



Review Article

Women's Participation and its Determinants in Livestock Management Across the Developing World: A Systematic Review

Shaista Naz^{1*}, Muhammad Arif² and Akhtar Ali³

¹Department of Rural Development, Amir Muhammad Khan Campus, Mardan, The University of Agriculture, Peshawar, Khyber Pakhtunkhwa, Pakistan; ²Department of Management Sciences, University of Swabi, Khyber Pakhtunkhwa, Pakistan; ³Department of Water Resources Management, The University of Agriculture, Peshawar, Khyber Pakhtunkhwa, Pakistan.

Abstract | Women are the prime contributors to livestock management and their increased participation can lead towards not only their own empowerment but also towards the development of the sector. Review of the empirical research across the developing world in the said subject not only shed light on the lessons learnt but also can identify the gaps left out. For this, a systematic review has been conducted to highlight the immense role of women in livestock and its determinants in the developing countries. To achieve these objectives, a total of 32 publications after following the inclusion and were reviewed. Content analysis has been used for analysing data and the study found that women have higher participation in livestock management as compared to crop production due to the easy accessibility of livestock and the quick outcome in the shape of milk and milk products for home consumption and sale to earn cash. Furthermore, women were found to have higher participation in the indoor livestock management activities like animal feeding, serving water, cleaning of sheds, milking of animals, and preparation of milk products, while have low levels of participation in the outdoor activities such as fodder cutting, marketing of animals and its produce like milk and milk products due to their restricted mobility, patriarchy, low technical know-how, social, cultural, and religious constraints. The study identified various determinants of women's participation in livestock like herd size, size of landholding, family type, educational status of the respondents, and household head as the negative and significant ones, while livestock rearing experience, extension contact, access to credit, age of the respondent, and farm income were the positive and significant ones. Concluding, the literature shows the considerable evidence of women's participation in livestock management but the determinants were not fully explored in the developing countries. Moreover, the time allocation studies (quantification) on the subject matter were found scarce. It is therefore recommended that more empirical research should be carried out on time allocation studies and determinants of women's participation in the livestock management as it will not only better quantify and recognize women's role in the sector but will also be helpful in designing more effective, women's specific policies and programs in the sector.

Received | May 01, 2018; **Accepted** | August 10, 2022; **Published** | December 29, 2022

***Correspondence** | Shaista Naz, Department of Rural Development, Amir Muhammad Khan Campus, Mardan, The University of Agriculture, Peshawar, Khyber Pakhtunkhwa, Pakistan; **Email:** shaista@aup.edu.pk

Citation | Naz, S., M. Arif and A. Ali. 2022. Women's participation and its determinants in livestock management across the developing world: A systematic review. *Sarhad Journal of Agriculture*, 38(5): 383-396.

DOI | <https://dx.doi.org/10.17582/journal.sja/2022/38.5.383.396>

Keywords | Women's participation, Livestock management, Review, Determinants, Developing countries



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Introduction

Agriculture served as the main sector of the developing world contributing towards GDP, employment generation, poverty reduction, and food requirements etc. However, the world estimates show that 1.2 billion rural people who depends on agriculture are extremely poor which are mostly found in the developing countries (Naz and Khan, 2018; Naz *et al.*, 2020). In the developing world, a country's fate is linked to the progressive growth of the agriculture sector and at the same time it requires the active participation of rural households in the growth process as well (Christiansen *et al.*, 2006).

Among the developing countries, agricultural growth, development and poverty reduction go parallel. The agriculture sector which is comprised of four subsectors, simultaneously played impertinent role in reducing poverty across the developing world (Asaan, 2014). Among these sub-sectors, livestock is an important one and its significance can be seen through its widely rearing by three-quarters of the poorer households to support their livelihoods (Smith *et al.*, 2013). A variety of livestock types are kept in rural areas of the developing countries, which most often include both the small (i.e., poultry, goats, sheep etc.) and large ruminants such as buffalo, cattle etc. (Herror *et al.*, 2012).

These livestock types are kept at household level in the developing countries, along with other crop production activities under the mix farming system which strengthen and improve the productivity, profitability, and sustainability of farms. Under the mix farming system, the households derived six to sixty seven percent of the total household income from the livestock and its products. The livestock are also kept under the small-scale farming system to support livelihoods by providing food, fuel, income, fertilizer, and security at bad timings (Nirmala *et al.*, 2012; Andaleeb *et al.*, 2017; Naz and Khan, 2018).

It is widely acknowledged that livestock provide multiple benefits under different farming systems in the rural areas of developing world (Assan, 2014; Ahmad, 2014; Zahoor *et al.*, 2013). More importantly, livestock is also most often reared by the small holders and landless poor as well to meet their daily food and cash needs and thus served as a more secure source of income for them. Additionally,

it provides employment opportunities for the landless and mitigate income variability of the small holders due to the crop failure in case of seasonal or weather calamities (Farooq *et al.*, 2010; Herror *et al.*, 2012; Naz and Khan, 2018). Thus, livestock through its multiple benefits not only can reduce poverty but also can improve the socioeconomic conditions of the rural poor in the developing countries (Farooq *et al.*, 2010).

It is evident that livestock are kept among the rural households throughout the developing world for its multiple benefits and support in livelihoods (Birader *et al.*, 2013; Issac *et al.*, 2012). Livestock are managed both within the household and at the farms by the rural households. Livestock rearing is a tedious task which requires time and skills. In the rural areas of the developing countries, livestock is mostly tended by women (FAO, 2015; Assan, 2014; Rashid and Goa, 2012) along with other domestic responsibilities such as cooking, dish washing, cleaning homes, care of children and elders etc. (Ahmad, 2014). Women engaged in a variety of livestock activities and thus support rural households (Naz *et al.*, 2018; 2021). All the labour provided for livestock rearing by women is unpaid and thus unrecognized and undocumented.

The information about women's participation in livestock management is not only limited (Andaleeb *et al.*, 2017) but not recognized as well (Khan *et al.*, 2012). Women's participation in livestock provided households with an opportunity to enjoy the multiple benefits derived from livestock and thus diversify, intensify, and support household economic conditions and livelihoods. High level of women's participation in livestock multiply the household level benefits. Thus, the exploration of literature on the existing level of women's participation and the factors which affect their participation in livestock management is desirable. It is important not only in highlighting the vital role of women in managing livestock but also helpful in identifying the gaps left in the literature under the subject. Further research on the left gaps in the literature can increase women's participation in livestock management and thus can positively contribute towards rural livelihoods. Higher levels of participation leads towards the development of the sector and women's empowerment too. Looking into this, the present systematic review study was designed to answer some research questions as; (1) What is the level of women's participation in managing livestock

across the developing world; (2) What determines women's participation in livestock management across the developing world; (3) is women's participation in managing livestock higher than crop production in the developing countries; (4) what were the most commonly used methods of quantifying women's participation in livestock management in the developing countries?

Materials and Methods

The current review study has employed systematic review type due to the associated benefits like rigor, transparency, and replicability (Mulrow, 1994; Escarcha *et al.*, 2018). For this study, the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) has been used due to the fact that various other related studies have also used these guidelines (Liberati *et al.*, 2009; Crane *et al.*, 2017; Phalkey *et al.*, 2015).

Search strategy and selection of literature

An electronic literature search has been carried out to gather relevant peer-reviewed articles published in the English language only, with an imposed time limit of publication year 2005 to 2018. The reason behind the set time frame is that to examine the published literature during the time that what areas have been focused in and what have not been fully covered. So, that further research focus may be geared towards the left research gap. The geographical coverage of this study was also limited to the developing countries only. However, for the study design, no limit has been imposed. The selection of literature was conducted to explicitly cover studies related to women's participation in livestock management and its' determinates in the developing countries. For the purpose, various key words have been used like women's participation, livestock management, determinants of women's participation, women's participation in crop production, quantification of women's participation in livestock management, etc. For the selection of literature, database search has been conducted including two databases such as Scopus and Web of Science. In the search focus was on the articles' titles, abstracts, and keywords. Various key words have been used during the process of search as mentioned earlier. In the process, a total of 200 articles have been found excluding the duplicates. After the adoption of inclusion and exclusion criterion a total of 32 articles have been retained which were reviewed in detail

and analyzed further. The inclusion and exclusion criterions have been presented as follow.

Inclusion criterion

Peer reviewed research articles on the topic of women's participation in livestock management and its determinants, quantification of women's participation, women's participation in crop production in the developing countries published during the time frame of 2005 to 2018 and written in English language.

Exclusion criterion

Studies which were not focused on the topic of women's participation in livestock management and its determinants in the developing countries, published outside the time set frame (2005-2018), outside the developing world, conferences papers, editorial material, and written in other language other than English.

Data analysis

After the selection of studies, a detailed review of the studies has been conducted. For this purpose, content analysis has been carried out and thus the main themes have been established and the results were summarized on the basis of the specific objectives of the study.

Results and Discussion

Number and types of publications

Current study has covered a total of 32 research articles published within the set time frame of the year 2005 to the year 2018 related to women's participation in livestock management and its determinates in the developing countries. For the retrieval of these publication an electronic literature search using two databases such as Scopus and Web of Science has been carried out following an exclusion and inclusion criterion (mentioned in the methodology section) as well used. In the search focus was on the articles' titles, abstracts, and keywords. In the process, a total of 200 articles have been found excluding the duplicates. After the adoption of inclusion and exclusion criterion a total of 32 articles have been retained which were reviewed in detail and analyzed further using content analysis.

It has been found that 91% research articles were empirical, while only 9% were conceptual (Table 1). In the case of type of study, 9%, 56%, and 35%

research articles were conceptual synthesis, case/cross-sectional, and statistical modelling, respectively (Table 2). Moreover, 9% and 91% research articles used secondary and primary data (Table 3). The results indicate that most of the studies carried out empirically, however, the use of appropriate statistical methods is still in question.

Table 1: Type of research method used in the reviewed publications.

Type of research method	Frequency	Percentage
Conceptual	3	9
Empirical	29	91
Total	32	100

Table 2: Type of study used in the reviewed publications.

Type of study	Frequency	Percentage
Conceptual synthesis	3	9
Case/cross-sectional	18	56
Statistical Modelling	11	35
Total	32	100

Table 3: Type of data sources used in the reviewed publications.

Data sources	Frequency	Percentage
Primary	29	91
Secondary	3	9
Total	32	100

Women's participation in crop production and livestock management

Women have vital contribution to the various sub-sectors of agriculture sector in the developing countries. However, the dilemma is that their participation is mostly unpaid which is accounted for

their un-acknowledged and unrecognized role. The women role can be found not only in the sub-sector of crop production but also in the livestock including backyard poultry as well. The literature emphasized on the lower levels of women's participation in crop production, while higher rate for livestock management due to the livestock's easy access within the household and the quick outcome in the shape of daily dairy products for home consumption and sale to earn cash income. The literature on the said subject is given (Table 4).

It is vital to know that women provide unpaid labour in the agriculture sector of the developing countries (Ahmad, 2014). In the developing countries, women participate in both the sub-sectors i.e., crop production and livestock management (Ahmad, 2014). In Pakistan, women accounted for 70% of labour provision in the agriculture sector (FAO, 2015). Literature show that women have participation in all the activities of the crop production from the field preparation till crop harvesting and its storage (Zahoor et al., 2013). They participated in the activities of weeding, hoeing, harvesting, storing of grain crops etc. (Afridi et al., 2009; Zahoor et al., 2013; Ahmad, 2014; Zahoor et al., 2013).

In case of livestock and especially at household level, its management is mostly a woman's job (Andaleeb et al., 2017; Yasmin and Ikemoto, 2015; Ahmad, 2014). This fact is supported largely in the literature (Tulachan and Karki, 2000). Women had participation in a range of activities which are discussed in detail in the upcoming sections of this review article. Literature further indicates for women's higher level of participation in the livestock as compared to crop production

Table 4: Summary of women's participation in crop production and livestock management from reviewed publications N=32.

Women's participation in crop production	Women's participation in livestock management
<ul style="list-style-type: none"> Provision of unpaid labour in crop production (Ahmad, 2014). Participate in the crop production (Chuhan, 2011; Ahmad, 2014; Assan, 2014; Andaleeb et al., 2017). Participation in the crop production activities like field preparation, sowing, weeding, hoeing, harvesting, and storage along with men (Afridi et al., 2009; Zahoor et al., 2013; Ahmad et al., 2014). 	<ul style="list-style-type: none"> Livestock management is largely considered as woman's job (Andaleeb et al., 2017; Yasmin and Ikemoto, 2015; Ahmad, 2014; Assan, 2014). High level of participation in livestock management as compared to crop production in Pakistan, Bangladesh, Nigeria (Ayode et al., 2009; Chuhan, 2011; Zahoor et al., 2013; Assan, 2014; Ahmad, 2014; Yasmin and Ikemoto, 2015; Simon et al., 2016). Livestock mostly kept within the house and thus women easily manage it (Simon et al., 2016; Yasmin and Ikemoto, 2015; Zahoor et al., 2013). Livestock served as an easily accessible important asset, income generating activity, and an entry point for women (Assan, 2014). Labour provision is unpaid (Assan, 2014; Ahmad, 2014; Andaleeb et al., 2017).

(Ayode *et al.*, 2009; Zahor *et al.*, 2013; Ahmad, 2014). The same fact has been endorsed in Pakistan (Ahmad, 2014; Zahoor *et al.*, 2013). This scenario is not only limited to Pakistan, but also in India (Chuhan, 2011), Bangladesh (Yasmin and Ikemoto, 2015), and Nigeria (Simon *et al.*, 2016).

It is evident from the review of above mentioned literature that women have higher levels of participation to the subsector of agriculture i.e. livestock in the developing countries which is due to various reasons. The important reasons include the livestock as an income generating activity, easily accessible important asset, and an entry point for women to achieve financial empowerment and higher levels of decision-making power (Assan, 2014; Naz *et al.*, 2018). The livestock and especially small ruminants like goats and sheep can be easily purchased and kept by women which provided financial security to them (Herror *et al.*, 2012). To manage livestock, women invest considerable amounts of their daily time, skills, and knowledge. Livestock also increases women's workload but due to easy access and mostly livestock are kept within homesteads so, women can easily manage it (Simon *et al.*, 2016; Yasmin and Ikemoto, 2015; Zahoor *et al.*, 2013). Furthermore, women and especially rural women in the developing countries work more than men and also involve themselves in the income generating activities like livestock management not only to provide food i.e., milk and milk products at household level but also to provide cash from the sale of dairy and by products (Ahmad, 2014; Assan, 2014; Herror *et al.*, 2012; Chuhan, 2011). Thus, women's role in the sector provide unpaid labour and lowers farm and household budget as well (Andaleeb *et al.*, 2017; Ayode *et al.*, 2009; Hashmi *et al.*, 2008).

Overall, the results indicate that women participate in livestock management across the developing world including a number of livestock management activities like feeding of animals, watering of animals, cleaning of sheds, milking of animals, milk products preparation etc. in relation to the crop production activities, women do participate however, the results of the study reveal that women participation in the livestock sector is higher than the other sector. Thus, livestock rearing is mainly a woman's job in the developing world.

Quantification of women's participation in livestock management

To quantify of women's participation in livestock

sector is vital not only to highlight their important role but also to highlight and identify their potentials and prospects of development in the sector. Literature endorsed that women allocate time to manage livestock along with the household chores and care of their children and elder one's in the households (Andaleeb *et al.*, 2017; Ahmad, 2014; Chuhan, 2011). However, the dilemma is that women's contribution in the developing countries has not been acknowledged in its full form (Ahmad, 2014).

Literature indicates that participation index (Ayode *et al.*, 2009; Zahoor *et al.*, 2013; Ahmad, 2014; Andaleeb *et al.*, 2017), descriptive statistics (Simon *et al.*, 2016; Yasmin and Ikemoto, 2015; Munnawar *et al.*, 2013; Chuhan, 2011; Lahoti *et al.*, 2012; Hoque and Itohoara, 2008; Rashid and Gao, 2012; Tudu and Roy, 2015; Riasat *et al.*, 2014; Batool *et al.*, 2014), frequencies and percentages (Hoque and Itohoara, 2008; Amin *et al.*, 2010; Nosheen *et al.*, 2011; Rashid and Gao, 2012; Munnawar *et al.*, 2013; Utami and Seruni, 2013), and time allocation, (Hashmi, 2008; Afridi *et al.*, 2009; Khan *et al.*, 2012; Andaleeb *et al.*, 2017) has been used for the quantification of women's participation in managing livestock. Data in Table 5 show that 72%, 12%, and 16% publications had used descriptive statistics, time allocation, and participation index, respectively for the quantification of women's participation in livestock management. Results indicate for the scarcity of time allocation studies.

Table 5: *Quantification method used for the estimation of women's participation in livestock management in the reviewed publications.*

Quantification method	Frequency	Percentage
Descriptive statistics	23	72
Time allocation	4	12
Participation index	5	16
Total	32	100

There are a few available studies on time allocation in Pakistan, while for the rest of the countries there is no such study found in the reviewed literature. A snapshot of the available time allocation studies has presented here to highlight its worth.

According to Hashmi (2008) in the Punjab province of Pakistan, women's time allocation to livestock activities were higher (4.71 hours/day) than men

(2.83 hours/day). According to [Khan et al. \(2012\)](#) in the Khyber Pakhtunkhwa province of Pakistan, women's time allocation to agricultural and livestock management was 6.23 hours/day. A study conducted by [Afridi et al. \(2009\)](#) reported that in the northern areas of the country, women's average time allocation to livestock activities were 5 to 6 hours/day. Women's were found to allocate their higher daily time to the activities of fodder cutting (64.8 minutes) and shed cleaning (43 minutes). A recent study conducted in the country show that women were highly participated in livestock activities with an average daily time allocation of for 4.81 hours ([Andaleeb et al., 2017](#)).

Overall the results show that women's participation in livestock management in the developing world has been mainly quantified through descriptive statistics. However, the suitable statistical methods like participation index and time allocation method has been used by only few studies which indicates for the need of studies to use these methods so that appropriate data may be available in this regard which can be further used for the designing of specific programs and projects.

Women's participation in the livestock management activities

It has been confirmed that women highly participated in the livestock management activities as compared to crop production in Pakistan ([Andaleeb et al., 2017](#); [Riasat et al., 2014](#); [Ahmad, 2014](#); [Batool et al., 2014](#); [Zahoor et al., 2013](#); [Munnawar et al., 2013](#); [Nosheen et al., 2011](#); [Amin et al., 2010](#)), Nigeria ([Simon et al., 2016](#); [Yasmin and Ikemoto, 2015](#); [Ayode et al., 2009](#); [Yisehak, 2008](#)), India ([Tudu and Roy, 2015](#); [Chuhan, 2011](#); [Lahoti et al., 2012](#)), Bangladesh ([Yasmin and Ikemoto, 2015](#); [Hoque and Itohoara, 2008](#); [Rashid and Gao, 2012](#)), and Indonesia ([Utami and Seruni, 2013](#)). The type of activities which shows high and low participation of women is also of immense importance to study in detail. It not only highlights the important role of women in each activity but also crucial to shed light in the activities where their participation was found low due to certain reasons. Thus, in the current review study, women's participation in each livestock management activity is discussed ([Table 6](#)).

Fodder cutting: It is an important activity in the livestock management which mostly carried out outside the home premises. In the developing countries, women have restricted mobility so, outside

activities were mostly carried out by men. Therefore, in the activity of fodder cutting women's participation was found low in Pakistan ([Khan et al., 2012](#); [Zahoor et al., 2013](#); [Ahmad, 2014](#); [Batool et al., 2014](#); [Andaleeb et al., 2017](#)). However, in India the tribal women's participation was found high in the activity due to the cultural trend of the area ([Chuhan, 2011](#)).

Animal feeding: The animal feeding is an important activity of livestock management which shows for the participation of both men and women. The selected studies showed for women's higher participation in the activity in Pakistan ([Javed et al., 2006](#); [Khan et al., 2012](#); [Munnawar et al., 2013](#); [Zahoor et al., 2013](#); [Ahmad, 2014](#); [Batool et al., 2014](#); [Luqman et al., 2014](#); [Andaleeb et al., 2017](#)), Nigeria ([Ayode et al., 2009](#); [Simon et al., 2016](#)), Bangladesh ([Aqeela et al., 2008](#); [Rashid and Gao, 2012](#); [Yasmin and Ikemoto, 2015](#)), and India ([Tudu and Roy, 2015](#)).

Water serving: This activity is carried out either within the home premises or outside. Livestock were offered water in the respective utensils or either taken to the nearby stream for watering twice a day usually. The activity showed for higher participation of women in India ([Tudu and Roy, 2015](#); [Chuhan, 2011](#)), Pakistan ([Javed et al., 2006](#); [Khan et al., 2012](#); [Zahoor et al., 2013](#); [Ahmad, 2014](#); [Batool et al., 2014](#); [Andaleeb et al., 2017](#)), Nigeria ([Ayode et al., 2009](#); [Simon et al., 2016](#)), and in Bangladesh ([Aqeela et al., 2008](#)).

Shed cleaning: The activity involves collection of dung to clean the animals' shed which often carried out twice a day. The animals' sheds were mostly located inside or nearby the house and thus having easy access for women. Thus, increasing the chances of women to participate in the shed cleaning. Women's higher participation in animals' shed cleaning was reported in India ([Chuhan, 2011](#); [Tudu and Roy, 2015](#)), Pakistan ([Javed et al., 2006](#); [Khan et al., 2012](#); [Zahoor et al., 2013](#); [Munnawar et al., 2013](#); [Luqman et al., 2014](#); [Ahmad, 2014](#); [Andaleeb et al., 2017](#)), Nigeria ([Ayode et al., 2009](#); [Simon et al., 2016](#)), and Bangladesh ([Aqeela et al., 2008](#); [Rashid and Gao, 2012](#); [Yasmin and Ikemoto, 2015](#)).

Milking of animals: This is an important activity of livestock management as it not only provide milk for home consumption but also provide cash income from its sale. The activity is mostly carried out twice a day within the sheds.

Table 6: Summary of women's participation in livestock management activities from the reviewed publications N=32.

Livestock management activities	Women's participation
Fodder cutting	<ul style="list-style-type: none"> Participation was found low in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014; Batool <i>et al.</i>, 2014; Zahoor <i>et al.</i>, 2013; Khan <i>et al.</i>, 2012). In India the tribal women's participation was found high in the activity due to the cultural trend of the area (Chuhan, 2011).
Animal feeding	<ul style="list-style-type: none"> High level of participation in Pakistan (Andaleeb <i>et al.</i>, 2017; Zahoor <i>et al.</i>, 2013; Ahmad, 2014; Batool <i>et al.</i>, 2014; Luqman <i>et al.</i>, 2014; Munnawar <i>et al.</i>, 2013; Khan <i>et al.</i>, 2012; Javed <i>et al.</i>, 2006). High level of participation in Nigeria (Simon <i>et al.</i>, 2016; Ayode <i>et al.</i>, 2009). Women's profound participation in Bangladesh (Yasmin and Ikemoto, 2015; Rashid and Gao, 2012; Aqeela <i>et al.</i>, 2008), Women's higher level of participation in the activity in India (Tudu and Roy, 2015).
Water serving	<ul style="list-style-type: none"> The activity captured high level of women's participation in India (Tudu and Roy, 2015; Chuhan, 2011). High level of women's participation was found in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014; Batool <i>et al.</i>, 2014; Zahoor <i>et al.</i>, 2013; Khan <i>et al.</i>, 2012; Javed <i>et al.</i>, 2006). High level of women's participation was reported in Nigeria (Simon <i>et al.</i>, 2016; Ayode <i>et al.</i>, 2009). Similarly, in Bangladesh, high level of women's participation was also found (Aqeela <i>et al.</i>, 2008).
Shed cleaning	<ul style="list-style-type: none"> Women's higher participation in animals' shed cleaning was reported in India (Tudu and Roy, 2015; Chuhan, 2011). The activity captured high level of women's participation in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014; Zahoor <i>et al.</i>, 2013; Munnawar <i>et al.</i>, 2013; Luqman <i>et al.</i>, 2014; Khan <i>et al.</i>, 2012; Javed <i>et al.</i>, 2006). Women's higher participation in animals' shed cleaning was reported in Nigeria (Simon <i>et al.</i>, 2016; Ayode <i>et al.</i>, 2009). In Bangladesh, women were profoundly involved in the activity of animals' shed cleaning (Yasmin and Ikemoto, 2015; Rashid and Gao, 2012; Aqeela <i>et al.</i>, 2008).
Milking of animals	<ul style="list-style-type: none"> High level of participation was found in India (Chuhan, 2011). The activity was mostly performed by women in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014; Batool <i>et al.</i>, 2014; Zahoor <i>et al.</i>, 2013; Munnawar <i>et al.</i>, 2013; Javed <i>et al.</i>, 2006). Women's high level of participation was found in the activity in Bangladesh (Aqeela <i>et al.</i>, 2008). A study in Bangladesh also provided contrary results as well (Yasmin and Ikemoto, 2015).
Milk products preparation	<ul style="list-style-type: none"> Mostly carried out by women as found in India (Chuhan, 2011). In Pakistan the activity is profoundly performed by women (Andaleeb <i>et al.</i>, 2017; Khan <i>et al.</i>, 2012; Javed <i>et al.</i>, 2006). The occasional participation of women in the activity is found in Bangladesh (Yasmin and Ikemoto, 2015).
Marketing of milk and milk products	<ul style="list-style-type: none"> Women have rare participation in the activity in Nigeria (Simon <i>et al.</i>, 2016; Ayode <i>et al.</i>, 2009). This activity has very low level of women's participation in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014; Zahoor <i>et al.</i>, 2013; Javed <i>et al.</i>, 2006). Due to restricted mobility of women in Pakistan women rarely participated in the activity (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014)

Thus, increases the possibilities of women to participate highly in the activity. Women's higher participation was found in milking of animals in India (Chuhan, 2011), Pakistan (Javed *et al.*, 2006; Zahoor *et al.*, 2013; Munnawar *et al.*, 2013; Ahmad, 2014; Batool *et al.*, 2014; Andaleeb *et al.*, 2017), and Bangladesh (Aqeela *et al.*, 2008). However, a recent study conducted in Bangladesh found for low participation of women in the activity (Yasmin and Ikemoto, 2015).

Milk products preparation: The surplus milk at household level is either sold out to earn cash or either converted into milk products which mostly include

yogurt, butter and butter oil etc. Furthermore, these products were also consumed at household level and also some part is sold out to earn cash income. The activity is an indoor activity and thus mostly carried out by women as found in India (Chuhan, 2011), Pakistan (Javed *et al.*, 2006; Khan *et al.*, 2012; Andaleeb *et al.*, 2017). Some of the studies reported for the occasional participation of women in the activity in Pakistan (Zahoor *et al.*, 2013) and Bangladesh (Yasmin and Ikemoto, 2015) since the activity is not a frequent one as it depends on the availability of surplus milk and market for milk products in the locality.

Table 7: Summary of determinants of women's participation in livestock management activities from the reviewed publications N=32.

Determinants of women's participation	Points
Age of the respondent	<ul style="list-style-type: none"> Age of the respondent has been found as the significant determinant of women's participation in livestock management (Ahmad, 2014; Yasmin and Ikemoto, 2015; Simon <i>et al.</i>, 2016). Middle age women mostly participate in livestock management in Nigeria (Simon <i>et al.</i>, 2016), Bangladesh (Yasmin and Ikemoto, 2015). Similarly, in Pakistan women in their middle age mostly participated in livestock management as well (Ahmad, 2014; Riasat <i>et al.</i>, 2014; Zahoor <i>et al.</i>, 2013).
Literacy status of the respondent	<ul style="list-style-type: none"> Mostly illiterate women participate in livestock management (Yisehak, 2008). High level of education among women reduces their participation in livestock management in Pakistan (Zahoor <i>et al.</i>, 2013; Ahmad, 2014; Khan <i>et al.</i>, 2012), India (Chuhan, 2011), Bangladesh (Rashid and Gao, 2012), and in Nigeria (Simon <i>et al.</i>, 2016; Girei and Onuk, 2016). A study conducted in Nigeria found contrary results (Ayode <i>et al.</i>, 2009).
Age of the household head	<ul style="list-style-type: none"> Young age household head increases the chances of women's participation in livestock management in Pakistan (Ahmad, 2014). The middle age household head also served as the positive and significant determinant of women's participation in livestock management in (Andaleeb <i>et al.</i>, 2017). In Sudan, age of the household head is the significant determinant as well (Ibrahim <i>et al.</i>, 2013).
Literacy status of the household head	<ul style="list-style-type: none"> The literacy status of household head served as the significant determinant in Sudan (Ibrahim <i>et al.</i>, 2013). It positively determines women's participation in livestock management in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014).
Family type	<ul style="list-style-type: none"> Family type served as the significant in Pakistan (Ahmad, 2014). Women who belong to joint family system mostly participate in livestock management in Pakistan (Riasat <i>et al.</i>, 2014; Zahoor <i>et al.</i>, 2013; Amin, <i>et al.</i>, 2010) and India (Chuhan, 2011).
Livestock rearing experience	<ul style="list-style-type: none"> In Nigeria (Simon <i>et al.</i>, 2016 and Girei and Onuk, 2016), India (Sharma, 2015), and Pakistan (Andaleeb <i>et al.</i>, 2017) the livestock rearing experience was found as the negative but significant determinant.
Access to credit	<ul style="list-style-type: none"> Access to credit served as the significant and positive determinant of women's participation in livestock management in Nigeria (Gwary <i>et al.</i>, 2015 and Ayode <i>et al.</i>, 2009). In Pakistan the same results have been reported (Andaleeb <i>et al.</i>, 2017; Luqman <i>et al.</i>, 2014; Zahoor <i>et al.</i>, 2013) and Ayode <i>et al.</i>, (2009).
Extension contact	<ul style="list-style-type: none"> In Nigeria, the variable has been found as the significant determinant (Simon <i>et al.</i>, 2016; Girei and Onuk, 2016; Ayode <i>et al.</i>, 2009; Yisehak, 2008). In Pakistan, similar results have been reported (Zahoor <i>et al.</i>, 2013).
Size of landholding	<ul style="list-style-type: none"> In Pakistan, women from small holder households mostly participate in livestock management (Ahmad, 2014; Zahoor <i>et al.</i>, 2013). Similarly, in India, women from small holder households mostly participate in livestock management (Chuhan, 2011).
Farm income	<ul style="list-style-type: none"> The variable served as the significant determinant in Pakistan (Khan <i>et al.</i>, 2012; Ahmed, 2014; Riasat <i>et al.</i>, 2014; Andaleeb <i>et al.</i>, 2017). In Bangladesh, The variable served as the significant determinant (Rashid and Gao, 2012). Similarly, in Nigeria the variable has been also confirmed as the significant determinant (Ayode <i>et al.</i>, 2009).
Herd size	<ul style="list-style-type: none"> Herd size determines women's participation in livestock management in India (Chuhan, 2011) and in Pakistan (Andaleeb <i>et al.</i>, 2017; Ahmad, 2014).

Marketing of milk and milk products: The surplus milk and milk products are sold out in the locality in the developing countries to receive cash income which is further used on household needs (Naz and Khan, 2018). The activity involves mobility and women mostly have restricted mobility in the developing world due to patriarchy and other cultural and religious constraints. Thus, women were found

to have rare participation in the activity of milk and milk products preparation as in India (Chuhan, 2011), Nigeria (Ayode *et al.*, 2009; Simon *et al.*, 2016), and Pakistan (Javed *et al.*, 2006; Zahoor *et al.*, 2013; Munnawar *et al.*, 2013; Ahmad, 2014; Andaleeb *et al.*, 2017). However, a study conducted in Pakistan reported for women's higher participation in the activity (Batool *et al.*, 2014).

Marketing of animals: This is also an outdoor activity and also involves technical knowledge. The activity involves sale and purchase of livestock either in the locality or outside the localities. As an outdoor activity, it limits women's participation due to their mentioned restricted mobility in the developing world. Thus, women have rare participation in the activity in Nigeria (Ayode *et al.*, 2009; Simon *et al.*, 2016) and Pakistan (Javed *et al.*, 2006; Zahoor *et al.*, 2013; Ahmad, 2014; Andaleeb *et al.*, 2017).

Determinants of women's participation in livestock management

It has been evident from the review of literature that women in the developing world were exclusively engaged in the livestock sector by perform a range of activities and the livestock at household level is mainly done by women. Hence, for the various benefits involved women's participation in the sector is vital and it needs encouragement as well. However, their participation is rather hindered due to various factors/reasons like cultural, social, economic, religious etc. however, at the same time there can be various factors which can accelerate women's participation in the sector as well. The understanding and exploration of these factors are thus vital to reap full benefits from the livestock sector. In this regard, literature has been reviewed to identify the factors which can hinder and accelerate women's participation in the sector. Literature shows that for the estimation of these factors/determinants, Multiple Linear Regression analysis has been largely used as a statistical analytical tool (Ayode *et al.*, 2009; Amin *et al.*, 2010; Zahoor *et al.*, 2013; Ibrahim *et al.*, 2013; Riasat *et al.*, 2014; Yasmin and Ikemoto, 2015; Simon *et al.*, 2016; Andaleeb *et al.*, 2017). The summary of these determinants has been presented in Table 7 and discussed in detail as follow:

Respondent's age: Age determines women's participation in livestock management activities. From the review of literature, it has been found that mostly middle aged women participate in livestock in various developing countries like Pakistan (Ahmad, 2014; Riasat *et al.*, 2014; Zahoor *et al.*, 2013), Nigeria (Simon *et al.*, 2016), and Bangladesh (Yasmin and Ikemoto, 2015). Literature further shed light on the fact that after middle age, women face health issues which affects their level of participation as reported in India and Pakistan (Chuhan, 2011; Khan *et al.*, 2012).

Literacy status of the respondent: This is a crucial factor in determining women's role in livestock management. It is evident from the literature that mostly illiterate women participate in livestock management (Yisehak, 2008). This is also endorsed by various researchers who reported that higher level of education among women reduces their participation in livestock management activities in Pakistan (Khan *et al.*, 2012; Zahoor *et al.*, 2013; Ahmad, 2014), India (Chuhan, 2011), Bangladesh (Rashid and Gao, 2012), and in Nigeria (Simon *et al.*, 2016; Girei and Onuk, 2016). However, a previous study conducted in Nigeria found that the higher the educational level of women, the more they take risk and participate in livestock management by acquiring knowledge and skills (Ayode *et al.*, 2009).

Livestock rearing experience: It is an important determinant of women's participation in livestock management activities. As the women got experience in livestock management, the more they contribute by allocating less time and performing more number of activities. Literature shows that in Nigeria (Simon *et al.*, 2016; Girei and Onuk, 2016), India (Sharma, 2015) and Pakistan (Andaleeb *et al.*, 2017) the livestock rearing experience served as the significant determinant of women's participation in livestock management in terms of time allocation having an inverse relationship. While, in a previous study conducted in Pakistan, it was found as the positive significant determinant (Zahoor *et al.*, 2013).

Access to credit: it served as an important determinant of women's participation in livestock management because as the access to credit increases, women invest more in livestock and thus their participation also increases. In Nigeria, access to credit has been found as the positive significant determinant (Gwary *et al.*, 2015; Ayode *et al.*, 2009). Similar findings have been reported in Pakistan as well (Zahoor *et al.*, 2013; Andaleeb *et al.*, 2017).

Type of family: Type of family also affects women's participation in the sector which has been reported by some studies in the developing world. The various familial systems like joint, nuclear, and extended one's affect either positively or negatively women's level of participation (Ahmad, 2014). In this regard, literature showed that, in Pakistan women of the joint family system highly participate in livestock because they have support system in the households for household

chores and other responsibilities ([Amin et al., 2010](#); [Zahoor et al., 2013](#); [Riasat et al., 2014](#)). Similar results have been reported in India as well ([Chuhan, 2011](#)).

Household head's age: Age of the household head is an important factor in determining women's participation in livestock management. It has been empirically found by [Ahmad \(2014\)](#) that in the Punjab district of Pakistan, the younger the household head the more the women participated in livestock management. The older household heads share the workload of livestock management activities with women thus lowering women's responsibilities. However, other studies in the country ([Andaleeb et al., 2017](#)) confirmed that as the household head advances in age the more the women participate in livestock management. In Sudan, it has also been found that household head age significantly determined women's level of participation in the livestock sector ([Ibrahim et al., 2013](#)).

Household head's literacy status: This is a crucial factor which has been evident from the review of literature. There is a positive relationship between women's level of participation and household head's literacy ([Ibrahim et al., 2013](#)). Further, the educational status of household head positively affects women's participation as reported in Pakistan ([Andaleeb et al., 2017](#); [Ahmad, 2014](#)).

Extension contact: This is an important factor which is positively associated with women's participation because they get more knowledge and skills which increases the chances of their higher involvement. Extension contact has been found as significant factor in determining women's participation in livestock in Nigeria ([Yishak, 2008](#); [Ayode et al., 2009](#); [Girei and Onuk, 2016](#); [Simon et al., 2016](#)) and Pakistan ([Zahoor et al., 2013](#)).

Size of landholding: The developing countries have a characteristic of small landholdings. This characteristic limited the affordability of hiring paid labour and thus here women's role became obvious which is easily available and mostly unpaid. Thus, to diversify household income, women from the small landholder households, largely participate in livestock as reported in Pakistan ([Zahoor et al., 2013](#); [Ahmad, 2014](#)) and India ([Chuhan, 2011](#)).

Farm income: Poverty resides in rural areas and

to overcome the issue women heavily participate in agriculture and its allied sectors to support their households. Livestock is one of the important sector in which women heavily participate to support rural livelihoods ([Shafiq, 2008](#); [Zahoor et al., 2013](#)). Through their participation women not only provide food but also cash from the sale of dairy products. The provision of food lowers household budget as well. Moreover, the provision of by products for farm like farm yard manure from rearing livestock also lowers farm budget ([Naz and Khan, 2018](#)). Provision of cash through the sale of dairy and by products by women has been reported in Pakistan ([Ahmed, 2014](#); [Riasat et al., 2014](#); [Andaleeb et al., 2017](#)) and Nigeria ([Ayode et al., 2009](#)) which indicate farm income as a significant determinant. However, it has been reported in the literature by [Khan et al. \(2012\)](#) that higher family income led to low levels of women's participation in livestock. This fact has been endorsed by researchers from Bangladesh ([Rashid and Gao, 2012](#)). In Nigeria, it has also been identified that farm income is a positive and significant determinant of women's participation in livestock management ([Ayode et al., 2009](#)).

Herd size: It has been widely acknowledged that livestock were mostly kept and managed by women within the homesteads and at farm ([Ahmad, 2014](#)). These livestock included both the small and large ruminants at household level ([Naz and Khan, 2018](#)). So, herd size is an important factor in determining women's participation in livestock management. It has been found that herd size has a negative relationship with women's participation which imply that as the herd size increased the women's participation starts decreasing because of business aspect. The women are found in domesticated livestock rearing. When the herd size increases the business, aspects starts and it develops in an enterprise and thus male took hold by hiring labour from outside which leads to low levels of women's participation. It has been confirmed by various researchers in India ([Chuhan, 2011](#)) and in Pakistan ([Andaleeb et al., 2017](#); [Ahmad, 2014](#)).

The results overall reveal that there are number of factors or determinants which significantly influence women's participation either positively or negatively in livestock management. However, such studies should be conducted more frequently in the developing countries so that more and in-depth analysis of the situation may result in more accurate factors which can further result in improving women's wellbeing

and of the livestock sector as well.

Conclusions and Recommendations

A systematic literature review on the topic of women's participation and its determinants in livestock management among the developing countries has been carried out. For this, a total of 32 published articles were retrieved through the use of PRISMA guidelines. It has been found that women have high level of participation in livestock management across the developing world as compared to crop production which has been highlighted well in the literature. Women's prominent level of participation in the livestock management as compared to crop production was due to the easy accessibility of livestock and daily outcome of milk and milk products for home consumption and sale to earn cash. For the quantification of women's participation in livestock management mostly descriptive statistics have been used while, time allocation studies have been found scarce. Women have high level of participation in the indoor activities like feeding animals, water serving, shed cleaning, milking, and milk products processing, while their participation was found low in the outdoor activities such as fodder cutting, marketing of milk and milk products due to the restricted mobility, low technical know-how, patriarchy, social, cultural, and religious constraints.

In the case of determinants of women's participation in livestock management, age of the respondent, literacy status of the respondent, age of household head, literacy status of household head, family type, livestock rearing experience, access to credit, extension contact, size of landholding, farm income, and herd size were found as the significant determinants. Furthermore, herd size, size of landholding, family type, educational status of the respondents and household head literacy status have been found as the negative and significant predictors, while livestock rearing experience, extension contact, access to credit, age of the respondent, and farm income served as the positive and significant determinants.

From the review of publications, it has been concluded that although, women's participation in livestock management is well documented in the literature, however, what determines their participation is not well documented which leads to the scarcity of effective policies and programs towards livestock

development and women's enhanced role to support rural livelihoods. The study recommends that future research must be geared towards the subject matter so that women's participation in the livestock sector must be enhanced which has further important effects on household, local, and national development. For the estimation or quantification of women's participation in the livestock sector, time allocation technique must be used. The proper estimation of women's participation and research related to the determinants of women's participation in livestock management in the developing countries will lead to the design of programs and project which can further enhances women's participation and their role in supporting rural livelihoods through livestock management.

Novelty Statement

The systematic review documented the unpaid and potential work of women in livestock. Further, the well and less-researched determinants have also been identified which further provides a direction for future research studies under the subject.

Author's Contribution

Shaista Naz: Idea conception, execution, overall data analysis and overall writing.

Muhammad Arif: Helped in content analysis and writing.

Akhtar Ali: Helped in articles retrieval, exclusion and inclusion criterion adoption, and data analysis.

Conflict of interest

The authors have declared no conflict of interest.

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