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Impact of COVID-19 Pandemic on Cattle Farming and its Sustainable Strategy in Kelantan

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A thesis submitted in fulfilment of the requirements for the degree of Bachelor of Applied Science (Husbandry Science) with Honours

Faculty of Agro Based Industry

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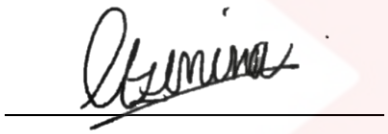
DECLARATION

I hereby declare that the work embodied in this report is the result of my own research except for excerpts as cited in the references.



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List of Symbols

%	Percentage
>	More than
<	Less than

List of Abbreviations

COVID-19	Coronavirus Disease 2019
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
WHO	World Health Organization
FAO	Food and Agriculture Organization
IFPRI	International Food Policy Research Institute
SPSS	Statistical Package for the Social Sciences
USDA	United States Department of Agriculture
MCO	Movement Control Order
DOSM	Director of Sales and Marketing
AI	Artificial Insemination
UNICEF	The United Nations International Children's Emergency Fund
UNHCR	United Nations High Commissioner for Refugees

Impact of COVID-19 Pandemic on Cattle Farming and its Sustainable Strategy in Kelantan

ABSTRACT

The COVID-19 pandemic is a global health threat because of its rapid spread and ability to kill millions of people. The crisis has also disrupted global livelihoods and economic activity. Livestock and food industries are sectors severely affected as a result of the spread of this epidemic. This situation has caused various problems to farmers such as insufficient feed supply and animal needs, animal health disorders, difficulties in selling animals and processing food, labour shortage, and declining income. Therefore, this study was conducted to investigate on the impact of the COVID-19 pandemic on cattle production in some selected areas of Kelantan and to develop effective strategies and measures to aid in the recovery of the cattle farming and economic activities. Questionnaires were prepared and interviews were conducted face to face and online to 30 smallholder cattle farmers in Kelantan. Then, data were collected and analysed. The relationship between farmers monthly income and the number of cows per households was investigated. Findings of this survey showed that about 77% of the respondents faced problems on cattle farm management since the COVID-19 pandemic occurred, in which problem for cattle buying faced the most (60% of the respondents). About 57% of the respondents were unable to make a movement to areas to go to the stores that supply animal feed and necessities due to movement control order. Under the unexpected COVID-19 pandemic, about 60% of the respondents claimed that they were not able to buy the feed and necessities in their local areas due to the closed the shop. Due to declining income, about 43% of the respondents faced a lack of budget to buy the feed and other necessities. About 57% of the respondents claimed that input prices increased and interrupted input supplies. In addition, about 33% of the respondents mentioned that they were facing a shortage of worker to run their farm. Furthermore, about 43% of the respondents mentioned that the trend on milk/meat price decreased during COVID-19. Compared to before COVID-19, the consumption trend of meat, milk, and egg dropped during COVID-19, which may be due to the effect of low income. To cope with the above problems, respondents are expected to receive government support in forms of finance, soft loans, agricultural input materials, training and favourable conditions for their production and business.

Keywords: COVID-19 pandemic, cattle, smallholder farmers, Kelantan

Kesan Pandemik COVID-19 terhadap Penternakan Lembu dan Strategi Mampannya di Kelantan

ABSTRAK

Pandemik COVID-19 adalah ancaman kesihatan global kerana penyebaran yang pantas dan keupayaannya untuk membunuh berjuta-juta orang. Krisis itu juga telah mengganggu mata pencarian global dan aktiviti ekonomi. Industri ternakan dan makanan merupakan sektor yang terjejas teruk akibat penularan wabak ini. Keadaan ini telah menimbulkan pelbagai masalah kepada penternak seperti kekurangan bekalan makanan dan keperluan haiwan, gangguan kesihatan haiwan, kesukaran menjual haiwan dan memproses makanan, kekurangan tenaga kerja, dan kemerosotan pendapatan. Oleh itu, kajian ini dijalankan untuk menyiasat kesan wabak COVID-19 terhadap pengeluaran lembu di beberapa kawasan terpilih di Kelantan dan untuk membangunkan strategi dan langkah yang berkesan untuk membantu pemulihan aktiviti penternakan lembu dan ekonomi. Soal selidik telah disediakan dan temu bual telah dijalankan secara bersemuka dan dalam talian kepada 30 penternak lembu pekebun kecil di Kelantan. Kemudian, data dikumpul dan dianalisis. Hubungan antara pendapatan bulanan petani dan bilangan lembu setiap isi rumah telah disiasat. Dapatan tinjauan ini menunjukkan bahawa kira-kira 77% daripada responden menghadapi masalah pengurusan ladang lembu sejak wabak COVID-19 berlaku, di mana masalah pembelian lembu paling banyak dihadapi (60% daripada responden). Kira-kira 57% daripada responden tidak dapat bergerak ke kawasan untuk pergi ke kedai yang membekalkan makanan haiwan dan keperluan kerana perintah kawalan pergerakan. Di bawah pandemik COVID-19 yang tidak dijangka, kira-kira 60% daripada responden mendakwa bahawa mereka tidak dapat membeli makanan dan keperluan di kawasan tempatan mereka kerana kedai ditutup. Disebabkan oleh pendapatan yang merosot, kira-kira 43% daripada responden menghadapi kekurangan bajet untuk membeli makanan dan keperluan lain. Kira-kira 57% daripada responden mendakwa bahawa harga input meningkat dan mengganggu bekalan input. Di samping itu, kira-kira 33% daripada responden menyatakan bahawa mereka menghadapi kekurangan pekerja untuk menjalankan ladang mereka. Tambahan pula, kira-kira 43% daripada responden menyebut bahawa trend harga susu/daging menurun semasa COVID-19. Berbanding sebelum COVID-19, trend penggunaan daging, susu dan telur menurun semasa COVID-19, yang mungkin disebabkan oleh kesan pendapatan rendah. Bagi mengatasi masalah di atas, responden dijangka menerima sokongan kerajaan dalam bentuk kewangan, pinjaman mudah, bahan input pertanian, latihan dan keadaan yang menggalakkan untuk pengeluaran dan perniagaan mereka.

Kata kunci: pandemik COVID-19, lembu, petani kecil, Kelantan

CHAPTER 1

INTRODUCTION

1.1 Research Background

The COVID-19 pandemic originating from Wuhan China caused by the SARS-CoV-2 virus is one of the most dangerous and potentially life-threatening epidemics. The spread of this epidemic has occurred very rapidly around the world. Control measures implemented by the government to stop the outbreak, such as restriction and control of movement, lockdown, and closure of public places such as shops, restaurants, educational institutions, and others have impacted all sectors, including the livestock and food industries. As a result of this situation, economic activity and income of farmers were severely affected.

During this difficult time, most farmers are confronted with a variety of issues, including a lack of feed supply and necessities for animal, animal health issues, challenges with product processing and production, difficulties selling and transporting

animals and products, declining demand from customers, and labour shortage. These issues have resulted in a decrease in the capacity to control animal products, a decline in income, and a delay in economic activity.

Several studies on the impact of COVID-19 on the livestock industry have been conducted in several countries. However, so far, no study has been done to establish the impact of COVID-19 on smallholder farmers in Kelantan. Therefore, this study was carried out in order to improve the amount of information published about COVID-19's effects on the livestock industry. This study focused on the impact of COVID-19 pandemic on cattle farming and its sustainable strategy in Kelantan.

1.2 Problem Statement

Undoubtedly, COVID-19 has a huge impact on the livestock sector. Restrictions and movement controls are in place to disrupt the economic activity and income of farmers. Smallholder farmers are among the most economically affected decks due to the spread of this epidemic. Restrictions on movement and closures of markets and shops make it difficult for farmers to obtain feed supplies and necessities for their livestock. This will have a serious impact on the health and production of animals from their farms. In addition, the government's decision to restrict movement also makes it difficult for farmers to trade live animals and their livestock products to market. As such, the processing and production of products such as meat and milk will also decrease as a result

of this issue. Furthermore, the reduction of workers also contributed to the lack of economic activity on farms and plant processing facilities. Following the COVID-19 crisis, the decline in selling prices of animals and food products such as meat and milk had to be done due to low purchasing and demand from consumers or customers due to movement restrictions. Issues like these give emphasis and pose big problems to farmers in managing their livestock business.

1.3 Objectives

i. To identify the problems faced by farmers in managing cattle farms during COVID-19.

ii. To develop effective strategies and measures to aid in the recovery of the cattle sector and economic activities.

1.4 Hypothesis

H_0: There is an effect of COVID-19 pandemic on cattle production in Kelantan

H_1: There is no effect of COVID-19 pandemic on cattle production in Kelantan

1.5 Scope of the Study

This study focused on the impact of COVID-19 pandemic on cattle farming and its sustainable strategy in Kelantan. This survey was conducted in all districts in the state of Kelantan including Kota Bharu, Kuala Krai, Bachok, Pasir Mas, Rantau Panjang, Tanah Merah, Jeli, Machang, Pasir Puteh, Gua Musang, and Tumpat. Smallholder farmers who raise cattle were selected as respondents for this survey. Field surveys and online questionnaires were used to collect data. They were given a set of questionnaires to complete, and their responses were examined to make conclusions.

1.6 Significant of the Study

This study could help to determine the impact of the COVID-19 pandemic on the cattle industry. Following that, this research was carried out to determine the difficulties faced by farmers in managing their livestock farms during the pandemic season. The transmission of COVID-19 can be prevented with awareness and knowledge of this issue. Furthermore, this study can inform farmers about the prevention measures that can be taken to stop the epidemic from spreading on their farms and ensure food safety. This research may also aid farmers in developing measures to boost their business income, which has been severely affected by COVID-19. This study can also be used as a resource

for researchers, students, and farmers who want to increase their knowledge and ideas about how to combat COVID-19's effects on cattle and the food sector in future studies.

CHAPTER 2

LITERATURE REVIEW

2.1 COVID-19 Pandemic

At the end of 2019, the world was shocked by an extremely severe COVID-19 pandemic that spread so quickly. COVID-19, also known as coronavirus, is an infectious disease caused by the SARS-CoV-2 virus. The outbreak of this pandemic began in Wuhan, China in December 2019. Thus, the World Health Organization (WHO) declared the pandemic to be in full swing and warned the world to implement travel restrictions from China to prevent the disease from spreading to other countries. According to statistics by Our World in Data, more than 300 million cases have been reported so far, and the number of deaths linked to COVID-19 has now surpassed 5 million. WHO urges all nations to plan preparatory and reaction steps in accordance with the Global Strategic Preparedness and Response Plan to prevent the spread of COVID-19 (WHO, 2020a; Vasavada, 2020). The COVID-19 pandemic will not only cause death, but this

transmission will also have an impact on all sectors and aspects of life. The livestock and food are also among the sectors that have been severely affected, causing production and supply chain disruptions. Therefore, every sector and individual should be a part of this struggle (WHO, 2020c).

2.2 Disruption of Economic Activity

During these challenging times, the cattle and food industries face a variety of issues, including falling income due to economic activity disruption. This is due to the government's decision to impose movement restrictions during the COVID-19 outbreak, which resulted in the shutdown of a number of companies. Furthermore, logistical constraints, animal export prohibitions, and the closure of slaughterhouses, shops, and restaurants have a negative impact on the output supply chain at all levels. This causes farmers to have difficulty shipping products and finding suitable markets to sell their live animals and products. Meat sales have declined due to the temporary closure of food shops and restaurants, which affected revenue coming from meat and meat products. According to statistics by the Food and Agriculture Organization (FAO) (2020), the drop in meat output under COVID-19 conditions grew from 338.9 million tonnes in 2019 to 333.0 million tonnes in 2020.

Apart from meat, the closure of these facilities also contributed to the decline in milk production and processing. In China, rigorous road traffic controls and limitations

impair the processing and transportation of meat and milk, resulting in meat spoilage and milk dumping. As a result of limited transit to markets, slaughterhouses, or processing plants, farmers are obliged to store their stockpiles longer or discard away meat and milk, resulting in higher production costs or losses. COVID-19 has a massive impact on the meat and milk processing and production sectors worldwide. The closure of slaughterhouses and processing plants not only affected meat and milk production, but also led to the labour shortage. In India, the pandemic resulted in higher unemployment, lower daily labour income, increased food insecurity, depletion of savings, and relief efforts (Harris & Kesar, 2020). The livestock and food industries are labour-intensive, which means that worker disruption can have a significant impact. The shortage of workers in the cattle industry has led to a reduction in slaughtering and processing capacity as well as a decrease in meat and milk production. This situation has affected economic activity and caused a decline in cattle output.

2.3 Impacts on Livestock Feed Supply

Following the prolonged COVID-19 crisis, the livestock industry was severely affected by the disruption of the supply of feed or raw materials for livestock. Farmers face severe stress due to feed supply disruptions, as animals need to eat daily for survival, growth, and to increase the production cycle. COVID-19 has caused delays and obstructions in the transit or transportation of raw materials for feed supplies, causing feed shortages in the livestock industry. The majority of raw materials for feed supplies

are shipped across borders by cargo ships. However, due to port closures and transportation constraints, many ships and other modes of transportation are unable to reach the port. In the months following the epidemic, worldwide trade has decreased by 13–22%. (Ijaz, 2021). Inadequate feed supply is caused in part by a lack of raw materials. While such shortages affect around 60% of the agricultural operations evaluated, they are most severe in the livestock industry, where animals may starve to death due to feed shortages. The sector is in a crisis, with existing issues and persistently high pricing due to the swine disease outbreak, which could lead to further price hikes.

According to analysis by Zhang (2020), a Senior Research Fellow at the International Food Policy Research Institute (IFPRI), the major concern facing agricultural firms is logistics disruption, particularly raw material shortages and delivery issues. Livestock farmers are particularly concerned, with 38.5% claiming "logistics disruption" as the most problematic issue, compared to 35.6% of all agricultural firms, 19.7% of non-agricultural operations, and 18.9% of service firms. The closing of establishments that offer animal feed has also had a negative impact on the livestock industry. Due to the travel restrictions and lack of available transportation options, suppliers are unable to move from one location to another. Apart from that, they were also unable to sell their products and feed supplies due to market closure restrictions. The stalls that supplied animal feed were initially shut down altogether. Farmers will find it more difficult to obtain feed supplies for their cattle as a result of this.

2.4 Reduced Access to Inputs and Services

Farmers' access to breeding materials and replacement supplies such as semen, and milking machines is limited due to movement restrictions and interruption of national and international commerce channels (Barrett, 2020). This may have an impact on input suppliers' sales. Furthermore, restrictions on travel as well as human activity monitoring hinder public services such as animal health services and food safety inspections. Animal health may be harmed as a result of delays in receiving prompt veterinarian services. Disruption in vaccination and medicine supply and use, which may raise the possibility of future outbreaks, notably those involving animal diseases that result in huge livestock losses. African swine fever epidemics in East and Southeast Asia, as well as outbreaks of other diseases that can be transmitted to people, are examples of such diseases (FAO, 2020). Government restrictions make it difficult for farmers to work with veterinary professionals, creating roadblocks to monitoring animal health and daily needs. As a result of this scenario, many farms will have extra stock, which will weaken the immune systems of the animals and raise the risk of disease outbreaks. Some farmers kill their animals to lower the number of animals on the farm, which reduces the amount of animal products that may be produced.

2.5 Meat Price Fluctuations and Changes in Consumer Behaviour

The COVID-19 pandemic led to changes in consumer food demand caused by several factors, such as food prices, movement restrictions, income levels, and food choices. According to the study by Bakalis and Cranfield (2020), they stated that the number of customer visits to food stores and the amount of food spent per visit changed during COVID-19. Demand for food including meat and milk, has been significantly affected as a result of mobility restrictions and lockdown orders by the government throughout the states in Malaysia. In addition, the partial or entire closure of public places where COVID-19 is suspected of spreading, such as workplaces, shops or stores, restaurants, and institutions, is likely to change food demand and the purchasing power of the public. According to the Food and Agriculture Organization (FAO), COVID-19 has a major impact on agriculture in terms of food supply and demand that is strongly tied to food security.

The production and processing of meat and milk were also affected, leading to rising meat and milk prices due to difficulties in obtaining production inputs such as food and animal necessities, border crossing restrictions that made it difficult to transport live animals, difficulties in accessing professional and veterinary services, a lack of labour, and restrictions on the supply of cattle products to the market. Previous studies of the effects of pandemics on the meat industry in America and Brazil indicated that virus outbreaks at slaughterhouses disrupted meat processing in April and May 2020, resulting in unexpected animal price rises. Later on, however, both production and demand for meat and milk declined significantly as a result of lower consumer purchasing power and

income status, resulting in lower meat prices. Fluctuating meat and milk prices have a significant impact on the agriculture and livestock industries' economies. This crisis arises as a result of factors listed above, which drive changes in customer behaviour and demand, as well as changes in meat and milk production and processing.

2.6 Farmer Awareness of COVID-19 and Preventive Measures Taken

As a consequence of the ongoing COVID-19 crisis, a response plan for farm and food workers has been developed to provide guidance for continuity operations on livestock farms, animal slaughter facilities, and food processing facilities in order to curb the spread of coronavirus outbreaks in the agriculture and food industries. Livestock farms and food processing facilities can be defined as critical infrastructure in the agriculture and food sectors. Therefore, hygiene control, sanitation or disinfection, screening, and monitoring of workers should be implemented to prevent the spread of coronavirus in such areas. COVID-19 prevention practices and hygiene controls by farmers, producers, and farm workers should be applied to prevent the spread of COVID-19 outbreaks in farm areas, including cattle processing and slaughtering facilities. Wearing face masks, social distancing, hand washing, providing hand sanitizers and disinfectants, and keeping equipment, animals, and the environment clean are effective measures recommended by the World Health Organization (WHO) to prevent the spread of COVID-19 on farms.

The health of farm workers is critical to the nation's food supply chain. Apart from an increase in the number of COVID-19 cases, failure to take measures to ensure the health and safety of farm workers will have a significant influence on the country's food supply. An infection among farm workers has the potential to shut down entire farm operations, putting entire workforce at risk of infection and at the same time disrupting the food supply chain. Therefore, immediate measures must be taken to safeguard the health and safety of agricultural workers. In Cayuga County, New York, three farm workers tested positive for COVID-19 and one of die.

According to the researchers, they highlighted that COVID-19 preventive efforts are influenced by the awareness and mindset of each individual. For instance, the SARS epidemic in China demonstrates how a lack of information and awareness can make disease prevention more difficult (Hung, 2003). This demonstrates how vital it is for each individual to be aware of and knowledgeable about this issue. The findings also support the theory that a lack of knowledge and awareness of COVID-19 contributes to a rise in the number of cases. This means that individual knowledge, mindset, and prevention measures must all be instilled in order to assist the government in curbing the spread of this outbreak.

CHAPTER 3

METHODOLOGY

3.1 Sample Population and Distribution

The target audience for the survey was smallholder farmers from across regions in Kelantan (Kota Bharu, Kuala Krai, Bachok, Pasir Mas, Rantau Panjang, Tanah Merah, Jeli, Machang, Pasir Puteh, Gua Musang, and Tumpat). Farmers were interviewed face-to-face in four districts: Rantau Panjang, Pasir Mas, Jeli, and Tanah Merah, while online questionnaires were distributed throughout Kelantan's districts. The survey conducted included smallholder farmers regardless of male or female from all over Kelantan. In order to be included in the survey, the potential respondents needed to be engaged in smallholder production who raised cattle as their main livestock. A total of 30 smallholder farmers were surveyed about their cattle farming management before and after the pandemic.

3.2 Sampling and Data Collection

Questionnaires and interviews with farm managers were conducted in person and online. Questionnaires were prepared in English and then translated into Malay to be distributed through face-to-face interviews with 10 farmers in Rantau Panjang, Pasir Mas, Jeli, and Tanah Merah, as well as via Google Forms, WhatsApp, and Facebook applications to a total of 20 farmers across Kelantan.

The questionnaire was divided into three sections, which can be referenced in Appendix 1, where Section A contained the socio-demographic information of the respondents; Section B contained questions prepared to find out the problems encountered in carrying out livestock activities during the COVID-19 pandemic; and Section C contained questions aimed at determining the effects of the COVID-19 pandemic on cattle farm management.

Questionnaires were first evaluated at 5% of the sample size before the actual data collecting began. Based on the finding, required changes were made to the question order, the addition of missing questions, the removal of less significant questions, and the language edition. Then, data were collected based on the feedback of the responding farmers via online and after the interviewer has completed a thorough assessment of the farm.

3.3 Data Analysis

Simple descriptive statistical methods such as percentages, means, and standard deviation were utilised to assess the quantitative data, using SPSS, a statistical analysis software package. The variables in the study were described and compared using SPSS. Using SPSS, the relationship between farmers' monthly income and the number of cows per household was estimated, and a p-value of $p<0.05$ was observed. Qualitative studies such as narrative, explanation, and interpretation were used to analyse the qualitative data. The results were presented using tables and charts.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Demographic and Socioeconomic Characteristics of the Respondents

4.1.1 Distribution of Respondents in this Survey

Distribution of respondents from different districts of Kelantan is shown in Figure 4.1.1. It shows that number of respondents in Rantau Panjang was higher (29%) followed by Pasir Mas (17%), Tanah Merah (13%), Jeli (10%), Machang (10%), Kota Bharu (7%), Kuala Krai (7%), and Bachok (7%). It was due to contact with the farmers face to face in Rantau Panjang, Pasir Mas, Jeli, and Tanah Merah, whereas farmers in other places were joined in this survey through online so that researcher did not have control or influence on online respondents.

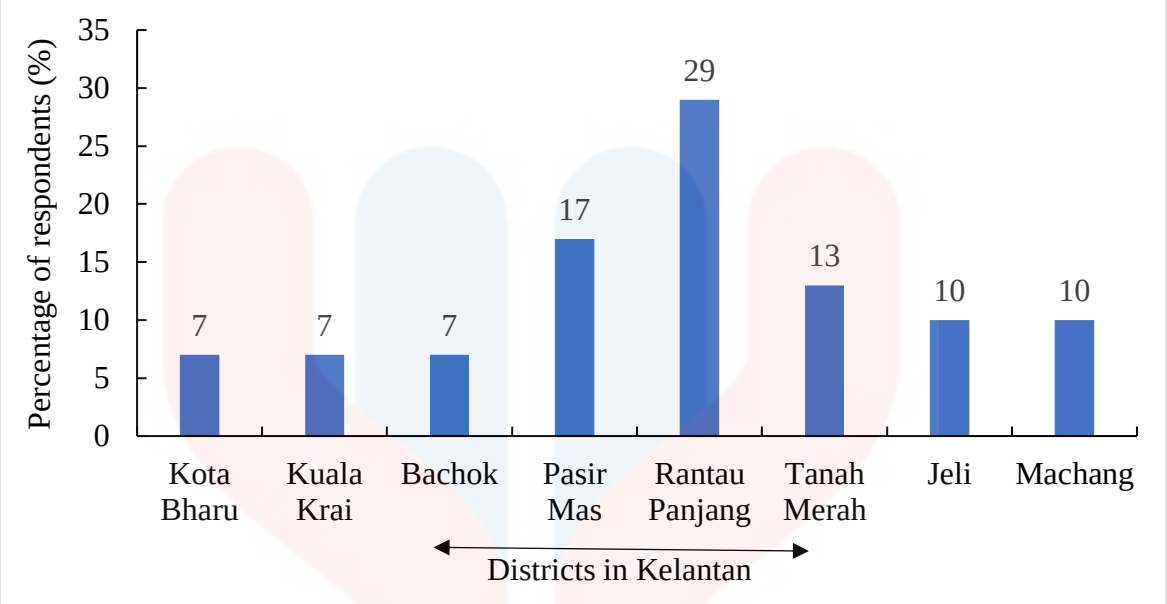

Figure 4.1.1: Distribution of respondents (%) from different districts of Kelantan in this survey.

4.1.2 Distribution of Gender among Respondents

Figure 4.1.2 shows that most of the respondents were male (70%) and the rest of the respondents were female (30%). This indicates that men are predominantly involved in this industry than women. The livestock industry requires heavy jobs and hard physical activities, so some of the women are hesitant to involve in this field and they prefer other alternative works. However, there were also some women who are interested in participating in the livestock industry. According to a survey undertaken by agricultural universities in India, women control the majority of livestock production in India (Patel

et al., 2016). This demonstrates that all genders are involved in the cattle business and play key roles to develop this sector.

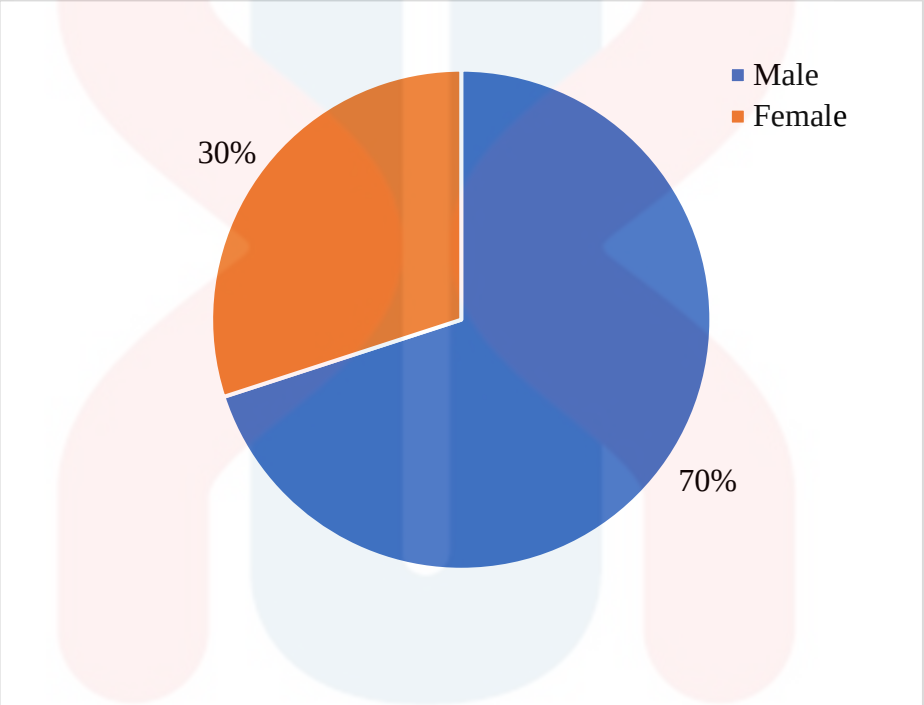

Figure 4.1.2: Percentage of male and female respondents in this survey.

4.1.3 Distribution of Age among Respondents

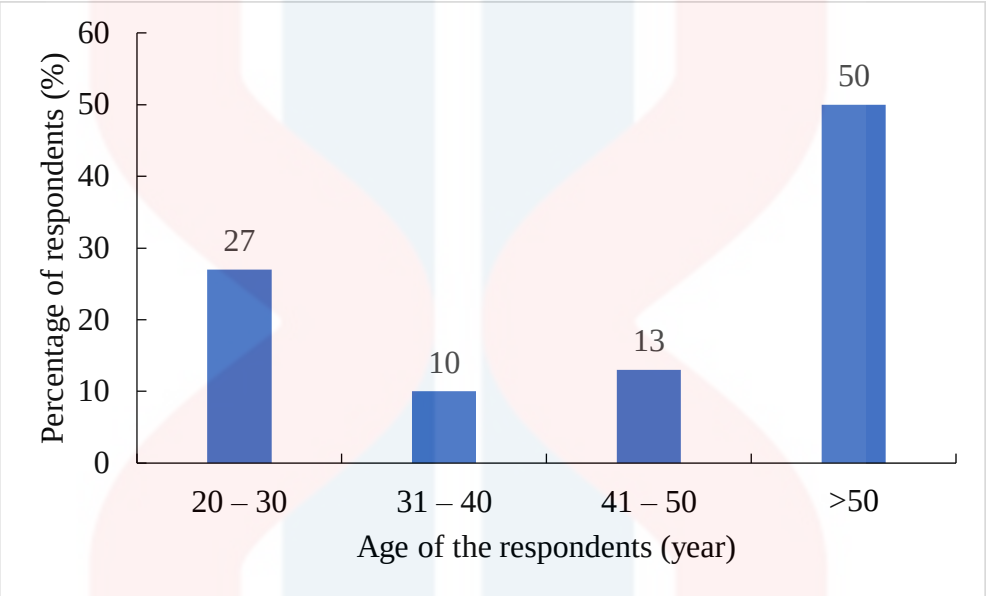

Figure 4.1.3: Percentage of respondents by age.

Figure 4.1.3 shows that half (50%) of our survey participants were more than 50 years old followed by 20-30 years old (27%), 41-50 years old (13%) and 31-40 years old (10%). It indicates that farmers in middle age (31-40 years old and 41-50 years old) are involved in other business. However, it seems that farmers in younger age have great interest to do in cattle farming, which was 27% in this survey. According to the statistics collected by the USDA (2017), the overall average age of all U.S. farm farmers in 2017 was 57.5 years. This is due to the fact that farmers in this age are more experienced and some of them having spent an average of 21.3 years on their current farm.

4.1.4 Distribution of Household Size among Respondents

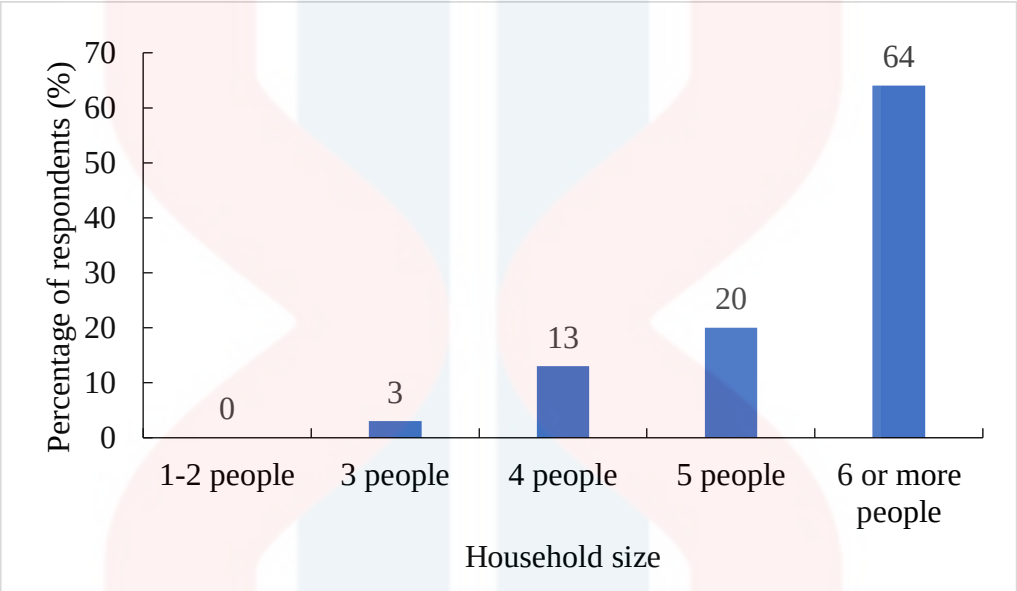

Figure 4.1.4: Percentage of respondents by household size.

Figure 4.1.4 represents that 64% of our survey participants had 6 or more family members followed by 20% (5 people), 13% (4 people) and 3% (3 people) in their household, whereas there were no respondents that have 1-2 people of family members. It indicates that those household have more family members they are involved in cattle farming. The possibility that members of large families might assist respondents in managing their livestock farms. It's also feasible that they have a family farm where the farms are operated by themselves. The majority of their family members also collaborate to expand their business. Family farms offer a lot of benefits, one of which is that they are not reliant on labour, which is profitable to them.

4.1.5 Distribution of Education Level among Respondents

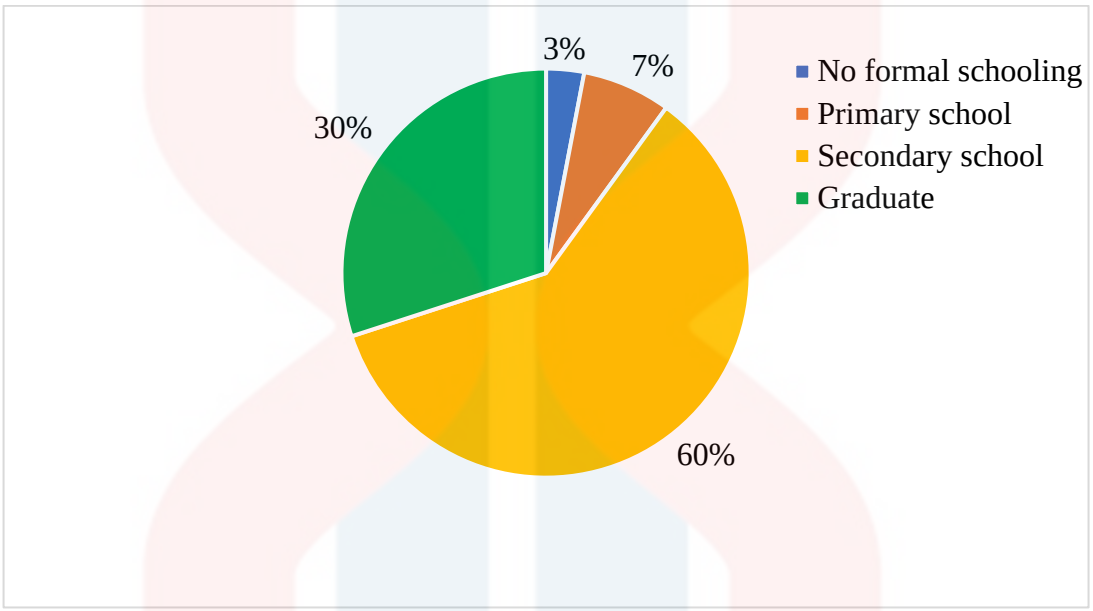

Figure 4.1.5: Percentage of respondents by education level.

As shown in Figure 4.1.5, 60% of the respondents had completed secondary school followed by 30% who were graduates, 7% who had completed primary school and 3% who had no formal education or no schooling. This indicates that those who have completed secondary school have received training through direct experience, such as observation and hands-on experience. Many farmers are traditionally born into farming families. Since they were trained from an early age, they have experience and are able to get active in this profession. Some of them learn and train through apprenticeships or under the supervision and training of experienced farmers. Farmers were graduated or hold a bachelor's degree in animal or agricultural science already have the knowledge,

training, skills, and abilities required in this sector. So, with the knowledge and skills they've acquired, they are able to run a farm. A survey conducted by Eric et al. (2014) from International Journal of Development Research has proven that farmers with secondary school education have a higher average than farmers with other levels of education.

4.1.6 Distribution of Respondents by Race

The data shows that among the survey participants, all were Malay, whereas there was no respondent from Chinese, Indian and others. It indicates that majority of residents in Kelantan is Malay. This is due to the fact that the regions where the researcher conducted his survey have a low number of people of other races, with Malay's accounting for the majority. In Kelantan, the Chinese, Indians, and others may prefer to work in fields other than cattle farming. According to the research by Sathian and Ngeow (2014) from the University of Malaya, they found that Chinese and others are ethnic minorities residing in Kelantan and the majority of the people of Kelantan are Malays.

4.1.7 Distribution of Monthly Income among Respondents

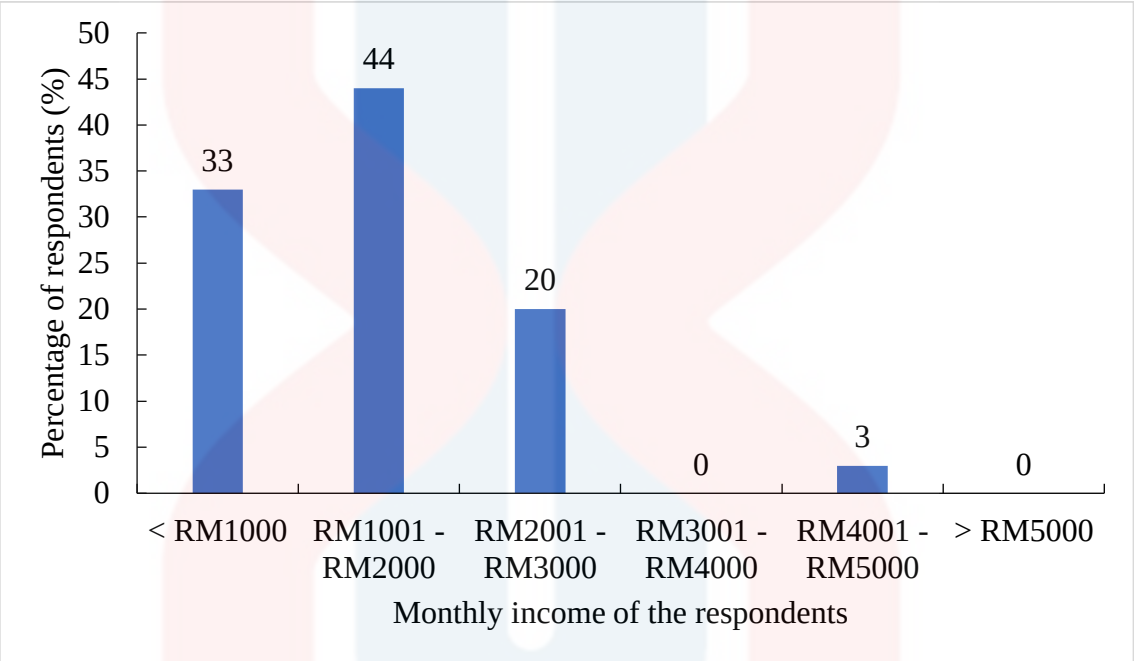

Figure 4.1.7: Percentage of respondents by monthly income.

According to the data shown in Figure 4.1.7, number of respondents with a monthly income between RM1001 to RM2000 (44%) were higher followed by income less than RM1000 (33%), RM2001 to RM3000 (20%) and RM4001 to RM5000 (3%). No respondent was reported who earned between RM3001 to RM4000 and more than RM5000. This is because the respondents who earned RM1001 to RM2000 were mostly smallholder farmers who had small number of cattle, small farm areas and growing food

crops at a low-to-medium level of intensity. In addition, the locations surveyed by the researcher are rural areas with a lower population in terms of income, education, and skills. According to a prior study by Nelson (2019), many smallholder farm households were lack of affordable access to basic necessities essential for poverty alleviation, such as education, nutritious foods, clean water and sanitation, energy and healthcare, in addition to lacking on-farm productive inputs and income-generating market access opportunities.

4.1.8 Distribution of Livestock Raising Experience among Respondents

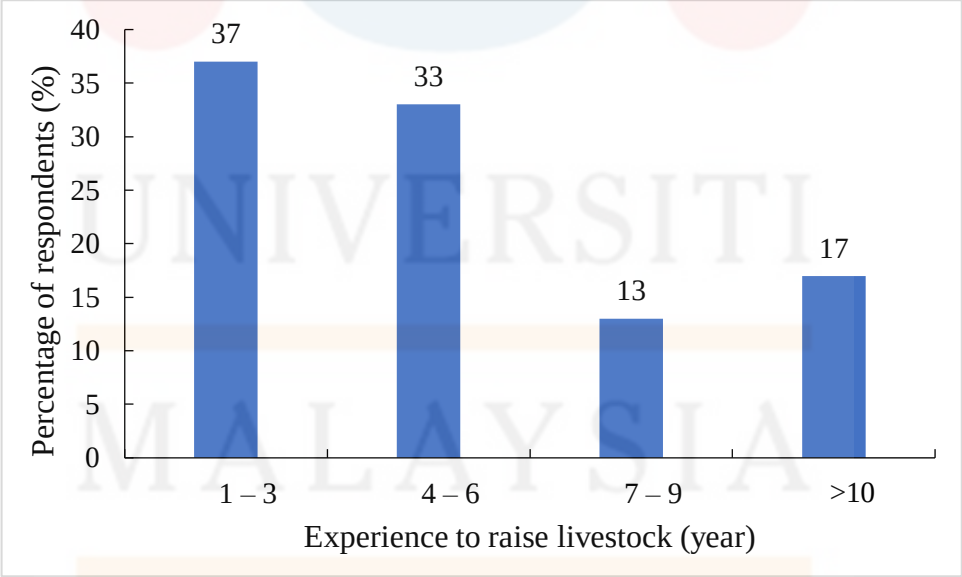

Figure 4.1.8: Percentage of respondents by period of livestock raising experience (year).

Figure 4.1.8 shows that 37% of the respondents experienced to raise livestock 1 to 3 years followed by 4 to 6 years of experience (33% of respondents), more than 10 years (17% raising livestock) and 7 to 9 years' experience (13% of respondents) in cattle farming. This represents that many respondents are still new in this industry. The livestock industry is becoming increasingly well-known for the large number of newcomers who involved in it. The majority of them see bright prospects in this industry, especially with the increasing demand for beef products, making it a good source of income for them. According to Degaldo and Christopher (2005), the growth of livestock in agricultural sector is driven by the rapidly increasing demand for livestock products, which is fuelled by population growth, urbanization and increasing incomes in developing countries.

4.1.9 Distribution of Meat, Milk and Egg Consumption Patterns Before and During COVID-19

According to Figure 4.1.9 (a), the data showed that about 7% of respondents consumed meat daily followed by 33% consumed meat 3–4 times, 50% consumed meat 1–2 times, and 10% who had never consumed meat before to the COVID-19 pandemic. During the COVID-19 pandemic, no respondents consumed meat daily, 20% consumed meat 3–4 times, 60% consumed meat 1–2 times, and 20% never consumed meat. This demonstrates that the meat consumption pattern of the respondents has changed due to the COVID-19 pandemic. Based on Figure 4.1.9 (b), 20% of respondents consumed milk

daily before COVID-19 pandemic followed by 27% who consumed milk 3-4 times, 40% who consumed milk 1-2 times, and 13% who never consumed milk. During pandemic, 17% of them consumed milk daily followed by 27% consumed milk 3-4 times, 33% consumed milk 1-2 times, and 23% never consumed milk. This indicates that the pandemic also had an impact on the milk consumption patterns of the respondents. Figure 4.1.9 (c) shows 37% of the respondents consumed egg daily before COVID-19 pandemic followed by 50% consumed egg 3-4 times, 10% consumed egg 1-2 times and only 3% of respondents never consumed egg, whereas during COVID-19, 47% of respondents who consumed egg daily, 33% of respondents who consumed egg 3-4 times per week, 13% of respondents who consumed egg 1-2 times and 7% of respondents who never consumed egg. As a result of the survey, the researchers found that the COVID-19 pandemic had a significant impact on consumption patterns of all three selected foods.

The reports show that the daily consumption of meat and milk during the COVID-19 pandemic decreased while the daily consumption of eggs increased. As the price of these foods has increased in the market, many respondents chose eggs as their daily food since eggs are cheaper than meat and milk. When the movement restriction was announced, the public went into a panic buying frenzy, leading retail sales of eggs, meat, and dairy to skyrocket. Stocks of eggs, meat, and milk at the market sold out due to panic buying, which are all in high demand. When such foods are soon sold out, the price rises, preventing many people from purchasing it. This is a consequence of the decreased in daily consumption of meat and milk and an increased in daily consumption of egg on a daily basis. In a study by Aday and Aday (2020) who stated that the increased customer demand resulted in empty shelves, and a loss in supply led in a rise in the price of meat and dairy products. From mid-March to early-April, wholesale egg prices in the United States tripled (Urner-Barry, 2020).

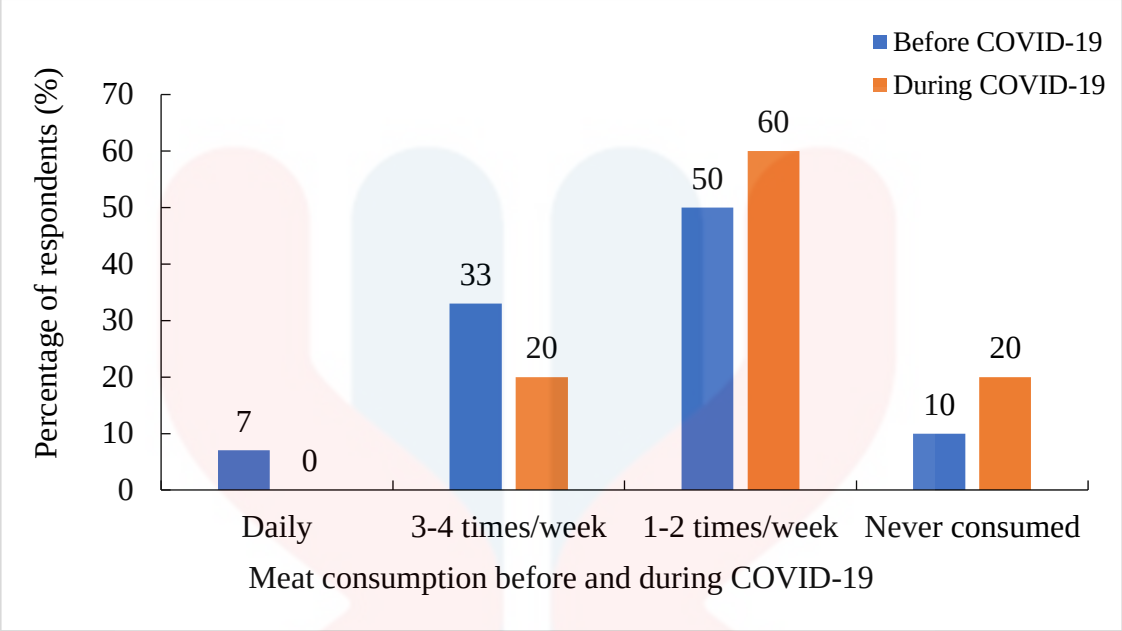

Figure 4.1.9 (a): Percentage of respondents consumed meat before and during COVID-19.

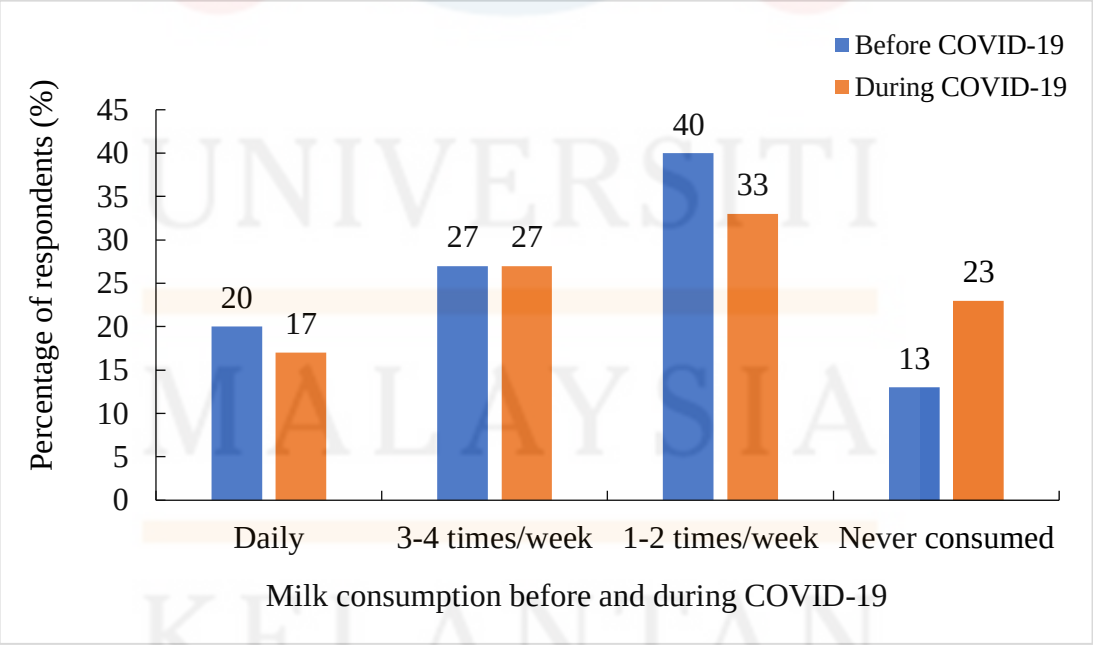

Figure 4.1.9 (b): Percentage of respondents who consumed milk before and during COVID-19.

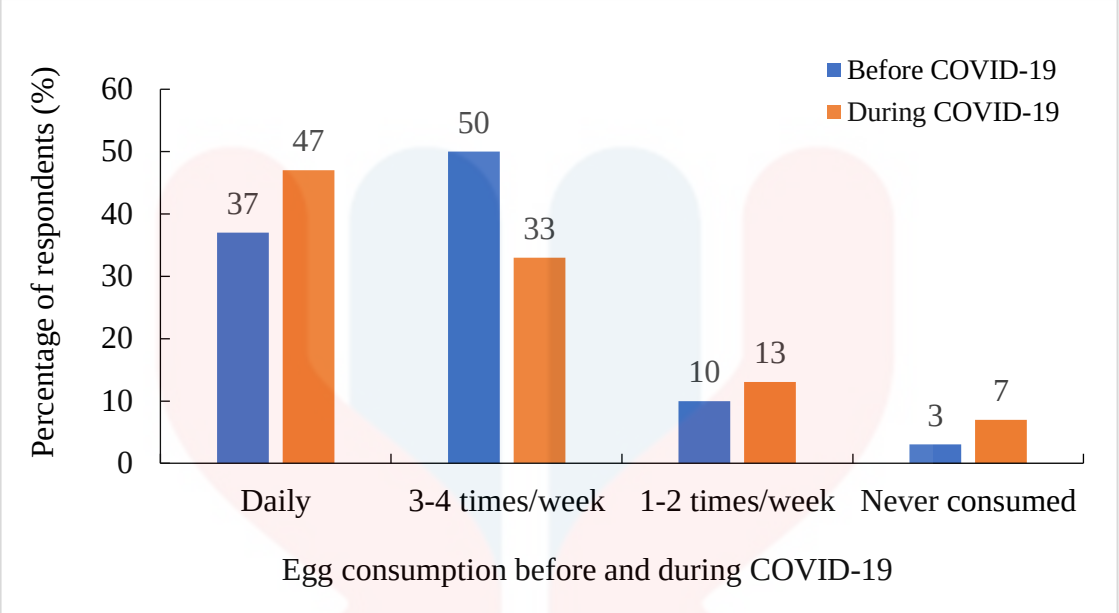

Figure 4.1.9 (c): Percentage of respondents who consumed egg before and during COVID-19.

4.1.10 Distribution of Number of Cow and other Livestock Hold in Smallholder Livestock Farmers

Table 4.1.10: Number of cow and other livestock in smallholder livestock farmers in this survey

Species	Number of livestock sold/household/year
Cow	15.83 ± 5.38 (30)
Goat	1.70 ± 5.06 (4)
Sheep	1.17 ± 3.77 (3)
Buffalo	0.17 ± 0.91 (1)
Total	18.87 ± 6.42 (30)

Figures in parenthesis indicate number of respondents. Mean ± standard deviation.

Based on a survey of all 30 respondents, the majority of smallholder farmers raised cattle as their main livestock, with some of them also raised other livestock such as goats, sheep and buffaloes. According to the reports, cows had the highest mean value of 15.83 cows per household followed by goat with the mean value of 1.70 goats per household, sheep with the value of 1.17 sheep per household, and buffalo with the mean value of 0.17 buffaloes per household. The total mean value of all species is 18.87 per household. This demonstrates that cattle farming has a positive impact on their business due to the increasing demand for meat and milk in the market. High prices and

demand for meat and milk can provide benefits to farmers or producers. It is not surprising that the cattle farming has grown in popularity. According to the previous research by Mugumaarhahama et al. (2021), cattle farming is a vital component of farmers' lives and one of the few income-generating alternatives for smallholders in South-Kivu, Democratic Republic of Congo.

4.1.11 Distribution of Number of Cow and other Livestock Sold in Smallholder Livestock Farmers

Table 4.1.11: Number of cow and other livestock sold in per household during last one year

Species	Number of livestock sold/household/year
Cow	4.07 ± 3.14 (25)
Goat	0.57 ± 1.55 (4)
Sheep	0.27 ± 0.83 (3)
Buffalo	0.07 ± 0.37 (1)
Total	4.97 ± 3.49 (26)

Figures in parenthesis indicate number of respondents. Mean ± standard deviation.

Table 4.1.11 shows that the number of cows sold in per household during last one year was the highest, with the mean value of 4.07 cows per household, followed by goat with the mean value of 0.57 goats per household, sheep with the mean value of 0.27 sheep per household, and buffalo with the mean value of 0.07 buffaloes per household. The total mean value of all livestock species sold in per household during last one year is 4.97 livestock per household. This demonstrates that the demand for cattle is very high compared to other farm animals. The cattle sector is a lucrative career for farmers due to the high demand for meat and milk in the market. However, since the advent of COVID-19, many cattle businesses have been adversely affected by a variety of issues.

4.1.12 Distribution of Respondents according to Additional Occupation

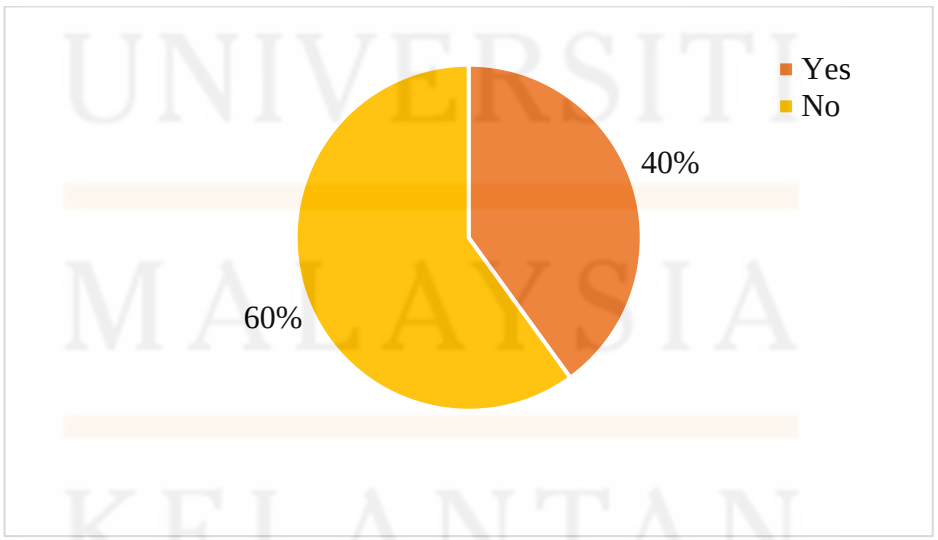

Figure 4.1.12: Percentage of respondents who have additional occupation in addition to raising livestock.

As illustrated in Figure 4.1.12, 60% of the respondents have no other occupation than raising animals, whereas 40% of respondents have their other occupation. This implies that 60% of them have a full-time job that entails raising livestock and earning money from it. This is due to their desire to focus entirely on their livestock and rely solely on the job. Unlike the rest, they have side jobs and have time to do both jobs at one time. According to the survey, some of them have side jobs such as rubber tappers, traders, teachers, and others. This shows that they are multitasking and able to generate more income from these jobs. However, there are also those who may need to look for other jobs in addition to farming as a side income. Their livestock industry may be affected due to the COVID-19 pandemic. In a report titled "Supply & Utilization Accounts Selected Agricultural Commodities 2016-2020," the DoSM state that the decline in livestock production attributed to a decrease in demand caused by a longer Movement Control Order (MCO) period.

4.2 Problems Faced in Carrying Out Livestock Activities during the COVID-19 Pandemic

4.2.1 Distribution of Problems on Livestock Farm Management during COVID-19 Pandemic

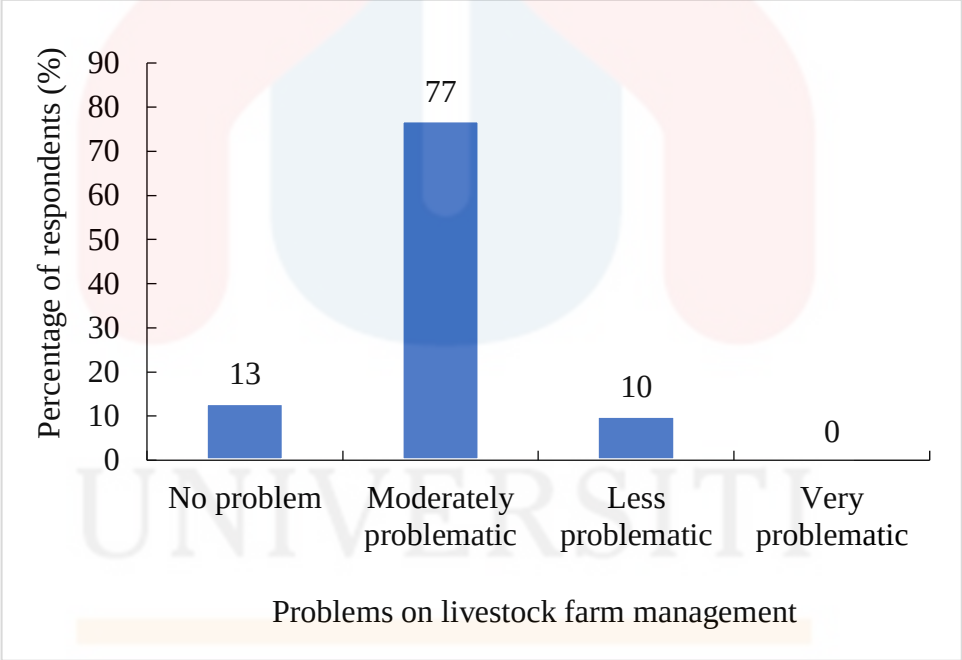

Figure 4.2.1: Intensity analysis of problems on livestock farm management during COVID-19 pandemic.

Figure 4.2.1 demonstrates that during COVID-19, 77% of the respondents reported moderate problems with livestock farm management, followed by 13% who had

no problems, 10% who had less problems, and no respondents who had major problems. This indicates that most of the farmers faced moderate problems with their livestock farm during COVID-19. This shows that the COVID-19 pandemic has an impact on farmers' farm management. The government's lockdown order has caused movement and transportation disruptions, which has triggered several problems for farmers, including insufficient feed supplies, labor shortages, animal health crises, difficulty processing, selling, and delivering products, and declining food demand. The government's lockdown order has caused movement and transportation disruptions, which have triggered several problems for farmers, including insufficient feed supplies, labor shortages, animal health crises, difficulty processing, selling, and delivering products, and declining food demand. According to the research done by Zhang (2020) of the International Food Policy Research Institute (IFPRI) in China, he stated that livestock farmers experience critical problems due to a lack of agricultural labor and raw materials, as well as an insufficient supply of animal feed.

4.2.2 Distribution of the Main Problems in Livestock Farm Management during COVID-19 Pandemic

Figure 4.2.2 shows that during the COVID-19 pandemic, the majority of the respondents (60%) faced problems buying cattle feed and necessities, as opposed to other problems such as difficulties selling animals (23%), animal health issues (10%), and slaughtering and processing issues. However, only a few respondents (3%) did not

face any problems in managing their farms during COVID-19. This shows that the problem for buying livestock feed and necessities is the most major problem that occurs among farmers. This is because, feed is very important to farm animals to ensure the survival and production of livestock. Due to movement restrictions and closure of shops issued by the government, Due to movement restrictions and closure of shops issued by the government, this poses a problem for farmers to access feed supply to their livestock.

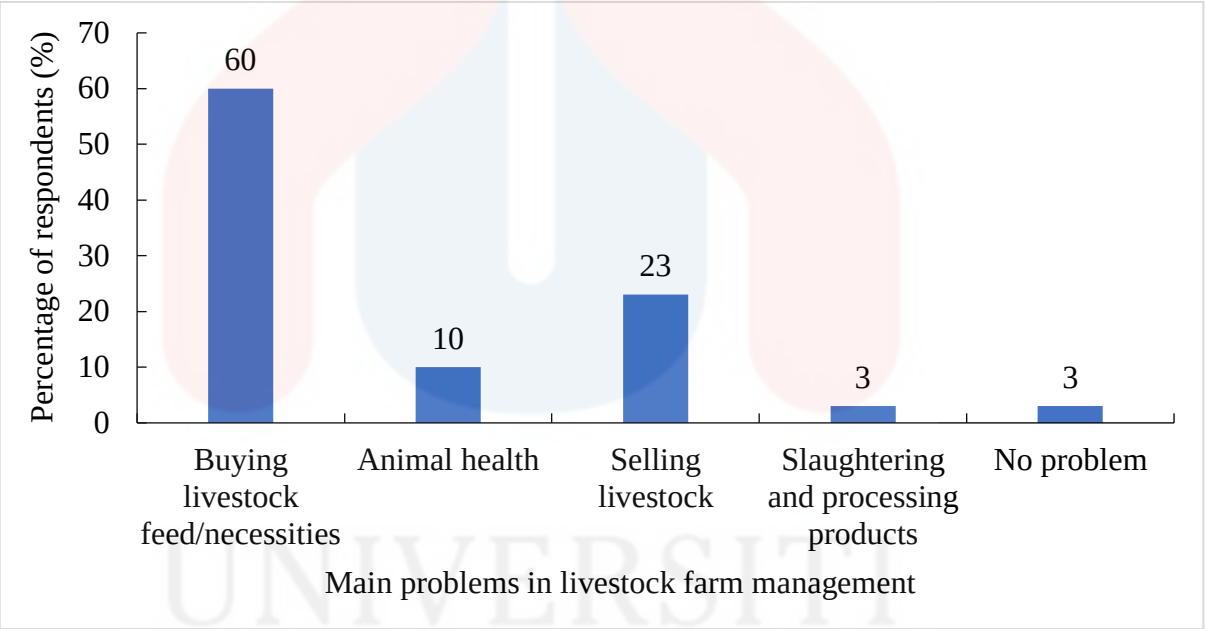

Figure 4.2.2: Main problems in cattle farm management during COVID-19 pandemic.

4.2.3 Distribution of Movement Restrictions to the Town

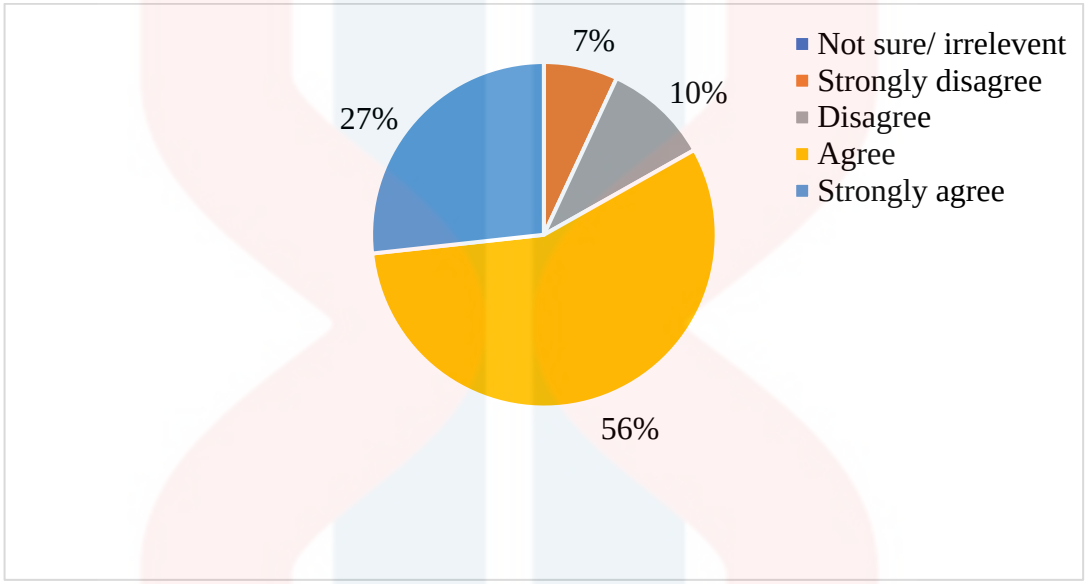

Figure 4.2.3: Distribution of movement restrictions to the town (Question: Unable to make movement to town/area to go to store that supplies animal feed and necessities).

As shown in Figure 4.2.3, majority of the respondents (56%) agreed that they cannot move to the town to access feed and necessities supply, whereas 27% of them strongly agreed. However, 10% of the respondents disagreed with this statement as they are able to move to the town to get the feed and necessities for their livestock, whereas 7% strongly disagreed. This is a string due to the COVID-19 crisis which resulted in mobility restrictions and lockdown orders to everyone. Due to this issue, farmers are unable to leave their homes and go to other places to purchase feed and other necessities for their livestock.

4.2.4 Distribution of Animal Supplier Stores Closure

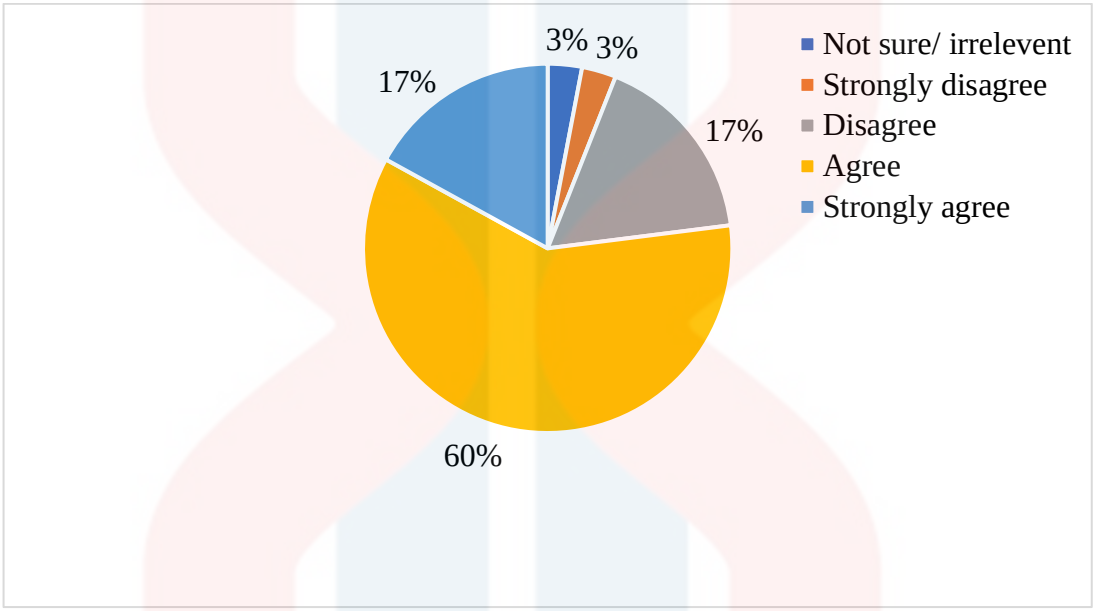

Figure 4.2.4: Distribution of animal supplier stores closure (Question: Stores that supply animal feed and necessities (medicines etc.) around your area are not open).

Figure 4.2.4 shows that about 60% of the participants agreed that the stores that supply animal feed and necessities around their area are not open followed by 17% strongly agreed. Only a few, 17% of them disagreed and 3% strongly disagreed about the closure of the stores around their area. 3% of the respondents not sure about this statement. This represents that most of the stores are shut down because of several issues like cut off feed supply from outside. The animal feed supply or raw materials are usually imported from foreign countries. But due to COVID-19, many suppliers had to close their stores due to delays and blockages of transportation delivering raw materials to the port.

4.2.5 Distribution of Insufficient Feed and Necessities Supply

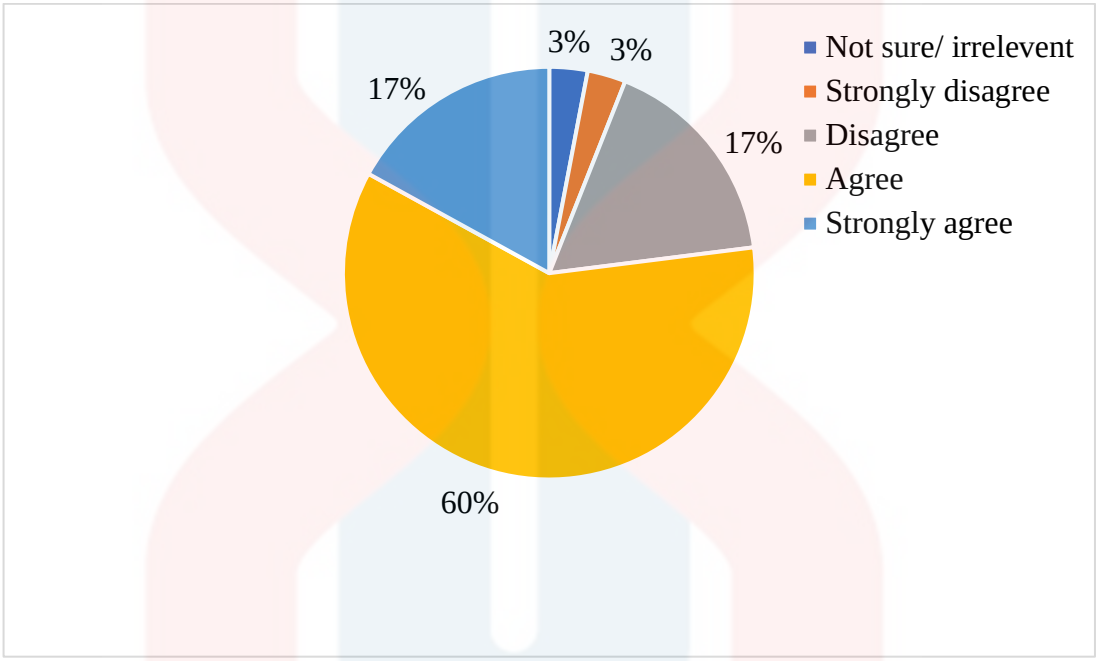

Figure 4.2.5: Distribution of insufficient feed and necessities supply (Question: There is an insufficient supply of animal feed/necessities in your area).

As shown in Figure 4.2.5, about 60% of the respondents agreed that the feed supply or animal necessities in their area were insufficient, with 17% strongly agreed. About 17% of the farmers disagreed about the insufficient supply of feed and necessities in their area, whereas 3% of them strongly agreed. The remaining 3% of the respondents who were not sure of the question. The majority of farmers were experiencing insufficient supplies of animal feed and necessities as a result of the closure of shops that provide feed supplies and animal needs.

4.2.6 Distribution of the Lack of Respondent's Budget

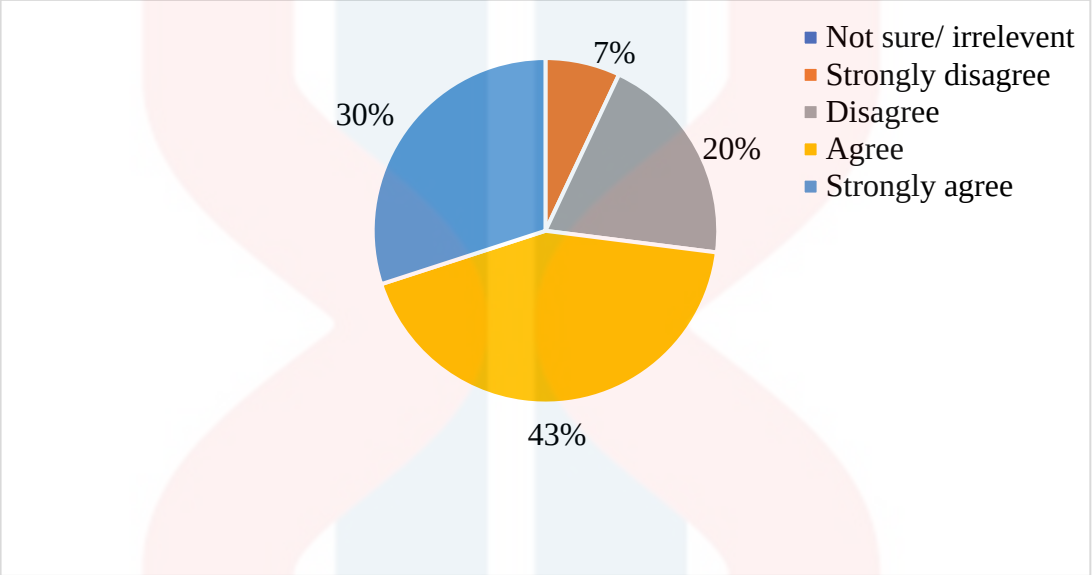

Figure 4.2.6: Distribution of the lack of respondent's budget (Question: The budget to buy animal feed/necessities is not enough).

Figure 4.2.6 illustrates that 43% of the respondents agreed that they are facing the lack of budget to buy animal feed and necessities, whereas 30% of them strongly agreed. However, 20% of farmers disagreed, with 7% strongly disagreed, that they are experiencing a budget shortage. This suggests that the majority of respondents did not have enough money to buy feed and needs for their animals. COVID-19 has been shown to have an impact on their income due to a lack of customer demand for live animals and livestock products like meat and milk. Lowering purchasing and demand of the customers leads in a revenue shortfall.

4.2.7 Distribution of Rising Feed Prices and Animal Needs

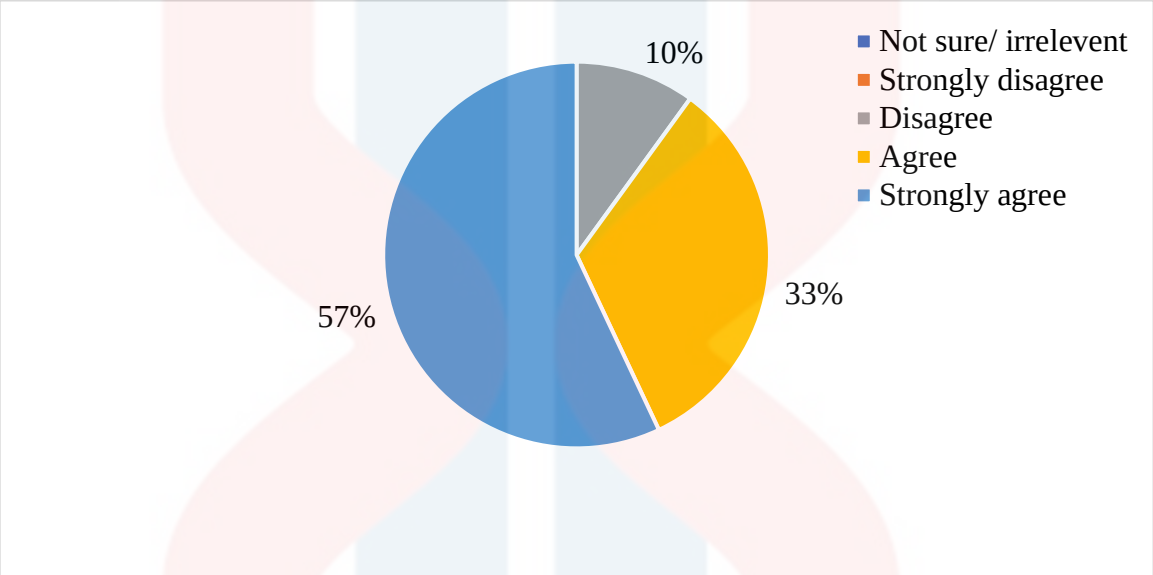

Figure 4.2.7: Distribution of rising feed prices and animal needs (Question: The price of animal feed/necessities is very expensive).

The data shown in Figure 4.2.7 indicates that majority of the farmers (57%) strongly agreed that the price of animal feed and necessities is very expensive. Furthermore, 33% of the farmers also agreed with that statement. Only a few of them (10%) disagreed about the high price of animal feed and necessities. This proves that COVID-19 led to an increase in the price of materials, putting many farmers out of business. Feed prices have risen as a result of suppliers' problems obtaining supplies from other nations. As a result, farmers are forced to buy feed and animal supplies at exorbitant prices in order to preserve their cattle and fields.

4.2.8 Distribution of Workers Shortage

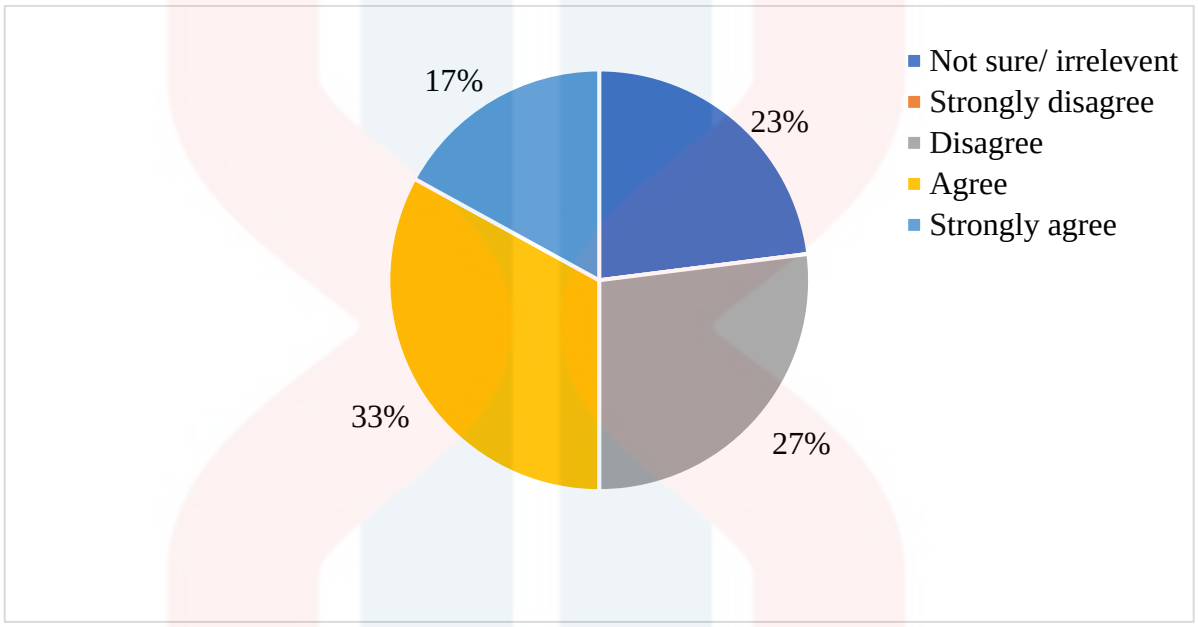

Figure 4.2.8: Distribution of workers shortage (Question: Workers cannot come to work).

Figure 4.2.8 shows that 33% of the farmers agreed that their workers couldn't come to work during COVID-19, with 17% strongly agreed. On the other hand, 27% of respondents disagreed that their employees would not be able to work during COVID-19. The remaining 23% are not sure about this statement. The percentage of the respondents who agree and strongly agree indicates that many of their employees are unable to come to work during this pandemic season. Many farm employees are unable to go to their workplaces or farms to perform their duties following the quarantine measures. This

extent has knock-on effects on farmers' incomes. In the United States, travel and immigration prohibitions enacted have exacerbated a pre-existing labour shortage in the farming sector (Willingham & Mathema, 2020). The disruption of normal economic activity caused by the epidemic demonstrates how crucial farmworkers are to the livestock industry.

4.3 Effects of Covid-19 Pandemic on Livestock Farm Management

4.3.1 Distribution of the Problem with Insufficient Feed Supply and Livestock Necessities

The pie chart in Figure 4.3.1 shows that 13% of the participants strongly agreed while 67% agreed that they were experiencing problems with insufficient feed supply and animal necessities. Only 3% of the participants stated that they strongly disagreed while 17% disagreed that they were experiencing insufficient feed supply and animal necessities problems. This chart shows that the majority of participants have problems with insufficient feed supply and animal necessities. Due to the COVID-19 crisis, the feed supply chain was disrupted due to movement restrictions. Many suppliers were cut off from feed supplies causing some of them have to close their stores. As a result of these factors, many farmers are unable to buy feed and the necessities of their animals. Major

suppliers such as Romania have prohibited exports to nations outside the European Union, causing serious demand-supply issues in the animal feed economy. Soybeans, flour, maize, barley, and wheat are among the forbidden grain exports (Choudhury, 2020).

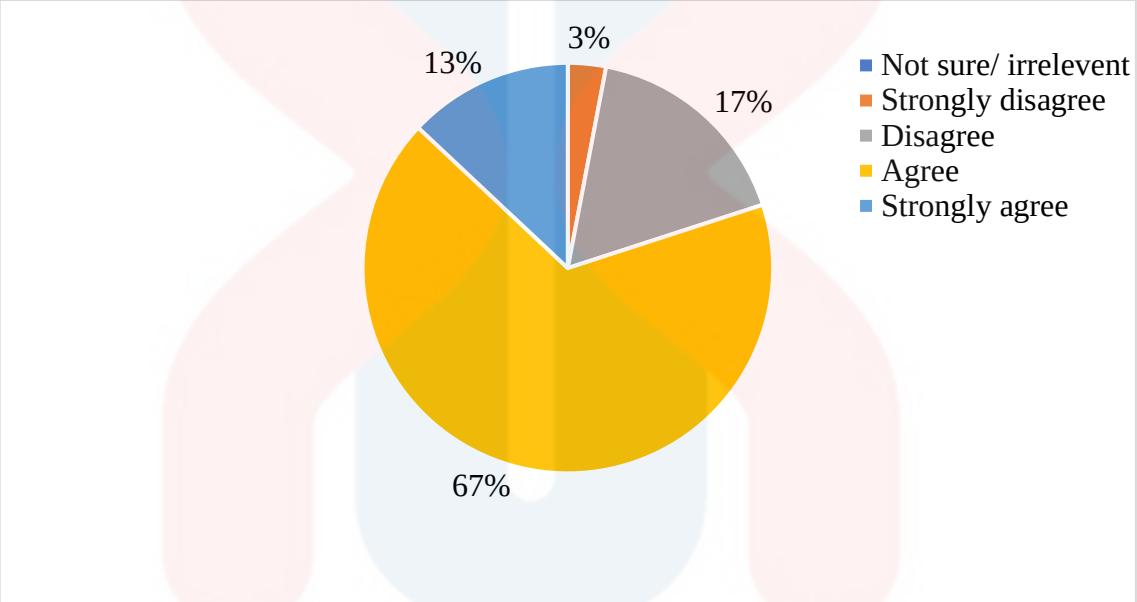

Figure 4.3.1: Distribution of the problem with insufficient feed supply and livestock necessities (Question: I have a problem with an insufficient feed supply and animal necessities).

4.3.2 Distribution of the Problem in Handling of Sick Animals

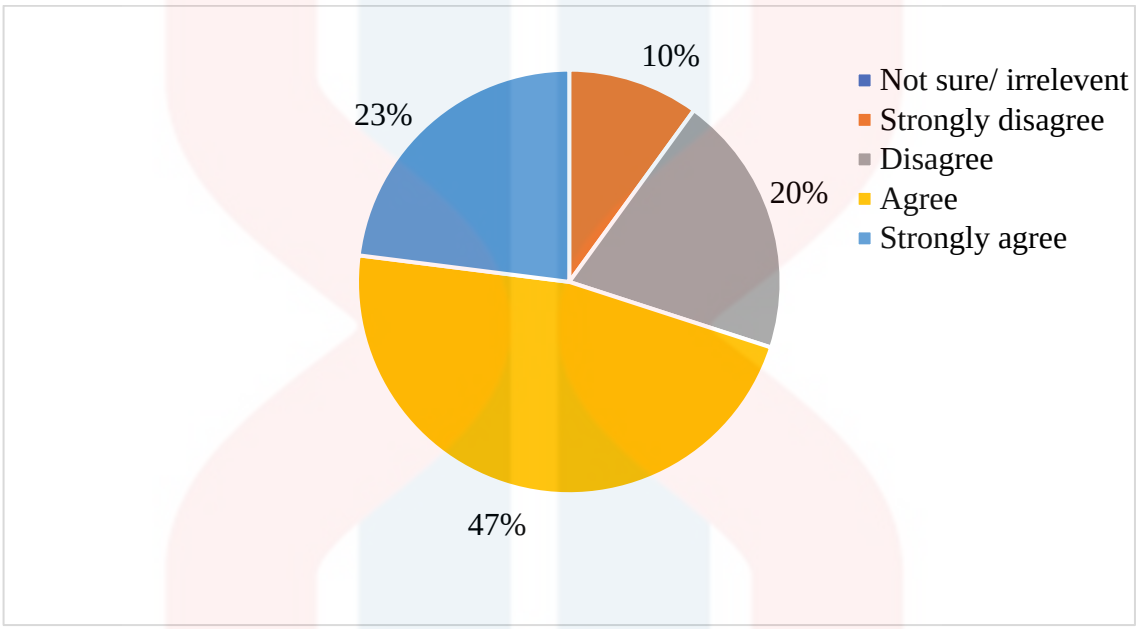

Figure 4.3.2: Distribution of the problem in handling of sick animals (Question: I have a problem handling of sick animals).

The distribution of pie chart in Figure 4.3.2 indicates that only 10% of the respondents strongly disagree that they have problem of handling sick animals while 20% only agreed. This pie chart also provides a clear visual impression that 47% of the participants agreed that they had problems with handling sick animals. About 23% of respondents strongly agreed that they had a problem of handling sick animals. This distribution of data provided enough reason to conclude that there was a problem of handling sick animals since majority of the participants agreed with this claim. Most

farmers were unable to get veterinary services due to sudden movement restrictions and lockdown measures, making it difficult for them to visit the farms. The effect of this also limited farmers to accessing animal health inputs and treatments such as vaccination, medicines and drugs, disinfectants, and other necessities.

4.3.3 Distribution of the Problem of Slaughtering or Processing Milk and Meat

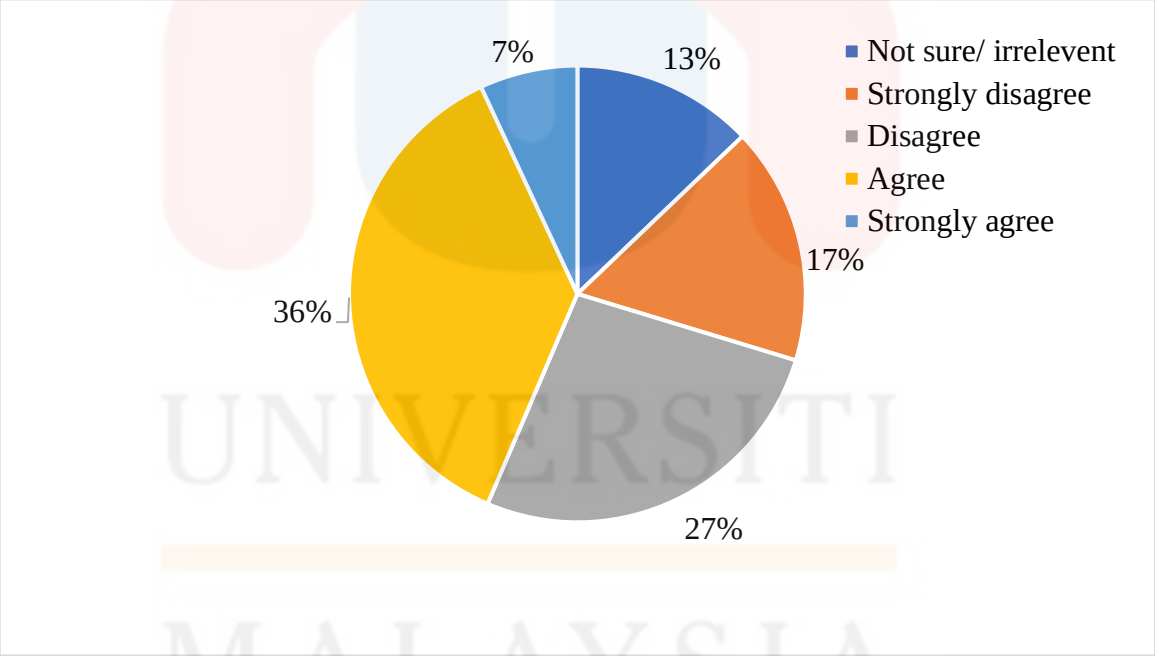

Figure 4.3.3: Distribution of the problem of slaughtering or processing milk and meat (Question: I have a problem slaughtering/processing (meat, milk etc.)).

Figure 4.3.3 shows that majority of the participants (36%) agreed that they had a problem of slaughtering or processing meat or milk while only 7% agree. This distribution of population is closely followed by individuals who disagreed with this statement (27%) where those who strongly disagree covers 17% of the population. 13% of the participants are not sure or perceive this statement of having problems with slaughtering or processing cattle products. The distribution of 36% of the participants indicates that during the COVID-19 pandemic there was a problem of slaughtering meat and processing of milk due to critical COVID-19 measures. Due to COVID-19, farmers have lost access to the market to sell their products causing a decline in product production. This decline caused the prices of meat and meat products to increase. The consumption of meat will be reduced because there are some consumers who cannot afford to buy meat at an expensive price. For instance, in China, meat production was decreased due to the quarantine of meat plant personnel, leading in a weakened supply chain and higher meat prices at local Chinese markets such as Beijing's Xinfadi market (Ijaz et al., 2021).

4.3.4 Distribution of the Employee's Shortage Problem

The pie chart in Figure 4.3.4 presents that 34% of the participants agreed that there was a problem of shortage of employees. 23% disagreed that they were facing the problem of shortage employees. On the other hand, the individuals who strongly agree and the ones who are strongly disagree with the problem of shortage of employees are the least with an equivalent percentage of 10%. However, 23% of the respondents not sure with

the problem of shortage of employees. The distribution of 33% of the participants gives adequate reason to conclude that during the COVID-19 pandemic there have been shortage of employees in farming sectors. Most of the employees developed the fear to contract Corona virus thus resulting to a problem of shortage of employees in livestock farming. According to the closure instructions and movement restrictions, most workers are unable to cross the border to get to work. This has contributed to the shortage of workers in their farms. Some had to be laid off due to economic problems faced by the farmers.

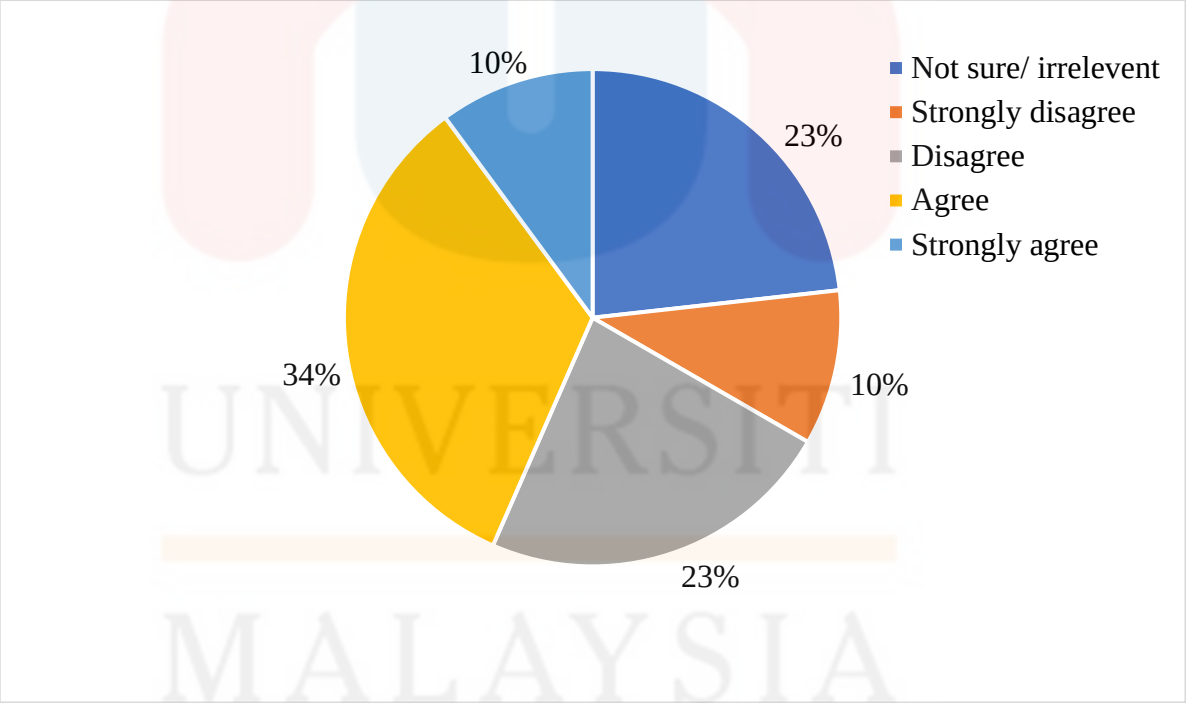

Figure 4.3.4: Distribution of the employee's shortage problem (Question: I have a problem in a shortage of employees).

4.3.5 Distribution of the Lack of Budget Problem

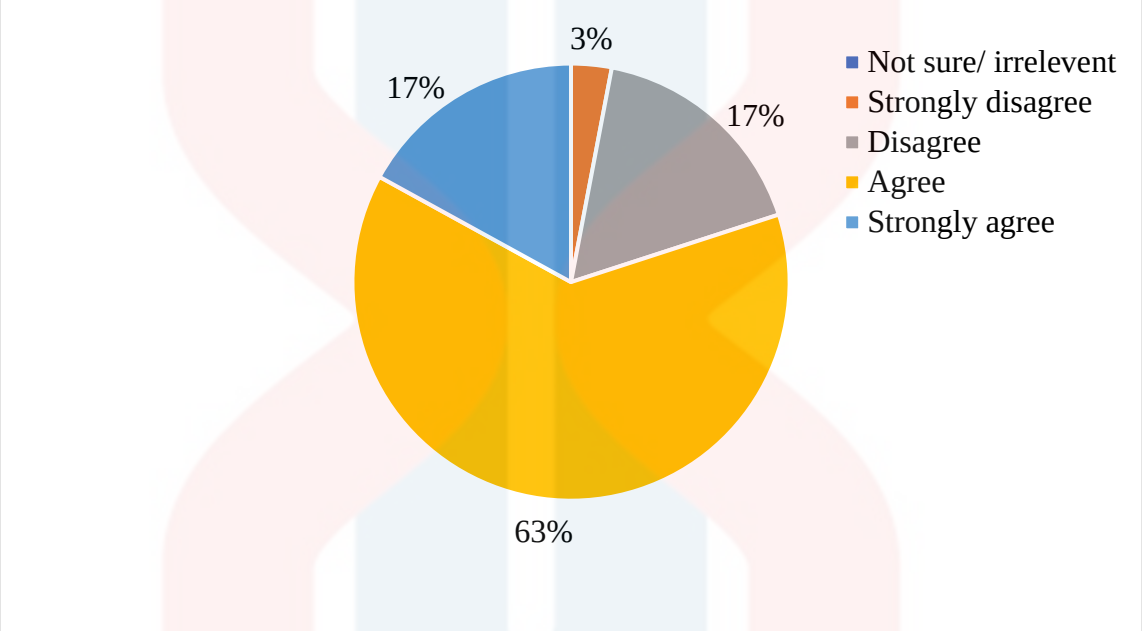

Figure 4.3.5: Distribution of the lack of budget problem (Question: I have a problem of lack of budget to buy animal feed/necessities).

As shown in Figure 4.3.5, 63% of the participants agreed that they had a problem with the lack of budget to buy animal feeds and other necessities while other 17% strongly agreed. This distribution of pie chart also provides a clear visual impression that only 3% of the participants strongly disagree with the aspect of having problems with the lack of budget of purchasing animal feeds and other necessities while other 17% are those who disagree got an equal population. This distribution gives clarification that there was some serious financial crisis during the COVID-19 pandemic thus resulting to budgeting

challenges to purchase animal's feeds and other necessities. The rising cost of feed and other items due to the COVID-19 outbreak also made it difficult for farmers to access feed and necessities for their livestock. Livestock feed prices have started to rise at a time when people have inadequate budgets due to low incomes.

4.3.6 Distribution of the Need to Lower Selling Price of their Livestock

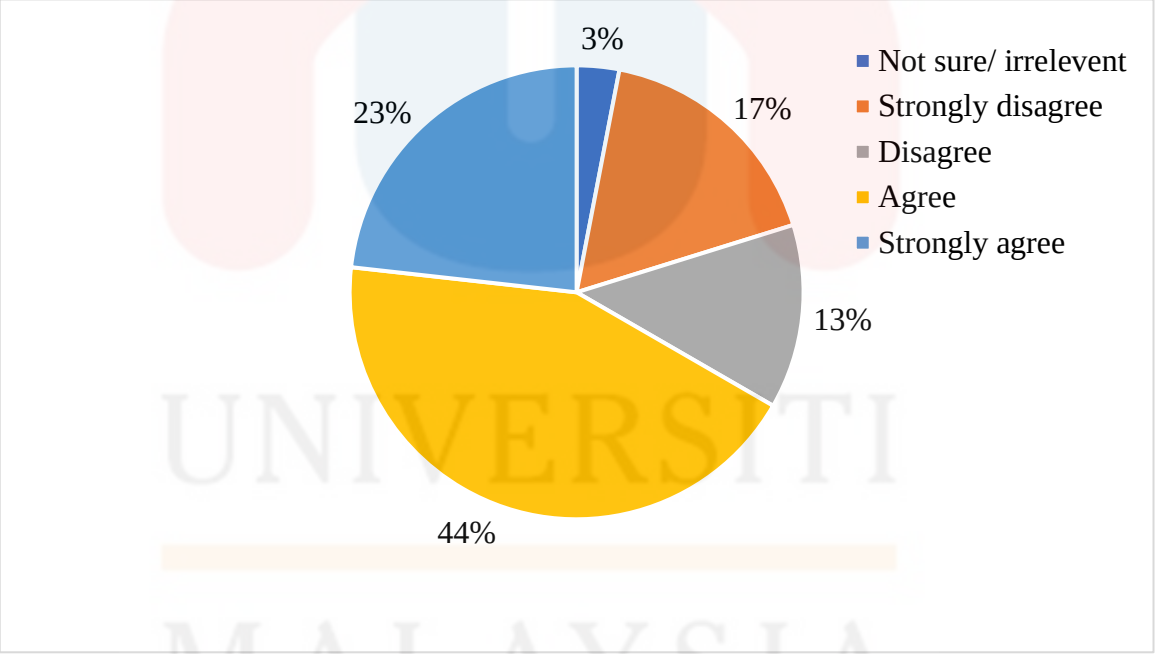

Figure 4.3.6: Distribution of the need to lower selling price of their livestock (Question: I need to lower the selling price of my livestock).

Figure 4.3.6 represents that 44% of the participants agree that they need to lower the selling price of their livestock and 23% are strongly agree. The individuals who disagree with this statement cover 13% of the population, and those who strongly disagree is 17%. On the other hand, the minority of the participants (3%) are not sure with the claim that they need to lower the selling price of their livestock. The distribution of pie chart indicates that majority of the participants clarifies that there was need for farmers to lower their selling price of livestock during the COVID-19. This implied that the livestock farming center experienced some losses due to some financial constraints during the COVID-19 pandemic. This implied that the livestock farming center experienced some losses due to some financial constraints during the COVID-19 pandemic. Many smallholder farmers have had to lower the selling price of their livestock so that it can be sold.

4.3.7 Distribution of the Respondent's Income during COVID-19 Pandemic

The distribution of pie chart in figure 4.3.7 shows that a significant number of the participants (74%) are experienced a decrease in their income during the Covid-19 pandemic. A moderate population of participants (23%) experienced no loss or gain in their income during the Covid-19 pandemic. The distribution of this pie chart also gives a clear visual impression that there is a slight number of the respondents (3%) experienced an increase in their income during Covid-19 pandemic. The distribution of 3% percent provides a clarification that only few of the livestock farmers had an increased amount of

income during the Covid-19 pandemic whereas the majority experienced a decrease in their income. The findings demonstrates that the COVID-19 epidemic has imposed a pressure on the economic activities of smallholder farmers. Many cattle farmers have suffered losses as a result of the reduction in the selling price of cattle and the rise in the price of livestock products such as meat and milk. According to a study carried out in india, the COVID-19 pandemic had a critical impact on smallholder farmers' productivity, sales price, and income (Harris et al., 2020). The findings reveal that farmers' income is decreased due to the COVID-19 pandemic (Gu and Wang, 2020).

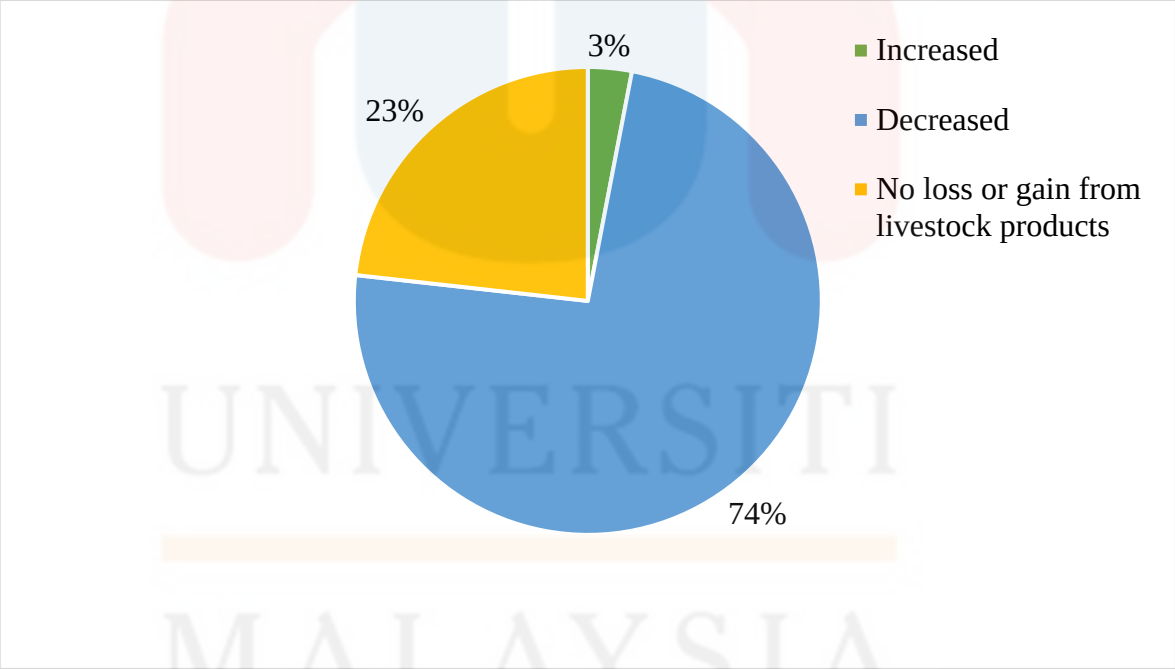

Figure 4.3.7: The respondent's income during COVID-19 pandemic.

4.3.8 Distribution of the Level of Concern Among Farmers about Contracting COVID-19 Pandemic

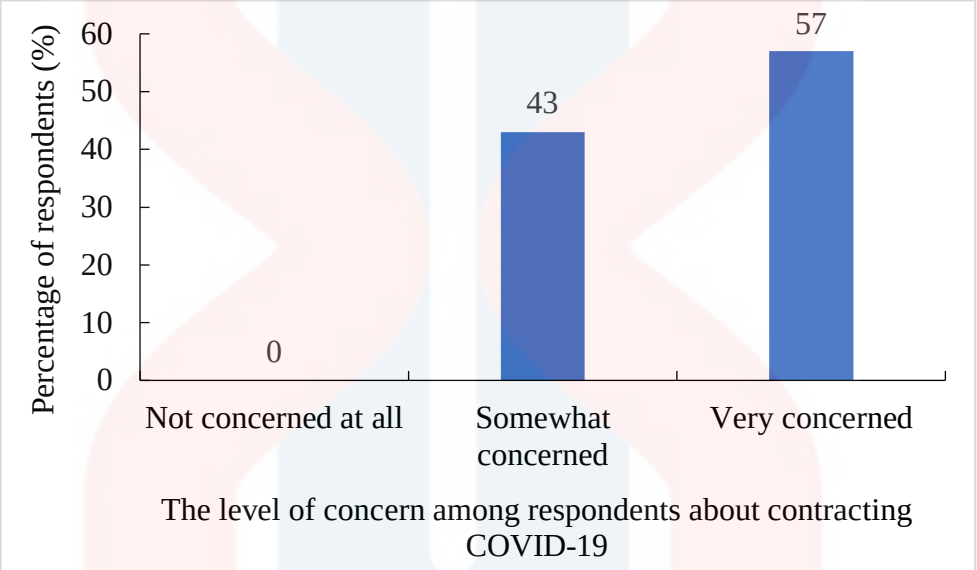

Figure 4.3.8: The level of concern among farmers about contracting COVID-19.

Figure 4.3.8 shows that the majority of the participants (57%) were very concerned about the contracting COVID-19, whereas moderate population of the participants (43%) were somewhat concerned with the aspect of contracting COVID-19 among farmers. The output of for graph also showed that none of the participant was not concerned at all with the aspect of contracting COVID-19. This data provides clarification that majority of the livestock farmers had a lot of concern on the aspect of contracting COVID-19. Hence, it is clear that performance of the livestock farming was highly affected due to the concern and fear of contracting COVID-19.

4.3.9 Distribution of COVID-19 Prevention Practices

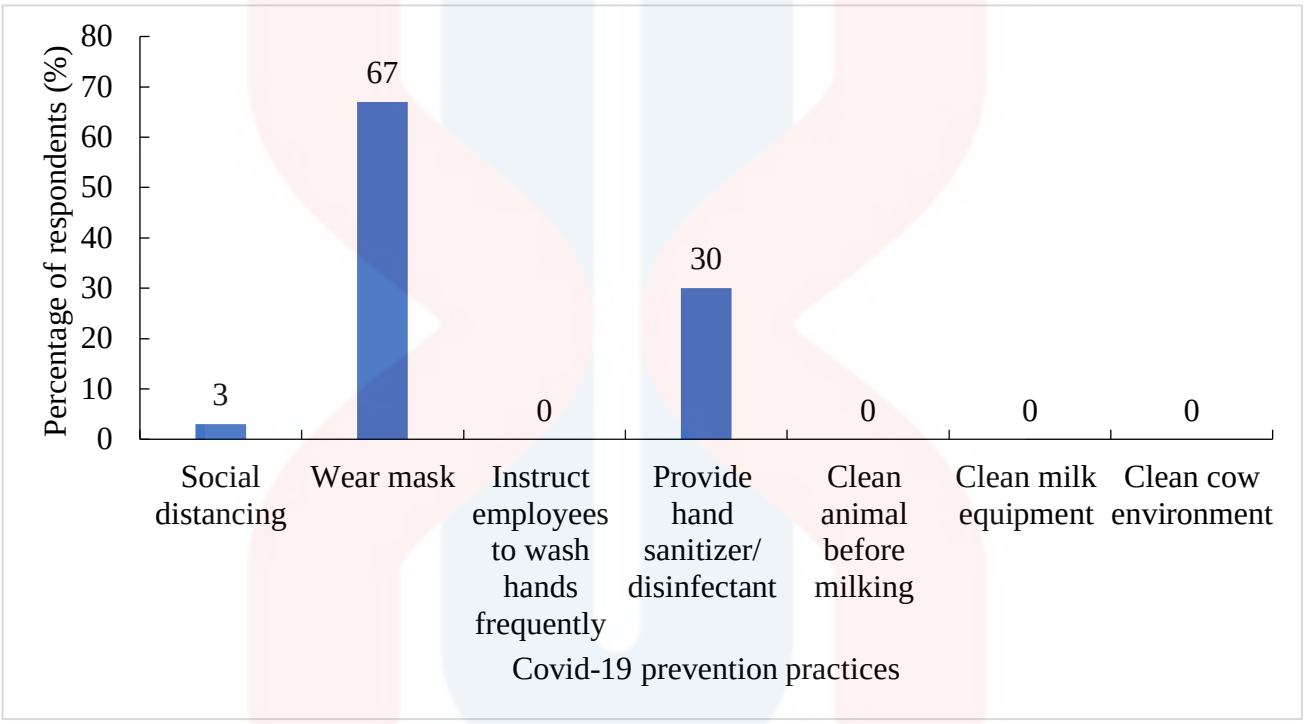

Figure 4.3.9: COVID-19 prevention practices.

According to the data in Figure 4.3.9, the majority of respondents (67%) considered to wearing a mask to be a major measure in preventing Covid-19 from spreading on their farms. About 30% of farmers prefer having hand sanitizer or disinfectant on hand to prevent the virus from spreading on their farms. To combat the disease, a small percentage of them (3%) priorities social distancing among farm employees. Other prevention practices such as instruct employees to wash hands frequently, clean animal before milking, clean milk equipment, and clean cow environment may also be applied by them but there are some who do not prioritize these

measures. The statistics show that farmers are aware and concern about Covid-19 transmission. Lack of understanding and awareness of this issue has contributed to the increasing number of Covid-19 cases. According to a previous study in Northeastern Ethiopia, 206 (63.6%), 157 (38.4%), and 117 (28.6%) of the 409 participants had sufficient knowledge, positive attitudes, and excellent preventative practices on COVID-19, respectively (Berhanu & Berihun, 2021).

4.3.10 Distribution of AI Service Trends during COVID-19 Pandemic

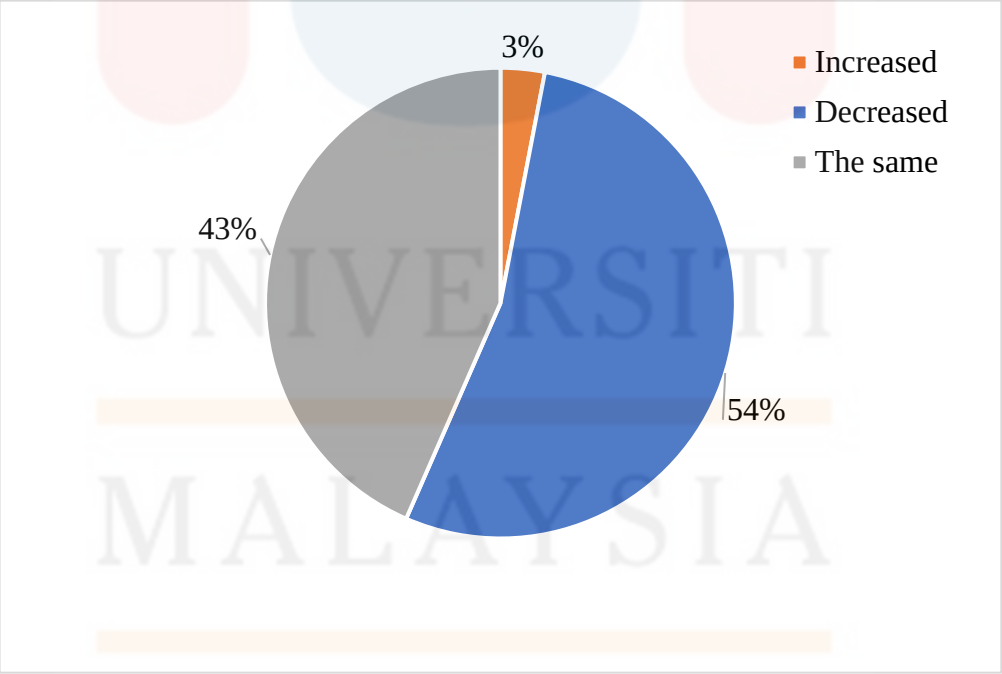

Figure 4.3.10: Trends of AI service during COVID-19 pandemic.

Figure 4.3.10 demonstrates that during the Covid-19 pandemic, 54% of respondents had a decrease in AI service, 43% of respondents remained stable, and the remaining 3% of respondents experienced an increase in AI service. The results showed that the majority of them had to deal with cattle breeding problems due to the ongoing Covid-19 crisis. To generate high-quality breeds, AI demands considerable investment. Since many farmers are financially impacted by the pandemic, they are unable to afford AI services, which necessitate highly trained personnel and specialized equipment.

4.3.11 Distribution of Veterinary Service Trends during COVID-19 Pandemic

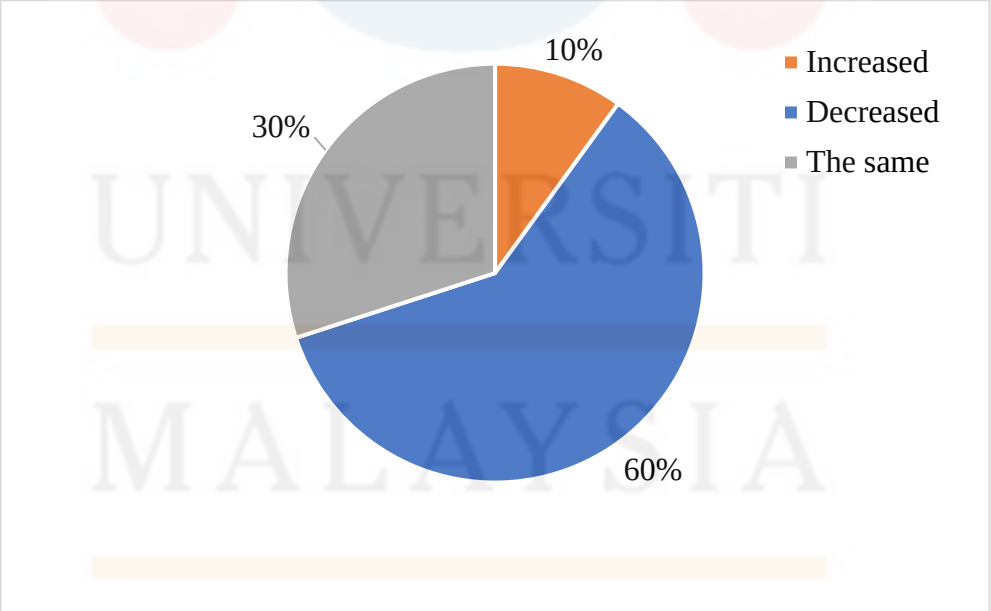

Figure 4.3.11: Trends of veterinary service during Covid-19 pandemic.

The chart in Figure 4.3.11 shows that most of the farmers (60%) had a decrease in veterinary service whereas while only a few (10%) of respondents have experienced an increase in the veterinary service. The respondents who did not experience any change in veterinary services representing 13% of the population. Movement restrictions and lockdown orders have prevented farmers from accessing veterinary service and give negative impact on veterinary service activities. According to the survey conducted by Food and Agriculture Organization of the United Nations Rome (FAO), both reported that movement restrictions were enforced in their respective countries as a result of COVID-19, which had an adverse impact on veterinary services' activities.

4.3.12 Distribution of Feed Supply Trends during COVID-19 Pandemic

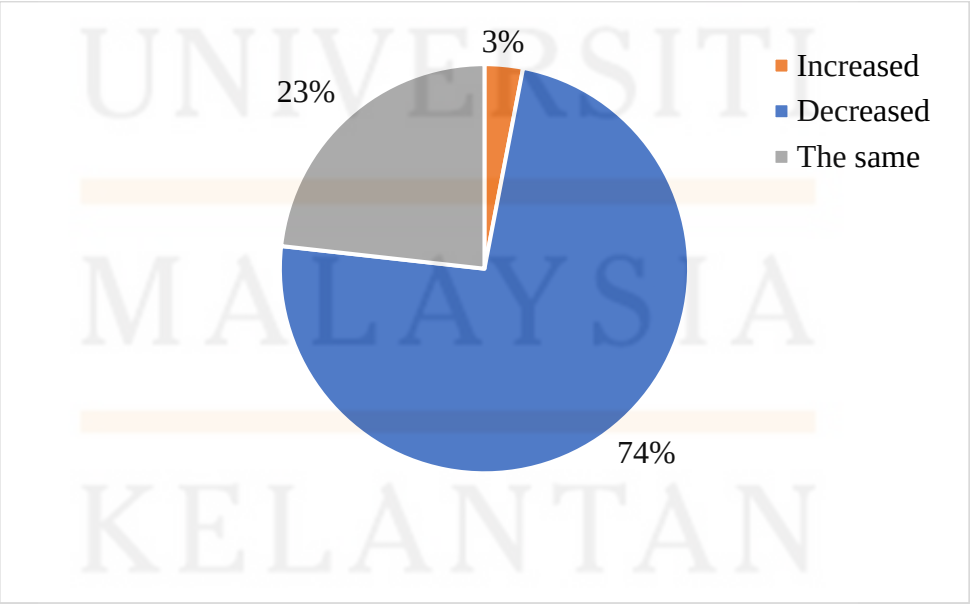

Figure 4.3.12: Trends of feed supply during COVID-19 pandemic.

Figure 4.3.12 demonstrates that during the COVID-19 epidemic, 74% of the participants experienced a decrease in feed supply. Only slightly participants (3%) experienced an increase in feed supply during this pandemic. In addition, 23% of the participants did not experience any change in livestock feed supply. This shows that majority of the farmers experiencing feed supply disruptions during COVID-19. In addition to the movement restriction and rising feed supply prices factors, the closure and ban on imports by the largest feed-producing states also led to the disruption of feed supply. China, a major supplier of organic soybeans has disrupted global organic feed producers and impacted the supply of containers and ships due to their measures to curb the spread of COVID-19. On the other hand, the Indian Government has ordered international ports to shutdown causing more difficulties in the animal feed supply chain.

4.3.13 Distribution of Meat/Milk Sold Trends during COVID-19 Pandemic

According to Figure 13, during the COVID-19 epidemic, a large number of farmers (67%) had a decrease in sales revenue of cow products such as meat and milk sold from farms, while just a few (3%) of respondents had an increase in sales of their livestock products. The remaining 30% did not experience any decrease or increase in sales revenue of their livestock products during COVID-19. This proves that COVID-19 has had a significant impact on their farms' meat and milk sales. The consumption of meat and milk by consumers is drastically reduced due to the movement control order (MCO) by the government. As a result of this, consumers are unable to purchase such products

due to limited mobility. Furthermore, farmers or producers of meat and milk face difficulties in selling and distributing such products to markets, shops, restaurants, and channels. There are other markets that must close, making purchasing and selling more difficult for customers, and producers. For instance, farmers in developing countries such as Pakistan were unable to travel from rural to cities due to a lack of transit options, preventing them from selling their animals in marketplaces due to lockdown rules (Ijaz et al., 2021).

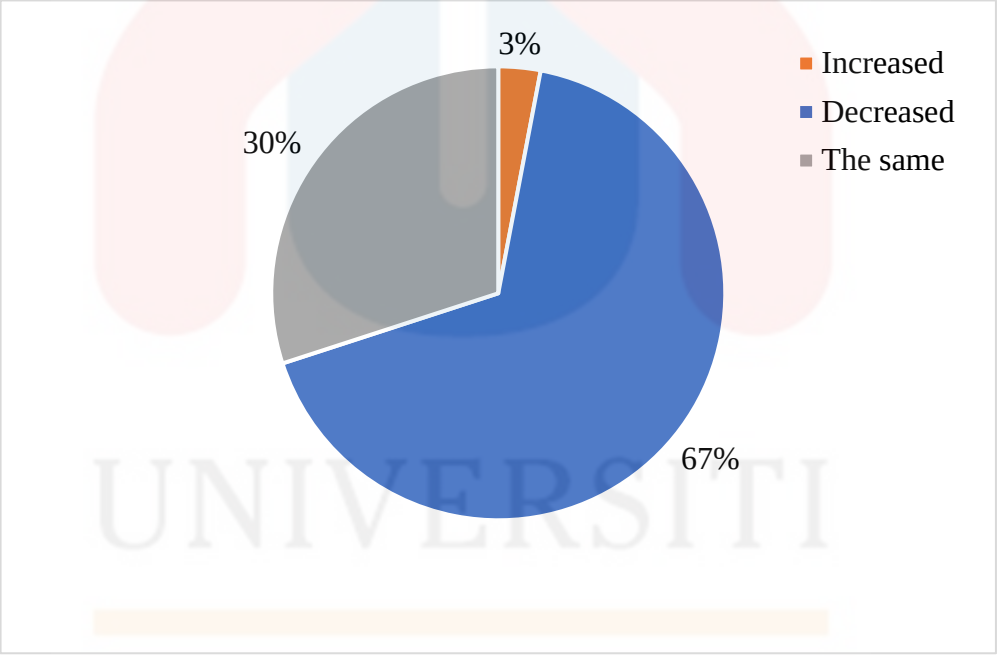

Figure 4.3.13: Trends of meat/milk sold from farms during the COVID-19 pandemic.

4.3.14 Distribution of Demand of Cow Meat/Milk during COVID-19 Pandemic

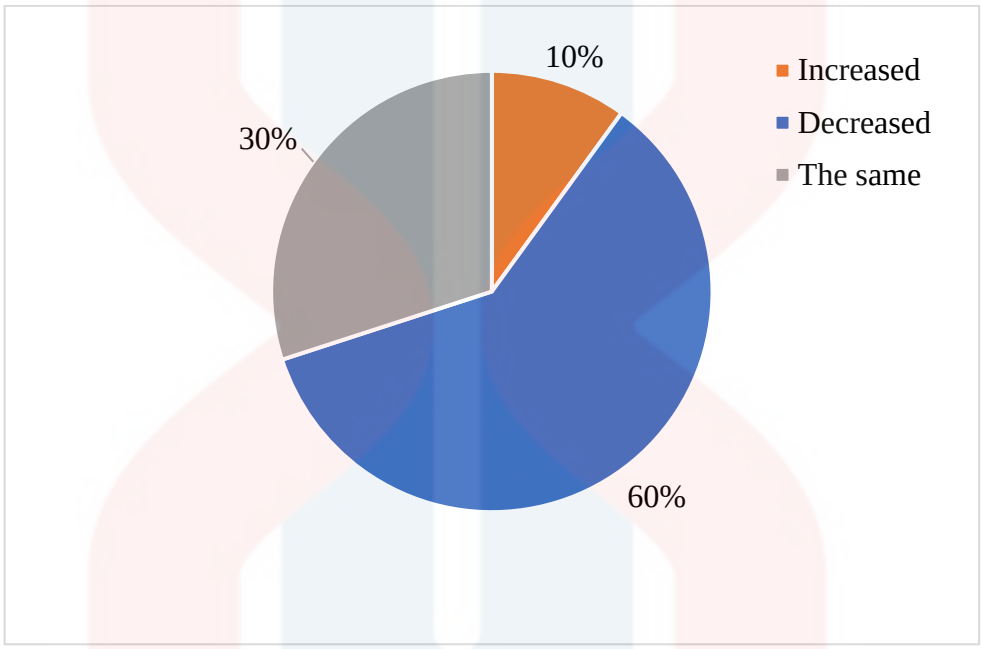

Figure 4.3.14: Demand of cow meat/milk by the customers during COVID-19 pandemic.

Figure 4.3.14 represents that 60% of the respondents experienced a decrease in customer demand of cow meat and milk during COVID-19 pandemic. The data also shows that 10% of respondents experienced an increase in the demand of cow meat and milk by customers during COVID-19 pandemic. Besides, 30% of respondents did not have experience a change in customer demand for beef and cow's milk. The report shows that demand for cow meat and milk dropped drastically following COVID-19. Movement restrictions have led to a lowering in consumer purchases, resulting in a decrease in meat

and milk demand. Many farmers are harmed by this distortion because they require consistent cash flow to feed their animals.

4.3.15 Distribution of Price at Meat/Milk Selling Trends during COVID-19 Pandemic

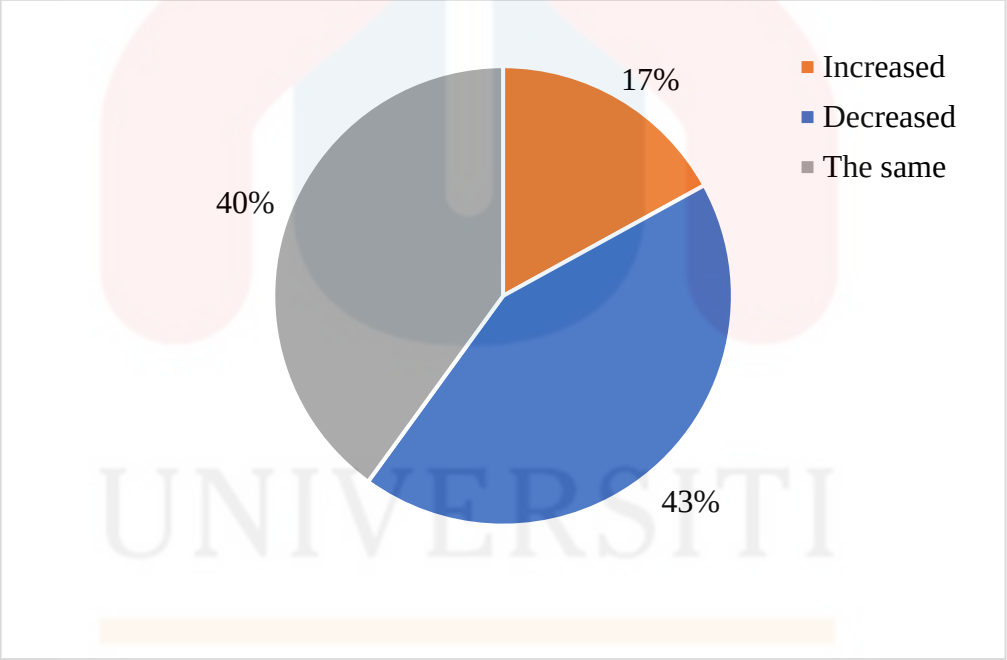

Figure 4.3.15: Response (%) of respondents for trends on price at meat/milk selling during COVID-19 pandemic.

As illustrated in Figure 4.3.15, 43% of the respondents had to decrease the price of cattle meat and milk during the COVID-19 pandemic. In contrast, 17% of farmers had to increase the price of cattle meat and milk during the COVID-19 pandemic. However, 40% of respondents did not do a change in meat or milk price during COVID-19. This indicates that only half of the respondents had to reduce the price of their products due to lack of meat and milk demand from customers or consumers. Some farmers have to raise the prices of their products due to lack of production from their farms and increased demand from consumers due to panic buying. According to the European Data Portal (2020), the COVID-19 epidemic resulted in a large increase in food prices due to lockdown restrictions, panic buying, and supply chain disruptions. Therefore, consumers are the major role in the meat and milk supply chain because changes in consumer behavior greatly affect the sales of such products.

CHAPTER 5

CONCLUSION

5.1 Conclusion

In conclusion, the result showed that COVID-19 pandemic has less significant impact on cattle production in Kelantan. The relationship between farmers monthly income and the number of cows per households was investigated. Findings of this survey showed that about 77% of the respondents faced problems on cattle farm management since the covid-19 pandemic occurred, in which problem for cattle buying faced the most (60% of the respondents). About 57% of the respondents were unable to make a movement to areas to go to the stores that supply animal feed and necessities due to movement control order. Under the unexpected covid-19 pandemic, about 60% of the respondents claimed that they were not able to buy the feed and necessities in their local areas due to the closed the shop. Due to declining income, about 43% of the respondents faced a lack of budget to buy the feed and other necessities. About 57% of the respondents

claimed that input prices increased and interrupted input supplies. In addition, about 33% of the respondents mentioned that they were facing a shortage of worker to run their farm. To cope with the above problems, respondents are expected to receive government support in forms of finance, soft loans, agricultural input materials, training and favourable conditions for their production and business.

5.2 Recommendations

The government must create, develop, and execute strategies to mitigate COVID-19's impact on the livestock industry and value chain. The government is recommended to support and ensure the availability of inputs and outputs for cattle farming households to encourage farmers to continue their current farming. For instance, the government should issue a list of exceptions to movement restrictions such as feed supply marketing, medicine, vaccines, live animal marketing, and public services such as veterinary services. This is to ensure that the livestock supply chain and animal products are in good working order.

Furthermore, the government should collaborate with farmers and producer organisations to encourage collective marketing in order to maintain product demand. It is suggested that the government promote e-commerce in order to assist connect rural producers with metropolitan consumers. Governments can work with NGOs and vendors

to buy products and resell them, for example, through food banks, religious charities, or international emergency and relief organisations like UNICEF and UNHCR.

In addition, the government and relevant agencies should provide multi-purpose financial assistance to vulnerable groups or farmers affected by COVID-19 so that they can acquire their basic needs from local marketplaces, therefore reviving the local economy and restoring market equilibrium. Instead, local governments should improve their vigilance in monitoring the supply of daily essentials in the market and controlling the aggravating situation. Long-term interest-free credit or flexible repayments should also be made available to help agro-based businesses recover from the severe COVID-19 shock and continue doing business as usual.

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APPENDIX 1

Online questionnaire

Impact of COVID-19 pandemic on cattle farming and its sustainable strategy in Kelantan

SECTION A: SOSIO-DEMOGRAPHIC INFORMATION
1. Name: ……
2. District: …….
3. Number of family members: ……
4. Age a) 20 - 30 years b) 31 – 40 years c) 41 -50 years d) 51 years and above
5. Gender a) Male b) Female
6. Nationality a) Malaysian/Chinese/Indian b) Others: ……...
7. Education Level a) PMR b) SPM c) STPM d) Diploma e) Degree f) Others: ……...
8. Monthly Income Level a) <RM 1000 b) RM 1001 - RM 2000 c) RM 2001 - RM 3000 d) RM 3001 – RM 4000 e) RM 4001 - RM 5000 f) >RM 5000
9. Period of running the farm a) 1-3 years b) 4-6 years c) 7-9 years d) 10 years and above
10. Types of animal and total number of animals

Species	Total Number
a) Cow	
b) Goat	
c) Sheep	
d) Buffalo	
e) Others: ……	

11. Average number of livestock species sold per household during last one year

Species	Total Number
a) Cow	
b) Goat	
c) Sheep	
d) Buffalo	
e) Others: ……	

12. Consumption of selected food items before COVID-19.

Product	Daily	3-4 times a week	1-2 times a week	Never consumed this food
Meat				
Milk				
Egg				

13. Consumption of selected food items during COVID-19.

Product	Daily	3-4 times a week	1-2 times a week	Never consumed this food
Meat				
Milk				
Egg				

14. Additional occupation (besides livestock)

a) No
b) Yes: ……

SECTION B: PROBLEMS FACED IN CARRYING OUT LIVESTOCK ACTIVITIES DURING THE COVID-19 PANDEMIC

Instructions: Tick (√) the selected answer.

1. Intensity analysis of problems on livestock farm management during covid-19 pandemic

a) No problem
b) Moderately problematic
c) Less problematic
d) Very problematic

2. Main problems in livestock farm management during covid-19 pandemic

a) Problems in buying livestock feed/necessities
b) Animal health problems
c) Problems in selling livestock
d) Problems in slaughtering and processing (meat/milk etc.) of livestock
e) Others: ……

1: NOT SURE/ IRRELEVENT; 2: STRONGLY DISAGREE; 3: DISAGREE; 4: AGREE; 5: STRONGLY AGREE

Instructions: Tick (√) the selected answer.

BIL.	CAUSES OF THE PROBLEMS	1	2	3	4	5
3.	Unable to make movement to town/area to go to store that supplies animal feed and necessities					

4.	Stores that supply animal feed and necessities (medicines etc.) around your area are not open					
5.	There is an insufficient supply of animal feed/necessities in your area					
6.	The budget to buy animal feed/necessities is not enough					
7.	The price of animal feed/necessities is very expensive					
8.	Workers cannot come to work					

SECTION C: EFFECTS OF COVID-19 PANDEMIC ON LIVESTOCK FARM MANAGEMENT

1. The income during COVID-19 pandemic

a) Increase
b) Decrease
c) No loss or gain from livestock products

1: NOT SURE/ IRRELEVENT; 2: STRONGLY DISAGREE; 3: DISAGREE; 4: AGREE; 5: STRONGLY AGREE

Instructions: Tick (√) the selected answer.

BIL.	EFFECTS OF COVID-19	1	2	3	4	5
2.	I have a problem with an insufficient feed supply and animal necessities					
3.	I have a problem handling sick animals					
4.	I have a problem slaughtering/processing (meat, milk etc.)					
5.	I have a problem in a shortage of employees					
6.	I have a problem of lack of budget to buy animal feed/necessities					
7.	I need to lower the selling price of my livestock					

8. The level of concern among farmers about contracting COVID-19

a) Not concerned at all
b) Somewhat concerned
c) Very concerned

9. COVID-19 prevention practices

a) Social distancing
b) Wear mask
c) Instruct employees to wash hands frequently
d) Provide hand sanitizer/ disinfectant
e) Clean animal before milking
f) Clean milk equipment
g) Clean cow environment

10. Trends of AI service during covid-19 pandemic

a) Increased
b) Decreased
c) The same

11. Trends of veterinary service during covid-19 pandemic

a) Increased
b) Decreased
c) The same

12. Trends of feed supply during covid-19 pandemic

a) Increased b) Decreased c) The same
13. Trend of meat/milk sold from farms during the COVID-19 pandemic a) Increased b) Decreased c) The same
14. Demand of cow meat/milk by the customers during covid-19 pandemic a) Increased b) Decreased c) The same
15. Trends on price at meat/milk selling during covid-19 pandemic a) Increased b) Decreased c) The same

Appendix II

Oneway

Descriptives

Cow

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
< RM 1000	10	14.3000	4.76212	1.50591	10.8934	17.7066	9.00	25.00
RM 1000 – RM 2000	13	17.0769	6.42212	1.78117	13.1961	20.9578	9.00	28.00
RM 2000 – RM 3000	6	15.6667	4.36654	1.78263	11.0843	20.2491	10.00	21.00
Total	29	15.8276	5.47115	1.01597	13.7465	17.9087	9.00	28.00

ANOVA

Cow

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	43.782	2	21.891	.717	.498
Within Groups	794.356	26	30.552		
Total	838.138	28			

Appendix III

Post Hoc Tests

Homogeneous Subsets

Cow

Duncan[a,b]

Treatment	N	Subset for alpha = 0.05
		1
< RM 1000	10	14.3000
RM 2000 – RM 3000	6	15.6667
RM 1000 – RM 2000	13	17.0769
Sig.		.331

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 8.731.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.