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Impact of concentrate supplementation in ewes and creep feeding in lambs on growth performance: Evidence from a front line demonstration under KVK, Utukur, YSR Kadapa

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Abstract
A Front Line Demonstration (FLD) was conducted during 2023 in three sheep-concentrated villages of Chinthakommadinne (C.K. Dinne) mandal, YSR Kadapa district, Andhra Pradesh, to evaluate the impact of concentrate supplementation in ewes and creep feeding in lambs under field conditions. One hundred (N=100) Nellore/Jodipi ewes and their lambs from flocks in C.K. Dinne, Papasahebpet, and Kopparthi were enrolled. Ewes in the demonstration group received a balanced concentrate mixture during late pregnancy and early lactation, while lambs were provided a 16% CP creep feed from 15 days of age to weaning. The demonstration resulted in higher lamb birth and weaning weights, increased average daily gain (ADG), reduced pre-weaning mortality, and a favorable benefit-cost ratio compared to farmers' traditional practice. Findings highlight the importance of targeted nutritional strategies to improve productivity and profitability of Nellore sheep in semi-arid production systems.

Keywords: KVK, Nellore (Jodipi) sheep, concentrate supplementation, creep feeding, ewe nutrition, pre-weaning growth, front line demonstration

Introduction
Sheep production in semi-arid tracts of Andhra Pradesh plays a crucial role in the livelihoods of small and marginal farmers. The Nellore (Jodipi) breed, widely reared in Rayalaseema, is typically maintained under extensive grazing systems with little or no concentrate supplementation. However, nutritional deficiencies, particularly during late gestation and early lactation, adversely affect ewe body condition, lamb birth weight, and survivability.

Creep feeding of lambs is an established practice to accelerate rumen development, enhance early feed intake, and promote higher pre-weaning growth. Despite its proven benefits, adoption in field conditions remains low. Front Line Demonstrations (FLDs) by Krishi Vigyan Kendras (KVKs) provide a platform to showcase and scientifically document the benefits of such interventions under farmer conditions.

The present FLD was implemented to assess the effect of (i) concentrate supplementation to ewes in late gestation and early lactation, and (ii) creep feeding of lambs on growth performance, survivability, and economics under field conditions in C.K. Dinne mandal.

Materials and Methods
Study Area and Period
The FLD was carried out from January to December 2023 in three villages of CK Dinne mandal, YSR Kadapa district: CK Dinne, Papasahebpet, and Kopparthi. The area represents a semi-arid zone with hot summers, erratic rainfall, and limited grazing resources.

Animals and Flocks
- **Species/breed:** Nellore (Jodipi) sheep.
- **Sample size:** 100 ewes and their lambs, from 15 smallholder flocks (5-20 ewes/flock).
- **Inclusion:** Healthy ewes in late gestation, with farmer consent.

Experimental Design
Farmers' Practice (FP) was compared with the Demonstration (Tech) group:

- **FP:** Grazing on native pastures with no concentrate or creep feeding.
- **Treatment:** Ewe concentrate supplementation + lamb creep feeding.

Feeding Protocols

- **Ewes:** Supplemented from 8 weeks pre-lambing to 6 weeks post-lambing at 1.0% BW (pre-lambing) and 0.75% BW (early lactation). The ration (18% CP, ME 10.5-11 MJ/kg) consisted of maize (35%), deoiled groundnut cake (25%), wheat bran (20%), broken maize/chunni (15%), mineral mix (2%), salt (1%), molasses (2%).
- **Lambs:** Provided creep feed ad libitum from 15 to 90 days (16% CP, ME ≥ 10 MJ/kg), formulated with maize (40%), soybean meal (20%), chickpea chunni (10%), wheat bran (25%), molasses (2%), mineral mix (2%), and salt (1%).

Health and Management
All animals received routine vaccination (PPR, ET), deworming, and clean water. Creep pens were constructed to provide lamb-only access.

Measurements

- Ewe BW at -60 d, -30 d pre-lambing, and +42 d post-lambing; BCS (1-5 scale).
- Lamb birth weight, weaning weight (90 d), ADG, and pre-weaning mortality.
- Economics: Feed cost, veterinary cost, gross returns (sale value at 90 d), net returns, and benefit-cost (B:C) ratio.

Statistical Analysis
Mean ± SD values were compared between FP and Tech groups using t-tests. Significance was set at $p<0.05$.

Results
Ewe Performance
Concentrate supplementation improved ewe body weight gain and BCS at lambing, reducing peri-parturient complications.

Table 1: Ewe body weight and peri-partum performance (Mean ± SD)

Parameter	FP	Treatment	Difference	P-Value
BW at -60 d (kg)	29.8±3.2	30.1±3.4	+0.3	0.62
BW at -30 d (kg)	30.2±3.1	32.8±3.3	+2.6	0.03*
BW change -60 d to lambing (kg)	+0.4±1.0	+2.7±1.2	+2.3	0.01*
BCS at lambing (1-5)	2.4±0.3	3.0±0.4	+0.6	0.02*
Retained placenta/dystocia (%)	6	2	-4	NS

Lamb Growth Performance
Lambs born to supplemented ewes and provided creep feed recorded significantly higher growth and survivability.

Table 2: Lamb birth and weaning performance (mean ± SD)

Parameter	FP	Treatment	Difference	P-Value
Birth weight (kg)	2.8±0.4	3.1±0.5	+0.3	0.04*
Weaning weight @ 90 d (kg)	11.6±1.8	14.8±2.0	+3.2	0.01*
ADG 0-90 d (g/d)	96±12	129±15	+33	0.01*
Pre-weaning mortality (%)	14	6	-8	0.05*

Economics
Despite increased feed costs, higher sale weights and reduced mortality improved overall profitability.

Table 3: Feed intake and economics per lamb (₹)

Component	FP	Treatment	Increment
Ewe concentrate cost (₹/ewe)	-	480	+480
Creep feed cost (₹/lamb)	-	360	+360
Other variable costs (₹)	250	270	+20
Gross return (₹/lamb)	3400	4500	+1100
Net return (₹/lamb)	3150	3890	+740
B:C ratio	1.25	1.48	+0.23

Village-wise Summary

Table 4: Village-wise lamb weaning weight and mortality

Village	N lambs	Weaning wt FP (kg)	Weaning wt Treatment(kg)	Mortality FP (%)	Mortality Treatment (%)
C.K. Dinne	34	11.7±1.5	14.9±2.1	15	6
Papasahebpet	32	11.5±1.9	14.7±2.0	13	6
Kopparthi	34	11.6±1.8	14.8±1.9	14	7

Discussion
The findings demonstrate that targeted concentrate supplementation during the critical periparturient period improved ewe body condition and indirectly enhanced lamb growth. Creep feeding significantly contributed to higher ADG and weaning weights. The reduced pre-weaning mortality reflects improved nutritional and immune status, as supported by earlier Indian studies (Girish et al., 2012;

Jayasree, 2014) [2, 3]. Economically, the intervention was cost-effective, with a higher B: C ratio (1.48 vs. 1.25). Improved lamb body weights ensure earlier marketability and increased farmer income. Adoption at scale will depend on reliable supply of concentrates, cost-effective ration formulation, and farmer training.

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Conclusions

- Supplementation of ewes with concentrates during late gestation and early lactation significantly improved ewe body condition and lamb birth weights.
- Creep feeding of lambs enhanced growth, reduced mortality, and increased profitability under field conditions.

The integrated feeding package is a scalable technology for Nellore sheep production in semi-arid regions and should be promoted through KVKs and extension programs.

Conflict of Interest
Not available

Financial support
Not available

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Appendices

Appendix A

Example concentrate and creep formulations (As-fed%)

- **Ewe concentrate (18% CP):** Maize 35, GNC 25, Bran 20, Chunni 15, Molasses 2, Mineral 2, Salt 1.
- **Lamb creep feed (16% CP):** Maize 40, Soybean meal 20, Bran 25, Chunni 10, Molasses 2, Mineral 2, Salt 1.

Appendix B

Data collection proforma

Farmer ID, village, ewe parity, BCS, BW at -60/-30/+42 d, lamb ID/sex/type, birth weight, 30/60/90 d weights, creep intake, health events, costs, sale value.