Cattle Disease Studies Via Geographical Information System in Bowi Subur Village, Masni District, Manokwari Regency, West Papua Province

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ABSTRACT: Geographical Information System (GIS) and remote sensing provide real-time data to stakeholders. GIS is new and modern tool that are essential for mapping, monitoring, and surveillance of animal diseases. This study aims to provide a digital map of cattle population and disease distribution. Using satellite imaging as mapping apparatus, this study map the distribution of cattle diseases. Animal health is key to livestock production and productivity. This study can be used as prevention and treatment measures efficiently and effectively. Based on the results of the study, the cattle population in Bowi Subur Village was 455 heads. About 78% of respondents graze their cattle extensively in a forage land while the other 22% keep their cattle intensively in the barn, 31 respondents (31%) stated that their cattle had health problems. The study showed that cattle diseases, such as helminth infestation, external parasite infestation, dystocia, and abortus, are varied. Both primary and secondary data showed that helminth infestation was the most common case. Bowi Subur Village has great potential for animal husbandry development especially ruminants in Manokwari Regency.

Keywords: Cattle diseases; Distribution; Geographical information systems.

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INTRODUCTION
Animal production is one of the priorities in achieving National Food Sufficiency. The high demand for animal husbandry commodities should be met with the increase in population and productivity of cattle. Animal health is key to livestock production and productivity. Improper animal health practices lead to major productivity and economic losses on the farm. Often, the most vulnerable communities are also most exposed to the consequences of poor animal health (Stringer et al., 2017).

Geographic Information Systems (GIS) is a special information system that processes spatial data. Geographical Information System (GIS) are information concerning the location where an object is found on the earth’s surface, this information then can be analyzed for policymaking decisions (Afandi et al., 2014).

Remote sensing applications can be utilized for mapping the distribution of the disease in an area, so prevention and treatment measures can be applied efficiently and effectively. The epidemiology of parasite infections in cattle has been well-documented in several countries, which improve helminths control, and animal performance, and decrease production losses (Bisimwa et al., 2018; Talila et al., 2014; Moussouni et al., 2018).

MATERIALS AND METHOD
The study was conducted for 2 months between May-July in an area of 2.230 Ha located in Bowi Subur Village, Masni District, Manokwari Regency, West Papua Province. The total of 100 cattle herders were interviewed. The tools used for this study were Google Earth Application, Computer with specifications as follows: Intel Core i5, 4GB RAM, internal memory 500GB, VGA NVidia 610m 2GB, Quantum GIS Application, cattle stools, formalin 10% and questionnaire.

The method of this research is to conduct a survey of residents in the area and take samples of ruminant feces for further microscopic testing. Microscopic test of the stool material was also collected randomly during the survey. The fecal sample placed in a plastic bag with 10% formalin solution as a preservative was sent to the Papua University laboratory for microscopic examination.

The land area showing the condition of the infectious disease was mapped using a drone. The picture was converted into a map using the Quantum GIS Application. Then the data is uploaded on the website that has been provided and can be accessed online by anyone. The image was taken by the Google Earth application and mark with cattle disease distribution that is founded. The image then processes virtually and digitally into the map. The percentage of data results analyzed by using Microsoft Office Excel.

RESULT AND DISCUSSION
Data were collected from January 2020 to June 2021 by interviewing respondents using questionnaire in Bowi Subur Village, Masni District Manokwari Regency. The cattle population in Bowi Subur Village was 455 heads. Some cattle are not herded by residents of Bowi Subur village, which is called Gaduhan system. In this system, the cattle owners are cooperative or capital owner. About 78% of respondents graze their cattle extensively (Figure 1) in a forage land while the other 22% keep their cattle intensively in the barn. Most farmers The cattle development pattern in this location, seen from the rearing system, is divided into two patterns, such as land-based and non-land-based.

The land-based rearing pattern has the following characteristics: (a) Livestock rearing is carried out in large pastures (infertile land). (b) Traditional livestock management techniques (without using technology). (c) Livestock farming is a source of social status. Meanwhile, the non-land-based rearing pattern has the following characteristics: (a) cattle kept in barns using cut-and-carry system, (b) cattle are tied to paddy fields or landing as a source of forage.
for livestock, (c) this pattern is generally implemented in densely populated areas residents, (d) exploitation on the non-land base pattern is more intensive compared to the land base pattern with the general aim of saving and partly for commercial purposes (Pomolango, 2016). A good cattle-rearing system will provide optimal production results, as explained by Matondang and Rusdiana (2013), that the low productivity of local cattle is caused by inefficient maintenance management.

![Free-Range Cattle in Bowi Subur Village, Masni District](image)

Figure 1. Free-Range Cattle in Bowi Subur Village, Masni District

The total of 31 respondents (31%) stated that their cattle had health problems. Health problems is mainly due to genetic causes, degenerative processes, metabolic problems, trauma, intoxication, parasite infestation, prion, and microorganism infection. These diseases are considered health problems according to law (Undang-Undang Nomor 41 Tahun 2014). Health problems that infect cattle in the study area vary, such as helminth infestation, ectoparasite infestation, dystocia, and abortus.

Both primary and secondary data showed that helminth infestation was the most common case. Its symptoms are less appetite, decreased body weight, and diarrhea. Lab finding on fecal samples showed various parasites, such as Fasciola sp. (Figure 3), Paramphistomum sp. (Figure 4), Strongyle sp. (Figure 5), and Monieza sp. (Figure 6). These diseases will lead to a decrease in productivity. The common finding is the decrease in body weight due to lack of nutrient absorption as also observed by Zalisar (2017) who found that the loss caused by helminth infection is due to the worm that absorbs blood and nutrient. Adult cattle be through re-infestation due to the higher frequency of forage given the higher feed requirement (Afifah et al., 2020). Helminth infection will affect cattle productivity, cause decrease in body weight and in severe cases will result in hindering the growth of cattle. The most common finding is thin body score due to lack of nutrients absorption. Farmers have financial loss if worm infection persisted because cattle will have nutrient absorption problems (Zalizar, 2017).
Helminth infestation inserts the body of the cattle via contaminated food. Cattle graze in open areas is at the most risk since helminth eggs are available in the environment. Tantri et al. (2013) stated that free-range cows are highly prone to helminth infection, especially liver worm infection. Paramphistomum sp. infects cows in a barn where a puddle of water is available. This statement is supported by Susilo et al. (2020) that proved many Paramphistomum sp. infections are commonly found in such places especially dirty puddles of water. The method of herding both extensive and intensively also affect infection case. Cattle are usually infected during grazing or when fed green fodder from agricultural waste, such as irrigated paddy rice. Millions of ruminants worldwide have been infected, resulting in an annual economic loss of over US$ 3.2 billion (Mehmood et al., 2017). Fascioliasis had a high prevalence in free-range cows because cows individually consume grass without knowing its quantity or quality. Rofiq et al. (2014) suggested that the treatment and anticipation must be carried out by providing periodic anthelmintics once every 3 months to reduce the worm. Of 100 respondents, 73% contacted a veterinarian or medical technician if their cattle had health problems while the remaining farmers just left the unhealthy cattle untreated.

If farmers report to the veterinarian or medical technician, the treatment will be given to them. Most farmers do not have knowledge about certain diseases or their symptoms that infect their cattle. Only 11% of farmers have knowledge about them. Farmers have a great responsibility toward cattle's well-being. The awareness of cattle herders is crucial for mitigating future problems, especially biosafety. Biosafety measures include isolation, disinfection, and cattle traffic control (Pinardi et al., 2019).
The distribution of cattle disease can be seen in Figure 6. The Figure showed that there are 6 points in Bowi Subur Village which are labeled as gastrointestinal parasite infestation. Other than that, we can see dystocia in 1 point and abortus in 2 points. This map is available at https://gis.polbangtanmanokwari.com.

This map will be beneficial for acquiring data accurately in real time. Thus, preventive and treatment measures are more precise. Nowadays, the government and private sectors use mapping technology. The most common method is Google Earth Engine (GEE) which can capture images solely or partially. The GEE is a cloud computing platform to store and processes large data sets for analysis and ultimate decision-making (Kumar and Mutanga, 2018).

The current data archive includes those from other satellites and Geographic Information System (GIS) based vector data sets, social, demographic, weather, digital elevation models, and climate data layers (Mutanga and Kumar, 2019). Kunang and Sulaiman (2019) found that cattle mapping can be acknowledged precisely due to the precision of the map coordinate.

CONCLUSION
Bowi Subur Village has high cattle population and is suitable for the cattle production center in Manokwari Regency. Cattle diseases in the study area are infectious and non-infectious, which are preventable and manageable. The prevention measures can be achieved by improving cattle management, such as the type of cattle herding and administration of worming tablets. Another effort can be assigning professionals counseling and advocate farmers in Masni District.

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