# MODELING AND FORECASTING OF BEEF, MUTTON, POULTRY MEAT AND TOTAL MEAT PRODUCTION OF PAKISTAN FOR YEAR 2020 BY USING TIME SERIES ARIMA MODELS

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**Abstract**

We use historical time-series data reported in data table to review trends in beef , mutton, poultry meat and total meat production. In this regard, first we use data from 1971-72 to 2007-08 to estimate a time trend for beef , mutton, poultry meat and total meat production. This time trend is estimated by employing an exponential function of the form $Y_f = ce^{bt}$, where Yf is for meat production and t depicts the year. The estimated parameters are highly statistically significant, while the overall explanatory power of the model is very high since R2 = 0.99. These results indicate that annual growth rate of meat production from 1971-72 to 2007-08 is 5% over per annum. In 2020 the projected annual growth of total production of meat will be in Pakistan , China, India and Developed world is 1.6,2.9,2.8 and 0.7 per year respectively. Similarly the total productions of meat in Pakistan in 2020 are estimated to be 4.7 million metric tons. where in 2020, China, India and develop world will be 86, 8 and 121 respectively. In 2020the per capita production is forecasted to be 25.2 kg/annum in Pakistan, 60 kg in China, 6 kg in India and 87 kg in Developing World. If we look at the production of the Beef , mutton, Poultry and meat in Pakistan , the annual growth production rate of beef is 0.6%, mutton is high and poultry meat is 1.2% so the total meat is 0.7% . The total production through 1993 for Beef, Poultry and Meat had been 35,27 and 100 million metric tons respectively and will be increased till 2020. it will be 38 million metric ton for beef, 38 million metric ton for mutton, 36 for poultry and 121 for meat. The per capita production of beef, poultry meat and meat had been 26, 21and 78 kg/annum respectively in 1993 and expected to be 28 kg ,26 kg and 87 kg for beef , poultry and meat respectively till 2020.

**Keywords:**Meat production, time series arima models

## Introduction

Pakistan is endowed with a large livestock population well adapted to the local environmental conditions. The national herd consists of 33.0 million heads of cattle, 29.9 million buffaloes, 27.4 million sheep, 58.3 million goats and 1.0 million camels. Livestock produce approximately 43.562 million tons of milk, making Pakistan the 3rd largest milk producer country in the world. Livestock also produce 1.601 million tons of beef, 0.590 million tons of mutton, 41.54 thousand tons of wool, 21.99 thousand tons of hair and 57.937 million skins and hides (Government of Pakistan, 2009). As we enter the next millennium, we need to have "2020 vision". What will be the numbers, production and demand for livestock in 20 years time? The world may be a very different place, especially in view of the growing pressure on natural resources. How accurately did we predict the state of the world in the 1972s, for instance, from our knowledge of the 1920s? Punjab's livestock resources hold considerable potential for increasing the production of meat. It has been estimated that about 5 million buffalo/cattle male calves are available for fattening in the Punjab province. But majority of these calves are sent to slaughter at 1-3 weeks of age. Some calves are raised to 60~80 kg on extremely poor and unbalanced diets. If we look at the production of the beef , mutton, poultry and meat in Pakistan , the annual growth production rate of beef is 0.6%, mutton is high and poultry meat is 1.2% so the total meat is 0.7% . The total production through 1993 for Beef, Poultry and Meat had been 35,27 and 100 million metric tons respectively and will be increased till 2020. it will be 38 million metric ton for beef, 38 million metric ton for mutton, 36 for poultry and 121 for meat. The per capita production of beef, poultry meat and meat had been 26, 21and 78 kg/annum respectively in 1993 and expected to be 28 kg ,26 kg and 87 kg for beef , poultry and meat respectively till 2020.

**Materials and methods**

The task facing the modern time series econometrician is to develop reasonable simple models capable of interpreting, forecasting, and testing hypotheses concerning the data. This challenge is growing over the passage of time; the original use of time series analysis was basically as an aid to forecasting.

Through the following software (SPSS & Eviews) we obtain few tests for serial correlation, normality and heteroskedasticity also detect the outlier in the data in the residuals from the estimated equation. Also obtain correlogram and Q-statistics that can displays the autocorrelations and partial autocorrelations of the equation residuals up to the specified number of lags. Histogram and normality test can displays a histogram and descriptive statistics of the residuals, including the Jarque-bera / Kolmogorov-smirnov z statistic for testing normality. Serial correlation Lm test this test is an alternative to the q-statistics for testing serial correlation. White's heteroskedasticity test this is a test for heteroskedasticity in the residuals from a least squares regression specification and stability tests.

Eviews software provides a number of test statistics that examine whether the parameters of the model are stable across various sub samples of data. Chow's breakpoint test the idea of the breakpoint chow test is to fit the equation separately for each sub sample and to see whether there are significant differences in the estimated equations a significant difference indicates a structural change in the relationship. Regression specification error test output from the test reports the test regression and the F-statistic and log likelihood ratio for testing the hypothesis that the coefficients on the powers of fitted values are all zero. The recursive residuals CUSUM test is based on the cumulative sum of the recursive residuals recursive coefficient estimates can enables us to trace the evolution of estimates for any coefficient as more and more of the sample data are used in the estimation. The view will provide a plot of selected coefficients in the equation for all feasible recursive estimations. Comparison of different models the different models can be compared with the wide availability of the forecast tests. Here we discuss and check those criterion.

**Linear Time Series Models**

There are $y_1, y_2, \cdots, y_t$ observations. Unlike the regression models, however, a set of explanatory variables is not used for modeling. Instead, y is explained by relating it to its own past values and to a weighted sum of current and lagged random disturbances.

**Autoregressive Moving Average (ARMA/ARIMA) Models**

The ARMA(p,q). It is represented by the following model

$$y_t = \phi_1 y_{t-1} + \cdots + \phi_p y_{t-p} + \delta + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \cdots - \theta_q \varepsilon_{t-q}$$

The variance, covariance and autocorrelation are solutions to difference equations

$$\gamma_k = \phi_1\gamma_{k-1} + \phi_2\gamma_{k-2} + \cdots + \phi_p\gamma_{k-p} \qquad k \geq q+1$$

$$\rho_k = \rho_1\gamma_{k-1} + \rho_2\gamma_{k-2} + \cdots + \rho_p\gamma_{k-p} \qquad k \geq q+1$$

q is the memory of the moving average part of the time series, so that, for $k \geq q+1$ the autocorrelation function (and covariance) exhibits the properties of a purely autoregressive process.

If the time series is homogenous stationary after differenced the series yt to produce stationary series $w_t$, we can model $w_t$ as an ARMA process. If $w_t = \Delta^d y_t$ and $w_t$ is an ARMA(p,q) process, then it is said that yt is an integrated autoregressive moving average process of order (p,d,q), or simple ARIMA(p,d,q). ARIMA(p,d,q) using back shift operator is written as

$$\phi(B)\Delta^d y_t = \delta + \theta(B)\varepsilon_t$$

where

$$\phi(B) = 1 - \phi_1 B - \phi_2 B^2 - \cdots - \phi_p B^p$$

is the autoregressive operator
and

$$\theta(B) = 1 - \theta_1 B - \theta_2 B^2 - \cdots - \theta_q B^q$$

is the moving average operator.

And when there is a differencing the ARMA model becomes ARIMA .

The time series is called stationary, if the characteristics of the time series (stochastic process) do not change over time, i.e., variance mean, and covariance then the time series is called stationary

**Augmented Dickey-Fuller (ADF) Test**

If the process is started at some point, the variance of y increases steadily with time and goes to infinity. If the absolute value of $\phi_1$ is greater than one, the series is explosive. Therefore, the hypothesis of a stationary series is evaluated by testing whether the absolute value of $\phi_1$ is strictly less than one. Both the Phillips-Perron and the Dickey-Fuller (DF) (PP) tests take the unit root as the null hypothesis: $H_O : \phi_1 = 1$. As te explosive series does not make much economic sense, therefore null hypothesis is tested against the one-sided alternative.

$$H_1 : \phi_1 < 1 .$$

The test is carried out by estimating an equation with $y_{t-1}$ subtracted from both sides of the equation.

$$\Delta y_t = \mu + \gamma y_{t-1} + \varepsilon_t$$

Where $\gamma = \rho - 1$ and the null and alternative hypotheses are

$$H_o : \gamma = 0 \ ,: \ H_1 : \gamma < 0$$

If the series is correlated at higher order lags, the assumption of white noise disturbances is violated. The ADF and PP tests use different methods to control for higher order serial correlation in the series. The ADF test makes a parametric correction for higher order correlation by assuming that the y series follows an AR(p) process and adjusting the test methodology. The ADF approach controls for higher-order correlation by adding lagged difference terms of the dependent variable y to the right hand side of the regression

$$\Delta y_t = \mu + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \delta_2 \Delta y_{t-2} + \cdots + \delta_p \Delta y_{t-p+1} + \varepsilon_t$$

This augmented specification is then used to test

$$H_o : \gamma = 0 , \; H_1 : \gamma < 0$$

During this it may appear that the test can be carried out by performing a t-test on the estimated $\gamma$, the t statistic under the null hypothesis of a unit root does not have the conventional t distribution. Fuller and Dickey (1979) showed that the distribution under the null hypothesis is nonstandard, and they simulated the critical values for selected sample sizes. MacKinnon (1991) more recently has implemented a much larger set of simulations than those tabulated by Fuller and Dickey.

### Durban Watson Test Statistic

The Durbin-Watson statistic is a test for first order serial correlation. More formally, the DW statistic measures the linear association between adjacent residuals from a regression model. The Durbin-Watson is a test of the hypothesis $\rho = 0$ in the specification

$$\mu_t = \rho \mu_{t-1} + \varepsilon_t$$

If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall below 2 if there is positive serial correlation. If there is negative correlation, the statistic will lie somewhere between 2 and 4.The statistic is computed as. Johnston and DiNardo (1997)

### Beef

We have made comparison among four tentative models and we are going to choose one best model among these. We have used different criterion given above to select the best candidate model. We stressed main focus on DW,AIC,RMSE and Theil's inequality to select the final model. RMSE and Theil's inequality shows the closeness of actual and forecasted values. Smaller Theil inequality is the best index of good forecasts. So here we chose ARIMA(0,1,15) model. On the basis of RMSE AND **THEIL'S** Inequality we suggest that the best model among these is ARIMA (0, 1, 15 ).

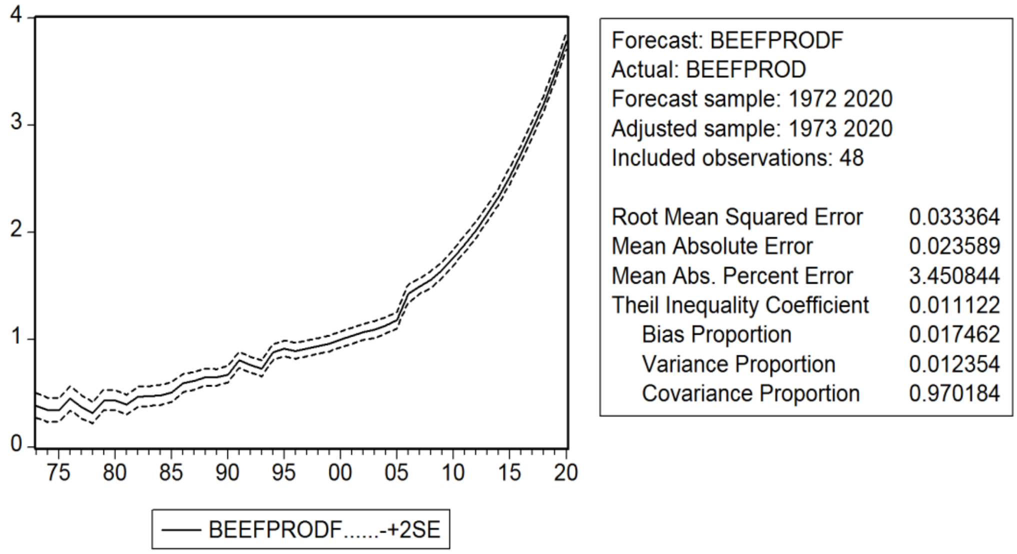
### THE FORECASTS FROM THE ARIMA MODELS ARE GIVEN BELOW

$$\Delta \log BF_t = 0.394 \; - 0.656\,\phi_{t-15} - 0.0189 POP_t + 0.0129 C_t + 0.108 B_t$$

(in million)

| Years | Buffaloes | Cattle | Beef Production | Human Population |
|---|---|---|---|---|
| 1971-1972 | 9.80 | 14.60 | 0.35 | 64.56 |
| 1979-1980 | 11.60 | 15.60 | 0.42 | 80.13 |
| 1989-1990 | 17.40 | 17.80 | 0.73 | 105.35 |
| 1999-2000 | 22.70 | 22.00 | 0.99 | 134.51 |
| 2009-2010 | 30.71 | 35.25 | 1.78 | 173.86 |
| 2010-2011 | 31.61 | 36.65 | 1.90 | 178.41 |
| 2011-2012. | 32.53 | 37.93 | 2.04 | 183.08 |
| 2012-2013 | 33.48 | 39.11 | 2.19 | 187.87 |
| 2013-2014 | 34.45 | 40.23 | 2.35 | 192.79 |
| 2014-2015 | 35.45 | 41.31 | 2.54 | 197.84 |
| 2015-2016 | 36.49 | 42.37 | 2.74 | 203.02 |
| 2016-2017 | 37.55 | 43.43 | 2.96 | 208.33 |
| 2017-2018 | 38.64 | 44.48 | 3.21 | 213.78 |
| 2018-2019 | 39.77 | 45.54 | 3.48 | 219.38 |

| | | | | |
|---|---|---|---|---|
| 2019-2020 | 40.93 | 46.62 | 3.79 | 225.12 |




From the above graph we see some statistics. We know that Small bias proportion indicates that the forecasts track the mean of the actual series. Smaller bias proportion shows the best fit of the model. Larger covariance proportion indicates actual and forecasts are very close to each other

**Mutton**

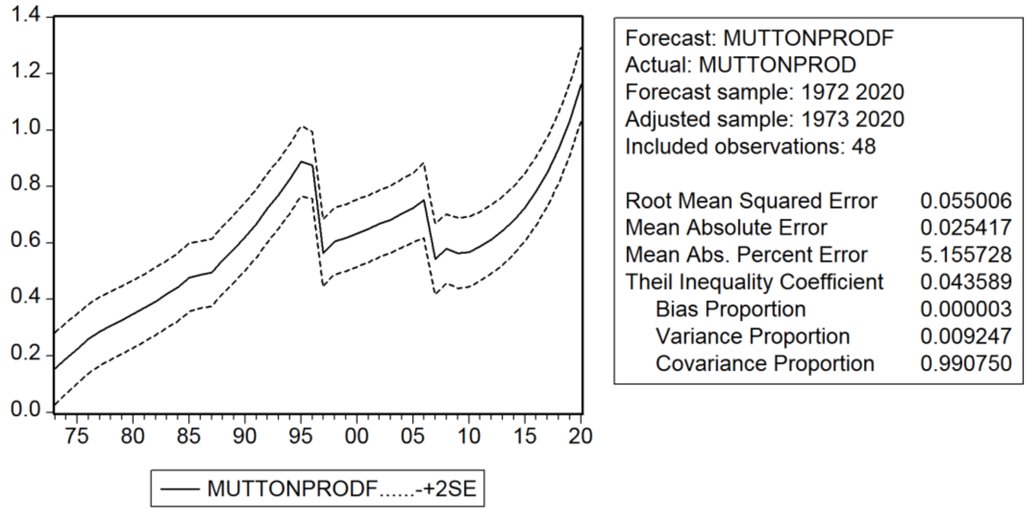
We have made comparison among three tentative models and we are going to choose one best model among these. We have used different criterion given above to select the best candidate model. We stressed main focus on DW,AIC,RMSE and Theil's inequality to select the final model. RMSE and Theil's inequality shows the closeness of actual and forecasted values. Smaller Theil inequality is the best index of good forecasts. So here we chose ARIMA(0,1,1) model. On the basis of RMSE AND THEIL'S Inequality we suggest that the best model among these is ARIMA (0, 1, 1 ).

**The Forecasts From The ARIMA Models Are Given Below**

$$\Delta \log M_t = -0.0960 - 0.116\,\theta_{t-1} + 0.004\,\mathrm{POP}_t + 0.0135\,\mathrm{G}_t + 0.008\,\mathrm{S}_t$$

| Years | Goats | Sheep | Mutton Production | Human Population |
|---|---|---|---|---|
| 1971-1972 | 15.60 | 13.70 | 0.21 | 64.56 |
| 1979-1980 | 24.90 | 21.40 | 0.35 | 80.13 |
| 1989-1990 | 35.40 | 25.70 | 0.62 | 105.35 |
| 1999-2000 | 47.40 | 24.10 | 0.65 | 134.51 |
| 2009-2010 | 60.51 | 28.21 | 0.57 | 173.86 |
| 2010-2011 | 61.69 | 28.79 | 0.59 | 178.41 |
| 2011-2012. | 62.86 | 29.37 | 0.61 | 183.08 |
| 2012-2013 | 64.04 | 29.97 | 0.64 | 187.87 |
| 2013-2014 | 65.22 | 30.58 | 0.68 | 192.79 |
| 2014-2015 | 66.39 | 31.20 | 0.73 | 197.84 |
| 2015-2016 | 67.57 | 31.83 | 0.79 | 203.02 |
| 2016-2017 | 68.74 | 32.48 | 0.87 | 208.33 |
| 2017-2018 | 69.92 | 33.14 | 0.96 | 213.78 |
| 2018-2019 | 71.10 | 33.81 | 1.08 | 219.38 |

| | | | | |
|---|---|---|---|---|
| 2019-2020 | 72.27 | 34.50 | 1.22 | 225.12 |



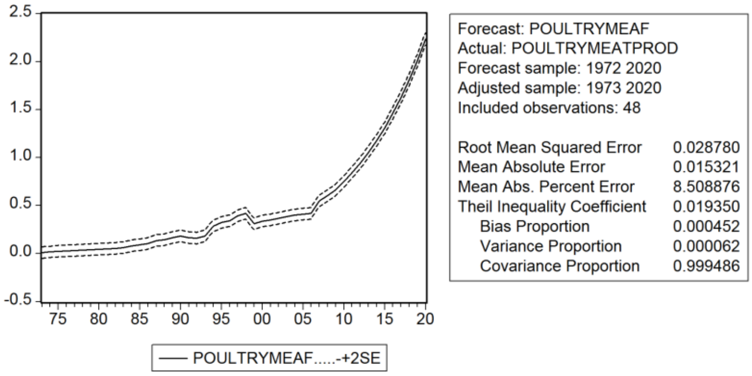

**Poultry**

We have made comparison among four tentative models and we are going to choose one best model among these. We have used different criterion given above to select the best candidate model. We stressed main focus on DW,AIC,RMSE and Theil's inequality to select the final model. RMSE and Theil's inequality shows the closeness of actual and forecasted values. Smaller Theil inequality is the best index of good forecasts. So here we chose ARIMA(0,1,1) model. On the basis of RMSE AND THEIL'S Inequality we suggest that the best model among these is ARIMA (0, 1, 1 ).

**The Forecasts From The Arima Models Are Given Below**

$$\Delta \log PT_t = -0.443\,\phi_{t-6} - 0.0189POP_t + 0.001P_t$$

| Years | Poultry Birds | Poultry Meat Production | Human Population | Meat Production |
|---|---|---|---|---|
| 1971-1972 | 24.30 | 0.01 | 64.56 | 0.57 |
| 1979-1980 | 62.60 | 0.05 | 80.13 | 0.82 |
| 1989-1990 | 153.90 | 0.16 | 105.35 | 1.51 |
| 1999-2000 | 303.00 | 0.32 | 134.51 | 1.96 |
| 2009-2010 | 730.94 | 0.75 | 173.86 | 2.93 |
| 2010-2011 | 837.55 | 0.84 | 178.41 | 3.06 |
| 2011-2012. | 944.16 | 0.94 | 183.08 | 3.21 |
| 2012-2013 | 1050.77 | 1.04 | 187.87 | 3.36 |
| 2013-2014 | 1157.38 | 1.17 | 192.79 | 3.52 |
| 2014-2015 | 1263.99 | 1.30 | 197.84 | 3.69 |
| 2015-2016 | 1370.60 | 1.45 | 203.02 | 3.87 |
| 2016-2017 | 1477.21 | 1.62 | 208.33 | 4.06 |
| 2017-2018 | 1583.82 | 1.81 | 213.78 | 4.25 |
| 2018-2019 | 1690.43 | 2.02 | 219.38 | 4.46 |
| 2019-2020 | 1797.04 | 2.26 | 225.12 | 4.68 |




## Meat

We have made comparison among four tentative models and we are going to choose one best model among these. We have used different criterion given above to select the best candidate model. We stressed main focus on DW,AIC,RMSE and Theil's inequality to select the final model. RMSE and Theil's inequality shows the closeness of actual and forecasted values. Smaller Theil inequality is the best index of good forecasts. So here we chose ARIMA(0,1,1) model. On the basis of RMSE AND **THEIL'S** Inequality we suggest that the best model among these is ARIMA (0, 1, 1 ).

### THE FORECASTS FROM THE ARIMA MODELS ARE GIVEN BELOW

$$\Delta \log MT_t = 0.104 - 0.773\,\theta_{t-10} + 0.421\,\phi_{t-2} - 0.546\,\phi_{t-3} - 0.0189POP_t$$

| Years | Meat Production | Human Population |
|---|---|---|
| 1971-1972 | 0.57 | 64.56 |
| 1979-1980 | 0.82 | 80.13 |
| 1989-1990 | 1.51 | 105.35 |
| 1999-2000 | 1.96 | 134.51 |
| 2009-2010 | 2.93 | 173.86 |
| 2010-2011 | 3.06 | 178.41 |
| 2011-2012. | 3.21 | 183.08 |
| 2012-2013 | 3.36 | 187.87 |
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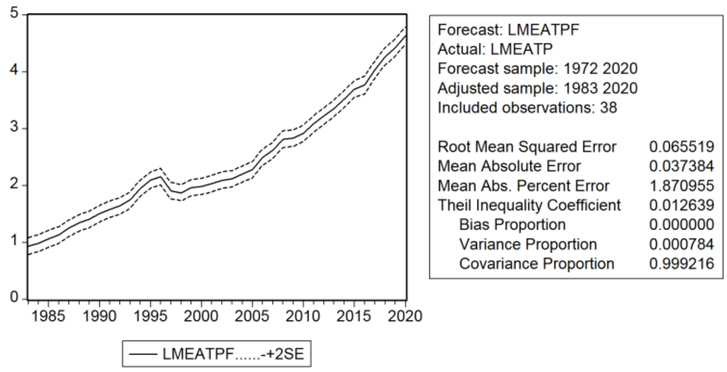
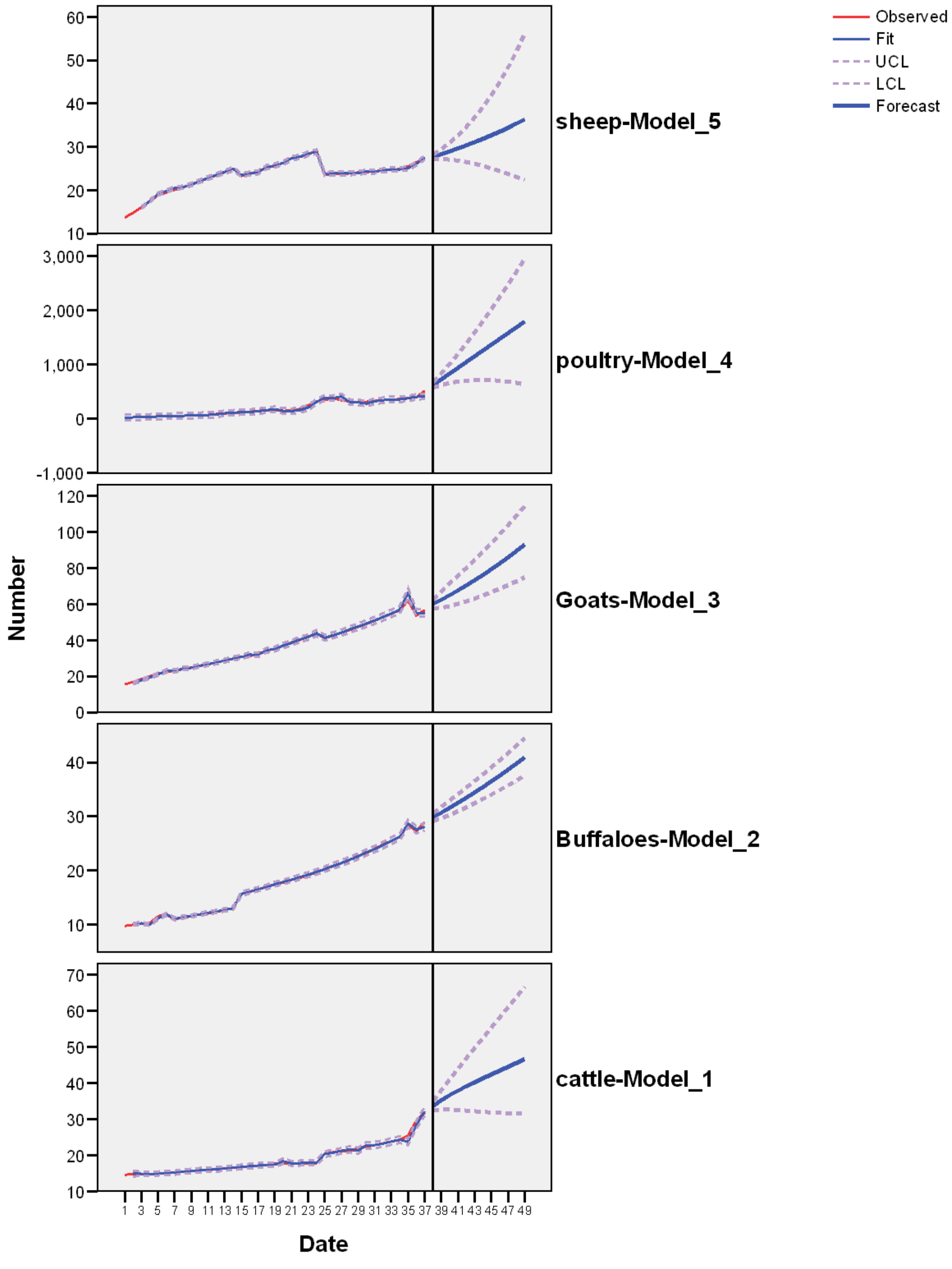
| 2016-2017 | 4.06 | 208.33 |
| 2017-2018 | 4.25 | 213.78 |
| 2018-2019 | 4.46 | 219.38 |
| 2019-2020 | 4.68 | 225.12 |



**Graph of Forecast Livestock Population**




**Human Population**

Growth. Model whose equation is Y = e**(b0 + (b1 * t)) or ln(Y) = b0 + (b1 * t).

$$Y = Exp[4.15 + (0.03t)]$$

**Conclusion**

As we enter the next millennium, we need to have "2020 vision". What will be the numbers, production and demand for livestock in 20 years time? The world may be a very different place, especially in view of the growing pressure on natural resources. How accurately did we predict the state of the world in the 1972s, for instance, from our knowledge of the 1920s?

We use historical time-series data reported in data table to review trends in beef , mutton, poultry meat and total meat production. In this regard, first we use data from 1971-72 to 2007-08 to estimate a time trend for beef , mutton, poultry meat and total meat production. This time trend is estimated by employing an exponential function of the form $Y_f = ce^{bt}$, where $Y_f$ is for meat production and t depicts the year. The estimated parameters are highly statistically significant, while the overall explanatory power of the model is very high since $R^2 = 0.99$. These results indicate that annual growth rate of meat production from 1971-72 to 2007-08 is 5% over per annum. We present a comparison of the projections for meat production in **Annexure K**, which indicates that meat Production In 2020 the projected annual growth of total production of meat will be in Pakistan , China, India and Developed world is 1.6,2.9,2.8 and 0.7 per year respectively. Similarly the total productions of meat in Pakistan in 2020 are estimated to be 4.7 million metric tons. where in 2020, China, India and develop world will be 86, 8 and 121 respectively. In 2020the per capita production is forecasted to be 25.2 kg/annum in Pakistan, 60 kg in China, 6 kg in India and 87 kg in Developing World.

The large increase in animal protein demand over the last few decades has been largely met by the worldwide growth in industrial production of poultry. This is expected to continue as real incomes grow in the emerging economies.

If we look at the production of the Beef , mutton, Poultry and meat in Pakistan , the annual growth production rate of beef is 0.6%, mutton is hfgh and poultry meat is 1.2% so the total meat is 0.7% . The total production through 1993 for Beef, Poultry and Meat had been 35,27 and 100 million metric tons respectively and will be increased till 2020. it will be 38 million metric ton for beef, 38 million metric ton for mutton, 36 for poultry and 121 for meat. The per capita production of beef, poultry meat and meat had been 26, 21and 78 kg/annum respectively in 1993 and expected to be 28 kg ,26 kg and 87 kg for beef , poultry and meat respectively till 2020. to see the Developing and Developed world (beef, poultry, meat) see **Annexure L**.

The traditional meat production systems in Pakistan are inefficient. Most of beef comes as by-product of dairy industry, end of career draft animals or emergency slaughtered animals. With a few exceptions, practically no commercial beef production/fattening activity is being carried out in Pakistan. Whereas the demand supply gap for mutton is increasing due to low productivity of small animals. Consequently the productive animals like female sheep/goat and young female stock are slaughtered indiscriminately to meet the demand.

Punjab's livestock resources hold considerable potential for increasing the production of meat. It has been estimated that about 5 million buffalo/cattle male calves are available for fattening in the Punjab province. But majority of these calves are sent to slaughter at 1-3 weeks of age. Some calves are raised to 60~80 kg on extremely poor and unbalanced diets.

If these calves are saved and raised on balanced fattening diets based on crop residues and agro-industrial by-products to live-weights of 250-300kg it is estimated that total beef production could be doubled. Experiences so far, suggest that success of meat production/feedlot fattening is only possible if these animals are processed at a modern abattoir and their meat is processed for value addition and efficient utilization of the byproducts, which are being wasted in the present conventional slaughtering system.

Though livestock production is very fragmented and most farm units are small and only 10 percent of the farms in the Punjab hold from 10 to 20 buffalo cows and 5 percent over 20 heads each. Such units are often run by capable and business oriented farmers who seem to be open to change and eager to adopt improved production practices if these prove profitable. Thus if sufficient incentives and workable production programs are given, their response is quick and positive.

In order to improve access to international markets and satisfy escalating concerns about food quality and safety among domestic consumers there is need to modernize meat production and processing systems. Unfortunately there is no value addition of meat products and wastage of valuable byproducts. The prevailing conditions result into uneconomical and low-quality meat production.

Punjab possesses huge potential to export meat and earn good foreign exchange for the country but unhygienic slaughtering and poorly handled meat is causing hindrance to achieve this goal. On the other hand the meat producer is not getting the profit, which he deserves, and the consumer does not get the meat of his own choice because the meat grading system does not exist in the country.

In coming years the demand for hygienic meat and value added products for local as well as international markets is expected to increase greatly, for a number of reasons. This necessitates establishment of state of the art meat processing/value addition system in the country. There is also a growing demand for Halal meat in the international markets. This requires establishment of modernized meat production and processing system in the country to meet local as well as international demand.

**Reference:**

Agricultural census organization, livestock census 1996, 2006- punjab, government of Pakistan, Lahore.

Annual report 2007-2008, state bank of Pakistan. (http://www.sbp.org.pk).

Anonymous 1998, cattle and buffalo development Punjab', Pakistan – German technical co-operation, planning & evaluation directorate, Punjab livestock and dairy development department.

Anonymous, Economic Survey Of Pakistan (2007-08), ministry of economic affairs, government of Pakistan.

Anonymous. 2007-2008. Agricultural Statistics of Pakistan. Gop, MINFAL, Economic wing, Islamabad.

Bourn, d., maitima, j., motsamai, b., blake, r.,nicholson, c. & sundstol, f. (2005). Livestock and theenvironment. In: owen e. A., kitalyi, n., jayasuriya t.Smith (eds): livestock and wealth creation: improvingthe husbandry of animals kept by resource-poor peoplein developing countries. Nottingham: nottinghamuniversity press.

Economic research service. 1997b. Worldagriculture: trends and indicators: world andregional data. Http://mann77.Mannlib.cornell.edu/data1.

c. Seré & h. Steinfeld.. (1996). World livestock production systems: currentstatus, issues and trends, by Fao Animal production and health paper 127. Rome: foodand agriculture organization of the united nations.

j. Bruinsma. . (2003). World agriculture: towards 2015/2030, an faoperspective, by FAO Rome and london: foodand agriculture organization of the united nations andearthscan.

H. Steinfeld, p. Gerber, t.Wassenaar, v. Castel, m. Rosales, c. De haan (2006a). Livestock's long shadow: environmentalissues and options, by by. FAO . Rome:fao. 390 pp.

FAO agricultural statistics (2003 & 2004). At http://www.fao.org.

Faostat (2003). Fao statistics database on the world wide web. Http://apps.fao.org/ (accessed february, 2003).

Food and agriculture organisation of the united nations (2002). World agriculture towards 2015/2030.
Food and nutrition board, institute of medicine. Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein, and amino acids. Washington, dc: national academy press, 2002.
Http://www.foodoutlook.org, June 2008.mht
Http://Www.Nationmaster.Com/Graph/Agr_Agr_Gro-Agriculture-Gricultural-Growth
Http://www.Pakissan.Com/English/Allabout/Livestock/Poultry/Birds.Breeds.Shtml
Http://Www.Pndpunjab.Gov.Pk/Page.Asp?Id=30
Http://Www.Statpak.Gov.Pk/Depts/Aco/Index.Html
Http://Www.UN.Org.Pk/Fao/
Http://www. USDA .org , food safety and inspection service.
http://www.who.int/whosis/whostat/en/.
Http:www.pakistan.gov.pk/divisions/food-division/media/asp_05-06_title.pdf
Kazim hussain naqvi, syed muhammad (1999) analytical study of pakistani native red meats. Phd thesis, university of the punjab, lahore.
Naqvi, syed muhammad kazim hussnain (1999) analytical study of pakistani native red meats. Phd thesis, university of the punjab, lahore.
Research corporation (mrc). 1995. Identification of nutrient sources, reduction opportunities and treatment options for australian abattoirs and rendering plants. Project no. M.445. Prepared by rust ppk pty ltd and taylor consulting pty ltd.
Usda (united states de partment of ag riculture).1997a. Agricultural sta tistics. Wash ington, d.c.:united states gov ernment print ing of fice.
Usda/fas. 2000. Meat and bone meal ban may induce south american soybean planting. United states department of agriculture: foreign agricultural service, (www.fas.usda.gov).

**Bibliography**

Bourn, d., wint, w., blench, r. & woolley, e. (1994)nigerian livestock resources survey. World animalreview 78, 49-58. Rome: food andagricultureorganization of the united nations (FAO).
Livestock of Pakistan by H.U Hasnain and R.H. Usmani. Islamabad: Livestock Foundation,2006.
Krystallis, a. & arvanitoyannis, i.s. 2006. Investigating the concept of meat quality from the consumers perspective: the case of greece. Meat science, 72:164–176.
Processed meat consumption and stomach cancer risk a meta-analysis -- larsson et al_ 98 (15) 1078 -- jnci journal of the national cancer institute.
Rosegrant, m.w., leach, n. & gerpacio, r.v. 1999. Meat or wheat for the next millennium? Alternative futures for world cereal and meat consumption. Proceedings of the nutrition society, 58: 219–234.
The future for red meat in human diets herbert w. Ockerman, 2002 the ohio state university department of animal sciences, research and reviews beef, special circular 162-99, the future for red meat in human diets.mht
Baxter, Marianne and Robert G. King (1999). “Measuring Business Cycles: Approximate Band-Pass Filters For Economic Time Series,” Review of Economics and Statistics, 81, 575–593.
Bhargava, A. (1986). “On the Theory of Testing for Unit Roots in Observed Time Series,” Review of Economic Studies, 53, 369-384.
Bowerman, Bruce L. and Richard T. O’Connell (1979). Time Series and Forecasting: An Applied Approach, New York: Duxbury Press.
Box, George E. P. and Gwilym M. Jenkins (1976). Time Series Analysis: Forecasting and Control, Revised Edition, Oakland, CA: Holden-Day.

Box, George E. P. and D. A. Pierce (1970). "Distribution of Residual Autocorrelations in Autoregressive Integrated Moving Average Time Series Models," Journal of the American Statistical Association, 65, 1509–1526.
Dickey, D.A. and W.A. Fuller (1979). "Distribution of the Estimators for Autoregressive Time Series with a Unit Root," Journal of the American Statistical Association, 74, 427–431.
Harvey, Andrew C. (1989). Forecasting, Structural Time Series Models and the Kalman Filter, Cambridge: Cambridge University Press.
Harvey, Andrew C. (1993). Time Series Models, 2nd edition, Cambridge, MA: MIT Press.
Phillips, P.C.B. and P. Perron (1988). "Testing for a Unit Root in Time Series Regression," Biometrika, 75, 335–346.