

DEMAND AND SUPPLY ANALYSIS OF MILK PRODUCTION: A CASE STUDY OF DISTRICT SARGODHA

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ABSTRACT: Milk is an important commodity. Milk supply and demand was studied in Sargodha district. Stratified random samplings of 110 respondents were selected. Multiple regression log-log models of demand and supply functions were estimated. In the estimated supply function, the most influential variables were milk price, number of milking animals and variable cost. Similarly, in the estimated milk demand function mainly significant variables were milk price and consumer's income. It is recommended that to overcome the shortage of milk supply, farmers may be provided motivation to set up new dairy and livestock farms.

Key words: Milk, Supply, Demand, Regression, Sargodha.

INTRODUCTION

The livestock sector has gained a pivotal position in the economy of Pakistan. The livestock sector generally comprises on small farmers and landless poor's. It is also considered as relatively very less risky enterprise. The importance of the livestock sector can be realised from the fact that it provides livelihood to about 30 – 35 million rural poors in the country. The share of the livestock in the GDP of the country during 2010-11 was 11.5 percent. (Govt. of Pakistan, 2010-11) The livestock sector provides two most important food products which are milk and meat. To overcome the shortage of these two products in the country, it has been realised by the government to involve the the private sector in this enterprise. To increase the growth rate in the livestock sector, emphasis will be on the improvement of per unit animal productivity and transformation from subsistence to market oriented and commercial livestock farming in the country. Pakistan is fourth largest milk producing country in the world and is producing 37,475 thousand tons of milk a year for human consumption. (Govt. of Pakistan, 2010-11). Milk holds primary position in human diet. Milk provides proteins, vitamins, minerals, salts and other valuable constituents. Milk is a cheapest source of nutrition and is beneficial in all stages of human growth.

The production (supply) and consumption (demand) of milk in Pakistan are characterized by seasonal fluctuations. Green fodder, lactation number and labour hours were found the dominant factors affecting milk production in buffalos (Hussain *et al.*, 2010). There are periods when milk is available in surplus which is then used to make milk products and periods of milk shortages when dry milk is imported. Keeping in view the importance of livestock and milk in the economy of

Pakistan, this study was focused to analyze the milk production with the following main objectives: (1) To estimate the supply function of milk. (2) To estimate the demand function of milk. (3) To suggest policy recommendations to overcome the problems related to supply and demand of milk.

METHODS AND PROCEDURES

This study was conducted in Sargodha district. Four villages were selected, randomly using stratified random sampling technique. Out of total 300 farmers 110 farmers were selected as best representatives of the study area. For the collection of primary data, a comprehensive questionnaire was constructed which was finalized after pre-testing. After pre-testing and revising the questionnaire the farmers were interviewed at their farm gate. The data were collected from 110 respondents during year 2007. The data were collected for different variables i.e. total milk production (Supply), total quantity of milk consumed (Demand), retail prices of milk, human population and population of milking animals. The milk supply function was specified in log-log form as follows:

$$\ln MS = \alpha_0 + \beta_1 \ln MP + \beta_2 \ln MA + \beta_3 \ln PA + \beta_4 \ln VC + \mu_t$$

Where

Dependent Variable:

$\ln MS$ = Quantity of milk supplied (thousand tons).

Independent Variables:

$\ln MP$ = Price of milk (Rs. /Litre)

$\ln MA$ = Number of milking animals.

$\ln PA$ = Price of animals (cost/purchase cost) of animal (Buffalo).

$\ln VC$ = Variable cost of milk production.

α_0 = Constant.

$\beta_1, \beta_2, \beta_3$ and β_4 = Coefficients of the independent variables to be estimated.

μ_t = Error term.

The milk demand function was specified in log–log form as follows:

$$\ln MC = \alpha_0 + \beta_1 \ln MP + \beta_2 \ln Y + \beta_3 \ln P + \mu_t$$

Where

Dependent Variable:

$\ln MC$ = Quantity of milk consumed per capita per year.

Independent Variables:

$\ln MP$ = Price of milk (Rs. /Litre).

$\ln Y$ = Per capita income (Rs/capita per year.)

$\ln P$ = Household number.

α_0 = Constant.

β_1, β_2 , and β_3 = Coefficients of the independent variables to be estimated.

μ_t = Error term.

RESULTS AND DISCUSSION

The supply and demand functions of fresh milk were estimated by employing ordinary least squares regression analysis. As the per capita income and population is increasing the demand of fresh milk is also increasing continuously. Similarly the adoption of modern milk production technologies have enormous potential to enhance the milk supply.

Supply Function: A log–log multiple regression analysis was used to estimate the supply function between the dependent variable and independent variables. The estimated coefficients of supply function are presented in Table 1. The F-test value is 8.93 which is significant at ($p \leq 0.01$). This suggests that the independent variables i.e. number of milking animals, price of milk and variable cost of milk production in the model are significantly affecting the milk supply (dependent variable). The value of R^2 is 0.54 which shows that all the independent variables explained 54 percent of the total variation in dependent variable.

Table.1. The Coefficients of the estimated Supply Function of Milk.

Variables	Coefficients	T-Values	Significance
Constant	0.10	7.80	0.102 ^{N.S.}
MP	1.20	2.62	0.001*
MA	0.50	5.81	0.043*
PA	-0.35	-3.32	0.423 ^{N.S.}
VC	-3.61	-5.01	0.009*
$R^2 = 0.54$			
F-test value = 8.93**			

* = ($p \leq 0.05$), ** = ($p \leq 0.01$), N.S. = Non-significant

The estimated coefficient of milk price (MP) was 1.20 indicating that if milk price increases by 1 percent, milk supply will increase by 1.20 percent. The competitive milk production lowers the milk price levels (Kawaguchi and Kaiser, 1997). The increase in the price elasticity of milk indicates that consumption has become more price responsive and price may has become an important characteristic of milk sale (McKenzie and Nieuwoudt, 1985). This coefficient of milk price is significant at ($p \leq 0.01$). The value of coefficient of number of milking animals was 0.50 and is significant at ($p \leq 0.05$). This indicates that one percent increase in the number of milking animals causes to increase in milk supply by 0.50 percent. It clearly reflects that to overcome the shortage of milk supply in the country it is imperative to increase the number of milking animals.

The value of the coefficient of price of animals was -0.35, and is non-significant at ($p \leq 0.05$). This shows that one percent increase in the price of animals causes to decrease in milk supply by 0.35 percent. Recently, there has been a tremendous increase in the price of animals in general and particularly of milking animals. It is because of the low supply of superior quality of animal stock for milk production in the country. Hence there is dire need to make availability of improved animal stock in the country.

In the same way the estimated coefficient of variable cost was -3.61 and is significant at ($p \leq 0.01$). It reveals that if variable cost (cost of feeds, fodders, etc.) is increased by one percent, milk supply will decrease by 3.61 percent. The milk production has increased substantially due to the use of hay and grains as animal feed (Halvorson, 1958). As the energy (fuel and electricity) prices are keeps on going up resultantly also pushing up the variable cost. Consequently, the cost of milk production is increasing. The green fodder which is an important component of variable cost, plays a significant role in milk production (Hussain *et al.*, 2010). The feeding of optimal level of feed and fodder performed a substantial role in milk production (Rao, 1985).

Demand Function: The milk demand function was estimated as milk demand is a function of per capita income per year, milk price and family size. A log–log ordinary least squares multiple regression model was estimated as a demand function of milk. The details of the estimated coefficients of the demand function are presented below in the Table 2.

The F-test value was 17.99 which is significant at ($p \leq 0.01$). This suggests that overall model was correctly specified. The estimated value of R^2 was 0.47. It clarify that all the independent variables included in the model explained 47 percent of the total variation in dependent variable. The estimated coefficient of milk price is -3.86, indicating that if milk price increases by 1

percent, the demand for milk decreases by 3.86 percent. It shows that milk consumption has become more price responsive. When fresh milk price rises people may be using close substitutes of fresh milk for example, dry milk. The coefficient of milk price is significant at ($p \leq 0.01$).

Table.2. The Coefficients of the Estimated Demand Function of Milk.

Variables	Coefficient s	T-Value	Significance
(Constant)	-8.83	-7.80	.102 ^{N.S.}
M.P	-3.86	3.51	0.001*
Y	6.50	5.81	0.043*
P	2.35	3.22	0.423 ^{N.S.}
$R^2 = 0.47$			
F-test value = 17.99**			

* = ($p \leq 0.05$) ** = ($p \leq 0.01$), N.S. = Non-significant

The estimated coefficient of per capita income is 6.50 which is significant at ($p \leq 0.05$). It explains that if per capita income is increases by 1 percent, the demand for milk will increase by 6.50 percent. As the income of the consumers is increasing they would like to consume more milk. Instead of using dry milk they would prefer to buy fresh milk. Similarly, the estimated coefficient of family members is 2.35. It indicates that if family members are increased by 1 percent, the demand for milk will increase by 2.35 percent. In fact the population of the country is increasing which in turn also increases demand for milk. To meet the rising demand of milk of consumers, the supply of milk must be improved.

Policy Recommendations: The following are the policy recommendations for improving the milk production in the country.

1. It is recommended that Government may provide attractive incentives to the farmers for the establishment of new dairy farms to increase the milk supply in the country.
2. It is also recommended that new cattle farms should be established to overcome the deficiency of animals for beef production.
3. It is recommended to provide the balanced feeds and fodders to the milking animals to improve the quantity and quality of milk.

4. To overcome the fluctuations of milk supply in the country the shelf life of milk may be increased.
5. To increase the milk production in the country it is further recommended that improved animal management, animal feeding and animal stock should be introduced in the livestock/dairy farms..

REFERENCES

- Agriculture Statistics of Pakistan. Ministry of Food, Agriculture and Livestock. Food, Agriculture and Livestock Division (Economic Wing) Islamabad (2005).
- C.C. McKenzie and W. L. Nieuwoudt. "Estimation of demand and supply functions for fresh and industrial milk in South Africa. *Agrekon*, 24(2): 27-33 (1985).
- Garcia, O., M. Khalid and H. Torsten. A Review of milk production in Pakistan with particular emphasis on small scale producers. FAO PPLPI working paper No. 3. (2003).
- Ghafoor A, H. Badar, M. Hussain and N Tariq. An empirical estimation of the factors affecting demand and supply of poultry meat in Pakistan. *Pakistan Vet. J.* 30(3):172-174 (2010-11).
- Government of the Pakistan. Economic Survey of Pakistan. Finance Division, Economic Adviser's Wing, Islamabad, Pakistan (2010-11).
- Halvorson, Harlow W. The response of milk production to price. *Journal of Farm Economics* 40:1101-1113 (1958).
- Hussain M; A. Ghafoor and A. Saboor. Factors affecting milk production in Buffalo: A case study. *Pakistan Vet. J.* 30(2):115-117 (2010-11).
- Kawaguchi, T., N. Suzuki and H. M. Kaiser "A Spatial Equilibrium Model for Imperfectly Competitive Milk Markets." *American J. Agri. Econ.* Vol. 79, No. 3: 851-859 (1997).
- Rao, B. S. Factors Affecting the Milk Production: A Case Study. *Indian J. Agri. Econ.* 40(2):169-174 (1985).
- Swamy, Gurushri and Hans. Binswanger. Flexible consumer demand systems and linear estimation: Food in India. *American J. Agri. Econ.* 65(4):675-684 (1983).