

Reproductive Performance of Local Rabbits from Three Ecotypes in Northern Ghana

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Abstract

The objective of this study was to compare the reproductive performance of local rabbits from three different locations in northern Ghana. Purposive sampling was used to acquire 90 weaned rabbits, which were reared for nine months. In all, 24 females and 6 males were reared in each of the three regions in northern part of Ghana (Northern, Upper East and Upper West) for reproductive traits measurement. Parameters measured were gestation, litter size at birth, litter size at weaning, birth weight and weaning weight. Data collected were subjected to analysis of variance using SPSS. Average of three kindles per doe was recorded over nine months. Litter size ranged from 1 to 5 kits in the first kindle (parity) in all the regions. It however, increased from 1 to 8 kits in the second and third parity (kindle). Animals in the Upper West region weighed heavier than those in the other regions except weaning weight in the first kindle in which case the Northern region was superior. Birth weight in northern region was lower ($p < 0.05$) than that of Upper West region but similar ($p > 0.05$) to that of the Upper East region. Upper West region had the highest birth weight ($p < 0.01$) than Northern and Upper East regions. Location (region) influenced both birth and weaning weights and so should be considered in selection and breeding of rabbits in this part of the country. Prewaning mortality was high when does were beginners in reproduction.

Keywords: Mortality, kindling, weaning weight, gestation, litter size

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INTRODUCTION

Rabbits are characterized by high production traits, such as high fertility, prolificacy and early puberty [1]. Profitability of production depends on the reproduction intensity and the number of kits being weaned from one litter [2, 3]. Researchers reported that the combinations of these characteristics are unique [4]. In addition to this, rabbits have a number of other characteristics that might be advantageous to subsistence farming system, such as their small body size, short generation interval with a relatively short gestation period averaging 30–31 days.

It has been reported that litter size ranged from 1 to 10 with a mean of four kits per litter [5]. An average of 5 to 8 kits per litter was obtained in Nigeria [6]. An average of five kindlings per year was reported in the Forest zone of Ghana [7]. According to a study [8],

two kindlings per year recorded higher percentage as against three kindling per year in the Upper East region of Ghana, which was attributed to poor nutrition. It is stated that poor feeding affects the number of times a rabbit will kindle in a year [9]. It has been reported that attempts at achieving six kindlings per doe per year tended to result in high kit mortality [5].

The productivity of rabbits depends principally on the number of young reaching the market and their growth rate. Prewaning mortality percentage (PWM %) of kit rabbits is of vital importance in commercial rabbit farming, where it plays a major role in determining the net financial income of the farms [10]. With the increase of litter size and decrease of mortality income becomes more elevated [11]. The genotype of both the mother and fetuses play a vital role in determining birth weight,

while the consequent litter weights basically depend, beside the fetuses' genotype, on the suckled milk from the dam [12]. Litter weight at weaning is controlled by the number of kits survived at weaning [13]. The objective of the present study was to evaluate the effect of location (region) on reproductive performance of local rabbits in northern Ghana.

MATERIALS AND METHODS

Location of Study

The study took place in the Northern, Upper East and Upper West Regions of Ghana. These three regions lie within latitude 8°N, 11°N and longitude 0°E 3°W [14]. The vegetation of these areas consists of grassland dotted with small drought resistant trees. The areas experience one rainfall season annually, beginning in March/April and ending in September/October. The average temperature is 31°C with a minimum of 28.2°C and a maximum of 42°C [14].

Study Population, Sample Size and Sampling

Ninety (90) rabbits (local genotype) of similar age were purchased from the three northern regions and used for reproductive traits measurement. In all, 18 males and 72 females were used. Purposive sampling was used to acquire 90 weaned rabbits (18 males and 72 females) which were reared for nine months. In all, 24 females and 6 males were reared in each region for reproductive traits measurement.

Management of Experimental Animals

The animals were purchased in the first week of May 2013 and housed for nine months in their respective regions under the care of selected rabbit farmers. For the first month, the rabbits were segregated according to sex, to allow the female rabbits to purge their systems of residual semen. After the first month, the rabbits were randomly grouped into families of one male to four females. After being allowed to mate, each female was kept in a separate cage to allow for easy identification of offspring at birth. Within 12 h after kindling, litters were checked, weighed and recorded. Animals were housed by the farmers in their various locations. Houses were made of locally available materials. Varied house types were used. Walls of the houses were

made of mud, wood, wire or iron sheets with the roof being thatch or iron sheets. The floors of the houses were made of concrete, wood or sand. Some holes were created in the houses to serve as nesting and hiding places for the rabbits. They were either made of concrete, wood or pipes. In some cases, pots, lorry tyres and rubber cans or empty gallons were used as nests and hiding places. In those with dust (sand) floors, rabbits created their own holes and nests by digging.

Rabbits were fed with a wide range of leaves, grass and food wastes from household. Some of the feed materials include pito mash, corn chaff, groundnut leaves, acacia leaves, bean vines, sweet potato leaves, fig leaves, cassava and yam peels, plantain peels and grasses. These were freshly cut and fed to animals or dried before feeding. There was no any careful balancing of the diets. Feed and water were administered *ad libitum*. They were however, supplemented and alternately fed with standard mixed feed especially in the dry months.

Although rabbit production in developing countries is based on low cost feeding using locally available forages/weeds, rabbits should also be supplemented with concentrates either purchased or locally made as this improves the growth and breeding performance of the rabbits [15, 16]. The feed was always moistened before given to the animals. Table 1 below contained detail of the supplementary diet.

Table 1: Feed Composition of the Supplementary Diet.

Feed ingredient	Inclusion level (%)	Estimated CP
Corn bran	63.5	12.7
soya bean meal (full fat)	15	5.55
Pito mash	10	2.3
groundnut haulms (hay)	10	1.3
Salt (iodated)	0.5	-
Vitamin premix	0.5	-
Dicalcium phosphate	0.5	-
Total	100	21.85

CPC = crude protein content, CP = crude protein and % = percent

Data Collection

Reproductive traits were defined and measured as follows:

Litter size at birth: the number of live kids per birth per doe at parturition.

Litter size at weaning: the number of weaned kids in a litter.

Mortality of adult rabbits over the nine months.

Offspring characteristics: Birth weight and weaning weight.

Littering interval: how frequent a doe litters in a year.

Offspring survivability: number of young ones survives up to weaning.

Statistical Analyses

Data collected were subjected to analysis of variance using (SPSS, version 17).

RESULTS

Reproduction Performance

Litter size ranged from 1 to 5 kits at the first kindle (parity) in all the regions. It however, increased to the range from 1 to 8 kits in the second and third parity (kindle). Litter size ranging from 1 to 6 survived up to weaning in the first and second kindles. This reduced to 1-5 in the third kindle (Table 2). The Rabbit reproduction characteristics are presented in Table 3.

Table 2: Descriptive Statistics of Reproductive Traits of Rabbits in Northern Ghana.

Litter size	% of adults nursing in 1st parity		% of adults nursing in 2nd parity		% of adults nursing in 3rd parity	
	Birth	Weaning	Birth	Weaning	Birth	Weaning
<i>Upper West Region</i>						
1	13.0	18.2	8.7	8.7	9.1	9.1
2	39.1	50.0	21.7	30.4	22.7	22.7
3	30.4	31.8	13.0	21.7	18.2	27.3
4	13.0		21.7	21.7	18.2	18.2
5	4.3		17.4	13.0	13.6	9.1
6			13.0	4.3	9.1	13.6
7			4.3		4.5	
8					4.5	
No	23		23		21	
<i>Upper East Region</i>						
1	21.7	30.4	10.0	20.0	11.1	23.5
2	43.5	60.9	15.0	15.0	16.7	17.6
3	21.7	8.7	15.0	25.0	16.7	11.8
4	13.0		25.0	20.0	22.2	23.5
5			15.0	15.0	11.1	5.9
6			15.0	5.0	22.2	17.6
8			5.0			
No	23		20		18	
<i>Northern Region</i>						
1	27.3	25.0	4.8	9.5	22.2	27.8
2	31.8	55.0	23.8	19.0	11.1	16.7
3	22.7	20.0	23.8	38.1	33.3	33.3
4	13.6		14.3	4.8	16.7	16.7
5	4.5		14.3	28.6	11.1	5.6
6			14.3		5.6	
7			4.8			
No	22		21		18	

No = number of adults in each kindle (nursing mothers); % = percentage

Table 3: Effect of Location (Region) on Reproductive Traits of Rabbits.

Variable	Region	1st kindling	P-Value	2nd kindling	P-Value	3rd kindling	P-Value
GS	UWR	30.00±0.43	0.462	30.89±0.36	0.435	30.17±0.31	0.634
	UER	30.71±0.43		30.80±0.34		30.50±0.27	
	NR	30.13±0.40		30.25±0.38		30.17±0.31	
LSB	UWR	3.57±0.34	0.824	5.11±0.50	0.824	5.67±0.60	0.117
	UER	3.27±0.34		4.70±0.47		4.00±0.52	
	NR	3.50±0.32		5.00±0.53		5.17±0.60	
BWT (g)	UWR	42.62±1.26 ^a	0.003	43.78±1.42 ^a	0.012	46.85±1.60 ^a	0.019
	UER	36.01±1.26 ^b		37.65±1.35 ^b		43.59±1.38 ^{ab}	
	NR	36.85±1.17 ^b		38.87±1.51 ^b		39.65±1.60 ^b	
LSW	UWR	2.00±0.25	0.488	3.56±0.44	0.667	4.50±0.61	0.087
	UER	1.71±0.25		3.20±0.42		2.63±0.53	
	NR	2.13±0.23		3.75±0.46		3.83±0.61	
WWT (g)	UWR	322.05±14.88	0.202	454.35±19.33 ^a	<0.001	466.00±25.21 ^a	0.025
	UER	310.32±14.88		341.70±18.34 ^b		372.09±21.83 ^b	
	NR	347.25±13.92		335.71±20.51 ^b		378.54±25.21 ^b	

P-Value = probability value, GS = gestation, LSB = litter size at birth, BWT = birth weight, LSW = litter size at weaning, WWT = weaning weight, UWR = Upper West Region, UER = Upper East Region and NR = Northern Region.
 NB: Means between/among regions with different postscripts are significantly different ($p < 0.05$; $p < 0.01$).

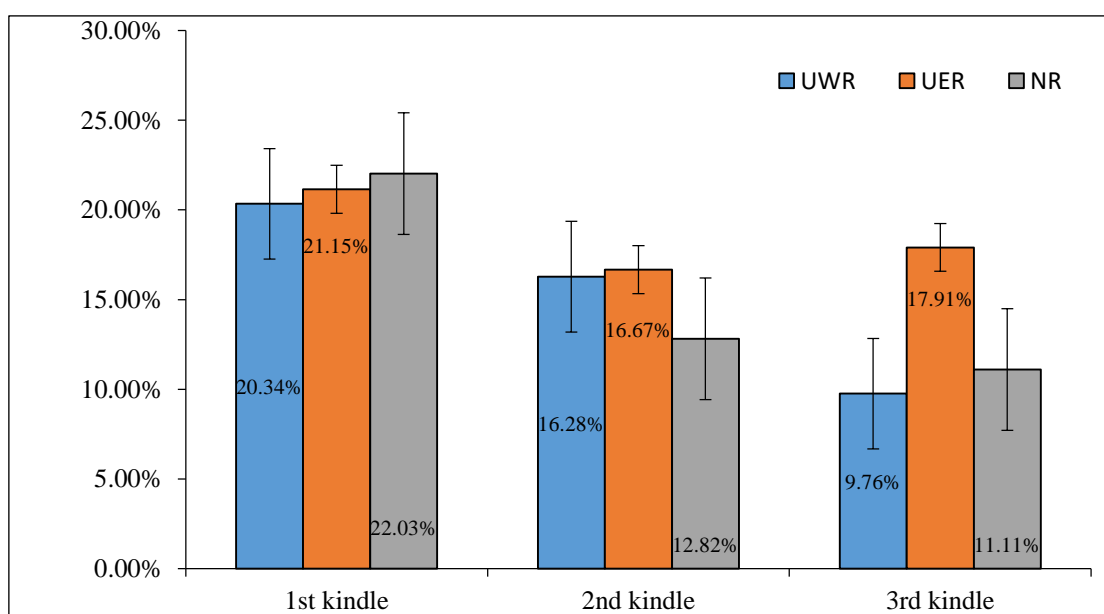


Fig. 1: Mortality Rate in Young Rabbits (birth to weaning) in Northern Ghana. (UWR = Upper West region; UER = Upper East region; NR = Northern region)

Mortality in Rabbits

Mortality was high (above 20%) during first kindle across all regions. Reduction in mortality was then observed right from the second kindle and continued in the third kindle in descending order with exception of the Upper East region (Figure 1). At the end of the experiment, 5 (2 in UER and 3 in NR) out of 72 adult animals (does) died, representing 6.94 percent.

DISCUSSION

Reproduction Performance of Rabbits

Litter size recorded in the study ranged 1–8 kits per kindle depending on the parity of the doe. This result is higher than the 1–6 range recorded earlier in the Upper East Region but lower than the average range of 8 to 10 kits per litter reported by researchers [8, 17]. The findings is similar to that of earlier reports that litter size ranged from 1 to 10 with a mean of

four kits per litter but lower than the average range of 5 to 8 kits per litter obtained in Nigeria [5, 6]. Previous work stated that the conditions which prevailed in West Africa do not permit farmers to have a large litter size which is not in line with this finding [18].

Average gestation in this study was 30 days in all the regions in northern Ghana with average of three kindlings within the nine month period. This suggests that gestation obviously is strongly controlled by genes but could be influenced by environment. This is lower than the average gestation period of 31 to 32 days reported [17]. The finding corroborates the report that rabbits have short generation interval with a relatively short gestation period average of 30–31 days [4].

In a study conducted earlier, two times kindling per year recorded higher percentage as against three times kindling per year, which was attributed to poor nutrition [8]. This assertion may be true as the feeding in this study was improved as compared to the ordinary feeding by local farmers, hence improved number of kindling. It has been stated that poor feeding affects the number of times a rabbit will kindle in a year [9].

There was significant ($p < 0.05$) effect of region on both birth and weaning weights across all phases of kindling except weaning weight in the first kindle (Table 3). Kits' weights increased with increasing age and parity of the does. This difference may be due to influence by nongenetic factors such as feeding, housing, parity, climate and management as stated by earlier reports [19–25]. Animals in different herds perform differently because they are given different treatment or management. They further asserted that animal performance varies with years due to differences in climatic variables in different years. According to earlier reports, such a character as milkyield in does, although influenced to some extent by inheritance, is affected by environment, especially diet, by the suckling of young and the parity of the litter [26]. Females, giving birth for the first time, produce smaller litter that has low weights and growth rates than older females [19–25]. Animals in the Upper West region

weighed heavier than those in the other regions except weaning weight in the first kindle. Birth weight in northern region was lower ($p < 0.05$) than that of Upper West region but similar ($p > 0.05$) to that of the Upper East region. The average birth weights recorded for the various regions in this study agree with the other findings, that the weight of a rabbit at birth is about 30–40 g but lower than the kits average weight of 51.0 g reported by [27, 28].

High kit mortality was recorded during the first kindle (June) in all regions. The lowest percentage of preweaning mortality was found in rabbits born in September and November, which may be due to the favorable conditions especially ambient temperature in these two months. This contradicts the report that the lowest percentage of preweaning mortality was found in rabbits born in March and January, which, they attributed to the favourable conditions especially ambient temperature in these two months [29]. This difference may be due to regional differences in climate or weather and/or difference in the breeds of rabbits used with respect to the locality.

CONCLUSION

Average of three kindles per doe was recorded over nine months. Litter size ranged 1–8 kits per kindle per doe. Location (region) influence both birth and weaning weights with Upper West Region being superior in most cases. Kits' weights increased with increasing parity of the does. Preweaning mortality was high when does were beginners in reproduction.

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