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A Cross Section Examination of Jute Production in Bangladesh

Syed Saad Andaleeb
Walter J. Primeaux, Jr.

College of Commerce and Business Administration
Bureau of Economic and Business Research
University of Illinois, Urbana-Champaign

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Syed Saad Andaleeb, Graduate Student
Department of Business Administration

Walter J. Primeaus, Jr, Professor
Department of Business Administration

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ABSTRACT

Jute has served as a vital agricultural commodity of the Bangladesh economy, accounting for a major share of the country's foreign exchange earnings. While the importance of the commodity is acknowledged, not enough research effort has been devoted to developing an understanding of the determinants of jute production.

Based on the assumption that local level pragmatic considerations of the farmers weigh heavily on their decisions to grow jute, this paper develops a multiple regression equation highlighting explanatory variables that reflect both controllable and uncontrollable factors. Four factors explain 83% of the variance in jute production.

The results of the study seem to portend a decline in jute production in Bangladesh in the future because the variables affecting production of the commodity are expected to change in an unfavorable way. The expected changes, as well as their expected impacts are discussed in detail in this paper. Some policy implications, derived from the model, are also suggested if jute's vital role in the Bangladesh economy is to continue.

A CROSS SECTION EXAMINATION OF JUTE PRODUCTION IN BANGLADESH

BY

SYED SAAD ANDALEEB AND WALTER J. PRIMEAUX, JR.

Jute is a vital agricultural commodity of the Bangladesh economy, but its significance has declined in recent years. The total foreign exchange earnings of the country from jute was 92% in 1960-1961 but the percentage declined to 69% by 1979-1980 [1]. Nevertheless, even though the Bangladesh economy has become more diversified in recent years, its dependence upon jute is beyond dispute. According to government sources, no other commodity exists which could make equivalent contributions to the country's economic development.

Despite the fact that the Bangladesh economy is heavily dependent upon jute production, the world import demand for the commodity has been gradually diminishing. World import demand has declined from 6.69 million bales in 1965 to 3.25 million in 1979-1980; Bangladesh's loss was even more dramatic as its share in total world production plummeted from a formidable 80% in 1947-1948 to about 29% in 1979-1980 [2].

The decline in the world import demand for jute as well as the fall in the Bangladesh share of world production can be explained by two factors. First, jute is facing more and more competition from synthetic fibers; second, some countries have begun to produce jute to supply their own requirements. Murshed explains that during the period 1967-1970 to 1976-1979 the output growth of jute in three of the four divisions of Bangladesh has been negative. Only in the Khulna Division of the country has the growth of output in percent per annum been positive [3].

Up to this point, the discussion has centered on the primary impact of jute production on the Bangladesh economy, yet the secondary impact of this crop is also quite significant. Approximately seventy-seven jute mills produce products mainly for export which depend upon jute as an input. Approximately 165,000 workers and 27,000 executives and clerical staff would be seriously affected with a shift away from jute to other agricultural commodities. Moreover, a decline in jute production would not only lead to underutilization of mill capacity but it would also have ramifications for foreign exchange earnings and employment levels within Bangladesh. Also, several subsidiary industries (furniture, packing, trading, etc.) which have developed through the years around jute would be adversely affected if the industry cannot be revitalized.

From the above discussion, it is clear that jute is a vital crop for the Bangladesh economy; consequently, it would be useful if the government understood better the determinants of jute production so that planners could deal with the controllable variables to increase jute's contribution to the economy; the main purpose of this study was to develop a model which would enhance this understanding. The model proved to be quite satisfactory and the statistical results are quite satisfactory.

PREVIOUS STUDIES

Rabbani [4] examined statistical data on jute production in India and Pakistan between 1931 and 1961. He concludes that the principal determinant of acreage allotted to jute is the farmers' expectation of the relative price of jute and rice and this is largely based on the preceding season's ratio of the two.

Mujeri [5] also developed a model for Bangladesh jute production, incorporating an adjustment lag which shows that jute acreage is quite responsive to changing economic factors. He estimated the effects of substitute products (e.g., rice) on jute acreage to be quite high.

Several other authors have estimated the price elasticity of acreage planted in jute and jute production; Table 1 presents results of some of the more important studies in this group. Interestingly, most of these studies reveal relatively low short-run and long-run elasticities; this is certainly the case in Mujeri's work [5], presenting a short-run price elasticity of acreage under jute for Bangladesh of .3453 and a long-run elasticity of .7605. Except for Thailand's higher than average long-run elasticity, the results for the different countries presented by Mujeri are quite similar.

Rahman [6] developed an econometric model to examine the economic and financial effects of a buffer stock supported price stabilization scheme on the Bangladesh jute industry. This study used annual time series data, covering the period 1955/6-1976/7.

Shahabuddin [7] estimated yield and price risks of major crops in Bangladesh, using aggregate time series data in four districts. Jute demonstrated very high yield risks in that it generated the highest variance of output disturbances. Similarly, price risks for jute were also high ranking third after pulses and oilseed.

Haque [8] found paddy to be relatively more profitable than jute in Bangladesh. His data show that in terms of 1975 prices it was more profitable to produce paddy as opposed to jute.

TABLE 1: SUMMARY OF ESTIMATES OF ELASTICITIES OF PRODUCTION OF JUTE

Geographic Region	Time Period	Short-run Elasticity	Long-run Elasticity	Dependent Variable
Bangladesh[a]	1950-1975	0.3453	0.7605	Area under jute
East Pakistan[b]	1948-1961	0.29 to 0.42	-	Area in jute or area in relative to alternative
Pakistan[c]	1949-1962	0.40	0.65	Area in jute
East Bengal[d]	1931-1953	0.60	-	Quantity
Bengal[c]	1911-1938	0.68	1.03	Area in jute relative to alternative crop
Bengal, Bihar, Orissa[c]	1911-1938	0.75	-	Area in jute relative to alternative crop
India[a]	1950-1975	0.7120	0.9986	Area under jute
India[d]	1931-1954	0.60	-	Quantity
India[c]	1951-1962	0.76	0.99	Area in jute
India (undivided)[f]	1911-1938	0.46	0.73	Area in jute
Thailand[a]	1960-1975	0.8205	1.1688	Area under jute
Thailand[g]	1954-1963	0.88 to 5.50	1.19 to 22.45	Area in jute
		Mean 2.70	Mean 5.75	

a Mujeri's estimates
b Hussain (1964)
c Rabbani (1965)
d Clark (1957)
e Stern (1962)
f Venkataraman (1958)
g Behraman (1968)

Source: Mujeri (see footnote 5).

The previous studies relate to this research only indirectly. Yet, they did influence the statistical model used in this work. One significant difference is that the previous studies were time series in nature and utilized different data from that employed in this study.

METHODOLOGY

As mentioned above, the previous research was all based on aggregate time series data. This study uses an entirely different approach; that is, two years (1979-1980 and 1980-1981) of pooled cross sectional data are used to develop the multiple regression equations.

Multiple regression equation

Cross section data were used for this analysis because production decisions are actually made at the local level; consequently, local pragmatic considerations weigh heavily upon the small farmers as they make these decisions. Indeed, these considerations dominate the larger macro considerations which may affect government policy. Since local conditions are so important in the production side of this industry, the cross-sectional data make it possible to take into account regional and district wise differences which cannot be captured by time series data. The model developed in this study, therefore, provides an alternative perspective for public policy makers who seek to stabilize jute production in terms of local or overseas demand.

The multiple regression estimating technique used was ordinary least squares with equations in the form:

$$\hat{Y} = A + B_1 RAJ + B_2 RF + B_3 RPLY + B_4 LMR$$

where

$\hat{Y}$ is the estimated production of jute for the districts.

RAJ = Ratio of area allocated to jute over total area allocated to jute and rice

RF = Rain and fertilizer interaction term

RPLY = Rice production lagged one year (Aman and Aus)

LMR = Land-man ratio

The Variables

The dependent variable is jute production, by districts, for the twenty-one districts in Bangladesh.*

Jute production is greatly influenced by how much paddy farmers intend to grow because Aus and Aman paddy are grown around the same time and most of the cultivable land is used to grow one of these three agricultural commodities. The effects of this condition on jute production is captured by the RAJ variable, which is the ratio of land devoted to jute to the total land devoted to these three crops within the district. As the land devoted to jute increases, jute production would also be expected to increase. Consequently, a positive sign is expected for the coefficient of this variable.

A second variable expected to affect jute production is the land-man ratio (LMR), defined as acres of land divided by population for each district. Where the land-man ratio is high, there would be a stronger

*Recently, however, the number of districts in Bangladesh have been increased by administrative decree. The 21 districts in this study represent those under the administrative system in 1982.

propensity toward jute production. Subsistence is of course first priority. Farmers are naturally interested in meeting subsistence food needs first; consequently, food production would receive their concentrated effort. After sufficient land is allocated to meet the survival needs of the family, any remaining land would be utilized for producing crops to supply cash needs. In this regard, jute is an established cash crop which farmers would then try to grow. It may, therefore, be argued that in districts where the relative population density is lower, jute production would be favored provided other conditions are also met (e.g., food self-sufficiency); consequently, the sign of the coefficient of this variable is expected to be positive.

A third variable is an interaction term which takes into account some physical rather than behavioral factors. Jute requires a plentiful supply of water; consequently, adequate amounts of water is an important factor in explaining the output of jute. For that reason, it was first thought that the distribution of water pumps by district would be an important variable affecting the output of jute. However, careful consideration led to the conclusion that this line of thought is fallacious. Actually, during the period when jute is grown and harvested (May through August) monsoons would overshadow any effect that power pumps would have on jute production. Furthermore, power pumps are generally used during the dry season (winter) mainly to improve the output of another variety of rice, IRRI. Because of the circumstances mentioned above, the power pump variable was dropped because it did not fit into the model logically. From the above discussion, it is apparent that a better water supply variable was necessary to capture this important effect on jute production.

The water supply variable finally used was actual rainfall data from the districts in which jute is grown. Complications were encountered because rainfall data were needed for each district, because of the cross sectional nature of the study. The data source [10], however, did not provide rainfall figures for each district. However, it did provide figures for seventeen centers where rainfall figures are collected, but there are twenty-one districts. Therefore, the rainfall figures had to be estimated for those districts that do not have a meteorological center. The estimation was done by summing rainfall figures for the adjacent districts and averaging the total.

Fertilizer is also another important part of the water supply variable affecting jute production. Fertilizer distribution figures were obtained for the different districts from the Statistical Yearbook [10].

Since both rain and fertilizer together affect jute production, an interaction variable (RF) was constructed to reflect their combined effects.

The last variable in the model (RPLY) is a lagged variable which attempts to capture another behavioral dimension. Farmers are rational and would attempt to maximize their gains from their agricultural endeavors. It was hypothesized that a good rice crop in the previous year would positively affect jute production in the current year. This outcome could be explained in two ways.

First, a good rice crop would result in a relatively low price being received by the farmer. The relatively low price would be a disincentive to continue rice production so they would seek alternative crops for next year and jute would be a good first choice.

An additional possible explanation is that a good year of rice production for the farmer may be profitable enough to make him consider diversification of future crops. In fact, he may be seeking a portfolio effect to reduce the risks of either failure from growing a single crop or to balance price fluctuations that are quite substantial in Bangladesh.

Price is not included as a variable in this model, even though it has appeared in several important previous studies of the jute industry. The reason for this difference is that the previous studies were time series in nature and the data permitted price to be considered as a variable. Since this study is a cross section examination of districts, the price of jute would not vary; consequently, it is not necessary to include it in the model.

RESULTS AND CONCLUSIONS

The regression equation is presented in Table 2; the results are quite robust. Approximately 83 percent of the variance in jute production is explained by the independent variables in the model and all of the variables are statistically significant; indeed, all variables except RF are significant at the .01 level, and RF is significant at the .025 level. Moreover, the overall equation has an F value of 53.72 which is significant at the .01 level.

Given the statistical results, it may be concluded that the regression model developed for assessing district level production of jute is quite robust and may be used for policy level decisions.

The results of this study seem to portend a decline in jute production in the future. This conclusion follows because the variables in

TABLE 2: MULTIPLE REGRESSION EQUATION - JUTE PRODUCTION

VARIABLE		PARTIAL REGRESSION COEFFICIENT	t STATISTIC
RAJ	Ratio of area in jute over total area in jute and rice	4495.76*	12.82
RF	Rain and fertilizer interaction term	.00015**	2.53
RPLY	Rice (Aman and Aus together) production previous year	.749*	7.94
LMR	Land-man ratio	75.34*	3.43

Constant -401.95

Adjusted R^2 = .83

F 53.72*

n = 42

DF = 37

*Significant at .01 level.
**Significant at .025 level.

the model which affect jute production in a significant manner are expected to change in an unfavorable way, according to some authorities. The expected changes, as well as their expected impacts, are discussed below.

If Haque's [8] analysis on relative returns per acre of land continues to hold, the ratio of land devoted to jute (the RAJ variable) is expected to decline in favor of rice. According to our model, this change would affect jute production adversely.

The land-man ratio (LMR variable) is another factor which suggests the possible decline in jute production. This follows from the high rate of population growth in the country; the population is expected to double in the next 25-30 years.* This high rate of population growth puts pressure on the food supply so rice production would be expected to be substituted for jute production to meet the country's growing food needs. This condition, according to our model, would adversely affect jute production.

The model clearly indicates that fertilizer is an important factor affecting jute production. Moreover, Badruddoza [9] has shown that the value of incremental production (of paddy) induced by fertilizer far exceeds the cost of fertilizer. Even so, he found that the observed rate of fertilizer use falls short of the optimal rate. The lower adoption rate, however, does not mean that farmers are irrational or inefficient. Instead, according to Badruddoza, it may mean that the net incremental income that farmers expect to receive for applications

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*The Bangladesh government indicates a population growth rate of 2.37% while the World Bank claims it to be around 2.7%.

of fertilizer is a random phenomenon influenced by the vagaries of weather (i.e., floods, cyclones, inconsistent rainfall, etc.). In other words, even if the net return from fertilizer application is expected to be high, if this is associated with great variability, then the risk averse small farmers would be reluctant to adopt this technology. Although fertilizer is an important factor in jute production, this discussion has shown why it is not likely that increases in yields from more intense fertilizer use will offset the negative factors mentioned above as expected future causes of declines in jute production.

To offset the dilemma of declining production of jute, one alternative is to develop the technology that would result in significantly greater yields. This would take the pressure off the land thus offsetting the decline in jute acreage. Attempts to strengthen the Intensive Jute Cultivation Scheme (IJCS) is a step in the right direction.*

Price incentives for jute cultivation could also be effectively introduced in the event that estimated jute production falls drastically. The statutory minimum price (SMP) introduced by the government is an attempt to stabilize jute production. Corruption, maladministration, lack of awareness among farmers about SMP, and profiteering by private traders has resulted in non-enforcement of SMP. Operationalization of price support mechanisms would also be influenced strongly by prevailing international prices and the competitive pressures from synthetics, bulk handling, and containerized transportation.

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*The IJCS is a project under the Ministry of Jute (Govt. of Bangladesh) aimed at improving the yield per acre of jute.

In the long-run, however, unless alternative uses of jute are found, this commodity may not survive the competitive pressures from synthetics. Based on traditional products that Bangladesh still relies on, jute may have outlived its potential to contribute to national growth projections.

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