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Sheep productivity under extensive and semi-intensive production systems in Egypt

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SUMMARY - A study was conducted to evaluate sheep productivity in north Sinai and Ismaelia governorates representing the extensive (transhumant herding system, THS) and semi-intensive production (mixed crop/livestock farming system, MCLFS) systems, respectively. A total of 31 sheep holders were monitored over a year focusing on ewe productivity and lamb production. Economic aspects were considered. The results indicated that the flock size did not affect the number of lambs born, number of lambs weaned and kg weaned per ewe lambed. The number of lambs born was higher under MCLFS conditions (1.31 *vs* 1.04). Due to higher lamb losses, the number of weaned lambs (at 4 months) was comparable in both systems. Productivity per ewe under MCLFS was 52% higher than those raised under that of THS. Although biological efficiency was lower in THS, the higher proportion of non-feed costs made an advantage to the transhumant herding system in Sinai since feed costs/kg of lamb weaned were offered lower compared to those under sMCLFS in Ismailia.

Key words: Production system, sheep, feed resources, reproductive traits, biological efficiency.

RESUME - *"Productivité des ovins dans les systèmes de production extensifs et semi-intensifs en Egypte". Une étude a été menée pour évaluer la productivité ovine dans les gouvernorats du nord du Sinaï et d'Ismaïlia qui représentent respectivement les systèmes de production extensifs (système des troupeaux en transhumance, THS) et semi-intensifs (système mixte agriculture-élevage, MCLFS). Un total de 31 propriétaires ovins ont été suivis sur une année en étudiant la productivité des brebis et la production d'agneaux. Les aspects économiques ont été considérés. Les résultats indiquent que la taille du troupeau n'a pas affecté le nombre d'agneaux nés, le nombre d'agneaux sevrés et le nombre de kg sevrés par brebis ayant agnelé. Le nombre d'agneaux nés était plus élevé dans les conditions MCLFS (1,31 contre 1,04). Dû à de plus grandes pertes d'agneaux, le nombre d'agneaux sevrés (à 4 mois) a été comparable dans les deux systèmes. La productivité des brebis dans le système MCLFS était supérieur de 52% par rapport au système THS. Bien que l'efficacité biologique ait été inférieure dans le système THS, la plus grande part d'alimentation sans coût a donné l'avantage au système de transhumance du Sinaï car les coûts alimentaires par kg d'agneau sevré étaient inférieurs comparés à ceux du système MCLFS d'Ismaïlia.*

Mots-clés : *Système de production, ovins, ressources alimentaires, caractéristiques reproductives, efficacité biologique.*

Introduction

Sheep contribute to several production systems in Egypt. Ecological' biological and socioeconomic factors are often principal determinants of system characteristics. Sheep usually are raised indoors or outdoors of small to medium size flocks as a part of larger farming operation (mixed crop/livestock farming systems) in intensive agriculture regions (mainly existing in the Delta and old reclaimed areas). Farm size is averaged 2.14 and 5.6 acres in the Nile Delta region (Metawi and Shehata, 1996) and in the old reclaimed area (Abd-El-Rahiem, 1990), respectively with 3.4 and 12.3 small ruminant per farm owner in the two regions, respectively. Lamb production in these regions could be intensified to fit the prevailing intensive conditions. Transhuman herding system, which so called nomadic system or (extensive production system) is prevailing in many desert regions where rainfall ranged 30-200 mm/year. It depends mainly on native rangelands as the principal feed resources, particularly in winter and spring seasons (El Shaer, 1981). Small ruminant average flock size ranges from 100 head in east Kantara region (Abd-El-Rahiem, 1990) to 255 head in the north western coastal zone (Aboul-Naga, 1987). This study aimed to compare between sheep performance under two production systems prevailing in desert region (the north eastern zone of Sinai) and old reclaimed areas (Ismailia) in Egypt.

Materials and methods

Survey region

Field performance tests were implemented in two villages of Ismailia Governorate (120 km east of Cairo) where the mixed crop/livestock farming system (MCLFS) is dominant. The tests also included 3 districts in the north eastern zone (NEZ) of Sinai (320 km of Cairo) where the transhuman herding system (THS) is practiced.

Animal, management and feed resources

Sheep breeds are generally crossbreeds of local Egyptian breeds. Ossimi blood is widespread in Ismailia, whereas Awassi blood is dominant in the NEZ of Sinai. Small ruminants are usually accommodated in cheap and simple animal's houses made from available local materials. The reproductive cycle is free mating. Berseem (*Trigolium alexandrium*) was the principal feed resources in Ismailia region in winter and spring (wet season) while grasses, straws, berseem hay, and crop-by products were used in summer and autumn (dry season). Under the THS in Sinai, annual ranges (*Bromus uniloides, Hordeum leporinum, Medicago coronata* and *Cynodon dactylon)* represent the main feed resources in the wet seasons. The most dominant perennial plants (such as *Panicum turgidum* and *Eremobium aegyptia*) in addition to straws and some crop-by products represent the feed resources in dry seasons. Supplementary feeding was practiced in both systems during dry season using yellow corn and barley grains and concentrate feed mixture (CFM).

Field survey methods

Ten farmers in Ismailia and 21 farmers in NEZ participated in a performance test of their sheep flocks. Data were collected on 148 parturitions. The analysed traits were: number of lambs born (NLB), number of lambs weaned (NLW), kg weaned lambs (KGWL) per ewe lambing, lamb mortality (LM) up to 120 days and lamb's average daily gain (ADG). Similar number of weaned male lambs (twenty animals aged 4 months) were used in growing and fattening trials under the conditions of both systems for 180 days. A composite ration of berseem hay, crop-by products was fed in the MCLFS in Ismailia. Lambs under the THS were fattened on mixture of harvested annuals and perennials range plants; lambs in both systems were fed *ad libitum* and supplemented with yellow corn to cover about 50% of their maintenance requirements of energy (Kearl, 1982). Body weight changes were recorded and average daily gain was calculated. Feed consumption and feed efficiency were also determined. Samples of all feed ingredients and plant species offered to all flocks allover the year and during fattening trials were collected, dried at 60°C, ground through a 1 mm size screen for chemical analysis (AOAC, 1984).

Data analysis

Production systems (P), villages (V), flock size (FS) and lambing season (L) effects were included in the analysis model of NLB, NLW and KGWL traits as follows: $Y= \mu + P + V/P + FS/P + L+PxL+$ Error. The effects of production systems, type of birth (TB), sex, season of birth (SB) on ADG, LM were tested using the following model: $Y= \mu + P + TB + Sex + SB + PxSB + PxTB +$ Error.

Results and discussion

Data in Table 1 showed that values of NLB, NLW and KGWL were not significantly varied between villages and flock sizes within the two production systems. The prolificacy traits were generally affected significantly with various degrees. The lambing season was coincided with feed availability in both production systems.

Table 1. Statistical analysis of factors affecting the prolificacy traits of sheep

Source	F - test			
	DF	NLB	NLW	KGWL
Production system (P)	1	***	NS	***
Village/P	3	NS	NS	NS
Flock size/P	3	NS	NS	NS
Lambing season (LS)	1	**	*	*
P x LS	1	NS	NS	NS

*P<0.05; **P<0.01; ***P<0.001; NS: non significant

Data in Table 2 presented that the season effect on NLB and LM traits was significant; it was more important than the production system - season interaction effect. On the other hand, the interaction between the production system and season was more powerful on the ADG trait.

Table 2. Production systems (P) - lambing season (S) subclass means

	MCLFS		THS		F - test		
	WS†	DS††	WS	DS	P	S	PxS
NLB	1.46	1.12	1.06	1.00	***	**	NS
ADG	117	112	93.6	78.3	***	NS	**
LM	14.8	20.0	2.75	12.2	***	*	NS

†Wet season; ††Dry season
*P<0.05; **P<0.01; ***P<0.001; NS: non significant

The NLB values were higher by 30 and 6% under the MCLFS and THS in the wet season, respectively, compared to those obtained in the dry season. Lambs mortality rate increased approximately one third and three folds higher in the dry season than those recorded in the wet season in the MCLFS and THS, respectively. Such findings are in agreement with several investigators (El Shaer, 1981; Aboul-Naga, 1987; Aboul-Ela *et al.*, 1988). Differences in NLB values between seasons of the year may be due to variations in the ovulation rate; such rate was highest in autumn season. Nutritional status of animals and feed availability (quantity and quality) could be also responsible for such variations in ADG, NLB and LM traits. For instance, in Sinai, NLB and ADG decreased during the dry season as a result of feed shortage (El Shaer, 1981) while LM was increased.

Data in Table 3 showed that, although the NLB was higher (26%) in the MCLF than that of TSH, the NLW was almost close due to higher mortality rate (17%) in the MCLFS compared to those of THS (7.4%). The NLB values (1.31 and 1.04) were reasonable which agree with those obtained by El Shaer (1981) for the nomadic system and Metawi and Shehata (1996) for the small holder farming system (averaged 1.03 and 1.23, respectively). The higher lamb losses could be attributed to several environmental factors, particularly during the dry season. The results of the MCLFS, also, reported that the lambs losses among multibirth (29.6%) was higher than that of the single birth (5.8%) which explained higher mortality for lambs under this system.

Values of flock productivity in MCLFS were 52% higher than that of THS (23.9 *vs* 15.7 kg waened/ewe/year). The biological efficiency seemed to be higher for sheep in the MCLFS. The non-feed costs represented 25 and 50% from the total DM intake in the MCLFS and THS, respectively. Thus, it made an advantage for the THS, since the feed costs/kg lamb weaned in the THS was 20% lower than that of MCLFS.

Table 3. Flock performance under the two systems of production

Parameters	MCLF	TH	F - test
Mature body weight of ewes/kg	44.1	41.8	*
No. of lambs born, (NLB)	1.31 ± 0.06	1.04 ± 0.05	***
No. of lambs weaned, (NLW)	1.10 ± 0.08	0.95 ± 0.06	NS
kg of weaned lambs, (KGWL)	20.8 ± 1.41	13.7 ± 1.10	***
Average daily gain of lambs (g)	114.6 ± 3.30	85.9 ± 5.10	***
Lambs mortality rate (%)			
0-7 days	5.88	3.58	NS
0-6 days	10.4	7.60	NS
0-120 days	17.4	7.44	***
Frequency of lambing[†]	1.22	1.22	-
kg weaned/ewe/year	25.3	16.6	-
Biological efficiency[††]	23.1	28.6	-
Non-feed costs (%)	25	50	-
Total feed costs (LE/kg lamb weaned)[†††]	5.19	4.16	-

[†]Metawi and Shehata (1996)
[††]Expressed as total kg dry matter consumed/kg lamb weanerd
[†††]Estimated costs were based on the current prices of feed ingredients (in Egyptian currency LE = 0.34 $)
*P<0.05; **P<0.01; ***P<0.001; NS: non significant

Results of Table 4 showed that feed ingredients, on overall average basis, were more nutritious in the wet season since the CP content was higher and NDF content was lower under the conditions of both systems. The TDN values were higher for rations fed during the dry season due to inclusion of feed concentrates, e.g., CFM, barley and corn grains, in addition to fresh grasses.

Table 4. Means of chemical composition of feedstuffs and their utilization by growing male lambs

Parameters	MCLFS		THS	
	Wet season	Dry season	Wet season	Dry season
Chemical composition (%)				
DM	30.4 ± 2.21	60.6 ± 2.81	34.8 ± 3.98	55.7 ± 2.8
CP	15.6 ± 1.83	7.73 ± 0.98	12.8 ± 1.63	8.42 ± 1.47
NDF	45.4 ± 2.61	70.6 ± 3.44	60.4 ± 4.6	73.2 ± 3.36
Total digestible nutrients, (TDN)[†]	49.5	60.1	48.1	55.7
Initial weight (kg)	19.4		16.2	
Body weight changes (kg)	25.2		17.7	
Daily gain (g)	140		98.3	
Total feed consumption (kg DM)	243.4		198.4	
Feed efficiency (kg feed/kg gain)	9.66		11.2	
Feed costs (LE/kg gain)	2.78		2.38	

[†]TDN % was estimated from the model derived by Wardeh (1981)

Higher weight gain was recorded for lambs fattened in MCLFS compared to their mates in THS (140 *vs* 98.3 g/d). It may be due to higher feed consumption and sheep breed differences in favour of sheep under the MCLFS (Metawi and Shehata, 1996; Kandil and Ahmed, 1997). Although, the feed costs under THS was lower by about 17% as the feed ingredients (mainly as annual forages) were

cheaper, the feed efficiency was superior under MCLFS, due to the superiority of local breeds in Ismailia region.

In conclusion, low preweaning average daily gain and high lamb losses were the main limited factors that affect flock productivity under THS and MCLFS, respectively. Twining was not an advantage in both systems as ewes had difficulties in obtaining enough nutrients to maintain themselves and their offsprings. High mortality rate under conditions of MCLFS in Ismailia needs further investigations.

References

Abd-El-Rahiem, K.I. (1990). *A study on some aspects in goat and sheep production systems in Ismailia Governorate.* MSc Thesis, Fac. Agric., Suez Cannal University, Egypt.

Aboul-Ela, M.B., El-Nakhla, S.M., Gabr, M.C., Ferial Hassan, A., Aboul-Naga, A.M. and Harahan, J.P. (1988). Effect of active immunization against androstenedione on ovulation rate and fecundity in fat tailed Rahmani and Finnish Landrace x Rahmani crossbred ewes. In: *Proc. 11th Inter. Cong. on Anim. Reprod. and AI,* Dublin, Ireland, 4: 407.

Aboul-Naga, A.M. (1987). Extensive flock management in arid range lands, case study of north western coast of Egypt. In: *Proc. 4th International Conf. in Goats,* Brazil, 8-13 March, 1987.

AOAC (1984). *Official Methods of Analysis* (14th Ed.). Association of Official Analytical Chemists Washington, DC.

El Shaer, H.M. (1981). *Comparative nutrition studies on sheep and goats grazing southern Sinai desert range with supplements.* PhD Thesis, Fac. Agric., Ain Shams University, Egypt.

Kandil, H.M. and Ahmed, A.M. (1997). Sheep performance on natural ranges with energy supplements in North Sinai. *Alex. J. Agr. Res.,* (in press).

Kearl, L.C. (1982). *Nutrient requirements of ruminants in developing countries.* Utah Agricultural Experimental Station, Logan, Utah, USA.

Metawi, H.R.M. and Shehata, E.I. (1996). A study on small ruminant production system in Egyptian villages. *Egyptian J. Anim. Prod.*, 33(Suppl.): 71-79.

SAS (1990). *SAS user's guide.* SAS Institute Inc., cary, NC, USA.

Wardah, M.F. (1981). *Models for estimating energy and protein utilization for feed.* PhD Thesis, Utah State University, Logon, Utah, USA.