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Cattle Monitoring System: The Innovation to Increase Dairy Farmers Empowerment in Providing Animal Logistics to Anticipate Anthrax Outbreak in Boyolali Regency

[1]Johan Bhimo Sukoco, [2]Luluk Fauziah

[1,2]Universitas Diponegoro
email: [1]johanbhimo@live.undip.ac.id , [2]lulukfauziah@lecturer.undip.ac.id

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Abstract

Boyolali Regency had a very high potential in the production of cow milk. This area dominated as much as 65% of the dairy cow population in Central Java. However, Boyolali Regency farmers found difficulties in avoiding various diseases that attack dairy cattle, such as the anthrax outbreak which became an Extraordinary Event in 2011. Therefore, the government made an innovation as a solution to anticipate the outbreak through the Cattle Monitoring System named in Indonesian as Sistem Monitoring Sapi (which later called SIMAPI as the acronym). This study aimed to describe the innovation of increasing the empowerment of dairy farmers in providing livestock logistics to anticipate an anthrax outbreak in Boyolali Regency based on information technology This study used a qualitative descriptive method. The data collection techniques used interview method, observation, and document analysis. The data validity technique used in this research was triangulation method and interactive analysis model was used as data analysis technique. SIMAPI was an innovation that has been carried out by Boyolali Regency since 2008. This system recorded each dairy cow owned by the farmer, by placing an ear tag on the ear of the cow in the form of a label labeled with a barcode made from atomic plastic. This application could accommodate 7.000 characters of information related to the identity of cows and farmers, to the health condition of the cow. Farmers or buyers can scan the ear tag barcode with the SIMAPI application to find out the health history of the cow. In the future, SIMAPI needs to be developed, considering that there were some data which need to be synchronized with other institutions, such as the Slaughterhouse or in Indonesian called Rumah Pemotongan Hewan (RPH).SIMAPI is a solution in increasing the empowerment of cattle farmers in dealing with anthrax outbreaks in Boyolali Regency. The selling value of cattle has stabilized, and buyers have given trust to cattle farmers again.

Kata Kunci: pemberdayaan, epidemi, e-logistik, sistem informasi manajemen, logistik peternakan

Abstrak

Kabupaten Boyolali memiliki potensi produksi susu sapi yang sangat tinggi. Daerah ini mendominasi sebanyak 65% populasi sapi perah di Jawa Tengah. Namun demikian, peternak di Kabupaten Boyolali mengalami kesulitan dalam menghindari berbagai penyakit yang menyerang sapi perah, seperti wabah antraks yang menjadi Kejadian Luar Biasa pada tahun 2011. Oleh karena itu, pemerintah membuat suatu inovasi sebagai solusi untuk mengantisipasi wabah tersebut melalui Sistem Monitoring Sapi (SIMAPI). Penelitian ini bertujuan untuk mendeskripsikan inovasi peningkatan keberdayaan peternak sapi perah dalam penyediaan logistik peternakan untuk mengantisipasi wabah antraks di Kabupaten Boyolali berbasis teknologi informasi. Penelitian ini menggunakan metode deskriptif kualitatif. Teknik pengumpulan data menggunakan metode wawancara, observasi, dan analisis dokumen. Teknik validitas data yang digunakan dalam penelitian ini adalah triangulasi metode dan teknik analisis data menggunakan model analisis interaktif. SIMAPI merupakan inovasi yang dilakukan oleh Kabupaten Boyolali sejak tahun 2008. Sistem ini mencatat setiap sapi perah yang dimiliki oleh peternak, dengan cara menempelkan "ear tag" pada telinga sapi berupa label berlabel barcode yang dibuat dari plastik atom. Aplikasi ini mampu menampung 7.000 karakter informasi terkait identitas sapi dan peternak, hingga kondisi kesehatan sapi. Petani atau pembeli dapat memindai barcode "ear tag" dengan aplikasi SIMAPI untuk mengetahui riwayat kesehatan sapi. Kedepannya, SIMAPI perlu dikembangkan, mengingat ada beberapa data yang perlu disinkronkan dengan instansi lain, seperti Rumah Potong Hewan (RPH). SIMAPI merupakan solusi dalam meningkatkan keberdayaan peternak sapi dalam menangani wabah antraks di Kabupaten Boyolali. Nilai jual sapi sudah stabil, dan pembeli kembali memberikan kepercayaan kepada peternak sapi.

1. INTRODUCTION

Boyolali Regency has a very high potential in the production of cow's milk, which dominates as much as 65% of the dairy cow population in Central Java. In fact, in 2016, Boyolali Regency controlled 20% of the national milk needs and 72% of the milk needs in Central Java. Boyolali Regency has 5 (five) districts which are the centers for dairy farming, namely: Musuk District, Ampel District, Cepogo District, Mojosongo District, and Boyolali City. Boyolali Regency has begun to rise from its downturn due to the anthrax outbreak which became an Extraordinary Event in 2011. Anthrax is an infectious disease in animals which usually attacks various types of livestock such as cows, sheep, goats, horses, pigs, and so on. Anthrax can also attack humans or it is said to be zoonosis and cause death (Soeharsono, 2002).

The anthrax began to become epidemic in 1990 in Boyolali District, exactly in Ampel and Teras Districts. The types of anthrax in that year are *cutaneous* and *intestinal*. This outbreak was repeated in 2009, where 2 (two) cases of livestock infected with anthrax were reported in Musuk and Selo Districts. In 2011, 16 similar cases were found in Tangkisan Hamlet, Karangmojo Village, Klego District, Boyolali Regency. Therefore, this case was designated an Extraordinary Event. It is based on the criteria for determining outbreaks in which this area has infectious diseases that previously did not exist. The following table is the distribution of cases according to age groups in Extraordinary Events of skin anthrax in Tangkisan Hamlet, Karangmojo Village, Klego District, Boyolali Regency in 2011 (Fahdhienie, 2012).

Table 1. The Distribution of Cases Based on Age Group in Extraordinary Events of Skin Anthrax at Tangkisan Hamlet Karangmojo Village, Klego District, Boyolali Regency in 2011

Age Group (Years)	Total Population	Total Case	AR (%)
≤ 10	2	2	100
11 - 30	3	-	-
31 - 50	46	4	8,7
51 - 60	16	1	6,25
≥ 61	22	9	40,9
Total	89	16	

According to this case, Boyolali Regency was designated as an anthrax endemic area. The super high livestock traffic in this area is a risk factor for anthrax transmission. In fact, Boyolali Regency has a very large cattle population potential, which as many as 92.000 dairy cows and 96.000 beef cows. The local government immediately anticipated this case in various ways, which one of the ways was collecting data on cows and farmers through the Cattle Monitoring System (SIMAPI) application.

The SIMAPI application was launched in 2018. This system was developed collaboratively between the Department of Animal Husbandry and Fisheries and the Department of Communication and Information Technology of Boyolali Regency. SIMAPI is able to accommodate 7.000 characters of information related to the identity of cows, farmers, to medical history and vaccines that have been given to livestock. This system records the cattle through the installation of ear tagon the ear of the cow in the form of a label labeled with an atomic plastic barcode. Farmers or potential buyers of livestock can scan the ear tag barcode to obtain a health history of cows and so on.

The previous research related to the thematic logistics of livestock had been carried out by other researchers (L.V. Holdova, et al. 2019, Santoso, et al. 2013, and Winarso, 2001). L.V. Holdova, et. al. (2019) examined the effect of age on the productivity and reproductive quality of dairy cows through their research. The results of the research indicated that it was necessary to develop livestock stocks to improve the quality and productivity of dairy cows' milk. Santoso, et al. (2013) examined the potential for developing a dairy farming business using the agribusiness paradigm. On the other hand, Winarso (2001), through his research regarding the role of land transportation facilities in increasing the efficiency of distribution of livestock and beef cattle products in Indonesia, found the fact that the use of livestock logistics transportation facilities had not been maximally implemented even though it had a potential to be developed. Some of these studies are very useful as references in assessing cattle farming. However, there are not many studies that focus on studying cattle farming related to the innovations in increasing the empowerment of dairy farmers in providing livestock logistics to anticipate the information technology-based of anthrax outbreaks. This research was focusedon examining this topic more.

2. METHODS

This research was a qualitative descriptive study. Travers (Sevilla, et al., 1993) stated that the descriptive method was used to describe the nature or situation that occurred at the time of the research, as well as to examine the causes of these symptoms happened. Furthermore, Slamet (2006) stated that the qualitative research was a research that has the aim of providing a description of the social symptoms under the study by describing these social symptoms based on the indicators that are used as the basis for the symptoms under study are exist or not. The qualitative descriptive research method in this research was used to describe the innovation of increasing the empowerment of dairy farmers in providing livestock logistics to anticipate the anthrax outbreak in Boyolali Regency based on information technology.

This research focused on Boyolali Regency. This location was selected based on the fact that Boyolali Regency is the largest producer of cow's milk in Central Java. Boyolali Regency controlled 20% of the national milk needs, and 72% of the milk needs in Central Java in 2016. The object of this research was an individual, with sampling using purposive sampling method. This technique was chosen by considering the competence of the informants (Sugiyono, 2009). In this study, informants were selected

by considering their competency in managing the application of the Cattle Monitoring System (SIMAPI) in Boyolali Regency, including: Staff of Boyolali RegencyAnimal Husbandry and Fisheries Department, Communication and Information Technology Department, and the cattle farmer community in Boyolali Regency.

The primary and secondary data were used in this study. Sugiyono (2009) stated that primary data is a data source that provides data to data collectors directly, while secondary data is the opposite, namely a data source that indirectly provides data to data collectors. The primary data in this study were sourced from key informants, while secondary data came from documents, archives, literature, and library materials.

Data collection techniques in this study used interviews, observation and document analysis. Unstructured interviews were chosen in this study in order to explore the answers of the informant further. Observation in this research used unstructured observation and participant observation. Sutopo (2002) stated that observation was used to extract data from an event source, place or location, as well as image recordings. Participant observation was carried out by the involvement of the researcher in the daily activities of the informants, while unstructured observation was carried out by referring to the observation signs in this research, which were related to information technology-based community empowerment. The document study was a complement to the observation and interview methods (Sugiyono, 2009).

The validity of this study used triangulation technique by comparing the results of interviews with the results of observations, and document analysis. The same or similar data would be more valid and verified if examined from several different methods (Sutopo, 2002). The data analysis technique in this study used an interactive analysis model, as stated by Milles & Hubberman (Sutopo, 2002), that interactive analysis is carried out by paying attention to 3 (three) main components, namely: data reduction, data presentation, and drawing conclusions and verification. Data from interviews, observations, and document analysis were reduced and selected which ones can be used further, and the datawere presented in the form of descriptive sentences, tables, or figures. The researcher drew conclusions from the arranged data presentation, afterwards verified it during the research so that it could be accounted for. This study used an interactive analysis model both between the main components and during the data collection process in the form of a cycle. If the data collection was deemed insufficient, the researcher conducted data collection that was focused on finding supporting data for conclusions and deepening data. The following cycle was an interactive analysis model in this study (Sutopo, 2002).

3. RESULT AND DISCUSSION

Cattle Monitoring System (SIMAPI) is a dairy cow data recording application developed as an innovation in Boyolali Regency. This system was developed by the Department of Animal Husbandry and Fisheries in collaboration with the Boyolali Regency Communication and Information Department. SIMAPI was first launched in 2018. The farmer's cows are labeled

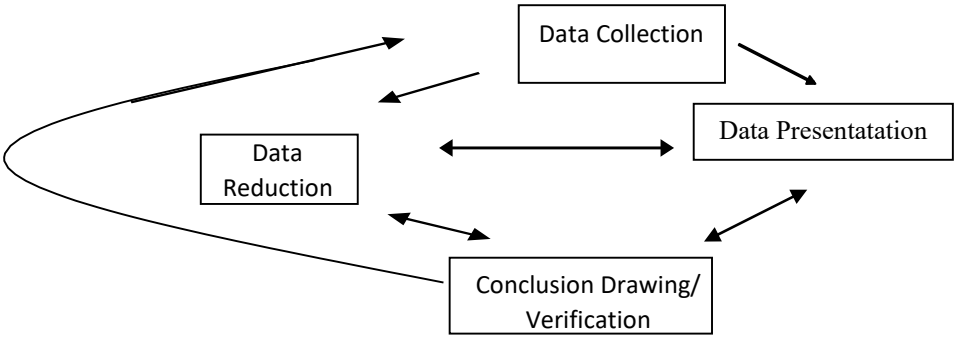

Figure 1. Interactive Analysis Model

Source: Sutopo, 2002

with a barcode on their ear, which is called an *ear tag*. Furthermore, SIMAPI application will scan the barcode to find out the identity and health history of the cattle, starting from diseases that have been suffered, vaccines that have been given, and so on. SIMAPI application contains data including the farmer's name, address, the number of cows owned, the sex of the cattle owned, the age of the cow, the weight of the cow, and other identities. SIMAPI is one of the efforts of Boyolali Regency Government towards "*Boyolali Smart City*". It was intended that the dairy farming center in Boyolali Regency could be developed continously and be optimal in developing its potential.

SIMAPI is the embodiment of a management information system. O'Brien (Rusdiana and Irfan, 2014) stated that the management information system is an integrated combination of people, hardware, communication, network and data resources which collects, transforms, and disseminates information in an organization. In line with this, Sutabri (2005) stated that a management information system is designed to provide information.

Jogiyanto (2010) wrote that management information systems are needed in the data processing cycle, where there are 3 (three) components, including: input components, model components, and output components. Moreover, Leitch and Davis (Wahana and Riswaya, 2013) stated that the existing system in an organization unites the daily, operational and managerial transaction processing needs which providing external parties with the necessary reports. J.F. Andry and J. Loisa (2019) wrote that "Information System Logistic Management (ISLM) is a valuable technology that companies use to evaluate the efficiency of their company's operations ...".

The Cattle Monitoring System (SIMAPI) was carried out by collecting data on cattle cows in Boyolali Regency through the installation of ear tag. The ear tag was a label attached to a cow's ear which was made from atomic plastic. At the beginning of the system development, the Animal Husbandry and Fisheries Department focused more on placing this label on dairy cows and female cows. This application could accommodate 7.000 characters of information related to the condition of cattle, as well as the identity of the farmers. The ear tag barcode label which attached to the cow's ear was simply scanned using the SIMAPI application to obtain a record of the cattle condition. The barcode image on SIMAPI could be seen in Figure 1.

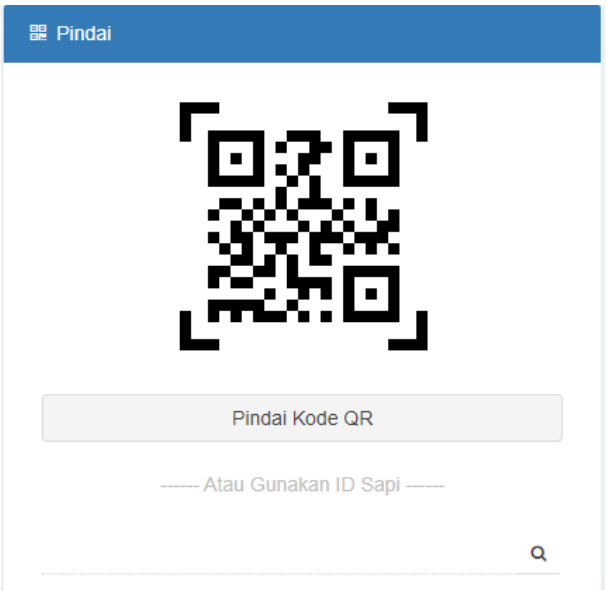

Figure 1. Barcode

SIMAPI was targeted to collect data up to 5.000 cows in Boyolali Regency. Based on the research results, Boyolali Regency Animal Husbandry and Fisheries Department was able to input data as many as 2.888 cows in 2018. The data collection in this first stage was carried out in Sukorejo Village and Karaanganyar Village (Musuk District), and Singosasi Village (Mojosongo District). Furthermore, the Animal Husbandry and Fisheries Department set a target of 5.000 head of cattle recorded in Boyolali Regency in 2019.

The barcode in Figure 1 could be accessed through SIMAPI application via Android. In addition, barcodes could be accessed through the SIMAPI website as well, at: *www.simapi.Boyolali.go.id*. Users could easily access the barcode to get the identity of the cattle and farmers, as well as the history of the cattle health. Users could simply scan the barcode attached to the ear tag labeled on the cattle's ear. The following pictures could be seen in Figure 2 which showed the farmer was scanning the barcode attached to the cattle's ear (Source: *Fokus Jateng*, 2019):

Figure 2. a) The farmer showing SIMAPI application; b) The farmer scanned the ear tag barcode attached to the cattle's ear.

SIMAPI is expected to integrate the data of cattle in Boyolali Regency. Data relating to the health history of cettle, reproduction, production, feed, and so on are data that needed to be input and displayed in this application. This smart application is expected to be able to provide access to information related to cattle properly. The data recorded in this system included: name of livestock owner, owner's address, the data of cows owned including information related to when cows are mated, when artificial insemination is necessary, and when for pregnancy checks. These data are integrated to facilitate livestock traffic in Boyolali Regency.

SIMAPI is a manifestation of a management information system in the application of Supply Chain Management (SCM). Hariyanto (2016) stated that this management information system provides great benefits for management due to considering the data presented in an integrated manner can contain information on the management of raw material supply, producers, supplier data, retailers, and the final consumers. In addition, Gie (Prasojo and Prasetyo) wrote that the management information system is the determination of the information relationship within the organization, starting from data collection, data processing up to distribution of information used in decision making.

Cattle Monitoring System (SIMAPI) can be free accessed by anyone through its website at: *www.simapi.Boyolali.go.id*. SIMAPI is a description of the data management information system for dairy cows in Boyolali Regency. The officers from Boyolali Regency Animal Husbandry and Fisheries Department can easily access and input cow-related data in this application. Each officer is given an access code for data input including when inputting data related to other actions which is also related to cattle farming, such as inspection, medication, vaccine administration, and so forth. The appearance of the SIMAPI application which can be accessed through the website (Source: *www.simapi.Boyolali.go.id*) can be seen as the Figure 3 below.

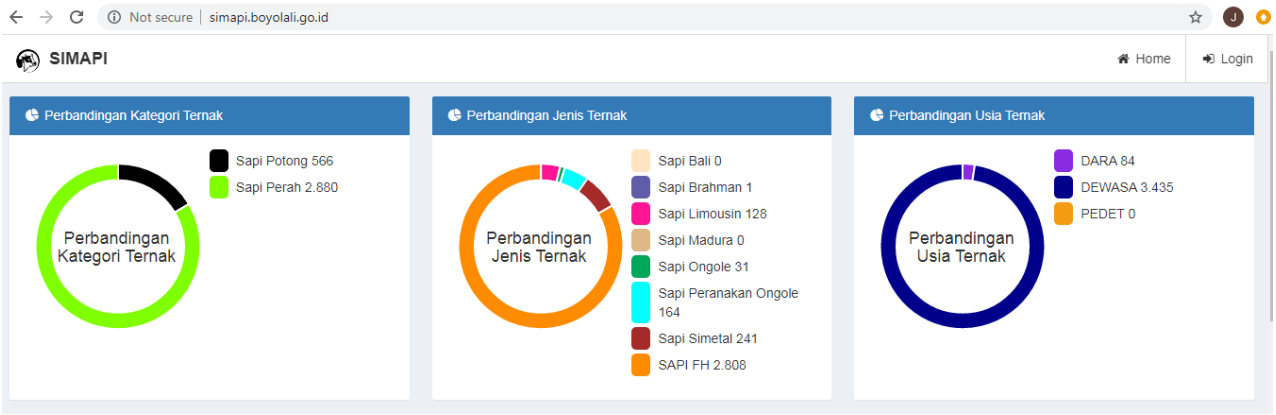

Figure 3. SIMAPI website

SIMAPI can be a reference for dairy farmers in Boyolali Regency. Boyolali Regency Animal Husbandry and Fisheries Department hopes that cattle farmers can make the best use of SIMAPI. This system will not be successful without the participation of the community (in this case, cattle farmers) in providing information and registering their cattle. SIMAPI is an innovation to increase the empowerment of dairy farmers in providing livestock logistics to anticipate an anthrax outbreak based on information technology. So, this system was developed in order to empower the farmer community in Boyolali Regency. Sumodiningrat (2007) stated that empowerment is an effort to increase community independence and ability. This can be done by creating conditions in which society can thrive. Furthermore, Alsop, et al. (2006) stated that empowerment is the capacity of groups or individuals to make effective choices those are making choices and then changing those choices into desired actions.

Farmers are expected to be well-cooperate in reporting the health history of their livestock. This is important to avoid the anthrax outbreak that occurred several years earlier in Boyolali Regency. Dutta TK (2011), described anthrax as a disease of acute infection caused by the bacterium *Bacillus Anthracis*. Anthrax is a type of zoonotic disease and it often attacks livestock. Several cases of anthrax outbreaks have occurred in Indonesia. Boyolali Regency is one of the endemic areas that have risks related to this anthrax. The distribution areas of anthrax in Indonesia is as below (Pudjiatmoko, 2017):

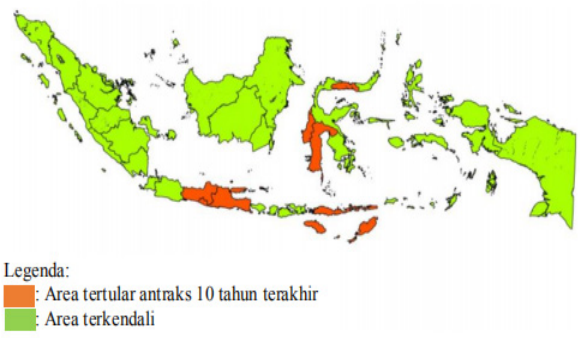

Figure 4. Distribution Map of Anthrax Cases in Indonesia, in the Period 2008-2017

SIMAPI can act as an innovation to increase the empowerment of dairy farmers in providing livestock logistics to anticipate anthrax outbreaks through information technology-based. The World Bank (Narayan, ed, 2002) stated that Empowerment is the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives. In addition, Payne (Masrukin, et al., 2016: 57) explained that Empowerment is to help clients gain power of decision and action over their own lives by reducing the effect of social or personal blocks to exercising existing power, by increasing capacity and self confidence to use power and by transferring power from the environment to clients.

SIMAPI application was designed to be used as a reporting tool if livestock need health assistance from the animal health team. Furthermore, farmers can report the need for medicine and can consult related to their cattle. The health team did not charge any fees for the consultation and medicine.

In connection with the prevention of anthrax and other diseases, Boyolali Regency Animal Husbandry and Fisheries Department took the blood sampling for cattle regularly. The officers also provided vitamins to maintain health and increase cows' stamina. This was aimed to determine whether the cow was infected with anthrax or other diseases such as *brucellios* and other infectious diseases in livestock. It was feared that livestock disease outbreaks would spread to other cattle, or even to human being. The results showed that if the officer found a case of a cow positive for anthrax, *brucellios*, or other infectious diseases, the officer would do forced slaughter for the cow, afterwards they replaced it with the social assistance fund. The Animal Husbandry and Fisheries Department of Boyolali Regency guarantees that the sampling and provision of vitamins for cattle are free and free of charge.

The anthrax outbreak that occurred in 2011 showed the shortest incubation period was 1 (one) day and the longest was 5 (five) days. The type of endemic curve was common sources, where there was only 1 (one) source of transmission and it can be seen in the Figure 5 (Fahdhienie, 2012):

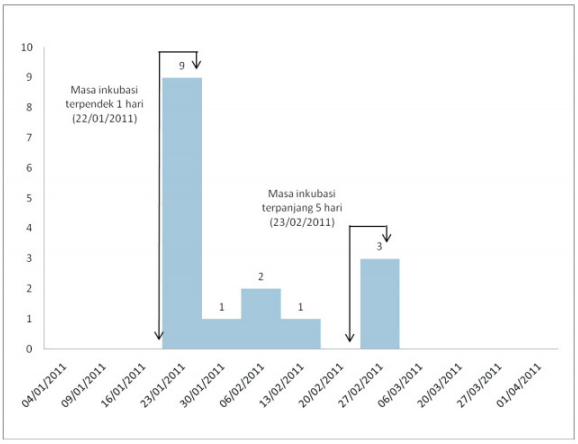

Figure 5. Epidemic Curve in Extraordinary Case Skin Anthrax Outbreak in Tangkisan Hamlet, Karangmojo Village, Klego District, Boyolali Regency in 2011

The principles of empowerment can be seen in the implementation of SIMAPI application where farmer participation will determine the success of the program. Bernard Crick (Azizy, 2003), mentioned that empowerment as an effort to empower people to actively participate in the decision-making process or public policy. This participation is a prerequisite for realizing a democratic life. Furthermore, Robert Chambers (Alfitri, 2011) stated that community empowerment is a concept of economic development that summarizes social values which are people centered, participatory, empowering, and sustainable. In line with this, Swift and Levin (Mardikanto, 2010) stated that community empowerment refers to the ability of people, especially vulnerable groups to have access to productive sources that enable them to increase their income, and actively participate in development and various decisions that affects them.

Wrihatnolo and Dwijowidjoto (2007) stated that there are 4 (four) dimensions of community empowerment, those are the dimensions of society as the development subjects (aspects: participatory, decentralization, democracy, transparency, accountability), dimensions of community institutional strengthening (aspects: institutional formation and strengthening, training for managers and communities, decentralization to community institutions, and participation of community institutions), dimensions of capacity and support of the government (aspects: capacity of government in facilitating, capacity of government in supporting and providing assistance), and dimensions of poverty reduction efforts (aspects: poverty mapping, suitability proposals with the requirements, coverage program, and accuracy in providing funds and management capacity).

The Animal Husbandry and Fisheries Department of Boyolali Regency hoped that through the SIMAPI application, cattle farmers can have good access to information regarding government programs related to dairy farming, such as mass treatment programs for dairy cows, giving vaccines, and so forth. Moreover, the data entered in SIMAPI is planned to be well integrated with the Animal Health Center in Boyolali Regency. This study found that there were 5 (five) Animal Health Center in Boyolali Regency, which were located in Karanggede, Simo, Ampel, Ngemplak, and Mojosongo Districts.

Hariyanto (2016) stated that management information systems have several benefits, such as providing guarantee of the availability of quality and expertise in the use of information systems, increasing the accessibility to data accurately, on time, and not requiring an information system intermediary, as well as identifying needs related to the support expertise of information system, and the development of an effective planning process.

Jogiyanto (2010) stated that information systems have the task of carrying out data processing cycle. This cycle has a component in carrying out the data processing life cycle (also called the information life cycle). There are 3 (three) components including: input components, model components, and output components. It can be seen in the Figure 6 below (Source: Jogiyanto, 2010):

Figure 6. Data Processing Cycle

Kristanto (2007) stated that the data processing provides an overview of the process of changing data into information, where methods and operations are carried out including: the data input, the transformation data (calculating, summarizing, classifying), and the data output (displaying results, reproducing, telecommunicating). In line with this, Rusdiana and Irfan (2014) stated that data processing is formed from the transformation process into information including: capturing, verifying, classifying, sorting, summarizing, calculating, storing, retrieving, reproducing, and communicating.

The Cattle Monitoring System (SIMAPI) can describe the comparison of livestock categories. Data collection up to 2020 showed the number of beef cattle is 566 heads, while dairy cows are 2.880 heads. This data showed that the quantity of dairy cows is higher than that the beef cattle in Boyolali Regency. It is not surprising if Boyolali Regency is dubbed as the City of Milk where the production of dairy cow's milk is the potential commodity in this area.

SIMAPI application is able to display the comparison of types of cattle in Boyolali Regency. This application records up to 2020 showed that there is no Bali Cows and Madura Cows (none), 1 *Brahman Cows*, 128 *Limousin Cows*, 31 *Ongole Cows*, 164 *Crossbreed Ongole Cows*, 241 *Simetal Cows*, and 2.808 *FH cows*. Based on this data, it can be seen that *Bali Cows* and *Madura Cows* are not available in Boyolali Regency. On the other hand, FH Cattle is the type of cow with the highest quantity in Boyolali Regency.

Not only description of the comparison of livestock categories and the comparison of the types of cattle, SIMAPI is also able to display the ratio of livestock ages. The age of the cattle is categorized into 3 (three) types, namely: heifers, adult cows, and calves. Recorded until 2020, there were 84 heifer cows, 3.435 adult cows, and 0 calves (none). Based on SIMAPI data, it can be seen that the largest quantity of livestock aged is adult cows. Calves have not been inputted because the Animal Husbandry and Fisheries Department of Boyolali Regency focused on collecting data on dairy and female cows on the aged of heifers and adult cows. The following Figure 7 is a display of the SIMAPI application which can be seen on the website (Source: *www.simapi.Boyolali.go.id*)

SIMAPI also displayed a Data Table related to the quantity of farmers and the number of cattle owned. The largest number of cattle farmers in Boyolali Regency was dominated by Musuk District, which there were 407 people. This quantity was followed by Mojosongo District with 260 people, and Ampel District with 165 people. On the other hand, the lowest quantity was in Wonosegoro District, Kemusu District and Juwangi District, where each of these areas had only 1 (one) farmer data. Regarding from this data, it could be said that the data input made by officers was not evenly distributed across regions, where the three regions dit not have the optimal data input yet.

Furthermore, Musuk District dominates the largest quantity of cattle, which is 1.183 heads. This quantity was followed by Mojosongo District with 1.006 heads, and Ampel District with 442 heads. SIMAPI data showed that only 1 (one) quantity of cattle in Wonosegoro District, while in Juwangi District, Kemusu District and Karanggede District, the system has not been recorded. It can be seen in the following Table 2 (Source: *www.simapi.Boyolali.go.id*).

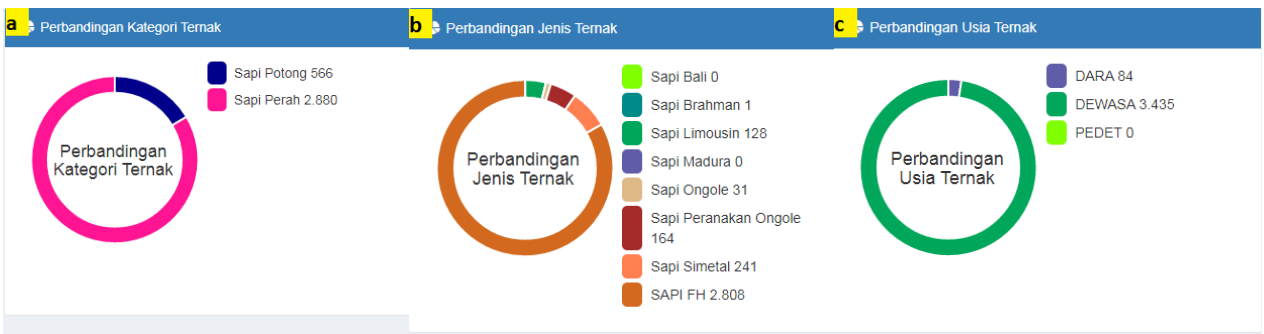

Figure 7. SIMAPI Subs. a) Sub Comparison of Animal Categories, b) Sub Comparison of Animal Types, c) Sub Comparison of Animal Age

Table 2. Quantities of Farmers and Livestock in Boyolali District

District	Farmers	Cattle
Selo	21	42
Ampel	165	442
Cepogo	111	281
Musuk	407	1.183
Boyolali	49	122
Mojosongo	260	1.006
Teras	25	58
Sawit	7	12
Banyudono	24	37
Sambi	75	118
Ngemplak	21	30
Nogosari	21	25
Simo	32	50
Karanggede	10	0
Klego	36	50
Andong	39	50
Kemusu	1	0
Wonosegoro	1	1
Juwangi	1	0
Total	1.306	3.507

The research results showed that although the Table 1 is also displayed on SIMAPI website, the quantity of data displayed in Table 1 is different from the data presented in SIMAPI application, especially in the data related to the number of livestock and the number of farmers. It can be seen in the Figure 8 as follows:

Figure 6 showed the unsynchronization data. This can be seen in the quantity in Table 1, where the number of farmers is 1.306 people, while the application display showed the number of farmers is 1.310 people. So, there is a difference of 4 (four) farmers from the data regarding the number of farmers. Also, it revealed with the data related to livestock quantity, where the quantity of livestock as shown in Table 1 is 3.507 heads, while the application display shows the number of livestock is 3.519 heads. There is a difference of 12 cows shown. The author described this unsynchronization data through the marked column in the red box and compared it to the Data Table before the arrow. Ideally, there will be improvements related to the application data processing in the future.

The results showed that SIMAPI application encountered fundamental problems in the data input. This is related to the decreasing quantity of dairy cows in Boyolali Regency, so that the input target for dairy cows through the SIMAPI application cannot be met. This is recognized by the Animal Husbandry and Fisheries Department of Boyolali Regency and the local government finally expanded the coverage of the data collection area to meet the annual the data input target. Banyanyar Village, Ampel District was chosen as the pilot project for this SIMAPI data collection. The government was targeting 2.500 cows in these villages to have ear tag barcode labels made of atomic plastic material, which become part of the SIMAPI application marking. However, the results showed that the target of 2.500 cows which were planned to be recorded,

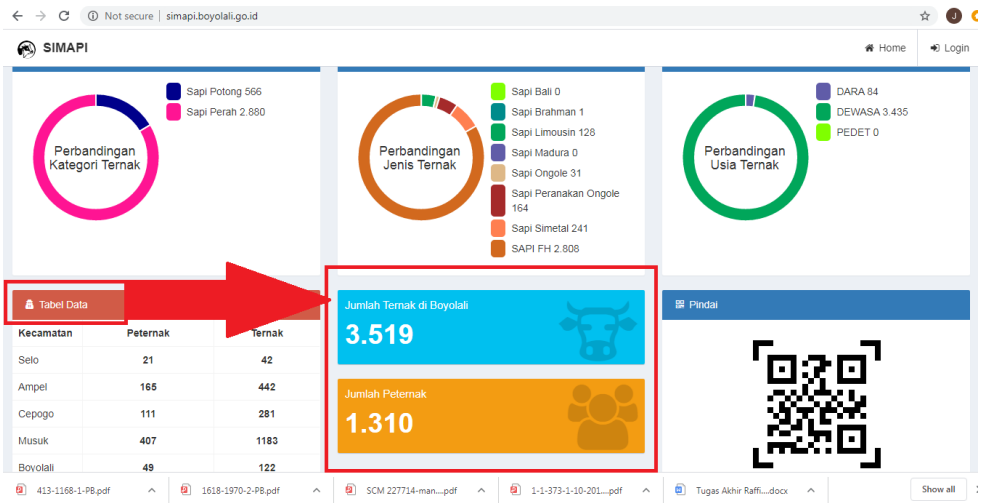

Figure 8. Unsynchronization Data

there were only about 500 cows barcoded. The local government had searched for dairy cows to be recorded, but it turned out that the conditions in the field showed the run out quantity (*Jawa Pos - Radar Solo*, 2018).

The results showed that the population of dairy cows in Boyolali has drastically decreased. This impacted the miss of the target set by the government regarding cattle data collection in Boyolali Regency. The real field condition indicated that many dairy farmers have switched to fattening beef cattle. The research results showed that in the recent years there has been a phenomenon of increasing the dairy cow farmers who are more interested in fattening beef cattle compared to increasing the productivity of dairy cows. Many farmers buy beef calves to raise and resale it. The field condition showed that the quantity of dairy farmers has begun to decline in Boyolali, where this has an impact on data input in SIMAPI application.

The phenomenon of the large number of dairy farmers in Boyolali Regency who has started to switch jobs become beef cattle farmers has spread in various districts. One of them is in Dungus Hamlet, Seboto Village, Ampel District. This condition is caused by the high cost of feed where the operational costs are not well-compared to the low selling price of cow's milk. The results showed that the cost of feed for dairy cows per day was IDR 30.000 per head. On the other hand, the production of cow's milk per day reaches 8 liters per head, so if cow's milk is sold at a market price of IDR 4.000 per liter, it will sell for IDR 32.000 per day. From this calculation, it can be seen that there is very thin difference, but it does not include the operational costs of labor and so on (*Okezone*, 2016).

Mandaka and Hutagaol (2005) stated that the problems that often occur in dairy farming are divided into 3 (three) sectors, namely: upstream, middle and downstream. The problems in the upstream sector are including: the high cost of animal feed, low productivity, insufficient available dairy cow seeds, small ownership scale, and low quality of human resources (HR) farmers. Moreover, in the middle sector, problems that often arise include: decreased land availability for feed production, low cultivation techniques, low business capital from banks, conversion of agricultural land to non-agricultural, and unintegrated cross-sector cooperation. On the other hand, problems in the downstream sector usually include: the unstable selling price of calves up to the low price of cow's milk.

Ideally, the problem related to the data input of SIMAPI can be predicted by the Animal Husbandry and Fisheries Department of Boyolali Regency. This can be seen in the conditions of the last few years, starting from 2007 where the phenomenon of the decreasing of dairy cow population in Boyolali Regency starting to appear. The Association of Indonesian Milk Cooperatives in Central Java noted that there was a significant decrease in milk production in Boyolali Regency in 2007. If the production of cow's milk was normally up to 90.000 liters per day, then there was a decrease of 80.000 liters per day in 2007. This condition was due to the long dry season which impacted the availability of food and clean water (*Tempo*, 2007).

Moreover, the supply ability of cow's milk in Boyolali Regency showed that it is still far from fulfilling the needs. This condition can be seen from the total dairy cow population of 88.695 dairy cows which only have the ability to supply milk of 100.000 liters to 120.000 liters per day, while the need for milk reaches 252.000 liters per day. Therefore, there is a lack of cow's milk supply of 132.000 liters to 152.000 liters per day. Starting from this data, it can be analyzed that in order to meet the milk needs of these dairy cows, Boyolali Regency still requires the additional 10.000 to 15.000 dairy cows. Solopos (2015) wrote that the lack of ability to supply milk for dairy cows is due to the rest 50% population of dairy cows in Boyolali or around 12.417 heads of the productive female population of 24.835 heads.

Sulistiyono (2008) mentioned that domestic cow milk production is still very dependent on dairy farming which is around 110.000 farmers. The daily average production of dairy cow's milk is 1.185 tons of cow's milk which is marketed to the cow's milk processing industry through cooperatives. Unfortunately, this production has not been able to meet the demands of domestic consumers. This is because the changes of the consumption of cow's milk are relatively increasing faster than its production.

In connection with the miss of the target data input of SIMAPI targeted by the government, it is because the target set by the government is not adjusted to the real conditions in the field. The initial target for data input was 5.000 cows which was planned to be fulfilled in Banyunyar Village (Ampel District) and Singosari Village (Mojosongo District) and it could not be fulfilled due to the quantity of cattle that did not match the target of data input. Therefore, finally the local government finally expanded the target area to other villages in Mojosongo District in 2018 through the Animal Husbandry and Fisheries Department of Boyolali Regency.

The Boyolali Regency Government continues to improve SIMAPI application, in order to make it easier for the public to see an overview of the condition of cows in Boyolali Regency. Information related to the health history of cows, history of cattle reproduction, intake of livestock drugs, data on vaccines that have been given as well as the drug doses given to cattle are very well presented in SIMAPI application. It is hoped that SIMAPI application can watch out the presence of cows in Boyolali Regency.

In the future, SIMAPI application will not only reach dairy cows, but also beef cattle. This is because Boyolali Regency has begun to explore the fulfillment of beef needs in Central Java. There are several districts in Central Java that require cow fulfillment in Boyolali Regency, including: Semarang Regency, Semarang City, and Kudus Regency. SIMAPI application will also be integrated with the Slaughterhouse in Boyolali Regency. It is hoped that the beef cattle sold in Boyolali Regency can be guaranteed their health, as well as avoid various diseases such as anthrax and so on. Cows that have been registered in SIMAPI can be controlled their medical history, history of vaccines that have been given, and other identities, so that it is hoped that they will be able to maintain the validity of data and information related to cattle in Boyolali Regency. This is important to avoid data manipulation by irresponsible individuals. Furthermore, this is important to maintain the good image of Boyolali Regency.

SIMAPI can be said to be successful or not depends on the its supporting components. Sutabri (2005) stated that there are 5 (five) physical components in a management information system, namely: software, hardware, databases, procedures, and personnel. The success of SIMAPI is very much dependent on the success of these components. SIMAPI was developed by the Animal Husbandry and Fisheries Service Department of Boyolali Regency in collaboration with Semarang State Polytechnic (*Polines*). This college integrates SIMAPI with the Dairy Ox Information System (*Si - Lemper*). The SI - Lemper application is an application made by Polines academics which was implemented in Boyolali Regency as a form of community service program in 2018. Through the integration of this application, it is hoped that it will make it easier to collect livestock data, with the android database. Similar to SIMAPI, data input of Si-Lemper is carried out via Android-based cellular phone (*Suara Merdeka*, 2018).

The integration of SIMAPI and Si-Lemper is a form of system development to a wider system. This is a *supra system* as stated by Rusdiana and Irfan (2014), namely a system that has a broader relationship than a system. Like SIMAPI, this system is part of another system, such as Si-Lemper, so its integration is very important. This is important in system development, so that collaboration is needed between the Animal Husbandry and Fisheries Service Department of Boyolali Regency, the Communication and Information Department, and the universities such as the Semarang State Polytechnic (Polines) as well as other universities.

SIMAPI needs to be strengthened as an innovation to increase the empowerment of dairy farmers in providing livestock logistics to anticipate anthrax outbreaks by information technology-based. Wrihatlono and Dwidjowijoto (2007) stated that community empowerment is the elements that enable people to survive and be dynamic in self-development and progress. Furthermore, Perkins and Zimmerman (1995) stated that empowerment refer to "empowered outcome" or defined as empowerment results/ outputs as follows: Empowered outcomes refer to operationalization of empowerment that allow us to study the consequences of empowering processes. Empowered outcomes of individuals might include situation-specific perceived control and resource mobilization skills.

4. CONCLUSION

Based on the research results, it can be concluded that the Cattle Monitoring System (SIMAPI) is still constrained by the data input, where the target data input is greater than the real conditions in the field. This condition is due to the phenomenon of the increasing number of dairy farmers who have switched to become beef cattle farmers and the calves raising farmer. Ideally, the local government through the Animal Husbandry and Fisheries Department of Boyolali Regency needs to implemet forecasting related to this phenomenon, considering that this phenomenon has occurred since 2007 while SIMAPI was launched in 2018. Another problem is the unsynchronized data between input and output data displayed. This data unsynchronization can be seen from the quantity of the number of farmer data and the number of livestock that is different from the data table shown.

In the future, SIMAPI application needs to be better developed, especially in data synchronization. Furthermore, it is necessary to integrate with the Slaughterhouse, the Animal Health Center, and other applications such as the Dairy Ox Information System (*Si-Lemper*) as well as other applications. SIMAPI also needs to be strengthened as an innovation to increase the empowerment of dairy farmers in providing livestock logistics to anticipate anthrax outbreaks by information technology-based.

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REFERENSI

Alfitri. (2011). *Community Development: Teori dan Aplikasi*. Yogyakarta: Pustaka Pelajar.

Alsop, Ruth; Mette Frost Bertelsen; and Jeremy Holland. (2006). *Empowerment in Practice – From Analysis to Implementation.* Washington, DC: The World Bank.

Azizy, Ahmad Qodri A. (2003). *Pemberdayaan Masyarakat dalam Pengembangan Kehidupan Berdemokrasi di Indonesia*. Jakarta: Lembaga Executive Club (LEC) Press.

Dutta TK, Sujatha S, Sahoo RK. (2011). Anthrax Update on Diagnosis and Management. *JAPI*. 2011; 59(1), 573-8.

Fahdhienie, Farrah; Desi Ari Apsari, and Anggun Pramita Djati. (2012). Kejadian Luar Biasa Antraks di Kabupaten Boyolali 2011. *BALABA*. Volume 8 Nomor 02, Desember 2012 : 41-44.

Fokus Jateng. (2019). Program Aplikasi Sistem Monitoring Sapi Pemkab Boyolali Ditarget 5.000 ekor. [online] Avaliable at : *https://www.fokusjateng.com/2019/02/09/program-aplikasi-sistem-monitoring-sapi-pemkab-boyolali-ditarget-5-000-ekor/,* [Accessed 9 March, 2020].

Hariyanto, Slamet. (2016) *Sistem Informasi Manajemen.* Tulungagung: Universitas Tulungagung.

JF. Andry and J. Loisa. (2019). Information Systems of Logistic Management: A Case Study. *Journal of Physics: Conference Series*, 1280 (2019) 042052.

Jawa Pos - Radar Solo. (2018). Populasi Hambat Barcode Sapi. [online] *Available at : https://radarsolo.jawapos.com/read/2018/10/26/100481/populasi-hambat-barcode-sapi, [Accessed 9 March, 2020].*

Jogiyanto. (2010). *Sistem Informasi Manajemen.* Tangerang : Universitas Terbuka.

Kristanto, Andri. (2007). *Perencanaan Sistem Informasi dan Aplikasinya*. Yogyakarta : Gava Media.

JV. Holodova, K.S. Novoselova, E.V. Mikhalev, A.V. Onegov and E.D. Chirgin. (2019). The Effect of Age on Milk Productivity and Reproductive Qualities of Dairy Cows, *IOP Conf. Series: Earth and Environmental Science315* (2019) 022087.

Mandaka, S. and M. P. Hutagaol. (2005). Analisis Fungsi Keuntungan, Efisiensi Ekonomi dan Kemungkinan Skema Kredit Bagi Pengembangan Skala Usaha Peternakan Sapi Perah Rakyat di Kelurahan Kebon Pedes Kota Bogor. *Jurnal Agro Ekonomi* 23:191-208.

Mardikanto, Totok. (2010). *Konsep-Konsep Pemberdayaan Masyarakat*. Surakarta: Fakultas Pertanian UNS dengan UPT Penerbitan dan Percetakan UNS (UNS Press).

Masrukin, Ahmad Sabiq, Toto Sugito, Bambang Suswanto, and Adhi Iman Sulaiman. (2016). Community Empowerment Model through Cooperative for the Villages Most Severely Affected by Eruption of Merapi. *International Journal of Social Science and Humanity*, Vol 6, No. 1, Januari 2016, page 57.

Narayan, Deepa. (ed). (2002). *Empowerment and Poverty Reduction: A Source book*. Washington, DC: PREM - The World Bank.

Okezone (2016). Beralih ke Sapi Potong, Boyolali Mulai Kehilangan Peternak Susu.[online] Avaliable at : *https://economy.okezone.com/read/2016/11/23/320/1549188/beralih-ke-sapi-potong-boyolali-mulai-kehilangan-peternak-susu*, [Accessed 9 March, 2020].

Perkins, Douglas D. (1995). Speaking Truth to Power: Empowerment Ideology as Social Intervention and Policy. *American Journal of Community Psychology*. Vol. 5, Page 765.

Prasojo and Prasetyo. (2005). Sistem Informasi Manajemen dalam Pembelajaran, *Majalah Ilmiah Pembelajaran,* 1(2), 159-170.

Pudjiatmoko. (2017). Pengendalian Penyakit Antraks pada Hewan. Dalam: Acara Siang Klinik Mengenal Penyakit Anthrax dan Penatalaksanaannya, di RSPI Prof. Dr. Suliyanti Saroso. Jakarta, 9 Februari 2017. Jakarta (Indonesia): Direktorat Kesehatan Hewan Direktorat Jenderal Peternakan dan Kesehatan Hewan. Kementerian Pertanian.

Rusdiana and Irfan. (2014). *Sistem Informasi Manajemen.* Bandung : Pustaka Setia.

Santosa, Siswanto Imam, Agus Setiadi, and Ratih Wulandari. (2013). Analisis Potensi Pengembangan Usaha Peternakan Sapi Perah dengan Menggunakan Paradigma Agribisnis di Kecamatan Musuk Kabupaten Boyolali, *Buletin Peternakan*, 37(2), 125-135.

Sevilla, Consuelo G, Jesus A. Ochave, Twila G. Punsalan, Bella P. Regala, and Gabriel G. Uriarte. (1993). *Pengantar Metode Penelitian* (Edisi terjemahan Alimuddin Tuwu), (Jakarta: Penerbit Universitas Indonesia /UI-Press).

Slamet, Y. (2006). *Metode Penelitian Sosial.* Surakarta: Sebelas Maret University Press.

Soeharsono. (2002). *Zoonosis.* Jakarta: Kanisisus.

Solopos. (2015). Produk Susu Boyolali : Boyolali Kekurangan Suplai 132.000 Liter Susu Per Hari. [online] Avaliable at :*https://www.solopos.com/produk-susu-boyolali-boyolali- kekurangan-suplai-132-000-liter-susu-per-hari-632050*, [Accessed 9 March, 2020].

Suara Merdeka (2018). Si-Lemper Diintegrasikan dengan Aplikasi SIMAPI. [online] Available at : *https://www.suaramerdeka.com/smcetak/baca/113677/si-lemper-diintegrasikan-dengan-aplikasi-simapi*, [Accessed 9 March, 2020].

Sugiyono. (2009). *Metode Penelitian Kuantitatif Kualitatif dan R & D.* Bandung: Penerbit ALFABETA.

Sulistiyono. (2008). Prospek dan Pengembangan Usaha Agribisnis (Usaha Persusuan bagi Koperasi), *Workshop Pengembangan Peternakan dalam Bidang Usaha agribisnis Persusuan*, Jakarta 11 Maret 2008.

Sumodiningrat, Gunawan. (2007). *Pemberdayaan Sosial: Kajian Ringkas tentang Pembangunan Manusia Indonesia.* Jakarta: Penerbit Buku Kompas.

Sutabri, Tata. (2005). Sistem Informasi Manajemen. Yogyakarta : ANDI.

Sutopo, H.B. (2002). *Metode Penelitian Kualitatif-Dasar Teori dan Terapannya dalam Penelitian.* Surakarta: Sebelas Maret University Press.

Tempo. (2007). Produksi Susu Sapi Boyolali Merosot. [online] Avaliable at : *https://nasional.tempo.co/read/104617/produksi-susu-sapi-boyolali-merosot*, [Accessed 9 March, 2020].

Wahana and Riswaya. (2013). Sistem Informasi Pengadaan Barang ATK di PT. Mekar Cipta Indah Menggunakan PHP dan MYSQL, *Jurnal Computech & Bisnis,* 7(2), 73-83.

Winarso, Bambang. (2001). Peran Sarana Angkutan Darat dalam Upaya Peningkatan Efisiensi Distribusi Ternak dan Hasil Ternak Sapi Potong di Indonesia, *Jurnal Penelitian Pertanian Terapan*, 15(2), 125-137.

Wrihatnolo, Randy R and Riant Nugroho Dwidjowojoto. (2007). *Manajemen Pemberdayaan: Sebuah Pengantar dan Panduan Untuk Pemberdayaan Masyarakat*. Jakarta: PT Elex Media Komputindo.