Applying the ISO 31000:2009 in livestock industries (Case study: XYZ livestock group)

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Abstract. XYZ Livestock Group is one of the livestock industries contributing to beef cattle and dairy cattle. However, there are many problems in the livestock industry. Because of the many uncertainties in managing the livestock industry, many cattle ranchers have switched professions to sand miners or residential entrepreneurs. This research is designated as a reference for livestock industry stakeholders to improve their business, especially to handle their risk. ISO 31000:2009 Framework is used as a method in this research. In this study, we found 13 risks with 13 causes of risk that occurred in the XYZ Livestock Group. Further analysis shows that there are three risks in the red zone, namely that livestock cannot be sold (dead/sick), and consumers of XYZ Livestock Group are declining. Furthermore, this research proposes a mitigation strategy to reduce risk. Three mitigations are obtained based on risk priorities, namely taking or increasing risks to get opportunities, eliminate sources of risk, and change the consequences.

1. Introduction
Sleman is a district in the Yogyakarta Special Region that contributes livestock products in Indonesia from existing beef cattle and dairy farmers. There are 2,053 beef cattle and 20 dairy cows managed by the Sleman livestock group. Sleman Regency is ranked fifth after Kalasan Regency [1]. However, dairy farmers in Sleman always complain about the low yield of dairy cows [2]. Another complaint is the emergence of various diseases in dairy cows, such as the Theiler virus, which infects many livestock farmers [3]. As a result, many dairy farmers directly switch their professions to become sand miners or residential entrepreneurs [4]. This study aims to create a comprehensive risk analysis and design risk mitigation strategy at the livestock group using the ISO 31000:2009 approach.

According to Moschini and Hennessy (2001), Agriculture or livestock industry is an industry that contains a lot of risks and uncertainties [5]. Livestock products such as cattle are an essential agricultural commodity because they contribute to global kilocalorie food security by 17% and global protein by 33%. [6] Failure to manage existing risks in a way will cause difficulties in meeting organizational goals [7]. In China, many farmers use two risk control instruments, namely insurance and agricultural cooperatives [5]. Insights into the social, technological, and economic systems, as well as the dynamics of cooperative behavior to regulate the transition in the energy sector and other sectors such as the agriculture industry [8]. This condition makes the livestock industry in Sleman Regency a challenge to find suitable risk management [9].

Risk management will face severe challenges when approaching specific and endogenous needs [10]. According to Knight (2007), in the face of increasing threats posed by climate change and natural disasters, the International Organization of Standardization developed ISO 31000:2009 in November 2009. ISO 31000:2009 provides general guidelines and frameworks in risk management from various countries [11]. The guidelines in ISO 31000:2009 provide an impetus for preventive measures that can be applied in anticipating negative impacts from emerging risks [12].
This study, calculations will be carried out to mitigate risk using the ISO 31000:2009 approach. The purposes of this study are to (1) set goals and context of the company, (2) conduct an assessment of risks, (3) conduct treatment of risks, and (4) analyze mitigation based on identified risks.

2. Methods
Agribusiness is an agricultural business that covers all activities, such as the procurement of agricultural inputs to the marketing of agricultural products or processed agricultural products [13]. The livestock industry also has the same business process in the agribusiness industry. The focus of this research is to find risk assessment in the livestock industry to mitigate identified risks based on ISO 31000:2009. The location of this research is the XYZ Livestock Group, located in Cangkringan, Sleman, DI. Yogyakarta. The framework of this study is to mitigate five risk aspects from the Livestock Industry using ISO 31000:2009. The result of this study will produce mitigating each risk from Livestock Industry, based on a study case in XYZ Livestock Group. The research framework explains as Figure 1.

3. ISO 31000:2009
Risk management guidelines based on ISO 31000:2009 require the support of models and theories in each sector, industry, service, organization, and project. Thus, the application of risk management can achieve effectiveness and easy to implement in a real work environment. The essential element of risk management is the uncertainty of human behavior, operated in complex systems, as concluded in different R&D environments [8].

The application of ISO 31000:2009 has been carried out in many industries, as applied to the agricultural and livestock industries, which have a high degree of uncertainty [5]. Unfortunately, risk management in the XYZ Livestock Group in Cangkringan, Sleman, has not well managed.

3.1. Establishing the Context
The initial step in conducting risk management based on ISO 31000:2009 is determining the goals and context to be achieved by the company. The livestock industry is a type of industry that has a fairly complex uncertainty problem. The livestock industry needs to adapt its industry to the weather, climate and range conditions that affect livestock production. The livestock industry must also be prepared to respond to feed prices and livestock market prices [14].
At the stage of setting objectives and context, it appears that the XYZ Livestock Group wants to improve livestock products such as meat and milk by avoiding the risks faced. The XYZ Livestock Group has yet to have a special SOP on risk management in managing beef cattle and dairy cattle farms.

3.2. Risk Assessment
3.2.1. Risk identification
Referring to the International Organization of Standardization, the organization has developed ISO 31000 guidelines in November 2009. ISO 31000:2009 provides general guidelines and frameworks in risk management of various countries [9]. There are five essential aspects to consider in managing risks in the livestock industry.

For example, the livestock industry will face risks, the first threat of livestock is disease [3], lack of knowledge of institutions, marketing, and capital [15], natural disasters from Mount Merapi, and the unstable price of feed and the selling price of cows [2].

In this case, the livestock industry will face several risks, namely law, environmental, marketing, resource, and operational aspects. Furthermore, the risk register event obtained will be elaborated as follows:
Table 1. Event risk register XYZ livestock group.

| No | Risk Area  | Sub No. | Risk Event                                                                 | Risk Agent                                               |
|----|------------|---------|-----------------------------------------------------------------------------|-----------------------------------------------------------|
| 1  | Law        | 1a      | Loss of consumer confidence                                                | Lost important certificate                               |
|    |            | 1b      | XYZ Livestock Group’s profit has dropped dramatically                       | Changes in government regulations                         |
|    |            | 1c      | Lost a big profit opportunity                                               | Production limits in the livestock industry              |
| 2  | Environment| 2a      | Livestock cannot be sold (dead / sick)                                     | The threat of livestock disease                          |
|    |            | 2b      | Loss of XYZ Livestock Group assets                                          | Natural disasters and human error                        |
|    |            | 2c      | The XYZ Livestock Group office cannot operate                               | The XYZ Livestock Group organization is opposed by the public |
| 3  | Marketing  | 3a      | Lack of public interest in transacting XYZ Livestock Group                  | The traditional shopping patterns of the community are still attached |
|    |            | 3b      | XYZ Livestock Group's profit margin decreased                              | The decline in livestock market prices                   |
|    |            | 3c      | Consumers of XYZ Livestock Group are declining                             | The emergence of similar industries                      |
| 4  | Resources  | 4a      | Losses incurred by XYZ Livestock Group                                     | Theft / embezzlement of money / company assets           |
|    |            | 4b      | Hampered business processes XYZ Livestock Group                             | Employees who are not compliant with SOP                 |
| 5  | Operational| 5a      | Lost or changed data on the system                                          | The system code on the XYZ Livestock Group database has changed |
|    |            | 5b      | Cessation of the process on the XYZ Livestock Group database               | Database XYZ Livestock Group overload                    |
3.2.2 Risk analysis

Risk analysis is the stage in which researchers search for information about the likelihood and impact that can occur in the XYZ Livestock Group. According to Water (2007) the analysis can be done in three ways [16], namely:

- Using knowledge of the situation and calculating the probability
- Employing historical data to see the frequency of events to predict future events
- Asking the risk owner (expert, employee, or leader) to get a view of the possibility of the existing events

The technique that will be used in this research is consequence or probability matrix. According to ISO 31000:2009 consequence or probability matrix is a combination of quantitative and semi-qualitative ranking techniques of impact and likelihood. This assessment is performed by experts. Following are the results of the analysis identified in the XYZ Livestock Group's industry:

Table 2. Risk analysis of XYZ livestock group.

| Sub No. | Risk Event                                      | Likelihood | Impact  |
|---------|-------------------------------------------------|------------|---------|
| 1a      | Loss of consumer confidence                     | Low        | High    |
| 1b      | XYZ Livestock Group profit has dropped dramatically | Moderate   | Moderate|
| 1c      | Lost a big profit opportunity                   | Moderate   | High    |
| 2a      | Livestock cannot be sold (dead / sick)          | High       | High    |
| 2b      | Loss of XYZ Livestock Group assets              | Low        | Moderate|
| 2c      | The XYZ Livestock Group office cannot operate   | Low        | Moderate|
| 3a      | Lack of public interest in transacting XYZ Livestock Group | Moderate | Low |
| 3b      | XYZ Livestock Group's profit margin decreased   | Moderate   | Moderate|
| 3c      | Consumers of XYZ Livestock Group are declining  | High       | Moderate|
| 4a      | Losses incurred by XYZ Livestock Group          | Low        | High    |
| 4b      | Hampered business processes XYZ Livestock Group | Moderate   | Low     |
| 5a      | Lost or changed data on the system              | Moderate   | Moderate|
| 5b      | Cessation of the process on the XYZ Livestock Group’s database | Low | High |

Based on the results of the risk analysis in table above, it can be recognized that there are some risks that have a very critical level. Further research can be proceeded on evaluating the identified risks.

3.2.3. Risk evaluation

In the risk evaluation stage, the likelihood and impact of risks will be identified and analyzed based on the results of the risk analysis above. This stage will form an evaluation matrix based on likelihood and impact values. The evaluation matrix can also be referred to as a risk map. An evaluation matrix or risk map is formed based on existing risk analysis parameters. Details of the risk evaluation parameters can be seen in Table 4, while the risk evaluation matrix can be seen in Table 3.
Table 3. Risk map.

| Likelihood | Moderate | Low | High |
|------------|----------|-----|------|
| High       | 3c, 2a, 1c |     |      |
| Moderate   | 3a, 4b, 1b, 3b, 5a |     |      |
| Low        | 2b, 2c, 1a, 4a, 5a |     |      |

Based on the results of the evaluation matrix above, a risk map is obtained, then an evaluation will be carried out as shown in Table 4 below. Possible risks will be sorted from high to low to find out the risk priorities, which are as follows:

Table 4. Risk priority.

| Sub No. | Risk Event                                                                 | Likelihood | Impact | The value of Risk |
|---------|---------------------------------------------------------------------------|------------|--------|-------------------|
| 1c      | Lost a big profit opportunity                                             | Moderate   | High   | High              |
| 2a      | Livestock cannot be sold (dead / sick)                                    | High       | High   | High              |
| 3c      | Consumers of XYZ Livestock Group are declining                            | High       | Moderate | High           |
| 1a      | Loss of consumer confidence                                               | Low        | High   | Moderate          |
| 1b      | XYZ Livestock Group’s profit has dropped dramatically                     | Moderate   | Moderate | Moderate          |
| 3b      | XYZ Livestock Group’s profit margin decreased                             | Moderate   | Moderate | Moderate          |
| 4a      | Losses incurred by XYZ Livestock Group                                   | Low        | High   | Moderate          |
| 5a      | Lost or changed data on the system                                         | Moderate   | Moderate | Moderate          |
| 5b      | Cessation of the process on the XYZ Livestock Group database              | Low        | High   | Moderate          |
| 2b      | Loss of XYZ livestock Group assets                                        | Low        | Moderate | Low              |
| 2c      | The XYZ Livestock Group office cannot operate                             | Low        | Moderate | Low              |
| 3a      | Lack of public interest in transacting XYZ Livestock Group                | Moderate   | Low    | Low               |
| 4b      | Hampered business processes XYZ Livestock Group                           | Moderate   | Low    | Low               |

4. Result and Discussion
The results of the risk evaluation analysis show that there are three highest risks with high evaluation matrix values. It is the risk of losing substantial profit opportunities, livestock cannot be sold (dead/sick), and consumers of XYZ Livestock Group are declining. Furthermore, there are six risks in the moderate risk evaluation matrix and four risks in the low-risk evaluation.

At the risk treatment stage, a proposal or mitigation will be identified in the hope that the mitigation undertaken can minimize the likelihood of such risks arising. Besides, mitigation is also carried out to minimize the impact that occurs.

The risk of losing a significant opportunity caused by legal factors is the existence of regulations from the local government to limit production in the livestock industry. In the event, the risk factor is unavoidable. XYZ Livestock Group can make other products that can be conducted together with raising...
beef cattle and dairy cows. Another product that can be produced is farming with an intercropping system.

The other risk is that livestock cannot be sold (dead / sick) caused by livestock disease threat factors. The completion of the risk involves routinely conducting health checks on beef cattle and dairy cattle belonging to the XYZ Livestock Group, periodic vaccination, and routine cage cleaning. Those are mitigation efforts that can be done to eliminate the source of risk.

Due to the emergence of similar industries, XYZ Livestock Group's consumer has decreased due to certain benefits offered to consumers. In this case, XYZ Livestock Group can reduce its impact by increasing the quality of beef cattle and dairy cattle. Quality improvement can be made by ensuring that raw materials (beef cattle) have superior quality.

The risk of losing consumer trust can be caused by the loss of essential certificates, such as halal certificates. So as to avoid these risks, XYZ Livestock Group can improve quality control of its products. The next risk is that the profits of XYZ Livestock Group dropped dramatically due to government regulations. At this risk, the legal nature of XYZ Livestock Group can do the same thing in point one. Managing risk in the profits of XYZ Livestock Group decreased due to marketing factors, namely the decline in livestock market prices. This risk can be avoided by making new preparations in beef and dairy cattle's initial product, thereby increasing selling prices and profits.

The risk of loss borne by XYZ Livestock Group is due to theft/embezzlement of money/company assets. This risk can be avoided by improving the XYZ Livestock Group's security system and imposing strict sanctions on its employees.

The changed system code causes the risk of data missing or changing on the system on the XYZ Livestock Group database. In this case, the risk can be minimized by backing up data on another storage system to avoid losing or changing data.

The risk of process interruption in the XYZ Livestock Group database is due to the XYZ Livestock Group database overload. This risk can be avoided by increasing the database capacity on the XYZ Livestock Group system.

Risk of loss of assets of XYZ Livestock Group caused by natural disasters or human error. In this case, the risk cannot be avoided, so XYZ Livestock Group must face the risk. However, XYZ Livestock Group can minimize its impact and possibilities by applying for insurance and training.

The risk of the XYZ Livestock Group Office not being able to operate is due to the opposition factor that the community does. The root of the problem of this risk is the existence of river pollution due to XYZ Livestock Group's waste, so that, in avoiding the risk of XYZ Livestock Group, it is necessary to treat the waste before it has flowed into the river. Proper treatment of waste can minimize community opposition.

The next risk is the lack of public interest in the XYZ Livestock Group transaction due to the community's inherent traditional shopping patterns. In dealing with this risk, XYZ Livestock Group needs to disseminate information to the public to switch it to modern transactions. The risk of obstruction in the business process of XYZ Livestock Group is caused by employees who do not comply with SOP. This risk could be handled by providing strict sanctions to its employees.

5. Conclusions and recommendations

5.1. Conclusion

This study successfully identifies risks and create mitigation efforts to reduce the XYZ livestock group's level of risk. By using ISO 31000:2009, this research effectively-identified thirteen risks, which were grouped into three categories. Namely: high risk (red zone), moderate risk (orange zone), low risk (green zone). Red zone risk requires more handling intensity than others. There are three risks in the red zone category: six in the orange zone and four in green categories. This study also succeeded in offering a risk mitigation strategy to reduce the impacts of thirteen identified risks.
5.2. Recommendations
This study succeeded in building a risk map and obtained a proposal to reduce risk at each level. This study's weakness is not calculating the magnitude of the risk costs and not considering the time needed to solve the risk factor. Future studies are suggested to consider with resources are needed to handle the risks, such as money, time, and others.

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