p-ISSN: 1907-8056
e-ISSN: 2527-5410
AGROINTEK
Jurnal Teknologi Industri Pertanian
journal homepage: journal.trunojoyo.ac.id/agrointek

The effect of information exchange on food loss in the milk supply chain in Banyumas, Indonesia

Mohammad Zidni Assifakhan Khoeri, Fauzan Romadlon*, Halim Qista Karima

Industrial Engineering, Telkom University Purwokerto, Banyumas, Indonesia

Article history
Received:
27 June 2023
Revised:
8 November 2023
Accepted:
11 January 2024

Keyword
Exchange;
Food loss;
Information milk;
Supply chain

ABSTRACT

Dairy farming in Indonesia is now experiencing significant development. In the milk supply chain, the increase in the use of milk as a raw material makes the milk processing industry increase its supply by 10% annually. However, milk production in Indonesia can only meet around 22% of the total. It means a gap of around 78% shall be imported. The imbalance between the demand and production causes Indonesia to lack self-sufficiency. Banyumas still have traditional methods, such as milking and filtering fresh milk. Such circumstances are prone to food loss, which needs preventive action to improve an effective and efficient supply chain by emphasizing information exchange in the milk supply chain. The study aims to determine how information exchange affects food loss in the milk supply chain in Banyumas. The study used quantitative and Chi-Square to conduct statistical analysis of 46 farmers. The result showed that demographics correlate with information exchange. Furthermore, farmers should improve their knowledge about the loss in the milk supply chain. They shall improve their understanding to adopt information technology to gain accurate and up-to-date data regarding milk production. Those activities are related to preventing food loss. Therefore, stakeholders' roles, such as farmer groups and cooperatives, are significant in facilitating the activities.

This work is licensed under a Creative Commons Attribution 4.0 International License.

* Corresponding author
Email: fauzan@ittelkom-pwt.ac.id
DOI 10.21107/agrointek.v20i1.20875

INTRODUCTION

Dairy farming in Indonesia is now experiencing significant development. This can be seen in the increasing economic level and people's understanding of the need for nutritious consumption. But, around 30% of food produced globally is lost or wasted along the food supply chain (Oliveira et al. 2021). Food loss is waste generated during three food supply chain processes: production, post-harvest and storage, and processing and packaging (FAO 2019). Indonesia is the world's second-largest food loss contributor after Saudi Arabia, with a per capita of 300 kg, and Saudi Arabia, 427 kilograms (Burritt 2017). Food loss can be defined as a decrease in food mass, such as quality and quantity, before it reaches the final consumer or occurs in the production process (Irianto and Giyatmi 2021). It also appears in the milk supply chain.

In the milk supply chain, the increase in the use of milk as a raw material makes the milk processing industry increase its supply by 10% annually (Anugrah et al. 2021). Increased production yield must align with good milk quality to reduce food loss. Standardization of milk quality is expected to improve competitiveness, and increase product prices and profitability (Grochowska and Szczepaniak 2019).

Milk production in Indonesia can only meet around 22%. The rest still use imported milk from several countries, such as Australia and Belgium, to meet their needs (Budiman and Alta 2022). The imbalance between the demand and production causes Indonesia to lack self-sufficiency (Ifani et al. 2022). It is both an opportunity and a challenge for farmers to increase milk production to realize autonomy. To reduce the gap, the government developed some programs to improve cattle populations (Bahermasyah 2021) and upgrade the human resources quality and supported facilities (Paramita 2020). Therefore, farmers need information related to standardization and quality to increase their productivity.

Furthermore, in Banyumas, traditional methods are still used, such as milking and filtering fresh milk. The conventional process can lead to bacteria spread, and it makes the milk standard low (Yusuf et al. 2023). Such circumstances are prone to food loss, which needs preventive action to improve an effective and efficient supply chain (Raut et al. 2019). As information, milk production in Banyumas reached 4,000 tons per year, and it is very far compared to Boyolali (51,000 tons/year) and Semarang (28,000 tons/year) as milk production centers in Central Java Province (BPS 2020). Therefore, information must be exchanged in the milk supply chain to maintain quality and quantity. The quantity is milk amount, and the quality is milk standards such as total plate count (TPC), total solids (TS), and density (Wasito 2018).

Information exchange is a flow of information or communication that includes dairy farmers and partners. Exchanging information means instructions delivered personally or impersonally (Zahra et al. 2022). Dairy farmers usually receive news from farmer groups. The information exchange with the farmer is expected to help improve the quality and quantity. Information Exchange is the intensity of companies or organizations exchanging information with partners to support joint business strategies (Panggaresta and Alhazami 2022). Another objective of information exchange is to gain information from business partners to increase knowledge and education related to the application of technology (Shikuku 2019).

In this case, the information exchange emphasized practices rather than platforms. Most farmers got outdated information from the cooperative regarding changing milk standards, such as total plate count (TPC) and total solids (TS), milk production, and concentrates as additional fodder availability. If the farmer has less information about milk production standards, it will lead to food loss.

Therefore, this study aims to determine how information exchange affects food loss in the milk supply chain in Banyumas. The study provides guidance to minimize food loss in the milk supply chain. Banyumas was chosen because several farmer groups are part of a cooperative (PESAT). Farmers distribute their milk to PESAT, where a small portion is processed and sent to Milk Banyumas (MILBA). PESAT distributes milk to several beverage companies (Setyawardani et al. 2021).

METHODS

The method used was quantitative. The research began with identifying problems, determining research objectives, and developing

research instruments based on literature reviews. Next, the data collection stage was carried out by observation and distributing questionnaires to dairy farmers in three farmer groups from Kemutug Lor and Limpakuwus villages. After obtaining the data, the data instrument test (validity, reliability, and normality) was carried out. Then, the Chi-Square test was carried out for statistical analysis using Minitab 19 software. The last stage is the conclusion and recommendation (Figure 1).

Three farmer groups conducted the research: Margo Mulyo, Tirto Margo Utomo, and Tirto Margo Mukti. These farmer groups were chosen based on a recommendation from the PESAT cooperative. The recommendation was needed to gain permission for data collection and ensure that the selected farmer group was still active in producing milk. The data were collected from a questionnaire using 46 respondents. The number of respondents is a farmer population based on PESAT cooperative data. The questionnaire was divided into two parts. The first part is demographic. The demographic included the farmer group, the number of cattle, the number of productive cattle, the cage area, and estimated morning and afternoon production (liters). The second part is information exchange attributes. The attributes contained production, harvesting, inventory, and transportation. The description of the attributes can be found in Table 1.

According to Table 1, the study used four attributes: production, harvesting, inventory, and transportation. Production attributes are feeding and drinking (P1), dairy cattle antibiotic administration (P2), the accuracy of dairy cattle-related information (P3), dairy cattle health report (P4), fast delivery of information technology on dairy cattle production (P5), use of information technology on dairy cattle production (P6), concentrate on feeding in the morning (P7), scheduled meetings of dairy farmers (P8). Then there is the harvesting, such as sterilization of milking equipment (P9), sterilization of cattle (P10), manual milking (P11), food loss in the morning (P12), and afternoon production (P13). Then there are the attributes of inventory, such as filtering milk into the milk can (P14), food loss during filtration (P15), food loss during transfer to the milk can (P16), and scheduled milk deposits (P17). Finally, there are the attributes of transportation, such as a deposit to shelter (P18), loss on delivery (P19), and the road traveled is fast (P20). Then the attribute of information exchange is measured using a Likert scale with a range of 1 to 7; 1) Strongly Disagree, 2) Disagree, 3) Fairly Disagree, 4) Neutral, 5) Fairly Agree, 6) Agree, 7) Strongly Disagree.

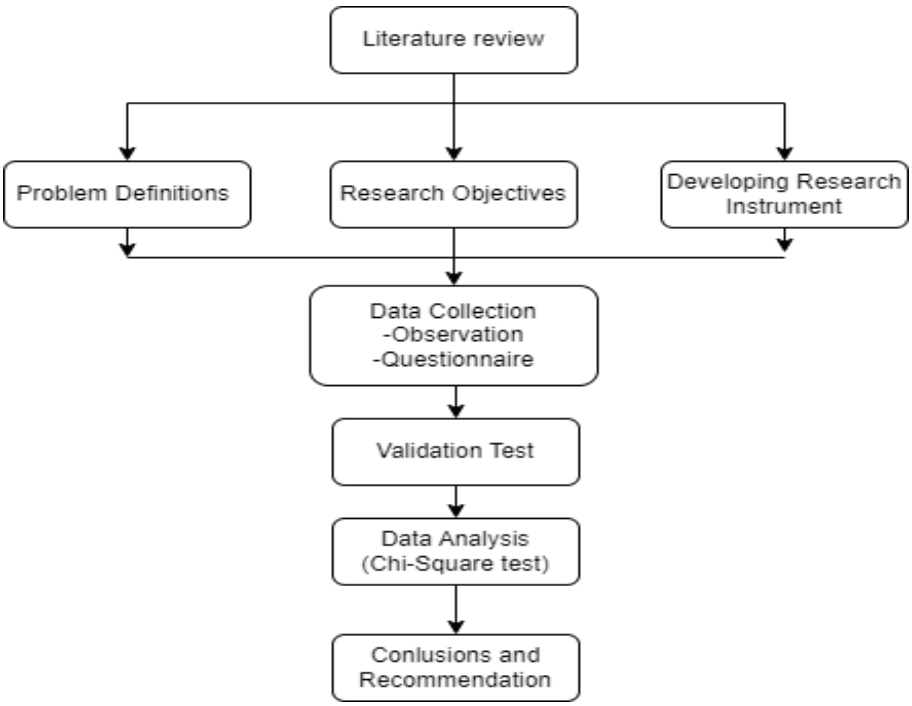


Figure 1 Flowchart of Research

Table 1 Information Exchange Attributes

Attribute	Code	Indicator
Production	P1	Feeding and drinking
	P2	Dairy cattle antibiotic administration
	P3	Accuracy of dairy cattle-related information
	P4	Dairy cattle health report
	P5	Fast delivery of information related to dairy cattle
	P6	Use of information technology in dairy cattle production
	P7	Concentrate on feeding in the morning.
	P8	Scheduled meetings of dairy farmers
Harvesting	P9	Sterilization of milking equipment
	P10	Sterilization of cattle
	P11	Manual milking
	P12	Food loss at milking
	P13	Morning and evening milking
Inventory	P14	Filtering milk into the milk can
	P15	Food loss during filtration
	P16	Food loss during transfer to milk can
	P17	Scheduled milk deposits
Transportation	P18	Deposit to shelter
	P19	Loss on delivery
	P20	The road traveled is fast

After gaining the data, the researchers conducted feasibility tests to determine the data's validity, normality, and reliability. Furthermore, data processing used the Chi-square test to test the influence of information exchange on food loss in the milk supply chain. This study used alpha 0.05, and the hypothesis was set below,

$\mathbf{H_1}$ = Information exchange affects food loss in the fresh milk supply chain in Banyumas.

RESULTS AND DISCUSSION

Dairy Farmer Demographics

The demographic data can be seen in Figure 2. Figure 2 shows that most farmers came from the Margo Mulyo farmer group (54%). They were followed by Tirto Margo Mukti (31%) and Tirto Margo Utomo (15%) (Figure 2(a)). Most cattle numbers are in the range of 1 to 10 (85%) (Figure 2 (b)). The most productive cattle are in the range of 1 to 10 (96%) (Figure 2 (c)). The cage area is in the range of 1 to 100 m^2 (89%) (Figure 2 (d)). Morning production reached 1 to 20 liters with a percentage of 70%, followed by 21 to 40 liters and 41 to 120 liters (Figure 2 (e)). While in afternoon production, most farmers reached 1 to 20 liters (91%) (Figure 2 (f)).

Instrument Test Results

The instrument tests consisted of validity, reliability, and normality tests. The processing uses Minitab 19 software. The data was valid if the value of validity was less than 0.05. The results showed that all the attributes were valid. The reliability test in this study uses Cronbach's alpha technique because this instrument technique has more than one answer (Adamson and Prion 2013). The results showed 0.6948, which is greater than 0.60. It means the data was reliable.

Furthermore, this study used skewness and kurtosis to test normality. Skewness and kurtosis determine whether the normality graph points to the right or left, is too flat, or collects in the middle (Sintia et al. 2022). The results showed skewness is -0.52 and kurtosis is -0.62. The data is normal because the skewness value is from -2 to +2, and the kurtosis value is from -7 to +7.

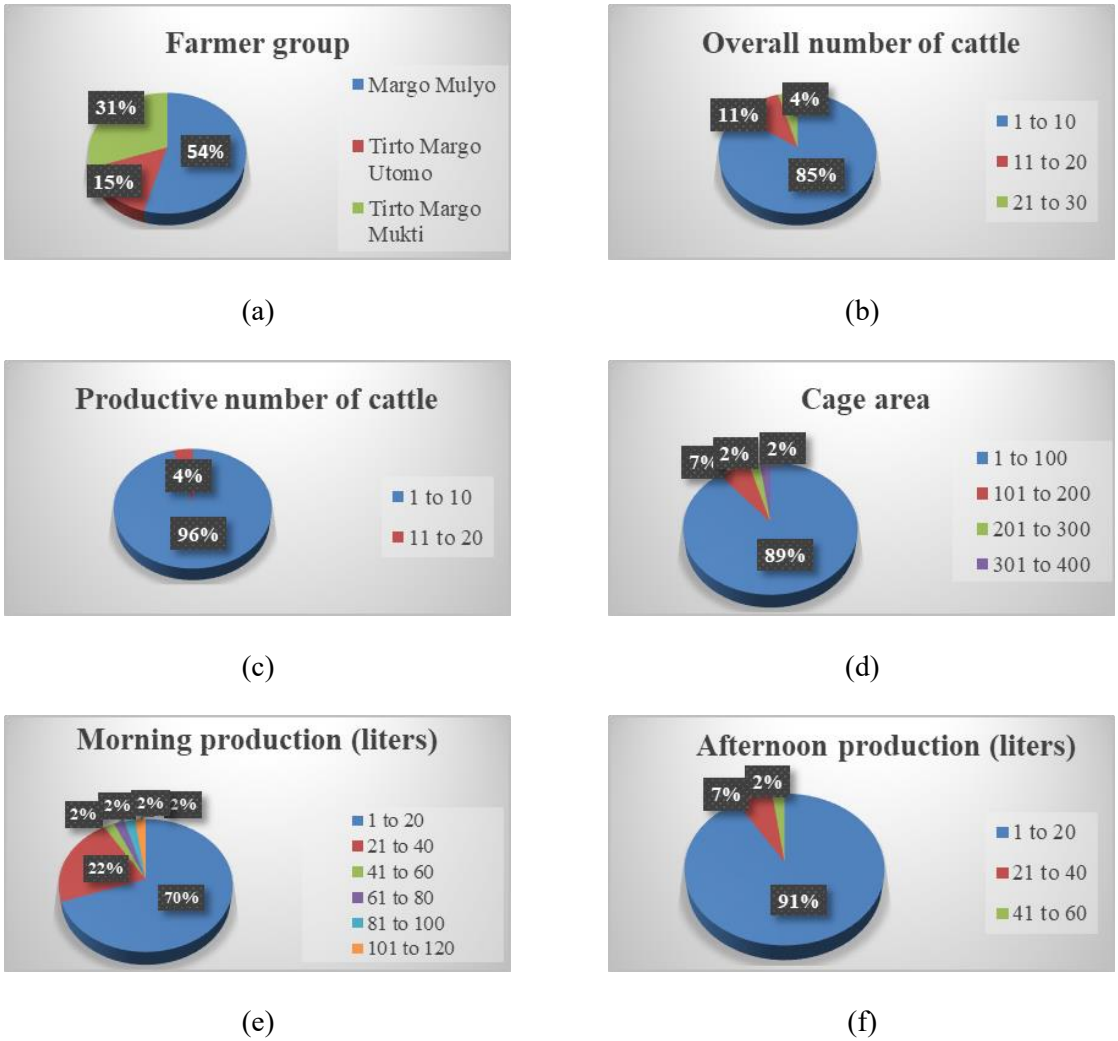
Chi-Square Test Results

The Chi-Square test determines the relationship between information exchange on food loss in the milk supply chain. The results can be seen in Table 2.

The observed milk supply chain started with the farmers and moved to the cooperatives in Banyumas. It is called the upstream milk supply

chain. After the milking process at the farmer level, farmers distributed the milk to the deposit shelter. Then, the milk was distributed to the cooperative from the deposit shelter. Table 2 shows three significant attributes: P16, P17, and P18. In P16, the estimated morning production correlates with food loss during transfer into a milk can. The accuracy of information is an essential factor in supporting the milk production process in dairy farming. The information displayed and presented must be timely (Wulandari et al. 2022). The information exchange has a role in preventing delays in information such as milk standardization, production results, and availability of concentrates and forages.

In P17, the cage area correlates with scheduled milk deposits [P17]. The narrowness of the cage area can affect farmers' movement during the milking process. In addition, the comfort of cattle is also an important thing that must be considered to prevent cattle from raging or kicking, which can cause food loss in fresh milk. The wider the livestock shed, the more milk production (Kleden 2014). The cage area is essential so that the milking process is not crowded and farmers are more comfortable maximizing production. The cage must have walls (0.5-1.0 m), the roof should measure 3.5-4.5 m, the floor with a slope of 5^0-15^0 be covered with rubber carpet to be easy to clean, and it must have a place to feed and drink (Echo 2021). Furthermore, farmers in Banyumas usually conduct some activities before milking, such as cleaning the cage and cattle and cleaning the cattle's udder using warm water to maintain milk hygiene (Sari et al. 2021).



Source: Data analyzed, 2022

Figure 2 Farmer demographic: dairy farmer (a), overall number of cattle (b), productive number of cattle (c), cage area (d), morning production (liters) (e), afternoon production (liters) (f).

Table 2 Chi-square Test Results

Demography		Total number of cattle	Number of productive cattle	Area of the cage	Estimated morning production	Estimated afternoon production	Milk can capacity
P1	*Chi-Square*	72.843	23.064	139.025	126.323	133.765	7.131
	DF	70	30	130	120	125	5
P2	*Chi-Square*	47.695	23.098	100.581	88.032	95.722	1.947
	DF	56	24	104	96	100	4
P3	*Chi-Square*	30.006	17.238	68.247	70.046	65.731	4.375
	DF	42	18	78	72	75	3
P4	*Chi-Square*	28.576	12.421	77.872	72.054	77.502	5.451
	DF	42	18	78	72	75	3
P5	*Chi-Square*	46.515	18.971	73.620	67.847	85.170	2.976
	DF	42	18	78	72	75	3
P6	*Chi-Square*	37.237	30.501	74.707	72.913	74.393	3.036
	DF	42	18	78	72	75	3
P7	*Chi-Square*	25.885	19.171	83.924	73.100	75.351	3.680
	DF	42	18	78	72	75	3
P8	*Chi-Square*	25.595	13.675	91.106	67.606	80.756	1.390
	DF	42	18	78	72	75	3
P9	*Chi-Square*	31.986	14.399	68.769	67.114	76.606	9.150
	DF	42	18	78	72	75	3
P10	*Chi-Square*	30.456	16.233	69.051	74.198	73.449	10.613
	DF	42	18	78	72	75	3
P11	*Chi-Square*	35.527	14.892	61.653	73.798	79.108	3.731
	DF	42	18	78	72	75	3
P12	*Chi-Square*	28.417	12.496	67.497	68.849	64.976	4.914
	DF	42	18	78	72	75	3
P13	*Chi-Square*	47.168	11.833	75.555	61612	76.081	3.469
	DF	42	18	78	72	75	3
P14	*Chi-Square*	53.547	24.726	148.642	117.638	124.072	5.062
	DF	70	30	130	120	125	5
P15	*Chi-Square*	35.881	25.687	115.657	97.569	74.188	5.847
	DF	56	24	104	96	100	4
P16	*Chi-Square*	55.636	19.909	88.362	156.017*	131.550	5.813
	DF	70	30	130	120	125	5
P17	*Chi-Square*	78.489	74.321	187.893*	173.480	148.077	5.516
	DF	84	36	156	144	150	6
P18	*Chi-Square*	49.702	27.186	144.183	103.271	152.708*	12.289
	DF	70	30	130	120	125	5
P19	*Chi-Square*	73.342	28.781	134.137	102.984	116.602	3.835
	DF	70	30	130	120	125	5
P20	*Chi-Square*	66.081	30.175	125.188	108.047	129.066	5.774
	DF	70	30	130	120	125	5

Furthermore, the estimated afternoon production correlates with milk delivery to the deposit shelter [P18]. The process was done around 4:00 p.m. and deposited after completion on the same day to prevent bacterial contamination. It aimed to avoid food loss and decreased quality not to meet the standardization of fresh milk (Murti et al. 2022). After depositing, farmers usually wash the milk can to maintain the cleanliness of the milk container, and the milk deposited into the shelter is then transported to the cooperative. The transportation from the refuge to the cooperative used a modified pick-up truck with an additional milk tank. The vehicle takes milk from the shelter in each farmer group to the cooperative and it is stored in a cooling tank (Cahyaputri et al. 2021). The accuracy of information exchange plays a role in fulfilling the deposit shelter based on the milk standard. The information exchange ensures the farmer deposits

the milk on time so that the milk produced is not discarded.

Implications of the Findings

Farmers in the milk supply chain are the most important actors and should understand milk quantity and quality standardization. The milking process in Banyumas uses manual methods, and farmers use hereditary practices. It happens because breeders learn more from experience and the surrounding environment, and teach farmers lineages (Maulana et al. 2021).

The demographic factors have significant correlations with information exchange. The demographic characteristics are cage area, morning production, and afternoon production. The information exchange can mitigate food loss in cage areas due to the limited and narrow areas. Sometimes, cattle accidentally kick the milk, and attention must be paid to farmer groups and cooperatives to train the farmers on mitigating the loss during the milking process. Information exchange plays a role in developing innovative transportation for morning and afternoon production. Farmers can minimize food loss during transportation by using a deposit shelter. Farmers faced some difficulty due to road conditions and distance. Therefore, cooperative and farmers' groups can modify transportation to prevent milk spillage.

Implementing information technology for information exchange is an excellent opportunity to be applied to farmers in Banyumas. Information technology can convey accurate information about cattle, such as financial transactions, conditions, and production yields. Information technology supports farmers in discussing and gaining more details (Muharam and Persada 2020).

Effective information exchange is expected to minimize food loss in dairy milk production. Collaboration between farmers and other supply chain actors is also essential. The information exchange that shall be developed creates good communication between cooperatives, farmer groups, and farmers. The objective is to gain updated milk standardization, such as TPC and TS numbers, production results based on quality, the quality of each farmer, concentrates, and forage availability. Farmers shall learn how to improve their TS and TPC quality and how much milk production is based on the quality. This is due to the quality of milk driving the product's price from the cooperative. In addition, farmers need information about forage and concentrate availability to maintain milk production and to feed other unproductive cattle. Therefore, information exchange is essential to developing good milk supply chain management.

A transparent food supply chain for companies, customers, and the government is needed to maximize food quality and reduce waste (Quaralia 2022). The quality and quantity of milk are essential in increasing milk availability to meet milk demands in Indonesia. This is because milk is easily contaminated with microbes, and it can be harmful and cause disruption to consumer health (Wiranti et al. 2022).

Farmers in Banyumas are unfamiliar with the food loss that can occur in the fresh milk supply chain. Farmers always focus on activities such as the availability of forage feed, concentrates, production products, and milking. It causes dairy farmers in Banyumas to not receive information about the impact and dangers of food loss in the milk supply chain. The effect found by farmers is a decrease in milk production and quality. It can threaten the economy, food security, and the environment (Ishangulyyev et al. 2019).

However, the farmer shall conduct training to increase the understanding of food loss in the milk supply chain. Another alternative is to attract students majoring in animal husbandry and stakeholders in the local environment to provide actual practice (Nababan et al. 2021). Farmers can be introduced to information technology to gain positive impacts and obtain accurate cattle information. Hence, the stakeholders' role in supporting dairy farmers in increasing production is to conduct training in adopting milking technology. It aims to keep the milk standard as an industrial requirement.

CONCLUSION

The research examines the relationship between information exchange and food loss in the milk supply chain. The demographic factors included morning and afternoon production and cage area. The information exchange had food loss while transferring to the milk can, scheduled milk deposits, and deposits to the milk shelter. The result showed that demographics correlate with information exchange.

Farmers shall improve their knowledge about the loss in the milk supply chain. They shall improve their understanding to adopt information

technology to gain accurate and up-to-date data regarding milk production. Those activities are related to preventing food loss. Therefore, stakeholders' roles, such as farmer groups and cooperatives, are significant in facilitating the activities.

This study has limitations, focusing only on small-scale farmers. The study needs more information about stakeholders' roles in preventing food loss through information exchange. Future research can focus on the role of stakeholders and related agencies (livestock) in implementing information technology to increase the understanding of dairy farmers on the occurrence of food loss in the milk supply chain.

ACKNOWLEDGMENTS

We would like to express our gratitude to the respondents and dairy cooperatives in Banyumas who helped fill out the questionnaire, as well as the team of surveyors from the Department of Industrial Engineering of the Institute of Technology. Surveyors from the Department of Industrial Engineering, Telkom Institute of Technology Telkom Purwokerto.

REFERENCE

Adamson, K. A., and S. Prion. 2013. Reliability: Measuring Internal Consistency Using Cronbach's α. *Clinical Simulation in Nursing* 9(5):179–180.

Anugrah, I. S., T. B. Purwantini, and Erwidodo. 2021. Milk Collection Points: Inovasi Kemitraan Usaha Ternak Sapi Perah Di Pangalengan-Bandung Selatan. *Analisis Kebijakan Pertanian* 19(1):1.

Bahermasyah. 2021. Kementan Siapkan Program Peningkatan Produksi Susu Nasional. https://infopublik.id/kategori/nasional-ekonomi-bisnis/521430/kementan-siapkan-program-peningkatan-produksi-susu-nasional.

BPS. 2020. Produksi Telur Unggas dan Susu Sapi Menurut Kabupaten/Kota dan Jenis Ternak di Provinsi Jawa Tengah (ton), 2019 dan 2020. https://jateng.bps.go.id/statictable/2021/04/15/2448/produksi-telur-unggas-dan-susu-sapi-menurut-kabupaten-kota-dan-jenis-ternak-di-provinsi-jawa-tengah-ton-2019-dan-2020.html.

Budiman, I., and A. Alta. 2022. Transfer Teknologi dan Pengetahuan untuk Peternakan Sapi Perah. *CIPS-Indonesia*(52):7–29.

Burritt, K. L. C. R. 2017. Material Flow Cost Accounting For Food Waste in The Restaurant Industry. *British Food* 119(3):1–17.

Cahyaputri, B., M. Yani, and Sugiarto. 2021. Implementasi Penilaian Daur Hidup Produk Susu Sapi Segar (Studi Kasus Koperasi Peternak Mjm). *Jurnal Teknologi Industri Pertanian* 31(1):78–87.

Echo, P. 2021. Desain Kandang yang Ideal untuk Ternak Sapi. https://fpp.umko.ac.id/2021/12/10/desain-kandang-yang-ideal-untuk-ternak-sapi/.

FAO. 2019. *The State Of Food Security And Nutrition In The World Safeguarding Against Economic Slowdowns And Downturns*. FAO, New York.

Grochowska, R., and I. Szczepaniak. 2019. Sustainability Business Models in Milk Processing. Considerations Based on the Polish Experience. *Journal of Agribusiness and Rural Development* 52(2):0–2.

Ifani, M., N. Cahyo, Danang, A. N. Syamsi, H. S. Widodo, and Y. Subagyo. 2022. Pengaruh Produktivitas Sapi Perah Terhadap Produksi Susu Sapi Nasional. *Journal and Proceeding fakultas Peternakan UNSOED* 9:14–15.

Irianto, H. E., and Giyatmi. 2021. Susut dan Limbah Pangan [Food Loss dan Waste] Hasil Perikanan. Universitas Sahid.

Ishangulyyev, R., S. Kim, and S. H. Lee. 2019. Understanding food loss and waste-why are we losing and wasting food? *Foods* 8(8).

Kleden, Y. L. 2014. Faktor-Faktor Yang Mempengaruhi Adopsi Teknologi Infus Asap Di Kabupaten Timor Tengah Selatan, NTT, Indonesia. *Jurnal Kawistara* 4(2):202–212.

Maulana, M., S. Emma, and D. Jatmika. 2021. Tingkat Pendidikan Lama Beternak Dan Praktik Hygiene Sanitasi Pemerah Susu Sapi Di Sleman Yogyakarta. *Jurnal Kesehatan dan Pengelolaan Lingkungan* 2(1):107–112.

Muharam, M., and A. G. Persada. 2020. Implementasi Penggunaan Website Sebagai Media Informasi dan Promosi Guna Meningkatkan Jangkauan Pasar (Studi

Kasus : Desa Sumberejo). *Automata* 1(2):22–29.

Murti, A. T., Rosyida Fajri Rinanti, and Hidayati Karamina. 2022. Profil Peternak Rakyat Sapi Perah Peranakan Friesien Holstein Laktasi Pada Kelompok Ternak Desa Pesanggrahan, Kota Batu. *Jurnal Ilmiah Fillia Cendekia Volume* 7(1):1–12.

Nababan, A. A., M. Jannah, E. Laia, and Y. Zai. 2021. Pemanfaatan Website Untuk Manajemen Informasi Pada Peternakan Arjuna Farm Medan. *Jurnal Pengabdian kepada Masyarakat Nusantara (JPkMN)* 2(1):28–34.

Oliveira, M. M. de, A. Lago, and G. P. Dal' Magro. 2021. Food loss and waste in the context of the circular economy: a systematic review. *Journal of Cleaner Production* 294:126284.

Panggaresta, M. J., and L. Alhazami. 2022. Pengaruh Information Sharing Dan Long Term Relationship Terhadap Kinerja Operasional Pada Outlet Chigo. *Jurnal Ekonomi dan Manajemen* 2(4):189–200.

Paramita, R. P. 2020. Konsumsi susu masih rendah, tapi produksi pun tak cukup. https://lokadata.id/artikel/konsumsi-susu-masih-rendah-tapi-produksi-pun-tak-cukup.

Quaralia, P. S. 2022. Kerjasama Regional dalam Rantai Pasokan Pertanian untuk Mencapai Ketahanan Pangan Berkelanjutan: Studi kasus ASEAN. *Padjadjaran Journal of International Relations* 4(1):56.

Raut, R. D., B. B. Gardas, V. S. Narwane, and B. E. Narkhede. 2019. Improvement in the food losses in fruits and vegetable supply chain - a perspective of cold third-party logistics approach. *Operations Research Perspectives* 6(June):100117.

Sari, V. M., G. Widyaswara, and F Pramonodjati. 2021. Pengaruh Perbedaan Waktu dan Teknik Pemerahan Susu Sapi Terhadap Jumlah Bakteri Escherichia Coli. *Journal of Health Research* 4(2):47–58.

Setyawardani, T., M. Sulistyowati, and J. Sumarmono. 2021. Penerapan Teknologi Kultur Starter Dan Grains Kefir Untuk Menghasilkan Minuman Sehat Pada Kelompok Tani Ternak (Ktt) Margo Mulyo Baturaden. *Dharmakarya: Jurnal Aplikasi Ipteks untuk Masyarakat* 10(2):122.

Shikuku, K. M. 2019. Information exchange links, knowledge exposure, and adoption of agricultural technologies in northern Uganda. *World Development* 115:94–106.

Sintia, I., M. D. Pasarella, and D. A. Nohe. 2022. Perbandingan Tingkat Konsistensi Uji Distribusi Normalitas Pada Kasus Tingkat Pengangguran di Jawa. *Prosiding Seminar Nasional Matematika, Statistika, dan Aplikasinya* 2(2):322–333.

Wasito. 2018. Persepsi Dan Adopsi Sni 3141.1: 2011 Keluarga Peternak Sapi Perah Kawasan Usaha Peternakan (Kunak) Kabupaten Bogor. *Jurnal Standardisasi* 19(3):241.

Wiranti, N., V. Wanniatie, A. Husni, and A. Qisthon. 2022. Kualitas Susu Sapi Segar Pada Pemerahan Pagi dan Sore. *Jurnal Riset dan Inovasi Peternakan* 6(2):123–128.

Wulandari, P., W. L. Putri, and P. H. Wahyudiono. 2022. Sistem Informasi Pengolahan Data Peternakan Ayam Kampung Pada CV. Dua Saudara Berbasis Web Mobile. *Journal of Engineering, Technology, and Applied Science* 4(1):14–21.

Yusuf, D. A., F. Romadlon, and F. D. Winati. 2023. The Influence of Material Handling and Operational Performance On Food Loss Occurrence In The Milk Supply Chain. *Agrointek: Jurnal Teknologi Industri Pertanian* 17(3):549–556.

Zahra, A. R., R. Syahputra, and S. Suhairi. 2022. Analisis Komunikasi Dalam Bisnis. *Da'watuna: Journal of Communication and Islamic Broadcasting* 2(1):25–34.