

An Empirical Study of Meat Supply Chain and Prices Pattern in Lahore (Pakistan): A Case Study

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ABSTRACT

Meat has become an integral part of human body because it is an affluent source of proteins, vitamins, minerals, micronutrients, and fats for human beings. This study is an attempt to investigate the spending of meat and pricing model in Lahore city. The essential factors of the contribution of small farmers of livestock in the meat sector have been highlighted in this paper. Based on the primary data of year 2008 from some stakeholders, dealers and officials of the meat industry of Lahore, the findings of this research reveal that the meat prices are growing up due to unnecessary transportation expenditures imposed on the suppliers (farmers) of remote areas. The global changes like 9/11 and other regional, national and international challenges have significant impacts on the meat production, consumption and pricing patterns. Based on the information embarked on this primary research, this study invokes the role of the Government and policy makers to perk up the productivity of meat. The authors are of the point of view that this seminal research will provide insight to the policy makers, planners, strategists, businessmen, and future researchers to replicate and spread it over other parts of the country.

Keywords: Consumption, Supply Chain, Price Pattern, Red Meat, White Meat, Slaughterhouses.

1. INTRODUCTION

Meat is the most important diet of human being because it is the source of proteins, vitamins, minerals, micronutrients, and fats that are fundamental needs for physical as well as mental nourishment of people. Presently, according to a worldwide survey of FAO, the production of meat per person is 42 kilograms on average but consumption fluctuates significantly based on the regional and socio economic status. The per capita per year consumption is about 30 kilograms in the developing countries while it is more than 80 kilograms in industrial world. The rapid growth in human population is a global issue especially in developing countries like Pakistan. According to a survey by Government of Pakistan in mid-2006, Punjab is the largest province of Pakistan and Lahore is the capital of this province, which is largest city of Punjab, second largest city of Pakistan, fifth largest city in South Asia and 23rd largest city in the world. It comprises of nine different towns and one hundred and fifty union councils. The

people of Lahore are very famous of their food habits and flourishing of the food business.

The equanimity of the meat requirement for the residents of Lahore has become a critical issue. Delgado (2003) argued that the growing revolution in meat consumption in developing countries is because of population growth, increasing trend of urbanization, and improvement in income levels. The meat prices are moving upward and significantly becoming unapproachable for a common person due to many reasons like drastic increase in demand, change in the global situation like war against terrorism, and worldwide economic crises. Pakistan unlikely has to export meat to Afghanistan instead of import to meet the local demand. Another factor of high prices is that more than half the consumer market is willing to pay a high price for meat. The animals are brought into Lahore animal market from different areas of the province of Punjab as well as from other provinces of Pakistan for sale once a week. After that the supply of meat at smaller scale is continued throughout the week. Transportation of

the animals is another factor of high prices because of tremendous expenditures on different places, in the whole chain of supply.

The major source of meat production is livestock. Livestock sector of Pakistan plays a vital role to contribute in the GDP of the country. It also has a significant role in rural economy of the country as 30-35 million people earn 40 percent of their income through livestock raising (Market Survey, 2008). This study gives a glimpse into the whole supply chain of meat in the city of Lahore to address the various important aspects and hurdles in the production and supply of meat. The main objective of the study is to attract the attentions of decision makers towards the issues that are faced by the small holders who are the fundamental component in the whole supply chain of meat. Following are the main objectives of the study:

1. Assessment of category-wise meat consumption pattern and future trend in Lahore.
2. Addressing the issues related to supply chain and marketing system in Lahore.
3. Evaluation of price pattern and factors effecting price of meat category-wise.
4. Impact of legal and illegal slaughtering in Lahore.
5. Strategic recommendations

2. LITERATURE REVIEW

Without suitable endowment of human nutrition, the progress of any country in the world is too difficult. A well-nourished populace can work and wield properly in the various spheres of life to contribute in the economy of any country by producing goods and services at optimum levels. Meat has become an integral part of human body because it is an affluent source of proteins, vitamins, minerals, micronutrients, and fats for people (McMichael *et al.*, 2007). They further purported that the consumption of meat trims down the fatal diseases like tumors/ cancers, arteriosclerosis, and adiposity in human beings. Despite the problems like bovine spongiform, encephalopathy, foot and mouth disease, avian influenza, E. coli, swine fever in the livestock the meat industry has been thriving worldwide (Pollan, 2002). Delgado (2003) argued that the growing revolution in meat consumption in developing countries is because of population growth, increasing trend of urbanization, and improvement in income levels.

The demand is rising as the population is growing and awareness about the nutritional value of meat. Brown,

Lester R. (1997) notes that the rate of world population is very high as it was 2.5 billion in 1950 which reached to 5.9 billion in 1998 which is more than double. According to a report (Washington, DC, 2005), the developing world is facing a stunning increase in the demand for animal products for last few decades. The urban population mostly uses a sufficient part of its rising income on animal products. While it is pertinent to note that the per capita consumption remained stable in developed countries with minor fluctuations between beef and poultry. It further states that the population of developing countries reached the double of their meat consumption pattern and especially tripled the amount of poultry meat over the last two decades. Delgado and others (1999) introduced the term "Livestock Revolution" for this phenomenal growth in supply and demand.

According to estimation about demand of animal products per capita in Pakistan is the lowest one in the world i. e. 6.9 grams while in New Zealand it is 75 grams, 65 grams in U.S.A., 61 grams in Australia, in Japan and Philippines it is 18 and 15 grams per capita respectively (FAO, 2008). The availability of food per capita per annum in Pakistan increased from 298.1 kg in 1979 to 1980 to 414.8 kg in 2007 to 2008. But the growth rate of population is 85.09 million to 163.8 million over the same period (Zaman, 2011). He further reports that the rate of growth per annum in overall food production grew to 3.9, 4.2 and 2.8% in the 1980s, 1990s and last recent decade respectively against 3.1, 2.4 and 1.9% growth of population in same years.

The production and consumption models of food are the main motives of any Economy and that play a decisive role in determining the future economic growth (Golai and Pradhan, 2006; Chernichovsky and Meesook, 1984). In Pakistan this pattern is changing since 1980s because GDP is growing at the average rate of 5.6% per annum from 1980 onward. The overall average growth rate of Pakistani economy during the last 20 years remained at 4.7%. The population in Pakistan has increased from 85.09 million in 1985 to 173.5 million in 2010 at the rate of 2.05% per annum approximately (Economic Survey of Pakistan, 2010). The population of Lahore was counted around 6.3 million in 1998 census which was again estimated in mid-2006 around 8 to 10 million. To cope with the increasing need of food for the fast growing population, the production of food must be increased accordingly. Reportedly the research shows a significant diversification in agriculture sector i.e. a shift from crop production to livestock production namely, milk, meat, eggs etc. (Husain, 2005; Khan, 2000).

Livestock is a major sector which plays a vital role in the economy of Pakistan. Expansion in the livestock industry and related stimulant production has contributed to concerns over proper land, air and water quality. Land use planning provides an opportunity for the community and livestock producers to work together to contribute to a vivacious livestock industry (Caldwell, 1998). According to the Economic survey of Pakistan (2007-08), livestock added 52.2 percent value to the agriculture, which contributes 11% to the overall GDP. The survey reveals that around thirty to thirty five million rural population's earning is based on livestock-raising which indicates a significant role of livestock in rural economy (Halwai, 2008). The forty percent of the income of smallholders' families (2-3 cattle/buffalos and 5-6 sheep/goats per family) is derived from these household holdings. The major part of meat in Pakistan is obtained from cattle, sheep, goats and poultry (self-survey, 2008). It was estimated that Pakistan will produce 2.8 million tons of meat and 0.7 million tons of fish during 2007-08 (market survey, 2006). The survey on livestock population in Pakistan reports that the total number of cattles and buffaloes is 60.8 million and Sheep and goats is 83.8 million and around 40,000 quality animals are transported in Lahore animal market every week for slaughtering.

Gallup Pakistan a well-known research agency in Pakistan has surveyed the market in October 2008 on the consumption pattern of meat in Pakistan. The results (assuming financial and price constraints kept constant) revealed that 52% respondents prefer meat in their daily diet. The pattern of meat consumption in the country has been changing over the years. The survey shows the changes in preferences of chicken, mutton and beef between the years 1986 and 2008. The consumption patterns of chicken and mutton have interchanged between the said years. The consumers of chicken were 14% in 1986 while 45% in 2008. The mutton was consumed 51% in 1986 but a drastic decrease is noted as 15% in 2008. The consumption pattern of beef remained stable over the years as 34% in 1986 and 37% in 2008. The reason of drastic decrease in the consumption of chicken was viruses like bird flu in poultry. This loss of chicken preference is converted into increase in mutton consumption (rising from 29% to 36% in 2007).

Fish and fishery are other major livestock and agriculture sectors' products that demonstrated vigorous growth in 2007-08, i.e. 3.8% and 11% respectively. Pakistan is an agriculture country blessed with huge natural resources like fertile land, around 700 km long warm-watered coastal area, rivers, dams, and canals. Unlikely by

properly utilizing the natural resources the production of fish and fishery can be carried manifold. During July-March 2007-08, the total aquatic and local fish production was estimated to be 640,000 metric tons which includes the share of aquatic fish to be 390,000 metric tons and local contribution to be 250,000 metric tons (The economic survey of Pakistan 2007-08). The production for the year 2006-07 was estimated to be 578,000 metric tons in which 353,000 metric tons was from aquatic and the remaining 225,000 metric tons was produced by local fishery sector. Pakistan exported over 100,000 metric tons of fish and fishery production and earned US\$188.5 million during July-March 2007-08.

3. METHODOLOGY AND DATA SOURCE

This research paper is based on the primary data, which is collected through a comprehensive survey. The sampling technique is undertaken by keeping in view the situational and contextual factors of the local population based on the type of information customary from butchers and consumers of different towns of Lahore. The data was collected from nine towns of Lahore city. The survey encompasses the main shopping bazaars/ centers in high-class vicinities, five star and lower star hotels / restaurants and the animal markets like Tolinton market, fish market have also been included in the survey. The main direct suppliers/dealer's shops and four recognised slaughterhouses i.e. Kot Kamboh, Baghbanpura, Shahdra and Cantonment board were also studied.

The scheme of this survey-based study is that a category-wise analysis of supply chain regarding meat consumption in Lahore city is illustrated in the following section while the consumption pattern of meat is elaborated in the next section. The subsequent section of this paper describes the price determination pattern and in the last section the results and findings of this survey-based study are discussed and concluded.

4. MEAT SUPPLY CHAIN

4.1. Supply chain of Red Meat

Through various routes/channels, meat animals are brought into Lahore animal market for trade. The middlemen like *vaparies*/ traders purchase these animals from farmers of different areas, cities and villages and transport them via trucks, mini trucks and Mazda etc. The supply system of meat animals includes the following main factors:

- i. Farmers sell their animals to the local butchers and *vaparies* by carrying them in small local markets.

Figure 1. Beef/ mutton Supply Chain Missing

Source: Direct Market Survey 2008

- ii. *Vaparies/* traders purchase directly from the farmers at source/farm level to transport them to the main market of Lahore city for further trade.
- iii. Local *vaparies* of Lahore market purchase these animals to further sell to butchers.
- iv. Traders purchase animals from Lahore mandi also supply animals to Afghanistan and KPK.
- v. Whole seller butchers purchase animals to further sell to small butchers after slaughtering.

4.2. Supply Chain of White Meat

4.2.1. Poultry

Poultry production has emerged as a good substitute of beef and mutton as they are considered as the highest nutritional quality. The survey indicates that daily poultry consumption in Lahore is about 361,000 kilograms. The chicken is supplied through two major poultry markets of Lahore. i.e. Tolinton market shares 55% chicken, 30% chicken is supplied in Sherawala market and rest of 15% is being sold by the direct suppliers.

4.2.2. Fish

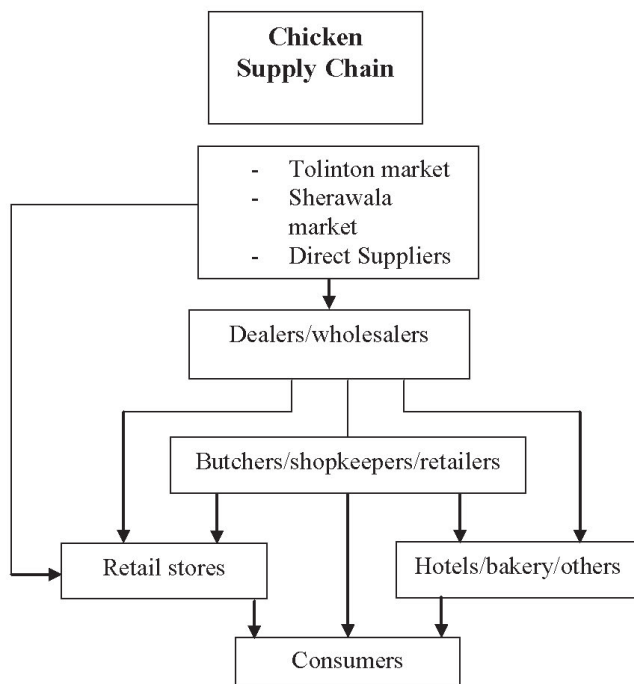
Fish is another source of white meat. Main source of Lahore fish market is Karachi Fish Harbour which handles about 90% of the fish and seafood catch in Pakistan and 95% of fish and seafood exports from Pakistan. Other harbours are Korangi, Pasni and Gawader. There are three types of fisheries;

- i. sweet-water or natural and farm fish
- ii. salt water or Sea fish
- iii. imported fish

About 80% of fish supply is through main fish market near Urdu Bazar Lahore and remaining 20% is through Tolinton Market Lahore. These markets suffered in out-season (March to September) because during summer season the sale and consumption of fish is decreased by 60-70%.

The first and main source of fish is fish farming located all around the province of Punjab. The second source is natural sources like Dams, Rivers, Ponds, Canals and the third ever last source is import from other cities like fish

Figure 2. Chicken Supply Chain



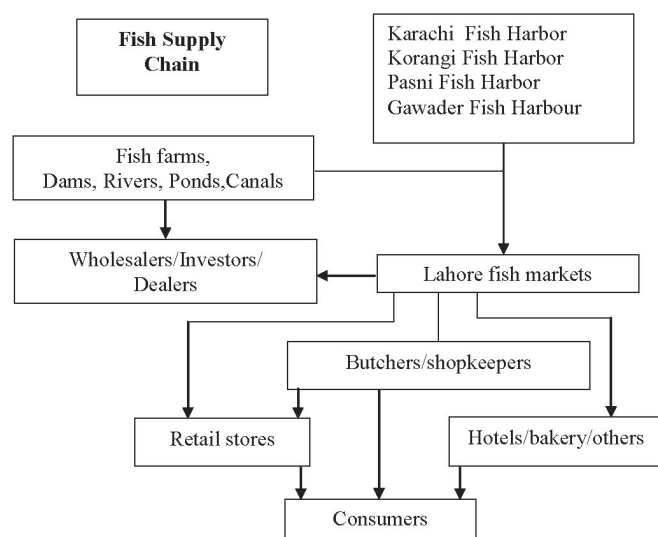
Source: Direct Market Information 2008

harbor Karachi. The supply chain of fish is as under (see Figure 3):

4.3. Transportation Expenditures of Red Meat

The detail of transportation cost incurred by the investors to enter in the Mandiis shown in Table 1.

Figure 3. Fish Supply Chain



Source: Market Information 2008

Table 3. Comparison between Mandi and Slaughterhouses by weight

Sr.	Type	Animals sold from Mandi/ week* (Kg)	Animals slaughtered at legal SH/ week (Kg)	Total meat being sold at Shops/ week (Kg)	Difference between Mandi and SH/ week (Kg)	Difference between SH and Shops/ week (Kg)
1	Beef	607,530	228,750	425,000	378,780	(196,250)
2	Mutton	480,000	259,200	240,500	220,800	18,700
	Total	1,087,530	487,950	665,500	599,580	(177,550)

*Week = 5 days

Source: Market survey 2008

Table 4. Daily Slaughtering in the Recognised Slaughterhouses

Sr.	Slaughterhouses	Beef (No. of Animal)	Mutton	Total
1	Kotkamboh	425	6000	6425
2	Baghbanpura	30	150	180
3	Shahdra	60	150	210
4	Saddar (Cantonment area)	120	250	370
Total	635	6550	7185	

Source: Market Information 2008

Table 1. Transportation cost

Description	Expenditure
Tax paid to toll tax and police check post, etc.	Rs.1500-2000/ truck
Entrance fee to Mandi for small animal	Rs. 25 per animal
Entrance fee to Mandi for large animal	Rs. 100 per animal
Slaughterhouse fee for small animal	Rs. 10 per animal
Slaughterhouse fee for large animal	Rs. 20 per animal
Slaughtering fee for small animal	Rs. 10 per animal
Slaughtering fee for large animal	Rs. 20 per animal

Source: Market Survey 2008

Table 2. Transportation cost for frozen fish

Transportation Means	Cost per Kg (Rs.)
By Air	23
By Rail	13
By Road	15

Source: Market Survey 2008

4.4. Transportation Expenditures of White Meat (Fish)

The frozen fish is imported from other cities, and it is sold out at high prices due to the following transportation charges:

5. THE MEAT CONSUMPTION PATTERN IN LAHORE

5.1. Meat Consumption Pattern

There are four recognised slaughter houses functioning under the Department of Livestock, Government of the Punjab and around 300 mini slaughterhouses are working for slaughtering the animals legally or illegally. The following information has been collected from these slaughter houses:

Table 5. Comparison of Census of Slaughtered Animals in Recognised Slaughterhouses

Type of Animals	1996	2006
Large animals	89,957	63,753
Small animals	1,427,067	1,300,216
Grand Total	1,517,024	1,363,969
% Decrease		10.2 %

Source: Market Information 2008

5.2. Meat Consumption Pattern in Main Sale Points in Lahore City

A summary of well-known sale points and shopping malls in Lahore city is given in Table 6.

6. PRICE DETERMINATION

The determination of prices is linked with several factors. The recurrent epidemics of events like deteriorated law and order and the acute energy shortage situations cause political instability which eventually has hard hit the large scale livestock and dairy sector (Halberg, 1999). The increasing prices of fuel, energy, and taxes have also caused the slower growth of this sector. According to the market survey the retail prices of meat is categorized on the basis of three main segments. Segment A includes Defense markets, Zainat's outlets, Pace, Alfatah, HKB and other shopping centers. The butcher's shops are segmented in Category B and category C which include the areas like Railway carriage workshop, northern Lahore, some areas of Wahga, Nishter towns where slaughtering of weak and diseased animals are taking place. The detail of meat price

Table 6. Well-recognised Sale Points

Hotels/ Centers	Mutton Kg	Beef Kg	Fish Kg	Chicken kg	Total	Sale/ Consume %	Source
Avari	130	80	60	160	430	80%	Direct suppliers
Pardesi Restaurant Food Street	40	25	40	80	185	85%	Tolinton market
Pace shopping mall	80	60	50	90	280	80%	Purchase animals and slaughter them from designated SHs
MAKRO 300		200	60	500	1060	85%	Dealers/Suppliers
METRO Cashand Carry	8000	500	300	800	2400	90%	Purchase animals and slaughter them from designated SHs

Source: Market Information 2008

Table 7. Price Pattern

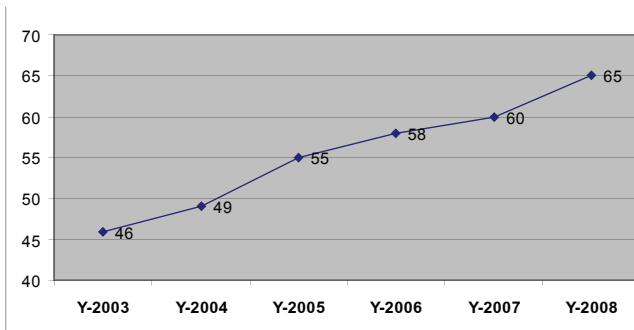
Sr.	Meat Type	Category 'A' Retail rates			Category 'B' Retail rates			Category 'C' Retail rates		
		Min	Max	Average	Min	Max	Average	Min	Max	Average
1	Beef	150	160	155	100	120	110	85	95	90
2	Mutton	275	300	287.5	250	260	255	230	240	235
3	Chicken	100	120	110	95	100	97.5	90	95	92.5
4	Fish	160	180	170	140	160	150	80	100	90

Source: Market survey 2008

Table 8. The average yearly wholesale rates of Live Broiler per kg (Rupees)

Years						Remarks
2003	2004	2005	2006	2007	2008	Yearly rates Decreased/Increased
46.00	49.00	55.00	58.00	60.00	65.00	Increased

pattern is shown in Table 7.

Figure 4. Average yearly wholesale rates of Live Broiler per kg (Rupees)

Source: Market Information 2008

7. DISCUSSION, FINDINGS AND CONCLUSION

The study has found out that the condition of slaughterhouses is depraved. These slaughterhouses are

facing several problems like low capacity, located in crowded areas, unhygienic, conservative and inadequate transportation facilities. The city-district of Lahore comprises of nine towns having 150 union councils. The average population in each town is around 8,000,000 (Table 9). Approximately 6000 red meat shops, 4000 chicken shops and 250 fish shops are located in Lahore city.

Average 35,000 small animals and 4500 large animals brought in Lahore's main animal market on weekly basis. Fifty five percent animals are slaughtered in recognised slaughterhouses whereas forty percent are slaughtered illegally in unrecognised slaughterhouses (mini slaughterhouses/ slaughtering at homes). Table 10 provides the statistics about consumption and sale/purchase of meat from butchers and retailer's shops situated in the different general public markets in 4-towns of Lahore city.

Table 11 documents that more than 632,650kg of meat is consumed in Lahore city daily, half of which is of poultry and fish. On average 6000 goats or sheep and 600 buffaloes or cows are slaughtered every day in the

Table 9. Category-Wise Number of Shops

Sr.	Meat Type	Total Population (2008) (approx.)	Total Towns in Lahore	Total shops in each Town (Average)	Total Shops in Lahore (Average)
1	Beef/Mutton	8,000,000	9	667	6,000
3	Chicken			422	3,800
4	Fish			28	250
	Total	8,000,000		1,117	10,050

Table 10: Category-Wise Consumption of Meat per Shop/Day

S.No.	Meat Type	Total shops in each Town (Average)	Total Shops in Lahore (Average)	Sale of meat/ Shop/ day (Average) (Kg)
1	Beef/Mutton	367	6000	B-50 M-37
2	Chicken	422	3800	95
3	Fish	28	250	27
	Total	817	10050	209

recognized slaughterhouses to supply 60,000kg of mutton and 45,000kg of Beef daily.

Table 11. Overall category wise consumption of meat in Lahore (per day)

Sr.	Meat Type	Total Shops (Average)	Total Sale of meat (Kg)
1	Beef	3300	165,000
2	Mutton	2700	99,900
3	Chicken	3800	361,000
4	Fish	250	6,750
	Total	10050	632,650

Market Survey 2008

8. MAIN FINDINGS

1. The most of meat animals are supplied from rural areas under small holder production system or as end of carrier animals from dairy farms. The investors (*arhti*) brought these animals to Baker mandi and Kotkamboh Lahore on weekly basis. The day by day growth in meat's prices is due to several factors like legal/illegal inputs like animals sale/purchase fee, entry fee, parking fee, union/mafias tax, slaughtering fee, etc.
2. Lahore is a metropolis city having 9 towns and 150 union councils with approximate human population over 9 million. There is only one cattle market at Kotkamboh Iqbal town adjacent with biggest slaughterhouse. This is one corner of the city. All other towns are dependent on this center for supply of meat to whole of the city. The long distance and transportation not only compromises the quality but extrapolates meat pricing in the city.
3. The cattle market management system is influenced by interest groups inside the local govern-

ment and by the contractors/mafias. Further the existing market by-laws and price control system is out dated rather against the interests of producers as well as consumers. This system is currently exploiting the benefits of all stakeholders except the controller (local govt and private contractors). This is a source of corruption as well as cause of price inflation and risk for hygienic meat supply.

4. The existing cattle marketing, animal slaughtering and meat supply system including red meat, poultry and fish is old fashioned, mismanaged, irrational, unhygienic and against the principles of food security and safety. There are multifarious issues at various tiers of meat supply chain like; no concept of quarantine in the animal market, no modern practices in slaughtering or use of by-products, lack of implementation of hygienic slaughtering standards and absence of proper transportation and selling of meat at shops etc.

9. CONCLUSION

The study based on primary data analysis shows that meat marketing system in Lahore can be discerned into four main categories, such as big shopkeepers having five percent market share who purchase animals directly from other animal markets outside the city and sell the meat at their shops in Lahore. The second category of meat shopkeepers having 30% market share, they purchase animals from local animal market (KotKamboh). Third category comprising 55% of total meat sale is wholesale marketing by middlemen. Small shopkeepers purchase slaughtered animals from slaughterhouses on wholesale rates for further selling at their shops. The last category is dealer/supplier's which has the remaining 10% of market share. They buy meat from slaughter houses and wholesalers to supply it to hotels/restaurants and others.

Table 12. Population-Wise Distribution of Meat at Lahore by Category

Sr.	Meat Type	Total Sale of meat (Kg)	Total population (Meat eater only)	Distribution per day/person (Kg)
2	Beef	165,000	7,040,000	0.023
3	Mutton	99,900		0.014
4	Chicken	361,000		0.051
	Fish	6,750		0.001
	Total	632,650		0.090

Less: 12.57% below 5 years children of total population and meat-less days.
Market Survey 2008

The white meat markets system is also divided into four categories. The first category is farms' owners who have only 5% share of total market. They have fish farms outside the city and their outlets/ sale points in Lahore city. Second category is wholesalers having 45% market share. They have proper integrative supply chain system in Lahore's main markets like Tolinton and other markets and have contracts with different poultry/fish farms including Karachi Fish Harbour. The third form of white meat market is retailer having 40 % market share. They buy meat from poultry markets Tolinton, Sheranwala and fish market then sale it on contractual rates. The last fourth category is called dealers/suppliers which has only 10% market share. They purchase poultry/fish from farms and markets and supply it to hotels, restaurants and others as per contract.

There are a number of legal and illegal inputs at various stages of meat supply chain in Lahore causing meat price inflation. Also current meat animal's marketing system (Kot Kamboh, Tolinton and Fish market) together with slaughter houses and allied business of by-products is controlled by mafias in connivance of local government functionaries. The old fashioned slaughterhouses are manually operated without appropriate hygienic measures. There is no concept of personal hygiene and safety in slaughtering workers and no screening of butchers against the most common communicable/ zoonotic diseases.

The study is an initiative and eye-opener for government as well as corporate sectors' strategists. The limitation of this research is that it is limited up to one city of Pakistan. The future research may be conducted in other areas of the country and country as a whole. This focuses only on meat production and consumption patterns which is the one product of livestock which may be replicated on other products and by-products of livestock. Therefore, the paper invokes the attention of future researchers by inviting their attention towards these very important and emerging food and nutrition issues.

REFERENCES

- Brown, L. R. (1997). meat production growth slows vital signs. *Ed. Starke, Linda. New York: Norton.*
- Caldwell, W. J. (1998). Land use planning, the environment, and siting intensive livestock facilities in the 21st Century. *Journal of Soil and Water Conservation.*
- Chernichovsky, D., & Meesook, A. (1984). Patterns of food consumption and nutrition in Indonesia. *The World Bank Washington, DC Technical Paper No. 670.*
- Delgado C. I., (2003). Rising consumption of meat and milk in developing countries has created a new food revolution. *Journal of Nutrition, 133, 3907S-3910S.*
- Waterlow, J. C., Armstrong, D. G., Fowden, L., & Riley, R. (1998). Feeding a World Population of More Than Eight Billion People. Ralph Riley. New York: Oxford.
- FAO, Commission on Genetic Resources for Food and Agriculture. (2007). *The State of the World's Animal Genetic Resources for Food and Agriculture*, Rome.
- FAO, FAOSTAT Statistical Database, Retrieved from apps.fao.org
- FAO, FAOSTAT Statistical Database. Retrieved from apps.fao.org, Compassion in World Farming, Laying Hens Fact Sheet, revised January 2004.
- FAO, Pollution from Industrialized Livestock Production, Policy Brief 2.(2008). Rome: Livestock Information, Sector Analysis, and Policy Branch, Animal Production and Health Division, undated.
- Gallup Pakistan Poll Findings on Meat Consumption (2008). Retrieved from <http://www.gallup.com.pk/Polls/30-3-09.pdf>
- Gillen, R. L. (1997). *Agronomy of Grassland Systems*. New York: Cambridge University Press.
- Goliai, R., & Pradhan, C. N. (2006). Changing food consumption pattern in rural India: Implication of food and nutrition security. *Indian Journal of Agricultural Economics, Indian Society of Agricultural Economics Mumbai, 61(3).*
- Govt of Pakistan, E. S.-1.(2009). Pakistan Economic Survey 2008-09. Islamabad: Government of Pakistan Finance Division Economic Adviser Wing. Retrieved from http://finance.gov.pk/survey_0809.html.
- Halwai, (2008). Meat production continues to rise. *Vital Signs Online*. Retrieved from www.worldwatch.org
- McMichael, A. J., Powles, J. W., Butler C. D., & Uauy, R. (2007). Food, Livestock Production, Energy, Climate Change, and Health. *The Lancet (Energy and Health Series)*, 1253-63.
- Pollan, M. (2002). *The Life of a Steer*, New York Times.
- U.N. Food and Agriculture Organization (FAO).(2008). Meat and meat products. *Food Outlook*.
- World Bank, Managing the Livestock Revolution: Policy and Technology to Address the Negative Impacts of a Fast-Growing Sector (Washington, DC: 2005), 6.
- Zaman, K. U. (2011). Food production and consumption pattern in Pakistan during 1979 to 2010. *Journal of Agricultural Biotechnology and Sustainable Development, 3(7), 108 -119.*