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Innovation for whom? The case of women in cattle farming in Nusa Tenggara Barat, Indonesia

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ABSTRACT

Rising beef demand in Indonesia, driven by population growth and urbanisation, presents an opportunity for local cattle producers to increase their domestic market presence. To create sustainable and inclusive agrifood systems, investments in innovation and capacity-building are essential. Using a case study, this research examined the influence of gender dynamics on the adoption of cattle farming innovations in Indonesia. Despite substantial research on gender and innovation in developing countries, limited attention has been paid to this issue in the Indonesian context. To address this gap, we conducted focus group discussions and key informant interviews with female farmers and extension officers to identify the challenges that rural Indonesian women face in accessing cattle farming innovations. Our findings reveal that women's inclusion in innovation is constrained by multiple issues, such as the invisibility of their contributions, their limited influence in decision-making processes, and complex sociocultural and institutional factors that perpetuate the concept of gender harmony, which contributes to the subjugation of women. To promote gender equality and enhance rural well-being in Indonesia, we recommend for a comprehensive transformation of policy and institutional approaches to women's empowerment and the implementation of gender-transformative policies in the agricultural sector.

1. Introduction

The escalating demand for beef in Indonesia, driven by population expansion and urbanisation, offers a potential avenue for local cattle producers to enhance their involvement in the domestic market. The Government of Indonesia (GoI) has made significant investments in beef sector innovation with the goal of fostering self-sufficiency in beef production (Basyar, 2021). This opportunity is particularly relevant given the detrimental economic consequences of the COVID-19 pandemic for small-scale Indonesian farmers (Olivia et al., 2020). New practices are required to invest in innovation and capacity-building to achieve a sustainable and inclusive cattle-based agrifood system. Nevertheless, social, political, economic, and agroecological settings shape how and to what extent innovations are adopted and their impact (Röling et al., 2004). Guided by the framework of Gender-Transformative Approaches (GTAs), this study aims to move beyond mere identification of gender disparities. Instead, its objective is to show how the deep-rooted social and gender norms embedded in

social institutions create and perpetuate unequal power relations between cattle producers, which act as barriers to innovation (Mullinax et al., 2018; Hillenbrand et al., 2015). GTAs provide a perspective to explore the impact and potential transformation of these norms, leading to more equitable participation in the cattle farming sector.

Decades of research have demonstrated that gender roles and stereotypes affect agricultural innovation adoption and its processes (Bergman Lodin et al., 2019; Doss and Morris, 2008; Johnson et al., 2016). Recent studies have showcased the importance of social norms as part of the enabling or inhibiting context of planned innovation interventions in agriculture (Badstue et al., 2020, 2021; Farnworth et al., 2019). In other words, discriminatory gender norms influence innovation processes (from design to dissemination) and constrain women's access to new agricultural technologies and practices, consequently impeding them from accessing and benefiting from interventions that promote these processes (Badstue et al., 2020; Ragasa, 2012). Awareness of the impact of discriminatory gender norms in these processes is crucial in various contexts (e.g. policymaking, academia, civil society,

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and farming) to promote sustainable agrifood systems and gender equality (Tavener et al., 2022). Utilising GTAs enables us to examine how these systemic gender-based limitations can be actively transformed, thus fostering a more equitable and sustainable adoption of innovation in Indonesian cattle farming.

A growing body of literature examines how gender dynamics influence innovation adoption in developing countries (e.g. Badstue et al., 2022; Farnworth et al., 2019; Gotor et al., 2022; Lopez et al., 2022). However, few studies have been dedicated to understanding how gender dynamics impact innovation in livestock production in Indonesia. In this study, we aim to fill this gap by identifying the challenges rural Indonesian women face in accessing agricultural innovations and providing gender-transformative recommendations for more inclusive livestock innovation programmes. We used data from cattle farmers and extension officers of six out of the eight rural districts in the Nusa Tenggara Barat (NTB) province that were part of a project named CropCow.¹ While NTB province is an important centre for cattle production in Indonesia, women in rural areas, such as this, may face significant barriers to participating in innovation. This case study will allow us to provide insights for policymakers on actionable strategies to address the factors that impede and enable women's participation in the adoption of innovation in Indonesia's cattle sector.

The remainder of this paper is structured as follows: Section 2 presents the study's theoretical background. Section 3 outlines our research methods and describes the case study. Section 4 presents the results and discussion, followed by Section 5, which elaborates on our study's theoretical and practical implications. Finally, the last section concludes the paper.

2. Theoretical framework

2.1. Gender-transformative approaches: a paradigm for change

In navigating the intricate dynamics of gender disparities in agricultural innovation within Indonesia's livestock sector, this study adopts GTAs as its guiding theoretical framework. While the GTAs are not inherently a theoretical framework, we employ them as such in our study because they provide a structured methodology for dissecting and addressing the complex gender roles and power dynamics deeply entrenched in rural agricultural communities and institutions. This enables us to progress from merely identifying gender disparities to analysing their root causes and suggesting transformative solutions. GTAs aim to move beyond individual self-improvement among women and towards transforming the power dynamics and structures that serve to reinforce gendered inequalities (Hillenbrand et al., 2015). They systematically address different spheres of influence, including the individual, household, community, organisational, and microenvironmental levels (FAO, IFAD, WFP & CGIAR GENDER Impact Platform, 2023).

GTAs have a rich genealogy, deeply rooted in wider transformative discourses that aim to rectify social injustices such as gender inequality and social empowerment (Batiwala, 2007, p. 4; Linnér and Wibeck, 2019). Studies have further developed these theories into transformative research practices that are action-oriented and focus on broader systemic changes (Mertens, 2007; Sweetman et al., 2010; MacArthur et al., 2022). GTAs aim to reshape gender dynamics by redistributing resources, expectations, and responsibilities among women, men, and non-binary gender identities, often focusing on norms, power, and collective action (Mullinax et al., 2018).

The rationale behind the GTAs emanates from its focus on interrogating the motivational aspects of programs and interventions.

¹ CropCow was a project of the IndoBeef, a research-for-development programme initiated by the Indonesian and Australian governments that began in 2012. The programme's goal was to strengthen the community-based livestock sector and improve the livelihoods of poor farmers in Indonesia.

According to Hillenbrand et al. (2015) and Mullinax et al. (2018), this principle insists on a form of change that is deep and enduring, ideally adhering to feminist ideals. The aim is not merely to ameliorate surface-level disparities but to generate radical shifts in the 'deeply ingrained nature of gender inequality' (Mullinax et al., 2018, p. 4). Hillenbrand et al. (2023) compared gender-transformative and gender-sensitive approaches in a Burundi agricultural intervention. The study found that the GTAs, involving both genders in critical reflection and action, led to more significant and potentially lasting changes in gender norms than the gender-sensitive approach, which primarily sparked community dialogues. At the heart of GTA is the concept of critical consciousness, initially theorised by Freire (1970), which posits that true change can only arise when individuals become critically aware of the oppressive elements in their social realities. Critical consciousness serves as both an analytical lens and a call to action; it promotes the idea that one must be cognisant of discriminatory norms and social practices and possess the motivation to alter them. Within the gender framework, critical consciousness denotes the ability to recognise and understand deeply rooted societal gender biases and injustices, coupled with a motivation to confront and change them (Freire, 1970). Furthermore, this consciousness complements the development of agency, defined as the capacity to set one's objectives and act on them (Kabeer, 1994, 1999).

Traditional theories of change often view gender equality as a secondary outcome, a by-product that naturally ensues from other development achievements (Moser, 1989). Such theories often fall short in directly addressing the root causes of gender inequality; they focus more on 'symptom alleviation'—such as increasing the number of women in leadership roles or improving educational outcomes for girls—rather than initiating the deep systemic changes required to alter gender dynamics fundamentally (Moser, 2021). In contrast, GTAs, in alignment with feminist development theories, consider gender not as a side issue but as a central pivot around which sustainable and equitable development revolves. GTAs propose that addressing gender disparities can act as a lever for broader systemic change, effectively reshaping ingrained gender roles and expectations (Kabeer, 1994, 1999; Nussbaum, 1999; Sen, 1999). Unlike traditional theories that tackle symptoms, GTAs aim for the root, seeking to challenge and alter deeply embedded gender norms and biases.

It is noteworthy to mention that in this study, we have chosen to focus on GTAs over other prominent frameworks, such as feminist political ecology, which has been explored by scholars like Carney and Watts (1991) and Schroeder (1999). This decision was made with careful consideration. GTAs offer a profound methodology that identifies gender disparities and actively delves into their underlying causes, advocating for transformative solutions. Despite criticisms regarding the occasional inconsistent application of GTAs and the appeal for a more intersectionality-informed analysis (Dworkin et al., 2015; Hunting and Hankivsky, 2020), the transformative potential of GTAs remains compelling. Feminist political ecology, with its intricate understanding of materiality and gendered dynamics of agricultural innovations (Kansanga et al., 2019; Vercillo, 2022; Najjar et al., 2023) and its emphasis on everyday gender inequalities, certainly provides valuable insights. However, whereas feminist political ecology offers a descriptive and analytical lens, GTAs convey a transformative aspiration—aiming to instigate profound systemic changes at the core of gender inequality. This drive for deep-seated transformation aligns seamlessly with our study's objectives, rendering GTAs an appropriate choice.

GTAs serve as both a theoretical lens and a practical guide for this study. By operationalising GTAs, the study sets an agenda for proposing how to identify gender imbalances, thereby serving as a catalyst for sustainable and equitable development within Indonesia's livestock sector. Therefore, this study's alignment with GTAs is not just a theoretical exercise but a deliberate strategy to contribute meaningfully to gender equality, women's empowerment and sustainable development.

2.2. Gender and innovation in agriculture

Gender norms play a crucial role in shaping agricultural innovation processes and determining the extent to which men and women benefit from new technologies and practices in agriculture. Research indicates that gender norms influence formal institutions and local structures, which, in turn, distribute power and shape opportunities for men and women to access and benefit from new technologies and services in agriculture (e.g. [Badstue et al., 2020](#); [Badstue et al., 2021](#); [Farnworth et al., 2018](#); [Galiè et al., 2022](#)). Gender norms also affect intra-household dynamics, which can significantly impact the decision to adopt innovation ([Shibata et al., 2020](#)), as women face systemic disadvantages in exercising choice and expressing their voice ([van Eerdewijk et al., 2017](#)). Studies show that household members' levels of input into innovation adoption decisions vary depending on their position within the farm household and the prevailing social norms in the sociocultural context in which they are located ([Theis et al., 2018](#)).

Innovation can be understood as a social construct that reflects and results from the interplay of different actors, sometimes with conflicting interests and objectives and with different degrees of economic, social, and political power ([Berdegué, 2005](#)). Several studies have examined the nature of innovation in agriculture and have stated that it is a systemic process that is context-dependent, multilevel, and ever-changing (e.g. [Geels, 2011](#); [Klerkx et al., 2012](#); [Schut et al., 2014](#)). Moreover, innovation in agriculture can involve different types of changes, such as technological improvements, socioeconomic adjustments, changes in institutions, and updates to organisational structures ([Badstue et al., 2018a, 2018b](#)). [Badstue et al. \(2018b\)](#) proposed that innovation in rural livelihoods can be defined by technological shifts in farming practices introduced by outside or local actors or even developed or adapted by farmers. In this study, we used [Badstue et al. \(2018a\)](#) approach to innovation, which does not refer to innovation as novelty in absolute terms but rather as people doing something different or new for them.

According to the Asian Development Bank ([ADB, 2013](#)), achieving gender equality in technology adoption is crucial from both economic and efficiency standpoints, as it enhances growth and development for all. Despite this, women have a low adoption rate for agricultural innovation worldwide. The literature suggests that the main factors affecting women's capacity to adopt technology in agriculture include limited access to resources, the presence of discriminatory gender norms, disregard for women's needs and interests, traditional views of men as farmers, the invisibility of female farmers' work, and women's lack of agency and human capital ([Badstue et al., 2020](#); [Fischer et al., 2018](#); [Huyer, 2016](#); [Lopez et al., 2022](#); [Peterman et al., 2014](#); [Rahman et al., 2020](#); [Satyavathi et al., 2010](#)). Social acceptance is critical for the adoption and diffusion of innovations targeting women. According to [Brugere et al. \(2020\)](#), gender relations and societal influences often act against these innovations, creating an approach that emphasises gender dynamics in capacity-building and engagement with men and other community members. Similarly, [Farnworth et al. \(2018\)](#) found that women's lack of self-identification with broader change and innovation processes is due to de facto exclusion by extension services, which results in social ostracisation if women transgress the bounds of culturally acceptable feminine behaviour.

Studies about intra-household bargaining power have highlighted various factors with relevant influence in the process, such as income, employment, control of assets, social networks, control of benefits, workload (care and domestic chores), mobility restrictions and credit access ([Doss, 2013](#); [Mishra and Sam, 2016](#); [Shibata et al., 2020](#)). Other factors identified include women's education, age, health, market participation ([Anderson et al., 2017](#)), and time allocation ([Mehraban et al., 2022](#)). Recent studies conducted in Indonesia have unveiled a notable absence of women's involvement in agricultural decision-making, particularly in activities that hold a higher value. This phenomenon is significantly influenced by social norms, context, and gendered labour division ([Mehraban et al., 2022](#); [Qanti et al., 2022](#)).

Although much research has focused on sub-Saharan Africa and South Asia, there is a knowledge gap regarding Southeast Asia (e.g. [Akter et al., 2017](#); [Quisumbing and Maluccio, 2003](#)). Southeast Asia exhibits distinct family farming characteristics, with couples jointly owning and managing assets and farming plots. This contrasts with sub-Saharan Africa, where men and women farm in separate plots and have unequal access to resources ([Akter et al., 2017](#); [Peterman et al., 2014](#)).

Another important factor when studying gender and innovation is that the type of innovation can impact women and men differently. In the field of gender and innovation, traditional studies have primarily centred on the innovation of products, processes, and organisations, thereby neglecting the human elements that are also at play ([Agnete et al., 2013](#)). For programs or projects that purport to be gender-transformative and incorporate an innovation component, it is insufficient to merely focus on gender-sensitive innovations that recognise and accommodate the different gender needs and roles. Instead, we argue that the emphasis should be placed on gender-responsive innovations that actively challenge and rectify existing gender disparities, such as initiatives aimed at reducing women's workload. These gender-responsive innovations are conceptualised to be integral parts of a broader gender transformative project, which goes beyond and aims for systemic and structural changes in gender power dynamics across multiple societal layers, from individual households to communities and broader institutional contexts ([World Bank, 2015](#)).

Another example of gender-responsive innovations is labour-saving innovations, which are essential for enhancing time efficiency in agricultural practices, particularly for women. Research has demonstrated that by streamlining various tasks and reducing workloads, these technological advancements allow women to allocate their time more effectively, potentially leading to increased productivity and improved quality of life ([Fischer et al., 2018](#); [Theis et al., 2018](#)). Numerous studies have explored the gendered impacts of agricultural innovation on time efficiency and resource allocation. [Gouse et al. \(2016\)](#) discovered that, in South Africa, men utilise the time saved from weeding operations for income-generating activities, while women concentrate on household chores and managing community vegetable plots. However, some studies have reported that agricultural innovations have negative effects. [Galiè et al. \(2022\)](#) suggested that although improved livestock breeds and innovations like fodder choppers or formal training considerably benefit women who have access to them, they also have inadvertently intensified women's workload. Similarly, [Fischer et al. \(2018\)](#) noted that, in Tanzania, the introduction of forage-chopping machines led to men's appropriation of mechanisation. Although this process relieved women of the work burden, it resulted in their dependence on men or hired labour. [Bryan and Mekonnen \(2023\)](#) found that access to innovative irrigation pumps did not significantly impact the empowerment of women on smallholder farms in Ghana, emphasising the need for complementary investments and approaches to help women benefit from agricultural technologies. In summary, the implementation of labour-saving innovations can help alleviate time constraints for women. However, factors such as women's decision-making ability, control over income and social norms can influence their usage. Therefore, it is crucial to carefully orient these interventions through gender analysis and incorporate participatory practices.

Addressing discriminatory gender norms and promoting gender equality in agricultural innovation adoption are essential for ensuring economic growth and social development. Adopting a gender-responsive approach that considers the unique challenges faced by women, such as limited access to resources and social constraints, can enhance the effectiveness of innovations such as labour-saving technologies and improve women's overall quality of life.

2.3. Unravelling the gender dynamics in Indonesian agriculture

Despite its recent significant modernisation and economic growth,

Indonesia is a patriarchal society structured on rigid social norms (Robinson, 2018). The perpetuation of patriarchal gender relations in Indonesia can be attributed to several factors, including religious influences, the legacy of colonialism, and patrilineal cultural traditions (Robinson, 2018). The root of the issue lies in the legal system, as Law No. 1/1974² on marriage defines men as the head of the family, reinforcing gender inequality and defining the entire societal structure (Prameswari, 2022). Additionally, Wieringa (2015) noted that state policies in Indonesia promote 'gender harmony' and the idea of a 'happy (Muslim) family', resulting in a discourse that upholds women's subordinate position, with the Ministry of Women's Empowerment and Child Protection (MoWECP) advocating that this approach, among other outcomes, reduces domestic violence. According to a recent report by the World Bank (2020), the Indonesian government's policy and institutional framework prioritise enhancing women's roles as wives and mothers for the betterment of family welfare.

Beyond the urban centres of Indonesia, there is considerable heterogeneity regarding the patriarchal structures in place (Diprose, 2023). Rural women in the rural areas of Indonesia constitute a diverse group, and their positions and roles are determined by multiple factors, such as religious group, social class, ethnicity, and the size of the land they occupy with their families (Azahari, 2008; Niehof et al., 2018; Pangaribowo et al., 2019). Previous literature has identified the importance of recognising Indonesia as a diverse nation with various ethnic groups, and these nuances need to be considered when implementing rural development interventions. For instance, Branson and Miller's (1988) study of Balinese women found that women hold property in their rights and exhibit financial independence through trading activities. However, the authors hypothesised that these activities could be evaluated within the Hindu structure. A second example is provided by Pyle (1985), who conducted a case study in rural Java and revealed that women's rights to marriage, divorce, inheritance, and property are comparable to those of men. This author mentioned that women in rural Java also possess considerable economic independence, social power, and decision-making abilities within households, leading to them being described as the silent head of the home or as having 'informal' power. A study on gender, ethnic groups, and cattle production in NTB showed that the involvement of women in cattle farming varies among different ethnic groups in Indonesia (Hilmiati et al., 2017). According to the authors, in some communities, rearing cattle is seen as a collaborative effort between husbands and wives, with women taking on tasks such as collecting and providing feed and water to animals. However, in other communities, such as the Sumbawanese, the role of women is far less prominent.

Rural Indonesian society is characterised by a traditional division of labour based on gender, which reflects traditional gender roles. In Indonesia, men are expected to be the heads of their families and breadwinners, while women are expected to stay in the domestic sphere and care (Puspitawati et al., 2018). In fact, as mentioned previously, these roles are depicted in the country's legislation. Despite Indonesia's diversity as a country with numerous ethnic groups, rural Indonesian women play an active role in various agricultural activities, ranging from planting to post-harvest handling (FAO, 2019; Koning et al., 2013). Similar to other nations, despite rural women being actively involved in agricultural activities, their contribution is often viewed as a 'help' to their husbands, limiting their participation in decision-making and their recognition as farmers (Galiè et al., 2022; Puspitawati et al., 2018; Wijers, 2019).

Financial administration is one of the essential roles of women in

² The Indonesian Gender Equality and Justice Bill, introduced in 2010 to promote equal gender relations and reform Law No. 1/1974 (on marriage), has faced delays due to opposition from Islamist groups. The bill covers 12 areas, including citizenship, education, employment, health, and marriage, and aims to provide equal rights and opportunities for both men and women.

Indonesian rural society. Women are acknowledged for their financial management skills in Indonesian rural society, and because of this role, rural women's participation in household and land investment decisions carries considerable weight (Hilmiati et al., 2017; Sajogyo et al., 1979). However, Qanti et al. (2022) have suggested that gender-based differences exist in perceptions regarding women's decision-making in agricultural activities. Although men and women have similar views on the types of activities in which women have higher or lower participation rates, women's overall role in agricultural activities tends to be relatively minor compared to what they perceive to have access to. In essence, they possess less influence over agricultural activities than they believe.

To summarise, rural Indonesian society is structured around traditional gender roles, which vary depending on various factors. Despite the importance of women in the agricultural sector, their work is consistently dismissed as mere help, which, among other factors, reflects on their perception and effective participation in the decision-making process.

2.4. Cattle farming and women in Nusa Tenggara Barat

The surge in Indonesia's beef industry presents an opportunity to promote better livelihoods and gender equality. This growth offers a chance for the professionalisation of cattle production in NTB (Valerio et al., 2022). In Indonesia, the majority of cattle farming is carried out by small-scale farmers, accounting for about 90% of the sector (Moss et al., 2016), which is crucial for their livelihood, especially for affording household needs. NTB ranks as the fourth-largest province in beef production and serves as a crucial area for the sector, supplying cattle to other provinces (Sudrajat et al., 2019).

During the last twenty years, the Indonesian government has launched several programs aimed at achieving self-sufficiency in beef production. While recent changes in intervention strategies have led to advancements in cattle production, the government's goal of self-sufficiency remains unattained (Basyar, 2021). Indonesian cattle farming continues to exhibit low productivity, irregular and minimal turnover, and reliance on low-input systems (Agus and Mastuti Widi, 2018; Sudrajat et al., 2019). To reach the government's primary objective, the sector must invest in novel technologies, practices, and business models and enhance infrastructure, markets, and institutions at different levels (Glover et al., 2019). Consequently, it is crucial to comprehend the various factors and conditions affecting the innovation system's efficiency across the beef industry to implement the most effective interventions.

In light of the increasing global concerns related to greenhouse gas emissions, it remains essential to recognise that a sudden shift away from beef production in Indonesia could exacerbate the challenges already faced by smallholder farmers, especially women. While the specific emissions from beef production in Indonesia have not been the primary focus of this study, it is crucial to underscore that the overall emission intensity in the country's livestock sector has shown a decreasing trend, indicating a marked improvement in livestock productivity efficiency (Nugrahaeningtyas et al., 2018). As we transition to low-carbon futures, it becomes imperative to ensure that such shifts are undertaken, keeping in mind the principles of a 'just transition', particularly considering the socio-economic implications for local communities.

The Indonesian beef industry features a complex socio-economic structure encompassing numerous formal and informal relationships. These relationships include cattle owners and keepers, processors and farmers, farm groups and associations, household members, ceremonies, as well as traders, butchers, and retailers, creating a network that connects rural and urban communities (Brown et al., 2012; Waldron et al., 2013). Informal institutions play a vital role in fostering commercial activities in Indonesia, as norms, roles, and traditions significantly impact smallholder farmers' decision-making processes (Jaleta et al.,

2009).

However, within NTB's smallholder cattle farming, men are predominantly viewed as the main income earners, entrusted with providing for the family's essential needs. Women, whilst deeply involved in tasks like farm labour, frequently have their contributions seen as supportive of their husbands' primary roles. There are instances where women do become the primary earners, especially during challenging times, such as a husband's prolonged illness. Yet, the prevailing perception remains that men are the family's primary breadwinners. Emphasising gender-responsive innovations in this sector could promote enhanced productivity, income, and gender equality. In this context, several studies suggest that women play a central role in cattle farming in Indonesia (e.g. [Hilmiati et al., 2017](#); [Prameswari, 2022](#); [Wijers, 2019](#)) and often assume full responsibility for livestock maintenance, whereas men allocate their time to other on- and off-farm occupations ([Wijers, 2019](#)). They explore alternative income avenues, which include farm labour, construction, working as motorbike taxi riders, and engaging in local trade.

In NTB, women predominantly undertake roles essential to animal husbandry. Their responsibilities encompass feeding, grazing, watering, cleaning the pen (depending on the production system: intensive or extensive and ensuring the cattle's health. This engagement in labour-intensive tasks, primarily at the production level, is typically situated close to their homes. Such proximity facilitates women's ability to simultaneously manage their care and domestic responsibilities. However, it is noteworthy that women's activities within this domain tend to be concentrated in areas that are less profitable compared to the roles undertaken by men. In the case of women in NTB, they are responsible for feeding, grazing, watering, cleaning the pen (depending on the production system: intensive or extensive), and ensuring the health of the cattle (*Ibid.*). Given the central role of women, prioritising gender-responsive innovations in cattle farming can enhance productivity, income, and gender equality in rural households. Given the central role of women, prioritising gender-responsive innovations in cattle farming can enhance productivity, income, and gender equality in rural households.

As previously mentioned, disparities in engagement across various ethnic groups are also prevalent within cattle farming. For instance, women in Sasak and Mbojo groups tend to be more actively involved in cattle rearing, whereas Sumbawese women are precluded from participating due to social norms ([Hilmiati et al., 2017](#)). However, a recent local study conducted by [Thei et al. \(2022\)](#) demonstrated the successful engagement of Sumbawese women in cattle farming through strategic interventions, such as study visits where they observed the financial gains of other women. This study introduced a variety of forage, which enabled women to become more engaged in cattle farming by allowing them to cultivate the forage closer to their households, thus eliminating the need to travel extensive distances to collect feed. Although there are variations in the level of engagement with cattle farming across Indonesian ethnic groups that can be significant, innovation can promote changes and further enhance women's participation in this sector.

In light of the vital role that women play in cattle farming, this study aims to identify and address the challenges rural Indonesian women face in accessing cattle farming innovations by using a case study of a relevant region for cattle production, the NTB province. The surge in Indonesia's beef industry and the shift towards professionalisation provide a unique opportunity to foster better livelihoods for smallholder farmers ([Valerio et al., 2022](#)), including women, who are often the primary caretakers of livestock. As mentioned, women are responsible for various aspects of cattle maintenance, from feeding and grazing to health management. Integrating gender-responsive innovations can significantly contribute to the industry's growth and sustainability.

3. Materials and methods

3.1. Data collection and analysis

Data were collected in two phases from the six districts targeted in the project: Central Lombok, Dompu, East Lombok, North Lombok, Sumbawa, and West Sumbawa. In the first phase, which took place in 2020, we conducted focus group discussions (FGDs) with female farmers in the six districts ($n = 14$) (see [Table 1](#)) and key informant interviews (KIIs) with farmers ($n = 54$, 44 males and 10 females). Participants in this phase of the study were farmers from three ethnic backgrounds within Indonesia: 40% Sasak (Lombok), 33% Sumbawa (West Sumbawa and Sumbawa), and 27% Mbojo (Dompu). To examine the cultural norms and practices relating to women's roles in cattle farming, we capitalised on the expertise of team members who are co-authors and hail from these specific regions. Their inherent familiarity with local traditions and first-hand experiences added depth to our research. In the Sasak and Mbojo communities, women's active participation in various aspects of cattle farming is the norm. However, in the Sumbawa community, such roles are largely male-centric due to longstanding beliefs about the associated risks and challenges of the activity. This integrated approach, combining empirical research with indigenous knowledge, enabled us to present a nuanced examination of how community values and traditions determine women's participation in cattle farming. All significant disparities between the groups were acknowledged and considered.

The second phase was conducted in 2021 and involved key informant interviews (KIIs) with female farmers who held positions as local leaders ($n = 14$) and government staff working in extension services ($n = 38$). In this study, convenience sampling was employed to select participants for FGDs and KIIs. The sample comprised farmers who participated in the CropCow project, personnel from the Department for Livestock Services, and female leaders from farming communities across the six districts encompassed by the project. The FGDs and KIIs were conducted using a structured interview guide. For the FGDs and KIIs with the farmers, participants were invited to discuss gender roles in cattle farming, the adoption of innovation, innovations they saw as beneficial, and the barriers they faced in adopting innovations in cattle farming. The KIIs conducted with government staff and local female leaders included additional questions about how the institutions approached gender mainstreaming in their implemented programmes.

The qualitative data for this study were initially collected and transcribed in Bahasa. To ensure the preservation of its subtleties, the data were translated into English by a certified professional. To unearth the underlying patterns and themes, the researcher employed the thematic analysis methodology, a revered technique in qualitative studies, as highlighted by [Fereday and Muir-Cochrane \(2006\)](#). This methodology was pivotal, as it offered a structured yet profound exploration of the research topic, enabling the extraction of substantive insights from the

Table 1
Distribution of focus group participants by district and ethnicity.

FGD	District	Ethnicity	Participants
1	North Lombok	Sasak	7
2	Central Lombok	Sasak	6
3	Central Lombok	Sasak	8
4	East Lombok	Sasak	7
5	East Lombok	Sasak	6
6	East Lombok	Sasak	8
7	West Sumbawa	Sumbawa	7
8	West Sumbawa	Sumbawa	8
9	West Sumbawa	Sumbawa	6
10	West Sumbawa	Sumbawa	7
11	Sumbawa	Sumbawa	8
12	Sumbawa	Mix (Sumbawa and Sasak)	6
13	Dompu	Mbojo	7
14	Dompu	Mbojo	8

data.

To streamline the coding process and ensure consistency, the research utilised the capabilities of the NVivo version 12 software. The initial stage of the analysis involved the researcher becoming intimately familiar with the data, immersing themselves in its depth to appreciate its nuances. Following this immersion, the research journey proceeded by drafting an initial code framework, in which pivotal data pieces were earmarked and attached with preliminary codes. As analysis progressed, the clustering of these related codes gave rise to the discovery of potential overarching themes that encapsulated the data's narratives.

The next step in the analytical process involved critically assessing these emergent themes. This was paramount to ascertain that they aligned with the research's objectives and questions. Based on this stage, the code framework underwent further refinement. Some codes were merged, others bifurcated, and a few were deemed redundant and consequently discarded.

The result of this process marked the final stage, during which the consolidated themes were articulated. These themes served as sources of the primary insights and patterns intrinsic to the dataset. By navigating through these structured stages, the researchers systematically categorised the data and discerned the themes and narratives that emerged from the data.

3.2. Description of the case study area

The western region of the Lesser Sunda Islands, depicted in Fig. 1, constitutes the NTB province. With an approximate land area of 20,000 km², this province is home to a population of five million, with Lombok being the most populous island. The NTB province comprises eight rural districts, namely North Lombok, Central Lombok, East Lombok, West Lombok, Bima, Dompu, Sumbawa, and West Sumbawa, as well as two urban districts, Mataram and Bima. It is worth noting that the province possessed a cattle population of 1.3 million in 2020, positioning it as the fourth largest cattle-keeping region in Indonesia, following East Java (4.8 million), Central Java (1.8 million), and South Sulawesi (1.4 million), as reported by the BPS in 2020.

The province plays a critical role in the beef industry owing to its robust breeding practices. The NTB province is an essential supplier of livestock to other areas in the country, and plays an instrumental role in catering to the beef consumption demands of provinces such as Java. According to the BPS (2022), the six districts selected for analysis in this

study (Central Lombok, Dompu, East Lombok, North Lombok, Sumbawa, and West Sumbawa) constitute a substantial proportion of the cattle population in NTB, accounting for approximately 72% of the province's cattle, or 936,000 animals.

3.3. Ethical considerations

Ethical approval was obtained from the appropriate ethics committee before starting the study, ensuring that the study's design and objectives complied with established guidelines. Informed consent was acquired from all participants, with transparent communication regarding the study's aims, the voluntary nature of their participation, and their entitlement to withdraw at any time without consequences. Confidentiality and anonymity were upheld throughout the research process by employing unique identifiers for participants, securely preserving data, and guaranteeing that published findings would not disclose personal information traceable to individual respondents. Moreover, the researcher remained vigilant of potential biases and power dynamics during data collection and analysis, striving to ensure accurate representation and respect for all participants' perspectives.

4. Results and discussion

4.1. Women as invisible farmers: 'we help our husbands ...'

According to Galiè et al. (2022), recognition encompasses an individual's ability to define and enact their desired roles and identities, along with the acknowledgement of these roles and identities by others in society. In our study, we found that the contribution of rural women to cattle farming in NTB has often been widely overlooked. Our results indicate that, despite women being responsible for or jointly participating with their husbands in all aspects of cattle farming, they are not recognised as cattle farmers. We observed that male farmers typically participate in other on- and off-farm activities, leaving women as the primary caretakers in cattle farming (except for the Sumbawese women). The farmers reported that women engage in various cattle farming activities, including feeding, grazing, watering, pen cleaning, and maintaining animal health. Interestingly, all but one of the interviewed rural women identified themselves as cattle farmers. They often referred to their work in cattle farming as 'help', as demonstrated in the following quotes:

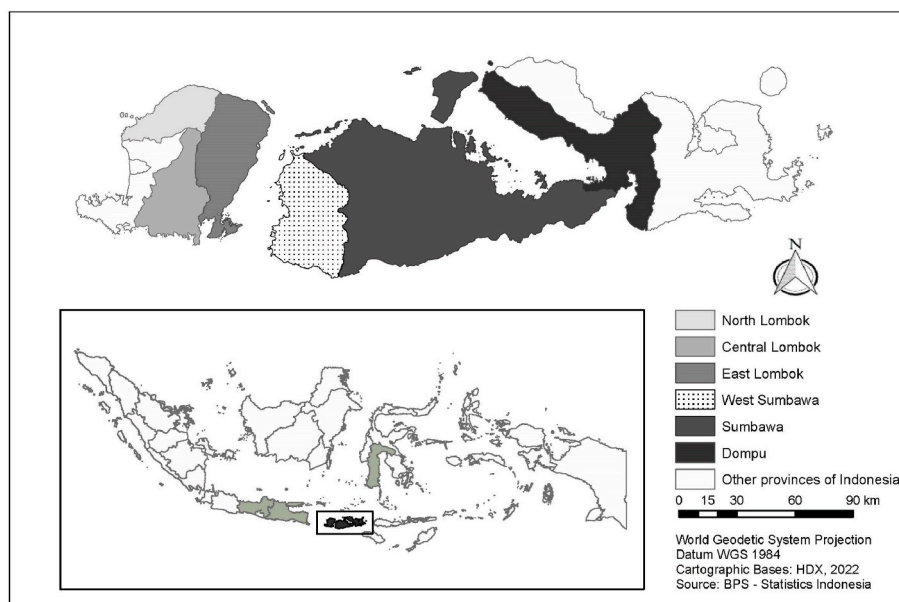


Fig. 1. Location of the districts selected for this case study within Nusa Tenggara Barat province.

We help our husbands with feeding and watering the cattle each day, heading out to fetch their feed, and cleaning their pens to keep the animals comfortable and healthy. We need to be involved because our husbands work a lot; sometimes they are out in the fields or at sea, so we need to look after the cattle every day. (Female farmer, FGD, Central Lombok)

My wife helps me with our cattle. She takes care of gathering grass for the animals, providing them water, and cleaning their living area. (Male farmer, KII, Central Lombok)

I am a housewife. Helping my husband is part of my household work, such as assisting him in feeding the cattle. When my husband goes out to collect the feed, I help by chopping the feed and then feeding the cattle. During the feeding process, I also take the opportunity to clean the barn. (Female farmer, FGD, Dompu)

Our findings also suggest that extension officers refer to the work of rural women as ‘support’ even though they recognise their importance to cattle farming in the area. The perspectives evident in our data resonate with larger social constructs, as they underscore the prevailing social biases deeply entrenched within the community. These biases, rooted in historical and cultural contexts (Freire, 1970), manifest in the way gender norms shape perceptions and practices (Mullinax et al., 2018). Moreover, a critical observation in our study suggests that these biases are not confined to farmers alone. Extension service officers, who play pivotal roles in the dissemination of knowledge and resources, also exhibit these biases. This raises concerns about the broader institutional structures and the need for interventions to ensure equitable recognition and resource distribution within the agricultural sector. This is consistent with results obtained from farmer KIIs and FGDs mentioned above and is exemplified in the following quote:

Women here also take part in cattle farming and play a really important role in supporting their husbands. They’re even more eager than their husbands in caring for the cattle every day. Usually, it’s the women who bring the cattle to the pens. Some women even act as shepherds, taking care of the cattle while they are grazing. They’re really supportive of their husband’s work. (Extension officer, Dompu)

Our findings suggest that one of the motivations for rural women to participate in cattle farming is that it serves as a means of saving for their children’s education. Previous studies have suggested that farmers keep cattle in the NTB province as a form of savings, with children’s education being the primary use of the resources generated from cattle (e.g. Hilmianti et al., 2017; Valerio et al., 2022). The following quote illustrates this use:

I help my husband with the cattle, collecting grass, and looking after the cows so he does not get too tired and wants to leave cattle farming. I am interested in keeping the cows because it is to pay for the future of my children. (Female local leader, KII, East Lombok)

The systemic devaluation of women’s contributions is revealed among female farmers and among extension officers, demonstrating an entrenched bias permeating the agricultural sector. The lack of recognition of women’s role in agriculture in NTB is based on the idealisation of women’s contributions as ‘help’, which is a manifestation of the gender bias entrenched within rural communities. Similarly, Najjar et al. (2023) underscore the prevalent misconception that women are not deemed farmers, even when they actively labour in their husband’s fields. These authors argued that the misrecognition stems from their historically subordinated positions, overshadowing their significant contributions to agriculture. Additionally, this finding is consistent with the literature, which highlights how women are often portrayed as mere helpers in agriculture, rendering their work invisible and reinforcing gender biases (e.g. Galiè et al., 2022; Rahman et al., 2020; Safi-lios-Rothschild, 1985; Spindel, 2019; Twyman et al., 2015). Similarly, a

recent study in India showed that, despite the increase in rural women’s labour contributions to agriculture, the visibility of their work and autonomy did not improve (Pattnaik and Lahiri-Dutt, 2022). Importantly, Galiè et al. (2022) highlighted the negative implications of viewing women as mere helpers in cattle farming, such as their exclusion from extension services and training, as well as ineffective communication regarding services such as artificial insemination due to extension officers often liaising with men only.

Drawing upon the GTAs, our study underscores the complexity and pervasiveness of gender roles in rural agricultural communities. These approaches imply that interventions must go beyond simply acknowledging existing gender disparities; they must actively work to transform the underlying discriminatory gender norms and power dynamics that perpetuate inequality (Mullinax et al., 2018; Hillenbrand et al., 2023). Our findings lend credence to this perspective by highlighting how gender biases are not just superficial or anecdotal incidents but are deeply embedded in both informal and formal agricultural practices and perceptions. This overshadowing of women’s significant contributions to cattle farming transcends mere neglect; it represents a systemic issue that consistently marginalises women, downplaying their crucial roles and side-lining their expertise. Furthermore, addressing these disparities mandates comprehensive changes to both informal and formal societal structures. Therefore, there is an urgent need to reconfigure and make social institutions more gender equal. This includes reforming formal institutions, such as laws, policies, rights, and regulations, in tandem with the transformation of informal institutions encompassing social norms, customs, values, traditions, and sanctions. In alignment with Gosnell et al. (2019), our approach recognises the importance of personal, practical, and political spheres in driving these transformations. Just as farmers in their study experienced transformative changes through holistic management, aligning their practices with deeply held values, our research suggests a similar need for alignment in gender transformation initiatives. By focusing on formal and informal institutions, we acknowledge the necessity of addressing the broader cultural, normative, and regulatory frameworks that shape gender dynamics in agricultural settings. These consequences lead to long-term effects on rural developmental outcomes. In summary, our results suggest that entrenched gender biases tend to make women’s cattle farming contributions invisible. A key motivation for women to participate in cattle farming is that the money earned is used for their children’s education. This perception is reflected among women farmers and extension officers, demonstrating the systemic devaluation of women’s contributions to agriculture.

4.2. Lack of participation in innovation decision-making: ‘... he will be the one making the call’

The results of our study reveal that the participants share similar perceptions of rural women’s involvement in making decisions related to innovation adoption in cattle farming. Despite acknowledging the shared ownership of cattle and women’s significant participation in making decisions about household expenditure, the interviewees reported that women have lower input in innovation adoption decisions compared to their husbands. Female farmers recognised that their husbands had the final say on the matter. Although male and female farmers often referred to cattle farming as teamwork, female farmers also recognised their lack of autonomy in decision-making for innovation adoption. This is illustrated in the following quote:

I need to talk with my husband first; for example, if there is no bull, then we have no choice but to use artificial insemination. But I will need my husband’s consent before doing anything. If he agrees, then we use artificial insemination. I would not dare make decisions of my own. It is teamwork; I will observe the animals and identify when to call the technician, but he will be the one making the call. (Female farmer, FGD, North Lombok)

The extension officers and local leaders interviewed supported this view, noting that although women could be consulted, men generally had the final say in decision-making processes. Additionally, the officers mentioned that because women are the ‘wallet keepers’ in rural households, this may provide them with some leverage in making decisions about household expenditure; however, this seems to be irrelevant for decisions related to innovation adoption.

According to our results, female farmers perceive that they have less influence on decisions regarding the adoption of innovative practices in cattle farming. The results of this study contradict previous research that suggests rural women perceive themselves as having greater involvement in joint decision-making than they actually do (Qanti et al., 2022). Moreover, Acosta et al. (2020) revealed that female spouses perceive that their ideas are considered; however, in reality, decisions regarding agricultural activities are predominantly made by the male partner. The extension officers and local leaders shared this view. The literature suggests that a lack of participation in joint decision-making is influenced by intra-household bargaining power, which is often associated with the ownership and control of assets and income (Doss, 2013; Meitzen-Dick et al., 2011; Mishra and Sam, 2016). However, in our study, female and male farmers reported shared ownership of livestock, as observed in other studies (Akter et al., 2017), and a certain degree of women’s influence on decisions made within their households. This result may be explained by the fact that, although women perceive ownership, their decision-making inputs for innovation are limited by social norms. This finding has also been reported in other studies (Doss and Quisumbing, 2020; Qanti et al., 2022). For example, Qanti et al.’s (2022) research in Indonesia showed that social norms dictate that men are the household heads and primary decision-makers, that agriculture is the men’s domain, and that men are the ones with agricultural knowledge. These ideas are deeply ingrained in individuals and within their communities.

Additionally, examining this situation within the context of the GTAs offer valuable insights. GTAs underscore the need for transformative changes to address the deeply rooted gender imbalances that are evident in our findings. This involves redefining unequal power structures shifting from power over to power with and within (Rowlands, 1997). Central to this is building agency, a cornerstone of empowerment, and nurturing mutual support and solidarity (FAO, IFAD, WFP & CGIAR Impact Platform, 2023). These imbalances are not just to be acknowledged but require targeted interventions. These could range from education to policy changes aimed at disrupting the existing norms and benefitting both men and women in rural communities (Hillenbrand et al., 2015; Mullinax et al., 2018).

The rural women in our study acknowledged that they had limited influence on decisions regarding the adoption of innovative practices in cattle farming despite acknowledging shared ownership of assets. The lack of participation in decision-making in innovation appears to be influenced by gender norms that designate men as household heads, primary decision-makers, and primary sources of agricultural knowledge.

4.3. Threat to the harmony of the household: ‘... up to a certain point to not disturb their functions as housewives’

Despite Indonesia’s significant modernisation and economic growth in recent years, the country remains a patriarchal society with rigid social norms influenced by factors such as religious beliefs, colonial legacies, and patrilineal cultural traditions, while state policies promote ‘gender harmony’ (Robinson, 2018; Wieringa, 2015).

Our findings suggest that one of the major barriers to women’s participation in the innovation process in NTB is the concern of disruption to their roles as wives or mothers. The extension officers interviewed stated that there are concerns about preserving the harmony of rural households. They noted that the GoI is resistant to programmes that promote women’s autonomy, as this may disrupt women’s

traditional role as housewives, which is seen as crucial to the functioning of the gender harmony doctrine. The findings suggest that, although there is some recognition of the importance of women’s economic inclusion and participation in agriculture, this is limited by the need to maintain social norms and traditional gender roles, as exemplified by the following quote:

I do not think women are fully considered in the innovation programmes we implement. It mainly focuses on the head of family [men], and there seems to be resistance to including women. They are only included up to a certain point to avoid disturbing their functions as housewives. (Extension officer, KII, Central Lombok)

These results are consistent with the World Bank’s (2020) report on its most recent country gender assessment, which suggests that the GoI’s policies and institutional framework have primarily focused on enhancing women’s participation in family welfare by protecting their roles as wives and mothers. Analysed through the lens of GTAs, the Indonesian emphasis on ‘harmony’ contradicts Young’s (1993) concept of ‘transformatory potential’. Within Young’s framework, ‘transformatory potential’ is posited as a mechanism to escalate women’s practical needs to strategic considerations, thereby challenging and reshaping established gendered dynamics and structures of subordination (Young, 1993, p. 156). Indonesia’s prioritisation of ‘harmony’, as elucidated by our findings, appears to reinforce, rather than disrupt, pre-existing discriminatory gender norms. This ostensibly seeks to situate women within the confines of traditionally accepted roles, potentially constraining their broader socio-economic participation. Such a stance on ‘harmony’ can be interpreted as an effort to retain a patriarchal equilibrium, where women’s roles and aspirations are tacitly acknowledged but simultaneously bounded to prevent any radical shifts in gender power dynamics. In this context, the notion of ‘harmony’, as operationalised within these policy frameworks, appears to undermine transformative aspirations, thereby perpetuating a status quo and constraining women’s agency.

Previous studies have found that the GoI prioritises promoting ‘harmony’, with women being assigned the central role in maintaining this harmony (Nur Hayati et al., 2013; Sitepu, 2000). The harmony phenomenon promoted by the GoI was analysed by Wieringa (2015), who conducted a discourse analysis of key official documents and concluded that concepts such as ‘gender harmony’ and ‘the happy (Muslim) family’ have been integrated into state policies. Additionally, Hyunanda et al. (2021) have shown how the concept of ‘women’s empowerment’ was instrumentalised by the GoI, which used the notion of Ibu (mother) to promote traditional gender roles and depoliticise and deradicalise feminist views, ultimately normalising societal expectations for women’s empowerment. This manipulation of ‘women’s empowerment’ to uphold traditional roles is problematic when viewed through the lens of GTAs, which emphasises the importance of transforming unspoken, institutional norms that perpetuate gender inequality (Rao et al., 1999) and seeks to alter underlying conditions causing gender inequities (Dworkin et al., 2015).

In summary, our findings suggest that the Indonesian government’s emphasis on preserving traditional gender roles and maintaining family harmony limits women’s inclusion in innovation activities. This finding aligns with previous research and underscores the need for a shift in policies and institutional frameworks to facilitate women’s participation in innovation processes and economic activities.

4.4. Gender-biased extension services: ‘... more careful and nurturing’

During the interviews, a prevailing notion among the extension officers was the existence of a gender bias within extension service institutions. Despite the significant number of women employed as extension officers in NTB, the interviewees expressed that there is a lack of commitment towards the gender mainstreaming interventions implemented by these institutions. For example, respondents reported

that guidelines exist for including women in training, but no monitoring system exists to track the effectiveness or impacts of the implemented interventions. Furthermore, the interviewees highlighted a general lack of sex-disaggregated data collection and reporting within extension service agencies. They mentioned that they learned through observation, as exemplified in the quote below:

As far as I can remember, the [institution name] has never conducted evaluations of the programmes we implement, especially regarding gender issues. We rely on lessons learned from the field, based on our observations. It is like this, especially for extension workers. (Extension officer, KII, North Lombok)

These findings are consistent with those reported in the literature. Our results show that extension service agencies neglect to carry out gender-responsive monitoring and evaluations of their implemented interventions, indicating an insufficient focus on gender-specific needs and concerns. This deficiency presents obstacles for women in terms of accessing and benefiting from agricultural extension services. This finding is consistent with studies showing that extension service agencies often fail to conduct monitoring and effectively measure women's participation in rural development programs in developing countries (e.g. Huyer, 2016; Ragasa, 2014; Ragasa et al., 2014). Rao et al. (1999) emphasised the necessity of transforming unspoken, informal institutional norms that perpetuate gender inequality to achieve equitable outcomes for all.

Our results suggest that discriminatory gender norms are entrenched in the functioning of these institutions and are reproduced by extension officers. Despite the interviewees recognising women's essential role in cattle farming, they constantly reinforced the notion that women farmers have 'natural' skills in nurturing and being detail-oriented and that their work with the cattle is an extension of their housework duties. This reinforces gender roles, which state that women should be caretakers, further rendering their work as farmers invisible and limiting their potential. This stereotype also reinforces the gendered division of labour in agriculture, limiting women's access to resources and their potential to contribute to innovation and decision-making processes and reinforcing the notion that women's roles are limited to traditional feminine tasks:

Women are very important for the cattle's health. If the wives don't take care of their cattle, their health will decline. They are more careful and nurturing. You know, sometimes men do not even care if their cattle are thin, but their wives take care of the cattle and tell their husbands to call the vet. I know this because they usually say, 'I told him to call yesterday!' (Extension officer, KII, East Lombok)

In the examination of our findings concerning gender-biased extension services, our data clearly demonstrate that these biases are not simply manifestations of individual attitudes. Instead, they are deeply ingrained in the organisational culture and institutional policies governing extension services (Maguire, 1984). This highlights systemic issues that are deeply entrenched in the structural frameworks underpinning how these services operate. In accordance with the transformative approach proposed by Maguire (1984), the ultimate objective should not be merely to reform these existing systems. Instead, a more radical transformation is needed to redistribute power and resources equitably. GTAs are well-aligned with multi-level and sectoral perspectives on systemic change (Rao et al., 1999; Scoones et al., 2020). Our results indicate that the stereotype of women's 'natural' nurturing abilities is rooted in the discourse among government staff, legitimising the notion that cattle farming is an extension of housework, which, as such, goes unrecognised.

Additionally, the government extension service's discourse on housewives being caring and dedicated to their husband's interests is reminiscent of the MoWECP's focus on motherhood and 'gender harmony', which obscures gender inequalities and perpetuates the acceptance of prejudice as 'natural' (Wieringa, 2015). The discourse on

women's 'natural skills' in agriculture can be criticised for perpetuating gender essentialism and reinforcing traditional gender roles, which can limit women's opportunities and perpetuate inequality. By attributing specific skills to women based on their 'inherent nature', this discourse overlooks their abilities, preferences and potential in other sectors and undervalues their contributions to the agricultural workforce.

4.5. Women's lack of participation in farmers' groups: '... it is a men thing'

By participating in farmers' groups, rural women gain access to resources and opportunities that can improve their lives and those of their families and contribute to the broader development of their communities. Our findings indicate that rural women in NTB are constrained from participating in public spaces owing to the rigid gender roles that limit women to the household sphere. This study revealed that women farmers acknowledge that farmers' group meetings are perceived as men's activities. When asked if they participated in farmers' group meetings, they indicated that they only went to cover for their husbands, as demonstrated by the following quote:

You know, it's a 'men thing', the participation in the group [mixed farmers' group], but as a farmer's wife, I help out when my husband isn't around. If he can't do his tasks, I take over ... (Female farmer, KII, North Lombok)

The meetings of the farmers' group [mixed] are sometimes held at night. We [women] are busy, but as wives, we cover our husbands' places when they can't attend. (Female farmer, FGD, Central Lombok)

As mentioned above, rural women usually attend meetings in farmers' groups when their husbands cannot. However, the interviewees said that women's participation in the training or farmers' group meetings was merely performative. According to both the extension officers and local leaders, women only attended the meetings to cover for their husbands; while they were there, they rarely participated actively and only prepared food and coffee. This finding is corroborated by Mudege et al. (2015), who observed that the perpetuation of gender roles in the dynamics of farmers' groups limits the potential advantages that these groups could offer to their female members.

As illustrated by the quote below:

The issue we are facing is that, so far, there haven't been many women attending the training or meetings; it's mostly men in attendance. And when women do participate, they are often assigned tasks such as preparing coffee, tea, and snacks. (Extension officer, KII, Central Lombok)

Regarding participation in the women-only farmers groups (KWTs), both extension officers and local leaders consistently mentioned the shortage of available time for women to participate. This limitation primarily stems from the myriad of household tasks and duties that women are traditionally expected to manage. Furthermore, Hilmia et al. (2017) showed that household responsibilities often restrict women from attending meetings, thereby limiting their exposure to information on innovations and training opportunities.

KWTs in NTB present an avenue to elevate the status of women in the community. Several initiatives within these groups promote specific economic activities, such as meat processing and fertiliser production. Notably, various local studies have highlighted KWTs' success in implementing these initiatives, fostering social solidarity among members, and prompting the adoption of innovative meat processing techniques (e.g. Camalin and Setiawan, 2017; Handayani et al., 2021; Waliyansyah et al., 2023).

Social capital plays a significant role in these dynamics. In the context of KWTs, social capital can be viewed as comprising the relationships, networks, and trust that members build within and outside

the group. This capital can be a driving force for innovation by facilitating the knowledge exchange, sharing of resources, and mutual support among women farmers. When leveraged properly, these networks can help women overcome barriers to innovation, whether they be informational, financial, or cultural.

Collective action, driven by robust social capital, can be instrumental in amplifying the benefits of these networks. By working collectively, women can pool resources, share risks, and collaboratively address challenges, making it easier to adopt new farming techniques or access training opportunities. However, the potential for gender transformation through collective action should be approached with caution, especially considering the influence of the ‘gender harmony’ doctrine in shaping the dynamics of KWTs, as indicated by local studies, such as [Camalin and Setiawan \(2017\)](#). While KWTs provide a platform for women’s participation and empowerment, it is the combined force of social capital and collective action that can truly propel women farmers towards innovation. By understanding and harnessing these elements strategically, we can better address gender disparities and promote sustainable advancements in the sector.

5. Theoretical and practical implications

In this section, we discuss the theoretical and practical implications of our findings concerning gender dynamics in cattle farming in NTB and provide recommendations for promoting gender equality in agriculture. Our analysis sheds light on the challenges and opportunities for policy interventions and future research in this area.

5.1. Theoretical implications

This study provides valuable insights into gender dynamics within the context of cattle farming in NTB, contributing to a theoretical understanding of women’s roles and intra-household dynamics in agricultural innovation. The findings highlight the invisibilisation of women’s work in agriculture, aligning with the concept of ‘invisible labour’ reported by [Hatton \(2017\)](#) and emphasising the limited participation of women in decision-making processes related to innovation. Our findings suggest that social norms and gender roles are central to innovative decision-making dynamics in rural Indonesia, even when women have tangible ownership of assets.

Moreover, the theoretical implications for GTAs in the context of gender and agricultural innovation. Specifically, the study elucidates how the systemic invisibility of women’s labour in agriculture, perpetuated discriminatory gender norms, and institutional biases converge to limit women’s participation and decision-making power. Within GTAs, these issues are not mere aberrations but structural impediments that necessitate transformative change. By identifying how state policies and institutional practices reinforce these barriers, the study highlights the necessity of policy-driven interventions that aim for more than incremental adjustments. Instead, radical changes are advocated to challenge and transform the existing gender hierarchies, institutional discriminatory norms, and resource allocations to achieve true gender equality.

This study offers significant theoretical insights into the gender dynamics of innovation in agriculture, especially in settings where state policies uphold traditional gender roles. Future research should explore the effectiveness of GTAs in fostering structural and systemic shifts in gender power dynamics within Indonesian agriculture. Additionally, an in-depth investigation into the impact of male labour migration from NTB on the evolving roles of women in agricultural activities would be valuable.

Our study has two main limitations that should be considered when interpreting its findings. First, the data collected in Bahasa were translated into English by a certified translator; however, there is a risk of losing some nuances or introducing errors during the translation process, which could impact the accuracy of the findings. Second, the study focuses on six districts within the NTB province in Indonesia. While

these districts represent a significant proportion of the province’s cattle population, it is vital to exercise caution when extending the findings to other areas in Indonesia or other countries with different cattle farming contexts and practices. Despite these constraints, the utilisation of the case study methodology in our research remains significant as it provides a comprehensive understanding of the unique context, establishing a solid groundwork for future research and guiding interventions and policies that are attuned to the specific circumstances. This study contributes to the growing body of literature on gender dynamics in agriculture and highlights the importance of addressing these issues to foster more equitable and sustainable innovation in the sector.

5.2. Practical implications and recommendations

This study has several practical implications for policymakers, extension services, and non-governmental organisations working in the livestock sector. In this section, we provide some recommendations on how to promote gender-responsive innovations and improve the livelihoods of rural households, specifically in Indonesia.

First, comprehensive gender analysis is essential for innovation in livestock programmes. As mentioned, the plurality in the context of Indonesia makes gender analysis even more important and will enable the design of effective mechanisms to address the limitations of rigid gender roles and boost women’s decision-making power regarding innovation adoption in the context of the programme. Efforts aimed at promoting collaborative decision-making between men and women in cattle farming, along with capacity-building initiatives that empower women and cultivate gender consciousness and agency at the community and governmental levels, have the potential to enhance gender equality in the livestock sector.

Second, it is essential to enhance the visibility of rural women’s contributions to cattle farming. This study shows that women engage in various cattle-farming activities; however, they are frequently overlooked and undervalued by their communities, government agencies, and even themselves. Initiatives that amplify their visibility and fortify their identity as farmers—such as increasing their involvement in female farmer associations, implementing targeted policies, and creating opportunities for participation in decision-making spaces at the community level—can highlight their significance within the sector and bolster their self-esteem. We acknowledge that accomplishing this is not an easy task, particularly in Indonesia, where ‘gender harmony’ is the central focus of women-targeted policies. Consequently, it is vital to address these challenges at the highest level of the government. For truly transformative change, it is necessary to address the feedback loops, structural rules, and embedded paradigms that perpetuate gender bias at multiple levels—individual, family, community, and organisation. This holistic, systems-oriented approach is more aligned with achieving sustainable gender equality in agricultural extension services.

Lastly, capacity development is critical to enhancing the autonomy and agency of female farmers. Extension services must ensure equal access, tailoring training to address women’s needs (in terms of knowledge and time) and ensuring that they actively participate in capacity development that bolsters their knowledge and skills in cattle farming. This may involve creating gender-awareness training modules for extension officers to engage effectively with female farmers. Farmers’ groups serve as crucial channels for promoting gender-responsive innovation and providing women with access to new techniques, technologies, and training opportunities.

Understanding the origins of the rigid gender roles in Indonesian cattle farming necessitates a multi-disciplinary lens that amalgamates insights from anthropology, sociology, and history. The evolution of Indonesian society, tracing back to its pre-colonial times when matriarchal communities predominated through to its post-colonial and contemporary periods where patriarchal ideologies gained prominence, provides a foundational context. This complexity is accentuated by Indonesia’s rich tapestry of ethnic groups, each bearing distinct gender

dynamics and traditions. To deconstruct these deep-seated paradigms, an intersectional methodology is imperative. Strategies should encompass community-based educational initiatives that shed light on the myriad gender roles interspersed throughout Indonesia's historical tapestry, debunking the misconception of an ever-present rigid gender norm. Simultaneously, it is vital to collaborate with religious and traditional figureheads, given that many gender-based conventions find their justification in religious and cultural narratives. By fostering dialogues with these leaders, these norms can be recast and remodelled, championing greater gender inclusivity. Platforms that amplify the voices of local women, allowing them to narrate their triumphs, trials, and tribulations within the cattle farming sphere, can serve as powerful tools in reshaping communal perceptions. Furthermore, an aggressive policy advocacy stance, underpinned by synergies between academia, non-governmental organisations, and grassroots women-led movements, can pivot away from the restrictive 'gender harmony' paradigm, steering towards policies designed to eradicate structures reinforcing gender disparities. With a profound understanding of the historical and cultural moorings, coupled with these pointed interventions, the rigid gender edifices that dominate Indonesian cattle farming stand a chance at genuine reform and rejuvenation.

6. Conclusion

This study contributes to a better understanding of the challenges faced by rural Indonesian women in accessing innovation in livestock production, using NTB as a case study. This research is novel, as there have been limited studies exploring the intersection of gender and innovation in Indonesian agriculture. In answering the question posed in the title, women do not truly benefit from this intervention category; they are constrained by multiple issues, which are described in detail below.

First, this study highlights the significant yet often overlooked contributions of rural women to cattle farming in NTB. Despite being responsible for or jointly participating with their husbands in all aspects of cattle farming, women's roles are frequently minimised and dismissed as mere 'help'. Rendering women's contributions invisible is a manifestation of the deeply rooted gender biases in rural communities, which are reflected in the perceptions of both interviewees. A lack of recognition of women's contributions can lead to their exclusion from extension services and training and ultimately affect rural development outcomes.

Furthermore, this study revealed that rural women in NTB have limited influence on decision-making processes related to the adoption of innovative practices in cattle farming despite acknowledging the shared ownership of assets. This lack of participation appears to be influenced by social norms that assign men to the roles of household heads, primary decision-makers, and the main sources of agricultural knowledge. To promote equitable and sustainable rural development, it is essential to address systemic gender biases and empower women to assume more visible and influential roles in the agricultural sector. By doing so, we can work towards creating more inclusive rural communities that recognise and value the vital contributions of women in agriculture.

Additionally, our study reveals the complex web of sociocultural and institutional factors that hinder women's participation in innovation and economic activities within Indonesia. Patriarchal norms and the government's emphasis on maintaining gender and family harmony have limited women's opportunities and reinforced their traditional roles as wives and mothers. Our findings highlight the urgent need for a critical reassessment of these policies and institutional frameworks, as they contribute to perpetuating gender inequality and stifling women's potential.

Moreover, our findings demonstrate that gender biases entrenched within extension service institutions also restrict women's access to resources, involvement in decision-making processes, and opportunities

within the agricultural sector. Addressing these issues requires a deeper and more critical analysis of the underlying societal norms and stereotypes. Additionally, it calls for the implementation of gender-responsive monitoring and evaluation systems that can drive necessary changes in these institutions.

The prevailing gender dynamics unveiled in this research underscore deep-seated challenges that inhibit the full inclusion of women in Indonesia's livestock innovation landscape. Embedded within traditions and reinforced by the 'gender harmony' doctrine, these dynamics have persistently marginalised women's roles in crucial spheres, notably in extension services and farmers' group participation. To effectively cultivate an inclusive livestock innovation system, employing GTAs in program design emerges as a key strategy. However, it is important to acknowledge that GTAs are not a 'silver bullet'; their effectiveness depends on a multifaceted and nuanced strategy. This entails a rigorous examination and challenge of established gender norms and power structures that perpetuate inequality and discrimination. Engaging all genders in rethinking traditional roles and advocating for equal opportunities is central to this process. Strong policy support and educational initiatives are essential to increase awareness of gender biases and their societal effects. Inclusivity demands the inclusion of diverse voices, especially from marginalised and underrepresented groups, to fully understand gender dynamics. Academic research plays a pivotal role in this context, offering insights and theories from disciplines such as sociology, psychology, gender studies, and political science. The effectiveness of GTAs depends on a commitment to ongoing learning, flexibility, and actively addressing and modifying deep-rooted societal norms and biases.

Additionally, policy frameworks should shift from simply promoting 'gender harmony' to actively dismantling discriminatory gender norms, ensuring women participate and influence and innovate within these platforms. Simultaneously, it is imperative to redesign extension services with gender at the forefront and strategically harness the potential of KWTs beyond the confines of traditional roles. In other words, there must be a comprehensive transformation in how policies and institutions approach women's empowerment in agriculture. This entails dismantling patriarchal structures that confine rural women to traditional roles and implementing more inclusive, gender-transformative policies that prioritise both men's and women's needs in the agricultural sector. By fostering an environment that empowers women to fully participate in innovation and economic activities, Indonesia can pave the way for a more equitable, sustainable, and inclusive future for all citizens.

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CRedit authorship contribution statement

Erika Valerio: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing, Validation. **Nurul Hilmiati:** Validation, Investigation, Writing – review & editing. **Ruth Stella Thei:** Validation, Investigation. **Alejandra Safa Barraza:** Writing – review & editing. **Julian Prior:** Writing – review & editing, Investigation.

Declaration of competing interest

The authors declare that they have no conflicts of interest.

Data availability

Data will be made available on request.

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ANNEX I.

Main Themes	Codes and Sub-Codes
Gender Norms and Social Structures	<ul style="list-style-type: none"> - Rigid social norms - Colonial legacies and patrilineal cultural traditions - State and 'gender harmony' - Concern about disrupting gender roles (wives/mothers) - Focus on women's roles as wives and mothers for welfare
Innovation and Economic Participation	<ul style="list-style-type: none"> - Promotion of family over women's empowerment - Women's inclusion in agriculture and innovation - Recognition vs. Real participation - Economic inclusion vs. Preservation of traditional roles - Transformatory potential vs. Emphasis on harmony
Extension Services and Gender Bias	<ul style="list-style-type: none"> - Lack of gender-responsive evaluations - Gender norms perpetuated by extension officers - Women's 'natural' roles - Gendered division of labour in agriculture - Institutional policies fostering gender bias - Stereotypes and their impact on resource distribution and recognition
Farmers' Groups and Participation	<ul style="list-style-type: none"> - Women's limited participation in mixed farmers' groups - Women as substitutes for their husbands - Women-only farmers groups (KWTs) and challenges to participation - Household responsibilities vs. Training opportunities - Economic initiatives - Influence of 'gender harmony' on group dynamics

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