# EFFECT OF RE-BREEDING INTERVAL ON THE REPRODUCTIVE EFFICIENCY OF DOE RABBIT

BY

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## DECLARATION

I hereby declare that this project titled **"EFFECT OF REBREEDING INTERVAL ON THE REPRODUCTIVE EFFICIENCY OF DOE RABBIT"** was written by me in the Department of Animal Production and Health, Federal University Oye-Ekiti, Ekiti State under the supervision of Dr. (Mrs) M. Orunmuyi. No part of this work has been presented in any previous work for an undergraduate degree in any University. Information obtained from any literature has been duly acknowledged in the project and a list of references provided.

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Olokede Jesupelumi John

21/3/19

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Date

## CERTIFICATION

This is to certify that this project titled **"EFFECT OF REBREEDING INTERVAL ON REPRODUCTIVE EFFICIENCY OF DOE RABBIT"** by Olokede Jesupelumi John meets the regulations governing the award of the degree of Bachelor in Agriculture of Federal University Oye-Ekiti, Ekiti State and is approved for its contribution to knowledge and literary presentation. The above declaration is confirmed by:

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**Dr (Mrs) O. O. Orunmuyi**
Supervisor

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**Date**

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**Dr. A.H. Ekeocha**
Head of Department Animal Production and Health

21/3/19

**Date**

## DEDICATION

This project is dedicated to Jesus Christ, the author and finisher of my faith who saw me through my five years study. Also to my most beloved parents, Pastor (Dr.) and Mrs Sola Olokede, my dearest mentor; Apostle Olokede Samuel and my adorable family in Christ (Gofamint Student Fellowship) for the privilege to serve in God's vineyard. The Lord bless you abundantly in Jesus name.

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## ABSTRACT

An experiment was conducted to determine the effect of re-mating interval on the reproductive efficiency of rabbits (doe). The experiment was designed to test two re-mating intervals – 14 and 21 days interval to determine the most suitable for the following traits body weight changes during pregnancy, litter weight, litter size, still birth, body weight before weaning, weaning weight and body weight after weaning. Twenty-five (25) matured does and five (5) matured bucks of different breeds were used in this experiment. The does were distributed into two (2) treatments with thirteen (13) does at 14 days treatment and twelve (12) does in 21 days treatment. The data collected on the parameters were subjected to statistical analysis using S.A.S package. The result obtained shows that the weekly mean of does mated were higher in 21 days treatment compared to does at 14 days treatment. However, the result shows that for number of kits born alive and dead, litter size at birth, litter weight at birth, mortality before weaning and weaning days, 14 days treatment is higher than 21 days treatment. From this result, it can be concluded that Does on 21 days rebreeding interval performed better than Does on 14 days due to proper physiological development of the Does which reduces the death of kits and farmers can adopt this to maximize rabbit productivity if efforts are made to reduce the number of still birth and mortality before weaning of young rabbits.

# CHAPTER ONE

## 1.0 INTRODUCTION

Over the years in developing countries like Nigeria, the demand for animal protein has been a major concern as protein sources from animals are not readily available and most times not affordable. According to Sonaiya (1997), Nigeria has been experiencing an ever widening protein deficiency gap. The minimum protein requirement is estimated at about 75g/person/day out of which 40grams should come from animal protein. Presently, animal protein consumption has been given as 7g/person/day by FAO (FAO, 2014), which suggests a less than 16% contribution of the animal products to protein consumption. The situation is degenerating with time as the population growth is not equated with the corresponding increase in animal per capital production (Shaibu, 2014). To meet this need for animal protein, there is the need for increasing the protein production in Nigeria. In order to maximize food production and meet protein requirements in Nigeria, viable options need to be explored and evaluated (Owen *et al.*, 2008).

In Nigeria today, much of the increase in animal protein production is mainly from goat, sheep and cattle which takes a longer period of time to produce (Opara *et al.*, 2010), however, rabbit production is also a veritable way of alleviating animal protein deficiency in Nigeria (Ajala and Balogun, 2004). Their by-products serve as major diet components and are devoid of fat thus making them suitable important source of protein. Rabbit meat is of high quality, being high in protein and low in fat content. Rabbit production can be integrated into small farming systems, with the rabbits being fed on crop residues, weeds, waste fruits, vegetables and poultry droppings. The manure can be used as fertilizer for crops and gardens (Mailafia *et al.*, 2010). They also convert forage into meat more efficiently than ruminants, a special attribute for developing countries, where population pressures and food shortages are greatest.

In many cases, there is abundant local vegetation, which cannot be consumed directly by man but can be fed to rabbits (Nalugwa, 1994).

In developing countries, rabbit production is a potential practice to overcome the crisis of animal protein and provide the masses with nutrients which is majorly required for growth and development (Owen 1981). According to Saha *et al.* (2013), farmers can venture into this business despite their economic status as rabbit production and management involves low input compared to other animals.

Breeding rabbits is of economic importance in meat production in developing countries which can serve as source of cheap animal protein over the years (FAO 1996). The advantage of raising rabbits for human consumption rests on their potential biological efficiency. However, the gap between biological potential and practical achievement is still wide in terms of reproductive performance (Awojobi *et al.*, 2009). Reproductive efficiency in rabbit as is the case with other species of animals is influenced by a host of parameters such as ovulation rate, conception rate, embryonic mortality, litter survivability and rebreeding intervals (Partridge et.al. 2009). It has been observed that rebreeding intervals is one of the major parameters in reproductive efficiency that contributes a great deal because the interval between parturition and re-mating determines to a great extent the number of off springs per doe per year and it makes a whole lot of difference in the overall gain of a farmer per year. In temperate countries, one to nine days rebreeding interval has been observed (Mendez *et al.*, 2009). Mcnitt and Moody (1992) re-mated does at fourteen days after parturition and the authors suggested that it is possible to achieve forty-five to sixty off springs per doe per year. (Parigi-Bini *et al.*, 1989) reported that cyclic production is giving way to the development of different reproduction protocols since continuous rebreeding interval decreases fertility rate and length of reproductive activity. (Castellini *et al.*, 2003) also reported that only a few does can sustain a fixed rebreeding interval.

In most tropical and developing countries, the current practice is weaning kits at the age of 6 - 8 weeks and rabbit does are re-mated thereafter. Under tropical conditions, long rebreeding intervals of 1- 2 months or more are observed which reduce the number of kits raised per doe per year but also important to reduce mortality in kits due to unfavourable weather conditions. (Iyeghe-Erakpotobor *et al.*, 2005).

Rebreeding interval in different breeds of rabbits have been documented, and interaction between the re-mating interval and the reproductive performance has a significant effect on various characteristics such as fertilization rate, gestational length, receptivity, still birth, number of litter, weaning weight, litter weight, body weight of doe, mortality, growth rate (Smith and Somade, 1994). Suitable re-mating interval of rabbits may offer an opportunity for increasing the output of rabbit farming. Information available in literatures advised a fourteen-day rebreeding interval for rabbits in the humid tropics (Yamani *et al.*, 1987).

An important factor causing a big barrier is poor information about rabbit's breeding efficiency (Awojobi *et al.*, 2005).

## 1.1 JUSTIFICATION

The research was therefore carried out so as to determine the effect of rebreeding interval on reproductive efficiency in female rabbits with regards to the number of litters, body weight of does, weaning weight of kits and kits mortality with the aim. Many researches have been carried out on different exotic breeds of rabbit and their rebreeding interval has been stated in journals to improve their productivity. However, this experiment gives information on breeding of mixed breeds of rabbits at certain re-mating intervals for their optimal productivity.

## 1.2 OBJECTIVE

The objective of this study is to determine the effect of rebreeding interval on the reproductive efficiency of Rabbit Does, in terms of litters at birth, weaning weight and death of kits in a view to improving rabbit production. Moreover, this research is carried out so as to determine the most suitable re-mating interval for the humid tropic environment to ensure maximum productivity of rabbits.

## 1.3 HYPOTHESES

- **$H_O$:** There were no significant differences in reproductive efficiency due to rebreeding interval
- **$H_A$:** There were significant differences in reproductive efficiency due to rebreeding interval

# CHAPTER TWO

## 2.0. LITERATURE REVIEW.

Rabbits are small mammals belonging to the family "Laporidae", and to the order "lagomorpha" after it was removed from the order "rodentia" because of physiological and anatomical (Sardi and Cooper, 2004) differences like having two more incisor teeth than rodents. It is closely related to the hare and wombat, they were generally found in the wild before their domestication. In the wild, they live in groups in furrows, feeding mainly on vegetables like carrots. The male rabbits are called buck, the female rabbits, doe, and the young ones, kitten or kit. Rabbit habitats include meadows, woods, forests, grasslands, deserts and wetlands (www.wikipedia.com/rabbit). According to Shaibu (2014), in most regions their population is checked by their natural predators such the fox, the birds of prey and the badger.

The rabbit is an animal which is endowed with various good qualities like high prolificacy, short gestation period, high growth rate, high ability to convert forage to meat, the cost of production is low when compared to other livestock, and meat which is highly nutritional and contains low fat, sodium and cholesterol (Mailafia *et al*, 2010). The meat has a high protein content of about 26.8% and its consumption is not limited by religious and cultural practices (Biobaku and Oguntona, 1997). The high ability of the rabbit to digest large amount of fibrous feed when compared to other non-ruminant has been attached with the presence of numerous microbes in its caecum (Taiwo *et al*, 1999).

## 2.1 RABBIT PRODUCTION IN NIGERIA

Rabbit production in Nigeria is largely traditional, non-commercial oriented, family-consumption targeted, and smallholder type comprising 2-7 does and 3 bucks on average. Between 3.4-5.2% of Nigerian population keep rabbits. Rabbits are raised for meat, pets or as

laboratory animal, none is raised for pelt, fur or wool. Demographic data obtained showed that women and the children are the most involved in the routine management and are particularly tasked during the dry season when green forages is scarce (Abu, *et al.*, 2008).

In recent years there has been increased awareness of the advantages of rabbit meat production in Nigeria as a means to alleviate food shortages. This is largely due to the rabbit's high rate of reproduction; early maturity; small body sized; rapid growth rate comparable to that of broiler chicken (Rao, *et al.*, 1977) high genetic selection potential; efficient feed and land space utilization, limited competition with humans for similar food; and high quality nutritious meat (Cheeke, 1980; Arijeniwa, *et al.*, 2000). Rabbit has the ability of turning forage into high protein and yet remains within the investment ranges of the poorest families (Smith, 1991). Rabbit has been identified as an economy livestock that could bridge the wide gap in dietary protein intake in Nigeria (Cheeke, 1980). It is a micro-livestock producing about 47 kg of meat per doe per year, which is enough to solely meet the animal protein requirements of a medium sized family under small scale rural farming systems (Adedeji, *et al.*, 2012; Hassan and Owolabi, 1996). Besides, rabbit meat is rich in vitamin B and extremely low in cholesterol and sodium levels (Jithendran, 2000; Omole, *et al.*, 2005). As a result of a number of characteristics that are advantageous to smallholder subsistence rabbit farmers coupled with a greater recognition that rabbit farming has significant potential to improve food security and nutrition in Nigeria which can reduce, to some extent the country's malnutrition problems, and the diminishing bush meat supply which has been a strong impetus to small-scale rabbit farming. Complete economic analysis is needed in order to know the full production potential and how to increase profit (Abu, *et al.*, 2008).

### 2.1.1 Feeding and Nutrition in Rabbit

Feeding of the rabbit animals can be made to be either cheap or expensive depending on the farmer (Lamech, 2013). According to Schiere (2004) the main feed of the

rabbit can be prepared at no cost using roadside grass, kitchen and garden waste, although supplementation with grains and concentrates will prove beneficial and enhance growth rates. Utilizing dried tomatoes pomace in feeding rabbits up to 20% level has proven efficient and safe with no adverse effect on the animal performance and carcass qualities (Sayed and Abdul-Azeem, 2009). Feeding of rabbits can be done utilizing garden waste (e.g. cabbage leaves, carrot, and bananas) and kitchen waste from home or nearby restaurants (Lamech, 2013), though using garden waste should be done carefully because of the herbicides / pesticide residues used during cultivation (Schiere, 2004). Normally rabbits should be given access to clean water daily (Lamech, 2013). The daily requirement of a doe and her kitten is 3.79 litres of water in a warm condition (Shaefter and Harper, 2008). Generally, the feeding material may vary greatly, depending on the locality. Feeds normally given in tropical Africa include; grasses such as guinea grass (*Panicum maximum*) and stargrass (*Cynodon dactylon*); legumes include Kudzu (*Pueraria phaseoloides*), groundnut haulms and cowpea haulms; the root crops include sweet potatoes leaves, and cassava chips; and herbs like *Tridax procumbens*, Euphorbia and Aspilia (Aduku and Olukosi, 1990). In rabbit production, deficiencies of energy and protein are more pronounced than that of minerals and vitamins (Mailafia *et al*, 2010). Although by nature, rabbits are herbivorous, there is a high reduction in the digestibility of forages with high fibre content (Mailafia *et al*, 2010) and because tropical grasses are high in lignin that the temperate ones, the grasses should be cut at a very tender age when they are of high protein content and low fibre.

### 2.1.2 Sexual maturity

Normally, medium to large breeds of rabbits attain sexual maturity at 4 -5 months, the small breeds at 3.5 to 4 months and the giant breeds at 6 to 9 months of age (McClure, 2011). Does are first mated when they attain 70 to 80% of their mature body weight (Lebas *et al*, 1986), which was 4 kg in a study by Rommers *et al*, (2001). The best time to carry out first mating

depend on the breed and rearing method (Szendro, 2008). Re-mating of does can be done as soon as she leaves the nest after kindling (Cheeke *et al*, 1986; McClure, 2011). Szendro, (2008) proposed four forms or rates of re-mating and they are:

- Extensive reproduction rate: Rebreeding is done after weaning (35 - 42 days after kindling).

- Semi-extensive rate: Does are rebred after 20 days of parturition and kits are weaned at 35 - 42 days of age.

- Intensive rate: Does are rebred after kindling (4 days after kindling at the maximum) and the kits weaned at 26 to 28 days.

- Semi-Intensive rate: Rebreeding is done 10 day after kindling and weaning at 28 – 35 days.

### 2.1.3 Receptivity of Doe

The doe receptivity is a major factor which hugely determines productivity of the animal due to its ability to allow being mated by a buck. High receptivity increases litter size and low receptivity decreases productivity Ola and Olatunbosun (2013). The instantaneous behaviour of the rabbit doe when presented to an intact buck could give a very good indication of her sexual receptivity. Aggressiveness, flattening and circling are behaviours indicative of a doe unwilling to mate Ola and Olatunbosun (2013). Iyeghe-Erakpotobor *et al.* (2005) observed that doe's willingness to mate appeared to decrease as post- partum re-mating interval increased. According to Lebas (1975), rebreeding does at 14 days postpartum increases the willingness of does to accept males, which ultimately increases pregnancy rates and thus the number of rabbits produced at any one time. It is now an established fact that the shorter the rebreeding intervals, the greater the number of rabbits produced and it has been estimated that rebreeding intervals is one of the major contributory factors in reproductive efficiency as stated by (McNitt and

Moody, 1992). It is known that most of the published works have recommended 14 day-rebreeding interval in humid tropics (Yamani *et al.*, 1987). Fortur-Lamothe *et al.* (2001) suggested that the high conception rate observed in the short re-breeding interval (7 days and 14 days) was due to high willingness on the part of does to accept male when the rebreeding intervals is short.

### 2.1.4 Doe Body Weight

According to Mmereole (2009), he observed that the weekly mean body weight of does during pregnancy was significantly higher in does placed on seven (7) days rebreeding interval than in all other treatment groups throughout the four weeks of observation. This observation tends to be in agreement with the conclusion of Yamani *et al.* (1987) that reducing the rebreeding intervals improved the overall productivity of the does. Oguike *et al.,* (2008) and Nicodemus *et. al.,* (2002) concluded that body weight of does is not affected by rebreeding intervals at mating, kidding and weaning.

Moreover, Adass *et al.* (2011) showed that significant breed differences on doe weight at mating observed might be due to the inherent breed differences in weight which corresponds with the report of Iyeghe-Erakpotobor *et al.* (2001), Odubote and Akinokun (1991) and Orheruata and Ojo (1999). The significant breed variability on doe weight at 7, 14, 21 and 28 days of pregnancy recorded in this study might be attributed to many factors among which are the inherent breed differences in weight, number foetuses and nutrition. In support of these findings was the report of Orunmuyi *et al.* (2001) who observed differences in weight among rabbit due to number of foetuses.

### 2.1.5 Re-mating Interval

This is the duration between the parturition of a doe to the next mating. A suitable re-mating interval of rabbits may offer the greatest opportunity for increasing the output of rabbits per year as deduced by Oguike *et al.* (2008).

Awojobi *et al.* (2005) showed that conception rate was highest in the 21-28 days group (98.8%) and lowest in the 10-20 days group (68.4%). They found that re-mating at 10-20 days after parturition is the time of peak of lactation and therefore partitioning of low level of nutrients for high milk yield, embryonic survival and maintenance may result in the lower conception rate. Gestation length did not differ significantly among the three postpartum re-mating interval groups of 1-9, 10-20 and 21-28 days. A similar result of significance of no difference in the gestation length was observed by Oguike *et al.* (2008) who worked with 27 primiparous Dutch and Chinchilla crosses, comprising re-mating intervals at 3, 4 and 5 weeks.

It has been reported that the interaction between re-mating interval and reproductive performance has a significant effect on several characters - conception rate, gestation length, litter size, weaning weight, litter weight, weight of doe, mortality, growth rate and milk production in dams (Smith and Somade, 1994). Reports by Mcnitt *et al.* (1996) indicated that does are fertile 24hrs after kidding and therefore can be rebred at this time. Cheeke (1983) also observed that since rabbits are sight-induced ovulators, they can be rebred 24 hours post-partum. It has been observed that a short re-mating interval in doe rabbits does not permit early body recovery in the does, and this can result in decrease in fertility, milk production, litter weight at weaning and kit survivability pre-weaning (Saha *et al.*, 2013). Moreover, Harkness (1988), reported that the practice of 24hrs re-mating interval has been condemned by animal welfare group.

### 2.1.6 Conception Rate

There are considerable variations in conception rate with respect to rebreeding intervals. According to Awojobi (2005), rabbits re-mated at 28 days postpartum recorded a high conception rate of 98%, compared to Does re-mated at 10 days post-partum which recorded 68% conception rate value. Similar observations were made by Saha *et. al.,* (2013) who reported that rabbits rebred at 24 hours, 10 days and 28 days have 86.4%, 80.0% and 93.2% conception rate respectively. But Mmereole (2009) reported a rebreeding interval of 7, 14 and 21 days post-partum with 89%, 68% and 62% respectively. This was in line with results obtained by Iyeghe *et al.,* (2005) who observed 85%, 65% and 50% respectively for rabbits rebred at 14 days, 21 days and 28 days post-partum. Oguike *et al.* (2008) attributed low conception rate noted in (week 5) re-mating interval to low receptivity observed in the does in this group. On the contrary, Yamani *et al.* (1992) observed high conception rate with increased re-mating interval with 87.9% for 10 days re-mated does, while 5 days re-mating recorded less 66.4%. Low conception rate was noted in (week 5) re-mating interval and it could be attributed to low receptivity observed in the does in this group.

### 2.1.7 Parity

Studies concerning parity i.e. previous exposure to litter, have been carried out and they show that experience with the young may influence subsequent parental behavior and development of the litter through a process that involves learning and or hormonal priming. Wang and Novak (1994) showed that parity seems to have qualitative and quantitative influences on maternal behavior. Multiparous mothers exhibit increased maternal responsiveness to the young, and this behaviour is relatively stable across the pre-weaning stages as compared to the primiparous mothers (Carlier and Noirot 1965; Bridges 1978 and Wright&Bell 1978). Litter development is also affected by the history of experience of the parent where litters from the multiparous does

are usually heavier and develop faster than those from primiparous does (Wright and Bell, 1978; Myers and Master, 1983; Ostermeyer and Elwood, 1984).

### 2.1.8 Reproductive Longevity

Longevity, a non-traditionally studied trait, is defined as the age at which a doe either dies or is culled from the production herd (Lukefahr and Hamilton, 2000). Long living animals able to maintain a high rate of reproductive performance during successive lactations are of great interest in animal production to reduce the replacement cost of the animals and in terms of animal welfare (Theilgaard *et al.*, 2007). Piles *et al.*, (2006) described reproductive longevity as the period between the age at first successful mating, assessed by pregnancy diagnosis and at first kindling to the time the doe is culled or dies or the ability of the female to delay involuntary culling. Breed differences in doe reproductive longevity would affect cumulative litter production and replacement costs that impact herd profitability. In meat rabbit production, the doe replacement rate is about 120% (Rafel *et al.*, 2001) with about 50% of the dead or culled does replaced during their first 3 production cycles (Rosell, 2003) or at between 1 to 2 years to be replaced by a new generation (Piles *et al.*, 2006).

### 2.1.9 Litter weight at birth

Litter size and weights at birth and at weaning are an indication of mothering ability of the doe hence its role in rabbit production (Lebas *et al.*, 1997).

Oguike *et al.* (2008) recorded a significant high average litter weights at birth for groups of weeks 4 and 5 compared to week 3 group which could be due to the opportunity to have their reproductive organs undergo some level of involution and also allowed to regain body reserves

probably lost during gestation and kindling before re-mating. He also observed that re-mating at 4 and 5 weeks post-partum afforded some days rest to the does.

However, according to Mmereole (2009), does placed on (7 day interval) produced higher litter weight than other treatment groups. This observation tends to agree with the opinion by Partridge *et al.* (1984), Lebas *et al.* (1986) and Fortune-Lamothe *et al.* (2001) who explained that early weaning provides higher viability and faster growth in weaners. They all reported sharp increase in the growth rate for those litter from 7 days re-mating interval. Moreover, Patridge *et al.* (1984) reported higher values of litter weight than values obtained by Mmereole (2009). While Patridge *et al.* (1984) reported litter weight at birth of 8.94, 8.81 and 8.72 for does re-mated at 7 days, 14 days and 21 days respectively, Iyeghe *et al.* (2005) reported 6.67, 6.80, and 5.80 respectively for the same re-breeding intervals. The variations reported by the different authors have been explained as due to the different strains used in the experiments (Mandez *et al.* 1986).

### 2.1.10 Litter size

The doe in rabbits is known to be polytochous and the number of kits born and raised to weaning is an indicator of doe performance (Mcnitt *et al.*, 1996). Litter size at birth and at weaning has been the objective of selection in several studies involving rabbit populations (Baselga *et al.*, 1992; de Rochambeau *et al.*, 1998; Gomez *et al.*, 1996). Litter size at birth is highly dependent on ovulation rate, uterine capacity and embryonic or foetal survival in the doe (Argente *et al.*, 2003), while litter size at weaning depends on litter size at birth, nest quality and survival rates of the litter (Lebas *et al.*, 1997).

### 2.1.11 Weaning weight

It has been observed that different rebreeding intervals has significant effects on the weaning weights of kits whose dams were rebred at 10 days, post-partum, when compared to others whose dams were rebred at 14 days, 21 days and 28 days post-partum (Iyeghe-Erakpotobor *et al.,* 2005). Earlier weaning than the standard age and weight belonging to each breed, due to culling or death of a doe, increases post-weaning mortality rate. Chimtelin (1992) showed that groups in which the weaning weight was less than 600g weaning weight or higher. The above results also tallies with the observation of Morrisse et al. (1985). Post weaning mortality is also affected indirectly with doe re-mating system and litter size at birth, since the doe which remates immediately after parturition and that one which kindle high litter size produce kits with lower weaning weights (El-Maghawry, 1993).

### 2.1.12 Still Births

This occurs during birth whereby the foetus is dead before expulsion. Mmereole (2009) observed that the highest number of still births occurred among kits of does remated in 7 days postpartum. While the percentage of still births was 13.33% for rabbits re-mated 7 days postpartum, the percentage stillbirths for does re-mated at 14 day and 21 day rebreeding intervals were 6.67% and 3.33% respectively. Patridge *et al.*, (1984) reported percentage still birth of 31% and 11% for does re-mated at 14 and 21 days intervals, Saha *et al.* (2013) reported mortality of kits at (40%, 50% and 20% of does re-mated within 24 hours after parturition, at 10 days and 28 days after parturition, respectively), Similar results showed by Partridge *et al.* (1984) in which least mortality (30%) was observed in does re-bred 1 day postpartum and 42%, 43% and 47% of does rebred 7, 14 and 21 days postpartum respectively.. However, Mandez *et al.* (1986) reported that stillbirth in does are independent of the rebreeding intervals. Iyeghe-

Erakpotobor *et al.* (2005) reported higher mortality for the 21 and 28 days postpartum re-mating of does compared to 14 days postpartum.

### 2.1.13 Milk yield

In female rabbit, milk production and feed intake increase with litter size (Lebas, 1987). However, an increased feed intake is not enough to compensate for the higher needs for milk production; (Fortun-Lamothe *et al.,* 1999 and Castellini *et al.,* 2003). Rabbit does can sustain lactation and gestation simultaneously but this overlapping depresses several aspects of reproductive activity (sexual receptivity, ovulation, fertilization, implantation, embryo survival) due to hormonal antagonism (prolactin, Theau–Clement *et al.* 2000 and Fortun-Lamothe, 2005) and energy deficit.

# CHAPTER THREE

## 3.0 MATERIALS & METHOD

This research was carried out at the Rabbit section of Teaching and Research Farm of Federal University Oye-Ekiti, Ikole Campus, Ekiti state, Nigeria.

Ikole-Ekiti is located at Latitude $7.7983^0$ North and Longitude $5.5145^0$ East and Altitude 461. The annual temperature range is $25\text{-}36^0$ C and the annual rainfall is about 2000-2700mm. Rainy season is between early April and late October. Ikole-Ekiti is located in the Derived savannah region of Nigeria.

## 3.1 ANIMALS AND EXPERIMENTAL PROCEDURES

Twenty-five (25) matured does and Five (5) matured bucks were used in this experiment. Two groups of rabbits of Pure Hyla Rabbits and Mixed breeds were used and were randomly distributed into 14 and 21 days rebreeding interval. Mating plan was done to avoid mating of related individuals to prevent inbreeding depression. Five (5) does were mated to one (1) buck. At the beginning, the does were mated by taking the doe to the buck. As soon as each doe was taken to the buck, within few minutes, mating was completed. However, where mating was unsuccessful, the doe was taken out from the buck and re-tried later. A buck is expected to mate a doe within 24 hours. The does were divided into two (2) different treatments with thirteen (13) does in one treatment (14 days rebreeding interval) and twelve (12) does in the second treatment (21 days rebreeding interval). All the females were first mated and after parturition, they were allocated to treatments. Before mating, the weight of the doe was recorded and it was taken again at 14, 21 and 28 days after mating. This is to determine the weight changes during pregnancy. At some days to kindling, the kindling boxes were introduced to the does so that they can easily kindle in the boxes provided to avoid kindling on

the cages so as to prevent kits mortality. After kindling, the litter size and litter weight, doe weight as well as the number of still births were recorded for each treatment group. The kits were weighed at seven (7) days interval before weaning them that is, 7,14,21,28 and 35 days respectively. At 35 days, the kits were weaned and tagged for identification The weight of the weaned kits were taken at 7, 14, 21, 28, 35 and 42 days after weaning. Dead kits were removed from the cages and are disposed far away from the farm. The kits are dewormed when necessary so as to decrease worm infestation and load.

## 3.2 FEEDING AND NUTRITION

Does were given unrestricted access to water supply and feed and were fed balanced diet. They were fed concentrates in the morning and they were fed with forages in the afternoon such as; *Tithonia diversoifolia, Panicum maxima, Tridax spp* etc. Feed and water was provided in earthen pots secured to prevent spillage.

**Fig. 1**

## 3.3 HOUSING AND ENVIRONMENT

Animals were individually caged in partitions measuring 2 x 2 x 2 m. Cages are made of wooden frames with wire netting on the sides and the base in a flat-deck system. Cages were kept indoors in a closed building roofed with iron sheet and equipped for cross ventilation. The housing used natural ventilation with no thermal insulation or cooling system. Does were kept under natural lighting throughout the experiment.

**Fig 2.**

**Fig 3.**

# CHAPTER FOUR

## 4.0 RESULTS

Table 1 shows the results of the body weight of Does at mating, 14, 21 and 28 days post-mating, at kindling and at weaning.

## 4.1 EFFECT OF RE-MATING INTERVAL ON WEIGHT OF DOES

The results obtained showed that the body weight of the Does at mating were not significantly different ($P>0.05$). No significant difference in the body weight at mating between does mated at 14 and 21 days. The body weights values obtained at mating were 2.02kg and 2.14kg for Does mated at 14 and 21 days respectively.

There were no significant differences between the body weight of Does at 21 days post-mating at different postpartum re-mating interval ($P>0.05$). Body weights were 2.29kg and 2.39kg for 14 and 21 days postpartum respectively.

There were no significant differences between the body weight of Does at 28 days post-mating at different postpartum re-mating interval ($P>0.05$). The values were 2.43kg and 2.39kg for 14 and 21 days postpartum respectively.

At parturition, the values obtained were 2.16kg and 2.19kg for does mated at 14 and 21 days respectively with no significant difference ($P>0.05$).

The result showed significant differences between the body weight of doe at weaning for 14 and 21 days re-breeding interval ($p<0.05$). The values obtained were 2.27kg and 1.28kg for does mated at 14 and 21 days respectively with does at 14 days postpartum having more weight compared to does in 21 days treatment.

## 4.1 Table 1: Effect of re-mating interval on weight of does

| | Postpartum re-mating intervals | | |
|---|---|---|---|
| **Parameters** | **14 days** | **21 days** | **P-value** |
| **Doe weight at mating (kg)** | 2.02 | 2.14 | 0.3980 |
| **14 days post mating (kg)** | 2.31 | 2.18 | 0.3411 |
| **21 days post mating (kg)** | 2.29 | 2.39 | 0.5000 |
| **28 days post mating (kg)** | 2.44 | 2.39 | 0.7294 |
| **Doe weight at kindling (kg)** | 2.16 | 2.19 | 0.7831 |
| **Doe weight at weaning (kg)** | $2.27^{a}$ | $1.28^{b}$ | 0.0304 |

## 4.2 EFFECTS OF RE-MATING INTERVAL ON REPRODUCTIVE PERFORMANCE OF DOES

Table 2 shows the effect of re-mating interval on the reproductive performances of Does

There were no significant differences between the gestation lengths for the two rebreeding intervals. The values obtained were 33.05 days and 32.79 days for 14 and 21 days respectively.

Litter size at birth showed that there were significant differences between the two rebreeding intervals. The result also showed that 14 days rebreeding interval is higher than that of 21 days rebreeding interval with values 5.95 and 4.71 for 14 and 21 days respectively.

The result from the number of kits born alive showed that there were no significant differences between the different postpartum re-mating interval ($p>0.05$). The values gotten were 4.69 and 4.43 for 14 and 21 days postpartum respectively.

There were significant differences between the numbers of kits born dead at different postpartum re-mating interval ($p<0.05$). The results obtained were 1.26 and 0.29 for 14 and 21 days postpartum respectively.

For kits mortality before weaning, there were no significant differences between does mated at different postpartum interval. The values gotten were 3.05 and 2.57 for 14 and 21 days postpartum respectively.

**TABLE 2: Effects of re-mating interval on reproductive performance of does**

| | **Postpartum re-mating intervals** | | |
|---|---|---|---|
| **Parameters** | **14 days** | **21 days** | **P value** |
| **Gestation length (days)** | 33.05 | 32.79 | 0.8044 |
| **Litter size at birth** | 5.95[a] | 4.71[b] | 0.06443 |
| **Number born alive** | 4.68 | 4.42 | 0.6615 |
| **Number born dead** | 1.26[a] | 0.29[b] | 0.0340 |
| **Mortality before weaning** | 3.05 | 2.57 | 0.5155 |

## 4.3 EFFECTS OF RE-MATING INTERVAL ON LITTER WEIGHT AT BIRTH, AT WEANING AND POST-WEANING.

Table 3 shows the effect of re-mating interval on litter weight at birth, at weaning and days after weaning.

The results obtained showed that there were significant differences between the weight of kits at weaning at different postpartum interval ($p<0.05$). The values obtained were 0.45 and 0.18 for does mated at 14 and 21 days respectively.

The result from 14 days post-weaning weight showed that there were significant differences between the two postpartum re-mating intervals ($p<0.05$). Furthermore, the kits from does at 14 days re-mating interval weigh higher than kits from dams mated at 21 days re-mating interval after 7 days post-weaning. The weights obtained were 0.53kg and 0.25kg for 14 and 21 days respectively.

The result from 14 days post-weaning also shows that there were significant differences between the two postpartum re-mating intervals ($p<0.05$). Furthermore, the kits from does at 14 days re-mating interval weigh higher than kits from dams mated at 21 days re-mating interval after 14 days of weaning. The values obtained were 0.52 and 0.23 for does mated at 14 and 21 days respectively.

In the results obtained from the experiment, it shows that at 21 days post-weaning there were no significant differences between does mated at different postpartum intervals ($p>0.05$). The values obtained are 0.25 and 0.5 for 14 and 21 days respectively.

In the results obtained from the experiment, it shows that there were no significant differences between does mated at different postpartum intervals ($p>0.05$). The results obtained are 0.23 and 0.25 for 14 and 21 days respectively.

In the results obtained from the experiment, it shows that there were no significant differences between does mated at different postpartum intervals ($p>0.05$). The results obtained are 0.41 and 0.46 for 14 and 21 days respectively.

**TABLE 3: Effect of re-mating interval on litter weight at birth, at weaning and post-weaning.**

| | Postpartum re-mating intervals | | |
|---|---|---|---|
| **Parameters** | **14 days** | **21 days** | **P-value** |
| **Litter weight at Birth (kg)** | 0.25 | 0.24 | 0.6443 |
| **Litter weight at Weaning (kg)** | $0.45^{a}$ | $0.18^{b}$ | 0.0018 |
| **7 days post weaning (kg)** | $0.53^{a}$ | $0.25^{b}$ | 0.0144 |
| **14 days post weaning weight (kg)** | $0.52^{a}$ | $0.23^{b}$ | 0.0392 |
| **21 days post weaning weight (kg)** | 0.25 | 0.50 | 0.0782 |
| **28 days post weaning weight (kg)** | 0.23 | 0.25 | 0.4165 |
| **35 days post weaning weight (kg)** | 0.41 | 0.46 | 0.7678 |

# CHAPTER 5

# DISCUSSION

## 5.1 EFFECT OF RE-MATING INTERVAL ON WEIGHT OF DOES

The result from this experiment showed significant difference between the body weight of does at weaning re-mated at 14 and 21 days re-breeding interval ($p>0.05$) and this finding goes against the findings of Saha *et al* (2013); Oguike *et al.* (2008); Nicodemus *et al.* (2002) who reported that there was no significant difference in the body weight of Does at weaning following different rebreeding intervals.

The non-significant difference in Does weight re-mated 14 and 21 days interval as obtained in this study agrees with that of Saha *et al.* (2013) and the authors deduced that there was no significant difference. Similar results were observed by Oguike *et al.* (2008) whereby an experiment was conducted on rabbits re-mated at 3 weeks, 4 weeks and 5 weeks postpartum intervals. Also, Nicodemus *et al.* (2002) reported that there was no significant effect on body weight of rabbit Does at different mating intervals.

## 5.2 EFFECTS OF RE-MATING INTERVAL ON REPRODUCTIVE PERFORMANCE OF DOES

Gestation is a physiological state and constant. It is not dependent on the breed and management but rather by the species. A range of 28 to 30 days was reported by (Chineke, 2006 and Fayeye and Ayorinde, 2008). The non-significant difference obtained in the gestation length agrees with the findings of Oguike *et al.* 2008 who also reported no significant difference ($p>0.05$) in the gestation length of the different postpartum re-mating intervals of 3, 4 and 5 weeks.

No significant effect was deduced from this experiment on number of kits born alive. This observation agrees with the findings of Partridge *et al.* (1984); Lebas *et al.* (1986) and Mmereole (2009) who deduced that the litter weight increases by decreasing re-mating interval.

## 5.3 EFFECTS OF RE-MATING INTERVAL ON LITTER WEIGHT AT BIRTH, AT WEANING AND DAYS AFTER WEANING

On the litter size, the significant effect obtained agrees with the findings of Partridge *et al.* (1984) who mated Does at 1-9 and 10-20 days, Fraga *et al.* (1989) who mated Does at 1 and 9 days postpartum, Iyeghe-Erakpotobor *et al.* (2005) who mated Does at 14, 21 and 28 days and Oguike *et al.* 2008 who mated Does at 3, 4 and 5 weeks postpartum. However, this result is contrary to observation of Addass *et al.* (2011) who mated Does at 7, 14 and 21 days whereby the authors reported significant difference on litter weight at 14 days postpartum. Addass *et al.* (2011) attributed the variability on litter weight at 7 and 14 days re-mating interval to the mothering ability of the different breeds. In this experiment, it was deduced that reducing re-mating interval increases the litter weight at birth and this agrees with result of Iyeghe-Erakpotobor *et al.* (2005) who reported that Does mated 14 days postpartum had more kits alive at 7 days up to 28 days postpartum than those rebred at 21 and 28 days postpartum. The results of Collin *et al.* (1980) and Perrier *et al.* (1982) disagrees with this by concluding that increasing the re-mating time interval increases litter size.

The body weight of kits at weaning showed significant differences. This disagrees with the findings of Iyeghe-Erakpotobor *et al.* (2005) and Saha *et al.* (2013) who concluded that there are no significant differences in body weight of kits at weaning for 14, 21 and 28 days and 24 hours, 10 and 28 days respectively.

The result obtained from this experiment for the mean weight of kits at post-weaning disagrees with the observations of Partridge *et al.* (1984); Lebas *et al.* (1986) and Fortune-Lamothe *et al.* (2001) who explained that early weaning provides higher viability and faster growth in weaners.

The mortality of kits after weaning showed significant differences. This result agrees with the reports of Partridge *et al.* (1984) and Iyeghe-Erakpotobor *et al.* (2005) who reported no significant effect on kits mortality at different rebreeding intervals. However, they reported higher kits mortality at 21 and 28 days postpartum re-mating intervals which is contrary to the report from Awojobi *et al.* (2008) and result obtained from this experiment.

The result obtained showed that there were significant differences between the numbers of kits born dead at different postpartum re-mating interval. This result disagrees with the findings of Oguike *et al.* (2008) who reported no significant difference in stillbirth at different rebreeding intervals.

For kits mortality before weaning, there were no significant effects in the postpartum re-mating interval. This finding agrees with Partridge *et al.* (1984) and Iyeghe-Erakpotobor *et al.* (2005) who reported the same. However, Iyeghe-Erakpotobor *et al.* (2005) reported higher mortality for the 21 and 28 days postpartum rebred does compared to does rebred 14 days postpartum and concluded that the higher the re-mating interval, the higher the death of kits before weaning which is contrary to the result from this experiment.

There were no significant differences between the litter weights of kits at birth for the different postpartum re-mating interval. Litter weight at birth followed the same trend as reported by Iyeghe-Erakpotobor *et al.* (2005) and agrees with the findings of Partridge *et al.* (1984) who reported that kit birth weight appeared to be unaffected by reducing the re-mating time after parturition. However, this is contrary to the result obtained by Oguike *et al.* (2008) who deduced that there are significant differences in the different postpartum re-mating intervals.

No significant differences between the number of litter sizes at birth. The result obtained is in tandem with the findings of Orunmuyi *et al.* (2001) and Addass *et al.* (2011) whereby 14 days rebreeding interval had higher number of litter size compared to other rebreeding intervals.

# CHAPTER SIX

# SUMMARY, CONCLUSIONS & RECOMMENDATIONS

## 6.1 SUMMARY

Reproduction parameters recorded in this experiment on the doe which include weight of doe at 14, 21 and 28 days after mating, weight of doe at kindling and weight of doe at weaning. The performance of does include; body weight of doe at 14 days mating, body weight of doe at 21 days mating, body weight of doe at 28 days mating, gestation length, litter weight at birth, number of kits born, number born alive/litter size at birth, number born dead. Litter traits include; litter weight at birth, body weight of kits at weaning, weaning days, body weight of kits at 7 days weaning, body weight of kits at 14 days weaning, body weight of kits at 21 days weaning, body weight of kits at 28 days weaning, body weight of kits at 35 days weaning and mortality before weaning.

In the experiment, the result showed that does re-mated at 21 days postpartum had higher body weight at mating, 35 days after weaning and days of mortality compared to does mated at 14 days re-mating interval. However, 14 days postpartum re-mating interval had higher values number of kits born, litter size at birth, number of kits born alive, number of kits born dead, weight at 7,14,21 and 28 days after weaning, mortality before weaning.

## 6.2 CONCLUSION

Based on the results from the experiment, 21 days postpartum re-mating interval is preferred to 14 days because the mortality of kits was reduced due to proper physiological development of the doe. This will boost rabbit productivity in Nigeria and farmers can adopt this re-mating interval for optimal productivity.

## 6.3 RECOMMENDATION

- More research should be carried on re-mating intervals for different breeds to ascertain the most suitable rebreeding interval for the breeds of rabbits so as to improve adaptability.

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