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Agricultural Exports of India: Issues of Growth and Instability

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The importance of trade in agricultural products cannot be over-emphasised in the context of economic growth especially in less developed countries (LDCs). Many LDCs have a comparative advantage in the production of agricultural products. The export of these products can pay for the import of capital goods, technology and other manufactured products necessary for sustained growth in LDCs. In effect, the market for developed countries (DCs) will expand and the trade in agricultural products will be of mutual benefit to both DCs and LDCs. However, the mutuality of interest is not so obvious in real world mainly because of poor bargaining power of LDCs in world market and tariff and non-tariff protection strategy followed by DCs. Also as often argued, the export of LDCs fluctuates more than that of DCs. This is because of the fact that the export of LDCs mainly comprises agricultural products having erratic supply.¹ The unstable export tends to destabilise the income of LDCs as long as export earnings constitute a significant proportion of national income which in turn has serious political and economic implications.

The results of the studies supporting the hypothesis of unstable agricultural export are primarily based on the analysis of export instability in product aggregates which are obtained by adding the products of very different characteristics. Therefore, these results were not supported by the recent studies analysing export instability for individual products (Habeck *et al.*, 1988; Mullor-Sebastian, 1988). Since export instability is influenced by the nature of product and the degree of industrialisation of a country, it would be more appropriate to study export instability in LDCs, its temporal behaviour and the effect of export diversification on the instability. The present study on agricultural exports of India is thus an attempt in this direction. Specifically, the study examines (i) the magnitude of growth and instability in agricultural exports, (ii) the determinants of the export of agricultural products and (iii) the causes of export earnings instability.

DATA AND METHODOLOGY

The present study is based on time-series secondary data pertaining to the period 1970 to 1989. The data for value and volume (henceforth referred to as earnings and quantum respectively) for principal agricultural export products and product aggregates² for India and the world were compiled from *FAO Trade Yearbook*. The data on domestic wholesale price indices and net national product were taken from *Agricultural Prices in India* and *Economic Survey* respectively. The unit values were obtained by dividing the export earnings by the corresponding quantity for each year. The export earnings were taken in US dollars (\$) as changing exchange rate of rupee can influence the instability to a great extent.

Growth of exports: The annual compound rate of growth was estimated to quantify the growth of export earnings and quantum of exports. In order to examine the determinants of export, the following log-linear export turnover function was estimated.

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$$\ln \text{EXP}_t = \alpha + \beta_1 \ln T + \beta_2 \ln \text{NNP}_t + \beta_3 \ln \text{PD}_{t-1} + \beta_4 \ln \text{WT}_t + \beta_5 \ln \text{REP}_t + u_t$$

where

EXP_t = export earnings in t-th year (000 \$);

T = trend variable;

NNP_t = net national product at current prices in t-th year (\$, crore);

PD_{t-1} = domestic production in the last year (000 tonnes);

WT_t = value of world trade in t-th year (000 \$);

REP_t = ratio of export to domestic wholesale price indices in t-th year;

β_1, \dots, β_5 are the corresponding elasticities; α is the constant; and u_t is the stochastic error term.

The explanatory variables in the function represent both supply and demand factors. The net national product (NNP) and domestic price together determine the domestic demand for the product. It is expected that with the increase in NNP, domestic demand for national products would increase and thereby the export would decline. The domestic production after meeting domestic demand would determine the exportable surplus. The world trade and export price measure the effect of global demand on export and thus these would stimulate the export. The time variable was included in the function to capture the effect of passage of time on export earnings.

Measurement of instability: The measurement of instability in time-series data requires an explicit assumption of what constitute the acceptable and unacceptable components. A systematic component which can be predicted does not constitute instability and hence, it should be eliminated from the data. The remaining unpredictable component represents the instability. Two methods, viz., moving average and trend fitting have been used in the literature to capture the predictable component. The preference here is for three-year moving average since this form may more adequately keep in touch with influences on trend earnings, such as changing comparative advantage and policy changes. The percentage deviation from moving average for each year and the coefficient of variation (CV) were computed to examine the magnitude of export instability.

$$\text{CV} = \frac{\left(\sum_{t=1}^n (X_t - X_t^*)^2 / n \right)^{1/2}}{\bar{X}} \times 100$$

$$\text{Percentage deviation} = \frac{X_t - X_t^*}{X_t^*} \times 100$$

where $X_t^* = \frac{\sum_{i=t-r}^{t+r} X_i}{m}$; $r = (m-1)/2$; m = period of moving average; \bar{X} = period mean of X ; and n = number of years in the period.

In order to trace the causes of instability, the variance of export earnings from individual products (for trend adjusted data) was decomposed into its quantity and unit value components using the Goodman's (1960) expression for the variance of products.³ It was expected that fluctuations in quantity would be the main cause of export instability because year-to-year changes in domestic production and demand influence the export of agricultural products in LDCs.

The unstable export earnings affect the economic growth through changing domestic investment. Therefore, the effect of export earnings instability on investment was also examined using regression analysis with the ratio of gross domestic capital formation to gross domestic product (a proxy for investment) as the dependent variable and total export earnings and three-year moving CV⁴ of total export earnings as the explanatory variables.

RESULTS AND DISCUSSION

Growth of Exports

The annual compound growth rates of principal agricultural exports of India during the period 1970 to 1989 are given in Tables I and II. Table I shows that India's total merchandise export earnings grew at the rate of 10.45 per cent per annum during the last two decades. This was substantially higher than the growth of export earnings from all agricultural products together (6.67 per cent) comprising food and animal products, beverages and tobacco, crude material, and animal and vegetable oils. Among the various agricultural export groups, the growth was highest in the earnings from the export of animal and vegetable oils (8.94 per cent) followed by food and animal products (6.92 per cent), and crude material (6.17 per cent). The export earnings from beverages and tobacco grew at the rate of 3.75 per cent per annum which was the lowest among the agricultural products. The growth of export earnings from fish and fishery products was quite impressive (12.26 per cent) which was even greater than that for total exports. In contrast, the export earnings from forest products were stagnant during the last two decades.

TABLE I. COMPOUND GROWTH RATES OF EXPORT EARNINGS FROM PRINCIPAL AGRICULTURAL PRODUCT AGGREGATES, 1970-89

Product aggregate (1)	Compound growth rate (per cent per annum) of export earnings (2)	Percentage share in total export earnings (1987-89)* (3)
Food and animal products	6.92	13.54
Beverages and tobacco	3.75	0.69
Crude materials	6.17	2.70
Animal and vegetable oils	8.94	0.48
Fish and fishery products	12.26	3.06
Forest products	-0.01	0.12
Total agricultural products	6.67	17.41
Total merchandise export	10.45	100.00

* Triennium average.

The growth in the export of individual agricultural products (Table II) showed a mixed pattern. For example, coffee, cotton lint and oilcakes registered a positive growth in export earnings as well as in the quantum of export. Contrary to this, two traditional export products

TABLE II. COMPOUND GROWTH RATES OF QUANTITY AND EXPORT EARNINGS
FROM PRINCIPAL AGRICULTURAL PRODUCTS, 1970-89

Product	Compound growth rate (per cent per annum)		Percentage share in total agricultural export earnings (1978-89) ^a
	Quantity (2)	Export earnings (3)	
(1)			(4)
Coffee	4.66	10.76	8.77
Tea	0.05	6.76	22.35
Sugar	-4.72	-3.12	0.34
Oilcakes	3.14	4.94	10.31
Tobacco	-0.13	2.65	3.32
Cotton lint	7.67	11.23	1.08
Jute and bast fibre	-7.18	-8.86	0.07

^aTriennium average.

of India, viz., sugar and jute registered negative growth rate in their export earnings and the quantum of export. The negative growth in sugar export could be attributed to an increase in domestic demand while for jute it could be because of synthetic substitutes, a shift in the export from fibre to manufactured products and stiff competition from other jute exporting countries like Bangladesh. For tea and tobacco, although export earnings rose over time, their quantum of export was stagnant. Thus with the exception of coffee, oilcakes and cotton lint, the quantum of export was either stagnant or declining for most of the products under study. It seems that the earnings from agricultural exports rose because of an increase in the unit value and the export of other non-traditional export products.

Determinants of Export

The international trade rests on the premise of comparative advantage. The export of a product having comparative advantage tends to increase when there exist a global demand for the product and exportable surplus left after meeting domestic demand. An attempt has been made in this section to measure the relative influence of these factors on the export of major agricultural products. The results of export turnover function (Table III) for selected products support the above-stated hypothesis to some extent. For example, in the case of sugar, an increase in domestic demand on account of an increase in the national income (NNP) has a decreasing effect on the export earnings. But an increase in domestic production and the world trade (showing an increase in exportable surplus and global demand for the product respectively) have enhanced the export earnings. However, the effect of supply and demand factors on export was not so clear for tea and coffee. Particularly for tea, the results were not encouraging because of the presence of a mild degree of multicollinearity. The domestic production and the world trade have a promoting effect on the export of coffee and tea respectively. This is consistent with the earlier observation of a positive growth in the quantum of coffee export and a stagnant quantum of tea export. The effect of relative export prices was not significant except in the case of coffee. In fact, the role of prices and/or exchange rate (real) may be less visible in agricultural exports primarily because of two reasons. First, the market forces do not freely operate in the world trade in agricultural products due to the quantitative restrictions (quota). Secondly, since most of the agricultural products are necessities or near necessities, their demand is inelastic in nature. The risk in exchange rate, an important factor in world trade,⁵ did not have any adverse effect on export

TABLE III. RESULTS OF EXPORT TURNOVER FUNCTION

Variable (1)	Coffee (2)	Tea (3)	Sugar (4)
Time	0.297**** (3.67)	0.260 [*] (1.33)	-0.394*** (2.29)
Net national product ^a	0.058 (0.12)	0.714 (1.17)	-0.161*** (2.25)
Lagged domestic production	1.008**** (5.80)	0.793 (0.68)	0.855**** (2.24)
World trade	0.065 (0.78)	0.354** (1.86)	6.545**** (3.40)
Relative export price	0.764**** (5.88)	0.013 (0.06)	-0.008 (0.11)
Constant	4.399	-1.41	-5.622
R ²	0.97	0.85	0.42

Note: Figures in parentheses are 't' values.

^a For tea, per capita net national product was taken.

****, ***, **, * significant at 1, 5, 10, and 20 per cent respectively.

earnings (Gupta, 1980). This might be because of inflexibility in the shift from world to domestic trade arising from quota restrictions. These observations, therefore, reveal that the export of agricultural products is largely influenced by domestic production and the surplus remained after meeting domestic demand.

Export Instability

The percentage deviation from three-year moving averages, mean positive and negative deviations and coefficient of variation in export earnings from various product groups are presented in Table IV. As shown in the last row of this table, the export earnings from total merchandise and agricultural exports were fairly stable (CV was 4.6 and 5.0 per cent respectively). Among the various agricultural product groups, contrary to the general belief, the export earnings were most stable for food and animal products (CV being 6.4 per cent) and moderately stable for beverages and tobacco, and crude material (CV was 13 and 13.9 per cent respectively). The most unstable export earnings among the agricultural groups were for animal and vegetable oils (CV being 19.6 per cent). For other two non-agricultural groups, viz., fish and fishery products and forest products, the export earnings instability was low for the former (CV being 7 per cent) and substantially high for the latter (CV being 24.6 per cent). Thus the export instability for agricultural and allied products together was not as high as was often feared particularly for food products. The low instability for total agricultural exports and high instability for various product groups indicate that the diversification in agricultural exports has a strong stabilisation effect on the total export earnings.

Table IV further reveals that the year-to-year fluctuations in the earnings from food products and total agricultural exports were almost similar. This is rather expected when food products have contributed 67 per cent or more to the total earnings from agricultural exports. The negative fluctuations were more deep during the years 1971-73, 1978-79, 1982 and 1988 owing to moderate to severe droughts in the country. Apart from droughts, the oil shocks, war with Pakistan and frequent changes in the national politics in the seventies led to sharp shortfalls (even higher than the eighties) in the export earnings.

Like agricultural exports, the percentage deviations in total export earnings were rather

TABLE IV. INSTABILITY IN EXPORT EARNINGS FROM PRINCIPAL AGRICULTURAL PRODUCT AGGREGATES

Year	Per cent changes from three-year moving average								Ratio of total agricultural to total agricultural merchandise exports	Ratio of foods to total agricultural exports
	Food and animal product	Beverages and tobacco	Crude material	Animal and vegetable oils	Fish and fishery products	Forest products	Total agricultural products	Total merchandise exports		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1971	3.0	-3.7	-13.4	-34.8	-11.1	-5.6	-11.6	0.7	0.34	0.75
1972	-12.9	8.1	13.2	-7.8	-0.4	-36.5	-6.6	-4.9	0.33	0.67
1973	-0.3	-6.2	-21.1	16.0	10.0	42.9	-3.9	-3.7	0.35	0.72
1974	-5.6	-0.3	26.6	9.9	-8.7	-9.9	1.5	3.1	0.36	0.70
1975	13.5	10.5	-18.1	-17.5	-11.2	-10.7	5.2	-4.2	0.38	0.81
1976	-9.2	-11.2	29.9	24.5	13.1	12.3	-2.9	3.8	0.31	0.73
1977	10.8	7.1	-16.8	-24.2	-7.3	-3.0	7.5	7.3	0.32	0.81
1978	-9.6	-0.5	-17.8	-11.9	-1.6	2.9	-8.5	-15.1	0.32	0.81
1979	2.9	-4.5	7.0	22.6	12.8	-2.9	-2.7	6.6	0.27	0.84
1980	0.6	-14.2	-4.0	4.6	-10.2	19.1	3.1	3.2	0.30	0.74
1981	8.0	16.6	14.4	-14.6	1.1	-27.1	8.2	-1.7	0.32	0.73
1982	-7.8	7.3	-8.3	-11.6	4.0	5.6	-6.5	2.0	0.26	0.71
1983	1.7	-7.3	9.1	-6.2	1.7	0.0	1.7	-0.7	0.28	0.72
1984	-0.2	3.3	-8.5	26.7	1.5	2.7	0.1	1.4	0.27	0.74
1985	-0.6	-13.0	3.2	3.3	-9.9	-32.4	-0.8	-4.0	0.28	0.76
1986	1.4	24.8	-9.4	-23.8	4.6	59.2	0.4	-4.5	0.26	0.77
1987	1.0	-15.7	15.2	0.7	-3.2	-28.1	2.3	0.4	0.21	0.76
1988	-4.6	-15.3	-6.9	-28.9	4.3	0.0	-6.0	-1.4	0.17	0.79
Mean negative deviation	-5.7	-8.4	-12.4	-18.4	-7.1	-17.4	-4.3	-4.5		
Mean positive deviation	4.7	11.1	14.8	13.5	5.9	20.7	3.3	3.2		
Coefficient of variation	6.4	13.0	13.9	19.6	7.0	24.6	5.0	4.6		

small in the eighties. However, in the eighties, particularly since 1985, total export earnings showed a tendency to decline. This could be because of unfavourable exchange rate of the rupee and slow rate of growth in the income of DCs. It is worth noting that the earnings from agricultural and total exports did not necessarily move in the same direction. For instance, despite a major shortfall in the export earnings from agriculture in 1971, 1976, 1979 and 1982, total export earnings showed major gains in these years except in the year 1971 when the earnings rose marginally. Conversely, in the two years 1975 and 1981, total export earnings declined sharply in spite of an appreciable increase in the earnings from agricultural exports. Thus the behaviour of Indian export earnings is no longer totally dependent upon agriculture. This is further supported by the fact that the share of agriculture in total export earnings declined from 34 per cent in 1971 to 17 per cent in 1988. However, more than three-fourths of the export earnings from agriculture are still attributed to food and animal products.

Table V clearly brings out that the instability in the export earnings from individual agricultural products was much higher than that for product aggregates. This was alarmingly high for jute, sugar and cotton lint with a CV of the order of 70, 67 and 40 per cent respectively. However, this was fairly stable for tobacco and tea with a CV of nearly 10 per cent. The instability in the quantum of export was the lowest in tea (CV being 7 per cent) followed

TABLE V. INSTABILITY IN THE EXPORT OF SELECTED AGRICULTURAL PRODUCTS 1970-89
(per cent)

Instability measure (1)	Product						
	Coffee (2)	Tea (3)	Sugar (4)	Oilcakes (5)	Tobacco (6)	Cotton (7)	Jute and bast fibres (8)
Quantity							
Coefficient of variation	12.32	6.97	53.81	17.16	14.74	44.67	64.30
Mean negative deviation	-9.08	-4.75	-50.40	-11.09	-11.20	-45.76	-41.68
Mean positive deviation	14.14	5.44	34.18	12.50	10.17	28.22	36.02
Export earnings							
Coefficient of variation	18.52	10.31	66.90	21.53	9.72	39.67	70.14
Mean negative deviation	-14.12	-10.68	-55.00	-18.19	-7.78	-44.84	-40.15
Mean positive deviation	19.11	5.79	49.74	16.63	8.06	29.99	42.89
Variance of export earnings attributable to*							
Quantity variance	12.72	19.11	46.92	45.59	41.50	159.43	92.23
Unit value variance	126.19	102.01	11.84	33.47	35.71	22.39	12.04
Quantity-unit value covariance	-27.11	-16.35	12.53	20.93	18.74	-45.86	-1.93
Higher order interaction	-11.80	-4.78	28.71	0.00	4.05	-35.95	-2.33

* Sum of the four components is 100 per cent for each product.

by coffee (CV being 12 per cent) and tobacco (CV being 15 per cent). The quantum of export was highly unstable for jute, sugar and cotton with a CV of 45 per cent or more. Interestingly, the CV of production was 15 per cent or less for these products (Pal and Sirohi, 1988). The instability in export is thus policy induced. Table V further shows that the instability in the export earnings was higher than that in the quantum of export for all the products except for tobacco and cotton lint. This means that the changes in quantity were more important for destabilising export earnings for tobacco and cotton lint, while the variability in unit values was more prominent for the other products. The exact contribution of quantity and unit values to the variability of export earnings is analysed in the next section.

Causes of Export Earnings Instability

The results of decomposition analysis (Table V) show that the variability in quantum of export was the dominant cause of the variability in the export earnings from the products of sugar, cotton lint, jute and oilcakes. For coffee and tea, the variability in export earnings was largely attributed to the variability in unit values stemming from the differences in the quantity of export. For tobacco, both unit values and quantity contributed almost equally to the variability of export earnings. The covariability between quantity and unit values was negative for coffee, tea, cotton lint and jute, indicating that the variability in unit values originated on the supply side. But for sugar, oilcakes and tobacco, the positive covariability implies that the variability in unit values originated on the demand side (for detailed discussion, see Murray, 1978). Thus there seems to be no apparent relationship between the nature of product and the cause of instability.

Effect of Export Instability on Economic Growth

Before we examine the effect of export instability on economic growth, it would be pertinent to assess the relationship between growth and instability in exports. For this, all the products and product groups under study were compared on the basis of the magnitude of growth and instability. It revealed following four broad patterns. First, the products having positive growth and low instability (CV less than 25 per cent).⁶ The export earnings from coffee, ea, oilcakes, tobacco and all the product aggregates except forest products belong to this category. For coffee and oilcakes, the quantum of export showed growth with stability. The second pattern of growth with high instability (CV more than 25 per cent) was observed for export earnings and the quantum of export of cotton lint. The third pattern depicting no growth with low instability was observed for export earnings from forest products and the quantum of export of tea and tobacco. The fourth pattern characterising negative growth and high instability was noticed for export earnings and the quantum of export of sugar and jute. The presence of these diverse patterns thus implied that there was no apparent relationship between growth and instability in Indian exports. This was further examined statistically by computing the Spearman's rank correlation between growth rates and CVs. It was -0.52 for product aggregates, -0.48 for export earnings from individual products and -0.46 for the quantum of export of individual products. None of these correlation coefficients was statistically significant, thereby suggesting that the growth in exports can be achieved with a fairly low degree of instability.

Table IV presents the results of regression analysis showing the effect of export earnings and its instability on investment in the country. The coefficient of total export earnings was positive and highly significant, indicating that the export earnings have accentuated the rate of investment in the country. The coefficient for moving CV of total export earnings was negative but poorly significant (at 20 per cent). Thus it seems that the instability in the export earnings did not have a major adverse effect on investment or economic growth of the country.

TABLE VI. EFFECT OF EXPORT INSTABILITY ON GROSS DOMESTIC CAPITAL FORMATION

Variable (1)	Regression coefficient (2)	't' value (3)
Dependent variable		
Ratio of gross domestic capital formation to GDP		
Explanatory variables		
Total export earnings	$(3.19 \times 10^{-4})^{**}$	2.90
Three-year moving CV of total export earnings	-0.1317*	1.56
Constant	0.2055	
\bar{R}^2	0.44	

** , * Significant at 2.5 and 20 per cent respectively.

CONCLUSION

It is clear from the foregoing discussion that the export of agricultural products was constrained by the increasing domestic demand. Further, the volatile world prices and policy changes have induced a very high degree of instability in the export earnings from important agricultural products. The results, contrary to expectations, failed to establish any relationship between the nature of product, growth and instability in exports. However, the instability in the total earnings from both agricultural and non-agricultural exports was fairly stable primarily due to the stabilisation effect of export diversification. Therefore, it is not the export stabilisation, but export promotion which should be accorded high priority particularly in the situation of present foreign exchange crisis. The indemnification and promotion of non-traditional value added products, and the integration of production, processing and export would add further to the export earnings of the country. Besides this, concerted efforts to increase the efficiency and productivity in agriculture would generate enough surplus for export. Research in agricultural bio-technology has great potential to meet this challenge. It would be more desirable that the LDCs pool their resources to strengthen their own research and development activities in bio-technology for their advantage.

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NOTES

1. For review of literature on export instability, see Manger (1979); Ghatak and Ingersent (1984).
2. The product codes are: Food and animal products 0; beverages and tobacco 1; crude materials Ex2; Animal and vegetable oil 4; coffee green or roasted and coffee substitutes containing coffee 071.1; tea 074.1; sugar refined 061.2; oilseed cake and meal, and other vegetable oil residues 081.3; tobacco unmanufactured 121; cotton lint 263.1; jute and bast fibres 264.
3. For detailed methodology, see Pal (1986).
4. Three-year moving CV for t-th year:

$$CV_t = \left[\left(\sum_{i=1}^{t-1} (X_i - X^*)^2 / 3 \right)^{1/2} \right] / X^* ; \text{ where } X^* = \sum_{i=1}^{t-1} X_i / 3$$
5. For review of literature on the effect of exchange rate variability on trade, see Medhora (1989).
6. The high and low instability were subjectively defined for easy classification of the products.

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