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Reproductive Performance of Pasundan Cattle After Foot-and-Mouth Disease Exposure in South Garut Region, West Java

(PENAMPILAN KINERJA REPRODUKSI SAPI PASUNDAN PASCA TERPAPAR PENYAKIT MULUT DAN KUKU DI WILAYAH GARUT SELATAN, JAWA BARAT)

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ABSTRACT

Foot-and-mouth disease (FMD) is a highly contagious animal disease that causes significant morbidity and substantial economic losses. The outbreak of FMD occurred in Garut Regency at the end of May 2022, leading to disruptions in production and long-term reproductive performance. This study was aimed to assess the mortality, morbidity, and reproductive performance of Pasundan cattle post-FMD exposure at the farm level. The research was conducted using a survey method with questionnaires containing structured questions directed at farmers. Additionally, in-depth studies were carried out with Fisheries and Livestock Service personnel, as well as direct observations and monitoring. Data collected included: livestock ownership, mortality, morbidity, and reproductive performance indicators such as service per conception (S/C), conception rate (CR), days open, and calving interval. The collected data were analyzed descriptively. The results showed that FMD in Pasundan cattle resulted in a morbidity rate of 86.41%, a mortality rate of 1.83%, and reproductive performance indicators as follows: S/C 1.80 ± 1.5, conception rate 50.0 ± 6.0, days open 140.0 ± 15 days, and calving interval 15.0 ± 1.0 months.

Keywords: Pasundan cattle; foot-and-mouth disease; reproductive performance

ABSTRAK

Penyakit Mulut dan Kuku (PMK) merupakan salah satu penyakit hewan menular yang morbiditasnya tinggi dan kerugian ekonomi yang ditimbulkan sangat besar. Penyakit

mulut dan kuku mewabah di Kabupaten Garut pada ahir bulan Mei 2022, yang menyebabkan gangguan produksi dan kinerja reproduksi dalam jangka panjang. Tujuan dari tulisan ini adalah untuk mengetahui mortalitas, morbiditas dan kinerja reproduksi sapi pasundan pascaterpapar PMK di tingkat peternak. Penelitian dilakukan dengan metode survei menggunakan alat bantu kuisioner yang dilengkapi dengan daftar pertanyaan terstruktur ditujukan kepada peternak di samping itu, dilakukan pendalaman (*indepthstudy*) kepada petugas Dinas Perikanan dan Peternakan dan pengamatan langsung serta monitoring. Data yang dikumpulkan meliputi: jumlah kepemilikan ternak, mortalitas, morbiditas dan kinerja reproduksi yaitu *service per conception* (S/C), *conception rate* (CR), *day-open* dan *calving interval*. Data yang telah dikumpulkan dianalisis secara deskriptif. Hasil penelitian menunjukka bahwa PMK pada sapi pasundan menyebabkan mobiditas 86,41%, angka mortalitas 1,83%, dan kinerja reproduksi meliputi S/C 1,80 ± 1,5, *conception rate* 50,0 ± 6,0 *day-open* 140,0 ± 15,0 hari dan *calving interval* 15,0 ± 1,0 bulan.

Kata-kata kunci: sapi pasundan; PMK; kinerja reproduksi

INTRODUCTION

Pasundan cattle are a local Indonesian cattle breed originating from West Java, and they thrive in the buffer zone areas of the forests in the northern Priangan region and the southern coastal regions of West Java (Indrijani *et al*., 2012). Furthermore, Arifin (2017) states that Pasundan cattle have a small body size, possess resilience to tropical diseases, and can withstand extreme environmental changes, including areas with low-quality feed. Pasundan cattle farming plays a significant role in providing meat as a food source and as an income source for farmers in Garut Regency. In practice, one of the challenges hindering the growth of Pasundan cattle populations is livestock health, particularly after the outbreak of FMD.

Foot-and-mouth disease is highly contagious and remains a concern in many countries, leading to severe economic losses (Adjid, 2020). According to Sudarsono (2022), as of May 17, 2022, data from the Indonesian Ministry of Agriculture showed that 15 provinces, 52 regencies/cities, and 13,965 animals had been detected with FMD. This disease has a high morbidity rate (up to 100%) and a low mortality rate (Verma *et al*., 2008). However, mortality can reach as high as 50% when the virus replicates in the heart muscle of younger animals (Gulbahar *et al*., 2007). The virus also affects vital endocrine glands, such as the pituitary gland, which controls metabolic functions. Damage to these glands can lead to symptoms such as panting, restlessness, decreased production, and weakness in the animals. In cattle and goats, infections in the udder and teats can develop into mastitis, resulting in the permanent loss of teats and decreased milk production. Infected animals remain weak for a long period, and FMD can lead to permanent productivity losses (Brooksby, 1982). Knight *et al*. (2015) describe the direct and indirect impacts of FMD, which include: (a) a 25% annual reduction in milk production, (b) reduced growth rates in beef cattle, (c) delayed maturity (10-20%), (d) decreased fertility (with an abortion rate of up to 10%) and delayed conception, and (e) 20-40% mortality in offspring of sheep and pigs.

One of the direct impacts of an FMD outbreak is a decline in the fertility of female cattle, which affects birth rates and reproductive performance. Productive livestock that are affected by FMD lose their ability to conceive for up to a year after the outbreak, with a 40% decrease in reproductive performance (Anwar *et al*., 2023). Beef cattle that suffered FMD experience a decline in body condition, which hinders reproductive performance, including days open, calving interval, conception rate, and calving rate.

Clinical symptoms in animals affected by FMD include high fever, loss of appetite, hyperactivity, weight loss, swelling of the submandibular glands, blisters in the mouth and around the hooves (Quinn *et al*., 2002). Knight *et al*. (2015) further states that FMD can cause long-term disruptions in production and reproductive performance, as well as lead to high mortality rates. Reproductive disorders resulting from FMD are often due to inadequate management and result in repeated breeding cycles. Reproductive performance can be assessed based on fertility indexes (FI), which are calculated from three variables: conception rate (CR), service per conception (S/C), and days open (DO) (Ihsan and Wahjuningsih, 2011). Other parameters used to assess reproductive performance include S/C, DO, and calving interval (CI) (Nuryadi and Wahjuningsih, 2011). Treatment for FMD in cattle includes using antiseptics in the mouth area, traditional herbal treatments, ensuring adequate hydration to prevent dehydration caused by difficulty drinking and fever, and other supportive treatments (Basuki *et al*., 2019).

The impact of FMD on the reproductive performance of Pasundan cattle has not been fully explored. Therefore, investigating the reproductive performance of Pasundan cattle post-FMD exposure is a crucial area for study.

This research was aimed to identify the morbidity, mortality, and reproductive performance of Pasundan cattle post-FMD exposure in Cibalong District, Garut Regency. The results of this study are expected to provide valuable information for farmers, veterinarians, and other relevant stakeholders in developing disease control measures, improving livestock management, and enhancing Pasundan cattle productivity.

RESEARCH METHODS

The research subjects are Pasundan cattle farmers who are members of farmer groups in Pasundan cattle development areas in Cibalong District, Garut Regency. The areas covered include the villages of Karyamukti, Sancang, Sagara, Mekarsasih, Najaten, Cigaronggong, Karyasari, Simpang, Maroko, Mekarwangi, and Mekar Mukti.

Methods and Data Collection Techniques

This study was conducted using a survey method, with interviews and questionnaires administered to 162 farmers selected through purposive sampling in Cibalong District, Garut Regency. Data collection took place through direct observation and monitoring over a period of 4 months, from January to April 2023. The data used in this research were primary data, collected through face-to-face interviews with the farmers based on a pre-prepared questionnaire. To gain more in-depth information, additional in-depth interviews (independent study) were conduct
ed with key informants. The number of respondents was determined proportionally based on simple random sampling, which accounted for 30% of the total sample. This method assumes that all members of the sample population share similar characteristics, and thus any randomly selected individual can represent the entire population (Mardikanto, 2001, cited in Satyawan, 2006).

Variables and Data Analysis

The data analysis method used in this study is qualitative analysis, which involves subjective data derived from survey responses and interview information. The variables observed in this study include livestock ownership, and reproductive performance indicators such as the number of matings until conception (service per conception), conception rate (CR), and days open. Each of these factors was analyzed both before and after the occurrence of Foot-and-Mouth Disease (FMD). The collected data were analyzed qualitatively, as they are subjective in nature, coming from survey and interview responses. The analysis was presented descriptively, providing a detailed explanation of the findings based on the responses obtained during the study.

RESULTS AND DISCUSSION

Based on the data in **Table 1**, the Pasundan cow population in Cibalong District is 883 head, each farmer ownnership between 9 and 37 cattle, averaging 18 head per farmer. The majority of farmers practice semi-intensive cattle management, where cattle are grazed throughout the day in open fields or rubber plantations to forage for food and are housed in pens during the night. In terms of livestock management practices, most farmers have a good understanding of animal husbandry techniques. They are capable of implementing proper breeding selection by choosing quality breeding stock. This shows that farmers are able to identify and select animals with desirable characteristics for breeding purposes.

For feeding their cattle the farmers rely on available grass from pasturelands and rubber plantations, as well as agricultural by-products, which are used as the primary feed for the cattle. However, during the dry season, the availability and variety of forage are limited in both quantity and quality, which negatively affects the nutritional intake and health of the cattle. Regarding livestock health, farmers are generally competent in preventing and addressing common diseases. They are capable of administering first aid and treatment for the cattle before contacting veterinary services. However, preventative measures such as sanitation and biosecurity practices are not fully optimized yet. On the other hand, farmers are responsive to vaccination programs initiated by the Garut Fisheries and Livestock Department, particularly for the control of Foot-and-Mouth Disease (FMD).

Farmers' knowledge and skills in detecting estrus in cattle are also crucial for the success of artificial insemination (AI).

Table 1**.** Pasundan cattle population in cibalong district, Garut Regency

No	Village	Number of Cattle (Heads)	Number of Respondents (People)	Average Cattle Ownership (Heads)	Technical Aspects	Maintenance System
1.	Mekar sari	185	20	9.25	Adequate	Semi-intensive
2.	Sancang	447	12	37.25	Adequate	Semi-intensive
3.	Sagara	16	1	16	Adequate	Intensive
4.	Cibalong	188	11	17	Adequate	Intensive
5.	Cigaronggong	13	1	13	Adequate	Intensive
6.	Karyamukti	34	3	11.4	Adequate	Intensive
.	TOTAL	883	48	18.4		

Tabel 2. Number of FMD Cases and Recovery in Cibalong District, Garut Regency

No	Village	Number of Cattle (Heads)	Number Of Cases (Heads)	Morbidity (%)	Number Recovered (Heads)	Mortality (Heads, %)
1.	Mekar sari	185	154	83.24	151	3 (1.95)
2.	Sancang	447	397	88.81	390	7 (1.76)
3.	Sagara	16	11	68,75	11	0 (0)
4.	Cibalong	188	161	85.64	158	3 (1.95)
5.	Cigaronggong	13	10	76.92	10	0 (0)
6.	Karyamukti	34	30	88.82	29	1(3.33)
	Total	883	763	86.41	749	14 (1.83)

Table 3. Reproductive Performance Before and After FMD Outbreak in Cibalong District

No	Reproductive Parameter	Reproductive Performance Before FMD (2021)	Reproductive Performance After FMD (2023)	Number Recovered (Heads)	Number Dead (Heads)
1.	Service per conception	1.4 ± 1.0	1.80 ± 1.5	60	6.80
2.	Conception rate (%)	70.0 ± 5.0	50.0 ± 6.0	956	44.60
3.	Days – Open (day)	120 ± 10	140.0 ± 15	5	0.54
4.	CalvingInterval (month)	14.0 ± 1.0	15.0 ± 1.0	236	49.70

Foot-and-Mouth Disease (FMD) in Pasundan Cattle

Generally, farmers can identify signs of estrus in their cows, such as specific behavioral changes, swelling and redness of the vulva, and secretion of vaginal fluids. Upon recognizing these signs, farmers typically contact an inseminator to perform AI. The ability to accurately detect estrus significantly affects the success rate of artificial insemination.

The FMD outbreak in Garut Regency peaked in the third week of May 2022 and spread across 26 districts. The outbreak originated from newly purchased cattle that were brought into the area without complying with the required standard operating procedures (SOPs), specifically lacking a *Surat Keterangan Kesehatan Hewan* (SKKH) or Veterinary Health Certificate (Dinas Perikanan dan Peternakan Kabupaten Garut, 2022). The high livestock traffic without strict biosecurity measures facilitated the spread of the virus, quickly infecting other cattle that came into contact with sick animals (Basuki et al., 2020). According to Sudarsono (2022), potential risk factors for the spread and transmission of FMD include the purchase of young stock or breeding animals, buying cattle from outside the region, the anxiety of owners selling sick cattle, veterinarians working in multiple areas, visits from other traders or farmers, weak biosecurity at cattle farms, and the use of livestock transportation.

In Cibalong District, the FMD outbreak among Pasundan cattle showed morbidity rates ranging from 68.75% to 88.82%, with an average of 86.41%. The mortality rate was 1.83%. FMD is characterized by high morbidity, sometimes reaching 100%, but relatively low mortality (Verma et al., 2008). The relatively high morbidity is attributed to the fact that FMD was a new disease for the area, and both farmers and veterinary personnel were not yet fully familiar with effective disease control measures. Additionally, the movement of farmers between farms to check on sick cattle, along with inadequate implementation of biosecurity practices, further facilitated the spread of the virus.

This rapid transmission of FMD is consistent with Syamsudin (2001). The virus can spread quickly through the air over long distances. The virus can travel up to 2-3 miles in calm weather and, in strong winds, can be carried over distances greater than 10 miles. The virus remains infectious for up to 14 days in the air. Alexandersen and Donaldson (2002) also highlighted that transmission can occur through direct contact with infected animals, contaminated equipment, airborne particles, feed, transportation, and animal movement.

The majority of cattle fatalities during this FMD outbreak involved calves younger than 4 months. This was primarily due to a decrease in milk production and mastitis in infected cows, made the cows refusing to nurse their calves. In both cattle and goats, infections of the udder and teats can develop into mastitis, causing permanent teat loss and decreased milk production. The death of the calves is likely due to the lack of sufficient milk intake from their mothers. Mortality in young animals can reach up to 50% when the virus replicates in the heart muscles of younger animals (Gulbahar *et al*., 2007). In Pasundan cattle, fatalities mainly occurred in cases where the infection was reported late—typically 3-5 days after the onset of initial symptoms such as hyper salivation. Farmers often delayed reporting the disease because they did not recognize the signs of infection, as the cattle did not exhibit anorexia (lack of appetite or refusal to drink).

The clinical symptoms of FMD in Pasundan cattle initially present as hypersalivation, accompanied by frothy saliva, followed by lesions in the mouth, nose, and interdigital spaces. Subsequently, the cattle develop anorexia, refusing to eat or drink. This happens because the cattle experience hyperthermia, which affects their appetite. Additionally,

inflammation in the mouth and esophagus makes swallowing difficult. During the disease's incubation period, the body's response includes an increase in body temperature due to the production of prostaglandins. This inflammatory response also causes pain and discomfort, leading to decreased appetite.

Infected Pasundan cattle were treated with a combination of antibiotics, antipyretics, vitamins, non-steroidal anti-inflammatory drugs (NSAIDs), premix feed, and routine disinfection spraying. This combination of treatments was effective in ensuring recovery, with all clinical symptoms disappearing within 7 to 14 days. Antibiotics such as long-action amoxicillin and trimethoprim-sulfa were used to prevent secondary bacterial infections. The lesions caused by the virus on the nose and interdigital areas are open wounds that can easily become infected with bacteria if not treated with antibiotics. If these open lesions are not infected, they heal faster.

The antipyretics used were medications containing dipyrone, which provide pain relief, fever reduction, and anti-inflammatory effects. These medications work by inhibiting the cyclooxygenase enzymes (COX-1 and COX-2) reversibly, reducing the production of prostaglandins, which are mediators of inflammation. By decreasing prostaglandin production, the inflammatory process is reduced (Plumb, 2011).

Traditional treatments practiced in the research area included the use of a mouth rinse made from a mixture of citric acid, molasses, and water, as well as foot care with a mixture of vinegar and water. Post-treatment care involved preparing a mixture of grated cassava and molasses to make it easier for the cattle to consume. Generally, Pasundan cattle showed signs of recovery within 2 to 3 weeks after being exposed to FMD. However, some cattle that were unable to stand had to be euthanized, while others were sold at lower prices.

To prevent the spread of the disease, farmers implemented disinfection of cattle pens using disinfectants containing recommended active ingredients such as citric acid, sodium hypochlorite (3%), sodium carbonate (4%), sodium hydroxide (2%), and acetic acid (2%). Preventative measures also included increasing awareness of FMD through communication, information, and education (KIE) for the public. Other preventative practices included providing quality feed to improve cattle health and ensuring that cattle purchased were healthy and accompanied by a valid *Surat Keterangan Kesehatan Hewan* (SKKH).

Impact of FMD on Reproductive Performance

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The impact of FMD on reproductive performance is categorized as an invisible loss because the effects are difficult to measure, especially in less intensive farming systems where FMD is an endemic disease (Knight-Jones et al., 2016). Several indicators are used to identify reproductive disturbances in cattle herds, including: calving interval exceeding 400 days, days open exceeding 120 days, conception rate below 50%, and service per conception exceeding two.

Based on the data in **Table 3**, it shows that the reproductive performance of Pasundan cattle after being infected with FMD experienced an average decline in the following parameters: calving interval ranging from 420–460 days, days open ranging from 125–155 days, conception rate ranging from 44–56%, and service per conception ranging from 1.65 to 1.95. The decline in reproductive performance in cattle exposed to FMD is suspected to be caused

due to the cattle refusing to eat and drink, leading to malnutrition. Feed-related issues causing reproductive and growth disturbances are often complex, meaning that a deficiency of one nutrient will be accompanied by a deficiency of other nutrients. Protein, a component that contains N, C, H, and specific elements such as S and P, plays an essential role in forming body tissues (muscle, bone, and fat), repairing damaged cells, and supporting reproduction (Budiyanto, 2012).

Furthermore, Anwar et al. (2023) stated that one of the direct impacts of the FMD outbreak is the reduced fertility of female cattle, which will affect the number of calf births and overall reproductive performance. Productive cattle infected with FMD will lose their ability to calve within a year after FMD infection, with a 40% decrease. Beef cattle infected with FMD will experience a decline in body condition, which hinders reproductive performance, including days open, calving interval, conception rate, and calving rate. Knight et al. (2015) stated that Foot-and-Mouth Disease can cause long-term disruptions in reproductive performance, leading to lower productivity and, in some cases, high mortality. Damage to the reproductive organs due to FMD leads to a decline in reproductive efficiency, with the main symptoms being reduced conception rates, an increase in the number of matings per conception, and infertility lasting 2–6 months (Brooksby, 1982). FMD can negatively impact birth rates as it causes reproductive disturbances in female cattle, including miscarriages or the birth of weak calves that are vulnerable to other diseases (Maas-Sampe et al., 2015 and Brito et al., 2017).

CONCLUSION

Foot-and-mouth disease (FMD) in Pasundan cattle caused a morbidity rate of 86.41%, a mortality rate of 1.83%, and reproductive performance indicators including service per conception (S/C) 1.80 ± 1.5, conception rate 50.0 ± 6.0%, days open 140.0 ± 15 days, and calving interval 15.0 ± 1.0 months.

SUGGESTION

Further research in other areas with FMD cases is needed to enrich the information regarding the reproductive performance of cattle.

REFERENCES

Adjid RMA. 2020. Foot and Mouth Disease: Exotic Animal Disease that Must Be Alert of Entry into Indonesia. *Indonesian Bulletin of Animal and Veterinary Sciences* 30(2): 249.

Andriani AP, Hadid T., Rezky S. 2023. Sosialisasi pencegahan dan penanganan wabah PMK pada masyarakat Desa Tanjung Rejo, Kecamatan Wuluhan Kabupaten Jember. *Jurnal Kreativitas Pengabdian Kepada Masyarakat* 6(5): 2016-2023.

Alim S, Nurlina L. 2014). The Relationship between Beef Cattle Farmer's Caracteristic and Its Perception to Artificial Insemination. *Journal of Animal Science Padjadjaran Universsity* 7(2): 165-169.

Anwar P, Jiyanto J, Mahrani M, Infitria I, Siska I. 2023. Penerapan program vaksinasi Penyakit Mulut Kuku (PMK) di Desa Sikakak dalam pencapain pengembangan ternak sapi potong rakyat. *Bhakti Nagori. Jurnal Pengabdian kepada Masyarakat* 3(1): 65-73.

Alexandersen S, Donaldson AI. 2002. Further Studies to Quantify the Dose of Natural Aerosols of Foot and Mouth Disease Virus for Pigs. *Epidemiology Infect* 128: 313-323.

Basuki RS, Isnaini MF, Rozi, Poermadjaja B, Saptarini. 2020. *Penyidikan Kasus Penyakit pada Sapi Suspect PMK di Kabupaten Pamekasan Tahun 2019*. Jakarta. Surveilans dan Penyidikan (Outbreak Investigation) Penyakit Hewan). Direktorat Kesehatan Hewan Kementrian Pertanian RI. Pp.115-122.

Budiyanto. 2012. Peningkatan tingkat kebuntingan dan kelahiran Sapi Indonesia dan Masalah-masalah yang terkait. Perhimpunn Dokter Hewan Indonesia Cabang Daerah Istimewa Yogyakarta. Seminar updating penyakit

gangguan reproduksi dan penanganan pada Ruminansia Besar. Yogyakarta 8 Maret 2012.

Brito BP, Rodriguez LL, Hammond JM. 2017. Foot-and-mouth disease virus: A review of the current state of knowledge on the pathogenesis and control. *Journal of Comparative Pathology* 156(1): 1-13.

Dinas Peternakan dan Perikanan Kabupaten Garut. 2022. *Penyakit Mulut dan Kuku Pada Hewan Ternak Ruminansia*. Garut. Dinas Peternakan dan Perikanan Kab Garut.

Direktorat Jenderal Peternakan dan Kesehatan Hewan. 2022. *Kesiagaan Darurat Veteriner Indonesia: Penyakit Mulut dan Kuku*. Edisi 3.1. Jakarta. Direktorat Jenderal Peternakan dan Kesehatan Hewan, Kementerian Pertanian Republik Indonesia.

Firman A, Trisman I, Puradireja RH. 2022. Dampak Ekonomi Akibat Outbreak Penyakit Mulut dan Kuku pada Ternak Sapi dan Kerbau di Indonesia. *Mimbar Agribisnis*8(2): 1123-1129.

Ihsan MN. 2012. *Ilmu Reproduksi Ternak Dasar*. Malang. Universitas Brawijaya Press.

Iswoyo, Widyaningrum P. 2008. Performans Reproduksi Sapi Peranakan Simmental. *Jurnal Ilmiah Ilmu-Ilmu Peternakan* 11(3): 125-133.

Indrijani, Johar Arifin, Dudi, Wendry SP, & Romi Z. 2012. Kajian Identifikasi Sapi Lokal Jawa Barat Dalam Mendukung Swasembada Daging Sapi. *Laporan Penelitian*. Bandung. Dinas Peternakan Provinsi Jawa Barat.

Kementerian Pertanian. 2022. Penyakit Mulut dan Kuku (PMK) pada Hewan Ruminansia. [Accessed October 31, 2022]. Available at: http://cybex.pertanian.go.id/99197/Penyakit-Mulut-dan-Kuku-PMK-Pada-Hewan-Ternak-Ruminansi.

Knight J, McLaws M, Rushton J. 2016. Foot-and-Mouth Disease Impact on Smallholders - What Do We Know, What Don't We Know and How Can We Find Out More?. *Transbound Emerg Dis* 64(4):1079–1094.

Maas-Sampe H, Sajuthi D, Darminto. 2015. Dampak Penyakit Mulut dan Kuku (PMK) Terhadap Produktivitas Ternak Sapi. *Jurnal Ilmu Ternak* 15(1): 7-17.

Sarsana IN,Merdana IM. 2022. Vaksinasi Penyakit Mulut dan Kuku Pada Sapi Bali di Desa Sanggalangit Kecamatan Gerokgak Kabupaten Buleleng Bali. *Jurnal Altifani* 2(5): 447-452.

Sudarsono RPE. 2022. Kajian Epidemiologi Kejadian Diduga Penyakit Mulut dan Kuku di Kabupaten Lamongan. *Journal of Basic Medical Veterinary* 11(1): 56-63. https://ejournal.unair.ac.id/JBMV.

Supriono. 2022. Monitoring dan Evaluasi Posko Penanganan PMK. [Accessed October 30, 2022]. Available at: http://sumselprov.go.id/detail/berita/.