

## SEASONAL PRICE VARIATION AND PRICE CHARACTERISTICS FOR SMALL RUMINANTS MARKETING IN BALOCHISTAN

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**ABSTRACT:-** Hedonic price model was used to examine factors affecting live-stock price formation while price variations due to time were examined using means and coefficients of variation. A sample of price observations of 725 animals (389 sheep and 336 goats) from Quetta livestock market was collected for one year on quarterly basis with a minimum sample of 150 animals. The objective was to determine seasonal price variation considering the effects of different attributes of the animals namely, live weight, age, gender, body score and time of sale of animals. The results indicated that there were significant differences in prices among seasons. The seasons considered in the study were Eid-ul-Azha, Ramadan, and severe feed shortage period. The prices were the highest at Eid-ul-zha followed by Ramadan and feed shortage (winter) season. The explanatory power of the model was considered adequate as the factors included in the model accounted for 76% of the price variation at Quetta market. Producers should consider major marketing demand events like Eid-ul-Azha, Ramadan, etc. as the exceptional occasion to put up their animals for sale. The price per kg on live weight was higher by 39% and 24% in Eid-ul-Azha and Ramadan seasons, respectively as compared to normal season. Live weight has considered a very important variable in determining the price of an animal. Installation of separate weighing machine for small and large animals should be placed at the entry point of Quetta market. This will help farmers to know the exact weight of animal and brings them at par with other market agents in price bargaining. So, the good quality animals will bring more if they are sold by grade and weight.

*Key Word: Small Ruminants Marketing; Economics; Seasonal Price; Variations; Characteristics; Pakistan.*

### INTRODUCTION

The Balochistan province has abundant livestock resources with substantial production potential. Livestock is an important component of the mixed farming system performs multiple functions providing high quality food, manure for crop production and cash income to agro-pastoral system. Subsequent to agriculture, the livestock industry is the second biggest source of income for rural poor and the provincial economy. Livestock raising is an important economic activity and provide primary source of cash income in drought or crop failure. Livestock contributes more than 40% of the agriculture share in the provincial economy and livestock sector alone contributes about 50% to the

province's Gross Domestic Product. Very little work on marketing of livestock was conducted in Balochistan. Marketing is an important aspect of any livestock system. It provides the mechanism whereby producers exchange their livestock and livestock products for cash. The cash is used for acquiring goods and services to satisfy a variety of needs ranging from food items, clothing, medication and schooling to the purchase of breeding stock and other production inputs and supplies. The primary reason for selling livestock is to generate income to meet their expenses and sale of animal is the last resort (Gezahegn et al., 2003).

Small ruminants have an important place in the subsistence agriculture of the

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Balochistan province. Balochistan region is rich in animal resources having the largest share of sheep and second largest goat population in Pakistan. However, not as much political and economic attention has been given to this sector as it deserves. Moreover, the potential for production has been constrained by a series of production and marketing problems. Some of the most important constraint on marketing of sheep and goat include market infrastructure, transport, retail meat fixed price policy and sale price determination on bargaining.

Almost 35 livestock markets (*Gunj* in Pushto and *Perri* in Brahvi and Balochi) are in operation at all the district headquarters of Balochistan on a daily basis. The majority of the markets are held either on roadside or open grounds. There are three livestock sale points in Quetta at Sabzal-Spinny cross, Nava killi-Airport road and Eastern by-pass. The main livestock market situated on Eastern bypass held on daily basis was purposely selected to represent Quetta based on volume of transactions and diversity of animal species transacted. This market deals small as well as large ruminants whereas the other two markets deal with sheep and goats only and are held on the roadside. Quetta main market was selected as source of information. Animals traded in this market are mainly for local slaughter while the bulk of animals meant for export to Islamic Republic of Iran and the Middle East. This market has its own ground covered with boundary wall, veterinary dispensary and slaughter house. However, still lacking facilities such as weighing machine, watering, feeding pans, sheds (protection from sun and rain) etc. for livestock owners those who bring their animals from long distances and animals remained hungry till the market is over.

Thus in any country, livestock marketing studies are essential to provide vital information on the operations and efficiency of the livestock marketing system for effective research, planning and policy formulation in the livestock sector. There is a severe paucity of time series data on livestock prices as well as on the perfor-

mance and efficiency of the livestock marketing system. A market study was undertaken to examine the price determinant characteristics of an individual animal and seasonal price variation in the Quetta livestock market of Balochistan. What are the underlying determinants of livestock prices? How do variations in prices affect livestock producers?

The prices are negotiated for an animal therefore, it was hypothesized that different attributes of the animal will contribute to the price ultimately negotiated. Thus data were collected on the agreed price and on the animal species, sex, age (months) and body condition. The purpose of this study was to know the price relationship to animal's characteristics i.e., live weight, sex, age, body score and time of sale for sheep and goats all over the year for seasonal price variation in the Quetta livestock market as well to know the price discovery at the religious events (Eid-ul-Azha, Ramadan) relating to other regular marketing almanac and finally to make recommendations on policy, institutional reform and infrastructural opportunities for improving domestic livestock marketing.

## MATERIALS AND METHODS

The data on animal characteristics such as live weight, age, sex and body condition was collected from the Quetta livestock market just before the Eid-ul-Azha (December 2008) and continued on quarterly basis till Eid-ul-Fitr (October 2009). Electronic weighing machine was used to collect the live weight of the animal traded. Price is the most important single parameter in collecting time series data, so the market price of traded animals was collected on quarterly basis. The other animal characteristics such as age of animal, sex (male and female) and body score (1 to 5, 1= very poor and 5= excellent) parameters were recorded on the data sheet. Minimum sample size was fixed as 150 animals on quarterly basis. General Linear Models and Multiple Regression Analysis were used to identify the impact of traits and effects on the auction price (Maxa et

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al., 2009). Multiple regression based on hedonic price model has applied the appropriate technique (Francis, 1990; Andargachew and Broken, 1993; Oludimu and Owakade, 1995); Williams et al., 2003) Multiple linear regression models were developed to analyze the price as dependent variable of independent variables such as live weight, age, sex, and body score. In general terms the price equation of sheep and goat can be classified as,

$$P = f(LW, A, S, BC)$$

where,

P = Price of animal (sheep, 1 and goat, 2)

LW = Live weight (kg)

A = Age of animal (years)

S = Sex of animal (male 1, female 2)

BC = Body condition (1, 2, 3, ..., 5)

The effect of price per animal (P) of several intrinsic characteristics such as live weight (W), body condition (B), gender (S), age (A) and time (T) of market simultaneously.

$$P = a + b_1W + b_2B + b_3S + b_4A + b_5T + e$$

#### Price Determination of Empirical Model

Finally, a multiple regression analysis was applied to fit a hedonic model for a given market relating price as dependent variable to live weight, sex, age, body score

and season as independent variables. Two equations were estimated; one for total sample using all factors and covariates and the other for only animals sold on Eid occasion. The longer the time series data the better the specification of the demand function. The resultant value will provide ability to predict future prices and its usefulness in quantifying the relationships between livestock prices and live weight, sex, age, and seasons of the year of Quetta market.

### RESULTS AND DISCUSSION

Price data of 725 animals (54% sheep and 46% goats) were recorded in the Quetta market in a year starting from Eid-ul-Azha, December, 2008 to Eid-ul-Fitr October, 2009 to know the prices hike of both the meat demand seasons with respect to regular consumption time of year (Table 1). Animals are generally sold to generate income to meet household needs. Prices depend mainly on supply and demand, which is heavily influenced by the season of the year and occurrence of religious festivals on the one hand, and occurrence of drought or other weather shocks on the other hand. The absence of data on the magnitude and seasonality of supply as well as prices can frustrate the success of development projects (Abbot,

**Table 1. Animal characteristics of sampled animals of Quetta livestock market**

Animal characteristics		Sheep(%)	Goat(%)
Animals (no.)		389(54)	336(46)
Sex			
	Male	333 (86)	188 (56)
	Female	56 (14)	149 (44)
Age			
	<1 year	47 (12)	28 (8)
	1	114 (37)	65 (19)
	2	112 (29)	105 (31)
	3	21 (5)	30 (9)
	4	76 (20)	51 (15)
	>5	28 (7)	58 (17)
Body condition			
	Very poor	6 (2)	15 (4)
	Poor	134 (34)	186 (55)
	Average	130 (33)	81 (24)
	Good	87 (22)	40 (12)
	Very Good	32 (8)	15 (4)

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1979). The demand for goat meat appears seasonal. Eid-ul-Fitr and Eid-ul-Azha are two major Islamic festivals in which sheep and goat meat play an important role. Eid-ul-Fitr is the festival of the breaking of the month-long fast of Ramadan. Fasting requires nutritious food during the month and prefers red meat every day in their food to meet body protein requirement, therefore, trade volumes of animal add to more demand during the month including Eid festival.

Eid-ul-Azha is another festival in celebration of God's deliverance of Abraham's son, Ismail, from the sacrificial altar. On this feast day, every earning male and female is required to slaughter a fatted ram/goat. But cattle and camel are also slaughtered by sharing seven persons. Therefore, seasonal variation in small ruminants' live-stock marketing has been focused in this study.

Comparatively more female goats (44%) are sold as compare to sheep female (14%). Majority of animals sold in the market lies under poor (44%), average (29%), good (12%) and very good (6%) body score. This indicates that farmer decide to sell their animals either in feed shortage season when animals are weak which are not

in a position to reach to its destination covering around 200 km from uplands to plains of Kachhi and not invest money for fattening their animals. The reasons might be the fix mutton retail price policy which did not pay the true price of fattened animals. Butchers are mainly interested in carcass weight rather than body score and sex of animal.

Initially descriptive analysis has been carried out to generate the basic information about 725 price observations collected on quarterly basis for one year. Price were found higher in Eid and Ramadan time showing Rs.6550/ animal and Rs. 5060/ animal while average weight was 38 and 32kg animal<sup>-1</sup>, respectively (Table 2). The average price per kg Rs.173 and Rs.158 at Eid and Ramadan seasons, respectively.

Average price per head were calculated as Rs. 5312, 4649 and 6650 with an average live weight of 33.8, 31.7 and 37.8 kg in annual, normal season and Eid seasons, respectively (Table 3). The price per kg of both sheep and goat is Rs. 157, 147 and 173 in annual, normal and Eid seasons, respectively. The average Eid prices per animal per kg was high as compared to normal seasons, the regression analysis was run of Eid price data separately to know the

**Table 2. Comparison of variables of all seasons of Quetta Market**

Seasons	Eid-ul -Azha	Winter (2 <sup>nd</sup> season)	Summer (3 <sup>rd</sup> season)	Ramadan season
<b>Price</b>				
Mean	6550	4245	4697	5060
SD	3536	1360	2381	2808
Min	1300	1650	800	1600
Max	23000	8600	12000	13600
<b>Weight</b>				
Mean	37.84	31.7	31.65	32.05
SD	14.9	10.2	13.96	12.07
Min	7	8	7	10
Max	100	65	80	71
<b>Age</b>				
Mean	2.9	2.04	3.12	1.8
SD	2.2	1.4	1.6	1.38
Min	0.5	0.3	2	0.5
Max	10	7	8	8
<b>Body score</b>				
Mean	2.7	2.6	2.85	3.14
SD	0.87	0.9	0.08	1.07

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**Table 3. Comparative analysis of descriptive statistics of annual, normal and Eid price data of Quetta livestock market**

Variables	Mean±S.D.	Range
Annual Price/head (Rs)	5334.00±2930	800-23000
Normal (3 seasons) P/h	4649.00±2307	700-13600
Eid price/head	6650.00± 222	1300-23000
Annual L/W (kg)	33.80± 13.5	7-100
Normal season L/W	31.08± 12.3	7-80
Eid L/W	37.80± 14.9	15-100
Annual age (years)	2.50+ 1.8	0.5-10
Normal season age	2.30+ 1.6	0.5-8
Eid age	2.90± 2.2	0.5-10

price pattern of this particular event and other three seasons combined. The prices of small ruminants per kg of body weight were based on the average prices farmers received when they sold small ruminants divided by their body weights. Maximum sale price and live weight was found relatively high during periods of Muslim religious festivities and relatively low during periods of urgent cash needs, which was mainly the case at the end of the dry season when cash is needed for land preparation and other inputs.

The average age of animal lies between 2 and 3 years of all the four seasons. Average age of Eid animals was high as close to three years and maximum was found 10 years. Actually one to two years of age of sheep/goat is highly preferable and of high market demand to capture price premium and decline in older or over mature animals.

**Price Determining Characteristics and Effects**

Relevant literature review revealed that price has strong relationship with live weight, age, sex, body condition and breed. Breed was initially considered as major element but dropped as sheep/goat breeds were found non-descriptive. Jabbar (1995) has mentioned that live weight, sex and physical conditions are the most important criteria used by buyer and seller in bargaining and arriving at the price of an animal. The prices of goat at markets in Nigeria

was affected by weight, sex, age and hair characteristics (Oludimu and Owokade, 1995).

Live weight, age, gender and body condition were hypothesized to be explanatory variables in predicting the price of a sheep and goat in the Quetta market. The sheep and goat prices were regressed using multiple regressions. Although sheep and goat are separate species but their meat prices are same in the retail market, therefore combine analysis has been carried out of all the price observations collected from Quetta market. To access the reliability of the model in predicting values, R<sup>2</sup> was used. The explanatory power of the model was considered adequate as the factors included accounted for 76.2% of the price variation at Quetta market (Table 4). The adopted variables in the model has explained more than 76% of the variability in the price paid

**Table 4. Determinants of sheep and goat prices (including Eid) in Quetta, Balochistan**

Covariates and factors	Price margin ±SE	t-values
Constant	856.00±314.70	2.72
Sheep/goat	-243.80±119.80	-2.03
Live weight	163.60±5.45	30.0
Male/female	-793.60±133.80	-5.93
Age	-139.05±34.72	-4.01
Body score	455.98±69.07	6.6
Season (Eid-ul-Azha)	-	-5.49
R <sup>2</sup>	76.2%	-
N	725	-

for the sheep and goat at the Quetta market and considered an indication of good model fit.

### Live Weight

The regression model showed that the estimated values of the live weight coefficient is Rs 164 kg. This implies that an increase of one kg live weight will lead on average to price increase of Rs 164 at Quetta market. The t-value showed the relationship of live weight to price significant at 5% level, therefore, live weight was a significant explanatory of price variation of Quetta market (Figure 1). Maxa et al. (2009) have reported a high influence of live weight of an animal on auction price of ram.

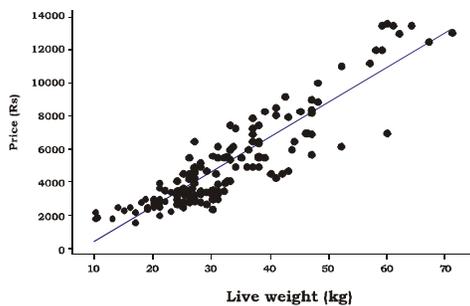


Figure 1. Scatterplot of price vs weight relationship of Quetta market

Analysis of price with single variable, live weight was found highly significant showing  $R^2$  at 69.9% which shows that live weight is the dominant factor in the price determination.

### Gender

Gender factor plays an important role in price determination in all slaughter animal species. Significant price disparity has found between male and female. The estimated sex coefficient in the price model was -794 in female which was highly significant at 1% level. Other things being equal, price per animal was significantly higher for males as compared to females in both sheep and goats. The female animals

showed estimated price penalty of Rs.794 per head at the market. The relationship was same with previously conducted studies carried out in Pakistan (Rodríguez et al., 1995). It is concluded that gender is a very important characteristics in determining the live weight price per head and coefficient was statistically significant.

### Age

An inverse relationship of age to price is statistically supported at Quetta market with an age coefficient of Rs. 139 which implies that price per head is higher for younger animal. Consumers prefer young animal's meat. As the age of animal increases, the price of animal lessens on yearly basis.

### Body Condition

The estimated coefficients of body condition all have the positive sign in the linear regression analysis. Body scores have been categorized into 5 (stating 1,2,3,4 and 5, indicating as very poor, poor, average, good and very good, respectively). An increase in body score added to an estimated cost of Rs 456 per animal. The identical relationship has been reported by Andargachew and Broken (1993).

### Price Determination Regression Eid Results

Eid-ul-Azha is a special event for Muslims all over the world and Muslim celebrate slaughtering animal after Eid prayer. Meat is alienated into three equivalent fractions; one for himself, the other for relatives and to end with poor people starting from neighbour to a wide range. The results are almost similar to previous model except price hike and all the variables were found significant (Table 5).

Same regression analysis apparatus was run without considering Eid price observation. Even though the price per kg live weight remained lower as compared to Eid season. The t-statistics of all explanatory variables proved significant. The rationale of analysis was how the prices be-

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**Table 5. Determinants of sheep/goat prices of Eid season, 2008 in Quetta, Balochistan**

Covariates and factors	Price margin±S.E.	t-values
Constant	642.80±720.90	0.89
Sheep/goat	-670.20±256.90	-2.61
Live weight	164.25±9.84	16.70
Male/female	-853.30±286.30	-2.98
Age	-114.11±59.23	-1.93
Body score	775.9±156.60	4.95
R <sup>2</sup>	74.6%	-
N	252	-

**Table 6. Determinants of sheep and goat prices (excluding eid) in Quetta, Balochistan**

Covariates and factors	Price margin±S.E.	t-values
Constant	-274.80±281.9	-0.98
Sheep/goat	-220.90±109.5	-2.02
Live weight	148.28±5.62	26.38
Male/Female	-737.40±122.0	-6.05
Age	-139.43±34.6	-4.03
Body score	330.92±60.02	5.51
Season	279.82±60.07	4.66
R <sup>2</sup>	81.1%	-
N	473	-

have in normal marketing seasons (Table 6).

Marketing of small ruminants has never been realized as a problem and has therefore been ignored in conducting research, to develop planning and removal of production constraints for many decades in Balochistan. Now it is time to make serious efforts for the removal of marketing constraints otherwise this will leave serious complication to the production as well as marketing system.

**RECOMMENDATIONS AND IMPLICATIONS**

Price discovery is public, so public auctions are an ideal place for determining the price level based on supply and demand and animals' characteristics factors. It is highly recommended for the policy makers/planners to plan policy for the replacement of traditional bargaining system into more modern and make sure that animal producers should get fair deal between the

buyers and sellers. It would be better to fix live weight price per kg of male sheep and goat instead of retail meat price policy. This will help reduce the role of middlemen in livestock marketing and empowering livestock producers through provision of information on market prices, buyers' preferences and demand of animals in major markets (Williams et al., 2003). Recommendations of study are as follows:

- Producers should consider major marketing demand events like Eid-ul-Azha, Ramadan etc. are the good time to sell sheep and goats.
- Live weight is considered a very important variable in determining the price of an animal. Separate weighing machine for small and large animals should be installed at the entry point of Quetta market. This will help farmers to know the exact weight of animal and brings them at par with other market agents in price bargaining. So, the good quality animals will bring more if they are sold by grade and weight.
- Consider body condition of culled and young animals, as weak animals bring less money. Consider the buyers' preferences and their willing to pay a premium price.
- Export of live animals from Balochistan to Iran has been started from the last six months and provides opportunity for livestock producers to get good prices. Livestock producers should prepare the young male stock (fattail) sheep with good body condition to generate additional income.
- Government interaction to improve marketing infrastructure to allocate proper land for market areas in all over the Balochistan at least at district level equipped with auction platforms, weighing scale (small & large ruminants), water points, feeding pans and sheds for cold and hot weather. The suggested improvements will bring the system a step forward from primitive to improved marketing network in Balochistan.

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