Original Research

Productive Performance of Sheep in Irrigated and Rainfed Areas in Krishna District of Andhra Pradesh, India

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Abstract

A study was conducted on the sheep of 250 shepherds selected through multistage stratified random sampling technique in irrigated and rainfed areas in Krishna district of Andhra Pradesh. Productive parameters like body weight, body length, height at withers, chest girth and punch girth of sheep of different ages (2 teeth, 4 teeth, 6 teeth and 8 teeth) for both male and females were recorded in irrigated and rainfed areas in Krishna district of Andhra Pradesh. Statistical analysis revealed that there was a significant difference in the body weights and other body measurements between the sheep of two areas. Sheep in the irrigated area have better body measurements that of the rainfed area. Males were significantly heavier than females at all ages in both areas.

Key words: Body Measurements, Irrigated Area, Krishna District, Rainfed Area, Sheep

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Introduction

Sheep production is the backbone of rural economy our country because sheep plays an important role in the livelihood of a large proportion of small and marginal farmers and landless laborers engaged in sheep rearing. The role of small ruminants is more pronounced in the arid and semi-arid zone of the country, where the risk and uncertainty of crop failure are high due to low availability of water and frequent natural vagaries like drought (Chaturvedi *et al.*, 2008). They act as a means of asset retention with high liquidity and helps in absorbing unemployed family labour (Suresh *et al*., 2007). They are raised mainly for meat, milk, and skin and providing a flexible financial reserve (social security) in crop failure for the rural population (Sastri, 1997; Puskur *et al.*, 2004). Rearing of small ruminants is preferred by farmers because

they are less expensive to purchase and require minimal input and maintenance costs, they are less susceptible to stress due to adverse change in climatic conditions (drought); and they have a relatively high reproduction rate and are easy to dispose off (Misra *et al.*, 2006). Sheep is very useful and important animal for the mankind, they contribute animal protein in the diets of human beings in the form of mutton and provide wool and skin to protect from adverse climatic conditions and also, increases the fertility of soil by providing valuable manure.

In South India sheep are mainly reared for meat production. Andhra Pradesh stands 1st in the total sheep population in the country with 13.55 million sheep (GOI-2012). Krishna district with a population of 5, 08,061 ranked 9th in the state (Statistical abstract of Andhra Pradesh-2015). Though the state has enormous sheep population, its productivity was very low due to poor genetic makeup and improper feeding practices. Biometric measurements provide an important evidence for the growth of the farm animal. Live weight plays an important role in determining several characteristics of the farm animals especially the ones having economic importance. The aim of the present study was to assess the growth performance of sheep in irrigated and rainfed areas in Krishna district of Andhra Pradesh.

Materials and Methods

The present study was conducted in the Krishna district of Andhra Pradesh. Selection of respondents was made by multistage stratified random sampling technique. The district is divided into two areas i.e. irrigated and rainfed areas. In the first stage from each area, five mandals were selected. In the second stage from each mandal, five villages were selected at random. In the third stage from each selected villages, 5 sheep farmers were selected forming total respondents of 250 farmers. On the basis of the above classification, the study involved a total number of 2 areas, 10 mandals, 50 villages and 250 farmers. The information on the biometric parameters of sheep was collected through interaction with the farmers, personal observations and on the spot recording of the parameters such as body weight, body length (distance between the anterior edge of the shoulder joint and the point of buttock), height at withers (vertical distance from the highest point of withers to the base of hoof), chest girth (circumference measured immediately behind the fore limbs) and punch girth (circumference measured immediately after abdomen) of sheep at various ages based on the eruption of permanent incisor. The data collected were subjected to standard statistical procedures as per Snedecor and Cochran (1994).

Results and Discussion

Body Weight

The mean body weight (kg) of sheep at different ages in the study area were measured and analysed and presented in Table 1. The mean values for body weights in the male for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 42.0±0.49, 44.50±0.34, 44.33±0.40 and 44.29±0.28 kg,

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respectively; while in the rainfed area, the corresponding values were 39.92±0.33, 42.67±0.33, 43.11±0.20 and 43.57±0.20 kg, respectively. The mean body weight for 2 teeth, 4 teeth, 6 teeth and full-mouthed ewes were 31.99±0.270, 36.02±0.240, 37.27±0.167 and 40.52±0.269 kg, respectively in the irrigated area; while in the rainfed area, the corresponding values were 29.30±0.40, 34.84±0.40, 37.22±0.35 and 42.01±0.56 kg, respectively.

Table 1: Mean (±SE) body weight (kg) of sheep for various age groups in irrigated and rainfed areas of Krishna district

S. No.	Age	Sex	Irrigated Area	Rainfed Area	t-value (df)	Overall
1	2-Teeth	Male	42.00±0.49 (12)	39.92±0.33 (12)	3.49**	40.95±0.36 (24)
		Female	31.99±0.27 (87)	29.30±0.40 (87)	5.55**	30.64±0.26 (174)
2	4-Teeth	Male	44.50±0.34 (6)	42.67±0.33 (6)	3.84**	43.58±0.35 (12)
		Female	36.02±0.24 (89)	34.84±0.40 (89)	2.49	35.43±0.24 (180)
3	6-Teeth	Male	44.33±0.40 (9)	43.11±0.40 (9)	2.68*	43.72±0.26 (18)
		Female	37.27±0.16 (89)	37.22±0.35 (89)	0.11**	37.24±0.19 (178)
4	8-Teeth	Male	44.29±0.28 (7)	43.57±0.20 (7)	2.04	43.92±0.19 (14)
		Female	40.52±0.26 (90)	42.01±0.56 (90)	-2.39**	41.26±0.31 (180)

*Values in the parenthesis indicate number of observations; ** indicates the values in a row were more significantly differed (P<0.01); *indicates the values in a row were significantly differed (P<0.05)*

The males in irrigated area differed significantly (P<0.05) with those of in rainfed area in all age groups, except in 8 teeth. The body weight of 4 teeth female sheep in the irrigated area did not differ significantly (P<0.05) compared to the rainfed area, while the corresponding weights in other age groups differed significantly. The body weights of males in both areas at all ages were significantly higher than the females of the same age (P<0.01). There is the effect of sex on body weights of sheep in both the areas.

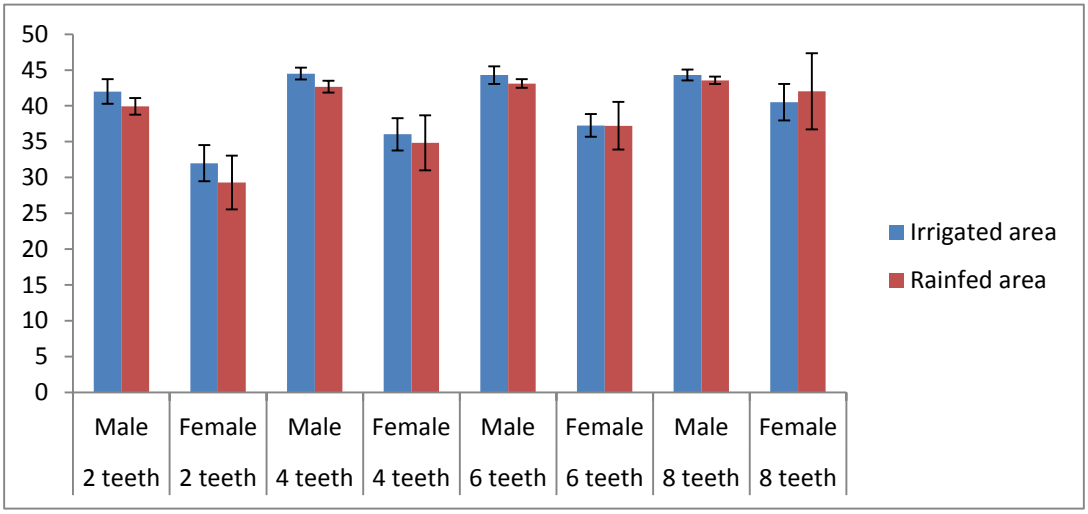

Fig. 1: Standard error bars for body weight of sheep in irrigated and rainfed areas Krishna district.

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Body Length

The mean body length (cm) of sheep at different ages in the study area was presented in Table 2. The mean values for body lengths in the male for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 76.08±0.22, 77.83±0.37, 78.11±0.30 and 78.17±0.28 cm, respectively; while in the rainfed area, the corresponding values were 74.75±0.21, 76.17±0.30, 76.89±0.26 and 77.14±0.50 cm, respectively. The mean body lengths for 2 teeth, 4 teeth, 6 teeth and full-mouthed ewes observed were 66.48±0.23, 64.93±0.44, 67.94±0.35, 72.78±0.50 cm, respectively, in the irrigated area; while in the rainfed area, the corresponding values were 64.17±0.46, 64.27±0.37, 65.99±0.32 and 67.43±0.50 cm, respectively.

Table 2: Mean (±SE) body lengths (cm) of sheep for various age groups in irrigated and rainfed areas of Krishna district

S. No.	Age	Sex	Irrigated Area	Rainfed Area	t-value (df)	Overall
1	2 teeth	Male	76.08±0.22 (12)	74.75±0.21 (12)	4.22**	75.41±0.20 (24)
		Female	66.48±0.23 (87)	64.17±0.46 (87)	4.39**	65.32±0.27 (174)
2	4 teeth	Male	77.83±0.30 (6)	76.17±0.26 (6)	3.83**	77.0±0.32 (12)
		Female	64.93±0.44 (89)	64.27±0.37 (89)	1.14	64.60±0.28 (178)
3	6 teeth	Male	78.11±0.30 (9)	76.89±0.26 (9)	3.02**	77.5±0.24 (18)
		Female	67.94±0.35 (89)	65.99±.032 (89)	4.07**	66.96±0.25 (178)
4	8 teeth	Male	78.17±0.28 (7)	77.14±0.50 (7)	2.69*	77.92±0.19 (14)
		Female	72.78±0.50 (90)	67.43±0.50 (90)	7.49**	70.10±0.40 (180)

*Values in the parenthesis indicate number of observations; ** indicates the values in a row were more significantly differed (P<0.01); *indicates the values in a row were significantly differed (P<0.05)*

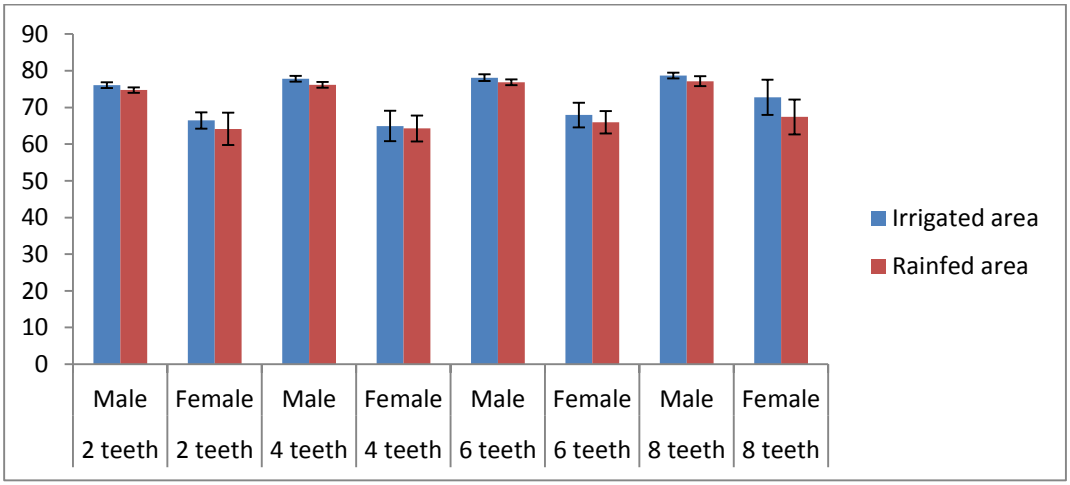

Fig. 2: Standard error bars for body lengths of sheep in irrigated and rainfed areas of Krishna district

From the study, it was evident that there was a significant difference between the sheep in two areas with respect to the body length in all age groups except between the females of 4 teeth age (P<0.05). The body

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lengths of males in both areas at all ages were significantly higher than the females of the same age (P<0.01). There is an effect of sex on body lengths of sheep in both the areas.

Height at Withers

The mean height at withers (cm) of sheep at different ages in the study area was presented in Table 3. The mean height at withers for 2 teeth, 4 teeth, 6 teeth and full-mouthed rams observed were 83.08±0.28, 84.83±0.40, 86.11±0.26 and 84.57±0.29 cm, respectively, in the irrigated area; while in the rainfed area, the corresponding values were 81.33±0.28, 81.83±0.30, 84.78±0.22 and 82.71±0.28 cm, respectively.

The mean values for height at withers in ewes for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 74.62±0.23, 75.93±0.17, 76.75±0.28 and 79.11±0.30 cm, respectively; while in the rainfed area the corresponding values were 72.51±0.29, 75.54±0.27, 76.12±0.29 and 76.88±0.31 cm, respectively.

Table 3: Mean (±SE) height at withers (cm) of sheep for various age groups in irrigated and rainfed areas of Krishna district

S. No.	Age	Sex	Irrigated Area	Rainfed Area	t-value (df)	Overall
1	2-Teeth	Male	83.08±0.28 (12)	81.33±0.28 (12)	4.32**	82.20±0.26 (24)
		Female	74.62±0.23 (87)	72.51±0.29 (87)	5.69**	73.56±0.20 (174)
2	4-Teeth	Male	84.83±0.40 (6)	81.83±0.30 (6)	5.93**	83.3±0.51 (12)
		Female	75.93±0.17 (89)	75.54±0.27 (89)	1.21	75.73±0.16 (178)
3	6-Teeth	Male	86.11±0.26 (9)	84.78±0.22 (9)	3.89**	85.44±0.23 (18)
		Female	76.75±0.28 (89)	76.12±0.29 (89)	1.53	76.43±0.20 (178)
4	8-Teeth	Male	84.57±0.29 (7)	82.71±0.28 (7)	4.50**	83.64±0.32 (14)
		Female	79.11±0.30 (90)	76.88±0.31 (90)	5.03**	77.99±0.23 (180)

*Values in the parenthesis indicate number of observations; ** indicates the values in a row were more significantly differed (P<0.01); *indicates the values in a row were significantly differed (P<0.05)*

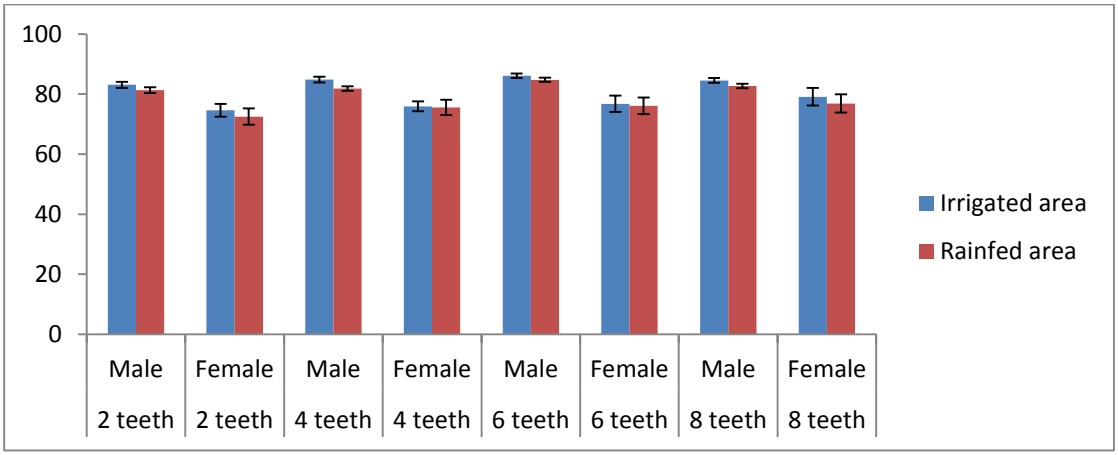

Fig. 3: Standard error bars for height at withers of sheep in irrigated and rainfed areas of Krishna district

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In the present study, it was observed that the mean height at withers of sheep in irrigated area was significantly higher compared to that of the rainfed area in all ages, except between the females of 4 teeth and 6 teeth age (P<0.05). The height at withers of males in both areas at all ages was significantly higher than the females of the same age (P<0.01). There is the effect of sex on height at withers of sheep in both the areas.

Chest Girth

The mean chest girth (cm) of sheep at different ages in the study area was presented in Table 4. The mean chest girth for 2 teeth, 4 teeth, 6 teeth and full-mouthed rams observed were 82.50±0.19, 85.50±0.42, 86.33±0.33 and 85.00±0.30 cm, respectively in the irrigated area; while in the rainfed area, the corresponding values were 81.25±0.25, 83.17±0.30, 84.22±0.32 and 83.43±0.20 cm, respectively. The mean values for chest girth in ewes for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 77.99±0.31, 79.83±0.26, 81.40±0.25 and 82.16±0.34 cm, respectively; while in the rainfed area the corresponding values were 73.94±0.31, 78.94±0.31, 81.24±0.52, 86.66±0.49 cm, respectively.

Table 4: Mean (±SE) chest girth (cm) of sheep for various age groups in irrigated and rainfed areas of Krishna district

S. No.	Age	Sex	Irrigated Area	Rainfed Area	t-value (df)	Overall
1	2-Teeth	Male	82.50±0.19 (12)	81.25±0.25 (12)	3.94**	81.83±0.20 (24)
		Female	77.99±0.31 (87)	73.94±0.31 (87)	9.04**	75.96±0.27 (174)
2	4-Teeth	Male	85.50±0.42 (6)	83.17±0.30 (6)	4.42**	84.33±0.43 (12)
		Female	79.83±0.26 (89)	78.94±0.31 (89)	2.13*	79.38±0.20 (178)
3	6-Teeth	Male	86.33±0.33 (9)	84.22±0.32 (9)	4.54**	85.27±0.34 (18)
		Female	81.40±0.25 (89)	81.24±0.52 (89)	0.28	81.32±0.29 (178)
4	8-Teeth	Male	85.00±0.30 (7)	83.43±0.20 (7)	4.26**	84.21±0.28 (14)
		Female	82.16±0.34 (90)	86.66±0.49 (90)	-7.44**	84.40±0.34 (180)

*Values in the parenthesis indicate number of observations; ** indicates the values in a row were more significantly differed (P<0.01); *indicates the values in a row were significantly differed (P<0.05)*

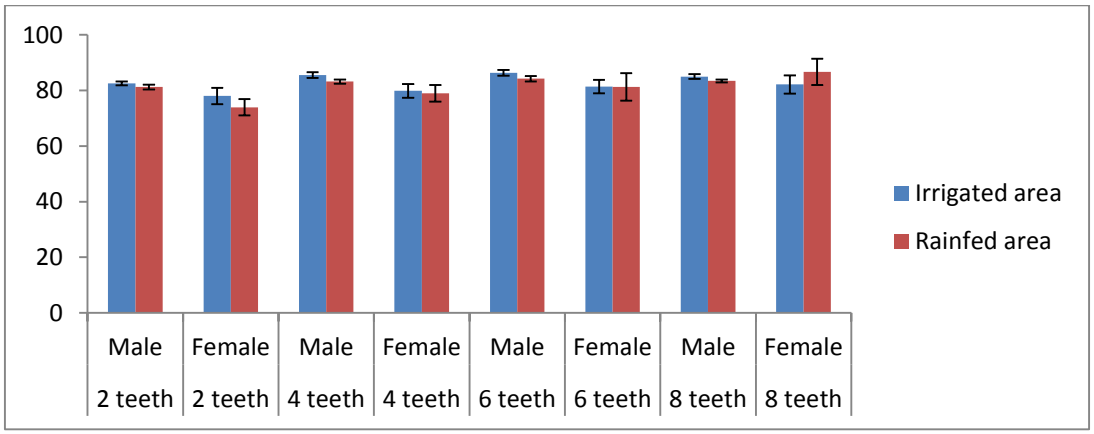

Fig. 4: Standard error bars for chest girth of sheep in irrigated and rainfed areas of Krishna district.

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In the present study, it was observed that the mean chest girth of sheep in irrigated area was significantly higher compared to that of the rainfed area in all ages, except between the females of 6 teeth age (P<0.05). But in the case of 8 teeth females, chest girth of rainfed area sheep was significantly higher than that of the female sheep in the irrigated area of the same age. The chest girth of males in both areas at all ages was significantly higher than the females of the same age except 8 teeth stage (P<0.05). In 8 teeth age, chest girth of female sheep in the rainfed area was significantly higher than that of the male sheep in the irrigated area (P<0.05). There is the effect of sex on chest girth of sheep in both the areas except in 8 teeth stage in the rainfed area.

Punch Girth

The mean punch girth (cm) of sheep at different ages in the study area was presented in Table 5. The mean punch girth for 2 teeth, 4 teeth, 6 teeth and full-mouthed rams recorded were 83.25±0.32, 86.50±0.42, 85.22±0.22 and 85.71±0.28 cm, respectively, in the irrigated area; while in the rainfed area, the corresponding values were 82.42±0.22, 84.83±0.30, 83.56±0.24 and 84.43±0.42 cm, respectively. The mean values for punch girth in ewes for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 80.09±0.33, 83.07±0.40, 84.21±0.28 and 89.24±0.44 cm, respectively, while in the rainfed area the corresponding values were 76.09±0.56, 82.65±0.30, 84.84±0.26 and 85.51±0.30cm, respectively.

Table 5: Mean (±SE) punch girth (cm) of sheep for various age groups in irrigated and rainfed areas of Krishna district

S. No.	Age	Sex	Irrigated Area	Rainfed Area	t-value (df)	Overall
1	2-Teeth	Male	83.25±0.32 (12)	82.42±0.22 (12)	2.08**	82.83±0.21 (24)
		Female	80.09±0.33 (87)	76.09±0.56 (87)	6.04**	78.09±0.36 (174)
2	4-Teeth	Male	86.50±0.42 (6)	84.83±0.30 (6)	3.16**	85.66±0.35 (12)
		Female	83.07±0.40 (89)	82.65±0.30 (89)	0.81	82.85±0.25 (178)
3	6-Teeth	Male	85.22±0.22 (9)	83.56±0.24 (9)	5.07**	84.38±0.0.25 (18)
		Female	84.21±0.28 (89)	84.84±0.26 (89)	-1.63	84.52±0.19 (178)
4	8-Teeth	Male	85.71±0.28 (7)	84.43±0.42 (7)	2.49**	85.07±0.30 (14)
		Female	89.24±0.44 (90)	82.51±0.30 (90)	12.43**	85.87±0.36 (180)

*Values in the parenthesis indicate number of observations; ** indicates the values in a row were more significantly differed (P<0.01); *indicates the values in a row were significantly differed (P<0.05)*

In the present study, it was observed that the mean punch girth of sheep in irrigated area was significantly higher compared to that of the rainfed area in all ages, except between the females of 4 teeth and 6 teeth age (P<0.05). The chest girth of males in both areas at all ages was significantly higher than the females of the same age, except 6 teeth and 8 teeth age. In 6 teeth age, punch girth of female sheep in the rainfed area was significantly higher than that of the male sheep in the irrigated area (P<0.05). Whereas, in the case of 8 teeth stage punch girth of female sheep in the irrigated area was significantly higher than that of the male sheep in the rainfed area (P<0.05).

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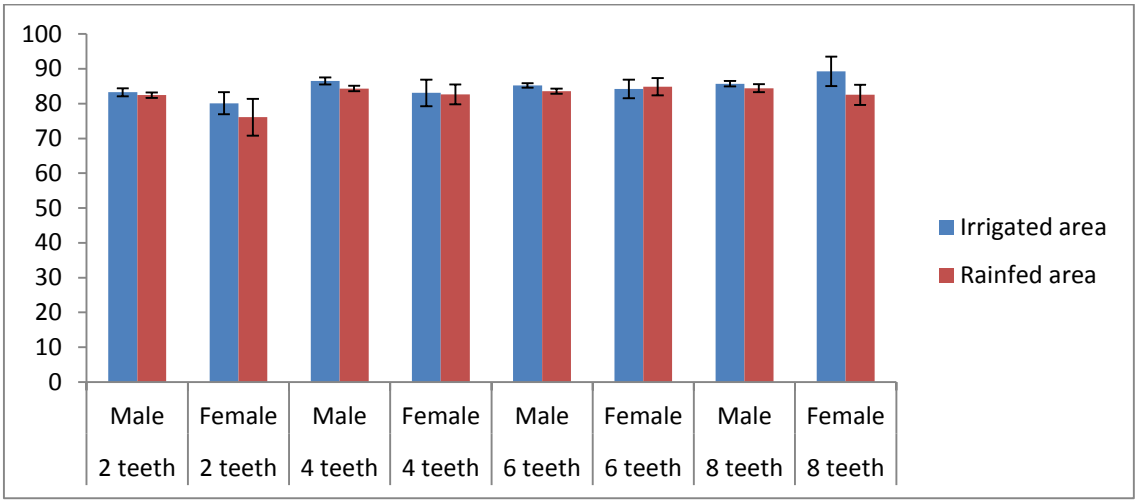

Fig. 5: Standard error bars for punch girth of sheep in irrigated and rainfed areas of Krishna district.

Overall highest body measurements of sheep were noted in the irrigated area of the district due to better grazing and management practices adopted by the farmers in this area. The difference in the body measurement may be due to variation in environmental conditions, feeding and management of the sheep in the two areas. The overall mean body weight, body length, height at withers, chest girth and paunch girth of the animals at the 8-teeth age were higher compared with measurements at 2-teeth age. This is an indication of increased skeletal and muscular growth of the animals with an increase in age. The overall body measurements obtained in the present study was higher than those reported by Rani *et al.*, 2014 in Nellore sheep.

Conclusion

The analysis of data on sheep of 2, 4, 6 and 8-teeth age reared under field irrigated and rainfed area of Krishna district of Andhra Pradesh has revealed that area and sex had significant (P≤0.01) effect on body measurements at the majority of ages studied. The mean body weights of rams at 2 teeth, 4 teeth, 6 teeth and 8 teeth age in irrigated area was 42.0±0.49, 44.50±0.34, 44.33±0.40 and 44.29±0.28 kg, respectively; while in the rainfed area, the corresponding values were 39.92±0.33, 42.67±0.33, 43.11±0.20 and 43.57±0.20 kg, respectively. The mean body weights of ewes at 2 teeth, 4 teeth, 6 teeth and 8 teeth in irrigated area was 31.99±0.270, 36.02±0.240, 37.27±0.167 and 40.52±0.269 kg, respectively, in the irrigated area; while in the rainfed area, the corresponding values were 29.30±0.40, 34.84±0.40, 37.22±0.35 and 42.01±0.56 kg, respectively. The mean values for body lengths in the rams at 2 teeth, 4 teeth, 6 teeth and full-mouth sheep in the irrigated area were 76.08±0.22, 77.83±0.37, 78.11±0.30 and 78.17±0.28 cm, respectively; while in the rainfed area the corresponding values were 74.75±0.21, 76.17±0.30, 76.89±0.26 and 77.14±0.50 cm, respectively. The mean body lengths for 2 teeth, 4 teeth, 6 teeth and full-mouthed ewes were 66.48±0.23, 64.93±0.44, 67.94±0.35, 72.78±0.50 cm, respectively, in the irrigated area; while in the

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rainfed area, the corresponding values were 64.17±0.46, 64.27±0.37, 65.99±0.32 and 67.43±0.50 cm, respectively. The mean height at withers for 2 teeth, 4 teeth, 6 teeth and full-mouthed rams were 83.08±0.28, 84.83±0.40, 86.11±0.26 and 84.57±0.29 cm, respectively, in the irrigated area; while in rainfed area the corresponding values were 81.33±0.28, 81.83±0.30, 84.78±0.22 and 82.71±0.28 cm, respectively. The mean values for height at withers in ewes for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 74.62±0.23, 75.93±0.17, 76.75±0.28 and 79.11±0.30 cm, respectively; while in the rainfed area the corresponding values were 72.51±0.29, 75.54±0.27, 76.12±0.29 and 76.88±0.31 cm, respectively. The mean chest girth for 2 teeth, 4 teeth, 6 teeth and full-mouthed rams were 82.50±0.19, 85.50±0.42, 86.33±0.33 and 85.00±0.30 cm, respectively, in the irrigated area; while in the rainfed area, the corresponding values were 81.25±0.25, 83.17±0.30, 84.22±0.32 and 83.43±0.20 cm, respectively. The mean values for chest girth in ewes for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 77.99±0.31, 79.83±0.26, 81.40±0.25 and 82.16±0.34 cm, respectively; while in the rainfed area the corresponding values were 73.94±0.31, 78.94±0.31, 81.24±0.52, 86.66±0.49 cm, respectively. The mean punch girth for 2 teeth, 4 teeth, 6 teeth and full-mouthed rams were 83.25±0.32, 86.50±0.42, 85.22±0.22 and 85.71±0.28 cm, respectively, in the irrigated area; while in the rainfed area, the corresponding values were 82.42±0.22, 84.83±0.30, 83.56±0.24 and 84.43±0.42 cm, respectively. The mean values for punch girth in ewes for 2 teeth, 4 teeth, 6 teeth and full-mouthed animals in the irrigated area were 80.09±0.33, 83.07±0.40, 84.21±0.28 and 89.24±0.44 cm, respectively; while in the rainfed area the corresponding values were 76.09±0.56, 82.65±0.30, 84.84±0.26 and 85.51±0.30cm, respectively. Statistical analysis revealed that there was a significant difference in the body measurements of sheep of different ages in irrigated and rainfed area of the district.

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