# EFFECT OF WINTER SUPPLEMENTATION ON THE PERFORMANCE OF BALOCHI EWES GRAZING NATIVE RANGELANDS IN HIGHLAND BALOCHISTAN

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## Summary

Eighty-two ewes of Balochi breed, two to four years of age were used in a completely randomized design to study the effect of winter supplementation on their performance in Kalat area of Balochistan and randomly divided into two groups of 40 and 42 animals. Two treatments (T1 and T2) studied were: 250 gm/animal/day of a 50 : 50 mixture of cottonseed cake and barley grain fed from Oct. 20 to Dec. 18, 1988 plus grazing and 500 gm/animal/day of the same feed mixture fed from Oct. 9 to Dec. 18, 1988 in addition to grazing. Lucerne hay and wheat straw in a 50 : 50 ratio were provided to all the ewes for a period of one month from Jan. 6, 1989 @ 320 gm/animal/day to sustain them in severe winter. Same feeding levels to the same ewe groups were again fed from Mar. 1 to May 27, 1989. Three breeding rams stayed with the flock from Nov. 1 to Dec. 13, 1988. Lambing took place from Apr. 2 to May 12, 1989. Conception, lambing and mortality percentage was found different ($P < .05$) between T1 and T2 (22.5 vs 52.4%, 22.5 vs 52.4% and 12.5 vs 4.8%, respectively). Lamb birth weights (3.4 vs 3.2 kg) were similar for T1 and T2 but lamb weaning weights were found different between T1 and T2 (12.6 vs 14.8 kg). The ewes on T2 maintained higher body weights throughout winter than the ewes on T1. The results are suggestive of improvement in conception rate with winter supplementation (flushing) and decrease in ewe mortality. Late-gestation and early-lactation supplemental feeding of ewes results in increases in weaning weights of their lambs.
(**Key Words**: Balochi Ewes, Winter Supplementation, Fertility, Lamb Performance)

## Introduction

Balochistan, with an area of 34.7 million ha, is the largest province of Pakistan and constitutes approximately 44% of the total land area of the country. However, only as little as 5% of this area is cultivable and thus, more than 93% of the area is regarded as only suitable for rangeland grazing by livestock particularly small ruminants (sheep and goats). The productivity of these rangelands is presently very low because the number of livestock they feed is much larger (5-6 times) than their estimated economic carrying capacity (Aro et al., 1988). Small ruminants are the principal livestock commodity of the province because these animals are better suited physiologically than cattle to the severe environmental conditions experienced in Balochistan. There are 11.1 million head of sheep and 7.3 million head of goats in Balochistan (GOP, 1986).

Since these animals get more than 90% of their feed requirements from range vegetation and these rangelands are only producing approximately 80-100 kg dry matter (DM) per ha/yr (FAO, 1983), it is evident therefore that these animals are malnourished. In consequence, they are more prone to disease and their overall productivity is very low. Lack of feed is particularly critical during winter as the range vegetation is dormant when the animals are either breeding (early winter), or in advanced pregnancy (late winter) or in early lactation (early spring). As their nutritional requirements are at a peak during this period, any nutritional stress at this time would greatly affect their productivity in terms of conception rates, lambing percentages, lamb birth weights and weaning weights. Any kind of management intervention which improves feed availability during these critical phases of the production cycle would have a two-fold benefit.

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It would not only help to alleviate the effect of severe nutritional deficit on production, but also would help decrease the grazing burden on the rangelands which might permit some rehabilitation of grazing resources.

Increasing ewe nutrition levels prior to mating (flushing) can increase the flock reproductive performance due to higher ovulation rates when in good body condition. Ten to twenty percent more lambs are expected from flushing of moderately underweight ewes (Meyer, 1985). Similarly, late-gestation and early lactation supplementary feeding can result in higher birth and weaning weights of lambs, and will help ewes to be better prepared for the next production cycle.

Studies have been underway at the Arid Zone Research Institute (AZRI), Quetta since 1986 which examine the effect of the provision of supplemental feed during reproduction on the productivity of ewes grazing the native rangelands of highland Balochistan. The study reported in this paper was conducted to monitor the effect of different levels of protein and energy supplementation in winter on the productivity of Balochi ewes grazing native rangelands at Zarchi (Kalat district). The vegetation of the Zarchi area is principally shrubs of Artemisia and Halloxylon species of very low overall productivity (approximately *100 kg/ha/yr dry matter*). The climate of the area is arid continental Mediterranean and approximately 200 mm of precipitation is received annually.

## Materials and Methods

The study was conducted at the AZRI Range-Livestock Research Station at Zarchi, 31 km west of Kalat (29°07'N, 66°24'E, elevation 1850m). Eighty-two Balochi ewes, of two to four years of age were used in a completely randomized disign to study the effect of two levels of protein and energy supplementation during the breeding cycle. Forty and 42 animals were used in treatments 1 and 2, respectively. Winter air temperatures are very low at this location (100 + frost days being expected), the range vegetation is dormant and unable to sustain the level of grazing imposed. The local population migrates to the low lands of Indus valley during winter in search of food, feed, labor and fuel along with their animals. Since we had to keep our ewes at the Station experimentally, therefore treatment 1 was included in the study to serve as control as it was not possible to have a true control. The supplement was a 50 : 50 mixture of barley grain and cottonseed cake and the two treatments studied were :

**Treatment 1**

250 gm per day per ewe of supplement from October 20th to December 18th + range grazing;

**Treatment 2**

500 gm per day per ewe of supplement from October 9th to December 18th + range grazing;

On November 1st three breeding rams were introduced to a flock of 100 ewes, including 82 of the ewes involved in the study, and they stayed with the flock for 43 days. Breeding was terminated on December 13th. All the animals grazed together and had equal access to the available range forage. Supplemental feeding was provided in the evening when the animals returned from grazing. Fresh water and salt were available freely. Due to the severity of the winter season the experimental animals were all clearly malnourished because of the poor availability of range forage. Traditionally, the local population *migrate in winter to the Indus valley where forage* is more freely available. However, experimentally we wished to sustain our animals at the station over winter as stated earlier; therefore, lucerne hay and wheat straw in a 50 : 50 ratio were provided to all the animals for a period of one month from January 6th, 1989 @ 320 g per animal per day.

Additional, supplemental feeding was restarted on 1st March, 1989 to the same groups and at the same rate as during breeding and continued until the 27th of May. Lambing principally took place between April 2nd and May 12th, 1989 and lambs were weaned on July 7th, 1989. All the ewes were vaccinated against enterotoxaemia and anthrax and drenched with nilverm (levamisol hydrochloride) for internal parasite control. Terramycin was injected whenever needed against pleuro-pneumonia and other respiratory infections and in this way general animal health was ensured. All the ewes were housed together in concrete buildings at night and in open during the day when came back from grazing at noon. The

following observations were recorded:

Initial body weight of all the ewes,
Fortnightly body weight of all the ewes,
Conception rates,
Lambing rates,
Lamb birth weights,
Lamb weaning weights,
Mortality.

The data on body weights were analyzed by Analysis of Variance technique using completely randomized design (Steel and Torrie, 1980); and conception, lambing and mortality rate data were analyzed by Chi-square analysis (Little and Hills, 1978).

## Results

Results on conception, lambing and mortality percentage are given in table 1. Treatment 2 significantly increased conception and lambing percentage and decreased mortality ($p < .05$). Birth and weaning weights are given in table 2. The two treatments did not differ in lamb birth weights (3.4 vs 3.2 kg). However, the lambs from ewes on treatment 2 had higher weaning weights (12.6 vs 14.8 kg; $p < .05$). Data on fortnightly body weights of all the ewes included in the study, whether they conceived or not, are presented in table 3. Ewes on treatment 2 maintained higher body weights than those on the control treatment ($p < .05$) throughout the study period except during last four fortnightly body weights. However, out of a total of 82 animals included in the study, less than 50% of the animals conceived. Therefore, to determine whether or not conception was critical to the body weight results, these have been examined as two separate groups. The results shown in table 4 summarize the fortnightly weights of sheep that did not conceive and these show a very similar trend to what can be observed in table 3. Fortnightly body weights of ewes that conceived are presented in table 5. No effective differences in body weights can be discerned between the two groups of sheep (tables 4 and 5).

## Discussion

The difference in conception and lambing percentage between the two treatments (22.5 vs 52.4; table 1) is an indication that protein and energy supplementation in winter, especially during breeding, can increase the productivity of sheep significantly ($p < .05$). Mortality losses which are largely due to poor nutrition and subsequent disease susceptibility (Nagy et al., 1987) can be reduced by almost one third (12.5 vs 4.8%).

The lambing percentages recorded (22.5 vs

TABLE 1. CONCEPTION, LAMBING AND MORTALITY PERCENTAGE OF EWES GRAZING NATIVE RANGELANDS AT ZARCHI AND FED TWO LEVELS OF PROTEIN AND ENERGY SUPPLEMENTATION

| Trt[1] | No. of Ewes | Conception percentage | Lambing percentage | Mortality percentage |
|---|---|---|---|---|
| T1[2] | 40 | 22.5*[4] | 22.5* | 12.5* |
| T2[3] | 42 | 52.4 | 52.4 | 4.8 |

[1] Trt - Treatment.
[2] T1 - Cottonseed cake + barley grain (50:50) mixture fed @ 250 gm/animal/day.
[3] T2 - Cottonseed cake + barley grain (50:50) mixture fed @ 500 gm/animal/day.
[4] * - Values in the same column differ significantly ($p < .05$).

TABLE 2. BIRTH AND WEANING WEIGHTS OF LAMBS FROM EWES GRAZING NATIVE RANGELANDS AT ZARCHI AND FED TWO LEVELS OF PROTEIN AND ENERGY SUPPLEMENTATION[1]

| Trt | No. of Lambs | Birth weight (kg) | Weaning weight (kg) |
|---|---|---|---|
| T1 | 9 | 3.4 ± 0.21 | 12.6* ± 0.85 |
| T2 | 22 | 3.2 ± 0.13 | 14.8 ± 0.54 |

[1] Trt, T1, T2, * - See table 1.

TABLE 3. FORTNIGHTLY BODY WEIGHTS OF SHEEP GRAZING NATIVE RANGELANDS AT ZARCHI AND FED TWO LEVELS OF PROTEIN AND ENERGY SUPPLEMENTATION[1,2]

| Trt | No. of Ewes | W1 | W2 | W3 | W4 | W5 | W6 |
|---|---|---|---|---|---|---|---|
| T1 | 35 | 25.39 | 25.07* | 25.47* | 25.86* | 26.34* | 25.89* |
| SE ± | | 0.51 | 0.52 | 0.52 | 0.52 | 0.53 | 0.54 |
| T2 | 40 | 25.79 | 26.69 | 27.32 | 28.28 | 28.93 | 29.33 |
| SE ± | | 0.48 | 0.49 | 0.48 | 0.48 | 0.49 | 0.50 |

| Trt | W7 | W8 | W9 | W10 | W11 | W12 | W13 |
|---|---|---|---|---|---|---|---|
| T1 | 25.05* | 24.89* | 23.88* | 23.21* | 23.62* | 22.47* | 23.98* |
| SE ± | 0.54 | 0.57 | 0.57 | 0.55 | 0.52 | 0.56 | 0.63 |
| T2 | 28.63 | 28.05 | 26.70 | 26.36 | 26.15 | 26.52 | 27.33 |
| SE ± | 0.51 | 0.53 | 0.53 | 0.51 | 0.48 | 0.52 | 0.59 |

| Trt | W14 | W15 | W16 | W17 | W18 | W19 |
|---|---|---|---|---|---|---|
| T1 | 27.24* | 30.49* | 32.94 | 33.17 | 33.50 | 33.15 |
| SE ± | 0.73 | 0.70 | 0.74 | 0.76 | 0.85 | 0.87 |
| T2 | 29.91 | 32.45 | 34.37 | 33.40 | 32.91 | 33.19 |
| SE ± | 0.68 | 0.65 | 0.69 | 0.71 | 0.79 | 0.81 |

[1] Trt, T1, T2, * - See table 1, SE - Standard error of mean.
[2] W1~W19 - Fortnightly body weights of sheep from mid Oct., 1988.

TABLE 4. FORTNIGHTLY BODY WEIGHTS OF SHEEP (NON-PREGNANT) GRAZING NATIVE RANGELANDS AT ZARCHI AND FED TWO LEVELS OF PROTEIN AND ENERGY SUPPLEMENTATION[1,2]

| Trt | No. of Ewes | W1 | W2 | W3 | W4 | W5 | W6 |
|---|---|---|---|---|---|---|---|
| T1 | 26 | 24.44 | 24.09* | 24.49* | 25.04* | 25.33* | 24.84* |
| SE ± | | 0.51 | 0.52 | 0.56 | 0.55 | 0.55 | 0.57 |
| T2 | 18 | 25.17 | 25.88 | 26.58 | 27.51 | 28.13 | 28.64 |
| SE ± | | 0.62 | 0.63 | 0.67 | 0.66 | 0.67 | 0.69 |

| Trt | W7 | W8 | W9 | W10 | W11 | W12 | W13 |
|---|---|---|---|---|---|---|---|
| T1 | 24.00* | 23.75* | 22.66* | 22.05* | 22.48* | 21.25* | 22.52* |
| SE + | 0.58 | 0.62 | 0.58 | 0.57 | 0.51 | 0.58 | 0.64 |
| T2 | 27.87 | 27.07 | 25.58 | 25.16 | 24.97 | 25.28 | 25.70 |
| SE ± | 0.69 | 0.75 | 0.69 | 0.68 | 0.62 | 0.70 | 0.77 |

| Trt | W14 | W15 | W16 | W17 | W18 | W19 |
|---|---|---|---|---|---|---|
| T1 | 25.40* | 29.92* | 32.05* | 33.46 | 34.31 | 33.91 |
| SE ± | 0.67 | 0.78 | 0.88 | 0.89 | 0.97 | 1.04 |
| T2 | 28.90 | 33.22 | 36.05 | 35.98 | 35.96 | 36.16 |
| SE ± | 0.80 | 0.94 | 1.06 | 1.07 | 1.17 | 1.25 |

[1] Trt, T1, T2, * - See table 1.
[2] SE, W1~W19 - See table 3.

TABLE 5. FORTNIGHTLY BODY WEIGHTS OF PREGNANT EWES GRAZING NATIVE RANGELANDS AT ZARCHI AND FED TWO LEVELS OF PROTEIN AND ENERGY SUPPLEMENTATION[1,2]

| Trt | No. of Ewes | W1 | W2 | W3 | W4 | W5 | W6 |
|---|---|---|---|---|---|---|---|
| T1 | 9 | 28.13 | 27.89 | 28.29 | 28.22 | 29.26 | 28.91 |
| SE ± | | 1.02 | 1.04 | 0.94 | 1.00 | 0.98 | 0.98 |
| T2 | 22 | 26.30 | 27.35 | 27.93 | 28.90 | 29.59 | 29.89 |
| SE ± | | 0.65 | 0.66 | 0.60 | 0.64 | 0.62 | 0.63 |

| Trt | W7 | W8 | W9 | W10 | W11 | W12 | W13 |
|---|---|---|---|---|---|---|---|
| T1 | 28.09 | 28.18 | 27.40 | 26.56 | 26.91 | 26.00 | 28.20 |
| SE ± | 0.98 | 0.98 | 1.01 | 0.93 | 0.90 | 0.91 | 1.01 |
| T2 | 29.25 | 28.86 | 27.63 | 27.35 | 27.11 | 27.53 | 28.66 |
| SE ± | 0.65 | 0.63 | 0.64 | 0.60 | 0.58 | 0.58 | 0.65 |

| Trt | W14 | W15 | W16 | W17 | W18 | W19 |
|---|---|---|---|---|---|---|
| T1 | 32.56 | 32.13 | 33.20 | 32.31 | 31.18 | 30.96 |
| SE ± | 1.37 | 1.41 | 1.31 | 1.20 | 1.29 | 1.24 |
| T2 | 30.73 | 31.82 | 33.00 | 31.30 | 30.42 | 30.74 |
| SE ± | 0.87 | 0.90 | 0.84 | 0.77 | 0.82 | 0.79 |

[1] Trt, T1, T2, * - See table 1.
[2] SE, W1~W19 - See table 3.

52.4) are rather low. Special circumstances may have prevailed to cause this. From the experimental flock, 17 breeding ewes were recently purchased prior to the experiment from another more favourable ecological zone. None of these animals conceived, perhaps due to the unfamiliarity of their feed source and environment. Removing these ewes from the results gives a lambing percentage of 30 and 63 for the respective treatments and subsequent discussion is focused on this restricted set of experimental results. These findings are in line with those reported by Nagy et al. (1987) from surveys conducted in Zarchi and Tomagh (Loralai district) areas where lambing rates of 65 75% and 60-70%, respectively prevailed. In addition, at the Multipurpose Sheep Research Station, Yetabad (Loralai district) a lambing percentage of 60-70 is common with improved management (Khan, 1989). These results would have been further improved if the following additional factors had been accounted for:

(1) Three breeding rams were used for the flock of 100 sheep but one of them was excessively dominant. Therefore, effectively there was only one breeding ram for a flock of 100 ewes, resulting in ewe-to-ram ratio three times higher than was intended. The breeding male/female ratio prevalent in the area is 1:50 (Nagy et al., 1987).

(2) The rams stayed with the flock for only 43 days during the breeding season to synchronize the lambing period in contrast to the local practice of keeping the rams with the sheep throughout fall and winter and a consequent protracted lambing till mid-summer (Nagy et al., 1987). Therefore, a short breeding time further enhanced the stress on the single dominant ram and this may have reduced the conception rates.

The birth weights of lambs (table 2) from ewes fed either experimental ration did not differ significantly (3.4 vs 3.2 kg; $p > .05$) and are similar to those reported by Atiq-ur-Rehman et al. (1988) from a related study conducted at the AZRI Range-Livestock Research Station, Tomagh (Loralai district). Therefore, we conclude that flushing mainly effects conception rates and there is no residual effect of flushing on birth weights. The higher weaning weights of lambs, from ewes fed the higher level of supplement (14.8 vs 12.6 kg), indicates that, late-gestation supplementary

feeding helps to increase lamb weaning weights. This comes about through the improvement of the dam's general condition and provision of more milk fo. the young. Nutritional requirements are highest after parturition (NRC, 1985) because the sheep are nursing the young and restoring their body reserves. Provision of additional feed will help them to restore adequate body weight and prepare them for recycling.

The difference in fortnightly body weights of sheep (tables 3 and 4) indicates that the better nutritional management helped the animals gain weight; and during the stress period (forage dormancy during winter), better nourished animals lost less weight than the control treatment. During the last two months of the study, the sheep on both treatments had similar weights (tables 3 and 4) which was a consequence of greater forage availability from range vegetation. There is a substantial change in the quantity and quality of available forage as a result of winter rains and consequently animals that experienced small losses in weight during winter are able to make up this loss by compensatory gain mechanisms. The new born lambs usually benefit little from this change in range vegetation because they depend mainly on dam's milk and browse very small quantities of forage during the first two months of their life.

Body weights of sheep that conceived are outlined in table 5. No significant difference in weights of sheep was observed between treatments ($p > .05$). This is an important finding as it reflects a more efficient utilization of available forage by pregnant animals maintained on a low plane of nutrition. It implies that when nutritional requirements are high (during pregnancy and lactation), metabolic efficiency improves and pregnant unsupplemented animals can make more efficient use of winter forage than supplemented animals. Moreover, some loss in weight during winter (up to 10%) can be made up through compensatory gain during the subsequent spring period (Holechek, Pers comm. 1987). A more detailed examination of weights of all the sheep included throughout the study period shows a downward trend during extreme winter that was made up after the winter was over. This observation is in line with that reported by the NRC (1985), under some range conditions, ewes lose weight in winter (during pregnancy) and re-gain weight during lactation when grazing high-quality summer ranges. The Zarchi range is however only of good quality during early spring when a fairly good and nutritious forage is available which helped the animals regain their body weight.

## Conclusions

Flushing for two to four weeks of moderately thin and weak ewes maintained on poor winter ranges can increase conception rates. Mortality losses during winter can be reduced substantially by this nutritional management. Continuation of supplemental feeding (flushing) after the ewes conceive is of little advantage. Some loss in body weight of ewes, whether pregnant or not, during winter is not disadvantageous and can be made up through compensatory gain during the subsequent spring provided intake is not restricted. Late-gestation supplementary feeding can result in higher lamb weaning weights.

The potential therefore for improved off take through a minor management intervention has been demonstrated for sheep being raised in the arid highlands of Balochistan. Further research is now required to refine the amounts and duration of supplement provided to range raised sheep to ensure the economic robustness of the change in management practise being considered.

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