



Importance of ARIMA Model in Prediction of Jute Production

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ABSTRACT

Jute plays an important role in the development of economy in Bangladesh and thus the forecasting of jute production by applying scientific process will definitely contribute to the upliftment of the socio economic condition of Bangladesh. The forecasting of jute production by using time series analysis and applying ARIMA model will help the concerned authority to adopt appropriate steps to produce the estimated jute production.

Keywords-- Jute, Production, Forecasting, Scientific, ARIMA etc.

I. INTRODUCTION

Mahbubul Islam et al. (2017) described that jute, scientifically known as *Corchorus* spp. is now universally recognized that jute is the English version of the current bengali word 'Pat', a kind of fibre which is obtained from two species annual and short day plants) of the genus *Corchorus* belonging to the family *Tiliaceae*. It is a common term used both for plant and the fibre obtained from the bark of the plants, *Corchorus capsularis* L. and *Corchorus olitorius* L. There are over 30 species, which belongs to the genus *Corchorus*. Jute (*Corchorus capsularis* & *Corchorus olitorius*), Kenaf (*Hibiscus cannabinus*) and Roselle (*H. sabdariffa* var (*Altissima*)) are vegetable bast fibre plants next to cotton in importance. In the trade there are usually two names of jute, White and Tossa. *Corchorus capsularis* is called White Jute and *Corchorus olitorius* is called Tossa Jute. In India & Bangladesh Roselle is usually called Mesta. Jute fibres are finer and stronger than Mesta and are, therefore, better in

quality. Depending on demand, price and climate, the annual production of jute and allied fibres in the world remains around 3 million tonnes. The fibre finds its use in the producing as well as in consuming countries in the agricultural, industrial, commercial and domestic fields. Sacking and Hessians (Burlap) constitute the bulk of the manufactured products. Sacking is commonly used as packaging material for various agricultural commodities viz., rice, wheat, vegetables, corn, coffee beans etc. Sacking and Hessian Cloth are also used as packing materials in the cement and fertilizer manufacturing industries.

Maulik (2001) stated that the jute fibres are used alone or blended with other types of fibres to make twine and rope. Jute butts, the coarse ends of the plants, are used to make inexpensive cloth. Conversely, very fine threads of jute can be separated out and made into *imitation silk*. As jute fibres are also being used to make pulp and paper, and with increasing concern over forest destruction for the wood pulp used to make most paper, the importance of jute for this purpose may increase. Jute has a long history of use in the sackings, carpets, wrapping fabrics (cotton bale), and construction fabric manufacturing industry.

In 2017, Mahbubul Islam et al. stated that jute was used in traditional textile machineries as textile fibres having cellulose (vegetable fibre content) and lignin (wood fibre content). But, the major breakthrough came when the automobile, pulp and paper, and the furniture and bedding industries started to use jute and its allied fibres with their non-woven and composite technology to manufacture nonwovens, technical textiles and composites. Therefore, jute has changed its textile fibre outlook and steadily heading towards its newer identity, i.e. wood fibre. As a

textile fibre, jute has reached its peak from where there is no hope of progress, but as a wood fibre jute has many promising features. With these view the study was undertaken to see the past and future of jute in Bangladesh, its production, research achievements and diversification as well.

Jute being the most important commercial crop plays a major role in agriculture sector of Bangladesh. Various development projects of Bangladesh are financed by the foreign exchange earnings from jute. Jute holds an important position in the industrial sector of the economy of Bangladesh. Jute is a versatile and environment-friendly bio-degradable natural fibre widely grown in Asia, particularly in Bangladesh, India and China. It is an important cash crop in Bangladesh and India, which together accounts for about 84% of world production of jute fibre (Maulik, 2001)

II. ECONOMIC IMPORTANCE OF JUTE PRODUCTION

Jute has always played an important role in the economy of Bangladesh. In the 1970s Bangladesh earned huge foreign currency by exporting raw jute, jute goods, arts and crafts made of jute fibre. That's why it was called the 'Golden Fibre of Bangladesh'. In recent few years Bangladesh Government is trying to promote the jute industry and to get back the lost position in the world market. The Government is trying to initiate a revolution in the jute industry and the current government policy is one of inducement and facilitation for promotion of investment and export of jute products. Subsequently, it has become an industrial raw material for production of packaging materials. Jute the 'Golden fibre' of Bangladesh has been considered as the major source of foreign exchange earnings of the country. It provides livelihood for millions of farmers, industrial workers. Cultivation of jute in the country has been drastically reduced from 25.42 lakh acres of land with production of 13.44 lakh tonnes jute fibre and 30.91 lakh tonnes of jute sticks in 1969- 70 to 9.6 lakh acres of land with production of 10.35 lakh tonnes jute fibre and 16.72 tonnes jute stick in the year 2004- 05. On an average, jute was cultivated between 10.00 to 11.85 lakh acres producing almost 53 to 57.5 lakh bales of raw jute in the country. The export market tried to sustain a steady trend showing positive and promising signal for jute. Jute sector could contribute to creation of huge employment opportunities, wide scale income generation and poverty alleviation, and ultimately higher contribution to GDP (Maulik, 2001).

III. SIGNIFICANCE OF JUTE PRODUCTION

As per Stephen and Abir (2014) ,in Bangladesh, the service sector accounts for 51% of GDP, the industrial sector 30% and agriculture 18%. Bangladesh is a major agricultural producer, particularly in the global production of rice (4th), fisheries (5th), jute (2nd), tea (10th) and tropical fruits (5th).

That is, Bangladesh is currently the second largest producer of jute fiber, now over taken by India. After the country's independence, more than 80% of total foreign currency in Bangladesh was earned from jute and jute related goods. But after 80's, the earning rate of foreign currency from jute industry has gradually declined due to low productivity of jute. The sector provides about 10% of the total employment in the economy and 12% of GDP. About 90% of jute products produced in Bangladesh is exported (Rahman, 2001).

Foreign exchange earnings of Bangladesh come mostly from jute. Beside, jute is a good source of revenue for the governments in the form of taxes, levies, sales tax, octroi and custom duties on jute goods (Sikdar and Banerjee, 1990).

Bangladesh is famous for jute production and earned a big amount of foreign currency by exporting jute and jute products to different countries. At one stage, Jute was only the vital sector in Bangladesh from which major portion of foreign currency is to come and help Bangladesh's economy and a large number of manpower were employed there. Bangladesh was recognized as one of the best jute producing and exporting countries of the world (Islam et al., 2013).

Over the last 20-25 years it did slide down to the seventh position. Thus the present study is selected to get the facts responsible for such declination which will be beneficial to the nation in estimating the jute production in the near future.

IV. METHODOLOGY

ARIMA modeling

The various techniques used for time series analysis are namely ARIMA models, Box-Jenkins multivariate models, Holt winters exponential smoothing (single, double and triple). The term ARIMA stands for Auto Regressive Integrated Moving Average where AR for Auto Regressive referring to the lags of the differenced series, MA for Moving Average (MA) referring to the lags of errors and I is the number of difference used to make the time series stationary. In ARIMA model

1. Data should be stationary and stationary means that the properties of the series doesn't depend on the time when it is captured. A white noise series and series with cyclic behavior can also be considered as stationary series.
2. Data should be univariate as ARIMA works on a single variable and Auto-regression is all about regression with the past values.

Basically exploratory analysis with fit the model and diagnostic measures are the steps to be followed for ARIMA.

Suppose that $\{u_t\}$ is a white noise with mean zero variance σ^2 , then $\{Y_t\}$ is defined by $Y_t = u_t + a_1Y_{t-1} + a_2Y_{t-2} + \dots + a_qY_{t-q}$ is called a moving average process of order q and is denoted by $MA(q)$. If the process $\{Y_t\}$ is given by $Y_t = a_1Y_{t-1} + a_2Y_{t-2} + \dots + a_pY_{t-p} + u_t$ is called an auto-regressive process of order p and is denoted by $AR(p)$. Models that are combination of AR and MA models are known as $ARMA$ models. An $ARMA(p,q)$ model is defined as $Y_t = a_1Y_{t-1} + a_2Y_{t-2} + \dots + a_pY_{t-p} + u_t + a_1u_{t-1} + a_2u_{t-2} + \dots + a_qu_{t-q}$, where, Y_t is the original series, for every t , we assume that u_t is independent of $Y_{t-1}, Y_{t-2}, \dots, Y_{t-p}$. A time series $\{Y_t\}$ is said to follow an integrated autoregressive moving average (ARIMA) model if the d th difference $W_t = \Delta Y_t$ is a stationary $ARMA$ process. If $\{W_t\}$ follows an $ARMA(p, q)$ model, we say that $\{Y_t\}$ is an $ARIMA(p, d, q)$ process. Fortunately, for practical purposes, we can usually take $d=1$ or at most 2. Consider then an $ARIMA(p,1,q)$ process. With $W_t = Y_t - Y_{t-1}$, we have, $W_t = a_1W_{t-1} + a_2W_{t-2} + \dots + a_pW_{t-p} + u_t + a_1u_{t-1} + a_2u_{t-2} + \dots + a_qu_{t-q}$ (Hossain et al., 2015)

Box-Jenkins Method

As per Box and Jenkins (1970), the influential work of Box-Jenkins shifted professional attention away from the stationary serially correlated deviations from deterministic trend paradigm toward the $ARIMA(p, d, q)$ paradigm. It is popular because it can handle any series, stationary or not with or without seasonal elements. The basic steps in the Box-Jenkins methodology consist of the following five steps.

Importance of ARIMA model

In statistics and econometrics, and in particular in time series analysis, an autoregressive integrated moving average (ARIMA) model is a generalization of an autoregressive moving average (ARMA) model. Both of these models are fitted to time series data either to better understand the data or to predict future points in the series (forecasting). $ARIMA$ models are applied in some cases where data show evidence of non-stationarity, where an initial differencing step (corresponding to the "integrated" part of the model) can be applied one or more times to

eliminate the non-stationarity (https://www.otexts.org/fpp/8/1; 11th August, 2018).

V. CONCLUSION

Considering the importance of jute from the view point of various aspects including primarily the economy, it is very much true that a predictive value based calculation system like mathematical modeling will boost up the the concerned management authority to adopt adequate steps to reach the expected jute production. Thus Jute production forecasting system may be helpful in future to keep balance between calculated and practically found jute production value.

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