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Evaluating Carcass Traits of Sheep and Benchmarking of Slaughter Premises in Coastal Districts of Andhra Pradesh

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ABSTRACT

A survey was conducted in coastal districts of Andhra Pradesh to estimate the post-harvest economics of sheep slaughtered in municipal slaughter houses and rural meat stalls and to benchmark the slaughter premises of sheep. This survey revealed a higher degree of unauthorised slaughter as a result of shutting down of some of the existing slaughter houses by Supreme Court order because of lack of effluent treatment plants. The other findings of the survey revealed lower levels of knowledge of butchers on SOPs and personal hygiene. The recycling of the waste was not carried out at satisfactory level and effluent treatment plants were not established. In sheep meat market, direct involvement of the farmer was very low and middlemen were playing a major role except in case of rural meat stalls, where slaughter unauthorised was prevailing. The rate of slaughter was higher on weekends when compared to the other days. Post mortem examination was done only in municipal slaughter houses, and Halal method was used for slaughter of sheep irrespective of place of slaughter. But the rate of slaughter and demand were high in street and rural meat stalls. The supply of water and electricity was good. A dressing percentage of 47.85 and 49.61 per cent in sheep along with a sale price of Rs. 570 and 600 per kg for mutton were recorded in municipal slaughter houses and rural meat stalls respectively. Utilization of by-products was almost 100 per cent and survey strongly revealed the dependency of profitability of post-harvest economics of sheep slaughter on by-products utilization. On an average a profit of Rs. 3218 was obtained per animal out of which Rs. 2623 was from by-products which indicates a profit share of 82 per cent is from by-products.

Keywords: *Sheep slaughter, Municipal slaughter houses, Rural meat stalls, Economics*

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INTRODUCTION

Slaughter of animals is a state subject and slaughter houses are managed by the local authorities. In Andhra Pradesh, the existing situation of sheep slaughter was changed after issue of G.O. (OrderNo.3296-ELR/PCB/ZO-VSP/2014-1199) by the pollution control board to shut down the unhygienic slaughterhouses where in effluent treatment plants were not in vogue. This led to a high number of unauthorised slaughter premises. An analysis of the system is generally regarded as the first step for development and can pave a way to understand the returns. Assessing post-harvest economics of sheep slaughter and bench marking the slaughter facilities at rural meat stalls where in un-authorised slaughter is on-going can pave a way to understand the current status of sheep meat industry in Andhra Pradesh to augment clean meat production and only a few studies were available in the literature in relation to economic value of sheep (Morais and Madalena 2006). Keeping these in view the following work has been planned with the objective of determining the present scenario and bench marking the slaughter premises in coastal districts of Andhra Pradesh and as well as to study the post-harvest economics of sheep slaughter.

MATERIALS AND METHODS

The present work was under taken in coastal districts of Andhra Pradesh on assessing the economic value of the sheep slaughtered in municipal slaughter houses and also in rural meat stalls during the year 2018 and 2019.

The study was conducted in eight municipal slaughter houses located in six coastal districts which were functioning during this period. The facilities of slaughter were observed in these slaughter houses viz., Vizianagaram, Hanumanthuvaaka, Kakinada, Rajahmundry, Eluru, Bhimavaram, Vijayawada and Nellore [Note: Slaughter houses in the districts of Guntur, Prakasam and Srikakulam were shut down under Supreme Court order, upon a petition by pollution control board, Government of Andhra Pradesh (GOAP)]. Apart from the municipal slaughter houses, in rural areas five meat stalls in each district were selected randomly to document the slaughter practices of sheep. In total 8 existing municipal slaughter houses and 45 meat stalls were taken for survey. Economics data was collected from a total of 360 sheep in case of municipal slaughter houses and in case of rural unauthorised meat stalls the data on economics was also collected from five stalls from each district to a total of 225 sheep (n= 6). The respondents and butchers were personally interviewed using structured pre-tested questionnaire.

The questions and statements were asked in vernacular language i.e., Telugu. The middlemen, working in the municipal slaughter houses and butchers were personally interviewed by the investigator which enabled to get first-hand information. General information pertaining to age, sex, breed and geographical distribution were explored.

Mode of operation of marketing channels and price fixation patterns were observed. Rate of slaughter and days of operation, quantity of meat sold were recorded for both municipal slaughter houses and unauthorised rural meat stalls.

Slaughter premises were examined for lairage, type of roof, floor type, walls, lighting, railing system, electricity, carcass dressing room, toiletries, water supply, offices, ground water availability, drainage, laboratory facilities, processing unit and cold storage. Also examined for method of slaughter, provision of scabbards,

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sterilizing equipment, singeing procedure, performing ante-mortem examination, butchers slaughter experience, medical facilities and working apparel for butchers.

Economic importance was assessed from the data obtained on the following items at the time of survey.

Carcass weight: Hot carcass weight or slaughter weight i.e., after the removal of head, skin and visceral organs was recorded. Carcass weight was taken within 10 minutes after slaughter.

Average carcass weight: Average weight of slaughtered sheep and lamb carcasses per head was calculated.

Rate of slaughter: Data on average number of sheep slaughtered on week days and Sundays or holidays was obtained.

Purchase price of the sheep: The middlemen purchased sheep from the farmer on whole sale rate. Based on this each animal price was calculated. The by-products were sold on weight basis. The structured questionnaire prepared was used to reveal various daily slaughter practices of the slaughter houses and the price of the carcass and by-products.

Pre slaughter weight: Immediately before slaughter, the weight of the animal was recorded as the pre- slaughter weight. Animals were weighed to the nearest 0.5 kg and were slaughtered by severing the jugular vein and carotid arteries. Halal was done by mullah employed in the slaughter houses. The carcass weight was recorded as the weight of carcass after evisceration.

Dressing percentage: Dressing percentage was calculated as percentage of hot carcass weight with the live weight.

$$Dressing\ Percentage\ (DP) = carcass\ weight/live\ weight \times 100$$

The data was analysed using Microsoft excel to determine the values using the methods of Snedecor and Cochron (1994).

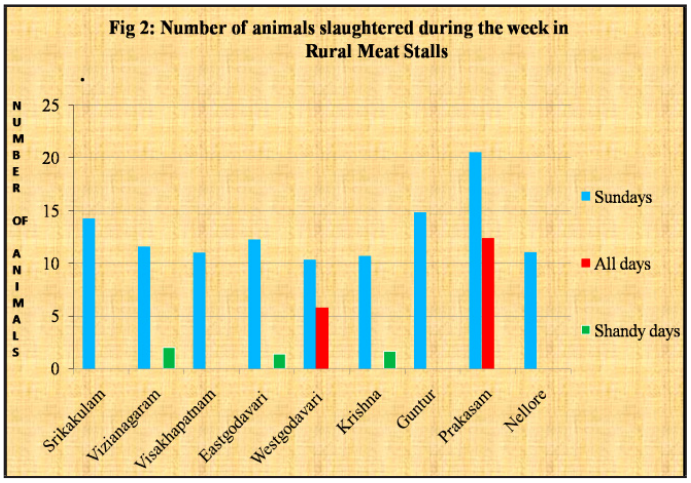
RESULTS AND DISCUSSION

The marketing channels were complex for municipal slaughter houses. Commission agents were playing a pivotal role in marketing of slaughter sheep. Very rarely the sheep were directly purchased by the butcher from farmers. The same opinion was also expressed by Ramesh et al. (2012), Oses et al. (2012) and Glimp (2009). At municipal slaughter houses, level the inflow and rate of slaughter followed by sale of meat was totally dependent on these agents.

The prices of sheep to be slaughtered were fixed based on the weight of each animal in a flock and the average age of the flock and also the relationship between the middleman and producer is also affecting the sale price of sheep. On an average the cost of a sheep aged 6-8 months, weighing around 7-8 kgs were Rs. 5000 and animals aged 1-2 years weighing around 15-16 kgs were Rs.12,000 approximately. The lower body weight of the sheep was due to the nativity of the breed and local feeding practices. A paradoxical increase in the price might be due to the high prevailing demand for mutton at unauthorized slaughter places because of the shutdown of considerable number of municipal slaughter houses according to government order.

Most of the times, the average price was fixed based on the weight of the animal and approximate dressing percentage. The middlemen maintain the flock for some time and would be sending the animals periodically for slaughter and sale of meat in their retail shops. In rural meat stalls the animals were purchased from farmers and they were slaughtered in the shops and sold.

Municipal slaughter houses were found to operate on all days in a week, irrespective of the area. Distribution of slaughter of sheep in different municipal slaughter houses and rural meat stalls are presented in Fig 1 & 2. The average number of sheep slaughtered on Sundays was highest followed by Wednesdays and Fridays. The municipal slaughter house of Vijayawada had recorded high rate of slaughter followed by Eluru and Rajahmundry slaughter houses. The high rate of slaughter might be due to the good conditions prevailing in these slaughter houses and also might be due to demand and local taste preferences and population of that area. Regarding operation of meat stalls about 71 % of meat stalls were being operated on Sundays only. The findings were in agreement with those of Kocho et al. (2011).



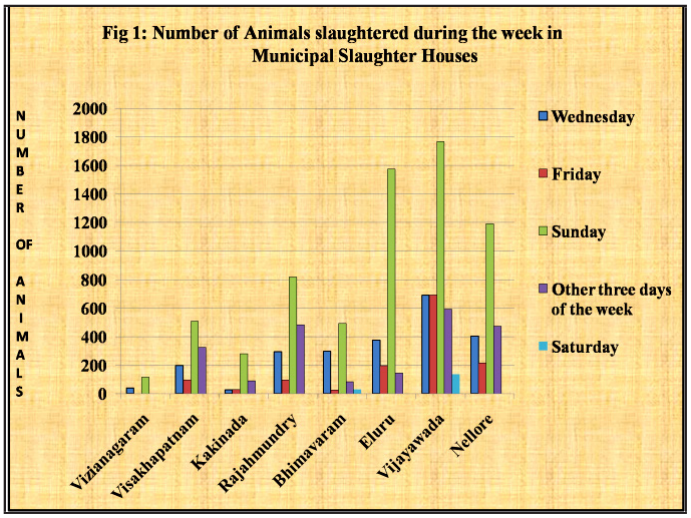


Fig. 1 & 2: Average number of animals slaughtered during the week in municipal slaughterhouses and in rural meat stalls

The quantity of meat sold on festival days was high. The variation in the rate of slaughter could be attributed to the population size and preference of the community. Muslim community during festivals used to buy animals and slaughter and distribute meat on their own accord. The findings were in relation to those of Goossen et al. (1998).

The age group of slaughter was 6-18 months and it was well in agreement with the findings of Sultana et al. (2010).

Facilities for slaughter, Slaughter practices and process: The facilities and utilities in Municipal slaughter houses and rural meat stalls in coastal districts of Andhra Pradesh were present in Table 1, 2 & 3.

All the municipal slaughter houses were located at residential area, 80 % of rural meat stalls were located in residential area. Out of the total investigated rural meat stalls only 20 % rural meat stalls were situated in non-residential area. Both municipal slaughter houses and rural meat stalls in coastal districts had good road access but there was no provision for fire extinguishers.

All the Municipal slaughterhouses had compound wall but only 15 % of rural meat stalls possess these facilities. Single entry and exit gate system were present in municipal slaughter houses but there was no provision in rural meat stalls.

Majority of the municipal slaughter houses were having lairage facilities. None of the rural meat stalls were having any provision to hold the animals before slaughter.

All the Municipal Slaughter houses were having cement floor in slaughter hall but in rural meat stalls 18 % were having tiled floors. Majority (75 %) of the municipal slaughter houses had tiled dadooing on walls of the slaughter houses, and only 18 % of rural meat stalls had this facility. Adequate lighting facilities hoist and overhead rails were in all municipal slaughter houses but in rural meat stalls only 20 % were having adequate lighting.

Electricity was present in all municipal slaughter houses whereas only 20 % of the rural meat stalls had electricity. There was provision of dressing rooms and bathrooms in all municipal slaughter houses. Hand operated water taps were available and well-built office space was available in all municipal slaughter houses. Sixty per cent of the rural meat stalls had the provision of hand operated water taps, other provisions like dressing room, bathrooms and office space were not available. All the municipal slaughter houses were having good source of water. They had own bore wells and as well as municipal water supply. There was no cleaning of sheep before slaughter with water spray.

Table 1: Facilities in Municipal Slaughterhouses and Rural Meat Stalls in Coastal Districts of Andhra Pradesh

S. No.	Feature	Municipal Slaughter Houses	Rural Meat stalls
Investigated slaughter houses/meat stalls		**8**	**45**
	Location		
	a) residential area	08(100%)	36(80%)
	b) non-residential area	Nil	09(20%)
	Road access	08(100%)	45(100%)
	Compound wall	08(100%)	7(15%)
	Entry and exit gate		
4.	a) Single	08(100%)	Nil
	b) Separate	Nil	Nil
5.	Provision of fire extinguishers	Nil	Nil
6.	Water	08(100%)	27(60%)
7.	Electricity	08(100%)	09(20%)
8.	Veterinary Doctor	08(100%)	Nil
9.	AM/PM inspection	08(100%)	Nil

Halal method of slaughter was fallowed in municipal slaughter houses and 60 per cent of rural meat stalls. The slaughter animals were hoisted to overhead rails in all municipal slaughter houses. In rural meat stalls, the slaughtered animals were hoisted manually to the wooden or iron structures fixed at the lintel level. De-skinning was done manually. The provision for weighing the carcass did not exist on the rails. Small scale weighing balances were utilized to weigh the meat. The whole carcass or meat was transported using auto rickshaws, regular trucks or sometimes two wheelers either covered or uncovered.

The slaughterhouses had limited sanitation facilities. The education level of butchers was very low and their personal hygiene was poor. The use of safety and hygienic dress code was not practiced. Periodical health check-up of workers was advised. Periodical

washing of slaughter house with detergent and sanitizer and regular washing of slaughter house with fresh water were practiced. The carcass was washed with fresh water but chemical decontamination was not practiced.

Table 2: Structure and ancillary facilities available in Municipal Slaughter Houses and Rural Meat Stalls in Coastal Districts of Andhra Pradesh

S. No.	Feature		Municipal Slaughter Houses	Rural Meat Stalls
Investigated Municipal slaughter houses/Meat stalls			08	45
1.	Lairage		08(100%)	Nil
2.	Slaughter house building type CC roofed		08(100%)	18(40%)
3.	Slaughter hall floors cement		Nil	8(18%)
4.	Walls of slaughter hall Tiled		06(75%)	8(18%)
5.	Lighting	a) available	08(100%)	09(20%)
		b) not available	Nil	36(80%)
	Hoist and overhead rails		08(100%)	45(100%)
	Electricity		08(100%)	09(20%)
	Availability of dressing room		08(100%)	Nil
	Availability of toiletries		08(100%)	Nil
	Availability water taps		08(100%)	27(60%)
	Availability of office space		08(100%)	Nil
	Water from bore well		08(100%)	09(20%)
13.	Drainage facility	a) Open type	06(75%)	9 (20%)
		b) Closed type	02(25%)	Nil
14.	Availability of laboratory		Nil	Nil
15.	Processing Unit		08(100%)	Nil
16.	Availability of cold storage		Nil	Nil

Ante-mortem and post-mortem examinations were done by qualified veterinarian in municipal slaughter houses and there was no inspection in rural meat stalls. Use of sterilized knives was practiced in municipal slaughter houses and only 80 per cent of the butchers in rural meat stalls were sterilizing their knives.

These observations indicated that, more training programmes were to be organized to educate the butchers on pre-slaughter practices. The findings were in well agreement with those of Bhandare et al. (2007) who done a comparison of microbial load on sheep/goat carcasses in modern abattoir and traditional meat shops.

Table 3: Slaughter process and storage facilities available in Municipal Slaughter Houses and Rural Meat Stalls in Coastal Districts of Andhra Pradesh

S. No.	Contents		Municipal Slaughter Houses	Rural Meat Stalls
No. of investigated slaughter houses			8	45
1.	Method of Slaughter	a) Halal	08(100%)	27(60%)
		b) Humane	Nil	18(40%)
2.	Provision of Scabbards		Nil	Nil
3.	Provision of sterilizing Equipment		08(100%)	36(80%)
4	Singeing of head and legs with fire		08(100%)	45(100%)
5.	Ante-mortem and Post-mortem examination		08(100%)	Nil
6.	Butchers	a) minimum education	06(75%)	27(60%)
		b) Uneducated	02(25%)	18(40%)
	Medical examination of butchers	a) Regular	Nil	NIL
		b) No provision	08(100%)	45(100%)
	Provision of working apparel		Nil	NIL

The butchers irrespective of either municipal slaughter houses or rural meat stalls followed halal method of slaughter and humane method was not practiced. All had hoisting facilities and sheep were lifted and immediately after bleeding and dressing was carried out manually. Upon observation the butchers were advised to lift the carcass before bleeding for complete removal of blood and demonstrated the methods to maintain hygiene. Majority had weighing balances, protective and working apparel but the butchers were not using.

The sanitation facilities in rural meat stalls were poor. Even though the sanitation in municipal slaughter house was satisfactory, it could be geared up. Foot dip facilities, air curtains, screening for communicable diseases and wearing of protective cloths was not undertaken even at municipal slaughter house level and this could be improved.

These findings indicated that educating the butchers on importance and implementation of proper hygiene and sanitation measures which would ensure quality meat. These findings were in accordance with that of NABARD (2013).

Washing and trimming of the carcass were practiced in both municipal slaughter houses and rural meat stalls. The provision and use of sterilizing equipment were 100 per cent with municipal slaughter houses and 80 per cent with rural meat stalls. These findings indicated a positive mindset towards adaptation of hygiene. Ante-mortem and post-mortem examination were carried out only in municipal slaughter houses and in rural meat stalls the provision for Ante-mortem and post-mortem examination did not exist and there was no tie up either with local governess or with local Veterinary Assistant Surgeon for certification of the meat. Similar views were expressed by Prah et al. (2012).

The disposal of waste was not in proper way. The sewage was dropped into municipal drains and none of the municipal slaughter houses were having Effluent Treatment Plant for recycling liquid waste. Solid waste was dropped off in open area followed by municipal dumping yard. Similar views were expressed by Ahmad et al. (2013) who stated that sanitary conditions around the abattoir plays major role in contamination. These findings were indicative of lack of awareness programmes on proper disposal practices of waste to control pollution. The findings were in line with report of NABARD (2013).

Carcass weight and Dressing percentage: The live weight, slaughter weight and dressing percent were presented in table 4 and 5. The average live weight of animals that were brought for slaughter in municipal slaughter houses and rural meat stalls was 37.27 and 29.84 kg respectively. The higher limit in municipal slaughter houses might be due to the knowledge of the personnel involved in slaughter practices and might also be due to the local textural preferences of the meat in urban areas.

The overall mean carcass weight of sheep in coastal districts of Andhra Pradesh was 18.12±0.75 kg and live weight was 37.31±1.54 kg. These results were well in agreement with the findings of Yigrem et al. (2013) who also reported near live and weight of carcasses as

mentioned above.

The data found that the dressing per cent of sheep in coastal districts of Andhra Pradesh was in the range of 47.85 to 49.61 per cent. This range was well within the profitable limits as supported by Sen et al. (2004) Mazumder et al. (1998) Ermias et al. (2006) and Safari et al. (2011). The average sale price of meat in municipal slaughter houses was ranging between Rs.600-650 per kg and rural meat stalls it was between Rs. 570 – 600/- per kg of meat. This difference in cost might be a demand and supply factor.

Table 4: Live weight, Carcass weight and Dressing percentage of Sheep in Municipal Slaughter Houses in coastal districts of Andhra Pradesh (n=6)

S. No.	Feature	Municipal Slaughter Houses		
		Live weight	Carcass weight	Dressing %
1.	Vizianagaram	27.83±1.03^{a}	13.42±0.82 ^{a}	48.03±1.10^{a}
2.	Visakhapatnam	34.00±2.63^{b}	16.83±1.30 ^{b}	49.61±0.90^{b}
3.	Kakinada	39.00±2.40^{c}	19.25±1.30 ^{c}	49.30±0.62^{b}
4.	Rajahmundry	40.33±1.30^{c}	19.70±0.60 ^{c}	48.80±0.54^{a}
5.	Bhimavaram	39.20±1.24^{c}	18.83±0.97 ^{d}	47.94±1.05^{d}
6.	Eluru	40.33±1.33^{c}	19.50±0.63 ^{c}	48.40±0.82^{a}
7.	Vijayawada	39.83±1.61^{c}	19.42±0.80 ^{c}	48.73±0.05^{a}
8.	Nellore	37.70±2.20^{f}	18.00±0.99 ^{f}	47.85±0.63^{d}

Note: Means bearing common superscripts do not differ significantly (P<0.05)

Table 5: Live weight, Carcass weight and Dressing percentage of sheep in Rural Meat Stalls in Coastal Districts of Andhra Pradesh

S. No	District	Rural Meat Stalls		
		Live weight	Carcass weight	Dressing %
1.	Srikakulam	28.56±0.88^{a}	13.84±0.45^{a}	48.50±0.46^{a}
2.	Vizianagaram	33.32±1.14^{d}	15.72±0.60^{c}	48.69±0.53^{a}
3.	Visakhapatnam	28.92±0.83^{a}	14.08±0.41^{a}	48.33±0.40^{a}
4.	East Godavari	32.32±1.14^{c}	15.62±0.57^{c}	48.33±0.60^{a}
5.	West Godavari	28.60±1.04^{a}	14.06±0.54^{a}	49.02±0.24^{b}
6.	Krishna	28.92±0.90^{a}	14.60±0.92^{b}	48.34±0.92^{a}
7.	Guntur	30.44±0.71^{b}	14.54±0.60^{b}	47.63±0.12^{c}
8.	Prakasam	28.60±0.71^{a}	14.10±0.91^{b}	47.83±0.51^{c}
9.	Nellore	28.88±0.92^{a}	13.98±1.02^{a}	48.52±0.54^{a}

Note: Means bearing common superscripts do not differ significantly (P<0.05)

CONCLUSION

The condition of the slaughter houses in the state was amended by the pollution control board and 44 slaughter houses out of 52 in the state of Andhra Pradesh were shutdown. Only eight slaughter houses were in operation in coastal districts of AP. Unauthorized slaughter was at rampant level and beyond control. This indicates the need of modernization of slaughter house by the government at a fast pace. The existing operating slaughter houses were having reasonably good facilities but the knowledge on operation of slaughter procedures for the butchers was less suggesting the need for skilful training on slaughter. In unauthorized rural places where stalls were raised, the premises were lacking basic requirements needed for producing clean and hygienic meat. In the marketing channels, involvement of middlemen was high. The study had benchmarked the facilities at slaughter and insisted upon the usage of by-products for profitability in sheep slaughter.

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COMPETING INTERESTS: The authors have no known competing interests either financial or personal between themselves and others that might bias the work.

ETHICS STATEMENT: Respondents had agreed on voluntary basis and passed no objection on the particular survey and questionnaire.

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