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Knowledge, Attitude, and Practice Survey of Cattle Farmers in Makassar towards Animal Welfare

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Abstract

Animal welfare is a critical aspect of livestock management, yet its implementation among smallholder farmers often remains inadequate. This study assessed the knowledge, attitudes, and practices (KAP) of cattle farmers in Tamangapa Subdistrict, Manggala District, Makassar City, Indonesia, where cattle are grazed at the Tamangapa urban landfill. A structured questionnaire was administered to 32 respondents, and data were analyzed using Spearman correlation, Kruskal-Wallis, and Mann-Whitney-Wilcoxon tests. Results revealed an average knowledge score of 0.92 (out of 1), an attitude score of 4.59 (out of 5), and a practice score of 3.07 (out of 5). No significant correlations were observed between knowledge, attitudes, and practices. However, significant positive correlations were observed between knowledge and the number of cattle ($\rho = 0.548$; $p = 0.001$) and between attitude and education ($\rho = 0.362$; $p = 0.042$), and a negative correlation between attitude and age ($\rho = -0.468$; $p = 0.007$). These results highlight the influence of demographic factors on animal welfare awareness and behaviors, emphasizing the need for targeted education and training programs to bridge the gap between knowledge and practice.

Keywords: Animal welfare, knowledge, attitude, practice, landfill, Tamangapa

Introduction

In Indonesia, smallholder farmers often prioritize livestock production quantities rather than improving animal welfare. This is partly due to limited resources and a lack of understanding of the benefits of welfare practices (Mayasari et al., 2023). Many farmers see animal welfare as a burden that slows down daily operations. Their limited awareness includes not only ethical concerns but also the economic value of better welfare (Sulistiawati and Wulandari, 2022). In fact, improving animal welfare has been shown to enhance livestock productivity and product quality, which benefits farmers financially (Sinclair et al., 2019). Additionally, animal welfare plays a critical role in sustainable food

production systems, positively impacting ethical, environmental, and economic dimensions while supporting enhanced productivity (Sardar et al., 2023).
In urban areas like Makassar City, Indonesia, limited grazing land poses challenges for cattle farming (Nangkiawa, 2015). According to the Makassar City Fisheries and Agriculture Office, 56 cattle farmers operate in the city, with 32 farmers concentrated in Tamangapa Subdistrict. The Tamangapa urban landfill in Manggala District serves as a semi-intensive grazing area for cattle, despite its location in a densely populated area with 1.3 million residents and the potential environmental and health hazards associated with landfill exposure (Nurfadillah, 2022). Cattle graze at the landfill during the day and are stabled at night, a system that impacts livestock health (Muthiadin et al., 2018). The landfill comprises 70.43% organic/inorganic waste, 11.5% paper, 9.47% plastic, and 3.62% metals, cans, and aluminum (Santoso, 2018). Farmers feed cattle organic waste from the landfill, assuming it provides adequate nutrition (Wardhayani et al., 2015). Organic waste consumed by cattle includes vegetable scraps, food waste, fresh grass, and leaf litter, and is often contaminated with non-nutritive substances such as plastic, paper, or metals, endangering cattle health. Prolonged exposure to pathogens and heavy metals such as cadmium (Cd) and lead (Pb) can result in organ damage and also pose serious food safety and public health risks for humans consuming contaminated meat (Wahyono, 2010; Yusuf et al., 2021).

Despite these challenges, limited evidence exists regarding cattle farmers' knowledge and application of animal welfare principles in Tamangapa Village. Understanding their knowledge, attitudes, and practices (KAP) is critical for identifying gaps and implementing strategies to improve animal welfare. This study aims to assess the KAP of these farmers regarding animal welfare.

Materials and Methods

This study was conducted in June 2024 at the Tamangapa urban landfill, located in Manggala District, Makassar City. The study employed a survey design to explore the relationship between demographic characteristics and farmers' knowledge, attitudes, and practices (KAP) regarding animal welfare. Respondents were selected based on data from the Makassar City Fisheries and Agriculture Office. The sample consisted of 32 cattle farmers who met the following inclusion criteria: residing near the Tamangapa Landfill, being at least 18 years old, owning cattle, having raised cattle for a minimum of six months, and practicing a semi-intensive grazing system where cattle graze at the landfill during the day and are stabled at night.

Data were collected directly from respondents using a structured questionnaire to assess demographic characteristics, as well as KAP towards animal welfare. The questionnaire, adopted from a study by Alemayehu et al. (2022), was validated using content validation that covered all five freedoms of animal welfare and had a Cronbach's alpha reliability value of 0.7. The collected data were tabulated using Google Spreadsheets and subjected to statistical analysis using Spearman correlation, Mann-Whitney-Wilcoxon test, and Kruskal-Wallis test in RStudio Desktop version 2024.04.2+764. Spearman correlation was used to determine relationships between KAP scores and demographic characteristics expressed as numerical (age, number of cattle, cattle rearing experience, and average length of cattle rearing) or ordinal categorical (education level) variables. This test was chosen for its suitability for non-parametric data and rank-based correlations. The Mann-Whitney-Wilcoxon test was applied to identify differences in KAP scores based on demographic characteristics expressed as dichotomous nominal variables, such as gender. The Kruskal-Wallis test was used to identify differences in KAP scores across demographic characteristics

expressed as non-dichotomous nominal variables, such as occupation. The analyses aimed to identify statistically significant relationships and differences, with a p-value of ≤0.05 considered indicative of significance.

Results and Discussion

Characteristics of Respondents

Understanding the demographic characteristics of respondents is crucial for interpreting the KAP of cattle farmers in Tamangapa Subdistrict, Manggala District, Makassar City. These characteristics include gender, age, education, occupation, number of cattle, cattle rearing experience, and the average length of cattle rearing. Table 1 presents the detailed demographic data of the 32 respondents surveyed in this study.

Table 1. Demographic characteristics of respondents in Tamangapa Subdistrict, Manggala District, Makassar City (n = 32).

Demographic Characteristics	Frequency	Percentage
Gender		
Male	31	96.88%
Female	1	3.13%
Age		
18–30	10	31.25%
31–40	9	28.13%
>40	13	40.62%
Education		
Did not attend school	6	18.75%
Elementary school	6	18.75%
Junior high school	3	9.38%
Senior high school	13	40.62%
Bachelor's degree	4	12.50%
Occupation		
Employee	2	6.25%
Self-employed	4	12.50%
Livestock keeper	26	81.25%
Number of cattle		
1–10	8	25.00%
11–20	9	28.12%
21–30	7	21.88%
>30	8	25.00%
Cattle rearing experience		
6 months – 5 years	6	18.75%
6–10 years	15	46.88%
>10 years	11	34.37%
Average length of cattle rearing		
1 year	4	12.50%
2 years	12	37.50%
3 years	13	40.62%
≥4 years	3	9.38%

Table 1 reveals that the majority of respondents were male (97%), over 40 years old (41%), and had completed senior high school (41%). Most respondents are livestock keepers (81%), owned between 11–20 cattle (28%), had 6–10 years of experience in cattle rearing

(47%), and the most common practice was rearing cattle for an average duration of three years (41%) before selling or slaughtering them. This demographic profile reflects the prevalence of male dominance in cattle farming in the region, with a strong representation of experienced farmers possessing moderate herd sizes and secondary-level education. This context is critical for interpreting the KAP findings and understanding the potential barriers to improving animal welfare in this region.

Animal Welfare Knowledge

The knowledge aspect of respondents was assessed using 11 statements. Respondents were asked to evaluate the accuracy of each statement by selecting one of three options: "true," "false," or "do not know." Each correct answer was assigned a score of 1, while incorrect or "do not know" responses were given a score of 0. The results of the knowledge survey are summarized in Table 2.

Table 2. Knowledge of cattle farmers in Tamangapa Subdistrict, Manggala District, Makassar City, on animal welfare (n = 32).

No	Questions	Answers			Mean Score
		True	False	Do not know	
1	Cattle need certain nutrients to grow and produce well.	31 (96.87%)	0 (0.00%)	1 (3.13%)	0.97
2	Cattle need sufficient drinking water to grow and produce milk.	29 (90.62%)	1 (3.13%)	2 (6.25%)	0.91
3	Cattle will not grow or produce milk without enough water.	28 (87.5%)	1 (3.13%)	3 (9.37%)	0.88
4	Cattle need a clean, comfortable, and sufficiently spacious place to lie down.	32 (100.00%)	0 (0.00%)	0 (0.00%)	1.00
5	Cattle can feel pain or physical discomfort.	32 (100.00%)	0 (0.00%)	0 (0.00%)	1.00
6	Untreated wounds and injuries affect the welfare and productivity of cattle.	29 (90.62%)	2 (6.25%)	1 (3.13%)	0.91
7	The growth and reproduction of cattle are influenced by the treatment of farmers or owners.	24 (75.00%)	5 (15.63%)	3 (9.37%)	0.75
8	Cattle are creatures that can feel suffering and pleasure.	26 (81.25%)	0 (0.00%)	6 (18.75%)	0.81
9	Poor treatment of cattle can make them fearful of farmers or owners.	31 (96.87%)	1 (3.13%)	0 (0.00%)	0.97
10	The behavior and expressions of cattle can change if they feel pain or stress.	30 (93.74%)	1 (3.13%)	1 (3.13%)	0.94
11	Cattle need to graze and find their own feed.	32 (100.00%)	0 (0.00%)	0 (0.00%)	1.00

Based on Table 2, the highest mean scores (1.00) were observed in three knowledge aspects: that cattle can feel physical pain and illness, require a clean, comfortable, and spacious place to rest, and need to graze and find their own feed. These findings align with Sudirman et al. (2023), who emphasized that farmers can recognize signs of calmness in cattle, such as

the absence of restlessness and commotion in the enclosure. Properly designed enclosures help ensure that livestock feel comfortable. Conversely, the lowest mean score (0.75) pertained to the knowledge that the growth and reproduction of cattle are influenced by the treatment they receive from farmers or owners. Notably, the statement "Cattle are creatures that can feel suffering and pleasure" had the highest percentage of "do not know" responses (18.75%). This suggests that while many farmers are aware of the physical needs of cattle, there is less certainty or awareness about their emotional capacities. According to Balzani and Hanlon (2020), farmers with a clear understanding of the impact of their actions on livestock welfare are less likely to cause harm. This includes treating livestock gently and kindly and avoiding the use of harmful equipment. The overall average knowledge score was 0.92 out of 1, indicating a high level of understanding among the respondents.

Animal Welfare Attitude

The attitudinal aspect of respondents was assessed through 10 questions with Likert scale-based response options. Respondents were asked to indicate their level of agreement with each statement by choosing one of five options: "strongly agree," "agree," "neutral/doubtful," "disagree," or "strongly disagree." Each "strongly agree" response was assigned a score of 5, "agree" a score of 4, "neutral/doubtful" a score of 3, "disagree" a score of 2, and "strongly disagree" a score of 1. The results of the attitude survey are summarized in Table 3.

Table 3. Attitude of cattle farmers in Tamangapa Subdistrict, Manggala District, Makassar City, on animal welfare (n = 32).

No	Questions	Answers					Mean Score
		Strongly Disagree	Disagree	Neutral/ Doubtful	Agree	Strongly Agree	
1	Is it mandatory to maintain the cleanliness of cattle feed?	0 (0.00%)	2 (6.25%)	6 (18.75%)	0 (0.00%)	24 (80%)	4.44
2	Is it mandatory to provide drinking water to cows at all times?	0 (0.00%)	3 (9.37%)	4 (12.5%)	3 (9.37%)	22 (68.8%)	4.38
3	Is it mandatory to keep the cow pen clean every day?	3 (9.37%)	4 (12.5%)	6 (18.75%)	2 (6.25%)	17 (53.13%)	3.81
4	Should animal waste be properly managed?	3 (9.37%)	2 (6.25%)	11 (34.38%)	3 (9.37%)	13 (40.63%)	3.66
5	Should barns protect cows from hot weather and rain?	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (6.25%)	30 (93.75%)	4.94
6	Are farmers required to prevent diseases by administering dewormers, vitamins, and vaccines?	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	32 (100%)	5.00
7	Are farmers required to inform healthcare professionals if a cow is injured or sick?	0 (0%)	0 (0%)	1 (3.125%)	1 (3.125%)	30 (93.75%)	4.91

8	Should farmers treat cows to prevent stress and fear?	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	32 (100.00%)	5.00
9	Should farmers provide spacious pens for cows to move freely?	0 (0.00%)	0 (0.00%)	1 (3.125%)	1 (3.125%)	30 (93.75%)	4.91
10	Do cows need to be given the freedom to graze and walk around?	0 (0.00%)	0 (0.00%)	0 (0.00%)	3 (9.37%)	29 (90.63%)	4.91

Based on Table 3, the highest average score (5.00) was observed for two attitudes: farmers' commitment to preventing diseases in cattle through measures such as administering dewormers, vitamins, and vaccines, and treating cattle to prevent stress and fear. These findings align with Nurhayati et al. (2017), who emphasized the importance of livestock health for optimal growth, production, and reproduction. Disease prevention in livestock can be achieved by separating affected animals and administering vaccines and medications. Kartika et al. (2023) also noted that vaccination serves as a protective measure to reduce the risk and severity of disease symptoms in livestock. The lowest average score (3.66) was recorded for the attitude regarding proper management of animal waste. According to Sudirman et al. (2023), cage sanitation involves maintaining a clean environment to safeguard the health of both livestock and farmers. However, farmers often neglect proper cage sanitation practices, relying solely on experience instead of adopting systematic cleaning methods. The average attitude score was 4.59 out of 5, reflecting generally favorable perceptions of animal welfare.

Animal Welfare Practice

The practice aspect of respondents was assessed through 12 questions with Likert scale-based answer options. Respondents were asked to indicate how frequently they performed specific practices by choosing one of five options: "always/very often," "often," "sometimes," "rarely," or "very rarely/never." Higher practice scores were assigned to more frequent positive practices, with "always/very often" receiving a score of 5, "often" a score of 4, "sometimes" a score of 3, "rarely" a score of 2, and "very rarely/never" a score of 1.

However, three questions (questions 7, 8, and 11) were inversely scored. For these questions, higher frequency responses (e.g., "always/very often") indicated less desirable practices and were assigned lower scores. The results of the practice survey are presented in Table 4.

Table 4. Practice of cattle farmers in Tamangapa Subdistrict, Manggala District, Makassar City, on animal welfare (n = 32).

No	Questions	Answers					Mean Score
		Very Rarely/ Never	Rarely	Some-times	Often	Very Often/ Always	
1	I ensure my cows receive enough feed every day.	27 (84.38%)	3 (9.37%)	2 (6.25%)	0 (0.00%)	0 (0.00%)	1.22
2	I immediately look for a solution when I see my cows are hungry.	17 (53.13%)	5 (15.62%	4 (12.5%)	0 (0.00%)	6 (18.75%)	2.16

3	I provide access to drinking water so my cows can drink whenever they want.	3 (9.37%)	2 (6.25%)	6 (18.75%)	1 (3.13%)	20 (62.5%)	4.03
4	I often clean the cow pen and remove the waste or manure every day.	10 (31.25%)	11 (34.37%)	3 (9.37%)	1 (3.125%)	7 (21.88%)	2.50
5	I always ensure the cows can move freely and are protected from the weather inside the pen.	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (6.25%)	30 (93.75%)	4.94
6	I monitor the growth and weight of my cows.	1 (3.13%)	1 (3.13%)	8 (25%)	5 (15.62%)	17 (53.13%)	4.13
7*	I often find my cows sick.	2 (6.25%)	1 (3.13%)	6 (18.75%)	3 (9.37%)	20 (62.5%)	1.81
8*	I often find my cows limping or injured.	1 (3.13%)	2 (6.25%)	6 (18.75%)	6 (18.75%)	17 (53.13%)	1.88
9	I immediately look for a solution when I see my cows injured or hurt.	0 (0.00%)	1 (3.13%)	3 (9.37%)	3 (9.37%)	25 (78.13%)	4.63
10	I consult with professional animal health workers (veterinarians or paramedics) when my cows are sick or injured.	1 (3.13%)	13 (40.62%)	6 (18.75%)	5 (15.62%)	7 (21.88%)	3.13
11*	I use physical methods on the cows (e.g., whipping, hitting, kicking, using tools) to make them obey my commands.	4 (12.5%)	10 (31.25%)	12 (37.5%)	4 (12.5%)	2 (6.25%)	3.31
12	I provide space for my cows to move freely (e.g., grazing) every day.	0 (0.00%)	0 (0.00%)	31 (96.87%)	0 (0.00%)	1 (3.13%)	3.06

*These questions are inversely scored.

Based on Table 4, the highest average score (4.94) was observed for the practice of ensuring cattle can move freely and are protected from the weather inside the pen. A study by van Eerdenburg and Ruud (2021) highlights that well-designed free stalls promote cattle welfare by allowing natural lying and movement behaviors, which are essential for health and productivity. Sudirman et al. (2023) emphasized that livestock comfort is greatly influenced by weather conditions, and proper housing can protect animals from heat and discomfort. Conversely, the lowest average score (1.22) was related to ensuring cattle receive sufficient feed daily. This finding suggests that farmers in Tamangapa Subdistrict rely on grazing their livestock in landfills (final disposal sites), where they cannot guarantee the nutritional adequacy of the feed. Sudirman et al. (2023) noted that proper feeding practices involve regular feeding, typically 2–3 times a day. Similarly, Nurfahmi (2014) highlighted that low scores in the animal welfare aspect of hunger and thirst reflect a reliance on makeshift feeding practices that fail to meet livestock's nutritional needs. The average practice score was 3.07 out of 5, indicating moderate application of animal welfare practices in the field.

Correlation between Knowledge, Attitude, and Practice

The Spearman correlation test was conducted to evaluate the correlation and significance between two non-parametric variables. According to Cohen (1988), the Spearman correlation coefficient (ρ) can be categorized as follows: 0.1–0.3 indicates a small/weak correlation, 0.3–0.5 indicates a medium/moderate correlation, and values greater than 0.5 indicate a large/strong correlation. The sign of the coefficient (+ or −) indicates the direction of the relationship. A positive coefficient suggests a unidirectional relationship, whereas a negative coefficient indicates an inverse relationship. In addition to the correlation coefficient, the relationship between variables is assessed using the p-value, which determines the probability of statistically accepting or rejecting the null hypothesis. A p-value ≤0.05 indicates a statistically significant correlation, whereas a p-value >0.05 indicates no statistically significant correlation. The results of the Spearman correlation test and p-values are presented in Table 5.

Table 5. Spearman's correlation coefficients (ρ) and p-values between knowledge, attitude, and practice of farmers towards animal welfare.

Variable	Knowledge	Attitude	Practice
Knowledge	1	0.078 (p = 0.673)	−0.127 (p = 0.487)
Attitude		1	0.237 (p = 0.192)
Practice			1

Table 5 presents the relationships between knowledge, attitude, and practice of animal welfare. The correlation between knowledge and attitude (ρ = 0.078; p = 0.673) indicates no statistically significant relationship. However, the very weak positive correlation coefficient suggests that increased knowledge may encourage a more favorable attitude, or vice versa. Hazel et al. (2011) observed that teaching veterinary and animal science students about animal welfare improved their attitudes toward animals, showing that knowledge can positively influence attitudes when education includes ethical components. The correlation between knowledge and practice (ρ = -0.127; p = 0.487) also indicates no statistically significant relationship. The weak negative correlation suggests a potential gap between knowledge and practice. Bassi et al. (2020) reported that while knowledge can influence behavior, other factors such as family traditions and environmental conditions often play a significant role in shaping farmers' practices. Similarly, the correlation between attitude and practice (ρ = 0.237; p = 0.192) reveals no statistically significant relationship. Despite this, the weak positive correlation implies that a more favorable attitude may contribute to better practices, or vice versa. According to Balzani and Hanlon (2020), positive attitudes towards animal welfare, shaped by farmers' knowledge and experience, can support behaviors that improve livestock care.

Correlation between Knowledge, Attitude, and Practice with Demographic Characteristics

The Spearman correlation test was conducted to examine the relationships between knowledge, attitude, and practice aspects with five demographic characteristics: age, number of cattle, cattle rearing experience, length of cattle rearing, and education (Table 6). Additionally, correlations among the five demographic characteristics were also analyzed (Table 7). A positive coefficient indicates a direct relationship, whereas a negative coefficient indicates an inverse relationship. A p-value of ≤0.05 signifies a statistically significant correlation, while a p-value >0.05 denotes no statistically significant correlation.

Table 6. Spearman's correlation coefficients (ρ) and p-values between knowledge, attitudes, practices, and demographic characteristics of farmers.

Variable	Age	Number of Cattle	Cattle Rearing Experience	Length of Cattle Rearing	Education
Knowledge	−0.048 (p = 0.791)	0.548 (p = 0.001)*	0.298 (p = 0.096)	−0.126 (p = 0.492)	−0.006 (p = 0.931)
Attitude	−0.468 (p = 0.007)*	0.049 (p = 0.786)	−0.111 (p = 0.543)	−0.245 (p = 0.176)	0.362 (p = 0.042)*
Practice	−0.258 (p = 0.153)	−0.122 (p = 0.504)	−0.070 (p = 0.702)	−0.110 (p = 0.546)	0.341 (p = 0.056)

*statistically significant (p = ≤0.05)

Among the 15 correlations between knowledge, attitude, and practice with demographic characteristics, three relationships were statistically significant ($p \leq 0.05$): (1) knowledge and number of cattle, (2) attitude and age, and (3) attitude and education. Additionally, one correlation, practice and education, approached the significance threshold ($p = 0.056$).

The correlation between knowledge and the number of cattle had a coefficient of 0.548 ($p = 0.001$), indicating a strong positive relationship. This suggests that farmers with larger herds tend to possess better knowledge of animal welfare. This finding may indicate that managing a larger number of cattle necessitates greater awareness of animal welfare principles, as knowledge becomes a functional requirement for maintaining herd health and productivity. Sadiq et al. (2021) demonstrated that dairy farmers with larger herd sizes and higher education levels displayed better understanding and implementation of dairy cattle welfare measures, emphasizing the role of scale in knowledge dissemination. While Alemayehu et al. (2022) report that mixed farming systems with larger herds in Ethiopia showed better animal welfare knowledge, attitudes, and practices compared to pastoralists, highlighting a link between operational scale and knowledge levels.

Conversely, the correlation between attitude and age yielded a coefficient of -0.468 ($p = 0.007$), demonstrating a significant negative relationship, which implies that older farmers tend to have less favorable attitudes toward animal welfare. This may reflect generational differences, with younger farmers being more receptive to modern animal welfare concepts due to increased exposure to education or new farming practices. Carnovale et al. (2022) noted in a study of public attitudes in China that younger individuals (18–24 years) exhibited more positive attitudes toward animal welfare compared to older individuals, indicating generational differences in perceptions.

For education and attitude, a coefficient of 0.362 ($p = 0.042$) indicates that farmers with higher education levels exhibit better attitudes towards animal welfare. Education likely improves awareness of animal welfare principles and fosters empathy toward livestock. Carnovale et al. (2024) observed that education level influenced attitudes toward animal welfare in China, with more educated individuals generally expressing greater concern for animal welfare. Mulyawati et al. (2016) stated that the higher the level of education of farmers, the better the implementation of livestock maintenance because farmers can adopt innovations and change their way of thinking. Huza et al. (2023) found that most livestock farmers who did not receive formal education received their livestock farming knowledge passed down from their parents and the efforts they made were only to follow what already existed.

The near-significant relationship between education and practice (coefficient = 0.341, $p = 0.056$) suggests that higher education levels may also influence better practices. Balzani and Hanlon (2020) found that farmers' education influenced their perception and adoption of animal welfare practices, emphasizing the importance of informed decision-making.

Table 7. Spearman's correlation coefficients (ρ) and p-values among demographic characteristics of farmers.

Variable	Age	Number of Cattle	Cattle Rearing Experience	Length of Cattle Rearing	Education
Age	1	−0.127 (p = 0.489)	0.348 (p = 0.051)	0.319 (p = 0.075)	−0.516 (p = 0.003)*
Number of Cattle		1	0.354 (p = 0.047)*	0.020 (p = 0.909)	0.181 (p = 0.319)
Cattle Rearing Experience			1	0.339 (p = 0.058)	0.014 (p = 0.938)
Length of Cattle Rearing				1	−0.079 (p = 0.664)
Education					1

*statistically significant (p = ≤0.05)

Table 7 highlights correlations among the demographic characteristics. There were two statistically significant relationships: (1) age and education (coefficient = −0.516, p = 0.003), and (2) number of cattle and cattle rearing experience (coefficient = 0.354, p = 0.047). The negative correlation between age and education suggests that older farmers tend to have lower levels of formal education. In contrast, the positive correlation between the number of cattle and cattle rearing experience implies that farmers with larger herds tend to have more experience.

Two additional correlations approached statistical significance: (1) age and cattle rearing experience (coefficient = 0.348, p = 0.051), and (2) cattle rearing experience and length of cattle rearing (coefficient = 0.339, p = 0.058). These findings suggest that older farmers may have more experience in cattle rearing and that farmers with longer rearing experience may maintain livestock for extended periods before selling them.

Relationship Between Knowledge, Attitude, Practice, and Occupation

The Kruskal-Wallis test was performed to determine whether significant differences exist in knowledge, attitudes, and practices among cattle owners based on their occupation. According to the test criteria, a p-value ≤ 0.05 indicates a significant difference, while a p-value > 0.05 indicates no significant difference among the groups. The results of the Kruskal-Wallis test are presented in Table 8.

Table 8. Kruskal-Wallis values and p-values for knowledge, attitudes, and practices across different types of cattle owners' occupations.

Variable	Kruskal-Wallis Value	p-value
Knowledge	2.3675	0.4997
Attitude	1.7405	0.6280
Practice	2.1571	0.5405

The Kruskal-Wallis test results indicate no statistically significant differences in knowledge ($p = 0.4997$), attitude ($p = 0.6280$), or practice ($p = 0.5405$) based on the type of occupation among cattle owners. These findings suggest that regardless of their occupation, cattle owners in Tamangapa Subdistrict exhibit similar levels of knowledge, attitudes, and practices towards animal welfare. Future studies with larger and more diverse samples may provide further insights into how occupational roles influence animal welfare awareness and behavior. However, research by Toha et al. (2022) suggests that individuals who work solely as livestock breeders may have more time to care for their animals, leading to greater attention, deeper knowledge, and more positive attitudes toward animal welfare.

Relationship Between Knowledge, Attitude, Practice, and Gender

The Mann-Whitney-Wilcoxon test was planned to assess the relationship between knowledge, attitudes, and practices regarding animal welfare and the demographic characteristic of gender. In this study, the sample included 32 respondents, consisting of 31 males and one female. Due to the presence of only a single female respondent, statistical analysis could not be conducted to examine the relationship between gender and the knowledge, attitude, and practice aspects of cattle owners. Although a gender-based analysis was not feasible, the overwhelming majority of male respondents reflects a notable gender imbalance in cattle farming in Tamangapa Subdistrict, Manggala District, Makassar City. Future research with a more balanced sample size across genders could help identify any potential gender-based differences in animal welfare awareness and behavior.

Conclusion

This study highlights the disparity between the levels of knowledge, attitude, and practice of cattle owners in Tamangapa Subdistrict regarding animal welfare. While the average knowledge score was relatively high, and the attitude score was positive, the practice score was comparatively lower. The statistical analysis revealed no significant correlations among knowledge, attitude, and practice, indicating that these variables do not directly influence one another. However, significant correlations were observed between knowledge and the number of cattle owned, between attitude and the age of cattle owners, and between attitude and the education level of farmers. These findings suggest that demographic factors, such as herd size, age, and education, may play a role in shaping the knowledge and attitudes of cattle owners toward animal welfare. Future efforts to improve animal welfare practices should focus on targeted interventions that address these demographic factors while bridging the gap between knowledge and implementation.

Conflict of Interest

We certify that there is no conflict of interest with any financial, personal, or other relationships with people or organizations related to the material discussed in this manuscript.

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