CHAPTER-III

METHODOLOGY

The methodology used to achieve the objectives of this study is presented in this chapter. The methodology adopted in this study was based on the views and reviews of various scholars conducted in past. The contents of this chapter are arranged under different sections as given below:

3.1 Data Sources

3.2 Analytical Framework

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3.2.2 Instability in exports and imports
3.2.3 Computation of Revealed Comparative Advantage (RCA)
3.2.4 Performance of trade
3.2.5 Directions of Trade

3.1 Data sources

The study was based on the secondary data pertains to the period 1984-85 to 2004-05 collected from various published governmental and non-governmental sources.

For growth and instability analysis, Foreign Trade Statistics of India-Principal Commodities and Countries published by Directorate General of Commercial Intelligence and Statistics (DGCI&S) have been used to source export and import data. For analysis purpose, all the export and import data were deflated to 2000-01 prices using whole sale price indices of the respective commodities to eliminate the effect of inflation. Exports of 6 major agricultural commodities were identified on the basis of more than one percent share of India’s total agricultural exports. These commodities together represent more than 30 per cent of India’s total agricultural export earnings from World. Six major imported commodities were also selected based on similar methodology. The major countries for each commodity were identified on the basis of share in Indi’s exports and imports. These countries for each commodity together accounted for 40 per cent of India’s total exports and imports of particular commodity. The different countries identified for each selected commodity along with their codes of Indian Classification based on Harmonised Commodity Description and Coding System (ITCHS) are listed in Table 31.
Revealed Comparative Advantage (RCA) and Revealed Competitiveness (RC) of India and other major competitors for various agricultural commodities were computed using data from various issues of FAO Trade and Commerce Year Book published by the statistics division of Food and Agricultural Organization (FAO), Rome. The official website of FAO, WWW.FAOSTAT.FAO.ORG has also been used for the same purpose. The competitiveness of India’s exports for each commodity were assessed and compared with those of other competitors. These countries together accounted for more than 60 per cent of exports of the respective commodities to the World market.

The prospects of agricultural products exports were obtained by using composite index approach. Seventeen commodities were selected for the study based on their percent shares, greater than or equal to one, in India’s total agricultural products exports during 2000-01 to 2004-05. The required time series secondary data have been obtained from the website of Food and Agricultural Organisation www.faostat.fao.org.

3.2 Analytical Framework

3.2.1. Compound Growth Rate of Exports and Imports

The compound growth rate was calculated by fitting exponential function to the export and import values for the period 1984-85 to 1990-91 and 1991-92 to 2004-05.

\[ Y_t = ab^t \]

Where,

- \( Y_t \) = Value of exports/imports (deflated) of each commodity for the year ‘t’
- \( t \) = Time variable (1,2,...,n) for each period/year
- \( a \) = Constant
- \( b = (1 + r) \), and
- \( r \) = Compound growth rate.

The log transformation of the above function is:

\[ \ln Y_t = \ln a + t \ln b + e_t \]

\[ \ln b = \ln (1+r) \]

The compound growth rate in percentage (CGR) = \([\text{antilog} \ (\ln b)-1]\)x100
3.2.2. Instability in exports and imports

Cuddy-Della index is most commonly used measures of instability of time series data and is universally acceptable. The indices were originally developed by John Cuddy and Della Valle for measuring the instability in time series data (Cuddy and Della Valle, 1978). This index is a better measure compared to coefficient of variation, as it is inherently adjusted for trend, often observed in time series data. This measure included as a component of instability all cyclical fluctuations present in the time series data, whether regular or irregular, as well as any component which could be defined as ‘white noise’.

The original formulation of the index is given as follows:

\[
I_x = \frac{SEE}{\bar{Y}} \times 100
\]

Where,

\( I_x \) = Instability index

\( SEE \) = Standard error of the trend line estimates

\( \bar{Y} \) = Average value of the time series data

It was shown that instability could also be measured as:

\[
I_x = CV \sqrt{(1 - \bar{R}^2)}
\]

Where,

\( CV \) = Coefficient of variation

\( \bar{R}^2 \) = Adjusted coefficient of multiple determination

3.2.3. Computation of Revealed Comparative Advantage (RCA)

Comparative advantage refers to a comparative cost advantage in producing commodities and explains observed trade patterns according to country differences in resource endowments, investment patterns, technology, human capital and managerial expertise, infrastructure and government policies. The concept of Revealed Comparative Advantage (Balassa, 1965, 1977, 1979, 1986) is a measure of international trade specialization which identifies the extent to which
a country has a comparative (dis) advantage in a commodity with respect to another country or group of countries. On the assumption that the commodity pattern of trade reflects the inter-country differences in relative costs as well as in non-technical factors, the index is assumed to “reveal” the comparative advantage of the trading countries. The factors that contribute to movements in RCA are economic: structural change, improved world demand and trade specialization. The advantage of using the comparative advantage index is that it considers the intrinsic advantage of a particular export commodity and is consistent with changes in an economy’s relative factor endowment and productivity. The disadvantage however, is that it cannot distinguish improvements in factor endowments and pursuit of appropriate trade policies by a country, (Batra and Khan, 2005).

Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EFC), Domestic Resource Cost (DRC) etc., can also be used to compute comparative advantage. But these indices need information on various details regarding marketing charges, transportation charges, etc. and it can be computed only for simple commodity. Most of this study is based on group of commodities. Since various charges will vary for each commodity in that particular group, Balassa’s index has been computed as this index adequately reflects the export competitiveness of a commodity and requires only information on value of exports.

The study estimated the comparative advantage in trade of horti-commodities with the help of Export Performance Ratio (EPR), also known as Revealed Comparative Advantage (RCA) using data from FAOSTAT for the period 1992-2003. The Export Performance Ratio of the ith commodity (EPRi) during the period can be expressed as:

$$EPR_i = \frac{E_i}{CE} \frac{CE}{W_i} \frac{W_i}{WE}$$

Where,
- $E_i$= exports of $i^{th}$ commodity from the country,
- $CE$= the aggregate exports of the country,
- $W_i$= total world exports of the $i^{th}$ commodity, and
- $WE$= total world exports during the period.

If $EPR_i$ is greater than unity, the country has comparative advantage in export of that commodity and vice versa (Balassa, 1965)
3.2.4 Performance of trade

a) Relative unit value realization

The Relative Unit Value Realization (RUVR) is often used to examine a country’s performance of agricultural trade (Datta et al, 2001). A value of RUVR of more than unity reveals better bargaining power of a country in the world export market either in term of the quality of products exported or as a major market player. Similarly, a RUVR of more than unity for agricultural imports shows that the country is paying prices for imports higher than what is prevailing in the world market. RUVR is the ratio between unit value realizations and is given as below:

\[
\text{Relative unit value realization} = \frac{VX_1/QX_1}{VX_W/QX_W}
\]

Where,

- \( VX_1 \) = Value of exports from India (in $000)
- \( QX_1 \) = Quantity of exports of exports from India (in metric tonnes)
- \( VX_W \) = Value of exports from world (in $000)
- \( QX_W \) = Quantity of exports from world (in metric tonnes)

b) Elasticity of value with respect to quantity

Date on the export of fruit & vegetables and processed fruits & vegetables by 8 HS (ITC) Classification were collected from the Export Statistics for Agro & Food Products, APEDA for the period 1992-2002. For comparing the performance under the pre- and post-WO periods, horticultural exports during 1992-95 (period I) were compared with that of 2002-03 (period II). The changes during the two periods were analysed by percentage changes in quantity (QC) and value (VC), and elasticity of value with respect to quantity (EV):

Anv value of EV greater than unity implies that the unit value realization from exports of that particular product is on increase. The higher the EV, greater is the prospect for that product to earn foreign exchange for the country (Datta et al., 2001).

3.2.5 Directions of Trade

The data on export of tea and its products were collected for the period 1980 to 2004 from various publications of Director General of Commercial Intelligence and Statistics (DGCI&S), Ministry of Commerce. Tea, leaf in bulk, constitutes 57 per cent of total tea exports and therefore, an in-depth assessment of shift in destinations and its future demand was performed taking ten (10) major tea importing countries. The biannual averages at four yearly interval data for the period 1995-2004 were used to analyze the market shares for onion, mango and tea exports. The average export to a particular
country was assumed to be a random variable that depends only on past exports to that country.

Following a first order Markov model (Dent, 1967), it can be denoted as:

\[ E_{jt} = \sum_{i=1}^{r} E_{it-1} P_{ij} + e_{jt} \] ..........................(1)

Where, \( E_{jt} \) = exports from India during the year \( t \) to \( j \)th country; \( E_{it-1} \) = exports to \( i \)th country during the year \( t-1 \); \( P_{ij} \) = the probability that exports will shift from \( i \)th country to \( j \)th country; \( e_{jt} \) = the error term which is statistically independent of \( E_{it-1} \); and \( r \) = the number of importing countries.

Transitional probabilities \( P_{ij} \), which can be arranged in a \((c \times r)\) matrix, have the following properties:

\[ 0 \leq P_{ij} \leq 1, \text{ and } \sum_{i=1}^{r} P_{ij} = 1, \text{ for all } i. \]

Thus the expected shares of each country during period ‘\( t \)’ can be obtained by multiplying the exports to those countries in the previous period (\( t-1 \)) with the transitional probability matrix. Transitional probability matrix was estimated with the help of a Linear Programming (LP) method referred to as

Minimization of Mean Deviation (Kumar et al, 2006) which is given below.

\[ \text{Min O.P}^* + \frac{Ie}{r(n-1)} \] ..........................(2)

Subject to

\[ X P^* + e = Y \]
\[ GP^* = 1 \]
\[ P^* \geq 0 \]

Where,

\( P^* \) = vector of the probabilities \( P_{ij} \);
\( 0 \) = vector of zeros;
\( I \) = identity matrix;
\( e \) = vector of errors;
\( Y \) = vector of exports to each country;
\( X \) = block diagonal matrix of lagged values of \( y \);
\( G \) = grouping matrix to add the row elements of \( P^* \) to unity;
\( n \) = number of time periods considered for analysis;
\( r \) = number of importing countries.