possibility and investment in crop production, which is usually men's income area. These sales are not giving immediate nutrition benefits but might improve the resilience of the household.

Women perceived the advantage of manure application to the homestead garden as it will increase the vegetable production in their backyard, which ensures diet diversity for the household. In contrast, men focused more on the commercial utilization of manure in their crop fields. Women also mentioned making fuel sticks with cow dung and jute sticks to use as a convenient fuel for cooking and some extra income from the sale of these sticks. Men hadn't mentioned it at all.

On the negative side, almost all female participants mentioned the mental stress of having livestock in the household, especially when a cattle is sick or a cow about to give birth or simply lose of appetite of a cattle for a regular feeding schedule. This mental stress often gives them a headache or no willingness to eat, which weakens them physically. Sometimes, in severe conditions, they can't sleep at night and keep checking the animals. Women mentioned that the hard work and delayed food intake impacted their health men did not talk about this. Although men said about the unhygienic environment of raising livestock at the household, they have not discussed anything about the extent of zoonotic disease risks.

Table 3: Potential positive impacts of livestock on household nutrition

Immediate impacts	Derived impacts (% of males and females reporting effects in brackets)	Participant	Some selected reflections of participants
Milk	<ul style="list-style-type: none"> • Household consumption→ nutrition (100% M and F) • Income (selling the left amount of milk after consumption) →children’s tiffin→nutrition (30% M and 100%F) • Income→medicine→improving wellbeing→nutrition (20% M and 87% F) • Income→children’s education→capable of 	Female	<i>We need not worry much about the cooking arrangement of dinner since we can have rice with milk.</i>
		Male	<i>The main advantage of keeping cows for farmers like us is that we can have pure milk daily most of the time</i>

	earning→nutrition (increase in ability to buy food) (0% M and 40% F)		<i>of the year.</i>
Meat	<ul style="list-style-type: none"> • Slaughtering animal occasionally→consumption→nutrition (60% M and 50% F) • Arranging community-contribution (money) to buy a cow→slaughter and distribution→consumption→nutrition (60% M and 20% F) 	Female	<i>We normally don't slaughter our cows for home consumption without any occasion.</i>
		Male	<i>With the initiation of this project many people have started raising cows in our locality than before, monthly/bi-monthly we raise money and buy one of the sellable cows from us and slaughter, distribute according to contribution. This is a unique opportunity for us to have meat as before we hardly had beef besides the 'Qurbani Eid' (an Islamic festival of sacrificing animal)</i>
Offspring	<ul style="list-style-type: none"> • Keeping the calf→increase milk production in future→consumption→nutrition (90% M and 70% F) • Sale off (when grows big)→income→investment in crop production→crop consumption→nutrition (90% M and 30% F) • Sale off (when grows big)→income→investment in crop production→crop sale→buy other nutritious food→nutrition (90% M and 30% F) 	Female	<i>From one cow, now we have 2 milking cows at home, and all the year-round we get milk, need not buy and can sell the excess amount.</i>
		Male	<i>Two months back, I sold out one of the bulls to my neighbor to cultivate potatoes in my field. Since agriculture is our main occupation, the income from potato cultivation of course goes to food purchase.</i>
Manure and Vermicompost	<ul style="list-style-type: none"> • Cow dung as manure→crop field and homestead garden →increased yield→consumption→nutrition (100% M and 30% F) • Cow dung as manure→crop field 	Female	<i>In my homestead garden, I apply manure a little bit, so I get a higher yield of vegetables now than before.</i>

	and homestead garden →increased yield→income from sale→purchase other nutritious food→consumption→nutrition (100% M and 30% F)	Male	<i>As we cultivate vegetables like tomato, cauliflower, cabbage, onion, potato and others commercially we needed to buy a lot of fertilizer before but now we can use our manure and vermi-compost</i>
Fuel stick	<ul style="list-style-type: none"> •Use in cooking food→save money→ purchase food (0% M and 80% F) •Sale→ income→purchase food (0% M and 80% F) 	Female	<i>Since instead of sitting idle, if we make some fuel sticks, we can use them for cooking and can sell them too. Isn't it a good advantage?</i>
		Male	<i>Nothing mentioned</i>
Biogas plant	<ul style="list-style-type: none"> •Use of slurry as manure →increased yield→income from sale→purchase other nutritious food→consumption→nutrition (5% M and 0% F) 	Female	<i>Nothing mentioned</i>
		Male	<i>The biogas plant is very beneficial to us-- --we can use the gas for cooking and the slurry as manure.</i>

Table 4: Negative impacts of livestock on household nutrition

Immediate impacts	Derived Impacts	Participant	Some selected reflection of participants
Hard work and less free time Delay in food intake	Physical stress→effect on health→poor nutrition (0% M and 100% F)	Female	<i>I must work for the household from dawn to dusk; with added livestock resources now, I can't sometimes have food in time. If I cannot have my food in time my stomachache starts; Do you say that I am healthy?</i>
	Mental stress→no mode for food intake→poor nutrition (0% M and 100% F)		
	Physical weakness and pain→no proper utilization of food→poor nutrition (0% M and 90% F)	Male	<i>Nothing mentioned</i>
Unpleasant environment	Bad smell and unhygienic →bad for	Female	<i>Nothing mentioned</i>
		Male	<i>An unpleasant smell is not good for health</i>

Quarrel/unhappiness in the household	health →poor health→poor nutrition (5% M and 0% F)	Female	<i>When there are many works related to cooking, caring and post-harvest activities as I expect help from husband/other family members, the arguments started regarding the gender roles, which makes me sad, and I lose appetite. These irregularities later give me stomach pain diseases.</i>
	Mental stress→no mode to eat→poor nutrition (0% M and 60% F)		
		Male	<i>Nothing mentioned</i>

Effects of women empowerment on the linkages between livestock production and food and nutrition security

Women's empowerment can influence the nexus between livestock and household food and nutrition security through six fundamental pathways (dimensions) (as outlined in the conceptual framework). In the following, the role of each of these dimensions will be analyzed in detail.

Dimension 1: Livestock production-related decision-making power

Table 5. Decisions made related to livestock production according to men and women participants in FGDs

Decision taken related to livestock production	According to men			According to women		
	Man	Woman	Joint	Man	Woman	Joint
Decide on keeping or not keeping livestock		×	×			×
Choice of livestock species (color, nature)	×		×	×		×
Decide on feed types		×	×	×	×	×
Decide on Artificial Insemination (AI)	×		×	×		×
Decide on vaccination	×		×	×		×
Calling LSPs/Doctors (in case of sickness of animal)	×	×		×	×	

The production decisions related to livestock, reported by female and male participants, seem to differ. Both men and women considered keeping livestock in households depends on the joint decision. A small segment of male respondents mentioned that keeping livestock depends on women's decisions since men are not at home and need to work outside. They mentioned that if women express interest, then they assist with money to buy animals.

According to the women, they usually don't have access to money, and it is the husband who provides money to buy an animal. Thus, women alone can't decide to keep livestock.

After my marriage, when I came to this home and found no cow, I gradually managed to buy one from my savings with the maximum money contributions from my husband. Currently, I have four, and I am the sole responsibility for looking after them and my husband, from time to time, helps with some activities like buying feed.....taking to the veterinary hospital.

(30, female participant)

The decisions on the breed are reported as joint because most women do not go to the livestock markets for purchasing cows, but they can raise suggestions about the type of breed and color of calves. A considerable segment of women also suggested that men decide it since they can't accompany men in the market. The feed type is chosen jointly by men and women. Women determine what type of feed is appropriate for the livestock, and men usually purchase concentrated feed from the market and cut grasses from the field. Although both men and women said artificial insemination (AI) and vaccination are normally decided jointly, men are responsible for taking them to the service center. Some women reported this is solely decided by men, when maximum women do not go the service center but when services provided by the project at the doorstep, the women take care of this affair by themselves.

Calling LSPs/Veterinary doctors (in case of sickness of animal) is usually considered men's task. Still, the decision to call is considered women's area since she stays at the house and observes the animal from time to time and she better knows the conditions of the animals. Some women said it is cultural norms and they sometimes don't know the contacts as they have minimal movement outside the house, so women don't call directly by their mobile phone (if husband is not at home) to the LSPs but call husband to ask to call LSPs. But in one FGD where the project had trained a female LSP, all the respondents agreed that they call her frequently in any problem. However, male participants urged joint decision is important to maximize the outcomes from the livestock when there is a significant investment in high yielding breeds, cowsheds and other facilities and the livelihood of the household depends on the livestock resources to a great extent. While female participants suggested though the decisions are jointly taken, male superiority on decisions sometimes compels them to agree. But in the case of small ruminants and local cow breeds, the maximum decisions and responsibility are vested upon women.

Dimension 2: Nutrition-related decision

a) Decisions on livestock products (milk, meat)

All female participants said they decide by themselves about the amount of milk to be kept for household consumption, but some female respondents from extended family backgrounds suggested that their mother-in-law decides it. However, almost all women said that men did not interfere with this aspect. Almost all male participants also agreed that the decision-making power on how much milk to be kept is in the hands of women. In dry seasons, when there is no milk from livestock at home, the households only buy occasionally and purchase decisions are taken by men in most of the cases when they visit the markets. If the household

has small children, they try to secure a portion from the neighborhood upon the joint decision and money support from the husband.

...now since I took participate in the training from ACIDI/VOCA on animal health and nutritional food for us, my husband trusted me with the responsibilities of rearing high-yielding cows and allows me to decide on the milk consumption and sale (Female, 30).

When the household is comparatively sufficient from the crop production and owns 2-3 cows the wife decides solely on the milk to be kept or sale and the husband has little or no say on it. This is because the husband has his income from crops and for livelihood; they are not dependent on livestock resources. But when the household's other income source is not sufficient or the herd size is more than 4 cows, men tend to practice more control over the milk sale/kept – even when they have less exposure to training and education.

Since almost all our croplands are lost to the river, livestock is the only income source, he (her husband) takes care of income from livestock and I take care of the cattle (Female, 35)

Some men with a progressive attitude, especially young men, opt for joint decision with wife since they value the women's knowledge and contribution to the household economy.

b) Roles and responsibilities of household food access, distribution and consumption within the household

No women considered the authority on food preparation or distribution as part of women's empowerment. It is them, sometimes in consultation with the mother-in-law, who prepares the food and distributes it among the family members. It is observed the roles and responsibilities regarding household food access and distribution are varied according to the age of the women.

I ask my mother-in-law what to cook, upon her suggestion, I prepare the food and my mother-in-law sometimes helps with some tasks, finally serving the food to all of the family members is her responsibility (23, female).

Another woman from participants mentioned that she did all of these responsibilities by herself since her mother-in-law did not live with them.

Except for any special request from husband, children, or any other family member, generally, I decide what to cook given from the available foodstuffs or what I can access (35, female)

The men in the discussion suggested that the authority on cooking and distribution of food is part of women's empowerment. In contrast, women mentioned that women typically decide by themselves about food preparation and distribution considering the husband's likes and dislikes.

I even don't know what is my wife cooking and I will know only when I sit for lunch and she knows my likes and dislikes (40, male)

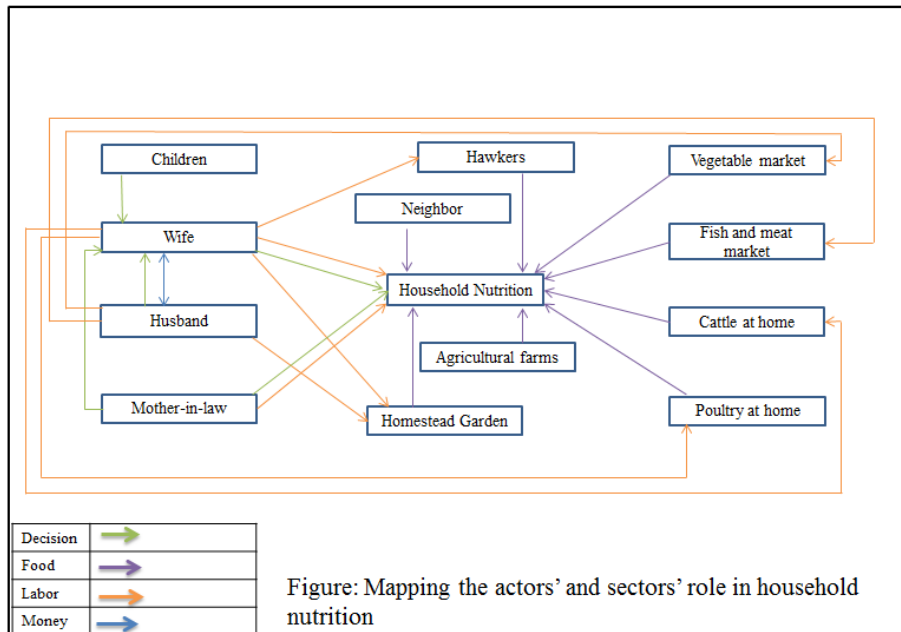


Figure 6: Mapping the actors' and sectors' role in household food nutrition

In the households in the studied area, the wife, in joint families jointly with the other female members, is typically in charge of cooking and distributing the food in the family (Figure 6). In terms of accessing food items, in many cases, they depend on their husband as the women do not go to the market normally. Homestead garden is a great source of accessing raw food materials for women. For purchasing fish and meat they have to ask the man in the household. Women also mostly manage the non-food material for cooking like the fuels by making fuel sticks with cow dung, collecting woods. As in terms of labor to be given in accessing food both the female and male are contributing to it. The wife provides money to the husband to buy necessary food from her savings and the husband also gives money to the wife to purchase foods especially from hawkers. The access to and control over the milk sale income equipped the women to buy nutritious food like fishes from the hawkers or eggs, vegetables from the neighbors. Also, the women provide a portion to the husband for buying chicken or beef meat from the market.

The female and male participants posit that since most of the households now are nuclear and women are conscious about the economic situation of the household and think that if they earn something will be good for their children. The nature of the household has an important role in women's empowerment and nutrition. When the household is nuclear the wife gets considerable decision-making power over the livestock keeping practices and household food access and distribution. But when the household is joint and extended the wife is not the one who decides on the household food cooking and distribution but the elder woman normally mother-in-law or some cases elder sister-in-law. In many cases, she does not actively take part and give full efforts in the livestock keeping since she feels she is not solely responsible for the family's wellbeing.

...since now the families are nuclear so without relying on others or coveting others, most women try to engage in any of the economic activities for the wellbeing of their own family
(Male, 45)

c) Food intake pattern of men and women by different food groups

Figure 7 shows the self-reported food intake in the last 24 hours by men and women, showing that men and women have similar eating habits regarding many food groups including grains, pulses, dairy, and other vegetables but men ate more eggs, meat, poultry, fish, and fruits.

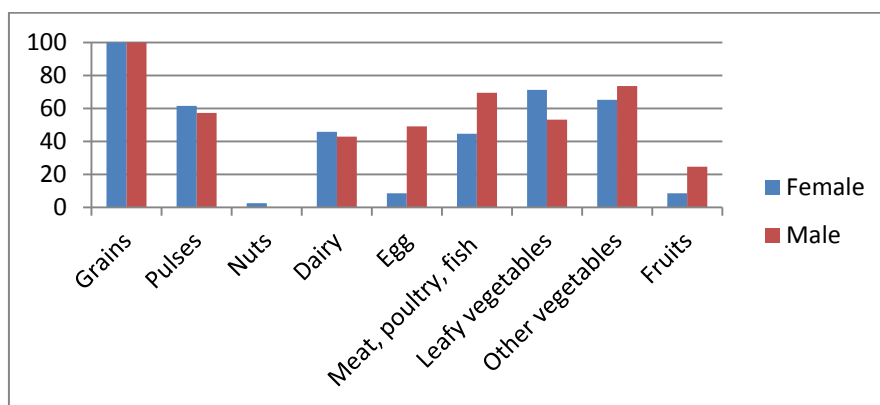


Figure 7: Food consumption of female and male participants captured in drawing exercises

The female participants mentioned that since they have milking cows and become aware of the importance of taking milk, they try to take milk.

I know from the nutrition training that milk intake is essential for all men, women, and children; upon availability, first I decide to keep for household consumption, then if left, decide to sell (Female, 25).

Dimension 3: Access to and control over resources

The female participants regarded that contribution on the decision of purchase, sale, or transfer of livestock and time to sell and expected price is an integral part of empowerment in livestock keeping practices. Most of the women said they decided jointly with the husband about this issue. When the sale of livestock is from home, the women remain present and sometimes bargain with the buyer about price, but women do not go to the market and suggest a price for sale to the husband. Men also agreed on the same. Three women in three different FGDs disagreed that they had no say on the decision of purchase, sale, or transfer of livestock and time to sell and expected price, one of them stated that,

...everything in this household belongs to him, who I am to decide, I am here just to give my labor. Though I give my effort in rearing when the question of ownership comes, he says nothing here is from my parent's house

Other women in the same discussion mentioned that... *all men are not alike; most of them, value our labors.*

Although women did not decide alone on the sale or slaughter of animal still jointly with the husband decide about the home consumption of meat. Here, the control over the decision of sale or consumption depends on the type of the animal. In the case of small animals like goats, the women in most of the cases suggested that they can decide by themselves with limited influence from the husbands.

My husband even don't know how many goats I have (Female, 50)

But this is not always the case. In the case of the sale or slaughtering of big animals like cows or bulls, the decision-making power depends on several issues, including the household status and dependency on the livestock and the men's attitude towards the contribution of the woman in keeping livestock influences the decision making power. Most of the female participants maintained that they can contribute to the decision to a considerable extent. Simultaneously, it is also perceived that women had a voice jointly with the husband about the decision of sale or purchase of livestock regarding the timing or breed though the women in these study areas don't go to market normally. This had important nutrition implication since these decisions directly affects household access to milk availability.

Dimension 4: Own income and control over household income

'Even dogs don't like bones without flesh- so women who do not contribute to income or labor are not adored.' (Female participant, 50)

'Since livestock keeping is the task women can do staying at home without much hampering the household activities and this adds extra income to the household, so I am at ease about it and have no objection' (Male participant, 40)

The female participants in all of the FGDs expressed that having their own income is the key essence of empowerment. Having livestock, women can normally have the income from selling milk irrespective of farm size. Since they contribute to the household income, the men have no objection to them engaging in livestock rearing activities. When owning a few and small animals, the women can spend the money to purchase small household necessities, tiffin or stationaries for the children, jewelry or clothes. In contrast, farmers with larger herd sizes and bigger animals fix a portion of milk income for purchasing feed.

The women mentioned that since they have their income or contribute to household income, the torments by husband have ended and they cooperate better with their wife and maintain good and happy relations. The female participants identified that having a good relationship between spouses is some sign of empowerment. Women can discuss their sufferings or hard labor with their husbands and get help from them. The women believed that most of the quarrels in the household are for economic reasons and that once they contribute to the income, their voices are also heard and they face no torture or humiliation. One of the male

participants mentioned how the time and attitude have changed and how the wife was treated in past from his experience.

There is no great medicine of disobedience except beating; it was my grandfather's theory to keep wife under control in past time, but now most of us discuss everything with wife (Male participant,50), even if we want to contribute some donations to the temple we discuss it with the wife... added by another participant

Male participants explained the reasons why a good relationship between the spouses is important. To them, it is the wife who is also working for the household's welfare, takes care of children and other family members, and has realized this thing due to orientation to some number of training.

I give the money from selling the cows to the wife, she is happy to keep it but she will never use a single penny without discussing and she will be willing to spend for family welfare for example to buy another two cows maybe or to build a house, but if I keep money with me perhaps I need to give a certain amount to spend on unnecessary things. While all women are not equal, most women think of family first. (50, male)

Money from selling milk is normally considered as women's income so man does not usually want them. But when in need women give it to husband (35, Female)

The female participants also highlighted that they have considerable command over the income earned from selling livestock like cows. In discussion with men, they also mentioned that they always consult with their women in the household about the expenditure of the money. They think this will help them to make the best use of it for the welfare of the household.

When I have money, I have the strength to say something on some affairs and that is also heard (Female participant, 35)

'Why should I ask for woman's approval' this ego no longer exists in me because I have seen taking decision together with my wife only to maximize our economic or other outcomes (male participant,45)

Since the woman has the income with her, she can contribute to some important intra-household economic decisions like building a new house or purchasing a piece of land.

Men's attitude has changed regarding "discussing with the wife" because they have seen that the wife is also trying to benefit the household. The mechanism of intra-household decision making does not only depend on the spouse willingness to make joint decisions for the improvement of the household's condition but also the presence of other elder family members, the age of the wife and literacy level, most importantly, income contribution of the wife and the attitude of the husband towards the gender issues.

Livestock keeping in the household has paved the way for increased income in the households. It was found that typically women had more control over the income from the sale of milk: at small-scale production, they have absolute control and used it to meet up the

expenditure from children's tiffin, medicine and purchase of other nutritious food from the market. Women also received the income from the sale of the animals but they decided jointly with their husbands about the utilization of the income. Here, women had a strong voice since they raised the livestock, though there is no definite ownership of livestock. A unique mechanism is noticed in spending of the sale from cow or bull, which is the husband in most of the cases trusted wife over the proper use of this income. Proper use means in their language 'for the welfare of the household'. The female participants agreed that the income is in most of the cases given to them to keep but spend upon discussion with husband.

I gave the money to my wife from the sale of a cow last month, she is happy only to keep the money with her and I know she will not spend it without any good purpose and also without discussion with me. (Male, 40)

But the contrasting case is also reported by one Female angrily,

According to him, nothing here belongs to me because I didn't bring these things from my parents' home, even working down to dusk after this household, taking care of livestock, he does not bother to sell the cows when he wants without asking me (Female, 35).

However, most of the participants suggested this is not always the case, and with the changing time, man is also becoming accountable.

Dimension 5: Access to and control of opportunities

Male and female participants identified that free movement outside the home is an important aspect of empowerment. Since the society has religious attitudes towards the free movements of women outside the house, most of the men expressed no concerns about involving women in livestock keeping at home. The women normally do not go to markets to purchase the feed or medicines or sell or buy of animals or sell milk at the marketplace. The men support them with what they need from the market or outside for example feeds or medicines. Another group of male participants expressed their concern about the safety and security of women to move outside freely, given the number of molestation and rape cases in the news every day. But some of the male participants had more progressive attitudes towards the women livestock service provider - the few women fodder entrepreneurs or feed dealers at the market places. Women considered going out is necessary to access the available facilities like training and to respond in any emergency time.

An empowered woman can take part in any training arranged by GOs or NGOs and their husband does not say no. (Female, 27)

When a woman becomes empowered, she can alone take her cows to Upazila veterinary clinic in some emergency without waiting for her husband or any other. (Female, 40)

The female participants mentioned that the freedom they enjoy now in moving outside of the household was not the same before. The reasons they suggested that women are contributing to household incomes, taking part in training makes them self-confident to perform livestock-related activities in a better way. The female participants also added that apart from the

livestock training, their husbands now have fewer objections to taking part in any other training or workshop like nutrition and hygiene training, since the husband has realized that the training or workshop helps the economic benefits of their households.

Given that women contributed to household income by keeping livestock, men any longer didn't inhibit their participation in training and groups. The household status influences the women's participation in training. If the households have an average or above-average status, the women don't prefer to attend any meeting/training outside their home, but they happily participated if it is arranged in their yard. Also, the women from these households do not go far in the Upazila for having any training. The husband, in many cases, does not allow his wife to participate in training occurring in other's house or distant places since this hamper their ego that as *"Do I not have enough income so that my wife needs to go outside."* These women face problems also in the time of need to take their cows to the veterinary clinic. In this case, the poorer women are freer to attend any training on income-generating activities.

Dimension 6: Extent of workload and time management

Because of the increased workload of having livestock besides other household and agricultural activities, I can't have food on time regularly, but it is me who decided to keep livestock; I spent my time and energy like my husband do in the field. (Female, 35)

The women and men mention that the increased workload has affected their leisure time because of owning livestock. Though they complained of not having enough time to take care of themselves, they said that is their own decision to keep livestock or not.

Salt is poison, but without it, the curry is tasteless; keeping cattle is laborious, but it gives us income. (Female, 55)

Most of the women reported that their workload has to be borne by them even if they are sick saying:

...during my sick time, the cows also suffer because my husband goes for his work, I can't give them in timely and enough food (Female, 30)

A few of the female participants mentioned that from time to time, their husband helps in different crop production, livestock, or child-care-related activities. But most of the female participants agreed that since men remain most of the time outside of the home, it is women's task to look after the livestock. Most female participants reported delayed food intake as their everyday phenomenon because they can't complete all household tasks, even without taking any rest until the evening.

Discussion and Conclusion

Scholars widely support that livestock intervention is one of the most suitable approaches for empowering women in rural areas. (Salazar et al., 2018 ; Quisumbing et al., 2015). It is also accepted in the literature that lack of resource ownership and lack of control over income arising from patriarchal attitudes, cultural, social norms in the first place obstruct women to engage in livestock (Price et al., 2018). This present study reveals that women's participation

in livestock is not always hindered and that women have access to and control over livestock resources to some degree. The general understanding of the available literature suggests that establishing women's resource rights is important for ensuring women's empowerment (Njuki & Sanginga, 2013). But in our study elder female participants suggested collective household resource ownership helped them. Since women have little or less access to any source of income, it would not be possible to buy a goat or cow alone and feed them in the beginning. Some women feel that as livestock are considered as a common resource of the household, the male members offer to help them with accessing the feeds and cutting the grass from the field during the dry periods. But not all the women in livestock, especially young women do not have the same feeling that ownership of livestock resources are not necessary.

The most discussed topic of gender equity is access to and control over income. The previous studies find that men control the income from livestock and allocate a little to women (Galiè et al., 2019). In contrast, women in our study have considerable control over the income from the livestock resources. They can utilize their milk income according to their wish. Typically the women with goats and local breed cows have more access to and control of the income. The women from the households with a comparatively good amount of cropland have greater control over income since the husband has another source of income to support the family. But in households that keep livestock to supplement crop cultivation in some seasons, the women have comparatively less control over the income from selling the livestock resources. However, they have gained a voice over crop cultivation since the income from her labor is utilized in crop farming. Controlling the family income in this way, the women exercise a role in purchasing nutritious food.

Decision-making power over the livestock keeping is higher among the women who received training and keep high yielding cross-breeds. Since they can decide about the number and type of animals, they have control over the household access to milk intake and meat consumption. Middle-aged women have greater power over the milk to be kept for household consumption and distribution among the different family members. The women who attended the training on nutrition are more conscious about the milk intake by themselves, children and other family members.

Physical labor and delayed food intake are some of the reasons behind the women's weak physical status which matches with the previous study which suggests that women cannot take time use or physical labor decision (Bain et al., 2018) due to the engagement in livestock. However, the assistance from the husband and their efforts to make arrangements of labor reducing technologies help their work getting done easily are the results of their intra-household bargaining power. The existing literature indicates that livestock adds the burden to women with men doing no or little work but enjoying the benefits (Dumas et al., 2018). The women in the present study identify men are also assisting them with livestock-related and household-related activities and this happened because of their increased bargaining power. Admiring the wife's contribution to household income some men also try to take care of her timely and nutritious food intake.

Implication and Scope of Future Work

The present study's findings have a set of implications for developmental organizations that target livestock as a way to empower women and improve household nutrition. First, it is problematic that such programs focus on the ownership of livestock and target only women. As shown by many studies in the African context, livestock ownership has to be accompanied by access to the feed, medicine, or other necessary things. Incorporating men in training can be the key as they are the gateway to make household nutrition better since they are mainly responsible for going to markets and accessing nutritious foods. When men are included in the program, they become more accountable. The developmental program should be focused on a broader gender perspective instead of focusing on women's empowerment in isolation.

Second, the cultural norms are also critical to consider, as this study shows when livestock is regarded as the household resource, both men and women try to give their efforts. In this study, crop production is the main livelihood earning way for most rural people where mainly men are engaged and women support the post-harvest activities and labor-intensive activities. So keeping the livestock is a women's task with little help from the husband. The technologies which facilitate the easy handling of the tasks like cultivating high yielding grass in the home yard, low-cost machines for cutting silages, clean water access to the cowshed, and other low-investment technologies should be introduced by the livestock development programs.

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Declaration of Conflicting interest

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