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SINTA 2

Operational Risks of Broiler Chicken Farming in Pamekasan Regency

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ABSTRACT

Broilers are one of the animal protein producers that experience an increase in demand every year. Based on data from the Food Security and Livestock Service Office of Pamekasan Regency in 2019, the highest broiler production in Pamekasan Regency was located in Larangan Subdistrict, however, many farmers closed their businesses. This research was conducted at Pak Rudi's broiler farm located in Pamekasan Regency with the aim of knowing the sources of risk, prioritizing risks that require the most immediate prevention, and knowing alternative control strategies. The methods used in this research are fishbone and FMEA. The results of this study indicate that there are three main sources of risk on this broiler farm including production risk, financial risk, and marketing risk. Risk prioritization lies in the source of production risk with an indicator of the risk of contracting diseases for alternative strategies used in controlling risks in the form of administering vaccines regularly to maintain the immune system of chickens and conducting examinations on chickens carefully and regularly so that if there are chickens that contract diseases, treatment can be carried out quickly and appropriately to avoid disease transmission to other chickens.

Keywords: broiler, fishbone, FMEA, risk

INTRODUCTION

Developing the potential of the food sector is a priority in Indonesia's national development program due to the annual increase in Indonesia's population. According to the 2020 population census, there was an increase of 32.56 million people compared to the 2010 census.(BPS, 2019b). The increase in population will have an impact on many aspects, one of which is the increased need for food and energy in Indonesia.(Khairati & Syahni, 2016)The livestock sector is one of the food sub-sectors that must be developed because it has a large contribution to regional development efforts.(Siagian, 2011)The livestock sector is included in efforts to increase national food security.(Abrar et al., 2008). Sari(Sari & Ramadhon, 2017)He stated that one of the potential businesses in Indonesia that experiences annual growth is broiler chicken farming. Demand for livestock products, particularly broiler chickens, increases annually.

This increase in demand occurred due to increased knowledge, awareness and understanding of nutrition and the

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benefits of consuming animal protein by the Indonesian people.(Mardiyanto et al., 2019). Increased community income also influences the high demand for broiler chickens.(Ridha, 2016)According to the National Socio-Economic Survey (SUSENAS), there has been an increase in per capita consumption of broiler chickens by the Indonesian people from 2012 to 2022 by 7.39% per year.(Ministry of Agriculture, 2022). Wessiani(Wessiani & Sarwoko, 2015)The year-on-year increase in Indonesian broiler chicken consumption has positively impacted the demand for poultry feed products. The quality of poultry feed is crucial for broiler chicken breeding. Broiler chickens can be harvested within seven weeks if provided with proper feed, water, vaccinations, and hygiene.(Lawrence Azua et al., 2022).

Aulia(Aulia, 2015)stated that the population of broiler chicken farms experiences an increase in demand every year because this type of chicken requires food at a lower price compared to other animal protein producers, is easy to process, contains high-quality animal protein, and is easy to obtain. Based on data from the National Socio-Economic Survey (SUSENA), the average per capita consumption of broiler chicken meat by the Indonesian people has increased every year. In 2021, the average per capita consumption was 6.5 kg, in 2022 it was 7.1 kg, and in 2023 it was 7.4 kg.(Ministry of Agriculture, 2023)The broiler population in Indonesia will reach 3.17 billion in 2022, with a growth rate of 0.44%. (Directorate General of Animal Husbandry and Animal Health, Ministry of Agriculture, 2022). Population growth and demand for chicken meat necessitate efforts to increase the broiler chicken population to meet domestic demand.

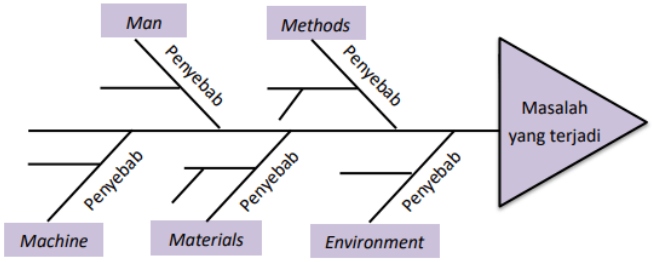
Efforts that have been made by the government through the Ministry of Agriculture, Directorate General of Animal Husbandry and Animal Health include developing poultry farming businesses in rural areas, organizing poultry maintenance in residential areas, and fostering partnerships for broiler chickens.(Ministry of Agriculture, 2022)According to BPS data, Java Island had the highest broiler chicken population in Indonesia from 2018 to 2022 (Directorate General of Animal Husbandry and Animal Health, Ministry of Agriculture, 2022). East Java produced 401 million broiler chickens.(BPS, 2022)In 2018, Pamekasan Regency became the regency on Madura Island with the highest broiler chicken population of 913,600.(BPS, 2019a)However, in 2021, Pamekasan Regency fell to second place on Madura Island with the highest broiler chicken population, namely 711,080.(Central Statistics Agency, 2023)

Bidin(Bidin A, 2017)He stated that poultry farming also carries risks that can lead to losses and even bankruptcy due to high chicken mortality or price fluctuations. Broiler chicken farming carries a relatively high risk of production.(Sekarrini et al., 2016)Mr. Rudi's chicken farm has also experienced a decline in broiler chicken production, from initially having two cages to only one this year due to several factors such as competition with other breeders, chicken deaths, and rising input prices.(Das et al., 2024)Small-scale farmers are in a vulnerable situation because they do not have sufficient access to proper guidance from relevant authorities or experts. Instead, they are tempted and encouraged by traders, medical representatives, and other local agents to use drugs and other additives without supervision or knowledge. This study aims to: (1) identify the sources of operational risks in broiler chicken farming, (2) identify the priority risks that require the most immediate prevention to reduce potential problems that will arise, (3)

identify alternative strategies for controlling operational risks in broiler chicken farming.

RESEARCH METHOD

The research location was conducted purposively (intentionally), namely Larangan District, Pamekasan Regency, East Java. The research was conducted in November 2023. The data used in the study were primary data. Primary data were obtained and collected through direct interviews with respondents who were owners of broiler chicken farms and workers. Data collection techniques can be done in three ways: recording, observation, and interviews. Observation techniques are techniques for collecting necessary data by directly observing the object being studied. Interview techniques are collecting data from respondents by asking directly. A list of questions (questionnaires) has been prepared beforehand so that the information obtained is in accordance with what is needed. The recording technique is data from interviews with respondents who are broiler chicken farmers. Fishbone diagrams and FMEA were used as methods for this research. Fishbone diagrams are cause and effect analysis. The purpose of using a fishbone diagram is to identify problems and determine the causes of the emergence of a problem faced by the company. The effects or consequences are depicted as the head of a fish and the bones are filled with the causes of the problems that arise.



Source: Nurike, 2021

Figure 1
Fishbone Diagram

After identifying the risk sources, an FMEA analysis is conducted to calculate the magnitude of the risk faced by each identified risk source using a fishbone diagram. FMEA is a method used to identify and analyze the consequences of failures in order to reduce losses in the event of failure.(Richma Yulinda et al., 2015). The stages of using FMEA are (1) reviewing and determining processes that have the potential for failure, (2) identifying failures in the process, (3) identifying the impact of each failure, (4) finding the severity rating (s) of the impact of each failure, (5) finding the likelihood rating (o) of failure, (6) determining the likelihood rating of failure detection (d) of each failure, (7) calculating the risk priority number or RPN of each failure, (8) ranking the criticality of failure based on RPN, (9) determining recommendations for handling or control actions to reduce the potential for failure, (10) calculating the residual value of RPN after handling or control actions. The objectives of using FMEA according to Carlson (2014) are (1) identifying and understanding potential failure modes, causes and effects of failure on the system,

(2) assessing risks and prioritizing problems by identifying their effects and causes, (3) identifying and implementing actions to address the most serious problems. The identification results from the fishbone diagram are then determined by the Severity, Occurrence, and Detection values with the following criteria

Table 1
Severity Criteria

Rating	Consequence	Verbal Criteria
1	Very low	There is no impact on livestock (The risk does not impact livestock results/income and/or capital of broiler chicken farms).
2	Low	Little impact (Risk can reduce production results/income and/or capital of broiler chicken farms by 15%).
3	Currently	Quite influential (The risk can reduce production results/income and/or capital of broiler chicken farms by 25%).
4	Tall	Very critical influence (Risk can reduce production results/income and/or capital of broiler chicken farms by 50%).
5	Very high	Very detrimental (The risk can reduce production/income and/or capital of broiler chicken farms by >50%).

Source: Vasdani 2017

Table 2
Occurrence Criteria

Rating	Opportunity Level	Verbal Criteria
1	Very low	Once a year or less.
2	Low	Several times a year.
3	Currently	Several times in a span of 6 months.
4	Tall	Several times.
5	Very high	Always.

Source: Vasdani 2017

Table 3
Detection Criteria

Rating	Level of Control	Verbal Criteria
1	Very high	Definitely detectable (Risk of being fully detected).
2	Tall	Most likely to be detected (Risk of being detected 75%).
3	Currently	Possibly detectable (Risk of detectability 50%).
4	Low	Low probability of risk being detected (Risk can be detected 25%).
5	Very low	The risk cannot be detected.

Source: Sari 2016

Then calculate the Risk Priority Number (RPN) which aims to make it easier to identify which sources of failure are a priority in preventing or reducing potential problems.

RPN= Probabilitas x Dampak x Deteksi

Information

- RPN : Risk Priority Number
- S : Severity (probability)
- O : Occurrence (impact)
- D : Detection (detection)

After knowing the RPN value, the criticality categories are then ranked and grouped from high, medium and low.

1 – 41.3 : low
42.4 – 83.7 : moderate
84.8 – 125 : high

RESULTS AND DISCUSSION

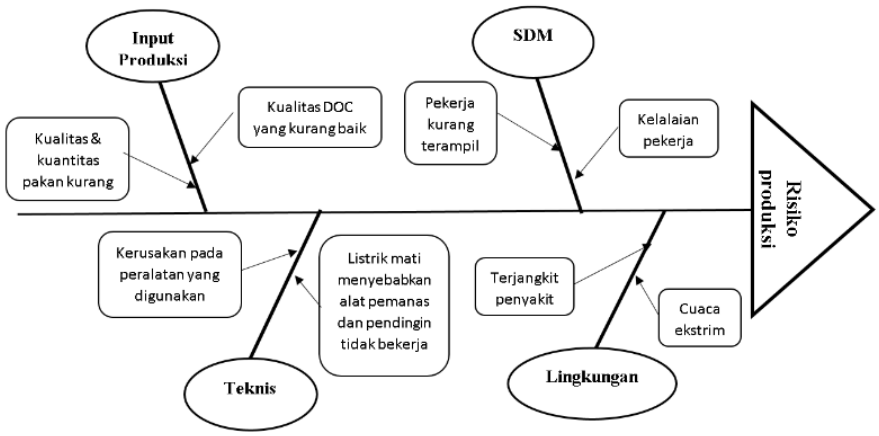
Identifying Risk Sources

Every entrepreneur running a broiler chicken farm certainly has risks that could lead to losses. Risks encompass all potential outcomes that could be detrimental to the business.(Wolf & Karszes, 2023)Operational risks arise due to human error, external factors, system failures and production processes.(Misman, 2022). Emerging risks can be prevented to minimize losses experienced by broiler chicken farmers. Interviews with Mr. Rudi, the farm owner, revealed several risks that could impact production volume. The three main risks are production risk, marketing risk, and financial risk.

Efforts to manage risks include analyzing and anticipating them with the aim of minimizing losses incurred by the company by employing more efficient strategies. Fishbone analysis can be one alternative strategy. One method within RCA Analysis (root cause analysis) is Fishbone. This method aims to analyze risks early on, allowing companies to prevent losses by developing appropriate business strategies.

Production Risk

Based on the identification that has been carried out on Mr. Rudi's broiler chicken farm, four production risk factors were obtained as follows:



Source: Processed data, 2023

Figure 2
Production Risk Fishbone

Four main factors have been identified in production risks. These risk factors affecting Human Resources (HR) relate to workers. Superior human resources, including thoroughness, discipline, and knowledge in maintenance, are crucial for farm success. This is because workers who are not meticulous and disciplined can stress broiler chickens, leading to death. Several worker negligence factors contribute to broiler chicken deaths, including improper feeding. Chickens should be fed twice a day, but only once, resulting in lower weights. Workers who are lazy about cleaning the coops can make chickens susceptible to disease. Workers who neglect the coop's temperature can also lead to chicken deaths. Lack of knowledge and supervision from farm owners can lead to careless and inattentive workers, resulting in suboptimal chicken production.

Factors thatAccording to Mr. Rudi, there are two factors influencing production inputs on broiler farms: DOC and feed. DOC is the term used for broiler and laying hens aged 1 to 14 days after hatching. The higher the quality of DOC, the healthier and more productive broiler chickens will be. Conversely, if DOC is provided in poor conditions, the mortality rate will be high. The quality and quantity of feed given to chickens also affect the production of broiler chickens. The increase in chicken weight is influenced by the quality of feed and the adequacy of feed needed to support the growth process in the body tissues of broiler chickens, which require adequate nutrition.(Sitompul et al., 2016)Mr. Rudi's chicken farm feeds twice a day, in the morning and evening. Insufficient feed can lead to unstable broiler chicken growth, even though they are large but underweight. The feed is concentrated, and calcium is usually added to stimulate growth.

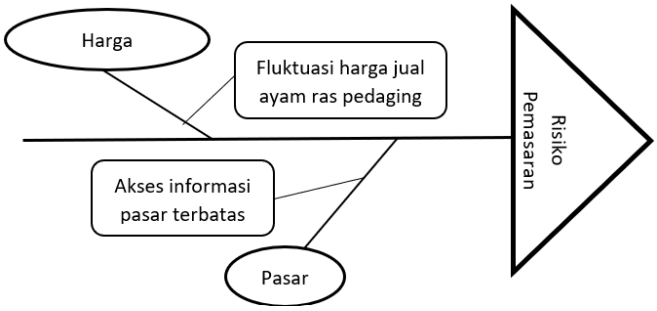
WrongOne cause of broiler chicken deaths is changing weather conditions, where the air temperature is too hot during the dry season or too cold during the rainy season. If the temperature is above thermoneutral, broiler chickens' breathing becomes rapid, shallow, and they make a panting sound.(Sundari & Santosa, 2015)Conversely, if the temperature is below the minimum, broiler chickens will huddle together and tend to remain still, stopping eating and drinking, resulting in nutritional deficiencies. During the transitional season, which marks the transition between the two seasons: dry and rainy, this change in weather causes broiler chickens to become stressed, their immune systems weakening, making them susceptible to disease. The types of diseases that commonly occur during the rainy season are:Newcastle Disease(ND) This disease appears due to poor hygiene, lack of sunlight, and poor air circulation. During the dry season, diseases that usually appear include:Chronic Respiratory Disease(CRD) which occurs due to excessively hot air.

FactorTechnical aspects relate to the equipment used. During extreme weather, heating and cooling equipment is essential for chicken survival. The equipment used depends on the electrical system; if equipment is damaged or the power goes out, it cannot operate, causing the broiler chickens to die. During the rainy season, heating equipment is usually used 24 hours a day for 1-20 days with the coop curtains closed. During the dry season, heating is only used when the chickens are 1-7 days old, with the coop curtains opened. During the summer, fans or blowers are used to prevent overheating, as overheating can

cause heat stress in coop temperatures exceeding 28° Celsius.

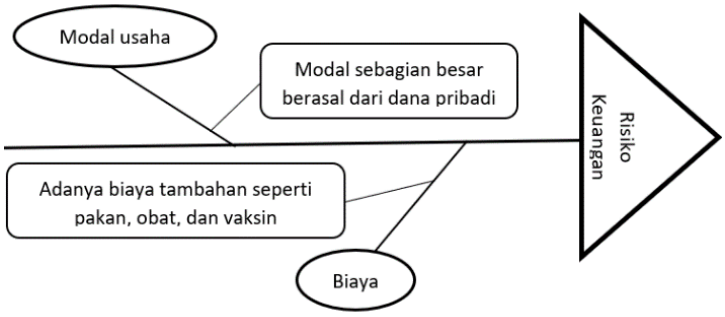
Financial Risk

Mr. Rudi's broiler chicken farming business is primarily funded by his own funds, with the remainder borrowed from a bank. While capital loans are crucial for business growth, careful consideration must be given to the potential risks. If the business fails without a well-thought-out plan and is funded by loans, repayments will be difficult. The type of loan used for this farm is the People's Business Credit (KUR). The existence ofAdditional costs, such as feed, medicine, and vaccines, are subject to price fluctuations, especially during poultry disease outbreaks. Farmers report experiencing difficulties in obtaining the necessary medicines and vaccines for their broiler chickens to prevent the spread of disease and the deaths of their chickens. The Pamekasan Regency Livestock Service typically provides outreach and assistance with vaccine and medication needs in the event of a poultry disease outbreak. This program will significantly ease the burden on farmers by reducing the cost of purchasing medicines and vaccines.



Source: Processed data, 2023

Figure 3
Financial Risk Fishbone



Source: Processed data, 2023

Figure 4
Marketing Risk Fishbone

Marketing Risk

Collectors will sell live broiler chickens to traders at a price of IDR 24,000/kg and traders will sell clean broiler chicken meat to consumers at a price of IDR 38,000/kg. The price of chicken from farmers to collectors per kg is determined by the collectors so that farmers cannot determine the price which causes the selling price of broiler chickens to be unstable. The fluctuating price of broiler chickens causes broiler chicken farmers to sometimes experience losses because production costs for broiler chicken farming are higher while low selling prices cause low profits to incur losses.

Farmers have limited market access. A lack of market information makes it difficult for broiler farmers to sell and obtain the highest price for their broilers. Mr. Rudi only knows one or two broiler collectors, which limits their ability to compare broiler prices.

Calculating the Size of Risk Sources Using FMEA

After identifying the sources of risk using a fishbone diagram on a broiler farm, an analysis was conducted using FMEA. Business risks cannot be eliminated but can be minimized by identifying business risks. Based on risk identification, there are three risk factors that occur on Mr. Rudi's broiler farm: production risk, financial risk, and marketing risk. After identifying the three risk sources, respondents will rate each identified risk based on severity, occurrence, and detection, then obtain a rating from the average. Risk level analysis is conducted to determine the level of operational risk and the impact that will occur. Risk assessment is the process of investigating potential uncertainties or negative threats, including estimating the likelihood of risks, the magnitude of consequences, and determining the associated uncertainties.(Adelhardt & Berneiser, 2024)Based on the results of the FMEA risk level analysis, the RPN value is obtained. The RPN value is obtained by multiplying the Severity, Occurrence, and Detection scores to determine the priority of risks that must be addressed quickly. Once the RPN value is determined, the next step is to rank the risks.

Based on the results of the risk level analysis using the FMEA method, the highest Risk Priority (RPN) value for production risk lies in the risk indicator for disease infection with an RPN value of 45. Marketing risk is known to have the highest RPN value lies in the risk indicator for fluctuating broiler chicken selling prices with an RPN value of 36. Furthermore, for financial risk, the highest RPN value lies in the risk indicator for high input costs with a value of 32. Of the three risks, namely production, marketing, and finance, the highest RPN value lies in production risk with an indicator for disease infection. This risk occurs because when broiler chickens are infected with a disease and treatment is late, many broiler chickens will die. This risk has a high severity and is very detrimental to farmers, causing a decrease in production results that reach ≥ 50%. For the frequency level, it gets a medium value because disease outbreaks sometimes occur and for the farmer's ability to detect it is medium because the arrival of an outbreak is likely to be detected if signs begin to appear on the body of broiler chickens. Diseases that attack broiler chickens during the dry season

The types of diseases that usually attack during the rainy season are:Newcastle Disease(ND) Meanwhile, during the dry season, diseases that usually appear areChronic Respiratory Disease(CRD). Meanwhile, the lowest RPN value is held by financial risk with a risk indicator of untidy financial recording with an RPN value of 8 points with a low level of

severity because according to farmers, the risk of untidy financial recording is considered not to have much impact on livestock income. Because even though financial recording is not done neatly, farmers feel they have made a profit and this livestock business has survived for years. The frequency level is difficult to avoid due to a lack of knowledge about good financial recording..

Table 4
FMEA analysis results

Sources of Business Risk	Risk Indicators	Rating			RPN		Rank
		S	O	D	(SxOxD)	Category	
Production Risk	DOC Quality	4	2	3	24	Low	6
	Quantity and quality of feed	3	2	2	12	Low	8
	Extreme weather	5	2	4	40	Low	2
	Disease	5	3	3	45	Currently	1
	Worker negligence	3	2	4	24	Low	6
Marketing Risk	Chicken selling pricemeat breedfluctuating	3	3	4	36	Low	3
	chicken selling pricemeat breeddetermined by the collector	2	3	3	18	Low	7
	Lack of market access	3	3	3	27	Low	5
Financial Risk	Limited business capital	3	3	1	9	Low	9
	Financial records are not neat	2	4	1	8	Low	10
	High input costs	4	4	2	32	Low	4
	Most of the income depends on livestock	3	3	1	9	Low	9

Source: Processed data, 2023

Alternative Operational Risk Management Strategies

Once the source of operational risk is identified, alternative risk management strategies can be implemented by determining appropriate strategies. Management strategies are needed to address various risks that may arise in the future. An operational risk strategy is expected to minimize these risks. Alternative management options for production risks in maintaining DOC quality include collaborating with a trusted company and re-inspecting DOCs shipped by the company. Characteristics of good DOCs include perfect body parts, ability to stand and be agile, and the absence of abrasions or bruises on the skin.(Suriani et al., 2022).

The first source of risk is production risk. This risk is divided into several categories, including DOC quality, feed quality and quantity, extreme weather, disease, and worker negligence. Alternative strategies include establishing partnerships with companies to provide seeds, feed, and production facilities.(Pelafu et al., 2018)This collaboration aims to ensure the quality of seeds, feed, and production facilities to produce fat and healthy broiler chickens. Farmers also benefit from this collaboration, starting from minimizing

production costs and receiving support from the company in the form of technological and knowledge support. Farmers can expand their knowledge of the latest techniques, practices, and innovations in broiler farming. Production risks are the biggest faced by farmers, especially regarding disease. Usually, vaccines are given to chickens 2-3 times at a price of around Rp. 400,000 for 1,000 chickens. Efforts that can be implemented to prevent disease can be done by conducting regular examinations and vaccinating broiler chickens 4-5 times. Some vaccines that can be given include pill vaccines for immunity, drop vaccines that are dripped on several parts of the chicken's body, and the Gumboro vaccine.

In the marketing process, farmers face several risks related to the selling price of broiler chickens and market access. Several alternative strategies can be implemented, including the government, through the local livestock service, providing counseling and collaborating with large companies to purchase livestock products. This way, farmers can choose which company or collector offers the best price and agreement, and then collaborate with them to sell their livestock. Besides government involvement, farmers can also join farmer communities to expand their network and gain market information. Another alternative strategy is to engage in a partnership farming business. This partnership can be a way to prevent losses caused by plummeting broiler chicken prices. This is because with a partnership model, the selling price of broiler chickens is not affected by price fluctuations; in a partnership model, the selling price of broiler chickens is dependent on the contracted price.(Ika, 2020).

Capital is a crucial aspect of running a business because everything requires funding. Without sufficient capital, farmers will struggle to conduct business. Some financial risks faced by farmers include limited capital, poor financial record keeping, high input costs, and livestock being the family's sole source of income. Several alternatives exist for obtaining business capital, including capital assistance from partners, assistance from the Animal Husbandry Department, and bank loans. Farmers managing partnership farms benefit from the core company covering the majority of the capital. The partner company will supply all livestock needs, from production to marketing.(Sibuea, 2016).

CONCLUSION

The operational risks of Mr. Rudi's broiler farm were identified as having three sources of risk: production risk, marketing risk, and financial risk. Using FMEA, the largest RPN was obtained for the production risk source with the risk indicator of disease infection. This risk occurs because when broilers contract a disease and treatment is late, many broilers will die. This risk has a high severity and is very detrimental to farmers, causing a decrease in production of up to 50%. The frequency level was moderate because disease outbreaks occur occasionally, and the farmer's ability to detect it was moderate because an outbreak is likely to be detected if signs begin to appear in the broiler's body. Alternative strategies that can be applied to the main risk include regular vaccination to maintain the broiler's immune system and conducting thorough and routine examinations of broilers so that if any broilers contract a disease, treatment can be carried out quickly and appropriately to prevent the disease from spreading to other broilers.

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REFERENCES

Abrar, H., Khomsan, A., & Heryatno, Y. (2008). Analysis of Animal-Origin Food Independence in the Context of Strengthening Food Security in West Lampung Regency. Journal of Nutrition and Food, 3(3), 205. https://doi.org/10.25182/jgp.2008.3.3.205-211

Adelhardt, N., & Berneiser, J. (2024). Risk analysis for agrivoltaic projects in rural farming communities in SSA. Applied Energy, 362(March), 122933. https://doi.org/10.1016/j.apenergy.2024.122933

Aulia, LN (2015). The Effect of Broiler Chicken Farming Business Patterns on Price Risk and Net Income. Journal of Chemical Information and Modeling, 53(9), 1689–1699.

Central Statistics Agency. (2023). Population of Broiler Chickens, Ducks, and Manila Ducks by Regency/City and Type of Poultry in East Java Province (heads), 2020 and 2021. BPS.

Bidin A. (2017). Risk Analysis of Independent Broiler Chicken Business and Alternative Solutions. Socio-Economics of Agriculture and Agribusiness, 4(1), 9–15.

BPS. (2019a). Official statistical news. Bps.Go.Id, 27, 1–52.

BPS. (2019b). Poultry Population by Regency/City and Poultry Type in East Java Province 2017-2018. BPS, 669.

BPS. (2022). Livestock in Figures 2022. Central Bureau of Statistics of Indonesia, https://news.ge/anakliis-porti-aris-qveynis-momava.

Das, S.C., Zubiatin Tasmin, M., Afrin, A., Ahmed, T., Lahiry, A., & Rahman, S. (2024). Challenges in the profitability of small-scale broiler farming by avoiding unfair use of drugs and additives. Heliyon, 10(3), e25001. https://doi.org/10.1016/j.heliyon.2024.e25001

Directorate General of Livestock and Animal Health, Ministry of Agriculture. (2022). Livestock and Animal Health Statistics 2022. Issn 2964-1047, 1, 1–276.

Ika, P. (2020). Partnerships are a way for poultry farmers to survive amid the pandemic. Liputan6. https://www.liputan6.com/bisnis/read/4348776/kemitraan-jadi-jurus-peternak-unggas-bertahan-di-tengah-pandemi

Ministry of Agriculture. (2023). Statistics of Food Consumption 2023. 1–132.

Ministry of Agriculture. (2022). Outlook for Broiler Chicken Livestock Commodities. Center for Agricultural Data and Information Systems, Secretariat General, ISSN 1907-1507, 75.

Khairati, R., & Syahni, R. (2016). Food Demand Response to Population Growth in West Sumatra. Journal of Village Development, 1(2), 19. https://doi.org/10.30559/jpn.v1i2.5

Lawrence Azua, O.O., Gebisa, G., & Gizaw, O. (2022). Effect of Feed Form on Body Conformation Traits of Different Hybrids of Broiler Chickens. International Journal of Zoology, 2022. https://doi.org/10.1155/2022/5616692

Mardiyanto, RT, A, NL, & Putri, AA (2019). Improving Knowledge of Balanced Nutrition as a Guide to Healthy Living in the Community Around Pondok Jagung Village, North Serpong

District, South Tangerang City. Proceedings of the National Seminar on Community Service, LPPM UMJ, September, 1–5.

Misman, RA (2022). Risk Management Analysis in the Operation of Roti Bakar 77 Business. Journal of Islamic Philanthropy and Disaster (JOIPAD), 2(2), 66–96. https://doi.org/10.21154/joipad.v2i2.5081

Pelafu, F., Najoan, M., & Elly, FH (2018). Potential for Developing Laying Hen Farms in West Halmahera Regency. Zootec, 38(1), 209. https://doi.org/10.35792/zot.38.1.2018.18941

Richma Yulinda, H., Rukmi, HS, & Susanti, S. (2015). Product Quality Improvement of Keraton Luxury at PT. X Using Failure Mode and Effect Analysis (FMEA) and Fault Tree Analysis (FTA) Methods*. International Journal of Quality & Reliability Management, 03(03), 137–147.

Ridha, A. (2016). Several Factors Affecting the Demand for Broiler Chicken Meat in Households in Idi Rayeuk District, East Aceh Regency. Media.Neliti.Com, 24, 23–31.

Sari, ML, & Ramadhon, M. (2017). Broiler Chicken Feeding Management in Tanjung Pinang Village, Tanjung Batu District, Ogan Ilir Regency. Sriwijaya Animal Husbandry Journal, 6(1), 37–43. https://doi.org/10.33230/jps.6.1.2017.5077

Sekarrini, R., Harisudin, M., & Riptanti, EW (2016). Risk Management of Broiler Chicken Cultivation in Boyolali Regency. Agrista, 4(3).

Siagian, H. (2011). Contribution of Livestock Businesses to Regional Development. Jurnal Wira Ekonomi Mikroskil, 1(1), 31–35. https://doi.org/10.55601/jwem.v1i1.54

Sibuea, MB (2016). Comparative Analysis of Livestock Income Partners The Breeder Self in The District Deli Serdang. AGRIUM: Journal of Agricultural Sciences, 20(2), 101–108.

Sitompul, SA, Sjofjan, O., & Djunaidi, IH (2016). The Effect of Several Types of Commercial Feed on Quantitative and Qualitative Production Performance of Broiler Chickens. Animal Husbandry Bulletin, 40(3), 187. https://doi.org/10.21059/buletinpeternak.v40i3.11622

Sundari, RD, & Santosa, PEFAJTMYDRDKSKB (2015). Physiological responses of medium-type roosters fed rations with different crude fiber levels. Integrated Animal Husbandry Scientific Journal, 3(2), 78–84.

Suriani, WO, Nugroho, H., Sura, IW, & Wanti, S. (2022). The Effectiveness of Using a Semi-Automatic Hatching Machine in Increasing the Production of Arabic Chicken (Gallus Turcicus). Journal of Scientech Research and Development, 4(2), 353–361.

Wessiani, NA, & Sarwoko, SO (2015). Risk Analysis of Poultry Feed Production Using Fuzzy FMEA. Procedia Manufacturing, 4(less), 270–281. https://doi.org/10.1016/j.promfg.2015.11.041

Wolf, C. A., & Karszes, J. (2023). Financial risk and resilience on US dairy farms: Measures, thresholds, and management implications. Journal of Dairy Science, 106(5), 3301–3311. https://doi.org/10.3168/jds.2022-22711