Retrospective Assessment of Mortality Cases of Water Buffaloes (Bubalus Bubalis) in Nueva Ecija, Philippines from 2010 - 2013

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INTRODUCTION

Livestock diseases are problems of considerable importance to farmers. In tropical countries like the Philippines, it is a major impediment in economic development [1]. In general, health influences productivity. Any changes or disturbances on health will increase or decrease the production [2,21]. Disease conditions, environmental factors and inadequate nutrition always impair livestock production and decrease their reproductive performance [3].

Understanding the incidence, prevalence and distribution of diseases in an area is necessary for undertaking efficient control program as well as formulating policies for future management of prevalent diseases [4]. The available animal health records when being analyzed will be able to harvest valid and precise information which can be used for making decisions in cases of disease outbreaks, production and management formulation. Also, these give more reliable information that can be related with the current status of the herd [2,21].

Any herd health plan is an on-going process, and as such records need to be reviewed for the herd health plan to be updated to ensure that it continues to target the key areas for future improvement of farm performance. Studying diseases of animals retrospectively is a rapid and inexpensive means to describe disease patterns which are important in identifying effective strategies for disease control. Therefore, a retrospective study was carried out on mortality cases of dairy cooperatives in Nueva Ecija recorded from January 2010 to
June 2013. Similar work was conducted to gain information that can be used to improve the existing herd health plan to reduce productivity losses and improve animal welfare [5,21].

MATERIALS AND METHODS

A retrospective study of diseases of water buffaloes concerning the records of dairy cooperatives in Nueva Ecija was done. Existing records from January 2010 to June 2013 were considered in the study. Data of calf mortality were not included in the analysis as dead calves were not subjected to necropsy procedures and reported only as losses. The leading diseases causing mortalities in the institutional herd, spatial distribution (by municipalities and by cooperatives) and temporal distribution (yearly and monthly) of the top five diseases causing mortalities were determined.

The data were reviewed and checked manually for obvious inconsistencies, recording errors or missing entries and were entered and managed in a computer worksheet. Proportion of different conditions causing mortality was expressed by percentage distribution. Descriptive statistical method was used to show characteristics of the gathered data and was presented in tables and graphs.

Results:

Causes of mortalities:

The causes of mortalities in NIZ dairy cooperatives are shown in Table 1. The top five leading causes of mortalities were Fasciolosis (43.77 %), foreign body syndrome (18.18 %), bloat (11.45 %), prolapse (7.41 %) and pneumonia (4.71 %). Other causes include multiple organ failure (2.02 %), dystocia (2.02 %), mycotoxicosis (1.68 %), pulmonary emphysema (1.01 %), toxicosis (1.01 %), Surra (1.01 %) and tumor (1.01 %). The rest of the causes of mortalities had lower percentage of 1 %. The diseases were diagnosed mainly through clinical history observed by the farmer and veterinarian and significant findings in necropsy.

Fig. 1: Yearly distribution of the top five leading causes of mortalities in Nueva Ecija cooperatives.

Fig. 2: Monthly distribution of leading causes of mortalities Nueva Ecija cooperatives.

Spatial distribution of top five causes of mortalities:

The study determined the top five causes of mortalities at NIZ Dairy Cooperatives in Nueva Ecija and determined its spatial distribution by municipalities and by cooperatives.

Fasciolosis (44.77 %) was the leading cause of mortalities at NIZ dairy cooperatives. The cases were mostly observed in Science City of Muñoz (24.62 %) followed by Llanera (16.92 %), Talavera (10 %), Sto. Domingo (8.46 %) and Rizal (7.69 %). The cooperative that mostly suffered from fasciolosis was Angat Buhay (11.54 %) followed by San Vicente DPC (8.46 %) and UFPC (5.38 %).

Foreign Body Syndrome (FBS) (54 cases, 18.18 %) is the earliest cause of mortality and the second leading cause of mortalities in NIZ dairy cooperatives. The highest cases was observed in San Jose City (20.37 %) followed by Guimba (14.81 %) and Muñoz (11.11 %).

Bloat (34 cases, 11.45 %) was the third leading cause of mortalities at NIZ cooperatives and the most common cause of sudden death in the herd. The municipality with the highest cases was San Jose City (23.53 %).
followed by Llanera (14.71%). The cooperatives with the highest cases of bloat were Brother’s Keeper, Cinense Dairy and San Vicente DPC with 3 cases each.

Prolapse (22 cases, 7.41%) was the fourth leading cause of mortalities. Most of these cases originated in San Jose City (4 cases) and Talugtug (3 cases). The cooperatives with the highest cases of prolapse were recorded in Simulang Panibagong Bukas Dairy Producers Cooperative (SIPBU) and Sunbeam Dairy Producers Cooperative with 3 cases each.

Pneumonia constitutes 4.71% (14 cases) of the total cases making it the fifth leading cause of mortalities. The disease was recorded in 14 cooperatives but most of the cases originated in Llanera with 3 cases. Stress from lactation, milk production, breeding, medication, abrupt changes in pasture consequently reduce resistance from infection and predisposes the animal from the development of pneumonia. There are 5 cases of aspiration pneumonia which were highly associated on careless feeding of the animals.

**Temporal distribution of top five causes of mortalities:**

- The study determined the temporal distribution of the top five causes of mortalities at NIZ Dairy Cooperatives in Nueva Ecija.
- The highest number of cases were observed in 2012 (48.82%) followed by 2011 (27.61%), and 2013 (17.51%) while the lowest number of cases were observed in 2010 (6.06%).

**Strengths, weaknesses, opportunities and threat analysis:**

- From January 2010- June 2013, PCC distributed at least 2,580 Murrah buffaloes (1,763 Brazilian and 817 Bulgarian) in different NIZ dairy cooperatives in Nueva Ecija. However, since the establishment of NIZ dairy cooperatives in 2010, the herd incurred a total mortality rate of 11.51%. The estimated cost of economic loss was P 51,586,397.46 excluding expenses from anthelmintics, supplements, vaccines and other indirect losses such as decreased milk production, poor growth rate and reduced fertility.

**Discussion:**

Fasciolosis was diagnosed through liver examination which is considered as the most reliable, direct, and cost effective technique for the diagnosis of Fasciolosis on dead animals [6]. Based on the necropsy reports of the veterinarians who diagnosed the cases, Acute Fasciolosis was diagnosed when lesions such as enlargement and severe haemorrhages in liver with presence of numerous flukes in the liver parenchyma were seen in the necropsy. The most common signs observed on cases with Acute Fasciolosis (4 %) are sudden loss of appetite, lameness and watery diarrhea. Chronic Fasciolosis (14 %) was diagnosed when fibrotic liver and significant numbers of adult flukes were present in bile duct and gall bladder. Based on the clinical history recovered in the necropsy reports, most common signs of Chronic Fasciolosis include poor appetite, chronic emaciation, cachexia, chronic diarrhea, jaundice and bottle jaw.

Non-perforating foreign body syndrome (54 cases) was diagnosed through recovery of foreign objects from the rumen such as bailing twines nylon, ropes, plastics, undigested feeds and other objects evidently causing blockade in the rumeno-reticular junction leading to death. Hardware disease was diagnosed when metallic objectives such as wires that caused blockade on the rumeno-reticular junction or puncture of nearby organs due to sharp objects such as nails. Bloat due to blockade of foreign objects was diagnosed as foreign body syndrome or hardware disease depending on the type of the object seen in necropsy.

Bloat (34 cases) was the most common cause of sudden death in the herd. It was diagnosed based on the examination of rumen contents and on cases of sudden death without having been ill. Pasture bloat is the most common type of bloat and was diagnosed in 17 cases. The causes of pasture bloat are the production of stable foam which traps the normal gases of fermentation in the rumen due to the ingestion of rapidly growing legumes or grasses that contains high concentration of soluble proteins. The coalescence of the small gas bubbles is inhibited and intramural pressure increases because eructation cannot occur [7]. Grain bloat was also diagnosed in 2 cases where animals ingested large quantities of rice grains from previous harvest and small quantities of roughage that promotes frothiness in the rumen that interfere in eructation. Positional bloat was diagnosed in 5 cases that commonly due to physical obstruction of eructation.

Prolapse (22 cases) occurred due to mineral deficiency and dystocia. It was diagnosed as uterine, vaginal and rectal depending on the portion of the organ that prolapsed. Uterine prolapse (13 cases) was the most common condition leading to death of the animals in the field due to sepsis, extensive trauma and hemorrhages. Uterine prolapse is highly associated with hypocalcemia in multiparous dairy cows. Calcium is important for proper functioning of smooth muscle tissue. When the cow is low on calcium, smooth muscle contraction becomes weak that leads to difficulty in calving. This will cause subsequent increased in intra-abdominal pressure that will lead in uterine prolapse [8].

The carcasses that showed congested, hemorrhagic, exudative and firm lungs extending to other related organs accompanied by respiratory signs such as nasal discharges were diagnosed as pneumonia (14 cases).
Aspiration pneumonia (5 cases) was also diagnosed in 5 cases where food ingesta are evidently present within trachea.

Other causes of mortalities include multiple organ failure, dystocia, mycotoxicosis, pulmonary emphysema, toxicosis, Surra, tumor, pulmonary emphysema, strangulation, brain infection, dehydration, drowning, heartworm, heart failure, kidney failure, lightning strike, paramphistomosis and vehicular accidents. Although these causes were recorded in low frequencies, it can be contributory to further economic loss related to decrease production performance of the animals, drugs and labor costs.

The high cases of Fasciolosis in Science City of Muñoz, Llanera, Talavera, Sto. Domingo and Rizal can be highly related to the description of the area and management practices of the farmer. Most of the cooperatives in this area were located nearby irrigation networks and rivers which provide the farmers easy access for grazing and wallowing areas for their animals. Grasses were continuously available in river banks and become the most common source of forages on stall fed animals in the area. Continuous exposure of animals in areas with high risk of infection such as irrigated rice fields with intensive rice production, rivers with continuous stable water level and fields fertilized by animal manure greatly affects the prevalence of Fasciolosis in a certain area [9-11].

Data were true at the time of the research, hence, these factors can be significant source of infection and such factors are commonly present in the area based on actual observations and are being supported by the NIZ field veterinarians. These conditions can be contributed to the high cases of Fasciolosis in these municipalities especially in Science City of Muñoz. However, such actual observations may not firmly conclude the situation due unavailability of data that describes the management practices of the farmers. This requires further study to explore the epidemiology of Fasciolosis especially in the high risk areas for Fasciolosis and examining the current management practices of farmers.

Based on the direct observation of the researcher and veterinarian in-charge in the area, majority of the entrusted buffaloes in San Jose City were almost confined throughout the year and fed through cut and carry system. According to Blood and Hutchins [12], incidence of FBS is higher in hand fed or stall fed animals than pasture rearing. Since feeding is controlled in stall-fed animals, amount of forage given may not be able to fully satisfy the animal. This will lead the animal to continually ingest objects indiscriminately to satisfy its appetite. Also, dietary deficiency and boredom due to lack of exercise on confined animals leading to pica also predisposes the animals in ingesting foreign objects [7] other than forages that are accessible to the animal. The most common object recovered from dead animals due to FBS was abaca twines and ropes. In addition, animals were not screened against the disease before being dispersed to NIZ dairy cooperatives. It can be suspected that animals already incurred the condition before the dispersal and most of these were distributed in San Jose City since most of the large cooperatives were located in this area. This implies that screening of animals for FBS must be included in the protocol prior to dispersal of animals in the field.

Because of the abundance of forages in the field after rice harvest, it is a regular practice of farmers at NIZ dairy cooperatives to allow their animals to graze in the newly harvested rice fields. During this season, rice fields were irrigated to prepare for the next cropping season (December- March). This will favour the growth of succulent pastures and become the main source of infection that will explain the high cases of bloat during these months.

According to the veterinarian and field technician in-charge in the area, most of the buffaloes dispersed in San Jose City were confined and stall fed with green forage, cut grasses, rice straw and stubbles. Good provision of forages with minimize animal activity would not restrict the animal from becoming fat and become overly conditioned. Excessive amount of pelvis fat would increase the pelvic pressure during calving that predisposed the animals to prolapse [13]. This statement agreed with the observation of attending veterinarians that most of the animals that had died from uterine prolapsed were overly conditioned indicated by high Body Condition Scoring (BCS) of the animals. The desired BCS of cows prior to breeding is 2.75 and the desired BCS at time of the breeding animals were confined in San Jose City. According to Risco et al. [15] and Fraser et al. [16], multiparous animals are more prone to hypocalcemia which is highly associated to the occurrence of uterine in the herd. This condition is aggravated by breeding and milk production and eventually will lead to milk fever that increases the risk of uterine prolapse up to three time [17]. Although hypocalcemia may not be sufficient to cause milk fever, the condition may still increase the occurrence of prolapse [8]. Confined animals are prone to mineral deficiencies due to their limited access on natural sources of minerals and are only dependent on supplements provided by the farmer or veterinarians. Thus, it can also be related to the occurrence of prolapse due to hypocalcemia in the animals confined in San Jose City. The Philippine Carabao Center (PCC) provided...
mineral supplements for the animals at NIZ dairy cooperative, however, this may not probably sufficient to meet the mineral demands of animals for dairy production and breeding.

Many predisposing factors can contribute to the susceptibility of animal to pneumonia. It can be caused by viruses, bacteria, fungi and physical agents and chemical agents. The causes of higher proportion of pneumonia might be associated with poor housing system in the area that expose animals to various stresses such as cold, wind, rain and dust favor establishment of some infectious agents in the lower respiratory tract [18].

Predisposition of bovine species to pneumonia can also be attributed to anatomical and physiological features of its respiratory system. The bovine lung is distinguished by the very thick connective tissue septa that separate areas on the surface and extend inward to divide the lung substance into segments. The septa, which may help to localize infection, become even more obvious in certain diseases in which they are thickened and edematous. The capacity for respiratory exchange is limited, when compared to other species, by the relatively small total alveolar surface area and lesser density of capillaries. A larger part of the lung capacity in the bovine is required for basal needs leaving little lung reserve available in stressful circumstances [7,16,19].

Generally, most of the mortalities in NIZ dairy cooperatives were due to Fasciolosis. The animals were properly dewormed and subjected fecalysis to assure that the animals were free from endoparasites prior to dispersal of water buffaloes in June 2010 and 2011. This indicates that the newly entrusted animals were apparently healthy and free from endoparasites that can be attributed to the low mortalities in 2010 (1 case).

The animals dispersed in June 2010 became infected in the succeeding months after entrustment of animals to the farmer- trustees. Following the prepatent period of Fasciola of four months, the animal begun to show clinical signs and die in the following year. This will explain the high increased of mortalities due to Fasciola in 2011 (27 cases).

The PCC conducted regular mass deworming twice a year in all NIZ dairy cooperatives. However, the dewormer used in 2010- 2011 were not provided free by PCC and the farmers purchased their own dewormer commercially or purchased directly to PCC. Some farmers may not be able to regularly provide the necessary dewormers during deworming schedule due to economic reasons leaving their animals undewormed. Consequently, farmers may not be able to strictly follow the regular deworming schedule of PCC and those undewormed animals may become source of reinfection in the herd. However, deworming schedules done by PCC in the past years and deworming history of the animals were not recovered in the study due to unavailability of the data.

In April 2012, the PCC provided free dewormer and drenching apparatus to each cooperative in NIZ. The provision of free dewormer may highly encourage the farmers to strictly adhere to the regular deworming of PCC. In addition, PCC shifted to Triclabendazole which is considered as the treatment choice for Fasciolosis [20] and dewormed the whole herd at NIZ dairy cooperatives in April- June 2012, September- November 2012 and May- June 2013. Strategic treatment with an effective drug is considered to be the most effective control measure for Fasciolosis [9]. This changes made by PCC can be attributed to the decrease of mortalities in 2013.

The high cases of Foreign Body Syndrome (FBS) can be attributed to the late recognition of the disease. The increasing mortalities due to FBS was only recognized during the preliminary assessment of mortalities at NIZ dairy cooperatives conducted by PCC on April 2013 and consequently given poor attention for mitigation and screening for the past years. This implies the need to increase the frequency of analysis of mortality data of NIZ dairy cooperatives for early recognition of increasing rate of mortalities. However, the recognition of the disease had led PCC to strengthen the screening of foreign body syndrome among the herd by providing ultrasound apparatus to monitor animals that were suspected for FBS. Rumenotomy is being practiced to treat the animals harbouring the syndrome. Thus, screening and treatment against FBS are now available to lessen mortalities due to this condition.

Infection of Fasciola happens throughout the year. However, variations on the peak of infection may explain the monthly variation of mortalities which is highly related to the grazing pattern and management practices of farmers in raising the animals. Using the prepatent period of Fasciola of four months [6], the peak of infection occurred from September to November due to grazing season of the animals where animals are allowed to freely access the recently harvested rice field. Rice straw, stubbles and hays which are commonly fed during these months is the most important source of infection [9]. This would explain the increasing mortalities in the months of February to April of the following year. A peak of infection of Fasciola happens again during harvesting season (April- May) and most animals show clinical signs of the disease and die in September to November. During the months of December to March, animals had limited access on rice fields where highest risk of infection occurs [9]. The source of forages being fed to animals during this season were planted by farmers or harvested from nearby places where forages are available. Forages were commonly air dried and hays were stacked under the sun before given, thus reducing the viability of metacercaria in the forages during this season reducing the infection. However, a survey must be conducted to further elucidate the epidemiology of Fasciolosis to have concrete basis on the seasonality of the disease.

The increasing mortalities due to bloat during September to November can be attributed to the grazing period of the animals. As observed during these months, it was a regular practice of farmers at NIZ dairy...
cooperatives to graze their animals in the newly harvested rice fields. Rice fields were irrigated for the next cropping season that favoured the rapid growth of succulent pastures and become the main source of infection during these months. The PCC conduct seminars on management of bloat patients. However, sudden death is most common in bloat that limits the usefulness of first aid using administration of antifoaming agents such as mineral oil. Prevention of bloat has some difficulties; however, further education of farmers in feeding management would lessen the occurrence of cases.

The increasing number of prolapsed cases were highly related to the breeding time and calving season of buffaloes at NIZ dairy cooperatives where most of the animals were expecting to calve on September to November that increases the incidence of prolapse during these months.

The veterinarians who attended the cases were already in service since the establishment of NIZ dairy cooperatives in the province. This made the attending veterinarian more familiar with the actual management practices and behaviour of the farmers, characteristics of environment where the cooperatives are located and other events happening in the field which is highly related in disease investigation and diagnosis. It made them also familiar with the cases mostly encountered in the field including the factors related to its occurrence. However, because of familiarity of these encountered cases in the field, the attending veterinarian may not be able to explore other causes other than the most encountered diseases in the field.

Based on the observation on the field works, on some few cases, field technicians conducted necropsy procedures with permission but most of the time without actual supervision of the field veterinarians. With this, field technicians with minimal knowledge on necropsy proceedings would not be able to identify the specific lesions that are present from various or specific cases. Also, they were not able to exactly describe the lesions that may have mislead the necropsy findings. Furthermore, if critical cases which are of highly public health importance were encountered (e.g. Anthrax) this maybe a threat to public safety. In addition, the cases diagnosed by non-veterinarian personnel may not be able to represent the actual conditions that had happen on the cases thereby exact diagnosis may not be identified. Hence, veterinarians should strictly be the one handling necropsy cases.

Low veterinarian to animals ratio (vet: ratio) was observed in the study. During the study, there were two veterinarians supervising the animal health monitoring and providing technical services in the field. Each veterinarian was managing 2 congressional districts with at least 1,000 heads of water buffaloes distributed in different municipalities. The veterinarians also performed other duties such as monitoring animal production and breeding. Each veterinarian has one field technician as a partner in providing technical services to cooperatives.

The low vet ratio may lead to inability of veterinarian to provide all the needed veterinary attention in the field. It may compromise monitoring of health animals since animals were not confined in one area and were distributed in considerably distant places in municipalities. When many sick animals are reported at the same time, not all cases may receive treatment at appropriate time. Less severe cases will most likely be given less attention making these cases develop into a more serious condition before appropriate action is given. The animals undergoing treatment may not receive complete treatment course since the veterinarian may leave the area immediately to attend to the other cases that also require his attention. The drugs may not be given in appropriate intervals that would lead to unsuccessful treatment of the disease. In cases of dead animals, necropsy procedures may not be performed at appropriate time compromising the diagnosis of cases. The availability of technical support of veterinarians from other PCC departments in case of unavailability of NIZ veterinarians is not always guaranteed since they also perform their duties in their respective offices. Low vet: animal ratio would therefore lead to inefficient animal health monitoring, delayed treatment of sick animals, inaccurate disease diagnosis due to delayed necropsy proceedings and technical services may not be provided in proper time. These circumstances due to low vet: ratio can be highly attributed to the high cases of mortalities at NIZ dairy cooperatives. Hiring 4 veterinarians and 2 field technicians in addition to the existing 2 veterinarians and field technicians that will be assigned in each congressional district would strengthen and assure that all veterinary services will be provided in all areas in the field.

Non screening of foreign body syndrome before dispersal of animals in the field and late recognition of the condition had led to the increased mortality of FBS in the field. This indicates that analysis of records must be required quarterly and annually to monitor emerging diseases that are becoming prevalent in the field. Immediate recognition of disease would direct the PCC in formulating appropriate control measures and prevention.

Cases such as pneumonia, mycotoxicosis, toxicosis, multiple organ failure, emphysema and hepatic tumor did not undergone laboratory testing procedures to confirm diagnosis or ascertain the specific cause. NIZ field
veterinarians must maximize the use of animal health laboratory where various laboratory testing can be conducted and are very important in disease diagnosis.

The provision of free dewormer, medications and other tools (drenching guns) to NIZ dairy cooperatives provided a good impact in encouraging the farmers to cooperate in the animal health program employed by PCC. Thus, resolving the economic instability of the farmer in providing biologicals needed for his animals.

**Conclusion And Recommendation:**

There are 297 mortalities recorded at NIZ assisted dairy cooperatives in Nueva Ecija recorded From January 2010 to June 2013. Most of the cases originated in Science City of Muñoz, Llanera, San Jose City, Talavera and Guimba. The cooperatives with the highest number of mortalities were Angat Buhay Producers Cooperative, San Vicente Dairy Producers Cooperative, United Farmers Producers Cooperative and Licaong Dairy Producers Cooperative. Most cases were recorded in 2012 during the months of August to November. The mortality rate was 11.51%. Economic loss from mortalities was estimated to ₱51,586,397.46. This excluded expenses from anthelmintics, supplements, vaccines, labor and other indirect losses such as decreased milk production, poor growth rate and reduce fertility.

The top five leading causes of mortalities are fasciolosis, foreign body syndrome, bloat, prolapse and pneumonia. Fasciolosis was the leading cause of mortality at NIZ Dairy Cooperatives. The highest cases were recorded in Science City of Muñoz, Llanera, Talavera and Sto. Domingo. The cooperative with the highest cases were Angat Buhay Producers Cooperative, San Vicente Dairy Producers Cooperative, United Farmers Producers Cooperative, Licaong Dairy Producers Cooperative and Licab Dairy Producers Cooperative. Highest cases were observed in 2012 and mortalities were prevalent throughout the year.

Foreign body syndrome was the second leading cause of mortalities at NIZ Dairy Cooperatives. Most of the cases originated in San Jose City; however, cases were also recorded in Guimba, Science City of Muñoz, Llanera, and Aliaga. The cooperative with the highest cases was Bubalus Bubalis Farmers’ Association. The cases were mostly observed in 2011 and mortalities were prevalent during the months of October to December.

Bloat was the third most common cause of mortalities in the herd and was commonly observed in San Jose City and Llanera. The cases were high during the months of October and November where animals were allowed to graze in lush pastures.

Prolapse was also high in San Jose City specifically in Simulang Panibagong Bukas Multipurpose cooperative (SIPBUPCO). The cases were high during the months of October to November which can be related to the breeding and calving season of animals at NIZ dairy cooperatives during these months.

Pneumonia was the fifth leading cause of mortalities and mostly observed in Llanera. Cases were high during August which can be attributed to the weather and other stresses that weakens the respiratory system of the animals. Although low number of cases was recorded, it can be a great source of economic loss due to decreased productivity of animals.

In this study, basic information on disease distribution patterns was determined that would be very helpful to the PCC in their disease monitoring and surveillance efforts. The information on specific location and prevalence of animal diseases could provide decision makers on how or where to best allocate the resources such as vaccines, medications and personnel.

Based on the information generated in the study, it is recommended that:

1. An additional of 4 veterinarians and 2 field technicians must be hired by PCC to assure that all the health and production services and proper attention will be given to all NIZ dairy cooperatives. One veterinarian and a field technician must be designated in each congressional district and their service must cover only on their designated district. Another two veterinarians must be available to respond to cases where the district veterinarians are unable to attend due to other important field works especially during mass deworming and vaccination of animals in the cooperatives. They will be responsible in monitoring treated animals and providing follow up treatments. These two veterinarians will also be responsible in assuring that all files (necropsy reports and other related documents, daily veterinary accomplishment reports) are properly documented, accomplished, analyzed and compiled.
2. A survey must be conducted to accurately describe and re-examine the current management practices of farmers.
3. To permit further analysis, the following data must be consistently included in the mortality reports: Clinical signs observed by the farmer or attending veterinarian before death, position of animal at the time of death, medications received by the animal, body condition score (BCS) of the animal, type of feeding (confined, tethered, grazed) and feeds (grasses, silage, concentrates) and housing (close confinement, free grazing), specific locations of significant lesions in organs and its approximate sizes and its distribution. Diagnosis must be properly categorized (i.e. prolapse (complete or partial; vaginal, rectal, uterine); fasciolosis (chronic and acute); bloat (primary and secondary)).
4. Cases such as pneumonia, multiple organ failure, emphysema, toxicities should mandatorily undergo laboratory testing procedures to arrive at specific diagnosis.

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