## Performance of desert black goat under extensive production systems in North Sinai in Egypt

**Ahmed A.M., Kandil M.H., El Shaer H., Metawi H.R.**

*in*

**Rubino R. (ed.), Morand-Fehr P. (ed.).**
**Production systems and product quality in sheep and goats**

# Performance of desert black goat under extensive production systems in North Sinai in Egypt

**A.M. Ahmed*, M.H. Kandil*, H.M. El-Shaer* and H.R. Metawi****
*Desert Research Center, Mataria, Cairo, Egypt
**Animal Production Research Institute, Dokky, Giza, Egypt

**SUMMARY –** A production system approach was used to study the performance of desert black goat under semi-arid conditions in North Sinai. A random sample of 19 goat breeders was taken. Least squares analysis of variance was performed using fixed effects linear models for all productive traits to develop the technical coefficients used in the study. Biological criteria were kg of kids weaned per doe joined and kg of kids marketed per doe joined. Gross margin per head of goat and output/input ratio were used as criteria of the economic efficiency of the existing production system. The technical coefficients for the studied area were 80.5%, 1.5, 11.0%, 12.2 and 15.9 for conception rate, twining rate, weaning mortality up to 4 months, kg of kids weaned per doe joined and kg of kids marketed per doe joined, respectively. Gross margin per head of goat was LE 62.4 and output/input ratio was 1.85. These results indicated that with improvements in management, it is feasible to substantially improve the level of performance of goats.

**Key words:** Production system, goat, performance, gross margin.

**RESUME –** *"Performances des chèvres noires du désert en système de production extensive dans le Nord du Sinaï en Egypte". L'approche du système de production a été utilisée pour étudier les performances des chèvres noires du désert en conditions semi-arides dans le Nord du Sinaï. Un échantillon aléatoire a été prélevé chez 19 améliorateurs de caprins. L'analyse des moindres carrés de variance a été menée en utilisant des modèles linéaires à effets fixes pour tous les caractères productifs pour mettre au point les coefficients techniques utilisés dans l'étude. Les critères biologiques ont été : kg de chevreaux sevrés par chèvre en reproduction et kg de chevreaux commercialisés par chèvre en reproduction. La marge brute par tête de caprin et le ratio output/input ont été utilisés comme critères pour l'efficacité économique du système de production existant. Les coefficients techniques pour la zone étudiée ont été de 80,5%, 1,5, 11,0%, 12,2 et 15,9 pour le taux de conception, taux de doubles, mortalité au sevrage jusqu'à 4 mois, kg de chevreaux sevrés par chèvre en reproduction et kg de chevreaux commercialisés par chèvre en reproduction, respectivement. La marge brute par tête de caprin a été LE 62,4 et le ratio output/input a été de 1,85. Ces résultats indiquaient qu'avec une amélioration de la gestion, il était faisable d'améliorer substantiellement le niveau de performances des chèvres.*

*Mots-clés : Système de production, chèvre, performance, marge brute.*

## Introduction

In situation where the land is of a poor quality, unproductive and constrained by several environmental factors, crop cultivation is often difficult. Under these circumstances, goats and often sheep rearing together make significant contribution to poor farmers and the stability of small farm systems. This importance and contribution by goats increases with decreasing quality of the land, sustainability and constitute a major component of the extensive production system (Devendra, 1988). Natural rangeland do not exist in Egypt, therefore small ruminants are either contained in crop/livestock production system in the Nile Valley and Delta or kept rain-fed areas in north coast. About two-thirds of the sheep and goats populations are kept in small flocks, usually less than 5 heads. There are about 3.2 millions goats in Egypt (MALR, 1997), most being in the region of Upper Egypt, Sinai and the Red Sea coast. The population of livestock in Sinai Peninsula (61,000 km$^2$) are 241,697, 135,649 and 16,083 heads of goats, sheep and camels, respectively. The study followed the system approach to: (i) characterize the current production system in the studied area; (ii) estimate the technical coefficients of the desert black goats raised under such system; (iii) calculate the biological and financial efficiency of the system; and (iv) development constraints. Such a study would be useful in identifying constraints to animal production development and in planning for improvement of the efficiency of the system.

## Materials and methods

### The study area

This study was carried out at North Eastern area of Sinai at 320 km north-east of Cairo. This area extends about 50 km length, from El-Arish to Rafah, with approximately 15 km depth. Annual rainfall averages 100 mm in winter season. Several annual and perennial plant species are naturally grown in this area. The native natural ranges in Sinai, as described by Girguis (1994), is an open shrub vegetation which are poor, deficient in energy content particularly during the drought seasons and can not even provide the maintenance requirements of the grazing animals. They are vary in their green biomass production, distribution, palatability and nutritive value from one location to another and from season to season. Environmental changes especially the annual rainfall, considerably affect the growth, coverage rate, yield of dry matter of ranges, in addition to their nutritive value. The desert black goat is the dominant breed in this area as they are the most adapted breed to the harsh environment, feed scarcity and drought stresses.

### Data

A random sample of 19 goat holders was taken. Biological data considered were number of doe conceive per doe joined, number of kids born per doe kidding, pre-weaning body weights which included weight at birth, at weaning, pre-weaning daily gain and post-weaning body weights at marketing, post-weaning daily gain and adult weight, in addition to mortality rate among born kids up to 4 months of age. Financial data recorded were annual operational costs including labour wages, feeding and veterinary costs, annual outputs included fattened kids, surplus doe kids, and culled bucks and breeding does.

### Statistical analysis

The data were analysed by the least squares techniques using the general linear model procedure of SAS (1990) for statistical analysis. The fixed-effects linear model used to analyse productive traits was as follow:

$$Y_{ijk} = \mu + a_i + b_j + c_k + e_{ijk}$$

where $Y_{ijk}$ is the observation; $\mu$ is the general mean, common element to all observation in the population; $a_i$ is the effect due to the $i$th age of doe, i=1,2,3,4, $b_j$; is the effect due to the $j$th type of birth, j=1,2; $c_k$ is the effect due to the $k$th sex, k=1,2; and $e_{ijk}$ is a random effect associated with the individual observation. This element represents the effect of all the unidentified factors that may affect the trait under investigation and are not included in the model.

### Criteria of system evaluation

Kilograms of kids weaned per doe joined and kilograms of kids marketed per doe joined were used as biological criteria while, gross margin per head of goat and output/input ratio were used as financial criteria.

## Results and discussion

### Main features

The common characterization is that Bedouins have a permanent base in the cultivated areas. Bedouins can be defined as these livestock herders who basically rely on seasonal movement but returning to a settled base for at least part of the year. Bedouins population are found exclusively in marginal areas where resources are scarce and unreliable. They often herd a mixture of animal species in order to maximize the production potential of various ecological niches available to them and to minimize the risk of losses from draughts and diseases. They are

found in small flocks and animal products are used mainly for home consumption and supplementary income to the family. These small flocks use mainly crop residues and free grazing around the village. Results of the field survey for the main features of the current production system are presented in Table 1. Age distribution within the flock showed that about 80% of males are less than 2 years for fattening, while 20% are greater than 3 years to be used as a breeding bucks in mating season. In the other hand, about 60% of the females are over 3 years to be used as breeding does and about 40% are less than 2 years for replacement. The mature body weights for bucks and does were estimated as 31.3 kg and 27.3 kg, respectively. The obtained result is higher than that estimated by Metawi and Shehata (1996) of 26.0 kg under small holder production system in Egyptian villages.

Table 1. Results of field survey of the studied area

| Parameters | Estimate |
| --- | --- |
| Average flock size (head) | 7.5 |
| Number of doe per buck (head) | 5 |
| Average adult weight (kg) | |
|   Buck | 31.3 |
|   Doe | 27.3 |
| Average weaning age (month) | 4.5 |
| Average marketing age (month) | 8.3 |

## Current management practices

Movement of the flock to the range starts early in the morning at sunrise and they return at sun set. Bedouins usually settle around a well, from which their animals drink once per day after returning from the range or every other day depending on the season. Generally during spring season while range plants are succulent, they usually offer no water to their animals. Animals are herded by girls and young boys. When animals return back from the range, they offered some concentrates, as traditional feed supplements, to supplement animals with particular nutrients which are likely to be deficient, i.e., energy, protein, vitamin A, depending on the type of plants they roamed. Breeding season usually starts in June-July for goats. Bucks are used for mating for the first time at an age of one year and are kept for about 4 years. When owners do not have their own sires, they borrow one for 20-30 days, one sire could serve 50 females. Sires are given extra feed during the breeding season, where corn, barley, grains and concentrates if possible. Kidding, which occurs once per year, starts in December-January. Kids are selected as future sires according to their vitality. Weaning occurs at the age of 4-5 months. Dams at weaning time, have their udders covered with a sac of cloth until their offspring are weaned.

## Technical coefficients

Technical coefficients of the desert black goats under the current production system are presented in Table 2. Mean kidding percentage is above 80%, but vary from year to another depending mainly on availability of feed. The number of kids born per doe kidded was estimated as 1.5. The estimate of the present study is lower than those reported by Aboul-Naga (1989) which ranged from 1.84-2.1 under research stations conditions in Egypt. These differences may be due to different management systems. Kids have high daily gain from birth to weaning and decline after weaning because of inadequate nutrition.

## Biological evaluation

Results of the annual biological performance of goats under the current production system are presented in Table 3. The latter measure in the table may be considered as one of the most indicative parameters for efficiency of the production in the flock. These values revealed that, goats are adapted to the harsh environment of the studied area, but they are of low productivity.

These average values suggest that with improve and more intensive systems of management, it is feasible to substantially improve the level of performance of goats.

These results reflected the problems of annual feed shortage and consequent low productivity are normal in many parts of the developing countries, and the basic issue is how to improve this deficit situation. Where land is limiting, increased fodder production becomes problem. The basic strategy is to ensure a feed supply that can be sustained on a year round basis, which means complete use of the total feed resources base. This includes use of available grazing (native and cultivated), cultivated forages including crops residues, agro-industrial by-products and non-conventional feeds.

Table 2. Technical coefficients of the desert black goat derived from the studied area

| Trait | Estimate | |
|---|---|---|
| Doe kidded per doe joined (%) | 80.5 | |
| Number of kids born per doe kidded | 1.5 | |
| Weaning mortality up to 4 months (%) | 11.0 | |
| | Male | Female |
| Birth weight (kg) | 2.46 | 2.46 |
| Weaning weight (kg) | 13.77 | 12.09 |
| Marketing weight (kg) | 21.57 | 19.21 |
| Pre-weaning daily gain (birth-weaning) (g) | 85 | 72 |
| Post-weaning daily gain (weaning-marketing) (g) | 67 | 67 |

Table 3. Annual biological performance of desert black goat under extensive production system in North Sinai in Egypt

| Trait | Estimate |
|---|---|
| Number of doe kidding/doe joined | 0.805 |
| Number of kids born/doe joined | 1.2 |
| Kilograms of kids born/doe joined | 3.0 |
| Number of kids weaned/doe joined | 1.07 |
| Kilograms of kids weaned/doe joined | 12.2 |
| Number of kids marketed/doe joined | 0.80 |
| Kilograms of kids marketed/doe joined | 15.9 |

## Financial evaluation

Barnard and Nix (1993) stated that comparison between gross margin per head of animal obtained from different farms gives a useful idea of the production and economic efficiency of the system. Gross margin per head of goat under such system was estimated as LE (Egyptian pound) 62.5. The obtained gross margin was similar to that obtained from Nile Valley and Delta. While the output/input ratio was estimated as LE 1.85. Results of financial evaluation indicated that this system is of low input/output system.

## Development constraints

The major constraints in the studied area are the highly fluctuating feed supply due to water availability (rainfall and/or underground water) which determine the amounts of feed prior and during the reproductive cycle which affects the reproductive and productive performance of goats (kidding percentage, mortality of newly born kids, daily gain), the small and fragmented flock size, the lake of institutional support for small ruminants. Overcoming the constraints necessitate better

understanding of the role of goats within the production system and opportunities for increased productivity and contribution from them. The major constraints that affect current productivity need to be given priority, and once identified, thoroughly investigated in terms of how potential improvements are likely to influence greater performance. Extend the technology in a manner that it will be acceptable to small farmers. Acceptable technologies are those that are simple, practical, within farmer's resources capacity, convincing and consistently reproducible.

## References

Aboul-Naga, A.M. (1989). *Genetics and genetic improvement of goats.* Course of goat production, Mediterranean Agronomic Institute of Zaragoza, CIHEAM.

Barnard, C.S. and Nix, J.S. (1993). *Farm Planning and Control,* 2nd edn. Cambridge University Press, Cambridge.

Devendra, C. (1988). Goat production in small farm systems. In: *Small Ruminants Research and Development in the Near East,* Proceeding of a Workshop held in Cairo (Egypt), 2-4 November 1988.

Girgius, W.A. (1994). *Project of development of range resources and fodder in Sinai* (Final report). Desert Research Center and Academic of Scientific Research and Technology, Cairo, Egypt.

MALR (1997). *Livestock Census.* Ministry of Agriculture and Land Reclamation, Animal Production Sector, Cairo, Egypt.

Metawi, H.R. and Shehata, E.Z. (1996). A study on small ruminant production system in Egyptian villages. *Egypt. J. Anim. Prod.,* 33 Suppl. Issue: 71-80.

SAS (1990). *User's Guide,* 6.03 edn. Statistical Analysis Systems Institute Inc., Cary NC, USA.