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INTERPRETING FARMER ATTITUDE TO FOOD LOSS PHENOMENON IN THE FRESH MILK SUPPLY CHAIN IN BANYUMAS, INDONESIA

Denok Meinar Iftita, Fauzan Romadlon*, and Halim Qista Karima
Industrial Engineering Department, Faculty of Industrial Engineering and Design, Institut Teknologi Telkom Purwokerto, Purwokerto, Central Java, Indonesia

*Correspondence Email: fauzan@ittelkom-pwt.ac.id

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ABSTRACT

Food loss is currently a global problem for both developing and developed countries. Food loss is defined as the loss of a portion of food that is still raw but cannot be processed into a food product because the resulting material does not meet the desired quality. Food loss occurs in livestock production, and one focus is the milk supply chain. Food loss in milking usually occurs due to activities carried out during the harvest, post-harvest, and distribution processes. Food loss in the milk supply chain is caused by decreased milk quality and the farmer's attitude. Problems regarding the attitude of farmers that often occur are farmers' low attitude of responsibility to conduct something. This study aims to determine the effect of farmer attitudes to food loss in the milk supply chain. The method used was quantitative by collecting data from a survey of 46 milk farmers in Bayumas. Then, data were analyzed using the ANOVA approach. The results showed that demographics significantly affect farmers' attitudes toward food loss in the milk supply chain. The food loss is due to farmers' treatments, including feeding, filtering milk into milk cans, and depositing milk in the shelter. Most farmers are over 50 and need more attention and knowledge about food loss in the milk supply chain. Therefore, it is necessary to conduct regular counseling programs for farmers in the supply chain regarding food loss mitigation. The stakeholders can provide the program to add new insights related to food loss. There should be intervention from the deposit shelter and cooperative in helping to increase farmers' awareness of food loss in quantity and quality.

Keywords: *farmer attitude, food loss, knowledge, milk, supply chain*

BACKGROUND

Food loss is currently a global problem for both developing and developed countries. Food loss is defined as the loss of several food ingredients that are still raw but cannot be processed into a food product because the elements produced do not match the desired quality (Qodriyatun, 2021). An innovative study stated that food loss mainly occurred in three food sectors: fruits and vegetables, livestock products, and seafood (Thi et al., 2022). Food loss occurs in livestock production and the supply chain (Guzmán-Luna et al., 2022). Currently, in Indonesia, many dairy farming businesses are produced by East Java Province (56.11%), West Java Province (31.16%), and Central Java Province (10.68%) (Statistics Indonesia, 2023). It is supported by Indonesia's natural conditions, suitable for developing dairy farming. It is also supported by increasing cattle milk consumption (Asmara et al., 2016). According to Statistics Indonesia, in 2020, national milk production will reach 947,685.36 tons, rising by 2% to 107.48 million tons in 2021 (Rangkuti, 2016). However, national milk

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

production has been unable to meet consumer demand due to the limited number of dairy cattle and low milk production. It is shown that only 20% of milk demand is produced domestically, and the rest is imported (Cahyaningrum, 2023).

Dairy farming is an advanced business that will continue to be developed (Astuti, 2022). Dairy farming is an excellent business to support the economy because it plays a significant role in the development of the milk processing industry (Nurjanah Ginting, 2020). Banyumas is one area supporting the establishment of a cattle milking business. One of its manifestations is the establishment of Baturraden BBPTU-HPT (Central of Cattle Breeding), a government-owned company focused on developing a dairy business with 34 cattle (Filian et al., 2016).

The majority of cattle's milk is conducted traditionally. A lot of milk is accidentally wasted before consumers consume it and become a food loss contributor. Food loss in milking usually occurs due to activities carried out during the harvest, post-harvest, and distribution processes (Widyastuti et al., 2013). Supply chain activities are carried out starting from the initial point of raw material production (upstream) to the end of use by consumers (downstream), which includes planning, production, storage, transportation, and distribution activities (Junifar, 2015). In the milk supply chain, food loss is mainly caused by infrastructure, such as inadequate milk storage (Gokarn & Choudhary, 2021) and loss of milk due to mastitis (Guzmán-Luna et al., 2022).

Meanwhile, food loss can occur due to the influence of the attitudes and knowledge of farmers (Filimonau & Ermolaev, 2021). Attitude is defined as a person's sense of responsibility for something that is done (Rui et al., 2022). Attitude is an action someone takes in response to a situation (Waithanji et al., 2020). Attitudes are abstract and cannot be observed directly (Edward & Latacz-lohmann, 2021). A person can be mentioned to have an attitude if he is aware of the consequences of each action (Dahniar, 2020). In the context of farmers, attitude means activities to solve problems and avoid risks.

Farmers' risk attitude is divided into three: avoiding risk, liking risk, and being numb to risk (Musyoki et al., 2022). Problems regarding the attitude of farmers that often occur are farmers' low attitude of responsibility to conduct something. In practice, Farmers need to be more careful when doing the milking process by hand, which causes splashes of cattle's milk not right in the container provided. In addition, they are less cautious when carrying and placing milk cans or containers used to keep cattle's milk sterile (Pradika et al., 2019). Farmers who lack knowledge about the impact of food loss can decrease cattle milk productivity (Daud et al., 2017).

Several studies mentioned farmer attitudes in several agricultural and other business sectors. Farmer attitude is influenced by their knowledge, which is mainly affected by age (Edward & Latacz-lohmann, 2021) even though many dairy farmers think there is no need for training and development for new workers (Schwendner et al., 2020). Furthermore, identifying problems regarding farmers' attitudes toward food loss is compulsory. The research aims to find the influence of farmers' attitudes on food loss along the milk supply chain. This research was conducted in Banyumas Regency. Banyumas Regency was chosen because most milking farmers still use traditional methods in the milking process. Manual milking causes a lot of milk spillage or food loss (Griep-Moyer et al., 2022). In Banyumas, there is less attitude about food loss, and some farmers think that food loss is not a critical issue. Whereas, food loss contributes to economic impact such as revenues. In addition, most farmers in Banyumas are more than 50 years old and are less productive. Most of them need more knowledge in milk production, especially for improving the quality and quantity. Therefore, based on farmer

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

attitudes, the study adds a new way to handle food loss in the milk supply chain. It can guide the government and milk cooperatives to conduct food loss prevention based on farmer attitudes.

RESEARCH METHODS

The method used was quantitative. Data were collected from 46 respondents as milk farmers in Banyumas. The questionnaire was developed to find the relationship between farmer attitude and the food loss occurrence in the milk supply chain. The questionnaire consists of two parts; demographics and farmer attitude variable. Demographics included farmer groups, the number of cattle, and estimated morning and afternoon milk production (Yusuf et al., 2023). Their supply chain practices determined the farmer's attitude. It was measured using a Likert scale in the range of one to seven; 1) Strongly Disagree, 2) Disagree, 3) Moderately Disagree, 4) Neutral, 5) Moderately Agree, 6) Agree, 7) Strongly Disagree (Pranatawijaya et al., 2019). The farmer's attitude is described in Table 1.

Table 1. Farmer Attitude in Supply Chain Practices Attributes

Attribute	Code	Items
Production (Galford et al., 2020)	Q1	Feeding properly
	Q2	An appropriate amount of feed
	Q3	Report if the cattle is not healthy
	Q4	Farmers understand food loss.
	Q5	The farmer is responsible for the milk that has been milked
	Q6	Farmers have a moral obligation to control food loss
	Q7	Farmers understand the consequences of food loss.
Harvesting (Utami et al., 2014) (Ferraretto et al., 2013) (Suhartono et al., 2019)	Q8	Cleaning of milking containers
	Q9	Cow sterilization
	Q10	Cage cleaning
	Q11	Wash hands before flushing
	Q12	Milking manually
	Q13	Milking every morning and evening
	Q14	Food loss during milking
	Q15	Food loss due to carelessness
	Q16	Additional support tools (bucket, dipper, can)
	Q17	Farmers understand the consequences of food loss
Inventory (Surucu-Balci dan Tuna, 2021)	Q18	Filter the milk into the milk can
	Q19	Food loss when filtering
	Q20	Food loss in delivery to the shelter

Source: Analyzed Data (2020)

According to Table 1, this study uses three attributes: production, harvesting, and inventory. Production attribute is an activity when caring for cattle, including feeding and drinking correctly (Q1), the appropriate amount of feed (Q2), reporting if the cattle is not healthy (Q3), farmers understanding food loss (Q4), the farmer responsible for the milk that has been milked (Q5), and farmers have a

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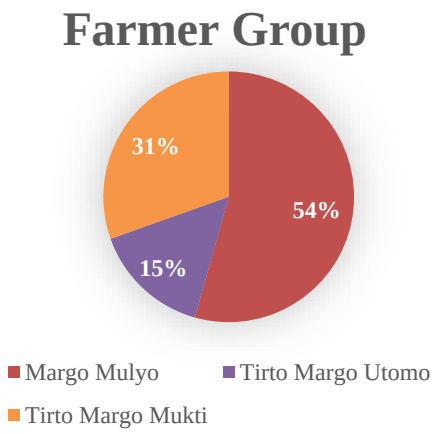
Vol 8 (2): 434-445, June 2024

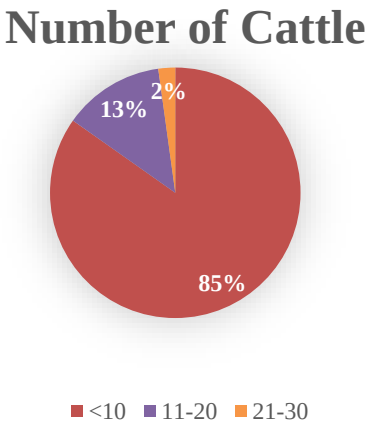
moral obligation to control food loss (Q6). Furthermore, harvesting attributes which are activities when milking cattle or activities while in the cage, include cleanliness of the milking container (Q3), cleanliness of the cell (Q4), washing hands before milking (Q5), manual milking (Q6), and milking every morning and evening (Q7). Then the attribute inventory or inventory of cattle's milk harvest includes cleaning of milking containers (Q8), cow sterilization (Q9), cage cleaning (Q10), washing hands before flushing (Q11), milking manually (Q12), milking every morning and evening (Q13), food loss during milking (Q14), food loss due to carelessness (Q15), additional support tools (bucket, dipper, can) (Q16), farmers understand the consequences of food loss (Q17), filter the milk into the milk can (Q18), food loss when filtering (Q19), and loss of food delivery to the shelter (Q20). After gaining the data, it was tested for validity, reliability, and normality. Then, ANOVA was conducted to determine which factors that influence food loss. The hypothesis was set as follows: H_1 = The farmer's attitude affects food loss in the fresh milk supply chain in Banyumas Regency.

RESULT AND DISCUSSION

Demographics of Farmers



(a)



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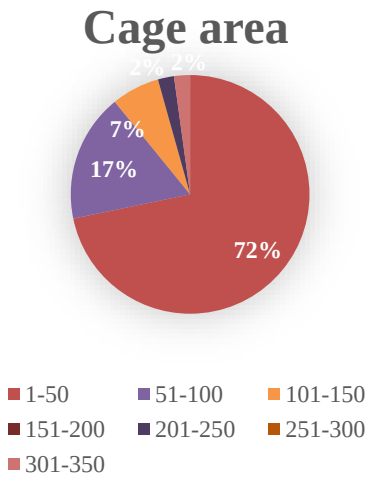

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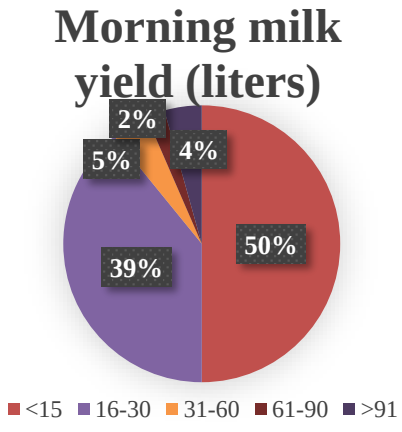

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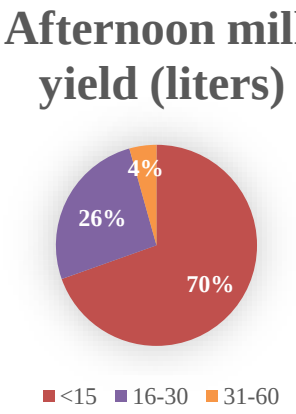
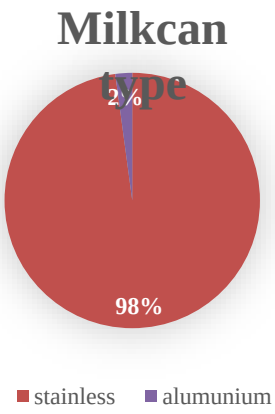
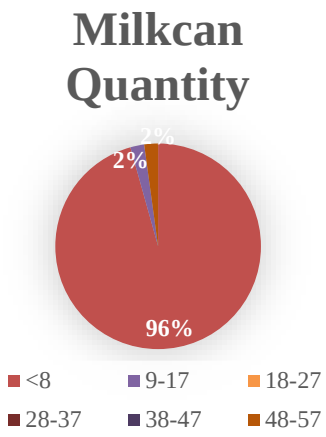
ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024



(e)



(f)



(g)

Figure 1. Demographics of Farmers including Farmer Group (a), number of cattle (b), Cage Area (c), Estimated Morning Milk Production (d), Estimated Afternoon Milk Production (e), Type of Milk can (f), Number of Milk can (g).
Source: Analyzed Data (2020)

Figure 1 shows that farmers in Banyumas Regency belong to three farmer groups, namely *Margo Mulyo (*54%), *Tirto Margo Utomo* (15%), and *Tirto Margo Mukti* (31%) (Figure 1(a)). The number of cattle farmers own also varies. Most farmers have less than 10 cattle, with a percentage of 85%, (Figure 1(b)). It means that most farmers need more productive cattle. Sometimes, some farmers have more than 10 cattle, but the cattle are non-productive, such as males and calves. The majority of farmers' cage area has an area of 1 to 50 square meters with a percentage of 72% (Figure 1(c)). Farmers need more space to grow their cattle and harvest the milk. It is common in Java Island, which is less open to gro cattle. Most farmers use limited areas, which can cause food loss such as spillage and accidentally kicked by cattle during milking. Estimated milk production in the morning (Figure 1(d)) with liter units mostly reached less than 15 liters with a percentage of 50%. The estimated milk production in the afternoon shows that 32 farmers produce milk less than 15 liters every afternoon, with a rate of 69.6% (Figure 1(e)). This means that morning production is higher than afternoon production. It is caused by the number of cattle fed and the time ratio to produce the milk. Two milks can materials are used: stainless (69.6%) and aluminum 30.4%) (Figure 1(f)). The differences in milk

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

can be due to the price and quality (stainless steel is more food grade standard) and suggestions from cooperatives, but for the purpose, they are almost similar. Finally, the number of milk cans shows that most farmers have milk cans of less than 8 pieces with a percentage of 95.7% (Figure 1(g)).

Instrument Test Results

The instruments test consisted of validity, reliability, and normality tests. The tests were conducted using Minitab 19 with a confidence level of 95%. The result showed validity test results had a p-value of less than 0.05 which stated that the data was valid. Then the reliability test results showed Cronbach's Alpha value of 0.6747, it means the data were reliable (greater than Cronbach alpha table 0.06). In the normality test using the Kolmogorov-Smirnov basis, the significance value is expected if the value is more critical than 0.05. The results show that the data is normally distributed, and the p-value was 0.115.

ANOVA Test Results

ANOVA test is a statistical hypothesis test used in concluding to determine the effect of factors on the response in the research conducted. The element in question is the demographic data of farmers, including farmer groups, the number of cattles, and estimated afternoon milk production. ANOVA test results can be seen in Table 2.

Table 2. ANOVA Test Results

Significance Factor	Code	P-Values
Cattle Number	Q1	0.020
Estimated Afternoon Milk Production		0.032
Estimated Afternoon Milk Production	Q18	0.033
Cattle Number	Q19	0.037
Farmer Group	Q20	0.029

Source: Analyzed Data (2020)

According to Table 2, the number of cattle factors in response Q1 has a p-value less than 0.05. It means that Cattle number has significant effect to feeding properly. In Banyumas, farmers need more treatment for their cattle, such as appropriate feeding and grazing time. The treatment will affect the milk yield because the activities will prevent the cattle from experiencing hunger and dehydration. The cattle that are given a large amount of nutritious food will produce a more significant amount of milk and vice versa.

Furthermore, feeding silage and adding concentrates to cattle affects the chemical quality of cattle milk (Christi et al., 2022). Giving appropriate feeding and grazing are related to farmers' knowledge to optimize the milk production quality and quantity. It shows the motivation of farmers when taking care of their cattle. Farmers feel motivated if they have well-conditioned cattle (Belage et al., 2019). The majority of dairy farmers in Banyumas have seven cows. Even though the number of cattle owned is small, farmers always keep the condition of the cattle fit. It means farmers are aware of their responsibility in caring for their cattle as a moral obligation. Therefore, these farmers try to provide well-managed feeds and drinks.

The estimated amount of milk production in the afternoon also showed significant results for feeding time (Q1). In Banyumas, the amount of milk production in the afternoon differs from the

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

morning production around 11 Liters. Although milking in the afternoon is less, it still gets the same treatment as milking in the morning. The difference in the amount of output is due to the different time lag between morning to afternoon and afternoon to morning (Asmayadi et al., 2016). Milk that is expressed in the afternoon must be deposited immediately at the shelter because it is following the specified time. The time provisions are adjusted to the milking time carried out by milking farmers. The purpose of applying this time is to avoid a decrease in milk quality, which can cause milk to become stale and not be processed into finished products or for sale of fresh milk (Murti et al., 2022). Sometimes, milking in the afternoon is better quality than in the morning (Mardalena, 2008). Therefore, the activity is still a concern to cattle because it affects daily milk production, which can impact to farmers' revenues.

The estimation factor for the amount of milk production in the afternoon has a significant value for filtering milk into the milk can (Q18). In Banyumas' context, this filtering is vital to obtain milk products protected from bacteria or foreign objects that can damage the milk quality. The filter used is made of clean white cloth or cotton. After being put into the milk can, then the milk can is closed tightly, then the results of milking in the morning and evening must be deposited directly to the shelter according to the specified time to avoid damage to the milk quality, which can cause food loss. Milk not directly deposited for cooling will quickly be damaged due to increased temperature and easily contaminated with bacteria (Santosa et al., 2013). Therefore, the shelter staff determines the deposit time in the morning at 06.30 AM and in the afternoon at 4.30 PM. The purpose of implementing this time is to avoid a decrease in milk quality, which can cause milk to become stale and not be processed into finished products or for sale of fresh milk (Murti et al., 2022). To maintain the quality of milk, this is done by putting milk deposited in a cooler with a capacity of 1000 liters to reduce the milk temperature (Nababan et al., 2014) and the set temperature is below 3^0C. Therefore, this activity is still a concern for farmers because it affects daily milk production, especially milk quality.

The occurrence the food loss when filtering milk (Q19) has a significant effect on the number of cows. Screening is done after the milking process. In Banyumas' context, the milk that was previously placed in a container will be transferred to a milk can equipped with a filter. The filtering stage aims to help reduce dirt, foreign particles, or dust that gets into the milk. Because filtering is done manually by pouring it into the milk can, much milk is spilled. Spilled milk will be wasted and cannot be deposited into the shelter or cooperative for further processing because the milk is dirty and contaminated with bacteria that cause a decrease in the milk quality. It is not wanted because it is an indicator of lousy handling (Ariani et al., 2018). Therefore, the more cattle a farmer has, the more food loss will occur at the screening stage. It corresponds to the actual situation in the field. When manually carrying out the filtering process, approximately 200 ml of milk spills daily. It means that this action is a contributor to food loss in the milk supply chain.

Furthermore, the farmer group factor significantly affects food loss when delivering milk to the shelter (Q20). Based on Riani et al. (2021), the function of farmer groups is as a communication medium between farmers and cooperatives to improve their performance. It can be a place to improve human resources quality and add farmers' insight and knowledge. In the Banyumas context, most farmers participate in one farmer group, and one of the farmer group's roles is operating a deposit shelter.

After milking, farmers must deposit their milk to deposit shelter and the majority of farmers' transportation is motorcycles. Milk is carried using milk cans until it reaches the shelter. Some farmers use tools such as sticks and ropes to balance the milk cans. The distance traveled by farmers is relatively short and takes less time around two kilometers. However, the poor condition of road infrastructure is a new challenge for farmers. Farmers revealed some incidents of milk cans accidentally falling during delivery to shelters. The reason is mainly due to the farmers' need for

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

caution and spilled milk cans on the road. In this case, farmers are expected to be more careful when carrying the milk can and get used to using additional tools such as ropes and wood so that the milk can tighten properly. According to this situation, the farmer group needs to train and educate the farmer on how to keep their milk can during delivery to the shelter. Farmer groups can suggest farmers harvest early to avoid road density or choose an alternative way to reach the shelter.

Moreover, this study aims to determine farmers' attitudes toward food loss in the milk supply chain in Banyumas Regency. Food loss means the loss of some raw materials that cannot be processed into product because it does not meet the required quality. . Some farmers have to take hygiene measures such as taking care of the cows before milking, such as keeping the cowshed clean, washing hands before the milking process, and keeping the milk container and container clean. Hygienic activities are essential to maintain the health of livestock and to maintain milk quality. In addition, farmers should be aware of milk quality and quantity. They should realize that proper feeding and grazing of cattle is mandatory to obtain milk standards. Farmers should consider additional feed, such as concentrates, to produce more milk (Christi et al., 2022). The number of cows factor affects the regular feeding of cows. The more cows a farmer has, the more feed he has to consider. If the cows are fed with an inappropriate amount or low quality of feed, the cows will produce low-quality milk. The afternoon milk production factor also influences the feeding of cows. Although afternoon production is less than morning, farmers should treat the cows similarly. In addition, the afternoon milk production factor also affects milk filtering into the milk can. Milking in the afternoon must be immediately deposited into the milk can maintain its quality. Before depositing, the milk will be screened to avoid any impurities or bacteria that can cause a decrease in milk quality.

Food loss can occur throughout the supply chain during harvest, post-harvest, and distribution (Hastuti et al., 2021). In this case, it was found that food loss mainly occurred during the screening process into the milk can and the delivery process to the shelter. Because the filtering process is done manually, it causes milk spillage. Then in the milk delivery process, farmers use motorbikes as a mode of transportation. The milk can place the motorcycle prone to fall and cause milk spillage. It happens because the road traveled by farmers is not viable. Mainly, it is driven by farmers' need for more caution when carrying the milk can. However, farmers consider this to be a regular occurrence. They say the spilled milk is not too much and poses no risk. Supply chain stakeholders need to realize the consequences of food loss (Manning et al., 2023). It is related to the attitude of farmers, such as their responsibility, and affects the decisions taken to address a problem. The cause is related to the parties' need for more socialization regarding the importance of minimizing food loss in cow's milk products. Providing extension programs such as regular counseling for farmers to add new insights related to food loss is necessary. There should be intervention from the shelter and cooperative in helping to increase farmers' awareness. It was found that farmers in Banyumas only focus on quantity, such as increasing the amount of milk production, without paying attention to the quality obtained, which leads to food loss. Maintaining the milk quality will effect milk price or incentive so that farmers can increase their revenue. Farmer groups and cooperatives can increase farmers' attitudes by creating a medium of communication between farmers to improve performance, as a forum for improving the quality of human resources, and adding insight and knowledge to farmers (Effendy dan Apriani, 2018). In a farmer group, it can shape farmers' knowledge and abilities because in it, all activities and work-related problems are carried out by the group simultaneously (Riani et al., 2021). By optimizing the role of farmer groups, farmers can increase awareness and knowledge.

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

CONCLUSION AND SUGGESTION

This study focuses on underlining farmer attitudes to food loss in the milk supply chain in Banyumas. The result showed that demographic affect the farmer's attitudes in the milk supply chain. The demographic includes cattle number, farmer group, and afternoon production. The farmer attitudes were elaborated in the supply chain practices such as production, harvesting, and inventory. The findings showed that cattle number has significantly influenced cattle feeding and filtering process. Afternoon prpduction has significantly influenced cattle feeding and pounding process to milk can. Then, farmer group has significantly influenced food loss during distribution to deposit shelter.

Moreover, farmer groups and cooperatives need to participate in reducing food loss by creating a medium of communication between farmers to improve performance, as a forum for improving the quality of human resources and adding insight and knowledge to farmers. In addition to providing extension programs such as regular counseling programs. The program is to increase awareness in each farmer group, it is also recommended that there be continuing education about practices to reduce food loss. Future research can focus on the role of stakeholders in improving farmers' attitudes toward food loss in the milk supply chain. In addition, this research is more appropriate if it is carried out in Malang or Boyolali areas because there are more populations of cattle breeders.

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http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (2): 434-445, June 2024

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