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ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF BOVINE MASTITIS AMONG DAIRY CATTLE FARMERS IN KELANTAN AND PAHANG

By

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ABSTRACT

Dairy cattle milk is a significant source of protein and a rapidly growing industry in Malaysia, particularly in states such as Kelantan and Pahang. However, mastitis remains a considerable challenge, reducing milk yield and quality. Research on farmers' knowledge, attitudes, and practices (KAP) regarding mastitis in this region is limited. This study aimed to assess KAP among dairy farmers toward bovine mastitis. A validated cross-sectional survey was conducted online and via face-to-face interviews with 20 dairy farmers, using convenience sampling and snowball sampling methods. Data were analysed descriptively, and associations were assessed using Fisher's Exact Test and Pearson's correlation in IBM SPSS Statistics version 30. Most respondents were male (n = 15, 75%) and aged 18 – 30 years (n = 11, 55%), with the majority working on intensive farms (n = 17, 85%) and farms with herd size more than 50 (n = 11, 55%). Lameness (n = 16, 80%) and mastitis (n = 15, 75%) were the most commonly reported health problems. Nearly half of the farmers (n = 9, 45%) were unaware that subclinical mastitis may occur without clinical signs. Most farmers (n = 12, 60%) agreed that treatment should only be prescribed by licensed veterinarians, while 8 (40%) remained neutral. Milk quality testing was infrequent, with 10% (n = 10) never testing and 50% (n = 10) routinely performing the California Mastitis Test. Overall, all respondents demonstrated good knowledge (n = 20, 100%) and attitude (n = 20, 100%), while (n = 7, 35%) exhibited poor practice. Significant associations were found between sociodemographic and farm factors, such as the education level ($p < 0.001$), years of experience ($p < 0.001$), role in the farm ($p < 0.001$), herd size ($p < 0.001$), and the management system ($p < 0.001$), with KAP scores ($p < 0.001$). Still, there are no significant correlations between knowledge, attitude, and practice ($p > 0.05$). These findings highlight the need for targeted educational and training programmes to improve farmers' awareness and implementation of mastitis prevention, subclinical detection, and diagnostic screening.

Keyword: Mastitis, Dairy cattle, KAP, Kelantan, Pahang

ABSTRAK

Susu lembu tenusu merupakan sumber protein yang penting dan industri yang semakin berkembang di Malaysia, termasuk di negeri Kelantan dan Pahang. Walau bagaimanapun, mastitis kekal sebagai cabaran utama yang mengakibatkan pengurangan hasil dan kualiti susu, di samping kajian mengenai pengetahuan, sikap, dan amalan (KAP) penternak terhadap mastitis di kawasan ini yang masih terhad. Kajian ini bertujuan menilai KAP penternak tenusu terhadap mastitis lembu. Satu tinjauan keratan-rentas yang telah disahkan, dijalankan secara atas talian dan melalui temubual bersemuka dengan 20 penternak menggunakan kaedah pensampelan mudah dan *snowballing*. Data dianalisis secara deskriptif, manakala hubungan antara pemboleh ubah dikaji menggunakan Ujian Fisher Eksak dan korelasi Pearson dalam IBM SPSS Statistics versi 30. Kebanyakan responden ialah lelaki (n = 15, 75%) dan berumur antara 18 – 30 tahun (n = 11, 55%), dengan majoritinya bekerja di ladang intensif (n = 17, 85%) dan ladang dengan jumlah ternakan lebih 50 ekor (n = 11, 55%). Ketempangan (n = 16, 80%) dan mastitis (n = 15, 75%) merupakan masalah kesihatan yang paling kerap dilaporkan. Hampir separuh daripada penternak (n = 9, 45%) tidak menyedari bahawa mastitis subklinikal boleh berlaku tanpa tanda klinikal. Kebanyakan penternak (n = 12, 60%) bersetuju bahawa rawatan hanya boleh diberikan oleh doktor veterinar bertauliah, manakala (n = 8, 40%) bersikap neutral. Ujian kualiti susu jarang dijalankan, dengan 20% (n = 10) tidak pernah melakukan ujian dan 50% (n = 10) menjalankan Ujian Mastitis California secara rutin. Secara keseluruhan, semua responden menunjukkan tahap pengetahuan (n = 20, 100%) dan sikap yang baik (n = 20, 100%), namun (n = 7, 35%) menunjukkan amalan yang lemah. Terdapat hubungan signifikan antara faktor sosiodemografi dan faktor ladang seperti tahap pendidikan ($p < 0.001$), tahun pengalaman ($p < 0.001$), peranan di ladang ($p < 0.001$), saiz kawanan ($p < 0.001$), serta sistem pengurusan ($p < 0.001$) dengan skor KAP ($p < 0.001$), namun tiada korelasi signifikan antara pengetahuan, sikap dan amalan ($p > 0.05$). Penemuan ini menekankan keperluan program pendidikan dan latihan khusus untuk meningkatkan kesedaran penternak dan pelaksanaan pencegahan mastitis, pengesanan mastitis subklinik, dan saringan diagnostik.

Kata kunci: Mastitis, Lembu tenusu, KAP, Kelantan, Pahang

CERTIFICATION

This is to certify that we have read this research paper entitled **'Knowledge, Attitude and Practice of Bovine Mastitis Among Dairy Cattle Farmers in Kelantan and Pahang'** by **Ahmad Amir Akmal Bin Abdul Hamid**. In our opinion, it is satisfactory in terms of scope, quality, and presentation as partial fulfilment of the requirements for the course DVT 55204 – Research Project.

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Thank You

DEDICATION

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LIST OF ABBREVIATIONS

AMR – Antimicrobial resistance

CMT – Californian Mastitis Test

DVS – Department of Veterinary Service

FET – Fisher's Exact Test

KAP – Knowledge, attitude, and practice

NDIDSP – National Dairy Industry Development Strategic Plan

NKEA – National Key Economic Area

SCC – Somatic cell count

SD – Standard deviation

SPSS – Statistical Product and Service Solutions

LIST OF SYMBOLS

°C = degree Celsius

% = Percentage

n = The number of respondents

< = Less than

> = More than

r = Pearson Correlation Coefficient

p = Probability Value

N = Population size

n = Total number of data values

f = Frequency

CHAPTER 1
INTRODUCTION

1.1 Research Background

The dairy industry is a significant prospect for the agricultural sector in Malaysia, and it has been experiencing tremendous growth over the years. In 2019, Peninsular Malaysia was home to 19,000 dairy cows and recorded 40.6 million litres in milk production in that year alone. Despite these significant numbers, Malaysia remains far from self-sufficiency, having achieved only 63.03%, with consumption at 64.4 million litres (Department of Veterinary Services, 2021). Recognising this, the National Dairy Industry Development Strategic Plan 2021–2025 has been launched by the Ministry of Agriculture to increase the self-sufficiency level by 2025 through expanding the national herd and improving per-cow yields (Kiandee, 2021). Major dairy provinces, such as Kelantan and Pahang, are home to a mix of smallholder farms and commercial farms. These regions have a tropical climate with high humidity and rainfall, characterised by temperatures ranging from 25 °C to 37 °C (Mayowa *et al*., 2015).

Mastitis has historically been divided into two categories to simplify a complex subject: environmental pathogens that rarely infect the mammary gland and contagious organisms that colonise the mammary gland and can be disseminated by milkers and milking machines (F. Peek & J. Divers, 2018). It causes significant economic losses by reducing milk yield and quality, increasing culling rates, impairing reproductive performance, and increasing treatment costs. The condition is caused by pathogens such as *Streptococcus agalactiae*, *Staphylococcus aureus*, *Escherichia coli*, and *Mycoplasma spp*. Mastitis occurs in two forms: clinical mastitis, characterised by visible signs such as swollen and painful udders and visibly abnormal milk, and subclinical mastitis, which shows no apparent symptoms and requires tests like somatic cell count (SCC) or the California Mastitis Test (CMT) (Khasapane *et al.,* 2023). Globally, mastitis costs the dairy industry an estimated US$22 billion annually (Rasmussen *et al*., 2024). In Malaysia, it remains a significant issue, with 31% prevalence of subclinical mastitis cases in the East Coast (Saeed *et al*., 2022), and nearly 60% of farmers reporting it as a major concern (Sadiq *et al*., 2024).

Prevention of mastitis is vital due to the devastating impact of mastitis on the health and economy. Effective measures include pre- and post-milking teat disinfection, foremilk stripping, udder cleaning, and clean bedding. Isolating infected cows, maintaining milker

hygiene, and encouraging cows to stand post-milking significantly reduce infection risks (Gleeson *et al.*, 2018; Fitzpatrick *et al*., 2021; Zigo *et al*., 2021).

In Malaysia, several reports have highlighted the magnitude of mastitis (Saeed *et al*., 2022; Sadiq *et al*., 2024). However, information on its associated risk factors, particularly concerning farmers' knowledge, attitudes, and practices, remains limited. Such insights are essential for understanding farmers' perspectives and for developing targeted strategies to reduce the disease's prevalence and impact. This study aims to assess the knowledge, attitudes, and practices of dairy farmers towards mastitis in dairy cows in Kelantan and Pahang.

1.2 Research Problem Statement

In the past few decades, the development of the dairy industry in Malaysia has led to an increase in dairy cattle farming, including in Kelantan and Pahang. These farms are managed by both experienced and small-scale or emerging dairy farmers. However, common production diseases, such as mastitis, continue to pose significant challenges to dairy cattle health and productivity. Improper milking hygiene and limited disease monitoring contribute to the persistence of these issues. Moreover, the awareness and implementation of proper prevention and management practices among farmers vary widely. With limited data available on the knowledge, attitude, and practice (KAP) toward mastitis in dairy cattle among farmers in these states, there is little evidence to guide targeted education or intervention programs. Hence, the status of farmer awareness and disease management in Kelantan and Pahang requires further investigation and attention.

1.3 Research Questions

1. What is the level of knowledge on mastitis among dairy cattle farmers in Kelantan and Pahang?
2. What is the level of attitude on mastitis among dairy cattle farmers in Kelantan and Pahang?
3. What is the level of practice on mastitis management among dairy cattle farmers in Kelantan and Pahang?
4. What are the factors associated with the level of KAP among the socio-demographic variables?

1.4 Research Hypothesis

1. Dairy cattle farmers in Kelantan and Pahang have a limited understanding of mastitis.
2. Dairy cattle farmers in Kelantan and Pahang have a poor level of attitude toward mastitis.
3. Dairy cattle farmers in Kelantan and Pahang have a poor level of practice on mastitis management.
4. There is an association between socio-demographic variables and the level of KAP.

1.5 Research Objectives

1. To determine the level of knowledge on mastitis among dairy cattle farmers in Kelantan and Pahang.
2. To determine the level of attitude on mastitis among dairy cattle farmers in Kelantan and Pahang.
3. To determine the level of practices among dairy cattle farmers in Kelantan and Pahang towards mastitis management.
4. To determine the association between socio-demographic variables with the level of KAP.

CHAPTER 2
LITERATURE REVIEW

2.1 Dairy Cattle Industry in Malaysia

Malaysia has long pursued dairy industry development through targeted programs since its early development. For example, the National Dairy Development Program (NDDP) was launched in 1974 under the Second Malaysia Plan to support smallholder dairy farmers (Suntharalingam, 2020). More recently, the Economic Transformation Programme's National Key Economic Area (NKEA) designated a dairy entry-point project (EPP 13) in 2013, which involves partnering local farmers with large foreign dairy companies to establish integrated dairy clusters and boost local production (Department of Veterinary Services, 2021). In 2021, the government launched the National Dairy Industry Development Strategic Plan 2021 – 2025 (NDIDSP) to further modernise the dairy industry. As of 2018, the national milk production is recorded at 38.5 million litres, and the milk consumption is recorded at 62.8 million litres. Hence, through the NDIDSP, the Agriculture Ministry aims to increase milk output by 20 million litres within five years, to achieve 100% self-sufficiency by 2025 (Kiandee, 2021; Department of Veterinary Services, 2021). Kelantan and Pahang are among the targeted locations for dairy industry development, with Lembah Muadzam initiated in 2009 and Lembah Pantai Timur scheduled to begin in 2025 (Department of Veterinary Services, 2021). This highlights the importance of conducting studies in these states, as Kelantan and Pahang are key focus areas for the country's dairy industry development.

2.2 Bovine mastitis

Mastitis has historically been divided into two categories to simplify a complex subject: environmental pathogens that rarely infect the mammary gland and contagious organisms that colonise the mammary gland and can be disseminated by milkers and milking machines (F. Peek & J. Divers, 2018). It has a devastating impact on the dairy industry, causing economic loss either directly or indirectly, through reduced milk production and quality, increased culling rate, poor reproductive performance, as well as the cost of labour, medications, and disinfectants for the treatment and control of the disease. This disease is typically caused by a wide range of microorganisms, including *Streptococcus agalactiae*, *Streptococcus dysgalactiae*, *Staphylococcus aureus*, *Streptococcus uberis*, *Escherichia coli,* and *Mycoplasma spp.*. Mastitis can be classified into clinical and subclinical mastitis. A clinical mastitis cow exhibits obvious clinical signs, including a hot, swollen, red, and painful udder, with visibly

abnormal milk, characterised by the presence of flakes, clots, blood, and pus. In contrast, subclinical mastitis exhibits no visible symptoms, as the cow appears normal and healthy, and the milk is also visually normal (Saeed *et al*., 2022). It is only detectable through tests such as somatic cell count or the Californian Mastitis Test (CMT) (Khasapane *et al*., 2023). Globally, clinical and subclinical mastitis are estimated to cost US$13 billion and US$9 billion per year, respectively (Rasmussen *et al*., 2024). In Malaysia, mastitis also poses a major problem. A study by Saeed *et al*. (2022) found that the prevalence of subclinical mastitis on the East Coast of Peninsular Malaysia is 31.4% (n = 74 / 235). Recently, a questionnaire-based study by Sadiq *et al*. (2024) reported that the majority of farmers (n = 68, 59.6%) have mastitis as the main problem on their farms. These figures indicate that a significant proportion of Malaysian dairy cows suffer from subclinical infections, which undermine productivity. Consequently, mastitis represents a major economic burden for Malaysia's small dairy sector, compounding the challenge of meeting national production goals.

2.3 Challenges in Treatment of Mastitis

The effective treatment of mastitis is hampered by several challenges. The primary concern is antimicrobial resistance (AMR). Many mastitis pathogens, especially *S. aureus,* have developed resistance to common antibiotics. In Malaysia, research found that almost half of the milk samples harbouring *S. aureus* demonstrated resistance to penicillin and ampicillin, and a substantial proportion were resistant to oxacillin, tetracycline, and other antibiotics. In the same study, all the isolates were able to form biofilms, and some were also capable of invading mammary cells. Biofilm formation and intracellular infection make *S. aureus* infections especially intractable, often leading to chronic recurrence despite treatment (Saeed *et al*., 2022). These findings demonstrate that treating mastitis is challenging, and preventative measures should receive greater attention.

2.4 Prevention of Mastitis

Given the difficulty of treating mastitis, preventing it is crucial. Good milking hygiene and management can significantly reduce the risk of infection. For example, routine teat disinfection using iodine or chlorhexidine dips before and after milking is highly effective in reducing new intramammary infections by up to 50% (Gleeson *et al*., 2018; Fitzpatrick *et al*., 2021). Other than that, the practice of stripping the first streams of milk can remove high bacterial foremilk and help detect early clinical cases before the attachment of a milking

machine (Gleeson *et al*., 2018). In addition, cleaning the udder with warm water or a mild disinfectant, followed by wiping with a clean towel, removes debris that harbours pathogens (Zigo *et al*., 2021). Good environmental hygiene, achieved through daily removal of soiled bedding and manure, along with frequent replacement of straw or sand bedding, can reduce the incidence of subclinical mastitis by up to 50% (Zigo *et al*., 2021). Isolating infected cows in a separate pen or milking them last may help prevent the spread of *Staphylococcus aureus* and *Streptococcus agalactiae* (Zigo *et al*., 2021). Strict personnel hygiene should be implemented in the milking plant, including the practice of frequent hand washing and wearing clean gloves. Finally, encouraging animals to stand after milking to allow the closure of the teat canal sphincter may reduce the incidence of environmental mastitis by 40-50% (Gleeson *et al*., 2018).

2.5 KAP Studies

Knowledge, Attitude and Practice (KAP) studies are widely used to evaluate the awareness, perception, and behaviour of populations toward specific health issues, including zoonotic and production-related diseases such as mastitis. They are instrumental in identifying existing knowledge gaps and risky practices that contribute to pathogen transmission among dairy farmers (Stull et al., 2012; Mangesho *et al*., 2017). These studies also enable public health and veterinary authorities to design targeted interventions. Moreover, socio-demographic variables like education level, farming experience, and age often influence knowledge and attitudes toward disease prevention (Sadiq *et al*., 2018). Identifying these variables helps tailor education efforts to less-informed groups, ultimately improving disease control outcomes.

A KAP study on mastitis among dairy farmers by Rahman *et al*. (2018) in selected areas in Bangladesh found that a significant proportion of farmers lacked awareness about mastitis screening methods, with only (n = 6, 9.2%) performing regular checks and (n = 50, 76.9%) having no knowledge of screening techniques. This highlights a crucial gap that is also evident in Malaysia, where no published KAP study on mastitis among dairy farmers currently exists, despite reports indicating that mastitis is one of the most prevalent diseases in the national dairy sector. Understanding the knowledge and practices of Malaysian dairy farmers is therefore crucial for controlling mastitis and enhancing herd health outcomes.

In the Malaysian context, it was found that only a limited number of KAP studies have been conducted on ruminant farming in Malaysia. However, none specifically address the

knowledge, attitude, and practice (KAP) related to mastitis among dairy farmers, indicating a significant research gap in this area. Notable KAP studies in Malaysia include those by Sadiq et al., one in 2021 that focused on zoonotic diseases among ruminant farmers, and a 2024 study on lameness among dairy farmers. Both studies employed questionnaire-based cross-sectional designs, utilising a combination of online surveys via Google Forms and face-to-face interviews. The sampling approach was primarily convenience sampling, targeting farmers registered with the Department of Veterinary Services (DVS), followed by snowball sampling, where participants nominated other potential respondents. The data was analysed by using SPSS 3.0. The collected data were analysed descriptively, and the reliability of the questionnaires was assessed based on Cronbach's alpha values (>0.70).

CHAPTER 3

METHODOLOGY

3.1 Study Area, Design, and Population

This study, conducted in Kelantan and Pahang from July to September 2025, employed a cross-sectional survey to evaluate the knowledge, attitudes, and practices of dairy cattle farmers regarding bovine mastitis. The study was conducted among dairy cattle farmers in Kelantan and Pahang.

3.2 Selection Criteria: Inclusion and Exclusion

The study included dairy cattle farmers located in Kelantan and Pahang who were at least 18 years old and were able to read, write, and understand either Bahasa Malaysia or English. Eligible participants also had to own or have managed at least one dairy cow within the preceding five years and demonstrate willingness to participate by completing the questionnaire. Conversely, veterinarians who were also dairy farmers, as well as farm owners who did not directly manage their farms, were excluded from the study to ensure that responses were obtained only from individuals with direct, hands-on experience in dairy cattle management.

3.3 Sampling Method and Procedure

The convenience method involved contacting dairy cattle farmers in Kelantan and Pahang who were registered with the Department of Veterinary Services. The snowball sampling method will be implemented by notifying respondents to nominate potential participants. The respondents were contacted via email and phone to seek their consent. They were also asked about their preferred method for completing the questionnaire, either online or paper-based. For those who opted for the face-to-face method, the researchers and participants arranged a suitable time and date for farm visits. Additionally, the online questionnaire was shared through social media platforms, including WhatsApp, Facebook, and Instagram. A total of 20 samples were collected during the sampling process.

3.4 Data Collection Tools

Responses were gathered through a newly developed and validated questionnaire hosted on Google Forms. The final questionnaire consisted of four sections: sociodemographic

information, knowledge, attitude, and practice. The knowledge section contained closed-ended questions with predetermined correct or incorrect answers to assess respondents' understanding of mastitis. The attitude section measured respondents' perceptions regarding mastitis using a Likert scale, while the practice section assessed the observable actions farmers undertook in the prevention and management of mastitis.

The KAP levels were rated as 'good, 'moderate', or 'poor' using Bloom's cut-off criterion (Goni et al., 2019). Incorrect or doubtful responses in the knowledge section were assigned a score of 0, while correct answers earned 1 point, with a maximum possible knowledge score of 42. Therefore, for knowledge, scores between 25 and 42 (above 60%) indicate 'Good' knowledge, while scores between 0 and 24 (below 60%) are classified as 'Poor'.

In the attitude and practice sections, scoring was structured to evaluate respondents' commitment and adherence to animal welfare principles and practices. The highest possible scores represented full marks on all questions, while the minimum score was set at 20% of the total for each section. For attitude, responses ranging from 'strongly agree' to 'strongly disagree' were scored from 5 to 1, respectively (Goni et al., 2019), with scores categorised as Good (80% or higher, 24-30 points), reflecting strong commitment; Moderate (60–79%, 18–23 points), indicating partial alignment; and Poor (below 59%, 1–17 points), suggesting limited adherence.

Similarly, for practice, responses ranging from 'always' to 'never' were scored from 5 to 1, with scores classified as Good (over 80%, 52–65 points), denoting consistent preventive behaviours, and Poor (below 80%, 1–51 points), indicating deficiencies in care practices. This framework provided a comprehensive approach to assessing attitudes toward animal welfare and the practical application of care behaviours.

3.5 Validity and Reliability

The questionnaires were newly developed and subjected to content validation by a panel of experts, including a statistical academician and a veterinarian specialising in ruminant medicine. Face validation was performed by testing the questionnaire with two selected farmers. Reliability testing was conducted through a pilot study involving 20 participants, and the internal consistency was evaluated using Cronbach's alpha, with a value greater than 0.70 considered acceptable.

3.6 Data Analysis

Data collected from the online forms were transferred to Microsoft Excel and subsequently copied into IBM SPSS (Version 30.0) for analysis. Categorical data were analysed descriptively, while numerical data were summarised using measures such as the mean and standard deviation. The data were also analysed using SPSS software, with Fisher's Exact test applied to assess the association between sociodemographic variables and the levels of knowledge, attitudes, and practices (KAP) related to the prevention and management of mastitis in dairy cattle. The confidence level was set at 95% with a 5% error margin. The results were planned to be tabulated and presented in graphical formats, such as pie charts or histograms.

3.7 Ethical Approval

As the investigation involved humans, human ethics approval was required. Therefore, an application for human ethics was submitted, and approval was obtained under the code UMK/FPV/HUMAN/EXT/ 0004/2025.

CHAPTER 4
RESULTS

4.1 Respondent Profile

In this study, 20 dairy farmers were successfully recruited in Kelantan and Pahang, as shown in Table 1, and their sociodemographic profiles show several clear patterns. Most participants were male (n = 15, 75%), and more than half were between 18 and 30 years old (n = 11, 55%), indicating that many farmers involved in dairy work are relatively young. The group was primarily Malay (n = 19, 95%), with only one Chinese respondent (n = 1, 5%). In terms of education, the respondents were quite diverse, with the largest groups having either completed SPM (n = 8, 40%) or holding a Bachelor's degree (n = 8, 40%). Only a few had certificate-level education (n = 2, 10%), a diploma (n = 1, 5%), or no formal schooling (n = 1, 5%). Most respondents had relatively limited experience in dairy farming, with many reporting less than five years of involvement (n = 11, 55%), while the remaining farmers had between 6–10 years (n = 3, 15%), 11–15 years (n = 4, 20%), or more than 15 years of experience (n = 2, 10%). When looking at their roles on the farm, supervisors made up the largest group (n = 10, 50%), followed by general workers (n = 6, 30%), with only a few being farm owners (n = 3, 15%) or managers (n = 1, 5%).

Table 1: Sociodemographic characteristics (N = 20)

Factors	Frequency	(%)
Genders		
Male	15	75
Female	5	25
Age (years)		
18 – 30 years	11	55
31 – 50 years	9	45
Race		
Malay	19	95
Chinese	1	5
Indian	0	0
Education		
No formal education	1	5
Sijil Pelajaran Malaysia (SPM)	8	40

Certificate	2	10
Diploma	1	5
Degree	8	40
Experience (years)		
Less than 1	5	25
1 - 5	6	30
6 – 10	3	15
11 - 15	4	20
More than 15	2	10
Role		
Farm owner	3	15
Manager	1	5
Supervisor	10	50
General worker	6	30

4.2 Respondent's Farm Information

The information collected about the respondents' farms is presented in Table 2, which highlights several noticeable trends across the Kelantan and Pahang dairy sector. Most farms were located in Pahang (n = 12, 60%), followed by Kelantan (n = 8, 40%). They were mainly operated under intensive system (n = 17, 85%), while only a small number used semi-intensive (n = 1, 5%) or extensive systems (n = 2, 10%). Crossbred cattle were the most common type kept on these farms (n = 16, 80%), with very few maintaining pure breeds (n = 1, 5%) and some reporting a mixture of breeds (n = 3, 15%).

Herd sizes varied widely, with more than half of the farms (n = 11, 55%) keeping over 50 animals. Smaller proportions managed herds of fewer than 10 (n = 4, 20%), between 11 and 29 (n = 2, 10%), or 30–50 head (n = 3, 15%). Most farms had been in operation for more than 10 years (n = 9, 45%), whereas others had operated for 6–10 years (n = 5, 25%), less than one year (n = 4, 20%), or between 1–5 years (n = 2, 10%).

Workforce size differed across farms, with two equally large groups: farms employing 1–5 workers (n = 8, 40%) and those using more than 15 workers (n = 8, 40%). A smaller number had 6–10 workers (n = 3, 15%) or 11–15 workers (n = 1, 5%). Regarding worker type,

half of the farms relied on a mixture of worker origins (n = 10, 50%), while others employed local workers (n = 7, 35%), foreign workers (n = 2, 10%), or family members (n = 1, 5%).

Most farms used machine milking systems (n = 16, 80%), with only a few still practising hand-milking (n = 4, 20%). Similarly, the majority had previously conducted milk quality checks (n = 16, 80%), while a smaller portion had never done so (n = 4, 20%).

Table 2: Detailed farm information

Factors	**Frequency**	**(%)**
Farm location		
Kelantan	8	40
Pahang	12	60
Management		
Intensive	17	85
Semi-intensive	1	5
Extensive	2	10
Breeds		
Crossbreeds	16	80
Pure breed	1	5
Mixture	3	15
Herd size		
Less than 10	4	20
11 – 29	2	10
30 – 50	3	15
More than 50	11	55
Operation (Years)		
Less than 1	4	20
1 – 5	2	10
6 – 10	5	10
More than 10	9	45
Number of farm workers		
1 – 5	8	40
6 – 10	3	15
11 – 15	1	5

Above 15	8	40
Type of worker		
Family	1	5
Local	7	35
Foreign	2	10
Mixture	10	50
Milking system		
Hand-milking	4	20
Machine-milking	16	80
Previous milk quality check		
Yes	16	80
No	4	20

4.3 Main health issues encountered in the farm

Table 4.3 presents the occurrence of common health problems reported on the respondents' farms. Mastitis was recorded by most farms (n = 15, 75%), showing that it remains a common issue in the study area. Lameness was also widely reported (n = 16, 80%), making it one of the most frequently encountered conditions. Abortion was noted by more than half of the respondents (n = 13, 65%), indicating reproductive challenges within their herds. Milk fever was reported by a considerable number of farms (n = 12, 60%). Ketosis appeared less frequently, with fewer respondents identifying this condition (n = 9, 45%). Calf mortality was reported by the majority of farms (n = 14, 70%), raising concerns about herd productivity and replacement. Respiratory disease was also reported by several respondents (n = 9, 45%).

Table 3: Main health issues in the farm

Main health problems in dairy farms	Frequency (%)
Mastitis	
Yes	15 (75)
No	5 (25)
Lameness	
Yes	16 (80)
No	4 (20)
Abortion	

Yes	13 (65)
No	7 (14)
Milk fever	
Yes	12 (60)
No	8 (40)
Ketosis	
Yes	9 (45)
No	11 (55)
Calf mortality	
Yes	14 (70)
No	6 (30)
Respiratory Disease	
Yes	9 (45)
No	11 (55)

4.4 Descriptive Analysis of KAP

Table 4.4 presents the descriptive statistics for the knowledge, attitude, and practice (KAP) scores among the respondents. The average knowledge score was 36.7 (SD = 3.10), with values ranging from 29 to 42, indicating that most farmers demonstrated a moderate to strong understanding of mastitis-related information. Attitude scores were comparatively consistent, with a mean of 28.3 (SD = 1.82) and a narrow range of 24 to 30, suggesting generally positive and aligned attitudes across the respondents. Practice scores, however, showed much greater variability, with a mean of 52.85 (SD = 12.00) and a wide score range from 13 to 65, highlighting substantial differences in how mastitis control and management practices were implemented on farms. Overall, Table 4.4 reflects relatively stable knowledge and attitude levels, but considerable variation in practical application among the farmers.

Table 4: Descriptive analysis of KAP

Variable	N	Mean	Std. Deviation	Min. Score	Max. Score
Knowledge	20	36.7	3.1000	29	42
Attitude	20	28.3	1.81934054	24	30
Practice	20	52.85	12.00114578	13	65

4.5 Assessment of Knowledge, Attitude, and Practice

4.5.1 Assessment of Knowledge

Table 5 shows the respondents' knowledge regarding mastitis, covering definitions, clinical signs, causative agents, diagnostic procedures, treatment, impacts, and prevention measures. Almost all respondents (n = 19, 95%) correctly identified mastitis as an inflammation of the udder. Recognition of clinical signs was also high, with all respondents identifying swelling (n = 20, 100%), and most recognising pain, redness, and increased warmth of the udder (n = 19, 95% each). Awareness of milk changes associated with mastitis was similarly strong, with many identifying flakes (n = 18, 90%), blood (n = 17, 85%), pus (n = 16, 80%), watery milk (n = 17, 85%), and foul odour (n = 20, 100%). However, fewer respondents were aware that mastitis can occur without visible clinical signs or changes in milk (n = 11, 55%).

Knowledge of causative agents was highest for bacterial infections (n = 20, 100%), while fewer respondents associated mastitis with viruses (n = 14, 70%), fungi (n = 8, 40%), or trauma (n = 18, 90%). Diagnostic procedures were well recognised, with all respondents identifying udder and milk examination (n = 20, 100% each). Familiarity with the CMT was high (n = 16, 80%), though fewer respondents were aware of SCC testing (n = 11, 55%).

For treatment, all respondents acknowledged antibiotics and anti-inflammatories as essential options (n = 20, 100% each), and most recognised the use of multivitamins (n = 19, 95%). Half believed surgery could be used (n = 10, 50%). Many agreed that medications must be prescribed by a licensed veterinarian (n = 17, 85%) and that prompt treatment improves production outcomes (n = 20, 100%).

Respondents also demonstrated strong knowledge of mastitis impacts, particularly on milk quality (n = 20, 100%), production cost (n = 20, 100%), cow health (n = 19, 95%), milk quantity (n = 19, 95%), and animal welfare (n = 18, 90%). Fewer associated mastitis with reduced conception rate (n = 7, 35%).

Knowledge of prevention methods was generally high, with all respondents identifying environmental hygiene, foremilk stripping, milking machine cleaning, and machine maintenance (n = 20, 100% each). Most recognised udder cleaning (n = 19, 95%), post-milking teat disinfection (n = 19, 95%), isolation of affected cows (n = 19, 95%), and maintaining good hand hygiene or glove use during milking (n = 19, 95%). Fewer identified post-milking standing (n = 14, 70%) and milking mastitis cows last (n = 13, 65%).

Table 5: Summary of responses for knowledge variable questions

Knowledge-based Item		Total (N=20)			
		Yes		No/I am not sure	
No	**Item**	**f**	**%**	**f**	**%**
1	Mastitis is the inflammation of the udder.	19	95	1	5
	Clinical signs of mastitis (udder changes)				
2	Swelling	20	100	0	0
3	Pain	19	95	1	5
4	Redness	19	95	1	5
5	Heat of the udder	19	95	1	5
	Milk changes during mastitis				
6	Flakes	18	90	2	10
7	Milk clot	20	100	0	0
8	Blood	17	85	3	15
9	Pus	16	80	4	20
10	Watery	17	85	3	15
11	Foul odour	20	100	0	0
12	Mastitis can occur in a cow without clinical signs and changes in milk	11	55	9	45
	Causative agent for mastitis				
13	Bacteria	20	100	0	0
14	Virus	14	70	6	30
15	Fungi	8	40	12	60
16	Trauma	18	90	2	10
	Diagnostic procedure for mastitis				
17	Examination of the udder	20	100	0	0
18	Examination of the milk	20	100	0	0
19	Californian Mastitis Test (CMT)	16	80	4	20
20	Somatic Cell Count (SCC) Test	11	55	9	45
	Treatment of mastitis				
21	Antibiotic	20	100	0	0
22	Anti-inflammatory	20	100	0	0
23	Multivitamin	19	95	1	5
24	Surgery	10	50	10	50

25	Prescription of medications must be made only by a licensed veterinarian	17	85	3	15
26	Prompt treatment of a mastitis cow can help improve production	20	100	0	0
	Aspects impacted by mastitis				
27	Cow's health	19	95	1	5
28	Milk quantity	19	95	1	5
29	Milk quality	20	100	0	0
30	Animal welfare	18	90	2	10
31	Conception rate	7	35	13	65
32	Cost of production	20	100	0	0
	Prevention method for mastitis				
33	Environmental hygiene	20	100	0	0
34	Foremilk stripping before milking	20	100	0	0
35	Cleaning the udder with soap and clean clothes before milking	19	95	1	5
36	Disinfecting the udder after milking	19	95	1	5
37	Post-milking standing	14	70	6	30
38	Milk the mastitis cow last	13	65	7	35
39	Isolation of a mastitis cow from the healthy herd	19	95	1	5
40	Wearing clean gloves or washing hands frequently during milking	19	95	1	5
41	Cleaning of the milking machine	20	100	0	0
42	Maintenance of the milking machine	20	100	0	0

f = frequency, N = population size

4.5.2 Assessment of Attitude

Table 6 presents the respondents' attitudes toward mastitis detection, treatment, and control. Most respondents agreed that routine screening is essential for early detection of mastitis, with the majority strongly agreeing (n = 17, 85%) and a few agreeing (n = 2, 10%). More than half of the respondents (n = 11, 55%) strongly agreed that only qualified veterinarians should prescribe and administer treatments, while the remaining respondents selected neutral (n = 8, 40%) or agreed (n = 1, 5%).

Most respondents strongly agreed that veterinarians should manage mastitis on a case-by-case basis (n = 14, 70%), while fewer selected "agree" (n = 2, 10%), "neutral" (n = 1, 5%), or "disagree" (n = 2, 10%). Respondents also expressed strong views on their own role in mastitis control, with most strongly agreeing that farmers play an essential role (n = 18, 90%) and a small number agreeing (n = 1, 5%) or strongly disagreeing (n = 1, 5%).

Training was similarly valued, as many strongly agreed that farmers need additional training on mastitis management (n = 17, 85%), while a small number selected neutral (n = 1, 5%), agree (n = 1, 5%), or strongly disagree (n = 1, 5%). Preventive measures were also widely supported, with most respondents strongly agreeing that prevention is essential to reduce mastitis on dairy farms (n = 18, 90%) and a few agreeing (n = 1, 5%) or strongly disagreeing (n = 1, 5%). Overall, the responses indicate a generally positive attitude toward proper mastitis control, veterinary involvement, training, and preventive practices among the farmers.

Table 6: Summary of responses for attitude variable questions

Attitude-based Item		Total scale									
		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree	
No	Item	f	%	f	%	f	%	f	%	f	%
1	Routine screening is an important practice for the early detection of mastitis.	1	5	0	0	0	0	2	10	17	85
2	Prescription of medicine and treatment should only be made by a licensed veterinarian.	0	0	0	0	8	40	1	5	11	55
3	Treatment of mastitis should be done on a case-by-case basis.	1	5	2	10	1	5	2	10	14	70
4	Farmers play an important role in mastitis control.	1	5	0	0	0	0	1	5	18	90
5	Farmers need training on mastitis management	1	5	0	0	1	5	1	5	17	85
6	Preventive measures are required to reduce mastitis in dairy farms.	1	5	0	0	0	0	1	5	18	90

f = frequency

4.5.3 Assessment of Practice

Table 7 summarises the response for the practice section. Washing the cow house revealed a positive trend, with a high number of respondents (n = 12, 60%) always performing this task and another portion (n = 4, 20%) doing it often. Showering cows before milking was consistently carried out by most respondents, with the majority (n = 13, 65%) always doing so and a smaller group (n = 4, 20%) doing so frequently. Cleaning the udder before milking and foremilk stripping showed moderate compliance, with around half of respondents always performing these practices (n = 10–12, 50–60%), while a low number reported doing it sometimes or never.

Disinfection of the udder after milking, wearing gloves, frequent hand washing, and cleaning or maintaining the milking machine showed high adherence, with the majority of

respondents (n = 13, 65% for each) always performing these tasks, and additional respondents doing them often. Allowing cows to stand after milking and separating cows with mastitis from the healthy herd were followed by a moderate number of respondents, with the majority (n = 9–12, 45–60%) consistently performing these actions. In contrast, fewer respondents did so sometimes or rarely. Milking cows with mastitis last was less consistently applied, with only a moderate portion (n = 8, 40%) always following this practice, while others did it often, sometimes, or rarely.

Seeking veterinary advice for treatment and drug prescriptions revealed a positive trend, with more than half of respondents (n = 11, 55%) always consulting a veterinarian, and additional respondents consulting a veterinarian often or sometimes. Routine screening using the CMT test revealed lower engagement, with only a small portion (n = 6, 30%) consistently performing it, while a notable number (n = 6, 30%) reported never having performed the test.

Table 7: Summary of responses for practice variable questions

Practice-based Item		Total scale									
		Never		Rarely		Sometime		Often		Always	
No	Item	f	%	f	%	f	%	f	%	f	%
1	I wash the cow's house.	1	5	0	0	3	15	4	20	12	60
2	I shower the cow prior to milking	1	5	0	0	2	10	4	20	13	65
3	I clean the cow's udder before milking.	4	20	0	0	2	10	4	20	10	50
4	I do the foremilk stripping before milking.	1	5	0	0	3	15	4	20	12	60
5	I disinfect the cow's udder after milking.	2	10	0	0	2	10	3	15	13	65
6	I allow the cow to stand for a while after milking	4	20	0	0	3	15	4	20	9	45
7	I milk the mastitis cow last, after all healthy cows have been milked.	5	25	1	5	1	5	5	25	8	40
8	I separate the mastitis cow from the healthy herd.	2	10	1	5	1	5	4	20	12	60

9	I wear gloves and wash my hands frequently during milking.	1	5	0	0	2	10	4	20	13	65
10	I clean the milking machine after using it.	1	5	0	0	2	10	4	20	13	65
11	I do the maintenance of the milking machine at its recommended interval.	1	5	0	0	3	15	3	15	13	65
12	I sought veterinary advice for treatment and a prescription for mastitis.	1	5	0	0	4	20	4	20	11	55
13	I performed routine screening of mastitis, such as the CMT test.	6	30	2	10	2	10	4	20	6	30

f = frequency

4.5.4 Summary of Respondents' Level of Knowledge, Attitude and Practice

Table 8 presents the overall levels of knowledge, attitude, and practice among the respondents regarding mastitis management. All respondents (n = 20, 100%) demonstrated good knowledge, scoring between 25 and 42, with none falling into the poor knowledge category. Similarly, attitude scores were uniformly positive, as all respondents (n = 20, 100%) achieved good attitude scores, ranging from 24 to 30, and none were classified as poor or moderate. For practice, the results were more varied. A majority of respondents (n = 13, 65%) demonstrated good practice, scoring between 52 and 65, while a smaller portion (n = 7, 35%) fell into the poor practice category, with scores ranging from 1 to 38. Overall, the table indicates that while knowledge and attitudes toward mastitis were uniformly high, practical implementation varied among the farmers.

Table 8: Summary of respondents' level of knowledge, attitude and practice

Variables	Level	Score	Frequency (%)
Knowledge	Poor	01 to 25	0 (0)
	Good	25 to 42	20 (100)
Attitude	Poor	01 to 17	0 (0)
	Moderate	18 to 23	0 (0)
	Good	24 to 30	20 (100)
Practice	Poor	01 to 38	07 (35)

	Good	52 to 65	13 (65)

4.6 The Associations Between Sociodemographic Variables and KAP

4.6.1 The Associations Between Sociodemographic Variables and Knowledge

Table 9 demonstrates that all respondents achieved a good level of knowledge (n = 20, 100%), with no individuals falling into the poor category across any subgroup. This uniform finding was consistent for both males (n = 15, 100%) and females (n = 5, 100%). A similarly high number of respondents in the younger age group (18 to 30 years; n = 11, 100%) and the older group (31 to 50 years; n = 9, 100%) also showed good knowledge. The same pattern emerged across race, with Malay (n = 19, 100%) and Chinese (n = 1, 100%) participants demonstrating good knowledge scores. All education categories, ranging from those with no formal education (n = 1, 100%) to SPM (n = 8, 100%), certificate holders (n = 2, 100%), diploma holders (n = 1, 100%) and degree holders (n = 8, 100%), reflected complete demonstration of good knowledge. This trend continued across various experience levels, farm roles, farm locations, management systems, breed types, herd sizes, years of operation, milking systems, and past engagement in milk quality checks, with every subgroup demonstrating good knowledge levels. Because there was no variation between categories, the FET produced very small p-values, indicating identical outcomes rather than meaningful differences.

Table 9: Summary of the associations between socio-demographic variables and knowledge

Variables		**Knowledge Level**		**Total**	**Fisher's Exact Test**	**p-value**
		Poor	**Good**			
Gender	Male	0	15	15	51.796	<0.001
	Female	0	5	5		
Age	18 to 30 years	0	11	11	51.518	<0.001
	31 to 50 years	0	9	9		
Race	Malay	0	19	19	53.169	<0.001
	Chinese	0	1	1		
	Indian	0	0	0		

Education	No formal education	0	1	1	49.932	<0.001
	SPM	0	8	8		
	Certificate	0	2	2		
	Diploma	0	1	1		
	Degree	0	8	8		
Experience (Years)	Less than 1	0	5	5	48.204	<0.001
	1 to 5	0	6	6		
	6 to 10	0	3	3		
	11 to 15	0	4	4		
	More than 15	0	2	2		
Role	Farm owner	0	3	3	50.034	<0.001
	Manager	0	1	1		
	Supervisor	00	10	10		
	General worker	0	6	6		
Location	Kelantan	0	8	8	51.549	<0.001
	Pahang	0	12	12		
Management	Intensive	0	17	17	52.144	<0.001
	Sem-intensive	0	1	1		
	Extensive	0	2	2		
Breeds	Cross breeds	0	16	16	51.799	<0.001
	Pure breeds	0	1	1		
	Mixture	0	3	3		
Herd size	Less than 10	0	4	4	49.651	<0.001
	11 to 29	0	2	2		
	30 to 50	0	3	3		

	More than 50	0	11	11		
Operation (Years)	Less than 1	0	4	4	49.341	<0.001
	1 to 5	0	2	2		
	6 to 10	0	5	5		
	Above 10	0	9	9		
Milking system	Hand-milking	0	4	4	51.955	<0.001
	Machine-milking	0	16	16		
Previous milk quality check	Yes	0	16	16	51.955	<0.001
	No	0	4	4		

4.6.2 The Associations Between Sociodemographic Variables and Attitude

Table 10 presents the distribution of respondents' attitude levels across all demographic and farm-related variables. All respondents demonstrated a good attitude (n = 20, 100%), and none fell into the poor or moderate categories. This pattern remained consistent across gender, as both males (n = 15, 100%) and females (n = 5, 100%) showed a good attitude. The same finding was observed in both age groups, as individuals aged 18 to 30 years (n = 11, 100%) and those aged 31 to 50 years (n = 9, 100%) achieved good scores. A similarly high number of respondents within each race category showed a good attitude, including Malay (n = 19, 100%) and Chinese (n = 1, 100%). All education groups demonstrated the same outcome, including those with no formal education (n = 1, 100%), SPM (n = 8, 100%), certificate holders (n = 2, 100%), diploma holders (n = 1, 100%), and degree holders (n = 8, 100%). The uniform distribution also appeared across different experience levels, farm roles, farm locations, management practices, breed types, herd sizes, years of farm operation, milking systems, and previous milk quality checks, with each subgroup showing that all individuals had good attitudes. Due to this complete similarity across all categories, the FET produced very small p-values, reflecting the absence of variation rather than actual statistical differences.

Table 10: Summary of the associations between socio-demographic variables and attitude

Variables		Attitude Level			Total	Fisher's Exact Test	p-value
		Poor	Moderate	Good			
Gender	Male	0	0	15	15	51.796	<0.001
	Female	0	0	5	5		
Age	18 to 30 years	0	0	11	11	51.518	<0.001
	31 to 50 years	0	0	9	9		
Race	Malay	0	0	19	19	53.169	<0.001
	Chinese	0	0	1	1		
	Indian	0	0	0	0		
Education	No formal education	0	0	1	1	49.932	<0.001
	SPM	0	0	8	8		
	Certificate	0	0	2	2		
	Diploma	0	0	1	1		
	Degree	0	0	8	8		
Experience (Years)	Less than 1	0	0	5	5	48.204	<0.001
	1 to 5	0	0	6	6		
	6 to 10	0	0	3	3		
	11 to 15	0	0	4	4		
	More than 15	0	0	2	2		
Role	Farm owner	0	0	3	3	50.0334	<0.001
	Manager	0	0	1	1		
	Supervisor	0	0	10	10		
	General worker	0	0	6	6		
Location	Kelantan	0	0	8	8	51.549	<0.001
	Pahang	0	0	12	12		
Management	Intensive	0	0	17	17	52.144	<0.001
	Sem-intensive	0	0	1	1		
	Extensive	0	0	2	2		
Breeds	Cross breeds	0	0	16	16		<0.001
	Pure breeds	0	0	1	1		
	Mixture	0	0	3	3		

Herd size	Less than 10	0	0	4	4	49.651	<0.001
	11 to 29	0	0	2	2		
	30 to 50	0	0	3	3		
	More than 50	0	0	11	11		
Operation (Years)	Less than 1	0	0	4	4	49.341	<0.001
	1 to 5	0	0	2	2		
	6 to 10	0	0	5	5		
	Above 10	0	0	9	9		
Milking system	Hand-milking	0	0	4	4	51.955	<0.001
	Machine-milking	0	0	16	16		
Previous milk quality check	Yes	0	0	16	16	51.955	<0.001
	No	0	0	4	4		

4.6.3 The Associations Between Sociodemographic Variables and Practice

Table 11 shows that a considerable proportion of respondents demonstrated strong practice scores, with 65% (n = 13) falling within the good practice range, while the remaining 35% (n = 7) were in the poor practice category. The distribution across demographic and farm-related factors further highlights the relationship between these characteristics and practice levels. Among males, 40% (n = 8) demonstrated poor practice, and 60% (n = 9) showed good practice. In contrast, females had 20% (n = 1) poor practice and 80% (n = 4) good practice. For the age groups, respondents aged 18–30 years recorded 36% (n = 4) with poor practice and 64% (n = 7) with good practice, while those aged 31–50 years had a higher proportion of poor practice at 67% (n = 6). Malays made up the majority of respondents, with 37% (n = 7) demonstrating poor practice and 63% (n = 12) showing good practice. Education appeared to influence practice scores, particularly among degree holders, where 88% (n = 7) demonstrated good practice. Experience also played a role, with those having 1–5 years of experience showing entirely good practice (n = 6), whereas respondents with less than one year recorded 60% (n = 3) poor practice. In terms of farm roles, supervisors generally demonstrated stronger practice (80%, n = 8), while general workers showed poorer practice at 67% (n = 4). Machine-milking operators recorded a higher proportion of good practice (75%, n = 12) compared to hand-milking (25%, n = 1). Larger herds, particularly those with more than 50 animals,

recorded 64% good practice (n = 7). Fisher's Exact Test values, all with $p < 0.001$, indicate that demographic factors, work roles, herd characteristics and management factors were significantly associated with respondents' practice levels.

Table 11: Summary of the associations between socio-demographic variables and practice

Variables		Practice Level		Total	Fisher's Exact Test	p-value
		Poor	Good			
Gender	Male	6	9	15	51.208	<0.001
	Female	1	4	5		
Age	18 to 30 years	4	7	11	50.448	<0.001
	31 to 50 years	6	3	9		
Race	Malay	7	12	19	52.555	<0.001
	Chinese	0	1	1		
	Indian	0	0	0		
Education	No formal education	0	1	1	56.762	<0.001
	SPM	3	5	8		
	Certificate	1	1	2		
	Diploma	1	0	1		
	Degree	1	7	8		
Experience (Years)	Less than 1	3	2	5	55.492	<0.001
	1 to 5	0	6	6		
	6 to 10	2	1	3		
	11 to 15	1	3	4		
	More than 15	1	1	2		
Role	Farm owner	1	2	3	54.462	<0.001
	Manager	0	1	1		
	Supervisor	2	8	10		

	General worker	4	2	6		
Location	Kelantan	5	3	8	50.510	<0.001
	Pahang	8	4	12		
Management	Intensive	7	10	17	53.283	<0.001
	Sem-intensive	0	1	1		
	Extensive	0	2	2		
Breeds	Cross breeds	7	9	16	53.654	<0.001
	Pure breeds	0	1	1		
	Mixture	0	3	3		
Herd size	Less than 10	3	1	4	54.552	<0.001
	11 to 29	0	2	2		
	30 to 50	0	3	3		
	More than 50	4	7	11		
Operation (Years)	Less than 1	3	1	4	53.757	<0.001
	1 to 5	1	1	2		
	6 to 10	1	4	5		
	Above 10	2	7	9		
Milking system	Hand-milking	3	1	4	53.995	<0.001
	Machine-milking	4	12	16		

*Association is significant at $p < 0.05$

4.7 Correlation Analysis Between Total Knowledge, Attitude and Practice

Table 12 shows the relationships between knowledge, attitude, and practice scores among the respondents. The correlation between knowledge and attitude was very weak and not statistically significant ($r = 0.078$, $p = 0.744$), indicating that higher knowledge scores were not associated with more positive attitudes in this sample. Knowledge and practice showed a moderate negative correlation ($r = -0.351$, $p = 0.130$), although this relationship was not statistically significant, suggesting that better knowledge did not necessarily translate into better practical implementation. Similarly, attitude and practice exhibited a moderate positive correlation ($r = 0.339$, $p = 0.144$), but this was also not significant.

Table 12: Results of Pearson's Correlation

Variables	Pearson Correlation Coefficient (r)	p-value
Knowledge - Attitude	0.078	0.744
Knowledge - Practice	-0.351	0.130
Attitude - Practice	0.339	0.144

*Correlation is significant at $p < 0.05$

CHAPTER 5
DISCUSSION

This study is the first in Malaysia to assess the knowledge, attitudes, and practices related to bovine mastitis among dairy farmers, as no previous work with a similar aim has been carried out locally. The study population was drawn from Kelantan and Pahang. These states were selected because they include small-scale, medium-scale, and commercial dairy operations and are part of the National Key Economic Area under the National Dairy Plan (Department of Veterinary Services, 2021). The limited number of KAP studies in ruminant health within this region also made it an appropriate starting point for research. The total number of respondents in this study was only twenty. This was primarily due to the small and specific population involved, as well as the low participation rate. Similar to the reports by Sadiq *et al.* (2021), respondents in this study were more willing to engage during face-to-face interviews than they were with online questionnaires. This preference, combined with the constraints of time and cost, further contributed to the small sample size.

The sociodemographic analysis indicated that most participants were male (n = 15, 75%) and aged 18–30 years (n = 11, 55%), suggesting that the dairy farming workforce in this region is predominantly young and male. This may reflect the physically demanding nature of dairy farming, consistent with the findings of Sadiq *et al.* (2021), who also reported that a majority of young male farmers are involved in this sector. Nearly all participants were Malay (n = 19, 95%), with only one Chinese participant (n = 1, 5%) and no Indian respondents, mirroring the demographic profile of the Kelantan and Pahang states. In this study, 40% of respondents (n = 8) had completed SPM, and another 40% (n = 8) held a Bachelor's degree. In contrast, the remaining respondents had either a diploma (n = 1, 5%), certificates (n = 2, 10%), or no formal education (n = 1, 5%). These results reflect a similar pattern to the findings of Sadiq et al. (2024), where 45.6% (n = 52) had completed SPM and 49.1% (n = 56) had graduated from a higher institution. However, unlike their study, which reported 5.3% (n = 6) postgraduate respondents, none of the farmers in the present study held postgraduate qualifications. Similarly, Sadiq et al. (2021) reported an evenly distributed educational background, with equal proportions of respondents having completed SPM (n = 42, 50%) and higher education at institutions (n = 42, 50%). Most respondents had limited experience, with 25% (n = 5) having less than 1 year of experience, and 30% (n = 11) having one to five years of experience in the industry. The findings are considerably lower in contrast to Sadiq *et al.* (2024), where only 28.9% (n = 33) had one to five years of experience. Farm roles were

dominated by supervisors (n = 10, 50%) and general workers (n = 6, 30%), with fewer farm owners (n = 3, 15%) and managers (n = 1, 5%). Limited experience, the prevalence of general worker roles, and lower education levels may contribute to reduced expertise in managing mastitis, which could help explain the lower knowledge, attitude, and practice scores observed in this group.

The analysis of farm characteristics revealed that most respondents were from Pahang (n = 12, 60%), followed by Kelantan (n = 8, 40%). The majority of farmers operated under an intensive system (n = 17, 85%), while smaller proportions used semi-intensive (n = 1, 5%) or extensive systems (n = 2, 10%). The findings differ from those of Sadiq et al. (2021) and Sadiq et al. (2024), which reported that semi-intensive farms account for more than half, with respective percentages of 55.5% (n = 55) and 56.1% (n = 64). More than half of the farms in this study maintained herds of over 50 animals (55%), with smaller proportions managing fewer than 10 (20%), between 11 and 29 (10%), or between 30 and 50 (15%) head. Larger herds tend to experience more disease incidents, which may provide farmers with greater exposure and experience in disease management, potentially contributing to higher KAP scores (Özlü et al., 2020). Most farms in this study used machine milking systems (n = 16, 80%), while a minority still practised hand milking (n = 4, 20%). Machine milking can contribute to mastitis through physical trauma and bacterial entry into the teat canal due to pressure changes (Noorlander, 1977). Conversely, hand milking by inexperienced personnel may also induce teat trauma and contamination from poor hygiene (Stanek *et al*., 2024). Supporting this, a study by Singh & Ramachandran (2020) in India found that only 80% (n = 24) of milkers washed their hands before milking. Likewise, the majority of farms in the current study had previously conducted milk quality checks (n = 24, 80%), whereas a smaller proportion had never performed such checks (n = 6, 20%), leaving the possibility that poor milk quality or subclinical mastitis may have gone undetected on these farms.

Dairy cattle farmers in this study reported mastitis (n = 15, 75%) and lameness (n = 16, 80%) as the most common health problems in their herds. Reproductive issues, including abortion (n = 13, 65%) and calf mortality (n = 14, 70%), as well as milk fever (n = 12, 60%), were also frequently observed, while ketosis (n = 9, 45%) and respiratory disease (n = 9, 45%) appeared less often. The findings are consistent with previous research by Sadiq *et al.* (2024), which identified mastitis (n = 68, 59.6%) and lameness (n = 66, 57.9%) as the main health problems on the farm. These conditions often occur during periods of physiological stress,

particularly around calving, when dairy cows undergo metabolic, immune, and inflammatory changes that increase their susceptibility to mastitis, lameness, and other health disorders (Lopreiato *et al.*, 2020).

This study shows that all respondents (n = 20, 100%) achieved good scores in knowledge and attitude regarding mastitis management. In contrast, practice varied, with 65% (n = 13) of respondents demonstrating good practice and 35% (n = 7) falling into the poor category. However, it is important to note that, although the majority of farmers are aware of the clinical signs of mastitis in the udder and milk changes, 45% (n=9) of respondents failed to recognise that mastitis in the subclinical stage can occur without visible clinical signs and milk changes. This finding is concerning, considering that the prevalence of subclinical mastitis on the East Coast of Peninsular Malaysia is 31.4% (n = 74), as reported by Saeed *et al*. (2022). Additionally, subclinical mastitis has been shown to reduce both milk yield and milk quality significantly (Martins *et al*., 2020).

Furthermore, the knowledge on the aetiology of mastitis is variable, where the majority identified these as causative, bacteria (n = 20, 100%), trauma (n = 18, 90%), fewer can recognise virus (n = 14, 70%) and fungi (n = 8, 40%). Previous studies have suggested that viruses, such as foot-and-mouth disease virus, may contribute directly or indirectly to bovine mastitis (Wellenberg *et al*., 2002). In contrast, fungi, including Candida spp. and Aspergillus spp., have been isolated from cases of mycotic mastitis (Raheel *et al.*, 2023). Regarding diagnostic practices, 20% (n = 10) of farmers were unfamiliar with the California Mastitis Test (CMT), while 45% (n = 9) were not aware of the somatic cell count (SCC) test. This lack of awareness is significant because both CMT and SCC are essential tools for diagnosing subclinical mastitis (Khasapane *et al.*, 2023). While farmers generally demonstrated a high level of knowledge about mastitis prevention, fewer recognised the importance of post-milking standing (n = 14, 70%) and milking mastitis cows last (n = 13, 65%), highlighting gaps in practices that could allow cross-contamination from infected to healthy cows.

The farmers' attitudes in this study were highly favourable toward mastitis detection and control, with strong endorsement of routine screening (n = 17, 85%), preventive measures (n = 18, 90%), and additional training (n = 17, 85%). These findings are consistent with reports from Bangladesh, where farmers overwhelmingly supported hygienic practices and early intervention to prevent mastitis (Rahman *et al.*, 2018). Similarly, Swiss surveys on antimicrobial use indicate that farmers generally recognise the importance of veterinary

guidance in disease management (Tepeli, 2023). However, the relatively high proportion of neutral responses regarding veterinarian-only prescriptions suggests underlying economic or access-related constraints, as seen in Kenya, where farmers often bypass withdrawal periods due to financial pressures or limited residue testing (Nyokabi *et al.*, 2021). This situation led to an increased risk of antimicrobial resistance (AMR) due to the misuse of antibiotics, including not consulting a veterinarian prior to use. The synthesis by Tepeli (2023) further highlights that positive attitudes do not always translate into appropriate antimicrobial practices, as some farmers rely on personal experience rather than veterinary directives. Overall, the findings suggest strong awareness and motivation among respondents, but structural and economic barriers must be addressed to ensure that favourable attitudes lead to consistent, responsible mastitis control.

In this study, the respondents demonstrated variable adherence to mastitis management practices. Hygiene measures, such as washing the cow house and showering cows prior to milking, were well implemented, with 60–65% (always performing these tasks. Cleaning the udder before milking and foremilk stripping showed moderate compliance, while post-milking measures, including udder disinfection, handwashing, wearing gloves, and milking machine maintenance, were widely followed. Practices to reduce cross-contamination, such as allowing cows to stand after milking, separating mastitis cows, and milking infected cows last, were less consistently applied. The veterinary consultation was generally positive, but the routine screening using the CMT test yielded low results. Overall, 65% of respondents demonstrated good practice, while 35% fell into the poor practice category. Similar trends were observed in Bangladesh (Sarker et al., 2018) and Kenya (Nyokabi et al., 2021), with Swiss farmers exhibiting stronger adherence to veterinary guidance but occasionally relying on personal experience (O. Tepeli, 2023). These findings suggest that although knowledge and attitudes are high, practical implementation requires further support through training and improved veterinary access.

The analysis of sociodemographic and farm variables revealed that all respondents achieved good knowledge and attitude levels, regardless of gender, age, race, education, or farm characteristics. This indicates that awareness and mindset regarding mastitis detection, treatment, and prevention were consistently high among the farmers. However, practical implementation varied. While most farmers consistently performed key preventive measures, such as washing the cow house, showering cows before milking, udder disinfection,

handwashing, and maintaining milking machines, other practices, including foremilk stripping, allowing cows to stand post-milking, separating cows with mastitis, and milking infected cows last, were less consistently applied. Overall, 65% of respondents demonstrated good practice, while 35% fell into the poor practice category.

Several factors, including education, farm role, herd size, and experience, influenced practice levels. Respondents with high school or university education demonstrated not only higher knowledge and stronger attitudes but also tended to implement better mastitis prevention practices, suggesting that formal education enhances both understanding and application of recommended measures. In contrast, respondents with lower education levels or who were illiterate demonstrated weaker adherence to certain practices, suggesting that knowledge alone may not be sufficient without practical guidance or experience. This pattern aligns with findings from Tajikistan, where livestock farmers with lower education levels generally had lower knowledge, attitudes, and practices regarding protection from zoonotic diseases (Lindahl et al., 2015). Farm roles also played a part, with supervisors generally performing better than general workers, likely due to differences in qualifications, responsibilities, and routine tasks. Experience gained from past disease outbreaks also shaped farmers' behaviour. This observation aligns with studies in Bangladesh, where less experienced cattle handlers were more proactive in preventive practices against zoonotic tuberculosis and brucellosis compared to their more experienced counterparts (Islam et al., 2021). Younger farmers tended to implement preventive strategies more readily, likely due to their higher educational qualifications and greater awareness of the disease's impact, whereas older farmers, despite their accumulated experience, were sometimes less likely to adopt new practices. Herd size and milking system also influenced adherence, as farmers managing larger herds or using mechanised milking systems appeared more consistent in preventive practices, possibly due to structured routines and greater economic incentives to maintain milk quality.

The researchers examined the relationships between knowledge, attitude, and practice scores to explore how these components interact. The correlation between knowledge and attitude was very weak and not statistically significant ($r = 0.078$, $p = 0.744$), indicating that higher knowledge did not necessarily correspond to more positive attitudes in this sample. Knowledge and practice showed a moderate negative correlation ($r = -0.351$, $p = 0.130$), although this was not significant, suggesting that greater knowledge did not automatically translate into better practical implementation. Similarly, attitude and practice exhibited a

moderate positive correlation (r = 0.339, p = 0.144), but this too was not significant, implying that while more positive attitudes may have some influence on practice, other factors likely play a stronger role in determining whether knowledge and attitude are converted into consistent actions on the farm. Overall, these findings demonstrate that translating knowledge and attitudes into practical action is not straightforward, underscoring the need for ongoing training, guidance, and hands-on support to help farmers implement effective mastitis control measures.

This study has several limitations. The primary concern is the small sample size, which may reduce the statistical strength and compromise the generalizability of the findings, making it challenging to represent the larger population accurately. Due to the small sample size, the researcher has no choice but to opt for an alternative statistical analysis, specifically Fisher's exact test. Although Fisher's exact test is suitable for small sample sizes, the result can be challenging to compare with other KAP papers on mastitis, because most other papers use chi-square analysis. It primarily limits the interpretation and discussion of the data to the association between the KAP score and sociodemographic factors. In addition, there is a lack of local KAP studies on mastitis in Malaysia, which makes it challenging to adapt the questionnaire to the local context, particularly in terms of the suitability of the questions that reflect the problems occurring in the field. Similarly, the lack of research papers on ruminants in Malaysia, especially regarding mastitis in dairy cattle, also becomes a challenge. As a result, several design decisions relied on the researcher's own judgement. Additionally, the study's short duration presented a significant challenge, particularly in the development of the questionnaire and the data collection process. Furthermore, farmers tend to respond better during face-to-face interviews, but limited time, travel distance, and associated costs reduce opportunities for more extensive sampling. In all, these limitations should be considered when interpreting the findings and suggest that future research would benefit from larger sample sizes, more extended study periods, and the use of validated instruments tailored to local conditions.

CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion, this study accepted the hypothesis that dairy farmers in Kelantan and Pahang demonstrate poor mastitis management practices. The study also rejected the hypotheses that farmers possess poor knowledge and good attitudes toward mastitis, as well as the hypothesis that a significant correlations exist between KAP scores. Although farmers generally understood mastitis and held positive attitudes toward its management, gaps remained in the practical implementation of preventive measures. Education, farm role, herd size, and milking system influenced adherence to good practices, while experience and exposure to intensive management systems supported better compliance. These findings highlight that knowledge and attitudes alone do not guarantee effective mastitis control. Therefore, targeted training and practical, hands-on guidance are essential to bridge this knowledge–practice gap and improve herd health and milk quality.

6.2 Recommendation

It is recommended that farmers maintain high standards of hygiene across all farm areas, particularly the cow housing facilities and the milking parlour, as poor sanitation increases the risk of mastitis transmission and environmental contamination. Farmers should also implement proper milking practices, including thorough pre-milking udder cleaning using soap and a clean cloth to reduce bacterial load, as well as consistent post-milking teat dipping with an effective disinfectant to prevent new intramammary infections. Additional preventive measures, such as isolating affected animals and ensuring that mastitis-positive cows are milked last, should be routinely practised to minimise the spread of pathogens within the herd.

A collaborative approach between universities and state veterinary services is strongly recommended to strengthen farmers' technical knowledge. Regular training programmes, workshops, and on-farm demonstrations will help farmers remain updated on mastitis prevention strategies, subclinical mastitis detection, and proper use of screening tools such as the California Mastitis Test. Enhancing farmer competency through ongoing education will foster improved herd health and sustainable dairy productivity.

Finally, expanding similar research to other regions of Malaysia, including Sabah and Sarawak in East Malaysia, as well as the West Coast of Peninsular Malaysia, is recommended.

Broader regional studies would provide a more comprehensive understanding of mastitis-related knowledge, attitudes, and practices across different production systems, enabling more targeted national-level interventions.

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APPENDIX

8.1 Appendix 1: Google Form Questionnaire

Kaji Selidik Tentang Pengetahuan, Sikap, dan Amalan Terhadap Mastitis dalam Kalangan Penternak Lembu Tenusu di Pantai Timur, Semenanjung Malaysia.

Responden yang dihormati,

Saya, Ahmad Amir Akmal Bin Abdul Hamid (D21B0100), merupakan seorang pelajar Tahun 4 Doktor Perubatan Veterinar, dari Universiti Malaysia Kelantan (UMK). Anda telah dijemput untuk menyertai tinjauan ini, sebagai sebahagian dari projek tahun akhir saya. Ini adalah sebuah tinjauan untuk mendapatkan maklumat berkenaan pengetahuan, sikap, dan amalan (KAP) mengenai mastitis (atau juga dikenali sebagai bengkak susu) dalam kalangan penternak lembu tenusu di Pantai Timur, Malaysia.

Anda layak untuk menyertai kajian ini jika anda memenuhi kriteria berikut :
1. Berumur 18 tahun dan ke atas.
2. Penternak lembu tenusu di Kelantan, Pahang atau Terengganu.
3. Boleh membaca, menulis, dan faham samada Bahasa Malaysia atau Bahasa Inggeris.
4. Bukan seorang doktor veterinar

Tempoh masa menjawab soal-selidik ini ini ialah selama 10 minit. Penyertaan anda di dalam kajian ini adalah secara sukarela. Semua maklumat yang dikumpul daripada tinjauan ini akan dijaga dengan kerahsiaan yang ketat dan hanya akan digunakan bagi tujuan kajian akademik sahaja. Penglibatan anda dalam kajian ini akan sangat membantu dalam menilai pengetahuan, sikap, dan amalan lazim mengenai penyakit mastitis dalam kalangan penternak lembu tenusu di negeri Pantai Timur, Malaysia.

Jika anda mempunyai sebarang pertanyaan berkenaan kajian ini, sila hubungi :

- Dr. Mohamad Sabri Bin Abdul Rahman (sabri.ar@umk.edu.my ; 0136339874)
- Ahmad Amir Akmal Bin Abdul Hamid (d21b0100@siswa.umk.edu.my ; 0122231348)

Dear Respondents,

I am Ahmad Amir Akmal Bin Abdul Hamid (D21B0100), a fourth-year Doctor of Veterinary Medicine student from Universiti Malaysia Kelantan (UMK). I invite you to participate in this survey as part of my final year project. The aim of this survey is to assess the knowledge

I am Ahmad Amir Akmal Bin Abdul Hamid (D21B0100), a fourth-year Doctor of Veterinary Medicine student from Universiti Malaysia Kelantan (UMK). I invite you to participate in this survey as part of my final year project. The aim of this survey is to assess the knowledge, attitude, and practices (KAP) concerning mastitis among dairy cattle farmers in the East Coast of Peninsular Malaysia.

You are eligible to participate in this study if you meet the following criteria:

1. You are 18 years of age or older.
2. You are a dairy cattle farmer in Kelantan, Pahang, or Terengganu.
3. You can read, write, and understand either Bahasa Malaysia or English.
4. You are not a veterinarian.

The survey will take approximately 10 minutes to complete. Your participation is entirely voluntary. All information collected will be treated with strict confidentiality and will only be used for academic research purposes. Your contribution to this study will significantly help in evaluating the current knowledge, attitude, and practices regarding mastitis among dairy cattle farmers on the East Coast of Peninsular Malaysia.

If you have any questions about the study, please feel free to contact:

- Dr. Mohamad Sabri Bin Abdul Rahman (sabri.ar@umk.edu.my ; 0136339874)
- Ahmad Amir Akmal Bin Abdul Hamid (d21b0100@siswa.umk.edu.my ; 0122231348)

Thank you for your participation!

* Indicates required question

BORANG PERSETUJUAN / CONSENT FORM *

Saya memahami tujuan tinjauan ini dan bersetuju untuk mengambil bahagian dalam kajian ini.

I do understand the purpose of the survey and agree to participate in this study.

◯ Ya, saya setuju / Yes, I agree

BAHAGIAN A : MAKLUMAT SOSIODEMOGRAPHIC PENTERNAK / PART A : FARMER'S DEMOGRAPHIC INFORMATION

Gender *

- ◯ Male
- ◯ Female

Age Group (Year) *

- ◯ 18 - 30
- ◯ 31 - 50
- ◯ > 50

Race *

- ◯ Malay
- ◯ Chinese
- ◯ Indian
- ◯ Other: _____

Level of education *

Sijil termasuk Sijil Veterinar Malaysia, Sijil Vokasional Malaysia, dan Sijil Institut Pertanian Malaysia / Certificates include Malaysian Veterinary Certificates, Malaysian Vocational Certificates, and Malaysian Agricultural Institutes Certificate.

- ◯ Sijil Pelajaran Malaysia (SPM)

Level of education *

Sijil termasuk Sijil Veterinar Malaysia, Sijil Vokasional Malaysia, dan Sijil Institut Pertanian Malaysia / Certificates include Malaysian Veterinary Certificates, Malaysian Vocational Certificates, and Malaysian Agricultural Institutes Certificate.

- ◯ Sijil Pelajaran Malaysia (SPM)
- ◯ Certificate
- ◯ Diploma
- ◯ Degree
- ◯ Master
- ◯ Doctor of Philosophy
- ◯ Other: _____

Farm location (States) *

- ◯ Kelantan
- ◯ Pahang
- ◯ Terengganu

What is your role at the farm? *

- ◯ Farm owner
- ◯ Manager
- ◯ Supervisor
- ◯ General worker

Pengalaman sebagai penternak lembu tenusu (Tahun) / Experience as a dairy farmer (Years) *

- ◯ < 1
- ◯ 1 - 5
- ◯ 6 -10
- ◯ 11 - 15
- ◯ > 15

BAHAGIAN B : MAKLUMAT LADANG / PART B : FARM INFORMATION

Sistem ternakan / Farming system *

Intensif - Lembu diternak di dalam kandang sepenuh masa.
Semi-intensif - Campuran intensif dan lepas bebas.
Lepas bebas - Lembu dilepaskan bebas untuk meragut rumput sendiri.

Intensive - Cows were kept in an enclosure and feed were sent to the house.
Semi-intensive - Mixture of intensive and extensive.
Extensive - Cows were let to graze on its own.

- ◯ Intensive / Intensif
- ◯ Semi-intensive / Semi-intensif
- ◯ Extensive / Lepas bebas

Baka lembu / Breed of cows *

Contoh baka tulen ialah seperti Holstein, Jersey, dan Friesian
Contoh baka kacuk ialah seperti Jersey-Friesian, Mafriwal, Holstein-Friesian

Pure breeds for example are the Holstein, Jersey, and Friesian
Crossbreeds examples include Jersey-Friesian, Mafriwal, and Holstein-Friesian

Baka lembu / Breed of cows *

Contoh baka tulen ialah seperti Holstein, Jersey, dan Friesian
Contoh baka kacuk ialah seperti Jersey-Friesian, Mafriwal, Holstein-Friesian

Pure breeds for example are the Holstein, Jersey, and Friesian
Crossbreeds examples include Jersey-Friesian, Mafriwal, and Holstein-Friesian

- ◯ Crossbreeds / Baka kacuk
- ◯ Local Indian Dairy (LID)
- ◯ Pure breed / Baka tulen
- ◯ Campuran baka tulen dan baka asli / Mixture of pure breed and crossbreeds

Jumlah ternakan (ekor) / Herd size (head) *

- ◯ < 5
- ◯ 6 - 10
- ◯ 11 - 29
- ◯ 30 - 50
- ◯ > 50

Berapa lamakah ladang anda sudah beroperasi (Tahun) / How long has your farm operated? (Year) *

- ◯ < 1
- ◯ 1 - 5
- ◯ 6 - 10

○ > 10

Jumlah pekerja di ladang / Number of workers in farm *

- ○ 1 - 5
- ○ 6 - 10
- ○ 11 - 15
- ○ > 15

Jenis pekerja / Type of worker *

- ○ Ahli keluarga / Family members
- ○ Pekerja tempatan / Local workers
- ○ Pekerja asing / Foreign workers
- ○ Campuran / Mixture

Apakah sistem perahan susu di ladang anda / What is the milking system in your farm? *

- ○ Perahan tangan / Hand-milking
- ○ Mesin perahan susu / Milking machine

Adakah anda pernah menghantar sampel susu ladang anda untuk pemeriksaan kualiti susu / Have you ever send your farm's milk sample for milk quality check? *

Adakah anda pernah menghantar sampel susu ladang anda untuk pemeriksaan kualiti susu / Have you ever send your farm's milk sample for milk quality check? *

- ○ Ya / Yes
- ○ Tidak / No

Penyakit yang pernah dihadapi di ladang / Disease encountered in farm. *

	Yes	No
Sakit ambing susu / Mastitis	○	○
Demam susu / Milk fever	○	○
Ketosis kebuntingan / Pregnancy ketosis	○	○
Sakit kaki / Lameness	○	○
Keguguran / Abortion	○	○
Kematian anak lembu / Calf mortality	○	○
Penyakit pernafasan / Respiratory Disease	○	○

BAHAGIAN C : PENGETAHUAN TENTANG MASTITIS DALAM LEMBU TENUSU / PART C : KNOWLEDGE ABOUT MASTITIS IN DAIRY CATTLE.

BAHAGIAN C : PENGETAHUAN TENTANG MASTITIS DALAM LEMBU TENUSU / PART C : KNOWLEDGE ABOUT MASTITIS IN DAIRY CATTLE.

Penyakit mastitis ialah keradangan ambing susu. / Mastitis is the inflammation of the udder. *

- ◯ Ya / Yes
- ◯ Tidak / No
- ◯ Saya tidak pasti / I am not sure

Berikut adalah perubahan yang boleh berlaku pada ambing susu yang terkena mastitis? The followings are the changes that can occur to the udder during mastitis.

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure
Bengkak / Swelling	◯	◯	◯
Sakit / Pain	◯	◯	◯
Merah / Redness	◯	◯	◯
Suhu panas pada ambing susu / Heatness of the udder	◯	◯	◯

Berikut adalah perubahan yang boleh berlaku pada susu daripada lembu mastitis / The followings are the changes that can occur to the milk of mastitic cow.

Berikut adalah perubahan yang boleh berlaku pada susu daripada lembu mastitis / The followings are the changes that can occur to the milk of mastitic cow.

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure
Serpihan / flakes	◯	◯	◯
Ketulan susu / Milk clot	◯	◯	◯
Darah / Blood	◯	◯	◯
Nanah / Pus	◯	◯	◯
Cair / Watery	◯	◯	◯
Berbau busuk / Foul odor	◯	◯	◯

Mastitis boleh berlaku dalam lembu anda tanpa menunjukkan simptom dan perubahan pada susu / Mastitis can occur in your cow without clinical signs and changes in milk. *

- ◯ Ya / Yes
- ◯ Tidak / No
- ◯ Saya tidak pasti / I am not sure

Berikut adalah agen yang boleh menyebabkan mastitis / These are the causative agent for mastitis mastitis

Berikut adalah agen yang boleh menyebabkan mastitis / These are the causative agent for mastitis mastitis

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure
Bakteria / Bacteria	○	○	○
Virus	○	○	○
Kulat / Fungi	○	○	○
Kecederaan disebabkan mesin perahan / Trauma due to foul milking machine	○	○	○

Berikut adalah prosedur yang boleh dilakukan untuk diagnosis mastitis / The followings are the procedures that can be done to diagnose mastitis.

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure
Pemeriksaan ambing susu / Examination of the udder	○	○	○
Pemeriksaan susu / Examination of the milk	○	○	○
Californian Mastitis Test (CMT)	○	○	○
Somatic Cell Count (SCC) Test	○	○	○

Berikut adalah contoh rawatan yang boleh diberikan kepada lembu mastitis / The followings are treatment that can be given to mastitic cow :

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure
Antibiotik / Antibiotic	○	○	○
Anti-bengkak / Anti-inflammatory	○	○	○
Multivitamin	○	○	○
Pembedahan / Surgery	○	○	○

Preskripsi ubat mestilah dilakukan oleh doktor veterinar bertauliah / Prescription of medications must be made by a licensed veterinarian. *

- ○ Ya / Yes
- ○ Tidak / No
- ○ Saya tidak pasti / I am not sure

Rawatan segera pada lembu mastitis boleh meningkatkan kembali pengeluaran susu / Prompt treatment of a mastitic cow can help improve production. *

- ○ Ya / Yes
- ○ Tidak / No
- ○ Saya tidak pasti / I am not sure

Mastitis boleh menyebabkan kesan buruk kepada perkara berikut / Mastitis can have a negative impact on these variables. *

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure.
Kesihatan haiwan / Cow's health	○	○	○
Kuantiti susu / Milk quantity	○	○	○
Kualiti susu / Milk quality	○	○	○
Kebajikan haiwan / Animal welfare	○	○	○
Kadar bunting / Conception rate	○	○	○
Kos pengeluaran / Cost of production	○	○	○

Amalan-amalan ini boleh membantu mencegah mastitis / These practices can help in preventing mastitis. *

	Ya / Yes	Tidak / No	Saya tidak pasti / I am not sure
Kebersihan persekitaran / Environmental hygiene	○	○	○
Perah susu pertama keluar dari ambing sebelum memulakan perahan / Foremilk stripping before	○	○	○
Membersihkan ambing susu dengan sabun dan kain bersih sebelum memulakan perahan / Cleaning the udder with soap and clean clothes before milking	○	○	○
Nyahkuman pada ambing susu selepas perahan / Disinfecting udder after milking.	○	○	○
Berdiri selepas perahan / Post-milking standing.	○	○	○
Memerah susu lembu mastitis paling akhir / Milk the mastitic cow last.	○	○	○
Mengasingkan lembu mastitis dari kumpulan lembu yang sihat / Isolation of mastitis cow from the healthy herd.	○	○	○
Memakai sarung tangan yang bersih atau kerap mencuci tangan semasa memerah susu / Wearing clean gloves or washing hands frequently during milking.	○	○	○
Membersihkan			

Membersihkan mesin perahan susu / Cleaning of the milking machine.	○	○	○
Menyelenggara mesin perahan susu / Maintenance of the milking machine.	○	○	○

BAHAGIAN D : SIKAP TERHADAP MASTITIS DALAM LEMBU TENUSU / PART D : ATTITUDE TOWARDS MASTITIS IN DAIRY CATTLE.

Ujian saringan secara berkala adalah penting untuk pengesanan awal mastitis / Routine screening is an important practice for the early detection of mastitis. *

	1	2	3	4	5	
Sangat tidak setuju / Strongly disagree	○	○	○	○	○	Sangat setuju / Strongly agree

Preskripsi ubat dan rawatan hanya boleh dilakukan oleh doktor veterinar bertauliah / Prescription of medicine and treatment should only be made by a licensed veterinarian. *

	1	2	3	4	5	
Sangat tidak setuju / Strongly disagree	○	○	○	○	○	Sangat setuju / Strongly agree

Rawatan mastitis perlu dilakukan mengikut keperluan satu-satu lembu / Treatment of mastitis should be done on a case-by-case basis. *

Rawatan mastitis perlu dilakukan mengikut keperluan satu-satu lembu / Treatment of mastitis should be done on a case-by-case basis. *

	1	2	3	4	5	
Sangat tidak setuju / Strongly disagree	○	○	○	○	○	Sangat setuju / Strongly agree

Penternak memainkan peranan penting dalam mengawal penyakit mastitis / Farmers play an important role in mastitis control. *

	1	2	3	4	5	
Sangat tidak setuju / Strongly disagree	○	○	○	○	○	Sangat setuju / Strongly agree

Penternak memerlukan latihan dalam pengurusan penyakit mastitis / Farmers need training on mastitis management. *

	1	2	3	4	5	
Sangat tidak setuju / Strongly disagree	○	○	○	○	○	Sangat setuju / Strongly agree

Amalan pencegahan amat diperlukan untuk mengurangkan mastitis dalam ladang lembu tenusu / Preventive measures are required to reduce mastitis in dairy farms. *

	1	2	3	4	5	
Sangat tidak setuju / Strongly disagree	○	○	○	○	○	Sangat setuju / Strongly agree

BAHAGIAN E : AMALAN UNTUK MENCEGAH PENYAKIT MASTITIS DALAM LEMBU TENUSU / PART E : PRACTICE TO PREVENT MASTITIS IN DAIRY CATTLE.

Amalan yang dilakukan bagi mencegah mastitis di ladang / Practice to prevent the occurrence of mastitis in the farm. *

	Tidak pernah / Never	Sangat jarang / Seldom	Kadang-kadang / Sometimes	Selalu / Frequently	Sentiasa / Always
Saya membersihkan kandang lembu / I wash the cow's house.	○	○	○	○	○
Saya memandikan lembu sebelum melakukan perahan / I shower the cow prior to milking.	○	○	○	○	○
Saya melakukan 'teat dip' sebelum memulakan perahan / I clean the cow's udder before milking.	○	○	○	○	○
Saya melakukan strip pada susu pertama sebelum memulakan perahan susu / I do the foremilk stripping before milking.	○	○	○	○	○
Saya melakukan nyahkuman pada ambing susu					
Saya membiarkan lembu untuk berdiri untuk satu tempoh masa selepas perahan / I allow the cow to stand for a while after milking.	○	○	○	○	○
Saya memerah lembu mastitis paling akhir, selepas lembu yang sihat siap diperah / I milk the mastitic cow last, after all healthy cow has been milked.	○	○	○	○	○
Saya mengasingkan lembu mastitis daripada kumpulan yang sihat / I separate the mastitic cow from the healthy herd.	○	○	○	○	○
Saya memakai sarung tangan yang bersih atau mencuci tangan dengan kerap semasa perahan susu / I wear gloves and wash my hand frequently during milking.	○	○	○	○	○
Saya membersihkan					

Saya membersihkan mesin perah selepas menggunakannya / I clean the milking machine after using it.	○	○	○	○	○
Saya menyelenggara mesin perah mengikut tempoh yang disarankan / I do the maintenance of machine at its recommended interval.	○	○	○	○	○
Saya mendapatkan khidmat nasihat veterinar bagi rawatan dan preskripsi ubat untuk mastitis / I asked for veterinary advice for the treatment and drug prescription for mastitis.	○	○	○	○	○
Saya melakukan ujian mastitis secara berkala seperti CMT / I did routine screening such as CMT Test.	○	○	○	○	○

8.2 Appendix 2: Cronbach's Alpha Results

KNOWLEDGE

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.795	.786	5

ATTITUDE

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.725	.840	6

PRACTICE

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.945	.951	12