# Production and reproduction characteristics of a flock of Baggara goats of South Kordofan, Sudan.

**A. A. Ageeb**

*Western Sudan Agricultural Research Project (WSAP)*

*El Father Research Station, P. O. Box 117, El Father, Sudan.*

## Summary

**The performance of Baggara goats is discussed in -this paper. The type was found to be small according to goat classification of Devendra and Burns (1983). The kidding rate (kid/doe/yr.), age at first kidding, kidding interval, gestation length and service period were estimated (± standard deviation) as 1.89 kid, 15.3 ± 1.7 month, 234.1 ± 28.9, 147.0 ± 4.8 and 76.1 ± 28.5 days, respectively.**

**Weight at birth, at 6 and 12 months (for both sexes) and at maturity (above 18 months of age) were 1.9 ± 0.5, 11.3 ± 2.6, 16.9 ± 2.3 and 26.4 ± 5.7 (female), 30.8 ± 8.0 (male) kg, respectively.**

**The amount of meat produced per kilogramme of breeding doe was 0.214 kg. The flock performance meat productivity (FPP), in meat equivalent, were estimated as 1010.8 and 1016.1 kg, respectively. The flock performance efficiency (FPE) was 87.3%.**

**The breed is relatively prolific and a good meat producer.**

## Introduction

**Goats are important species of livestock in most traditional agricultural production systems in Africa. The**

**recognition of the importance of goats is developed as a result of the capacity that goats can survive under marginal conditions unfavourable for cattle and sheep.**

**In the Sudan, goats play an important integral component in most traditional production systems. They provide milk for children, meat, skins and cash income from sales (Ageeb, 1986). The total number of goat in the country was estimated at 14 million head (Ockerman and Aziz, 1985); the majority are reared under arid and semi-arid zones. The contribution of the goats to the total meat produced in the country was reported at 15% (Taneja, 1982).**

**The main goat breeds in the country are the following (Mason, 1960; Devendra, 1983):**

**Sudanese Nubian - milk improved breed, known for milk production.**

**Sudanese Desert - meat improved, known for meat quality and prolificacy.**

**Nilotic Dwarf; and other unidentified strains.**

**Baggara goats are believed to be a stabilised cross between the Sudanese Desert and Nilotic Dwarf goats in South Kordofan (Ageeb, 1986). The population of these goats was estimated at 0.8 million head (Regional Animal Diseases Control Project, 1981); mainly in hands of transhumants in the area.**

**Goats in the Sudan have received little emphasis in research programmes. The basic information on Baggara goats ore not available. Therefore, the objective of this study was to assess and evaluate the production and reproduction potential of these goats under South Kordofan conditions,**

## Materials and Methods

*Livestock:*

**The experiment involved 95 animals bought from Lagawa and Kailak markets in Messeirya tribes homelands. The flock structure was as follows:**

| | |
|---|---|
| **Breeding females** | **32** |
| **Breeding ii,ales** | **2** |
| **Yearlings** | **7** |
| **Kids < 5 months old** | **54** |

**The flock was kept at the research farm of Kadugli Research Station for 15 months. The main feed was natural range grass and browse trees. The average % dry matter (DM), crude protein (CP) and crude fibre (CF) of the grasses (seed set) was** 36%, 12.5%, **30.1%, respectively; compared to 8%, 3.2%, and 39.5% DM, CP and CF when the grasses dried out. These changes occurred in three months. Animals are allowed to graze by shepherds freely from about** 7:30 a.m. **to sunset; after which they were penned in corrals. The necessary measurements and records are collected and kept. For the determination of dressing percentage, 10 randomly chosen bucks (intact) were slaughtered and treated according to Ibrahim and Gaili (1982).**

*Statistical analysis:* •

**Crunch Interactive Statistical Package (CRISP) computer programme - 3 - was used for statistical analysis. For testing the differences between the monthly total kids born, Chi-square Test was used (Steel and Torrie, 1980).**

## Results and Discussion-

**]. *Linear measurements***

**i. Body length:**

**Body length is an indication of productive capacity. Long high animals from the ground are more productive, best suited to browse and less susceptible to udder infection. The body length of Baggara goats was 58.9 ± 2.8 and 61.5 ± 5.6 cm for females and males, respectively (Table 1).**

**ii. Heart girth:**

**Heart girth is an important measurement that predicts body weight in livestock. The average heart girth for these goats was 68.8 ± 3.8 and 74.4 ± 6.1 for females and males, respectively (Table 1).**

**iii. Wither height:**

**The mean wither height of Baggara type goat was ± 3.1 and 65.3 ± 4.1 cm for females and males, respectively (Table 1).**

**Recently, Devendra and Burns (1983) classified goats according to their height at wither as follows:**

| | |
|---|---|
| **Large;** | **over 65 cms.** |
| **Small;** | **51 - 65 cms.** |
| **Dwarf;** | **50 cm and below.** |

**According to this classification, Baggara type fall under the category of small goats and in that respect they are smaller than Sudan Desert goats but definitely larger than the Nilotic Dwarf type (Devendra and Burns, 1983).**

**iv. Ear length:**

**Ear length was used to group African goats into either small short-eared or large lope-eared types (Mason and Maule, 1960).**

of liaggara goals

Table 1
Mean liveweight and body measurements of male and, female Baggara goats of South Kordofan (± standard deviation).

| Sex | Mature weight (kg) | Body length (cm) | Heart girth (cm) | Wither height (cm) | Ear length (cm) | Scrotal a circumfer. (cm) |
|---|---|---|---|---|---|---|
| Females | 26.4 ± 5.7 | 58.9 ± 2.8 | 68.8 ± 3.8 | 62.5 ± 3.1 | 17.8 ± 2.0 | NA |
| Males | 30.8 ± 8.0 | 61.5 ± 5.6 | 74.4 ± 6.1 | 65.3 ± 4.1 | 18.0 ± 1.5 | 25.2 ± 0.5 |

a, scrotal circumference.
NA = not applicable.

**Baggara goats have moderate pendulous ears of about 17.9 ± 1.8 cm long which fall in small short-eared classification of Mason and Maule.**

**v. Scrotal Circumference:**

**Scrotal circumference is highly correlated with fertility and sperm output in livestock (Males, 1987; personal communication).**

**The male Baggara goat had 25.2 ± 0.5 cm Scrotal circumference (Table 1).**

*2. Reproductive performance*

**A. Males:**

**In October 1987, the breeding females (over 15 months of age) were 32 does with only two mature bucks. Wilson (1970) reported that the number of bucks per flock of goats should not be a "limiting factor in reproduction".**

**B. Females:**

**i. Birth rate (kid/doe/yr.):**

**In the calendar year 1988, the total breeding females were 46; giving a total of 87 kids among them. Therefore, the average number of kids born/doelyear was 1.89. The average annual kidding percentage will, then, be 189; less than 208% reported for desert goats in Darfur (Wilson, 1976). This could be due to differences in type, managemeut systems, nutrition and the year's effects. WSARP (1984) reported 173.6 as an annual kidding percentage of goats in Nuha mountains sedentary system (the type was not mentioned, but most likely the 'ilotic Dwarf).**

**ii. Age at first kidding:**

**In this study, many does kidded for the first time but previous records were not available on all of them. From 4**

**does with recorded birth dates, the mean age at first kidding and standard deviation was 15.3 ± 1.7 months.**

**Most goats give birth for the first time at 14 - 18 months of age estimated from development of the first pair of permanent incisors. The mean weight of does at first kidding was 27.3 ± 4.7 kg.**

**iii. Kidding interval:**

**The period between two consecutive kiddings represents the kidding interval. It was estimated as 234 ± 28.9 days for the Baggara goats.**

**The correlation between kidding interval and weight of dam at first kidding was negative (r = -0.396; p > 0.05). Long kidding intervals may be due to nutritional factors as reflected on lighter weights. The kidding interval of Desert goats was reported as 238 ± 41 days (Wilson, 1976) and 252 days for mixed Nilotic Dwarf and unidentified strains at Nuba mountains (Ageeb, 1986). The three results are almost similar if location differences and feeding habits are considered.**

**iv. Gestation length:**

**The average gestation length of 25 Baggara goats was 147 ± 4.8 days. In this study, the length of gestation was found to be affected by type of birth (p < 0.05). The goats that carried twins had longer gestations compared to those that carried singles (Table 2).**

**The correlation between gestation length and kid birtn weight in this study was small (r = 0.18) and not significant (p > 0.05). Mishra *et al.* (1979) reported a significant correlation of r = 0.33 for Sirohi goats. The small sample size in our study may justify the insignificant correlations.**

**Table 2: Mean gestation length in days (± standard deviation) of Baggara goats by type of birth.**

| Birth type | No. | Mean ± S.D. |
|---|---|---|
| **Single** | 13 | 145.1 ± 3.3a |
| **Twin** | 9 | 149.9 ± 5.7b |
| **Triplet** | | 145.0 ± 0.0a |

Note: In this and the subsequent tables means followed by the same superscript are not significantly different.

v. Service period:

Postpartum oestrus is normally affected by the conditions of the animal. How soon a doe conceives ancr kidding is an important question

The mean service period of Baggara goats was estimated as 76.1 ± 28.5 days. The percentage of does that kidded twice in 1988 in the flock was 12.1%; the remaining (87.9%) kidded once a year; giving an average litter size of 1.69 kids (kid / parturition) and 1.12 parturitions per year. Devendra (1962) reported 92 days as service period for Katjang (local Malaysian) goats. The difference between the two findings could be attributed to breed and:or management differences.

vi. Sex ratio:

Sex ratio is important in breeding stocks because an increase in the frequency of the desirable sex is required. This increase in the frequency should improve the genetic gain for

**reproduction by increasing the level of selection intensity. The total kids born in 1988 were 87: 55 were males and 32 were females; giving a sex ratio of 1 : 0.6 (male : female); almost 1 : 1 ratio.**

**vii. Multiple births:**

**The 87 kids born were 30 singles** (34.5%), 51 twins **(58.6%) and 6 triplets** (6.9%). The twining rate is high. The distribution of kids horn in 1988 was depicted in Figure **1.**

Chi-square was used to test whether or not the monthly total kids born were similar; it was found to be significantly different ($p < 0.01$).

**viii.** Peak kidding period:

Baggara goats are non-seasonal breeders. Kidding occurred in all months of the year except September (Figure 1). The peak kidding was in October (22 kids born out of 87; 25.3% of the total).

Since the gestation period was estimated as 5 months, then the peak mating activity was in June; the onset of rainy season and lush.

*3. Liveweight and growth:*

**i. Birth weight:**

**Regardless of birth type, the average birth weight was 2.0 ± 0.5 and 1.8 ± 0.4 kg for male and female kids, respectively (Table 3).**

**Birth weight was significantly affected by year ($p < 0.05$) and by birth type ($p < 0.001$). Kids that were born in 1987 were heavier in birth weight compared to those that born in 1988 (1.9 ± 0.6 vs 1.6 ± 0.5) kg). Sex and the interaction birth type x sex were not significantly ($p > 0.05$) affecting birth weight. No difference ($p > 0.05$) in birth**

Fig .1 _ *Tokil* ***Number Of lads Horn By rypeZitionth in 1988***
***Hem' Of Daggara Cools in Soin1/2*** *A:Oct/010 /7*

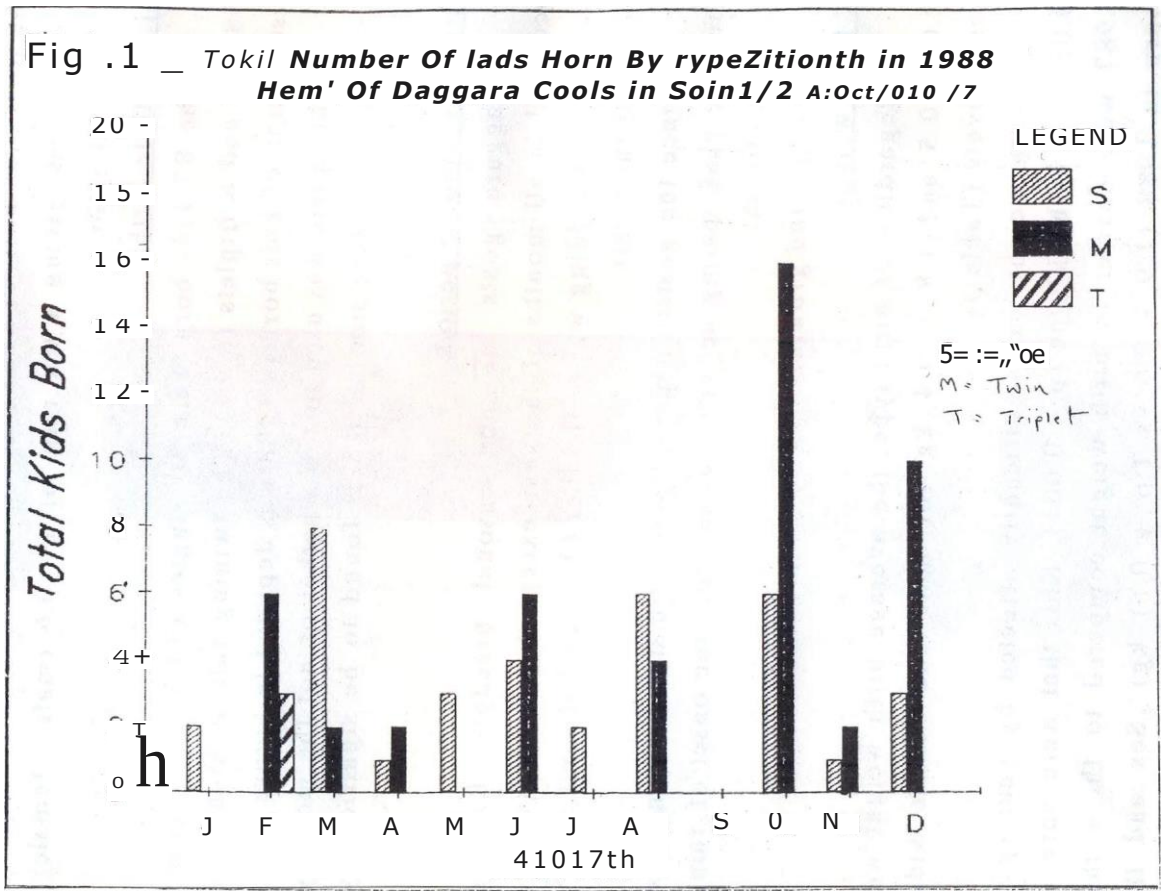


**Table 3**
**Average weight (kgs) of Baggara kids from birth to one year of age (± standard deviation)**

| Age | No. | Overall mean | No. | Male | No. | Feinale |
|---|---|---|---|---|---|---|
| Birth | 40 | 1 9 ± 0.5 | 21 | 2.0 ± 0.5a | 19 | 1.8 ± 0.4a |
| Singles | 30 | 2.0 ± 0.6 | 21 | 2.1 ± 0.6a | 9 | 1.9 ± 0.5a |
| Twins | 51 | 1 6 ± 0.5 | 19 | 1.7 ± 0.5b | 22 | 1.5 ± 0.4b |
| Triplets | 6 | 1 3 ± 0.6 | 5 | 1.3 ± 0:7b | 1 | 1.4 ± 0.0b |
| 1 month | 40 | 4.3 ± 1.0 | 21 | 4.4 ± 0.9a | 19 | 4.2 ± 1.2a |
| 2 months | 40 | 5.9 ± 1.4 | 21 | 5.9 ± 1.1a | 19 | 5.9 ± 1.6a |
| 3 months | 40 | 7.4 ± 1.7 | 21 | 7.8 ± 1.5a | 19 | 6.9 ± 1.9a |
| 4 months | 49 | 8.9 ± 2.0 | 21 | 9.3 ± 1.9a | 19 | 8.5 ± 2.2a |
| 5 months | 40 | 10.0 ± 2.3 | 21 | 10.6 ± 2.0a | 19 | 9.4 ± 2.5a |
| 6 months | 40 | 11.3 ± 2.6 | 21 | 11.9 ± 2.4a | 19 | 10.5 ± 2.8a |
| 12 months | 20 | 16.9 ± 2.3 | | | | |

weights for males and females; but single-born kids were born heavier than twin - and triplet-born (Table 3). Between twins and triplets, their birth weights were similar ($p > 0.05$). Wilson (1976) reported 1.73 and 1.71 kgs. for twins and triplets, respectively, as birth weight of Sudanese Desert goats. Devendra and Burns (1983) reported 1.8 kg as birth weight of single Sudanese Nubiati goats in Egypt. Our findings were in line with latter research reports.

ii. Growth rates:

The growth rates of kids were determined from the monthly weighings. The average weight of kids at 6 months of age was 11.9 ± 2.4 and 10.5 ± 2.8 kg for males and females, respectively. Males (though rather heavier at later ages) and females grew at the same rate ($p > 0.05$) till 6 months of age (Figure 2). The mean weight of these kids at one year of age was 16.9 ± 2.3 kg (Table 3). The correlation between birth weight and subsequent body weight was high (Table 4). The highest was at 3 months of age ($r = 0.662$, $p < 0.001$). The correlation between weaning weight (4 months of age) and weight at one year of age was high ($r = 0.579$; $p < 0.001$); indicating that weaning could be used for selection purposes i.e. select the heaviest female kids as replacement.

Sacker and Trail (1966) reported a poor correlation between birth weight and later body weights ($r = 0.20$ with 2 months weight; 0.16 with weaning weight and 0.04 with weight at one year) in Mubende goats of East Africa. Our findings are not in line with Sacker's results. This could be due to breed and management differences.

*Toial Kids Born*

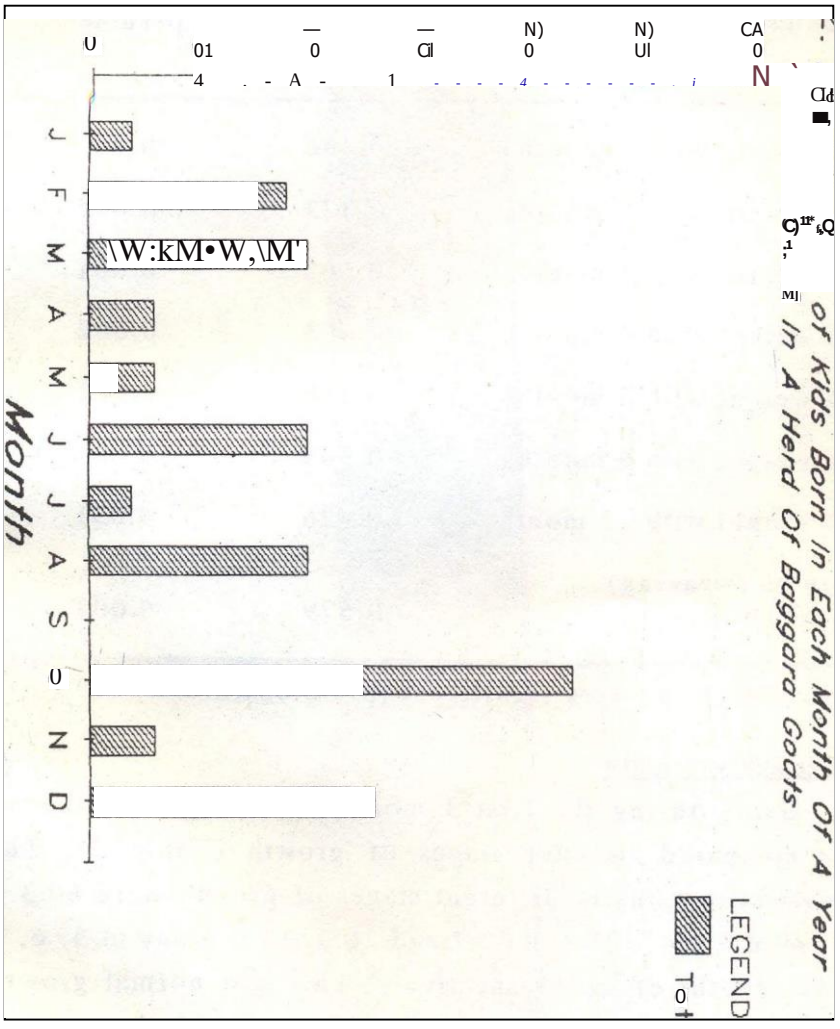


**Table 4: The correlation between birth weight of Baggara kids and subsequent body weights.**

| Variables | Correlation coefficient (r) | p-value* |
|---|---|---|
| Birth weight with 1 month | 0.456 | 0.003 |
| Birth weight with 2 months | 0.473 | 0.002 |
| Birth weight with 3 months | 0.662 | 0.001 |
| Birth weight with 4 months | 0.563 | 0.002 |
| Birth weight with 5 months | 0.488 | 0.001 |
| Birth weight with 6 months | 0.504 | 0.001 |
| Birth weight with 12 months | 0.426 | 0.031 |
| 4 Months (weaning) with 12 months | 0.579 | 0.003 |

*** All correlations were significant ($p < 0.05$).**

**iii. Growth intensity**

**Gains during the first 3 months were higher for both sexes compared to later stages of growth (Table 5). The average daily gains in different stages of growth were 60.3 ± 22.7, 40.8 ± 18.1, 38.6 ± 22.7 and 26.3 ± 3.6 g/day at 3, 6, 9 and 12 months of age, respectively. This is a normal growth curve in which rates of gain tend to diminish with the increase in age. Sex and birth type were found to have no effects ($p > 0.05$) on ADGS in the 4 stages of growth.**

Table 5
The Average Daily gains (ADG) of Baggara goats at different growth stages by sex and birth type (± standard deviation)

| Sex and Type | No. | ADG (gms.)/claya | | | |
|---|---|---|---|---|---|
| | | 3 months | 6 months | 9 months | 12 months |
| Male | 16 | 65.3 ± 18.1 | 42.2 ± 18.1 | 35.8 ± 22.7 | 29.0 ± 13.6 |
| Female | 15 | 56.7 ± 27.2 | 39.0 ± 22.7 | 41.7 ± 22.7 | 23.6 ± 13.6 |
| Singles | 13 | 68.0 ± 27.2 | 40.8 ± 18.1 | 37.7 ± 18.1 | 25.9 ± 18.1 |
| Twins | 17 | 56.2 ± 18.1 | 38.1 ± 18.1 | 40.8 ± 22.7 | 26.8 ± 13.6 |
| Triplets | 1 | 55.3 ± 00.0 | 75.8 ± 00.0 | 14.9 ± 00.0 | 30.4 ± 00.0 |
| Overall | 31 | 60.3 ± 22.7 | 40.8 ± 18.1 | 38.6 ± 22.7 | 26.3 ± 13.6 |

a The average daily gain in each groWth stage of the two sexes and birth types are not significantly different ($p > 0.05$).

**Wilson (1976) reported average daily gains of Desert kids as 87 and 67 g/day to 3 and 6 months of age, respectively. The high variability of weight gains at different growth stages may indicate changes in nutritive value of feeds under range conditions, parasitic, infestation and/or phosphorus deficiency in feeds which has been reported in the area (Cook and Fadlalla, 1987).**

**iv. Seasonal liveweight changes:**

**The average monthly liveweights for 36 mature does with complete weight records throughout the year 1988 were used to illustrate the changes in body weights. The annual weight toss or gain of the breeding does is shown in Figure 3. Goats were loosing weight in the period from January through June; the dry season of the year. The peak loss in weight was in May. The breeding does were in good body condition during both breeding (June) and k idding (October) periods (Figure 4). The gain in weight in the first three months after kidding may be the reason fog having does kidded twice a year.**

**Generally, the loss in weight during the dry season of the year was not that severe. Season was found to have no effect on Desert goat liv( weights in South Darfur region (Wilson, 1976).**

***4.*** *Meat production:*

**The meat producing ability is an important character to be considered in evaluating the performance levels of a breed. The average dressing percentage of 10 intact bucks was 44.17; the range was 41.3 - 47.5%. The formula developed by Wilson and Clarke (1976) was used to estimate meat**

Fig.3. *Oro wil? **Rates O**f g g " Coats From Birth To Six o ths Of Age*

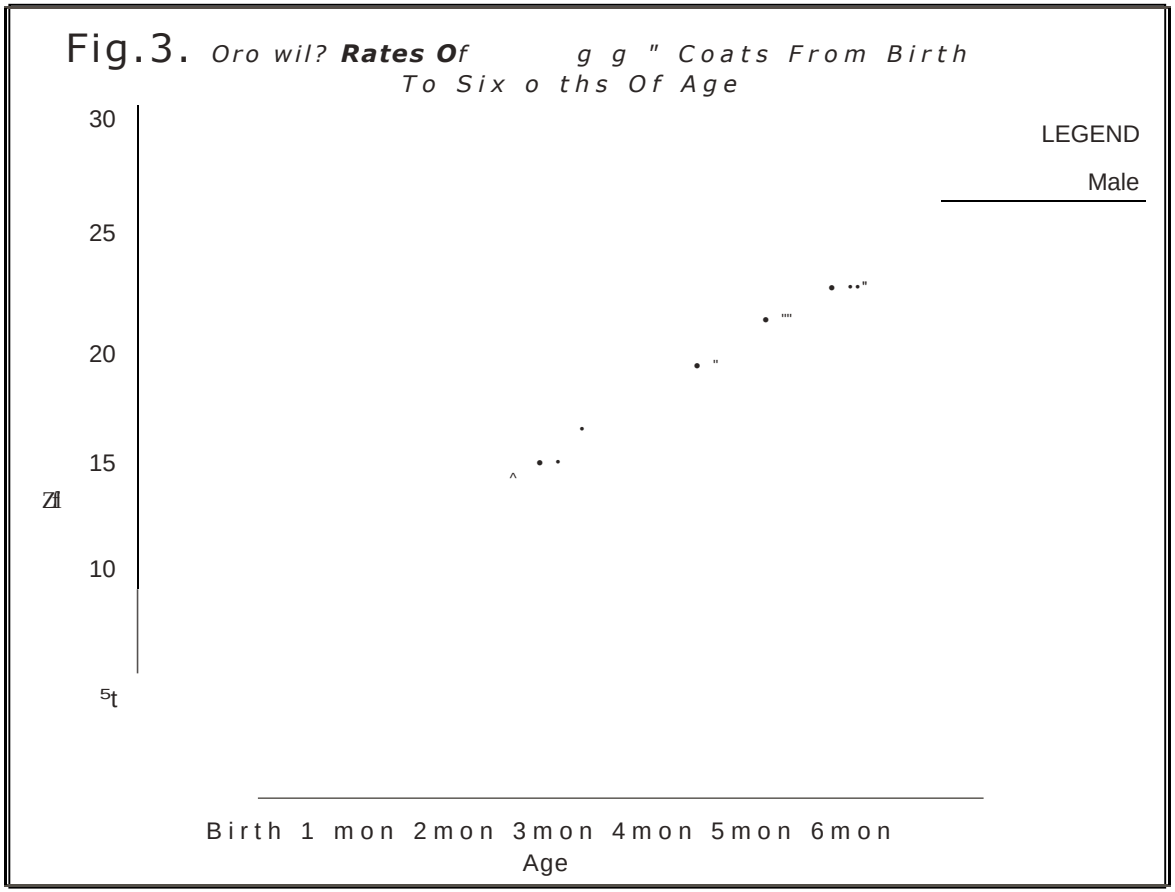
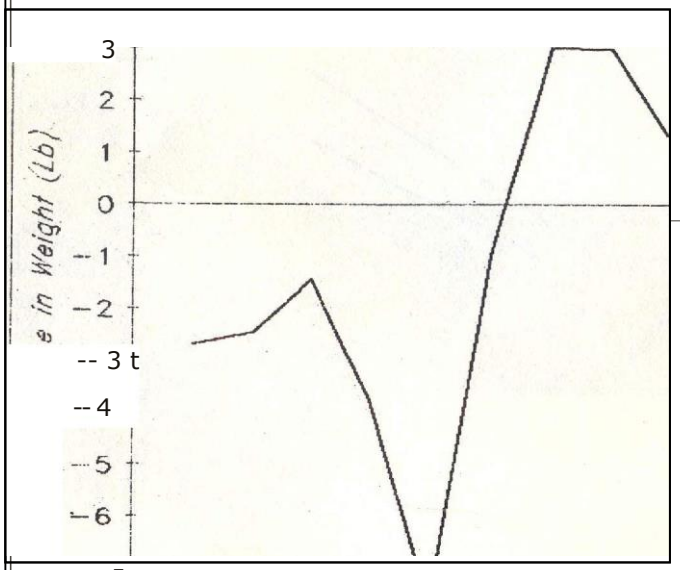


FIg.4

' Weigh/ Chav7ges. of Eemcile- "Dagya7-4:7" at, CY ig.




J F M A M J J A S 0 N D

Mar7

**production of kids (to 6 months of age) per kilogramme of breeding doe.**

$$p = (bsld)/L$$

Where:

p = meat production per kg of breeding female.

b = kidding percentage.

s = survival rate (to 6 months of age).

1 = weighed average liveweight of kids at 6 months of age.

L = average liveweight of breeding females.

Using the above equation, the amount of meat produced per kilogramme of breeding female can be estimated as:

$$(1.89 \times 0.60 \times 11.3 \times 0.44)/26.4 = 0.214 \text{ kg}$$

Peters (1987) described formulae to enable in assessing meat productivity and performance efficiency of a flock of goats. The formulae are the following:

A. Flock Meat Productivity (FMP)

FMP = litter/year x kids/litter x kid viability to weaning x kids weaning weight.

For the Baggara goats, the FMP was estimated as:

1.12 x 1.69 x 60 x 8.9 = 1010.8 kg.

(weight at 4 month age was used here as weaning weight)

B. Flock Efficiency (FE)

FE = FMP/doe weight$^{0 \bullet 75}$

The FE of the Baggara goats was 86.8%.

C. Flock Performance Productivity (FPP) in meat equivalents:

FPP = FMP + ((daily **milk yield)(days in lactation)}/9 (1 kg of meat = 9 kg of milk).**

**(daily milk yield = 0.32 kg).**

**(days in lactation is assumed as 150 days).**

**For the Baggara breeds, the FPP was estimated as 1016.1 kg.**

**D. Flock Performance Efficiency (FPE)**
**FPE = FPP / doe weight$^{0.75}$**

**The (FPE) of the breed under study was** 67.3%.

5. *Mortality:*

**The distribution of mortalities in adults and kids, durin-g the period of the study, was shown in Table 6.**

**i. Adult mortality:**

**Goats greater than 6 months of age were included in estimating adult mortality.**

**The average adult mortality (in 1988 only) was 9.1% (Table 6).**

**ii. Kid mortality:**

**Still births were included in kid mortality. The average kid mortality in 1988, was 40.2%. Most deaths occurred in January, February, April and October (Table 6).**

**iii. Causes of mortality:**

**Deaths during November to February (cooler months of the year) were mainly due to pneumonia.**

**Unidentified losses were greater for adults and kids as shown in Table 6. Actually, most of these losses were either theft or wild animals attack; herders did not 3dmit these type of losses because this would be considered a zarelessness and they had to pay for the loss from their salaries.**

**Weakness and starvation, also, caused great mortalities in kids during the dry season (March - June), the peak nutritional and heat stresses.**



**Table 6: The distribution of adult and kid mortalities, by month, Baggara goats of South Kordofan.**

| Month | 1987 Adult | 1987 Kids <5 months | 1987 losses | 1988 Adult | 1988 Kids <5 months | 1988 losses |
|---|---|---|---|---|---|---|
| January | | | | 0 | 7 | 0 |
| Februrary | | | | 2 | 4 | 0 |
| March | | | | 1 | 0 | 7 |
| April | | | | 1 | 8 | 0 |
| May | | | | 0 | 3 | 0 |
| June | | | | o | o | 2 |
| July | | | | 0 | 0 | 0 |
| August | | | | 1 | 2 | 0 |
| September | | | | 0 | 2 | 1 |
| October | 0 | 2 | 0 | 1 | 5 | 3 |
| November | 1 | 1 | 0 | 0 | 3 | 0 |
| December | 1 | 4 | 0 | 0 | 1 | 1 |
| Totals | 2 | 7 | 0 | 6 | 35 | 14 |
| No. in flock | 34 | 61 | | 66 | 87 | |

## Conclusion

The performance level and the physical characteristics of the breed were studied. The performance level of these goats, which was the result of their genetic make-up plus their ability to ii teract with the external environmental factors such

as heat and diseases, was optimum. The breed is relatively prolific and a good meat producer.

These basic information could be the base-line for genetic/management improvements of these goats in the future.

**Acknowledgements**

I wish to thank the Director of WSARP for his permission to publish the results of this study. I am grateful to Mr. Mohammed Suliman for assistance in organizing the data for analysis and to Mr. Abu Bakr El Siddig for editing and typing the manuscript.

**References**

Ageeb, A. G. (1986). Livestock husbandry and management practices in a sedentary farming system at Nuba Mountain region. WSARP 1986-87 Annual report, Khartoum (unpublished).

Cook, R. H. and Fadlalla, B. (1987). Seasonal variation in plasma phosphorus levels of transhumant sheep in Kordofan, Sudan. Trop. Anim. Hlth. Prod., 1957 - 1962.

Devendra, C. (1962). Upgrading of local goats by the Anglo-Nubian at the Federal Experimental Station, Serdang, Malaysian Agric. J., 43: 265 280.

Devendra, C. and Burns, M. (1983). Goat Production in the Tropics. Commonwealth Agric. Bureaux. Unwin Brother Ltd., Old Woking, Surrey.

Gall, C. (1981). Goat Production. Academic Press, London, N.Y., Sydney.

**Ibrahim, A. and Gaili, E. S. E. (1982). Relationships of slaughter and carcass data to carcass composition of Sudan Desert goats. World. Rev. Anim. Prod.**

**Mason, I. L. and Maule, J. P. (1960). The Indigenous Livestock of Eastern and Southern Africa. Commonwealth Agric. Bureaux, Farnham Royal, Bucks, U.K.**

**Mishra, R. K.; Nivsakar, A. E. and Arora, C. L. (1979). A note on the analysis of gestation length in Sirohi goats. Indian J. of Animal Science, 49 (11): 967.**

**Ockerman, H. W. and Abdelrahman A. Aziz (1985). Sheep and goat production in the Sudan. Wrold. Rev. Anim. Prod. Vol. XXI No. 3: 26 - 29.**

**Peters, K. J. (1987). Evaluation of goat population in tropical and sub-tropical environments. ILCA Bulletin 28: 14 - 21. Addis Ababa, Ethiopia.**

**Regional Animal Disease Control Project (1981). I and II. Booker Gric. Intern. Ltd. and Center for Tropical Vet. Medicine, Edinburgh, Scotland, U.K.**

**Sacker, G. D. and Trail, J. C. M. (1966). Production characteristics of a herd of East African Mubende goats. Tropical Agric., Trindad, 43: 43 - 51.**

**Steel, R. G. D. and Torrie, J. H. (1980). Principles and Procedures of Statistics. 2nd Ed. McGraw-Hill Book Company, N.Y.**

**Taneja, G. C. (1982). Breeding goats for meat production. In: Proceedings of 3rd. International Conference on Goat Production and Diseases. p. 27. January, 10 - 15th, 1982. Tuscon, Arizona, USA.**

Wilson, R. T. (1976). Studies on livestock of Southern Darfur, Sudan. IV. Production traits in goats. Trop. Anim. Hlth. Prod. 8: 221.

Wilson, R. T. and Clarke, S. E. (1976). Studies on the livestock of South Darfur, Sudan. 11. Production traits in cattle. Trop. Anim. Hith. Prod. 8: 47 - 57.

WSARP (1984). Western Sudan Agric. Research Project. Range Livestock Research Activities 1982183. WSARP Pub. No. 29 Khartoum, Sudan.

Author:

**Mr. Abdel Gadir Ahmed Ageeb**

El Fasher Research Station, P.O.Box 117, El Fasher,

Sudan.