



**UNIVERSITI PUTRA MALAYSIA**

**EVALUATION OF CALVING INTERVAL OF SWAMP AND MURRAH  
CROSSDBRED BUFFALOES AND ITS ASSOCIATION WITH RAINFALL**

**MUHAMMAD HAFIZ BIN ABU HASAN**

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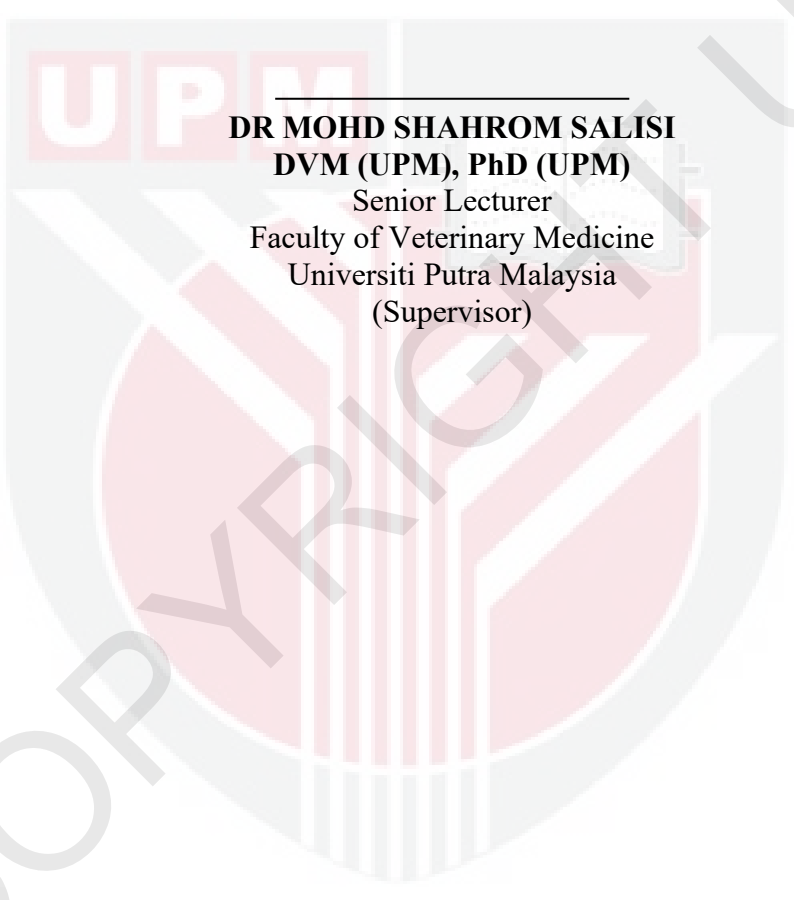
**EVALUATION OF CALVING INTERVAL OF SWAMP AND MURRAH  
CROSSDBRED BUFFALOES AND ITS ASSOCIATION WITH RAINFALL**

**MUHAMMAD HAFIZ BIN ABU HASAN**

A project paper submitted to the  
Faculty of Veterinary Medicine, Universiti Putra Malaysia  
in partial fulfilment of the requirement for the  
**DEGREE OF DOCTOR OF VETERINARY MEDICINE**  
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MARCH 2017

It is hereby certified that we have read this project paper entitled “Evaluation Of Calving Interval Of Swamp And Murrah Crossbred Buffaloes And Its Association With Rainfall” by Muhammad Hafiz bin Abu Hasan and in our opinion it is satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the course VPD 4999 – Final Year Project.



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## **DEDICATION**

This thesis is dedicated to my family, my best friends and the one I love, who had accompanied me in my journey of becoming a veterinarian.



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## ACKNOWLEDGEMENTS

I would like to express sincere gratitude to my supervisor, Dr Shahrom Salisi and co-supervisor Professor Dr Mohd Ariff Omar, Associate Professor Dr Rosnina Hj Yusoff for their constant support, guidance and motivation. It would never have been possible for me to complete this final year project without their incredible support and encouragement throughout this final year project. Their guidance and friendship has made this project a meaningful education.

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**ABSTRAK**

Abstrak daripada kertas projek yang dikemukakan kepada Fakulti Perubatan Veterinar memenuhi sebahagian daripada keperluan kursus VPD 4999 – Projek Tahun Akhir

**PENILAIAN CORAK SELANG BERANAK DI ANTARA KERBAU SAWAH DAN MURRAH KACUKAN DENGAN PURATA HUJAN**

Oleh

**Muhammad Hafiz Bin Abu Hasan**

2017

**Penyelia: Dr. Mohd. Shahrom Salisi**

Objektif kajian ini adalah untuk menganalisis corak selang beranak dalam baka kacukan Murrah dan Sawah dan untuk menentukan hubungan antara selang beranak dan faktor purata hujan . Kajian ini telah dijalankan di Pusat Pembiakan dan Penyelidikan Kerbau, Jabatan Perkhidmatan Haiwan dan Perusahaan Ternak, Telupid, Sabah. Kajian retrospektif telah dijalankan ke atas seramai 50 kerbau betina (25 Swamp dan 25 Murrah kacukan). Data seperti umur, berat badan, dan selang beranak daripada kerbau dikumpulkan daripada rekod ladang dan dibandingkan dengan data purata hujan untuk menentukan kaitan antara pembolehubah. Kerbau dipilih berdasarkan dua kriteria; usia antara 3-9 tahun dan rekod pembiakan mempunyai baik. Analisis korelasi telah dilakukan untuk menentukan hubungan di antara selang beranak, purata hujan dan baka. Hasil kajian menunjukkan terdapat perbezaan yang signifikan di antara selang beranak dan baka  $P < 0.05$ . Selang beranak dan

hujan berkaitan negatif dan tidak ketara secara statistik ( $P > 0.05$ ). Corak beranak selang Murrah kerbau kacukan (449 hari) adalah lebih pendek berbanding dengan kerbau Sawah (497 hari).

**Kata kunci:** kerbau, retrospektif, selang beranak, hujan



**ABSTRACT**

An abstract of the project paper presented to the Faculty of Veterinary Medicine in partial fulfilment of the course VPD 4999 – Final Year Project.

**EVALUATION OF CALVING PATTERN OF SWAMP AND MURRAH CROSSBRED BUFFALOES WITH AVERAGE RAINFALL**

By

**Muhammad Hafiz Bin Abu Hasan**

**2017**

**Supervisor: Dr. Mohd. Shahrom Salisi**

The objective of this study was to analyse the calving interval pattern in Swamp and Murrah cross breed buffaloes and to determine the relationship between the calving interval and the average rainfall factor. The study was conducted at Buffalo Breeding and Research Centre, Department of Veterinary Services and Animal Industry, Telupid, Sabah. This retrospective study was conducted on the total of 50 female buffaloes (25 Swamp and 25 Murrah crossbred). The data on age, body weight, and the calving interval of the buffaloes was collected from the farm records and compared with the data of the rainfall to determine the correlation of the variables. The buffaloes were chosen based on two criteria; the age between 3-9 years and having good breeding record. Correlation analysis was done to determine the relationship between the calving intervals, average rainfall and breed. The results showed significant difference between the calving intervals and breed at  $P < 0.05$ . There was also significant correlation between breed and rainfall at  $P < 0.05$ . The

calving interval and rainfall were negatively correlated but not statistically significant ( $P>0.05$ ). The calving interval pattern of Murrah crossbred buffaloes (449 days) was shorter as compared to Swamp buffaloes (497 days).

**Keywords:** Buffalo, retrospective, calving interval, rainfall.



## 1.0 INTRODUCTION

Buffaloes are among our native animals in Malaysia. The native breed that is in Malaysia Swamp buffaloes and the most important aspect to sustain the survivability of the buffalo is through reproduction. By ensuring a good reproductive efficiency in buffaloes, we can sustain the population. Buffaloes population in Malaysia is 138,098 heads and 95% of the number is swamp type (AbasMazni et al., 2006). and from year 1970 to 2004, the total population of buffalo is steadily decreasing. This is influence by several factor such as reproductive problem, nutrient, long calving interval, disease, or the decreasing demand of the buffalo. The factors listed are all interrelated among each other therefore, in order to achieve the optimum reproductive efficiency. All the factors should be investigated to understand the significant impact on reproductive cycle. However, based on study done by Nazir buffalo are said to achieve late age maturity and slow breeding behavior which then results in longer inter-calving periods (Ahmad, Chaudhry, & Khan, 1981). Although calving interval serve as an important factor, since the parameter have low genetic influence as compared to environmental factors. The variable that this study have choose is average rainfall. The objective of this study is to understand the relationship between average rainfall with calving interval. Thereby, directly relating reproductive efficiency with environmental factor which is average rainfall. efficiently thereafter, causing considerable economical consequences (Carr, 2006). Furthermore, the risk for developing diarrhoea post-weaning is increased if the piglets had experienced gastrointestinal disorders during the suckling period (Swensmark *et al.*, 1989).

## 1.1 Objectives

This study was conducted:

1. To compare calving interval pattern in Swamp and Murrah cross breed buffaloes
2. To determine the association of calving interval with average monthly rainfall factor

## 1.2 Hypotheses

Null hypothesis,  $H_0$ : There is no association between calving interval with average rainfall factors.

Alternate hypothesis,  $H_a$ : There is association between calving interval with average rainfall factors.

## **2.0 LITERATURE REVIEW**

### **2.1 Species of Buffaloes**

Buffaloes comes from a family of Bovidae and subfamily Bovinae. Buffaloes occur in two broad category which are the African buffaloes and the Asian Buffalo. The *Bubalus bubalis* belongs to the class Mammalia, subclass Ungulata, order Artiodactyla, suborder Ruminantia, family Bovidae, subfamily Bovinae, tribe Bovini, which includes the following three groups: Bovina (cattle), Bubalina and Syncerina. Syncerina includes only the species *Syncerus caffer* (the African buffalo). Bubalina (the Asian buffalo) includes three species: *Bubalus depressicornis* or Anoa which lives in Indonesia, *Bubalus mindorensis* which lives in the Philippines and *Bubalus bubalis* deriving from the domestication of the *Bubalus arnee*, the Indian wild buffalo. The Asian buffaloes or known as genus *Bubalus* are further divided into two subgenus which are the *Bubalus* and *Anoa*. The *bubalus* subgenus consider to be from southeast asia. The *anoa* subgenus are known to be native in Indonesia. The reason we have no idea of this subgenus as compared to the *bubalus* or more commonly known as water buffalo, due to the fact the *anoa* are listed as endangered species in the International Union for Conservation of Nature (IUCN) Red List

## 2.2 Buffaloes in Malaysia

The type of buffaloes that commonly found in Malaysia are River and Swamp Buffaloes. In 1998, there was about 170 000 buffaloes in Malaysia. The native buffaloes which is the swamp buffalo used for working in the rice fields and when the buffaloes are old, it will be slaughtered and sold as meat to the locals. Over the few decades, the Murrah buffaloes was brought in by Indian Immigrants at the beginning of the 20th century and this caused a lot of crossbreeding between both the buffaloes resulting in a lower number of swamp buffaloes. According to FAO, buffalo population has decreased by 2.9% over a decade between 1990 and 2000. Similarly, a recent statistic between 2009 and 2014 revealed 2.8% reduction in buffalo population. Although, the population is reducing, the demand for beef consumption keeps increasing. Since the beef consumption predominantly dominated by cattle production, meat supply by buffaloes should be increase to enable equal sustainability of the market. There have been reason behind low acceptability which could be due to low production of buffaloes and also reduce in reproductive efficiency. (Borghese, 2005)

### 2.3 Reproductive Cycle

Reproductive cycle starts when buffaloes achieve puberty. Puberty in buffalo takes a longer duration compared with cattle (Perera, 2011). There is various factor in which the puberty can be effected. One of which is environment of the farm together with feeding management. Besides that, there are also season, climate, nutrition and growth rate that can influence the onset of the puberty. Under favourable conditions, puberty may occurs at 15-18 months in river buffalo and 21-24 months in swamp buffalo (Perera, 2011)

Asian River buffalo exhibit first oestrus cycle at around 24 to 36 months of age with an average body weight of 250 to 275kg. However, these body weight and reproductive cycle varies according to breed. According to (Othman, Zuki, Bakar, Kasim, & Saad, 2014) , Murrah buffalo type exhibit first oestrus cycle earlier approximately around 15 to 18 months compared to swamp buffalo which is around 24 to 36 months of age. The mean length of the oestrous cycle is 21 days, with greater variation than observed in cattle. The signs of oestrus in buffalo are less overt than in cattle and homosexual behaviour between females is rare. The duration of oestrus is 5-27 h, with ovulation occurring 24-48 h (mean 34 h) after the onset of oestrus (Perera, 2011). The duration of oestrus is similar in river and swamp buffalo, varying between 5 and 27 h, and ovulation occurs about 24–48 h (mean 34 h) after onset of oestrus, or 6–21 h (mean 14 h) after the end of oestrus (Abdalla, 2003)

Although buffaloes are polyoestrus, their reproductive efficiency shows wide variation throughout the year. As reported by different authors in the this study((Moioli & Borghese, 2005)), buffalo cows exhibit a distinct seasonal change in displaying oestrus, conception rate and calving rate. This may be the cause of the

prolonged intercalving period since buffalo calving during the unfavourable season may not resume their ovarian activity until the following favourable season, decreasing their reproductive efficiency.

In a study undertaken over five years on Indian Murrah buffaloes, the maximum percentage of heats were observed in November and the minimum in June; the conception rates ranged from 41.85 percent to 44.85 percent during August to November, with the highest rate in September, and from 29.45 percent to 32.92 percent during the months of February to April, with the lowest rate in April ((Moioli & Borghese, 2005)

#### **2.4 Calving interval**

Calving interval is defined as indicator of sound reproductive status of milk animals. The calving interval for cattle and buffalo has been recommended to be a period of 12 -13 months. (Sanker, Kumar, Mandal, Taggar, & Das, 2014). The calving interval is the ideal parameter to evaluate the reproductive efficiency of a cattle or buffalo because by determining the calving interval, the dry period is also determined. The shorter the dry period and calving interval of a female buffalo indicates a faster rate for an animal to be able to reproduce. Thus, the calving traits proves to be an important economic parameter. Therefore, many study have been done to investigate the significant factor effecting the calving interval. The two major factor is genetic and non-genetic factor. In my study, non-genetic factor of which a seasonal variable is being tested against calving interval.

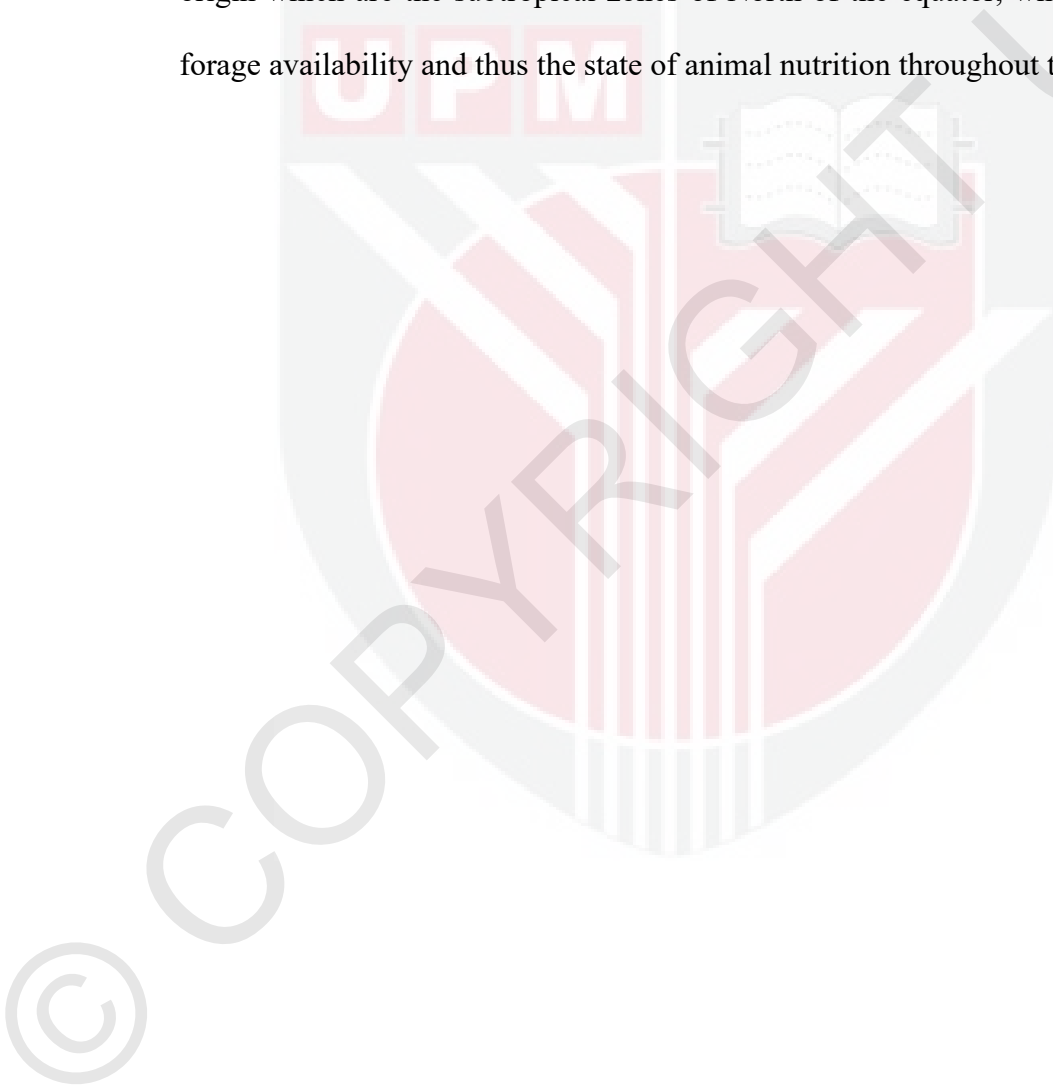
## 2.5 Seasonal Factor

Although buffaloes are polyoestrus, their reproductive efficiency shows wide variation throughout the year. As reported by different authors (Shah et al., 1989; Singh and Lal, 1994; Zicarelli, 1997; Srivastava and Sahni, 1999), buffalo cows exhibit a distinct seasonal change in displaying oestrus, conception rate and calving rate. This may be the cause of the prolonged intercalving period since buffalo calving during the unfavourable season may not resume their ovarian activity until the following favourable season, decreasing their reproductive efficiency. (Borghese, 2005)

Data collected on Surti buffaloes reared in Rajasthan confirm a distinct seasonality in breeding behaviour. The monthly and seasonal calving pattern recorded at the research station and in the field indicated that buffaloes calved all the year round but have a tendency to calve more during the rainy season (July to September) followed by the winter season (October to January). The breeding season started in the rainy period and the winter appeared the most favourable season while the summer appeared the most unfavourable season for buffalo reproduction (Bilal, Suleman, & Raziq, 2006). Also for buffaloes bred in Pakistan, Shah (1988) reported that the breeding frequency was highest during the winter, decreased in autumn and spring, and was lowest in the summer.

Similarly, Vale et al. (1990) in a study on buffalo reproduction in the Amazon Basin, were of the opinion that the seasonality in buffalo could be due more to management factors and unavailability of green fodder rather than to the inability of the species to reproduce throughout the year. However, in Italy, where buffaloes are fed with a constant balanced diet in place of free grazing, a distinct seasonal reproductive pattern

is also found (Zicarelli, 1992). With regard to this aspect, Zicarelli (1997), in his review on buffalo seasonality, emphasizes how the need of a species, mainly in wildlife, to coincide calving and weaning with favourable environmental conditions represents one of the causes of reproductive seasonality; therefore the tendency of buffalo to seasonality depends upon the environmental characteristics of their place of origin which are the subtropical zones of North of the equator, which condition the forage availability and thus the state of animal nutrition throughout the year.



### **3.0 MATERIALS AND METHODS**

#### **3.1 Study Animals**

This study was conducted at the Buffalo Breeding and Research Centre, Telupid, Sabah and it is owned by the Department of Veterinary Services and Animal Industry. The Centre was established at Sook in 1975 before being relocated to the current site at Telupid in 1979 to provide a large land volume (Malaysian Livestock Breeding Policy, 2013).

In Telupid, there are three types of buffalo breed they are the swamp buffalo, the Murrah x Swamp crossbred and the White buffalo, representing 44%, 46% and 10% of the total buffalo population in this farm, respectively. This farm consisted of 749 acres of land with the current total of 405 heads of buffaloes. The management of the buffalo are managed equally and they used male buffalo as breeders to be used in research activities. The buffaloes produced is then to be sold live to farmers for rearing purpose.

#### **3.2 Buffalo Management**

All buffaloes are fed extensively with established pasture (*Brachiaria decumbens*) with concentrate supplementation at the rate of 1 kg/animal/day. Wallowing areas were available in each paddock. Rotational grazing was practiced and the rotational intervals of about 30-day rotational grazing system were determined and monitored through the supervision the farm manager. The pasture was fertilised twice a year while silage was prepared occasionally when pasture production exceed demand.

This farm practiced natural breeding with male to female ratio of 1:20. Pregnancy diagnosis was carried out every 3 months following breeding and the breeding season was between November and January each year. The calving rate ranged between 60% and 70% since 2014.

The calves remained in the paddocks together with their dam until the age of three before being released into paddocks. The feeding regime is same as all until they reach body weight of 250kg and the farm practiced minimum breeding weight of 385 kg following recommendation by University Putra Malaysia. All the buffaloes are weighed every three months. The different breeds of buffaloes in this farm were kept separated from each other.

### **3.3 Data Collection**

A total of 25 heads of swamp buffaloes and 25 heads of crossbred (Murrah x Swamp) buffaloes that were calved between 2014 and 2016 were included in this study since the record were complete for this three years. The breeding records of the selected animals which included the animal identification and data on age, body weight, and the calving interval of the selected buffalo were acquired and analysed retrospectively using SPSS software version 22. The calving interval days for each buffaloes is then calculated accordingly and tabulated according to monthly basis as to match with the data of rainfall. The average rainfall was separated according on monthly basis for 2014, 2014 and 2016. Similarly, these data were calculated both for female swamp and Murrah crossbred buffaloes respectively and were analysed and recorded. The difference between calving interval for swamp and Murrah crossbred buffaloes were analysed using independent T-test. Correlation analysis was done using

data collected between these three variables, average rainfall, calving interval and breed.

The correlation between the average rainfall with calving interval of swamp and Murrah buffaloes was determined respectively. The coefficient was interpreted based on categorisation adopted from (Wiersma, 2003).



## 4.0 RESULTS

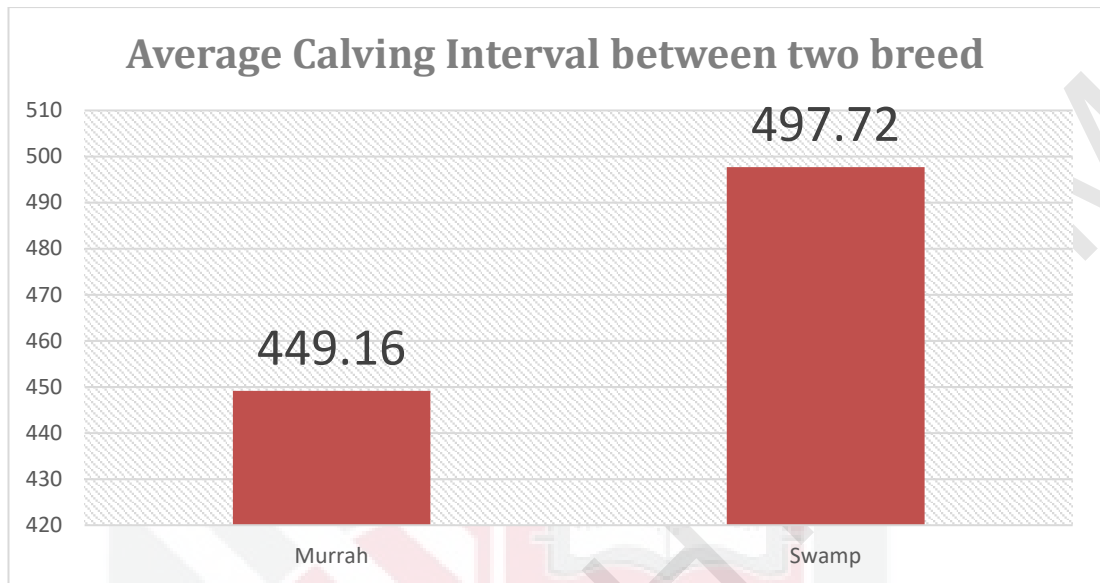
### 4.1 The Calving interval for Swamp Buffaloes and Murrah Crossbred Buffaloes

The mean  $\pm$  standard error mean calving interval values of both swamp and Murrah crossbred buffaloes for 2014, 2015 and 2016 are shown in Table 1. There was significant ( $p < 0.05$ ) difference in the calving interval between swamp ( $497.72 \pm 86.88$  days) and Murrah crossbred ( $449.16 \pm 72.74$  days) buffaloes. Thereafter, the Murrah crossbred showed significantly ( $p < 0.05$ ) shorter calving interval for 2014, 2015 and 2016 respectively. The targeted reproductive efficiency cycle was achieved by desired days for swamp buffaloes as compared to Murrah crossbred buffalo (Table 1).

**Table 1: The Calving interval (Mean  $\pm$  SEM) for Swamp Buffaloes and Murrah Crossbred Buffaloes**

	Calving Interval
Swamp	$497.72^a \pm 86.88$
Murrah Crossbred	$449.16^b \pm 72.74$

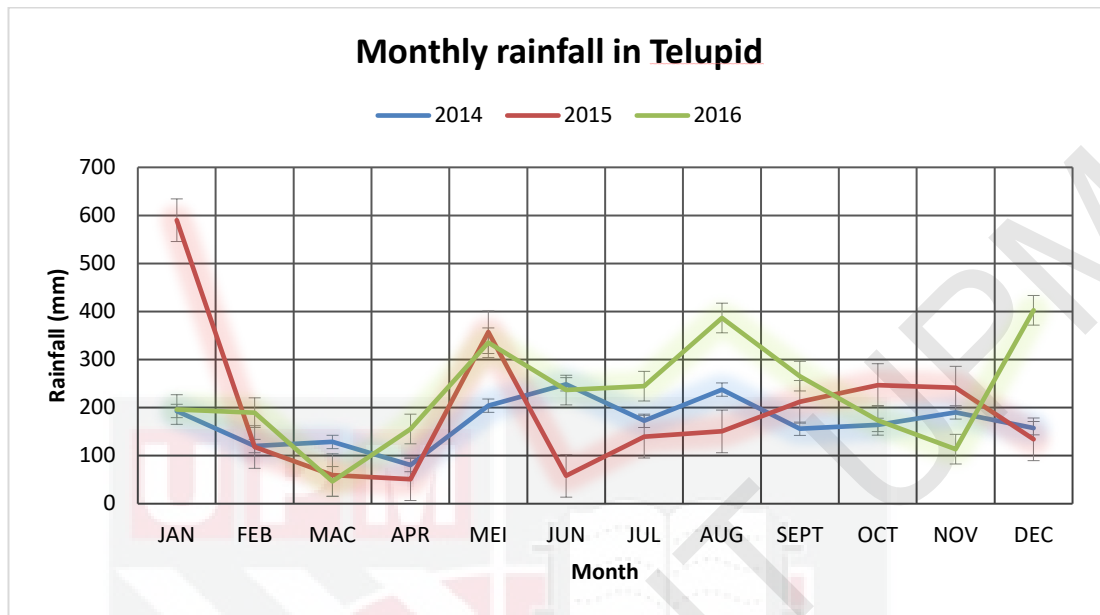
<sup>ab</sup>Values on the same column with different superscript indicate significant difference ( $P < 0.05$ )



**Figure 1: Average calving interval between Murrah crossbred and Swamp buffaloes.**

#### **4.2 The Monthly rainfall for Murrah and Swamp Buffalo**

The Annual rainfall record have been divided according to the month of the year for 2014, 2015 and 2016 is tabulated in Table 3. The rainfall for 2014 shows almost linear line of rainfall distribution compared to 2015 and 2016. The distribution is the highest on early of January 2015 (600mm) and the lowest around April of 2015 (<100mm). Meanwhile, rainfall distribution for 2016 is the highest at few months. The month May, August and December marked a peak record of rainfall distribution with December being the highest rainfall for the year 2016 with average rainfall 1of 400mm. The distribution data for the year can be seen consistent around May of 2014, 2015 and 2016. The average distribution of rainfall during that time of the year ranges from 200mm – 400mm. The data was not normally distributed which is due to environmental factor. Therefore, the spearman correlation analyses were done to identify the coefficient between calving interval and rainfall. The coefficient was - 0.114. According to standard SPSS analyses, the data is negatively related and was not statistically significant ( $p>0.05$ ). According to the Henkle 1998, the value falls under interpretation of little to no significant correlation between these two variable



**Figure 2: Monthly rainfall in Telupid from 2014 -2016**

## 5.0 DISCUSSIONS

According to Abayawansa et al., 2011, there are several factors that influence the calving interval of the buffaloes which are environmental temperature, rainfall, breeds, nutrition and management of the buffaloes. For this study, the rainfall and breeds factors only will be considering to analyse the calving interval pattern in Swamp and Murrah crossbred buffaloes and determine the relationship of calving interval with average rainfall factor in Buffalo Breeding and Research Centre, Telupid, Sabah. The average calving interval of Murrah crossbred was significantly shorter compared to swamp buffaloes which same as the findings reported by Campanile et al 2003 and Tuyen and Ly, 2001. It was reported that the calving interval for buffalo ranged between 15 months for Murrah buffaloes in India (Campanile et al., 2003) and 18 months for swamp buffaloes (Tuyen and Ly, 2001). From this study, calving interval was 15 months for Murrah buffaloes and 16 months for swamp buffaloes which are two months shorter for Swamp buffaloes.

The duration of calving interval of the buffalo's influence of nutrition, ambient temperature and photoperiod and rainfall. According to Perera et al, (2011) buffalo are polyoestrous and are capable of breeding throughout the year. In Malaysia and other tropical locations where photoperiod is relatively constant, annual changes in rainfall appear to influence oestrous cyclicity, and may cause different duration of calving interval. In this study, there were no significant relation between the average monthly rainfall with the calving interval of the breed. This may due to indistinguishable raining season from year 2014 until 2016. The rainfall for 2014 shows moderate

number of rainfall distribution compared to 2015 and 2016. The distribution is the highest on early of January 2015 (600mm) and the lowest around April of 2015 (<100mm). For 2016, the rainfall distribution is the highest on May, August and December marked a peak record of rainfall distribution with December being the highest rainfall for the year 2016 with average rainfall of about 400mm. The distribution data for the year can be seen consistent around May of 2014, 2015 and 2016. The average distribution rainfall during that time of the year ranges from 200mm – 400mm.

The period of postpartum anoestrus or anoestrus is usually longer in buffalo than in cattle under comparative management conditions (Dobson and Kamonpatana, 1986 and Jainudeen and Hafez, 1993). Under optimal conditions buffalo resume anoestrus by 30–90 days, but factors such as poor nutrition and body condition (Baruselli et al., 2001), suckling management (Perera et al., 1987 and Usmani et al., 1990) and climate (Nanda et al., 2003), which also influence nutrition through feed quality and availability, can delay this considerably. For example, indigenous buffalo in Sri Lanka raised under free grazing with abundant natural feed and calves allowed access to the dams for suckling only once per day, resumed oestrous cyclicity by 30–60 days after calving, whereas those under harsher conditions with free suckling by the calves remained anoestrous for 150–200 days (Perera, 2011)

High rainfall will cause environment temperature low and also cause more fresh green fodder availability as the sources of feed. The conditions are considered to be favorable for reproductive activity in buffalo (Roy and Prakash 2007). According to study by Perera et al, (2011) showed that rainfall had both immediate and continuous effect on ovarian activity and oestrus expression. The present study also showed that during rainy season postpartum buffalo initiated early exhibition of oestrus. As a result, the percentage of buffalo that came to oestrus was gradually increased and maintained at higher percentage for few months after the cessation of rainy season. The results are in consonance with the findings of an early report by (Tekerli, Kucukkebabci, Akalin, & Kocak, 2001).

## 6.0 CONCLUSIONS

Based on the findings in my study, the Murrah crossbred buffalo have a shorter calving interval compared to swamp buffaloes. Besides that, there is little correlation between rainfall with calving interval of Swamp and Murrah crossbred buffalo. The rainfall factors believed to have significant impact, however since the environment factor and the trend changes in climate is not static and effected by globally environment. The rainfall distribution has changes throughout the years. Therefore, the calving interval can be said to impose a significant impact towards the reproductive efficiency of buffaloes, thereby achieving the main objective of analyzing the calving interval pattern in Swamp and Murrah crossbred buffaloes.

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