A PRELIMINARY NOTE ON THE EFFECT OF PRICE ON THE FUTURE SUPPLY OF RAW JUTE

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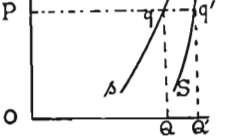
It is well known that prices affect supply. In this connexion, economic theory distinguishes between two types of effects, *viz.*, *short time* and *long time* effects. In the case of an annual crop like raw jute, once the crop is harvested its supply is more or less fixed and cannot be changed until the next harvest. Therefore, changes in price within the crop year, *e.g.* monthly variations in price, would affect only the quantity to be put on the market for sale in the different months of the year. In other words, the *short time* effects of price would relate to changes in the *rate of release of existing supply*. But prices have also a profound influence on subsequent production and therefore on future supply. The price paid in any year influences the quantity that will be produced for sale in the next succeeding year. At the same time, price affects the supply of the next year in another way *i.e.* by means of carry-over. Thus a low price in any year would tend to reduce the supply offered for sale in that year but to increase the carry-over and hence to augment the supply in hand in the next year. These two reactions may be exhibited by the following figure, where *ss'* is the *usual* supply curve for the quantity produced in response to price of the previous year. The horizontal distance (qq') between *ss'* and *SS'* represents the carry-over from the current supply to the next year in response to the price of the current year. Thus for a price OP, new production will supply OQ in the next year, while the quantity qq' (or QQ') will be carried over from the current supply, making a total supply OQ' in the next year. In other words the *total* supply in the next year in response to the *prevailing price* of the *current season* will be given by the curve *SS'*. The object of the present note is to make a preliminary investigation into the effect of price on the future supply of raw jute, (as represented by the curve *SS'*) on the basis of available statistics.



The relevant data for the period 1920-21 to 1939-40, on which the present analysis is based, are shown in Table (1). Official statistics of production of raw jute are known to be defective, while accurate information relating to carry-over is practically non-existent. Direct estimates of total supply are not therefore possible, and we have to fall back upon

the figures of "visible supply" of the crop (as ascertained by means of trade statistics) which are accordingly shown in col. (2) of the table. As regards prices, we have apparently to work with the average price of the crop during each season[1]. This would mean that we should take the *weighted* average price of each season, the weighting being done on the basis of sales effected at each price. Unfortunately, however, such an ideal price series is not available owing to lack of data relating to the volume of sales made at different prices during each season. But a good approximation to the ideal price series would probably be to take the monthly prices and weight them in proportion to the quantities marketed in the different months of each season. We have accordingly taken the index numbers of monthly prices of raw jute reported in connexion with the Official Index Numbers of Wholesale Prices at Calcutta[2] and computed the annual average price for each season on the basis of weights proportional to the quantities arriving[3] at the Calcutta market in the different months of each season. The average prices thus computed for each season are then deflated by the corresponding general (all-commodity) index numbers of wholesale prices at Calcutta to allow for the variation in the purchasing power of money. These adjusted annual prices of raw jute (in the form of index numbers) are entered in col. (3) of the table, with a *lead* of one year *i.e.* price shown against any year (say 1925-26) actually referring to that of the preceding season (*i.e.* 1924-25).

As *relative* rather than *absolute* changes form the basis of relationship in economic series, it has been deemed expedient to work with the relative changes in supply and price as compared with the preceding year, which are accordingly tabulated in cols. (4) and (5) of the table.

Denoting these relative changes in supply and price by y and x respectively, we find that there is a fairly close relationship between the two series, the coefficient of correlation r_{yx} working out at $+ 0{\cdot}57$ which is above the value (*viz.*, 0·47) at 5 per cent level of significance[4] with $n'=16$(or $n=18$).

As both the variables dealt with are affected by errors, it would be better to take the line of mutual regression[5] instead of the usual regression line to express the concrete relation between y and x. By actual calculation, the line of mutual regression is found to be

$$y=0{\cdot}354+0{\cdot}652(x) \qquad (1)$$

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1. The season runs from 1st July to 30th June.

2. These index numbers are regularly published in the *Indian Trade Journal*, the weekly organ of the Department of Commercial Intelligence and Statistics from which source the figures have been taken.

3. The arrival figures are regularly published by the Bengal Chamber of Commerce and reproduced in the Annual Reports of the Indian Jute Mills Association. We have calculated the percentages of monthly arrivals to the totals for each season on the basis of the figures given there. These percentage figures for the five years ending 1938-39 are however shown on page 155 of the "Report on the Marketing and Transport of Jute (First Report) 1940" issued by the Indian Central Jute Committee.

4. The value of the coefficient is equal to that at 2% level of significance.

5. The usual regression line is fitted on the assumption that the independent variable is free from error, and that the dependent variable only is affected by errors. The line of mutual regression, on the other hand, assumes errors in both the variables and is obtained by making the sum of the squares of the normal distances on the line minimum. Its equation is given by $y-y'=m(x-x')$ where m is determined from the relation

$$m^2+\frac{(\sigma_x)^2-(\sigma_y)^2}{(\sigma_x)(\sigma_y)(r_{xy})}\cdot m-1=0$$

where $(\sigma_x)^2$ and $(\sigma_y)^2$ are the variances of x and y and r_{xy} the coefficient of correlation.

which may be regarded as an approximation to the total supply curve (SS') in the relative form. Equation (1) shows that an increase of 10 per cent in the real price of raw jute as compared with the preceding year is, on the average, followed by a similar increase of about 6 per cent in its total supply during the next year. The nature of response is thus found to be inelastic.

To transform equation (1) in terms of the original variables (cols. 2 and 3 of the table), we put

$$y=S/S_{-1} \text{ and } z=P_{-1}/P_{-2}$$

where (S) is the supply in the current year, (S_{-1}) is the supply in the preceding year, (P_{-1}) the price in the preceding year, and (P_{-2}) the price two years previous. We then obtain

$$S=0.354(S_{-1})+0.652(S_{-1})(P_{-1})/(P_{-2}) \qquad (2)$$

which is in a very convenient form to estimate the total supply in bales from the index numbers of prices shown in col. (3) of the table. Thus to obtain the equation for 1926-27 in terms of the original variables, (S) and (P), we substitute the value of (S_{-1}) and (P_{-2}) for that year[6] from the table and get

$$S=3246.5+81.02(P_{-1}) \qquad (3)$$

As the price in 1925-26 was 112·3, the value of S for 1926-27 works out from equation (3) above at 123·4 lakhs of bales, as against a total supply of 122·0 lakhs of bales in that year with a difference of only 1.1 per cent. Equation (3) also shows that an increase or decrease of 10 per cent in the price (real) of raw jute in 1925-26 would have caused a similar change of 9 lakhs of bales in the total supply of the crop during the next year. On the other hand, by taking 1932-33, a year of low prices, we find that a change of 10 per cent in price in that year would have increased or reduced the total supply of the next year i.e. 1933-34 by about 5 lakhs of bales. On the basis of the *average experience* of all the years included in the study, however, we find that an increase of 10 per cent in the price of any year is followed by a similar change of about 6 lakhs of bales in the total supply of *next* year.

In conclusion, it may be of interest to investigate the supply position during the current season i.e. 1940-41 in the light of the statistical findings reached above. Substituting the values of (S_{-1}) and (P_{-2}) for 1940-41 from the table in equation (2) above, we get

$$S_{(1940\text{-}41)}=3548.5+111.15\ P_{(1939\text{-}40)} \qquad .. \quad (4)$$

The adjusted annual price during the season 1939-40 works out at 81·3, which when substituted in equation (4), yields a total supply of 125·9 lakhs of bales for 1940-41. As the price in 1939-40 was very high, the amount carried over from that season to the next (i.e. 1940-41) is likely[7] to be very small. In the circumstances the corresponding points on the total supply curve (SS') and the *usual* supply curve (ss') would differ but little from each other[8] and the figure (125·9 lakhs of bales) derived on the basis of the total supply curve

6. As the prices are entered in col. 3 of the table with a lead of one year, P_{-2} for 1926-27 would be 73·8 i.e. the price entered against 1925-26.

7. That entered in col. 3 of the table against 1926-27

8. The estimated value of total supply works out at 80 lakhs of bales, against an actual of 85 lakhs.

9. This would be clear from a reference to the diagram given on page 1. The horizontal distance (qq') between the two curves becomes smaller and smaller as we move further and further along the ordinate or price axis.

may be taken to be approximately equal to new production called forth in response to price in the preceding year. It appears, therefore, that unlike previous years, the official forecast, which put the crop of 1940-41 at 125·6 lakhs of bales, is likely to be very near the mark.

CONCLUSION

The main conclusions suggested by the present analysis, may be stated as follows :—

(*i*) Prices of raw jute have a significant influence on its supply during the next season.

(*ii*) A change of 10 per cent in the price of raw jute, as compared with the preceding season is, on the average, followed by a similar change of about 6 per cent in its total supply during the *next season*.

(*iii*) On the basis of the statistical analysis, the 'total supply' of the crop during the current season (*i.e.* 1940-41) may be placed in the neighbourhood of 125 lakhs of bales, which agree fairly closely with the estimate made in the Final Jute Forecast, 1940.

TABLE 1. PRIMARY DATA

Crop year (July-June)	Total Supply of Raw Jute (000 bales)	Index Nos. of prices** of raw jutes adjusted for price level (July 1914 = 100)	Link relatives of figures in		Crop year (July-June)	Total Supply of Raw Jute (000 bales)	Index Nos. of prices** of raw jutes adjusted for price level (July 1914 = 100)	Link relatives of figures in	
			Col. 2	Col. 3				Col. 2	Col. 3
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
1921-22	7510	48·4	—	—	1931-32	6408	46·6	0·664	0·724
1922-23	6311	51·7	0·840	1·068	1932-33	8531	56·4	1·331	1·210
1923-24	9217	67·6	1·461	1·308	1933-34	8521	50·0	0·999	0·887
1924-25	8937	46·5	0·970	0·688	1934-35	9831	44·9	1·154	0·898
1925-26	9171	73·8	1·026	1·587	1935-36	8182	48·3	0·832	1·076
1926-27	12200	112·3	1·331	1·522	1936-37	10741	57·1	1·313	1·182
1927-28	11398	60·3	0·934	0·537	1937-38	9097	53·1	0·931	0·930
1928-29	10726	63·9	0·941	1·060	1938-39	8051	52·0	0·895	0·979
1929-30	10217	70·6	0·952	1·105	1939-40	10024	58·8	1·120	1·131
1930-31	9654	64·4	0·944	0·912	1940-41	—	(81·3)	—	—

* The figures have been taken from the abstract statement appended to the Consolidated Final Jute Forecast where they are referred to as "the crop according to trade statistics."

** These are entered with a *lead* of one year *i.e.* the figure shown against any year (say 1926-1927) actually referring to the preceding year *i.e.* 1925-26.

The statistical Constants are :—

$$\Sigma x = 18.804 \qquad \Sigma yx = 0.540525$$

$$\Sigma y^2 = 0.742474$$

$$\Sigma y = 18.038 \qquad \Sigma x_{12}^2 = 1.219362$$

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