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Comparative Study of Two Systems of Production in Barki Sheep

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ONE hundred and eleven mature fat - tailed Barki ewes of mixed ages were used to examine the relationship between input and output in two systems of production. Fifty four ewes were bred 3 times in 2 years during June, February and October (System A) while 57 were bred once per year during June (System B). Apart from the breeding programme both groups were similarly managed. Dry matter intake (DMI) for ewes and their lambs was estimated up to marketing age in both systems over the experimental period. Weaning took place at 8 weeks of age in system A and at 12 weeks in system B, while marketing of lambs took place at 9 months in both systems.

System A significantly exceeded system B by 55.5% in number of lambs born / ewe joined (2.8 vs. 1.8), 52.9% in number of lambs weaned / ewe joined (2.6 vs. 1.7), 56.3% in number of lambs marketed / ewe joined (2.5 vs. 1.6), 21.3% in kg weaned lambs / ewe joined (38.8 vs. 32.0) and 43.4% in kg marketed lambs / ewe joined (92.2 vs. 64.3) respectively. The DMI / ewe and its lamb (S) up to marketing age were 1246.8 and 963.0 kg for systems A and B, respectively, with an increament of 29.5% for the former compared to the later system.

Keywords : Barki sheep and Systems of Production .

Sheep are known to be the lowest in efficiency of meat production among different livestock (Owen, 1976). Local Barki sheep has low production rate (Younis and Galal, 1973; Aboul - Naga, 1983) and Low biological efficiency of meat production (Younis *et al* ., 1984).

Younis (1977) discussed in details different possibilities for increasing sheep productivity in arab countries with special reference to Egyptian conditions. Rebreeding is considered one of the main avenues suggested for increasing productivity and improving production efficiency in local sheep. This is based on the fact that in Egypt ewes exhibit

oestrus all year round with significant monthly variation (El - fouly *et al.*, 1977; Younis, 1977; Aboul - Naga and Aboul - Ela, 1986). Three lambings in 2 years is visible under local conditions (Aboul - Naga, 1983) and could increase efficiency of meat production. Howevr, frequent breeding is also expected to increase feed costs which represent a substantial item of sheep production under local conditions. Therefore, information on the relationship between input and output is needed before recommending such a system. Thus, this paper examines the relationship between input and output in two systems of production (3 lambings in 2 years vs. 2 lambings in 2 years) in local Barki sheep.

Materials and Methods

Experimental animals

One hundred and eleven mature, coarse - wooled, fat - tailed, Barki ewes of mixed ages (2 - 6 years) were used in this study, of those 54 were chosen at random within age to be bred 3 times in 2 years during June, February and October (System A), while the remaining 57 were bred once per year during June (System B).

Management

Mating period was limited to 34 days in any breeding season. The first breeding season occured in June for both systems. During mating, ewes within each system, were divided at random to 3 subgroups of about 20 ewes each and were joined with a fertile Barki ram. Rams were daily rotated among the groups to avoid sire group confounding effects.

Ewes were fed in a group feeding according to their average live body weight and physiological status (NRC, 1975) on berseem hay (*Trifolium alexandrinum*) plus a concentrate mixture (65% undecorticated cotton seed cake, 20% rice polish , 9% wheat bran, 3% molases, 2% limestone and 1% common salt). In all cases DMI was estimated for all animals over the experimental period. Fresh water was available for animals twice daily.

Lambing occured during November, July and March in system A and during November in system B. Lambs born were ear taged and weighed within 24 hours after lambing. Lambs were kept with their dams during the suckling period up to weaning, which occured at 8 weeks in system A and 12 weeks of age in system B . Lambs were fed in the pre- weaning stage on their dam's milk plus small amounts of hay and concentrates, which were offered to their dams. After weaning, lambs were grouped and fed on the same concentrate mixture plus berseem hay according to their body weight (NRC, 1975) up to marketing, which took place at 9 months of age for all lambs regardless of system.

Lambs were weighed biweekly from birth to weaning and at monthly intervals thereafter (weaning to marketing) to the nearest 50 g.

Data recorded

Dry matter intake was estimated for both ewes and their lambs in both systems over the experimental period. Feed samples were taken biweekly for DM determination. All reproductive and productive traits were measured and recorded for ewes in each season and system, and included conception rate, lambing rate, lambing percentage, average litter size, birth weight, weaning weight, marketing weight, total weight of lambs born, weaned and marketed and daily gain (from birth to weaning and from weaning to marketing).

Statistical analysis

The least squares method was used for analysing the data of all productive triats. For number of lambs born, weaned and marketed the model of analysis included age of dam and system. Sex was excluded in that model because sex ratio did not differ significantly among both systems. However, for birth, weaning and marketing weights the model included system, age of dam, sex of lamb and season within each system.

The analysis was carried out utilizing Harvey's Mixed Model Programm (1977).

The models were as follows :

1. $Y_{ijk} = U + A_i + S_j + e_{ijk}$

where

Y_{ijk} = number of lambs.

U = general mean.

A_i = an effect due to age of dam.

S_j = an effect due to system of breeding.

e_{ijk} = random error.

2. $Y_{ijkim} = U + A_i + S_j + X_k + O_{jl} + e_{ijkim}$

where

Y_{ijkim} = weights of lambs.

U = general mean.

A_i = an effect due to age of dam.

S_j = an effect due to system of breeding.

X_k = an effect due to sex of lamb.

O_{jl} = season within system.

e_{ijkim} = random error

However, traits of discontinuous nature were analysed by Chi - square according to Snedecor and Cochran, (1970).

Results and Discussion

Livebody weight changes of ewes

Average live body weight of ewes at the start of the experiment was 41.9 and 32.2 kg in systems A and B, respectively. Ewes gained on the average 9.6 and 9.7 kg from mat-

ing to the end of pregnancy for Systems A and B, respectively. These values indicated that ewes on both systems were well fed and managed. It indicates as well that rebreeding had no deleterious effect on ewe condition, provided proper feeding and management were practiced.

Reproductive and productive performance of ewes

Average length of oestrous cycle (single cycles only) was 17.8 and 14.5 days for ewes on systems A and B, respectively, with an overall mean of 16.1 days (Table 1). This estimate lies within the normal range of 14.2 to 17.3 days reported by Badawy *et al* . (1973) and Younis *et al* . (1984) for the same breed.

TABLE 1. Reproductive and productive performance of ewes in two systems of production.

Traits	System A			Over all	System B		Over all
	SA_1	SA_2	SA_3		SB_1	SB_2	
No. of ewes joined	54.00	54.00	54.00	162.00	57.00	57	114
Average oestrous cycle length (days)	18.20	17.50	17.50	17.80	16.00	12.80	14.5
No. of ewes concieved (Lambed + Aborated)	46.00	46.00	50.00	142.00	48.00	50.00	98
No. of ewes lambed	44.00	46.00	50.00	140.00	46.00	50.00	96
Conception rate (%)	85.20	85.20	92.50	87.60	84.20	87.70	85.9
Lambing rate (%)	83.30	85.20	92.50	87.00	80.70	87.70	84.2
Lambing percentage	87.00	87.00	107.00	93.70	87.70	94.70	91.2
Average litter size	1.07	1.02	1.16	1.08	1.04	1.08	1.06
No. of lambs born	47.00	47.00	58.00	152.00	50.00	54.00	104
No. of lambs weaned	44.00	45.00	54.00	14300	46.00	49.00	95
No. of lambs marketed	42.00	43.00	49.00	134.00	44.00	48.00	92
Mortality of lambs							
from birth to weaning	6.40	4.30	6.90	5.90	8.00	9.30	8.7
from weaning to marketing	4.60	4.50	9.30	6.10	8.30	2.00	5.2
Total weight of lambs born / ewe joined	3.20	3.50	3.80	10.50	3.30	3.40	6.7
Total weight of lambs weaned / ewe joined	11.90	12.80	14.10	38.80	16.00	16.00	32.0
Total weight of lambs marketed / ewe joined	28.50	29.40	34.20	92.20	31.20	33.10	64.3

System A, 3 lambing in 2 years
System B, 2 lambings in 2 years
SA_1 , June, 1984
SA_2 , February, 1985
SA_3 , October, 1985
SB_1 , June 1984
SB_2 , June, 1985

Conception rate ranged from 85.2 to 92.5% for ewes on system A with an average of 87.6% and from 84.2 - 87.7% with an average of 85.5% for those on system B, differences being nonsignificant. Within system A, ewes mated in October had a higher conception rate compared to those mated in either June or February, which agrees with Aboul - Naga *et al* . (1991) who found that there was a significant variation in the breeding activity at different mating seasons.

Dzakuma *et al* . (1982) found that in five combinations of Finnsheep, Dorset and Rambouillet, fertility of ewes was reduced during May - June breeding (47.8%) compared to January - february breeding (91.8%) and September - October breeding (90.6).

Lambing rate expressed as the number of ewes lambing per ewe bred was 87.0 and 84.2 for systems A and B, respectively, differences being nonsignificant. However, these values lie within the normal range (84.6 to 92.0%) of lambing rate for Barki sheep reported previously by Aboul - Naga and Aboul - Ela (1986).

The average litter size was 1.08 and 1.06 for ewes on systems A and B, respectively, being higher than previous estimates reported for the same breed (Younis *et al* ., 1984). System A exceeded system B significantly (Tables 1 & 2) by 55.5% in number of lambs born per ewe joined (2.8 vs. 1.8). 52.9% in number of lambs weaned per ewe joined (2.6 vs. 1.7) and 56.3% in number of lambs marketed per ewe joined (2.5 vs. 1.6). Aboul - Naga (1983) working on Ossimi, Rahmani and Barki sheep for 18 successive crops, found that the number of lambs weaned per ewe joined for system A was 0.71, 0.80 and 0.66, respectively. The corresponding values for system B were 0.95, 1.06 and 0.92. Similar results were obtained by Goot and Maijala, (1977) in a twice - yearly lambing system The number of lambs born per ewe were 1.52 and 4.03 for ewes lambed once within a calender year and lambed twice, respectively.

TABLE 2 . Least squares means and standared errors for numbers of lambs born, weaned, marketed per ewe joined.

Source of variation	Number of lambs born / ewe	Number of lambs weaned / ewe	Number of lambs marketed / ewe
System			
A	1.95 ± 0.025*	1.90 ± 0.024*	1.86* ± 0.027
B	1.67 ± 0.018	1.62 ± 0.025	1.61 ± 0.026
Age of dam			
2 - 3 yrs	1.78 ± 0.042	1.74 ± 0.041	1.71 ± 0.045
3 - 4 yrs	1.83 ± 0.027	1.78 ± 0.026	1.76 ± 0.028
> 4 yrs	1.82 ± 0.025	1.76 ± 0.025	1.73 ± 0.027

* $P < 0.05$

System A, 3 Lambing in 2 years

System B, 2 Lambing in 2 years

System of production had a highly significant effect on the total weight of lambs born, weaned and marketed per ewe joined (Table 1). System A exceeded system B by 21.3% of total weight of lambs weaned (38.8 vs. 32.0 kg) and 43.3% of lambs marketed per ewe joined (92.2 vs. 64.3 kg).

Average birth weight was 3.86 and 3.83 kg for lambs on systems A and B, respectively, with an overall mean of 3.84 kg (Table 3). Previous estimates in the literature for the same breed ranged from 2.34 to 3.93 kg (Fahmy *et al* ., 1969).

TABLE 3 . Least squares means and standared errors for lambs weights (kg) at different ages.

Source of variation	Birth weight	Weight at 16 weeks	Weight at 24 weeks	Marketing weight 36 weeks
System				
A	3.86 ± 0.07	20.47 ± 0.55	25.80 ± 0.81*	33.15 ± 1.08*
B	3.83 ± 0.08	21.11 ± 0.62	27.53 ± 0.91	36.99 ± 1.21
Season / system				
SA_1	3.82 ± 0.13	21.26 ± 0.96	26.31 ± 1.41	32.79 ± 1.88
SA_2	4.01 ± 0.11	20.49 ± 0.84	25.37 ± 1.23	31.98 ± 1.64
SA_3	3.74 ± 0.12	19.65 ± 0.87	25.73 ± 1.27	34.69 ± 1.70
SB_1	3.92 ± 0.12	21.84 ± 0.41	27.16 ± 1.33	37.11 ± 1.78
SB_2	3.74 ± 0.11	20.37 ± 0.81	27.16 ± 1.18	36.99 ± 1.21
Sex of lambs				
Male	3.86 ± 0.08	21.38 ± 0.60*	27.98 ± 0.89**	36.92 ± 1.19**
Female	3.79 ± 0.08	19.7 ± 0.60	24.74 ± 0.85	32.46 ± 1.13
Age of dam				
2 - 3 yrs	3.57 ± 0.13**	20.88 ± 0.99	26.04 ± 1.46	33.79 ± 1.95
3 - 4 yrs	3.89 ± 0.11	20.01 ± 0.82	26.55 ± 1.20	35.10 ± 1.60
> 4 yrs	4.03 ± 0.06	20.74 ± 0.74	26.51 ± 0.69	35.18 ± 0.92

* P< 0.05 ** P< 0.01
System A, 3 lambing in 2 yeas
System B, 2 lambing in 2 yeas
SA_1 , June, 1984
SA_2 , February, 1985
SA_3 , October, 1985
SB_1 , June , 1984
SB_2 , June, 1985

Season of lambing had no significant effect on lamb birth weight while age of dam significantly affected the same trait. There is a tendency of increase in birth weight of lambs with the advancement of age of dam; such trend may be due to changes which occur in the uterine environment. Younis *et al* . (1984) observed the same trend and found that the significant effect of age of dam on birth weight disappeared at later stage. Sex of lamb had no significant effect on birth weight with an overall mean of 3.79 and 3.87 for females and males, respectively. However, sex of lamb affectes significantly subse-

quent weights in favour of male ones (at 16, 24 and 36 weeks of age). This is in agreement with Sidwell and Miller (1971) and Ragab *et al* . (1978).

Average weight of lambs at 16 weeks was 20.5 and 21.1 kg for lambs of systems A and B, respectively. System and season of lambing had no significant effect on weight of lambs at 16 and 24 weeks of age, which agrees with the findings of Kassab and Karam (1961).

Marketing weight was 33.2 and 37.0 kg for lambs of systems A and B, respectively, such difference being significant. This is expected since lambs of system B had more chance with their dams than those of system A. Male lambs were significantly heavier than females at marketing by 4.4 kg (36.9 vs. 32.5 kg). However, season of lambing had no significant effect on the same trait.

Mortality rate of lambs born in system A was 5.9 and 6.1% from birth to weaning (8 weeks old), and weaning to maketing, respectively (Table 1). Corresponding values for system B were 8.7, and 5.2%, differences between systems being not significant (X^2 = 0.72 and 1.14). With the exception of summer born lambs (SA3) mortality rate in this study was of reasonable magnitude. This may be due to the high mothering ability of Barki ewes compared to other breeds (Galal *et al* ., 1972). However, results of the present study show that under practical farm conditions proper management and feeding could reduce lamb losses when lambs are kept with their dams up to at least 8 weeks of age.

Conclusion

Studies on the output of local sheep in relation to the input are very limited. Under local conditions feed costs represent the major part of input while lamb production represents the main source of output.

In the present study, the total DMI by the ewe and its lamb up to marketing was 1246.8 and 963.0 kg for systems A and B, respectively. This means that animals on system A consumed 29.5% more DM than those on system B over the experimental period. On the other hand system A significantly exceeded system B by 43.4% in kg marketed lambs per ewe joined (92.2 vs. 64.3 kg). Meanwhile, labour cost increase by 25% in system A compared to system B.

Accordingly accelerating lamb production by using a system of 3 lambings in 2 years caused an increament in DMI by 29.5%, while resulting in 43.4% increament in kg marketed lambs per ewe joined compared to the conventional system of 2 lambings in 2 years. In view of the fact that the value of unit weight of feed is far below that of live body weight of lambs, accelerated lambing is considered an effective method of improving efficiency of meat production in local sheep.

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دراسة عن العلاقة بين الكمية المستهلكة من الغذاء والمنتج من العملان فى نظامين من نظم التربية

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أجريت هذه الدراسة لايجاد العلاقة بين كمية الغذاء المستهلك وكمية المنتج من العملان فى نظامين من نظم التربية (ثلاث ولادات فى السنتين أو ولادة واحدة فى السنة). استخدم فى هذه الدراسة ١١١ نعجة برقى من أعمار مختلفة . تم تطبيق نظام ثلاث ولادات فى السنتين على ٥٤ نعجة . تم معاملة جميع النعاج فى كلا المجموعتين معاملة متماثلة تماما .

تم فطام الحملان فى نظام التربية الاول (٣ ولادات فى السنتين) على عمر ٨ اسابيع فى حين تم فطام الحملان فى نظام التربية الثانى (ولادة واحدة فى السنة) على عمر ١٢ اسبوعا فى حين كان عمر التسويق للحملان فى كلا النظامين ٩ أشهر.

أظهر نظام ٣ ولادات فى السنتين تفوقا معنويا على نظام الولادة الواحدة فى السنة بمقدار ٥٥٪ فى عدد الحملان المولودة بالنسبة لعدد النعاج الداخلة موسم التربية (٨ر٢ ، ٨ر١ حمل) ، ٩ر٥٢٪ فى عدد الحملان المفطومة للنعاج الداخلة موسم التربية (٦ر٢ ، ٧ر١ حمل) ، ٣ر٥٦٪ فى عدد كيلوجرامات الحملان المفطومة بالنسبة لعدد النعاج الداخلة موسم التربية (٨ر٣٨ ، ٠ر٢٢ كجم) و ٤ر٤٣٪ فى عدد كيلوجرامات الحملان عند عمر التسويق بالنسبة لعدد النعاج الداخلة موسم التربية (٢ر٩٢ ، ٣ر٦٤ كجم).

قدرت المادة الجافة المستهلكة للنعجة الواحدة وحملانها خلال فترة التجربة وكانت ٨ر١٢٤٦ ، ٠ر٩٦٣ كجم لكل من النظامين الاول والثانى على التوالى بزيادة مقدارها ٥ر٢٩٪ لنظام الثلاث ولادات فى السنتين.

مما سبق يتضح أن الزيادة فى انتاج الحملان فى نظام ٣ ولادات فى السنتين كانت اكبر من الزيادة فى كمية الغذاء المستهلك مقارنة بنظام الولادة الواحدة فى السنة.