

Review

A review of methodological issues relating to the estimation of *terms of trade* and trends in *terms of trade* between agricultural and non-agricultural sectors of the Indian economy since 1950'S

Rajesh, G. K.

Council for Nature Conservation and Environmental Protection (CONCEPT), RBV Bhavan, Thattathumala Post, Trivandrum District, Kerala State, India. E-mail: gkrajeshrajesh@gmail.com. Tel: +91 9446904653.

Accepted 27 June, 2012

The movements of intersectoral *terms of trade* (TOT) in India since independence is characterized by periodical shifts in favor and against agriculture. The intersectoral *terms of trade* has been favorable during 1967- 1968 to 1977-1978 and during the post reforms period. But the indicators of performance and growth of the sector has been showing unimpressive trends in the post reforms period. While considering the slow pace of reforms in the country, it is also observed that policy changes in agriculture were still slower. This paper analyses the impacts of the swings in *terms of trade* (favorable and unfavorable to agriculture) on the performance of agricultural sector in the country. It was revealed that while the favorable swing in *terms of trade* has caused increased private gross fixed capital formation in agriculture, it has not led to any perceptible improvement in agricultural production or growth rate of agriculture gross domestic product (GDP). While the favorable TOT during 1967-68 to 1977-78 is speculated to be the result of government price support mechanism, this paper argues that the favorable TOT in the post reforms period is a result of decline in the aggregate crop output rather than government policies.

Key words: Terms of trade (TOT), agricultural growth rate, gross domestic product (GDP), government policies.

INTRODUCTION

Karl Marx says "at a certain stage of development, the material productive forces of society come into conflict with the existing relations of production or (this merely expresses the same thing in legal terms) with the property relations with in the frame work of which they have operated hither to. From forms of development of the productive forces, these relations turn into their fetters. Then begins an era of social revolution" (quoted from Mitra, 1977). Ashok Mitra (ibid) identifies *distribution of property and the alignment of classes* as the missing (or carefully hidden) link between the Marxian rubric and the Keynesian belief (that income distribution, whether between persons or between factors of production, has a certain relevance to economic realities). Mitra has argued

that the *instrument of terms of trade* belongs to the arena of class war. 'In a society torn by class divisions, it is sought to be used by each of the contending classes to tilt the structure of asset and income distribution in its favor. . . the manner in which it is wielded shapes in large measure the pattern of accumulation and growth for the economy as a whole'. Mitra projects *terms of trade* as merely reflecting the effects of property relations on relative income shares and does not see it as the dominating variable in the mutual interaction between class relations and product-cum-factor price.

The concept of *terms of trade* has its origin in international trade on the basis of comparative advantage. The idea of *terms of trade* may be traced

back in the theory of specialization and exchange of Adam (1776) and in the doctrine of comparative costs developed by Ricardo (1817), but they had not developed any precise estimate about the quantum of gains from trade. Moreover, some of the underlying assumptions of *terms of trade* in the international trade do not hold well in the intersectoral framework. Comparative advantage assumes the immobility of factors of production between countries and their perfect mobility within countries. However, in reality, the structural and functional rigidities operating in the economy do not allow the factors of production to be mobile within the country, even within the sector. So is the case with land, which is quite often difficult to allocate freely from one crop to another. Therefore, one has to relax the classical assumption of perfect mobility of factors of production while estimating intersectoral *terms of trade* within the country (Misra, 2004).

The objective of this paper was to bring out the various methodological issues encountered while calculating the intersectoral *terms of trade* and to delineate the trends in the *terms of trade* between agriculture and non-agricultural sectors in India since 1950s. The major aim of this paper is to discuss within the limitations of available data, whether *terms of trade* is an adequate and reliable measure in determining the prosperity of agriculture sector and the well being of farmers. This paper is conceived in three parts: the first part reviews the various methodological issues relating to the estimation of *terms of trade* between agriculture and non-agricultural sectors; the second part outlines the trends in the *terms of trade* since 1960s and the third part discusses how important is the concept of *terms of trade* in determining the prosperity of agriculture sector and the farmer.

METHODOLOGICAL ISSUES RELATING TO ESTIMATION OF INTERSECTORAL TERMS OF TRADE

Empirically intersectoral *terms of trade* can be measured in various ways. The pioneering works were done by Dorrance, Imlah and Morgan (as reported by Vittal, 1986). In the Indian literature, the yardstick of measurement of *terms of trade* has commonly been either a straight comparison of prices (by way of a ratio of composite indices of prices) or a conjunction of this with estimation of quantity of output sold, also indexed. These are the *net barter terms of trade* (NBTOT) and *income terms of trade*, respectively (ibid). The barter TOT has been widely used to examine the changes in relative price between two competing sectors. A TOT index generally referring to NBTOT is defined as ratio of prices received by the agriculture sector to the prices paid by agriculture to non-agriculture sector (Thamarajakshi, 1990; Kahlon and Tyagi, 1980; GOI Task Force, 1995).

This is calculated as:

$$\text{NBTOT} = P_x / P_m$$

Where P_x and P_m refer to composite price indices of sale and purchase respectively. The two composite price indices are defined in such a way as to represent the aggregate price movements of exportable and importable commodities, which requires the respective commodity weights to be assigned on the basis of items actually traded by a given nation. The other index that evaluates the quantum of tradable referred as the *gross barter TOT* (GBTOT) is defined as: ratio of agriculture and non-agriculture GDP deflators (Acharya, 2001):

$$\text{GBTOT} = Q_x / Q_m$$

Where Q_x and Q_m stand for the quantities (or values) of exports and imports, respectively. Some other indices of TOT were also developed as income TOT (ITOT), single factorial TOT (SFTOT) and double factorial TOT (DFTOT). The ITOT takes into account the effects of changes in prices of traded goods and the value of exports (or imports). Therefore, while Dorrance (1950) defined ITOT as the value index of exports divided by the price index of imports, viz:

$$\text{ITOT} = Q_x P_x / P_m$$

Staehle (1951) specified ITOT as the value index of imports divided by the price index of exports, viz:

$$\text{ITOT} = Q_m P_m / P_x$$

While the former determines the *capacity to import* (or *purchasing power of exports*), the latter indicates the *required import bill* (or *value of required exports*) in a nation's foreign trade. On the other hand, the DFTOT and SFTOT take into consideration relative change in the productivity levels of export and (or) import originating sectors. The SFTOT is defined as the commodity TOT multiplied by an index of domestic productivity level. The DFTOT also takes into account the foreign productivity level and is defined by the commodity TOT multiplied by the ratio between domestic and foreign productivity levels. For empirical estimation, DFTOT is worked out as the ratio of unit value index of exports to that of imports after adjusting for the changes in their productivity levels, viz.

$$\text{DFTOT} = P_x T_x / P_m T_m$$

Where T_x and T_m denote productivity indices in the export and import sectors, respectively. The TOT worked out for Indian agriculture mainly refers to the indices of NBTOT and ITOT. The basic methodology pioneered by Thamarajakshi (1969) has involved the construction of

composite indices of prices received and prices paid by agriculture for its traded goods. The methodology for approximating quantum of agricultural exports in terms of the marketable surplus also owes much to Thamarajakshi's study. Subsequently, Kahlon and Tyagi (1980, 1983), Tyagi (1987) and Mungekar and Palanivel (as reported by Deb, 2002) have attempted empirical estimation of NBTOT and ITOT. The indices of ITOT were developed on the lines of Dorrance's measure. Palanivel (as reported by Deb, 2002) also provides estimates of DFTOT by utilizing total factor productivity indices in agriculture and manufacturing. The methodological issues in estimation of agricultural *terms of trade* are best understood by a review of various attempts at estimating it.

VARIOUS METHODS

Thamarajakshi's methodology

Early attempts in India at the empirical estimation of agricultural NBTOT worked out the series on *parity indices* between prices received and prices paid at the level of individual crops. Subsequently, the focus shifted towards examining the NBTOT between aggregate agriculture vis-a-vis industry. In this method, agricultural NBTOT was analyzed on the basis of straight comparison of wholesale price indices (WPI) of all agricultural vis-a-vis all industrial (or non-agricultural) commodities (Deb, 2002). The first systematic study incorporating this refinement was Thamarajakshi (1969), who provided estimates of NBTOT and ITOT from 1951/52 to 1965/66. In this study, the wholesale price indices (WPI) of individual commodities traded between agriculture and non-agriculture were aggregated using a derived set of weights. A total of 13-commodity group(s), 7 for the purpose of intermediate use and 6 for final use, were selected to represent the total purchase by agriculture from non-agriculture¹. Similarly, 18 groups (12 for intermediate use and 6 for final use) were used to represent the total sales by agriculture to non-agriculture². The commodity weights were derived from the value of sectoral purchase of individual commodities by using the following method (Thamarajakshi 1969).

¹ Thamarajakshi's [1969] list of commodities that agriculture purchases from non-agriculture included: 1) fertilizers, 2) repair and maintenance of fixed farm assets, 3) oil-cakes, 4) drugs, medicine and salt for work animals, 5) electricity for farm production, 6) diesel oil and 7) pesticides & insecticides, for items of intermediary inputs. The items for agriculture's final consumption contained 1) edible oil, 2) sugar, 3) salt, 4) clothing, 5) fuel and lights and 6) non-food items.

² The list of non-agriculture's purchase from agriculture for items of intermediary inputs were: 1) oilseeds, 2) cotton, 3) raw jute, 4) other fibers 5) tea, 6) coffee, 7) rubber, 8) sugarcane, 9) tobacco, 10) hides, 11) skins and 12) wools. The final consumption items included: 1) food grains, 2) pulses, 3) milk and milk products, 4) meat, egg and fish, 5) fruits and vegetables and 6) other food.

The value of bilateral sales and purchases by each sector was approximated by using the National Sample Survey's (NSS) per capita rural and urban consumption expenditure data, Central Statistical Organization's (CSO) estimate of aggregate private consumption expenditure and value of product estimates. The NSS data on rural and urban per capita expenditure were assumed to denote the agricultural and non-agricultural consumption pattern, respectively. Next, estimates of agriculture's sales to and purchases from non-agriculture were constructed for individual items of intermediate and final use. The value of agriculture's sale of intermediate items has been generated after allowing for retention in the CSO value of agricultural product. The agricultural purchase of intermediary inputs was worked out using the disaggregated CSO information. The agriculture's sale and purchase of final use items have been estimated by applying the blown-up NSS per capita consumption data to the CSO's aggregate consumption expenditure data. Using the value of sectoral purchases as weights, the composite price indices were constructed under 6 commodity classifications, viz. prices received by agriculture from non-agriculture for the latter's purchase for intermediate, final and all uses and prices paid by agriculture to non-agriculture for the former's purchase for intermediate, final and all uses. The income TOT was derived according to the equation:

$$ITOT = QxPx / Pm$$

Where Px and Pm refer to composite price indices of sale from agriculture and purchase from industry respectively and Qx stands for quantity (or value) of sales from agriculture.

Agriculture's export to non-agriculture has been denoted by the former's marketable surplus, which the latter purchases for its final and intermediate consumption. The marketable surplus of final consumption goods was generated by applying the per capita NSS consumption expenditure data to aggregate CSO data. That is, first the value of total consumption expenditure of non-agricultural sector on agricultural products, and the total expenditure of the economy were generated by applying the sector-wise population estimates to the NSS data. Then the ratio of expenditures on agricultural products by non-agriculture to the economy's total expenditure was applied to CSO's total consumption expenditure of the economy. From this, the value of imports for cereals, fruits and vegetables in the economy was deducted to arrive at the non-agriculture's expenditure on domestic agricultural products. These estimates after a deflation by the composite WPI (base: 1960/61) were used in the analysis.

The criticism on Thamarajakshi's work as meted out by Kahlon and Tyagi in 1980s can be summed up in their own words as "..... *most of the studies cited on the subject suffer from serious limitations on account of limited coverage, use of improper weights, inappropriate*

price indicators, adoption of incorrect method for estimating the volume of exports, and the use of a method for constructing the price indices which, on a priori reasoning, would underestimate the rise in the prices of non-agricultural goods and inflate the rise in the prices of agricultural commodities" (Kahlon and Tyagi, 1983). The criticism on Thamarajakshi by Kahlon and Tyagi (1980, 1983) led to a whole host of debate for and against each of the issues they had risen. The following summarize these debates over the key issues:

(1) The weights assigned on the basis of wholesale price indices do not represent the price paid and received by agriculture: A major criticism of Kahlon and Tyagi (1980) of Thamarajakshi's (1969) methodology is the use of WPI, which they believed are not representative of either prices received or prices paid by agriculture. They maintain that WPI series in India has simultaneously overestimated the price rise in agriculture and underestimated those for industrial commodities, due to its inconsistent method of compiling price quotations.

They accordingly advocated the use of FHP for agricultural commodities so as to capture the prices actually received by agriculture. Vittal (1986) also raised certain objections against the use of FHP in TOT calculations. She claimed that the use of FHP may misrepresent the prices received for major part of the volume of grain traded, since the lean season sales by surplus producers and also the small farmers' repayment in kind, remains outside the harvesting price records. Subsequently, Thamarajakshi (1990) reiterated that WPI are more appropriate because these data are collected throughout the year, and not just during the harvesting periods. Mungekar (1993) provided support for the use of FHP by arguing that: (a) the bulk of agricultural produce is disposed during the harvest period, and (b) some evidences reflect that WPI overstate the price received by agriculture.

(2) Items purchased by agriculture for capital formation are not included: In addition to the methodological considerations, there are differences between Thamarajakshi and Kahlon and Tyagi with regard to the coverage of commodities in agriculture's trading list. While Kahlon and Tyagi maintained that Thamarajakshi's shopping list understates the number of items purchased by agriculture, Thamarajakshi's (1990) subsequent article asserts that there is an understatement of agriculture's sales in Kahlon and Tyagi.

Of particular issue is the inclusion of items for capital formation in agriculture's purchase by Kahlon and Tyagi, while Thamarajakshi (1969) had included items relating to current consumption and production only. Moreover, Mungekar (1993) objected to Kahlon and Tyagi's use of the expenditure pattern of rural cultivator class to identify commodities pertaining to agriculture's final purchases. He suggested that since the TOT is for the entire agricultural sector and not just for farmers, the average

consumption pattern of all rural expenditure classes should have been incorporated.

(3) Using NSS for some commodities and CSO for some others to assign weights is not scientific: Another significant criticism by Kahlon and Tyagi (1980) had been with regard to the method followed in evaluating agriculture's marketable surplus of final consumption goods, and the approximation of respective commodity weights. Thamarajakshi (1969) developed these estimates by combining the NSS's household level consumption expenditure data with CSO's total consumption expenditure of the economy. Kahlon and Tyagi (1980) and subsequent studies have broadly pursued this method only. However, while Thamarajakshi (1969) applied the NSS proportions to CSO data, Kahlon and Tyagi (1980) chose to use the break-ups of both NSS and CSO information to provide alternate weights. Furthermore, they used the CSO distribution on blown up NSS estimates so as to estimate the agricultural marketable surplus. In this regard, Vittal (1986) and subsequently Thamarajakshi (1990) claimed that these techniques by Kahlon and Tyagi were more of the use of "alternative data" rather than any "alternative methodology". Later, Mungekar (1993) maintained that Thamarajakshi's series on marketed surplus does not suffer from any methodological limitations, except for the fact that her series was linked with a low base year value.

(4) Finally, Kahlon and Tyagi (1980) expressed doubt on the concept of ITOT used by Thamarajakshi on the ground that it did not portray an analogous sectoral relationship. That is, TOT improvement for one sector is not necessarily accompanied by deterioration in the other. They claimed that the definition of ITOT is "misleading" since it is based on the volume of export of only one sector. Vittal (1986) suggested some modifications to the measure, viz. to adjust the expression of agriculture's ITOT with its imports from non-agriculture.

Methodology followed by Kahlon and Tyagi

Kahlon and Tyagi (1980) introduced some changes with regard to the commodity coverage, price data and commodity weights in TOT calculations. The selection of commodities and estimation of weights were undertaken by using information on consumption expenditure data (both NSS and CSO), estimates of gross capital expenditure (Debt and Investment Surveys, Reserve Bank of India), and some disaggregated information from CSO. To represent the final consumption by agriculture, 17-commodity group(s) was selected from the details provided in 26th Round of NSS consumption expenditure survey for cultivator households. Another 7 items were selected from the information available in National Accounts Statistics (CSO) for agriculture's basket of intermediate purchases. Finally, 8 items for capital formation were included from the information provided in

All India Debt and Investment Surveys³. The commodities that non-agriculture purchases from agriculture for final and intermediate use contained 22 items⁴. Using both Laspeyer's and Paasche's formula, they came to the conclusion that Laspeyer's formula inflated indices of net barter *terms of trade* in the years when they were in favor of agriculture, but underestimated the indices for the years when the *terms of trade* against agriculture.

The major criticism on Kahlon and Tyagi's method was that their use of harvest prices misrepresents the prices received by agriculture sector for major part of the volume of grain traded. Items like tea, coffee, rawhides, wool are not included in the list of commodities sold by agriculture, which results in the underestimation of the value of sales of agriculture to non-agriculture sector. However, Misra (2004) opines that the list of items used by them seems to quite comprehensive and the data set was more consistent. GOI has taken the methodology adopted by them to measure the barter terms of trade.

Studies by Mungekar and Palanivel

Deb (2002) has provided a review of works done by Mungekar (1992) and Palanivel (1999) (as reported by Deb, 2002). The separate studies by Mungekar and Palanivel constructed their own estimates of agricultural NBTOT, but did not explicitly discuss any of the debated issues (by Thamarajakshi, Kahlon and Tyagi) surrounding the data and methodology. As a result, it is difficult to discern whether their methodology and estimates can be distinguished from earlier attempts. Deb (2002) concludes that the basic methodology involved in either Mungekar or Palanivel is not very different from Thamarajakshi (1969). However, modifications with regard to the use of alternate price data, wider commodity coverage and alternative set of commodity weights draw upon the claims of Kahlon and Tyagi (1980). Mungekar and Palanivel (as reported by Deb, 2002) made a strong case for the use of FHP and retail prices so as to capture the components of prices received and prices paid by agriculture, respectively. Palanivel (as

reported by Deb, 2002) incorporates the rural retail price (RRP) data to capture the *rural purchase price* on non-agricultural commodities. However, this data as available from the Monthly Abstracts of Statistics (CSO) is accessible only since 1970/71. Palanivel (as reported by Deb, 2002) resolved this problem by supplementing it with Wholesale Price Index (WPI) data for observations prior to 1970/71. The estimation of commodity weight in both the studies was accomplished by following the earlier practice, viz. by applying the NSS proportions to aggregate CSO data.

Methodology of taskforce

The Government of India appointed a task force in 1995 under the chairmanship of A. S. Kahlon for estimating *terms of trade* between agricultural and non-agricultural sector. The methodology adopted by taskforce has been reviewed by Misra (2004). The total items purchased by agriculture increased to 44 (as against 32 by Kahlon and Tyagi, 1980) and total items sold by agriculture rose to 48 (as against 22 by Kahlon and Tyagi). Weights were assigned on the basis of following: marketed value of each commodity with respect to total value of marketed surplus for all the commodities. Farm harvest prices were used for 23 out of 48 commodities, factory price paid to sugarcane and wholesale prices for farm product were taken into consideration for estimating weight. Price paid-weight for final consumption was developed as per value of expenditure incurred on the selected items in the total consumer expenditure for rural sector based on NSS 43rd round. For intermediate inputs such as seeds, fertilizer, etc., the weight to each item was assigned as its percentage contribution to total cost of selected agriculture inputs. Total expenditure on capital formation in farm business as available in the reports on All-India Debt and Investment Survey 1981-82 was moved forward to 1988-89, 1989-90 and 1990-91. This was done using compound growth rate of gross capital formation in agriculture in the household sector available in the NAS (Misra, 2004).

Other series

In addition to the aforementioned studies, the Commission for Agricultural Costs and Prices (CACP) in the Ministry of Agriculture, GOI, has also been compiling indices of TOT between agriculture and non-agriculture, with triennium ending 1971/72 as base. The CACP report (GOI, 1998) has published a new TOT series estimated by Directorate of Economics and Statistics (DES) in the Ministry of Agriculture. The DES series is claimed to be better in terms of larger coverage of traded items, as it covers 71 and 48 items, respectively for items of prices paid and prices received by the farm sector, as against 32 and 21 items, respectively used in the CACP series

³ The 32 items considered by Kahlon and Tyagi (1980) are as follows: 1) edible oils, 2) sugar, 3) salt, 4) kerosene oil, 5) matches, 6) electricity, 7) coal, 8) tobacco and tobacco products, 9) textiles, 10) footwear, 11) drugs and medicines, 12) cosmetics, soap and detergent, 13) metal products, 14) paper and paper products, 15) utensils, 16) cycles, and 17) consumer services, for items of final consumption. Similarly, 1) cement, 2) lime, 3) transport equipment, 4) machinery and machine tools, 5) iron and steel, 6) log and timber, 7) tools and implements and 8) bricks and tiles, were included for items of capital formation. Finally, 1) chemical fertilizers, 2) electricity, 3) diesel oil, 4) pesticides and insecticides, 5) repair and maintenance of fixed capital, 6) oil-cakes and 7) salt and medicines for animals, were considered for elements of intermediate consumption.

⁴ These are, 1) rice, 2) wheat, 3) jowar, 4) bajra, 5) barley, 6) maize, 7) ragi, 8) milk and milk products, 9) meat, fish and eggs, 10) vegetables, 11) fruits, 12) gram and pulse products, 13) gur, 14) groundnut, 15) sesamum, 16) rapeseed and mustard, 17) linseed, 18) castorseed, 19) cotton, 20) jute and mesta, 21) rubber and 22) sugarcane and tobacco.

Table 1. Features of various agricultural NBTOT series in India.

Series	Thamarajakshi (1969, 1977, 1994)	Kahlon and Tyagi (1980) and Tyagi (1987)	Mungekar (1992)	Palanivel (1999)	CACP	DES	Task force (1995)
Agriculture's selling list	Final and intermediate use	Final use intermediate use and capital formation					
Prices received data	WPI	FHP and WPI				FHP, WPI and MSP	FHP(23), WPI(24), price paid by sugar factories (1)
Prices paid data	WPI			RRP and WPI	WPI	RRP and WPI	RRP
Base year	1960-61, 1978-79	Triennium ending 1971/72	1961/62 and 1971/72	Triennium ending 1971/72		Triennium ending 1990/91	1981-82
Period of series	1952-66, 1952-75, 1952-92	1968-78, 1953-84	1953-87	1951-88	Since 1970/71	Since 1981/82	Since 1981-82

WPI-Wholesale Price Index; FHP- Farm Harvest Prices; RRP- Rural Retail Prices; MSP- Minimum Support Price; CACP- Commission for Agricultural Costs and Prices; DES- Directorate of Economics and Statistics. Source: Deb (2002), Thamarajakshi (1969) and Misra (2004).

(GOI, 1999).

Comparison of various agricultural NBTOT series

The debate on methodological issues will not be complete without a comparison between the various methodologies adopted by researchers in arriving at various existing series of NBTOT. This is especially relevant while considering the large volume of debate the issue had sparked off. Any observer of these debates will naturally have the inclination to see how far the various series of agricultural NBTOT differ or converge. Table 1 compares the salient features of various agricultural NBTOT series in India. Deb (2002) compared the six series (Thamarajakshi, 1994; Tyagi, 1987; Mungekar, 1992; Palanivel, 1992; CACP and DES) by employing graphical plots to

examine their pattern of movements over time after connecting the series to a common base-1980/81. He observed a common pattern at a broader level and states that when plotted together the individual series could not be distinguished from one another. The coefficient of correlation between respective series and the one based on implicit price deflators (IPD) also revealed a high degree of correlation.

A subsequent statistical test also revealed that in spite of numerous methodological differences, the fundamental nature of different NBTOT indices reflected similar attributes over comparable time periods. It also revealed that the Tyagi (1987) and Thamarajakshi (1994) series have a similar mean and variance (Deb, 2002). Misra (2004) has also endorsed this view by observing that the movements of barter *terms of trade* of the Task Force are by and large comparable with that of Kahlon and Tyagi (1980) and Thamarajakshi

(1994), though there is no point-to-point correspondence between different series. Therefore, it may be safely concluded that although the empirical estimation of agricultural NBTOT in India is subjected to an extensive debate, the underlying nature of the various series is not much different.

DISCREPANCIES INVOLVED IN ESTIMATION

A discussion on the methodological issues relating to measurement of *terms of trade* will be incomplete without discussing the problems in estimation. The basic methodology of NBTOT estimation involves the creation of composite price indices of prices received and prices paid for the goods traded by agriculture. Most of the debate on NBTOT is due to the difference in selection of commodities traded. Table 2 gives a

Table 2. Items of inter sectoral exchange in agricultural NBTOT estimation.

Series	Purchase				Sales		
	Final use	Intermediate use	Capital formation	Total	Final use	Intermediate use	Total
Thamarajakshi	6	7	-	13	6	12	18
Kahlon and Tyagi	17	7	8	32	12	10	22
Mungekar	7	8	6	21	6	5	11
Palanivel	-	-	-	120	-	-	44
CACP	16	7	9	32	11	10	21
DES	49	9	13	71	39	9	48
Task force	17	12	15	44			48

Source: Deb (2002), Thamarajakshi (1969) and Misra (2004).

picture of the dissimilarity of *shopping lists* existing among the various methodologies of calculating agricultural NBTOT in India. The selection of traded commodities and their sampling design used in their selection has a bearing on the precision of a composite index number. The substantial difference existing projects the non-availability of a complete shopping list of agricultural sales and purchase at the aggregate level.

Equally important is the fact that most of the studies have excluded *factor* and *non-factor* service items from the commodity basket. The *factor services* refer to services provided by the factors of production (labor, capital and land), while the *non-factor services* could be services supplied by transport and communication, trade, commerce and other government services; which without considering, the calculations can be erroneous. Deb (2002) observes another discrepancy of *joint application of aggregate and disaggregate data* by most of the studies conducted. For example, consumption expenditure at household levels are blown up and applied to the aggregate economy's consumption expenditure to derive the value of sectoral consumption. Similarly, price details such as wholesale, farm harvest, rural retail and some implicit price deflators have been assembled together to design a composite price variable. This adds to the discrepancies in estimation of NBTOT.

TRENDS IN THE AGRICULTURAL TERMS OF TRADE IN INDIA

In spite of the nearly four decade's intensive debate and creation of a number of series on TOT, no common consensus has been arrived at regarding the movements of agricultural *terms of trade* in India. Thamarajakshi (1969, 1977) [as reviewed by Vittal (1986)] maintained that domestic NBTOT remained favorable to agriculture during the 60's and till about mid-70. Kahlon and Tyagi (1980) differed by claiming that NBTOT moved against agriculture during this period. In their own words, "*a comparison of these results with those derived from the calculation of Thamarajakshi (1977) by adopting the*

triennium ending 1971/72 =100 showed that whereas for the period 1967-68 to 1974-75 (the common period between ours and her study) according to her data the terms of trade moved in favor of agriculture from 100.63 to 107.79, using the refined methodology our results showed that during this period the terms of trade moved against agriculture from 117.8 to 101.6."

However, Tyagi (1987) revised the position taken by Kahlon and Tyagi (1980), arguing that TOT in India did favor agriculture during mid-60 to mid-70. Thamarajakshi (1990) subsequently extended her series referring to the base 1978/79 and demarcated two sub-periods viz. 1961/62 to 1973/74 and 1974/75 to 1987/88, which showed a reversal in the trend of agricultural NBTOT. She found that NBTOT moved in favor of agriculture at an annual compounded growth rate of 2.38% during the first period and deteriorate at 0.99% annually in the second period. Mungekar (1992) also found the NBTOT movement favorable to agriculture during 1952-53 to 1973-74 and unfavorable later. Palanivel (1992) as reviewed by Deb (2002) identified only periodic swings in agricultural NBTOT instead of any uniform trend during the overall period, viz. 1950-51 to 1987-88. His series indicated a significant dip in NBTOT during the pre-green revolution period and a rally in the later part. Subsequently, Thamarajakshi (1994) updated her earlier series and also provided a modified series. She could not detect any distinct trend in either of the NBTOT series during 1971-72 to 1991-92. Apart from these studies, both the CACP and DES series as published in GOI (1998) revealed an improvement in agricultural NBTOT during 1981/82 to 1990/91, and a further improvement between the period of 1990-91 to 1994-95. Furthermore, Thamarajakshi (2000) provided a new NBTOT series between 1990-91 and 1998-99, with 1993-94 as base. This series reflects favorable agricultural TOT during the entire post-reform period. No single series is available on agricultural *terms of trade* covering the period from 1960's to recent times.

Therefore in this paper, for further discussion, the two series of viz. Thamarajakshi (1994) series (base: 1978-79) which extends from 1951 – 52 to 1991 - 92 and

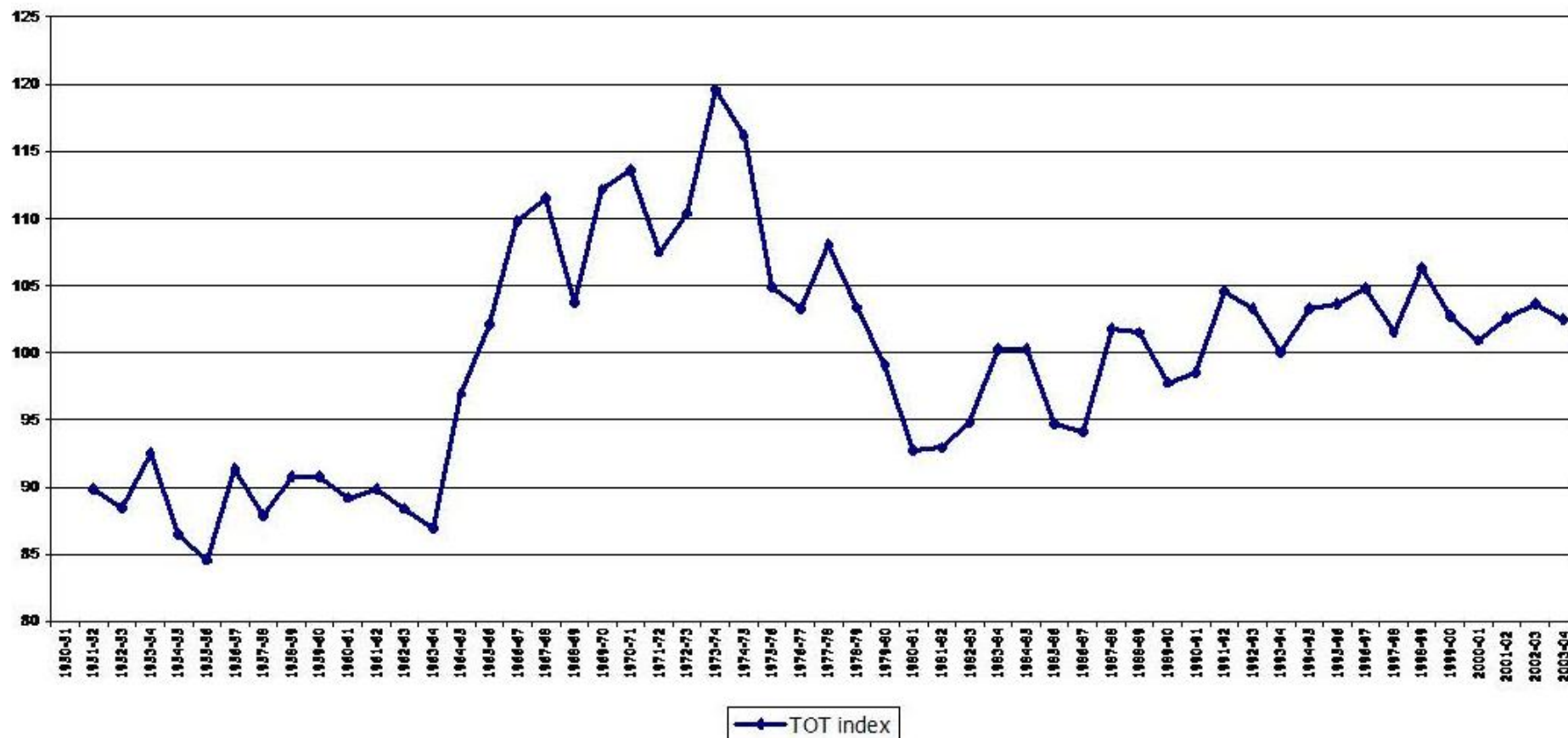


Figure 1. Movements of Agricultural TOT in India from 1950- 2004. Source Thamarajakshi (1991, 2000), Ministry of Finance.

Thamarajakshi (2000) series (base: 1993-94) that extends from 1990-91 to 1998-99 were spliced together to the base 1993-94. To this series, another series provided by Economic survey, Ministry of Finance that was worked out to the base 1993-94 was appended to extend it up to 2003-4. This has been done based on the conclusion drawn from this paper that *the fundamental nature of different NBTOT indices*

reflected similar attributes over comparable time periods and the statistical evidence provided by Deb (2002) that the coefficient of correlation between various series and the series based on Implicit Price deflators revealed a high degree of correlation of common observations. The resultant series is shown in Figure 1. The plot indicates that it follows almost the same trend already established by previous studies. Between 1950-51

and 2003-04, it suggests four distinct phases of shifts in terms of trade. In the first phase ending 1964-65, the *terms of trade* was unfavorable to agriculture, while for the second phase ending between 1978-79 and 1979-80 was favorable to agriculture. The third phase ending 1990-91 was unfavorable and the fourth phase beyond 1991-92 is favorable to agriculture and the trend continues the same through 2003-04.

The trends in TOT over the past fifty odd years can be summed up as follows. In the graphs, percentage growth of the agricultural parameters is taken in the Y-axis and TOT indices are taken on the parallel Y-axis for comparative trend analysis.

I phase: Movement of gross *terms of trade* was unfavorable to agriculture during the period 1952-53 to 1964-65. During this phase of *traditional* technology, growth in agriculture was mainly due to the increase in the cropped area. Growth in crop output was through huge investment in irrigation. The unfavorable TOT may be due to the importance given to industrialization. Along with this, imports of food grains also did not allow the agriculture prices to raise (Misra, 2004).

II-phase: After the food crisis in the mid of 1960s, major investments in green revolution technologies were made and these were accompanied by a significant improvement in gross TOT for agriculture during the period 1967-68 to 1977-78. The price support mechanism installed in 1965 (through Agricultural prices commission) resulted in the favorable TOT during early 70s. Mitra (1977) has opined that the favorable TOT to agriculture by about 50% in 1973-74 was due to political arrangements; that is, administrative prices had been deployed for pushing up the market prices. He also pointed out that the gains of TOT were monopolized by the surplus raising farmers and their trading partners. Thus, the shift in TOT did not result in raising agricultural production, but resulted in low output in the organized industrial sector. The favorable TOT along with the new technology helped in raising the gross capital formation. As a result, the crop production increased.

III-phase: With accumulating national food grains surpluses in the late 1970's and declining unit cost of production as a result of technological change, prices came down and TOT went against agriculture. Agricultural growth continued to be dependent on productivity rather than expansion in cropped areas. This kind of growth was achieved in spite of fall in gross capital formation of both public and private (Misra, 2004).

IV- phase: Since the introduction of economic reforms in 1991, the *terms of trade* became favorable to agriculture due to: 1) exchange rate devaluation; 2) reduction in the protection to the manufacturing, reducing there by anti-agricultural bias and 3) higher increase in support price. The swing in *terms of trade* in favor of agriculture in the post reforms phase is noteworthy especially since the favorable trend appears to be strong after the year 2000.

It is to be inferred that the economic reforms adopted in the country were not at the cost of the interests of the farming sector and maybe as claimed by Misra (2004), the agricultural price policy has duly taken care of the

farmer's interests. The trends shown in Figure 2 support this view. This figure gives the growth rate of minimum support price of paddy and wheat since 1978 against TOT. During the post reform period up to 2000, the support price's growth rate was better compared to the preceding period 1980-89 when the TOT was unfavorable to agriculture.

It is of general belief that one of the reasons for favorable TOT to agriculture in the post reforms period is 'higher increase in support price'. However, the Figure 2 indicates after 2000, the support prices (growth rate) showed a declining trend, but the TOT continues to be favorable to agriculture. It may be said that higher support prices help to maintain TOT favorably, but in the post reforms period the favorable TOT could sustain in spite of the downward trend of support prices. Figure 3 shows that the growth rate of minimum support prices of coarse cereals plotted against TOT for similar periods reinforces this argument. A question that emerges at this point is whether the agriculture sector could enjoy in the future, a favorably sustainable TOT without much government intervention by way of benevolent price policies. To probe this issue further, the gross fixed capital formation in agricultural sector (as a proxy for investment in agriculture sector) in pre and post reform periods is graphically analyzed against the TOT shifts.

Furthermore, Figure 4 gives the dynamics of the growth rate of total gross fixed capital formation in agricultural sector against TOT shifts. It reveals that growth rate of investment is either steady or in the increase during the two periods (since 1965) when the TOT is favorable for agriculture. Figures 5 and 6 show the dynamics of the growth rate of gross fixed capital formation in agricultural sector by public sector and private sector, respectively. Considering the two periods (since 1965) of favorable TOT, it is seen that during these phases, the private sector gross fixed capital formation almost always showed a positive growth rate and is better than that of the public sector share. During the unfavorable phase the public sector share shows a drastic decline and negative growth rate except for the period from 1979 to 1983. Moreover, in the post reforms period, it appears that the gross fixed capital formation in agriculture sector is lead by the private sector. However from Figure 4, it is understood that the total gross fixed capital formation has not declined in the post reform phase; that is to say the private investments have filled the gap. This raises serious doubts regarding the role of public sector investment in ensuring favorable TOT in contemporary Indian agricultural scene. It is also indicative of the better participation of the private and corporate sectors in agriculture and possibility of increased private sector investments in future.

Ramesh Chand in a recent paper argues that the decline or stagnation of public sector capital formation for past two decades has adversely affected the agriculture output growth in India (Chand, 2007). According to him,

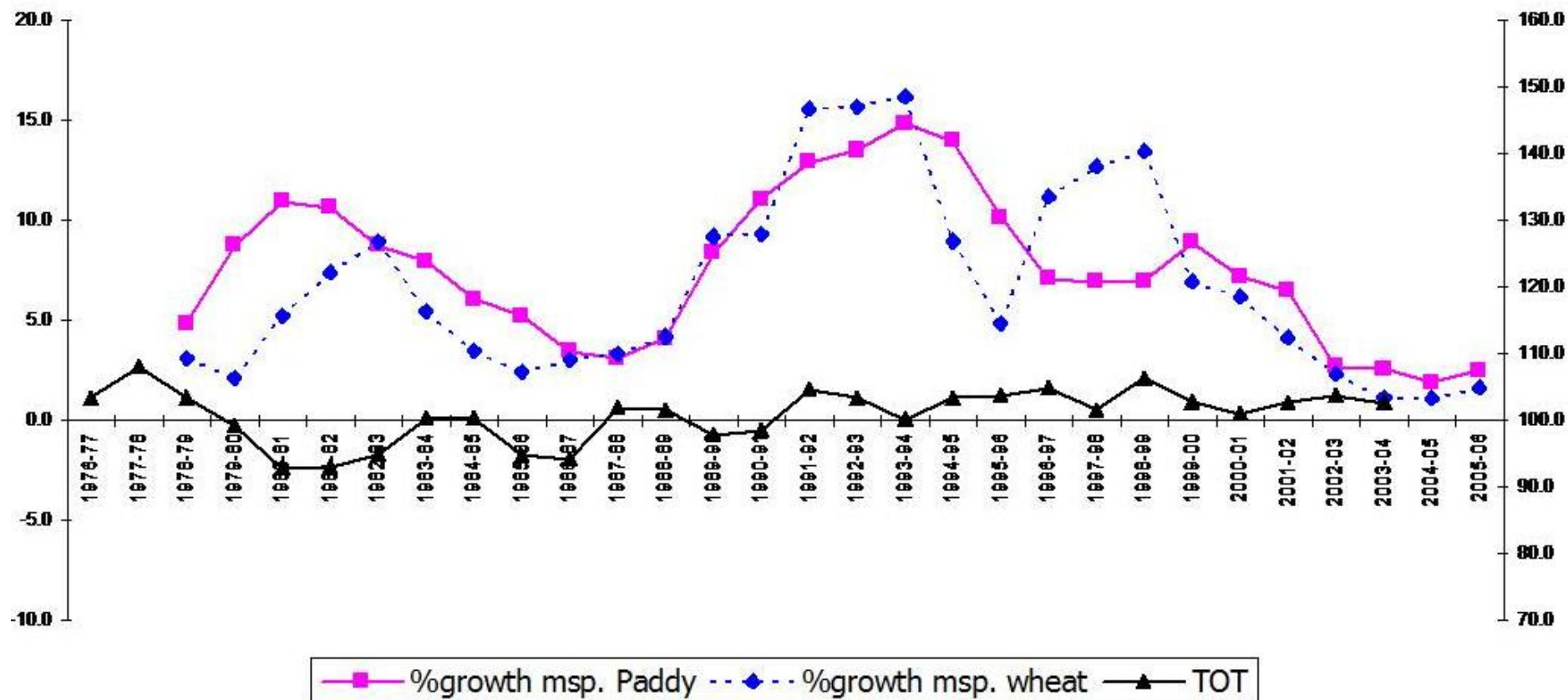


Figure 2. Growth rate of minimum support price of paddy and wheat against TOT. Source: Ministry of Agriculture, GOI.

the reason for decline in public investment does not indicate any neglect of agriculture sector in terms of resource allocation, but due to the diversion of resources from capital account to current account, that is, from capital formation to subsidies. Similar view is expressed by Rao (2004). Chand (2007) acknowledges that this diversion of resources from investments to subsidies has a net negative effect on output. This

is illustrated in Figure 7. The growth rate of GDP of agriculture has continuously declined or stagnated over the years in spite of periodical favorable TOT. The post – reform growth rate is as low as that exhibited in the pre - green revolution phase. Additionally, Figure 8 gives the growth rate of net irrigated area across the four phases of TOT shifts. It indicates that during the period from

1964-65, there was an increase in its growth rate. But in the post reforms period there is a steady decline. Along with the decline in public investment, the decline in net cultivated area also may be a reason for this and it is indicated by the trend of net sown area in the same graph. This is suggestive of a decline in the aggregate crop output. As some empirical studies have observed the negative coefficient between TOT and

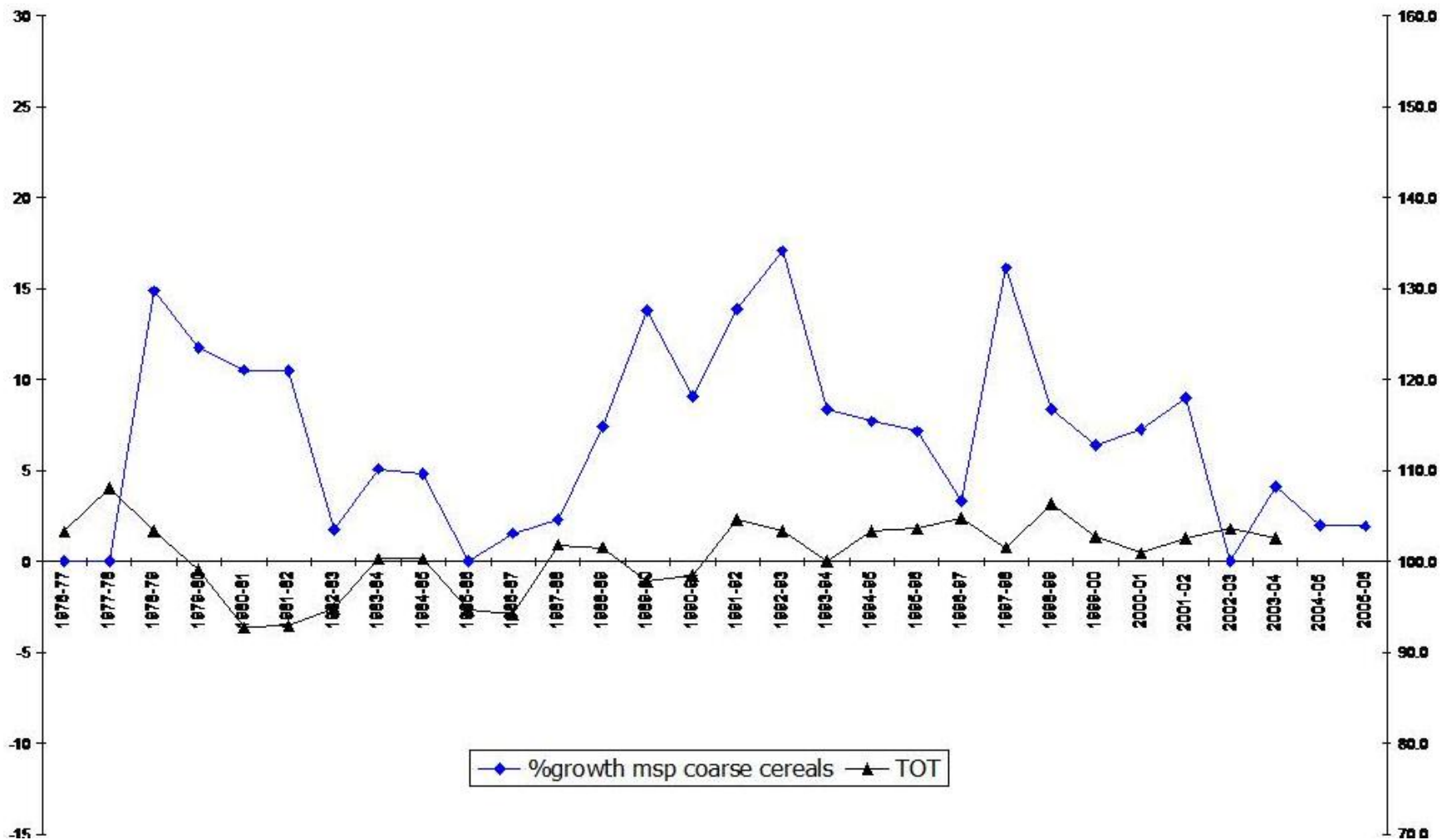


Figure 3. Growth rate of minimum support price (3-year moving average) of coarse cereals against TOT. Source: Ministry of Agriculture, GOI.

aggregate output / marketed surplus (Thamarajakshi, 1994), this raises the question whether the favorable *terms of trade* realized in the post reforms period is in relation with the

decline in net sown area and aggregate crop output. The trend in growth rate of production of food grains and commercial crops is illustrated in Figures 9 and 10. Since the mid 1970s, the

growth rate of food grain production and production of commercial crops (excluding fruits and vegetables) has been stagnant. The growth rate of food grains production has shown a

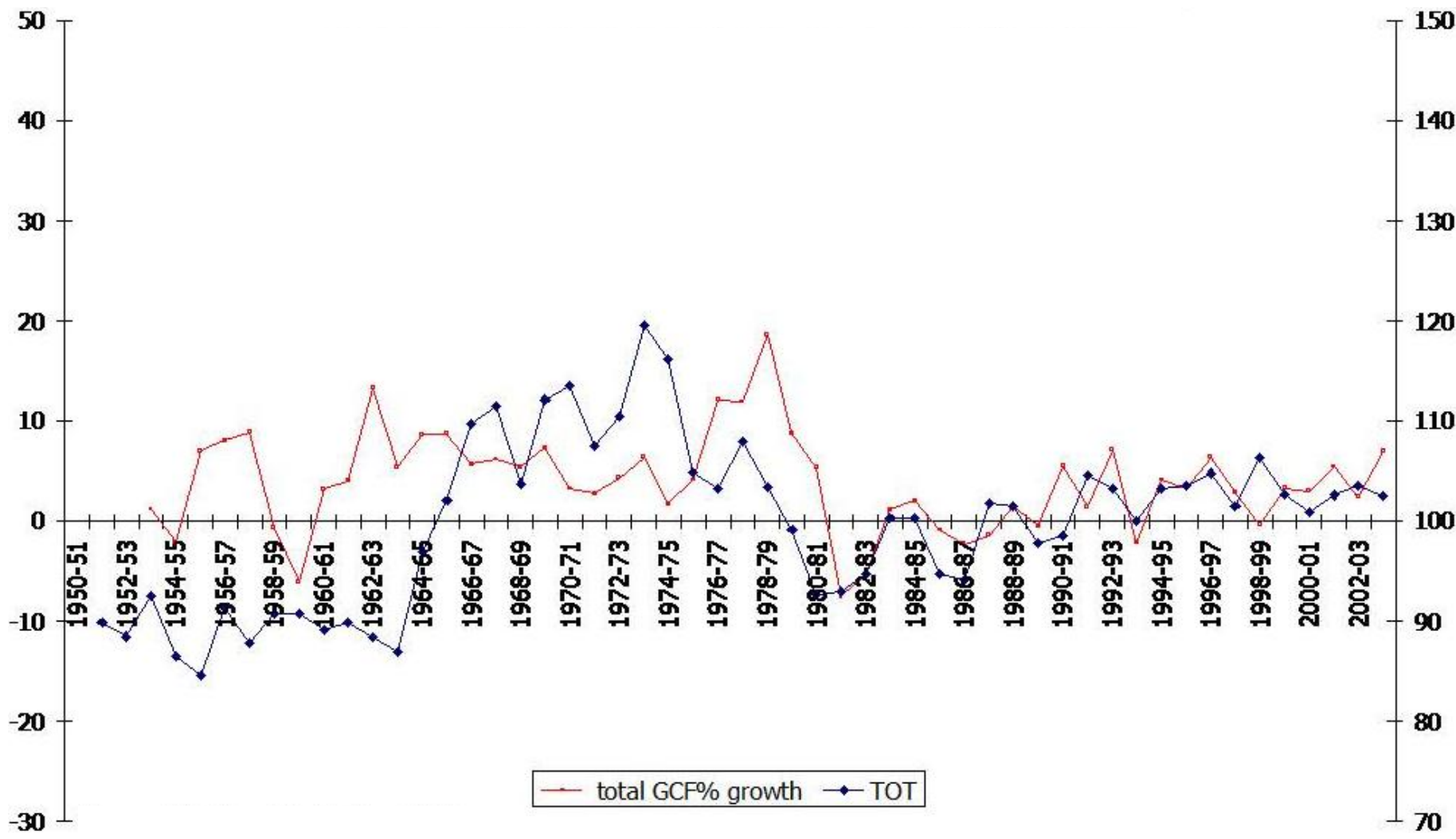


Figure 4. Total gross fixed capital formation in agriculture and allied sectors (% growth) and TOT.
 Source: Ministry of Agriculture, GOI.

decline in the post reforms period. It appears that the periods of unfavorable TOT has not affected the production of commercial crops much. Here, it

is to be noted that the fixed capital formation in agriculture by the private sector has been growing ever since 1970s. The private investments in large

scale and even by the corporate sector might have helped the commercial crops growth rate from declining.

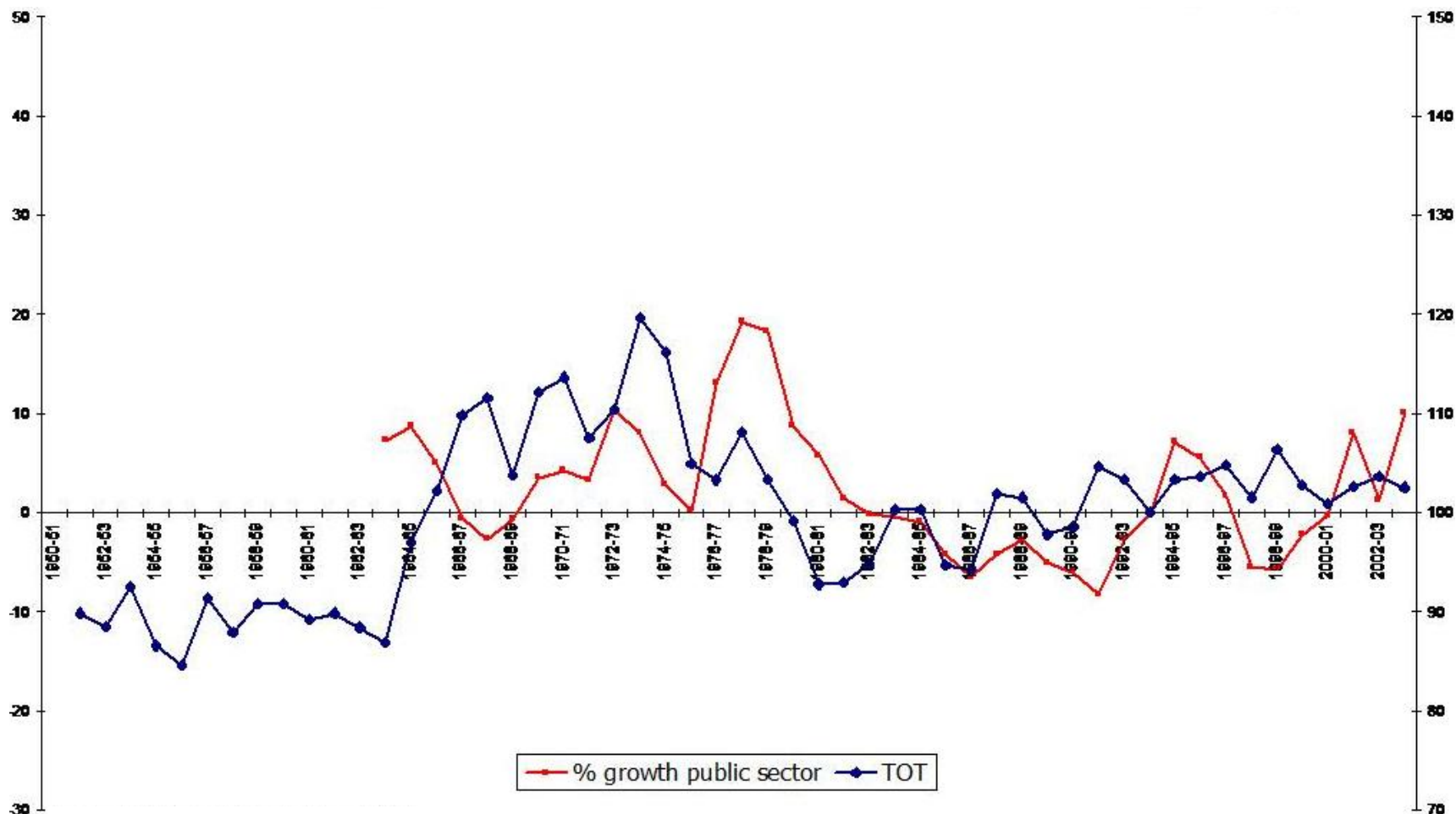


Figure 5. Gross fixed capital formation by public sector in agriculture and allied sectors (% growth) and TOT. Source: Ministry of Agriculture, GOI.

THE EFFECT OF TOT SHIFTS ON THE AGRICULTURE SECTOR

Figure 11 compares the shifts in TOT with industrial GDP growth rate over the years. It shows that a TOT shift in favor of agriculture is

almost always accompanied by a drop in industrial growth rate and vice versa. At the same time Figure 7, which compares the agricultural GDP growth rate does not indicate any increase in agricultural growth with favorable TOT. This is understandable since the performance of

agriculture is dependent on various other factors as well. Figure 12 also compares TOT indices with growth rate of household savings (as a proxy for income). The trend does not indicate any positive relation between favorable TOT and increase in household savings rate; rather, it

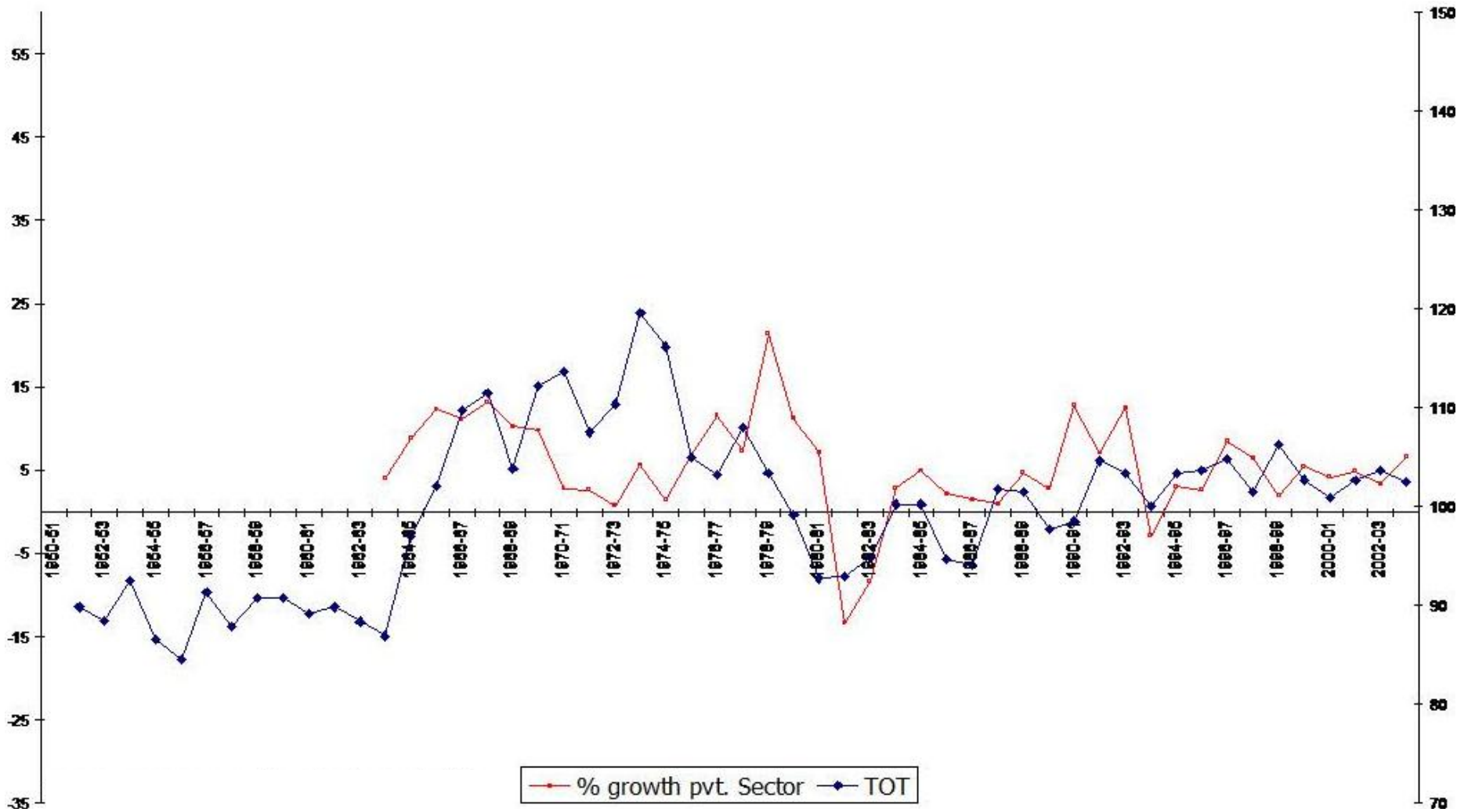


Figure 6. Gross fixed capital formation by private sector in agriculture and allied sectors (% growth) and TOT.
 Source: Ministry of Agriculture, GOI.

appears to be on the reverse. In the current scenario, it can be summed up that during the period 1967-68 to 1977-78, the favorable TOT

was due to favorable price policies. In spite of this; however, agriculture production did not improve during that phase but industry was adversely

affected (maybe other factors also influenced this). In the post reforms period, the *terms of trade* has become favorable to agriculture, which acted

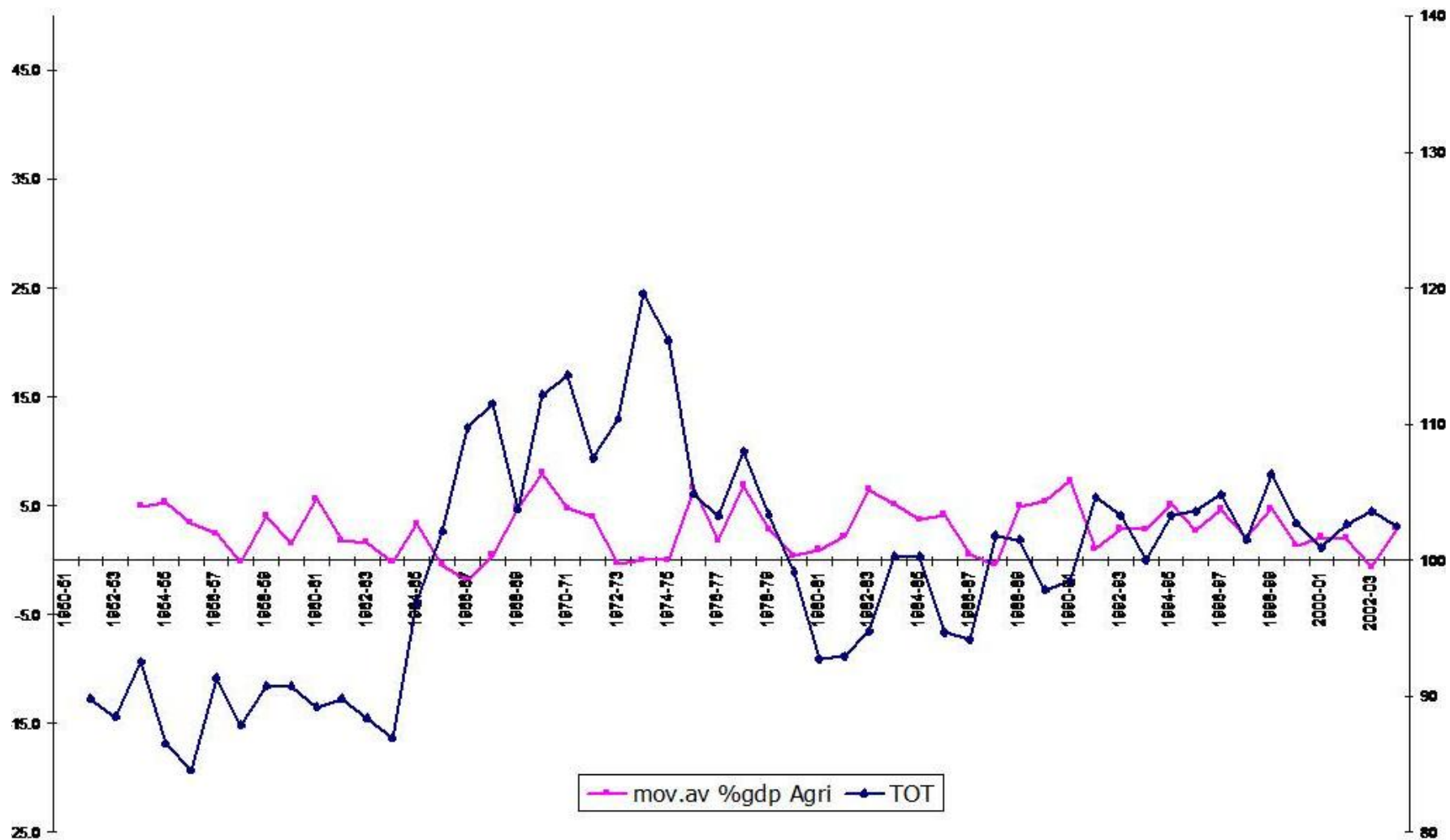


Figure 7. Agriculture GDP growth rate (3 years moving average) and TOT. Source: RBI.

as incentive for more private corporate sector participation in agriculture. Subsequently gross fixed capital formation by private sector in

agriculture has increased.

However, the agricultural GDP growth rate has stagnated or declined in the post reforms period. It

is estimated that the per capita calorie consumption increased 20% between the early 1980's and 2000 (Persaud and Rosen, 2003). In

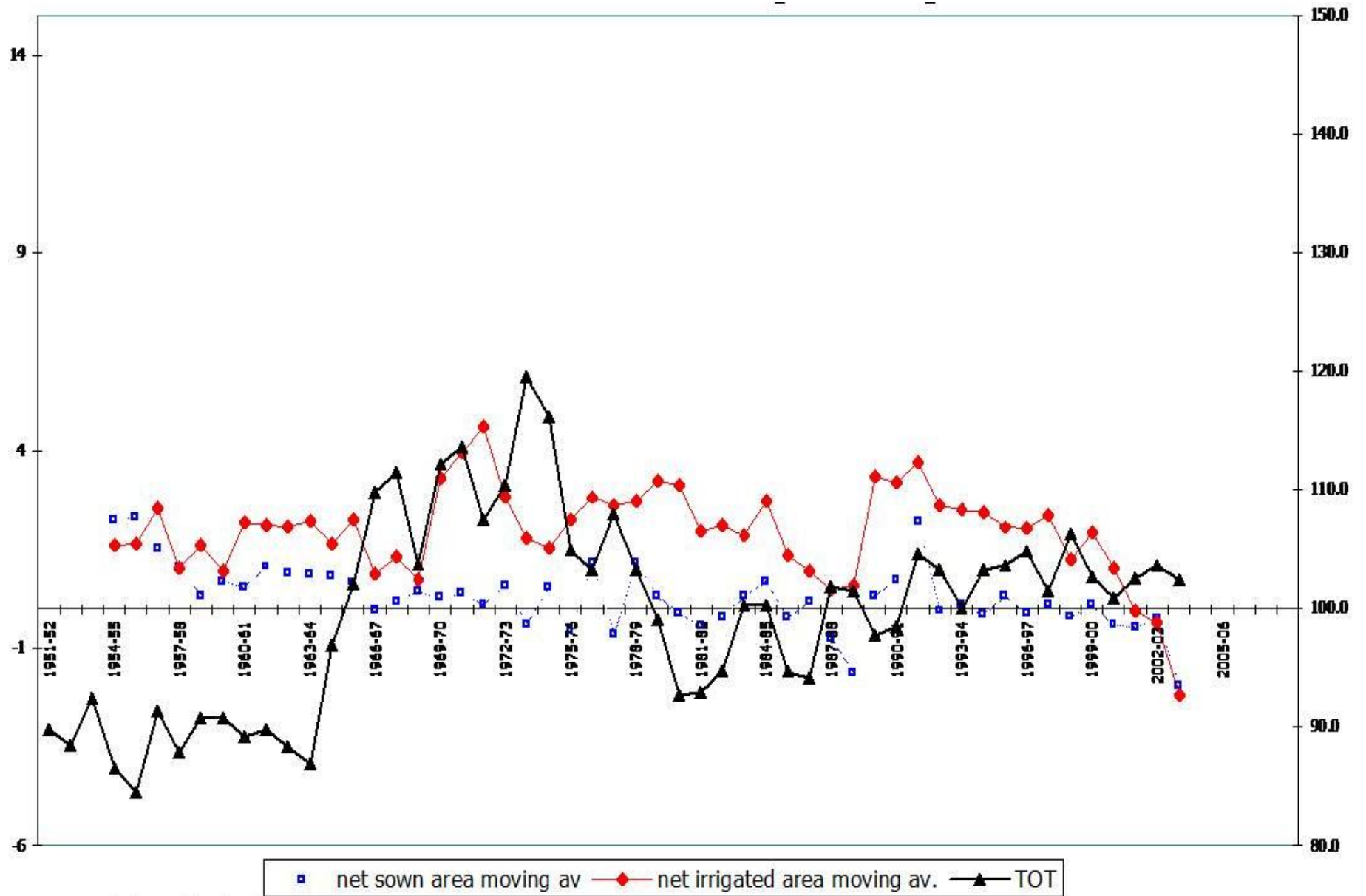


Figure 8. Growth rate of net sown area and net irrigated area against TOT.
 Source: Ministry of Agriculture, GOI.

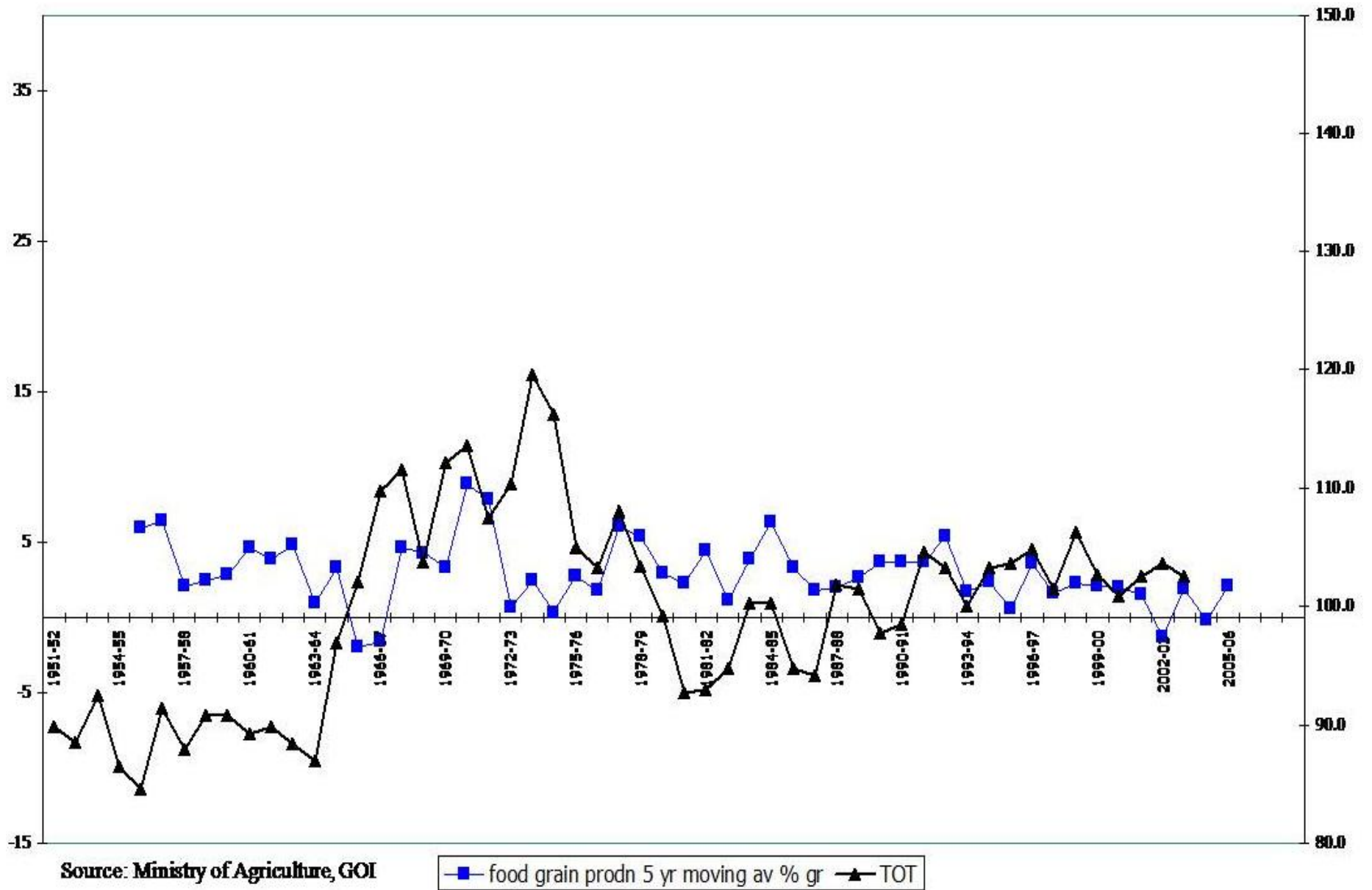


Figure 9. Growth rate of food grain production (5 years moving average) against TOT.
Source: Ministry of Agriculture, GOI.

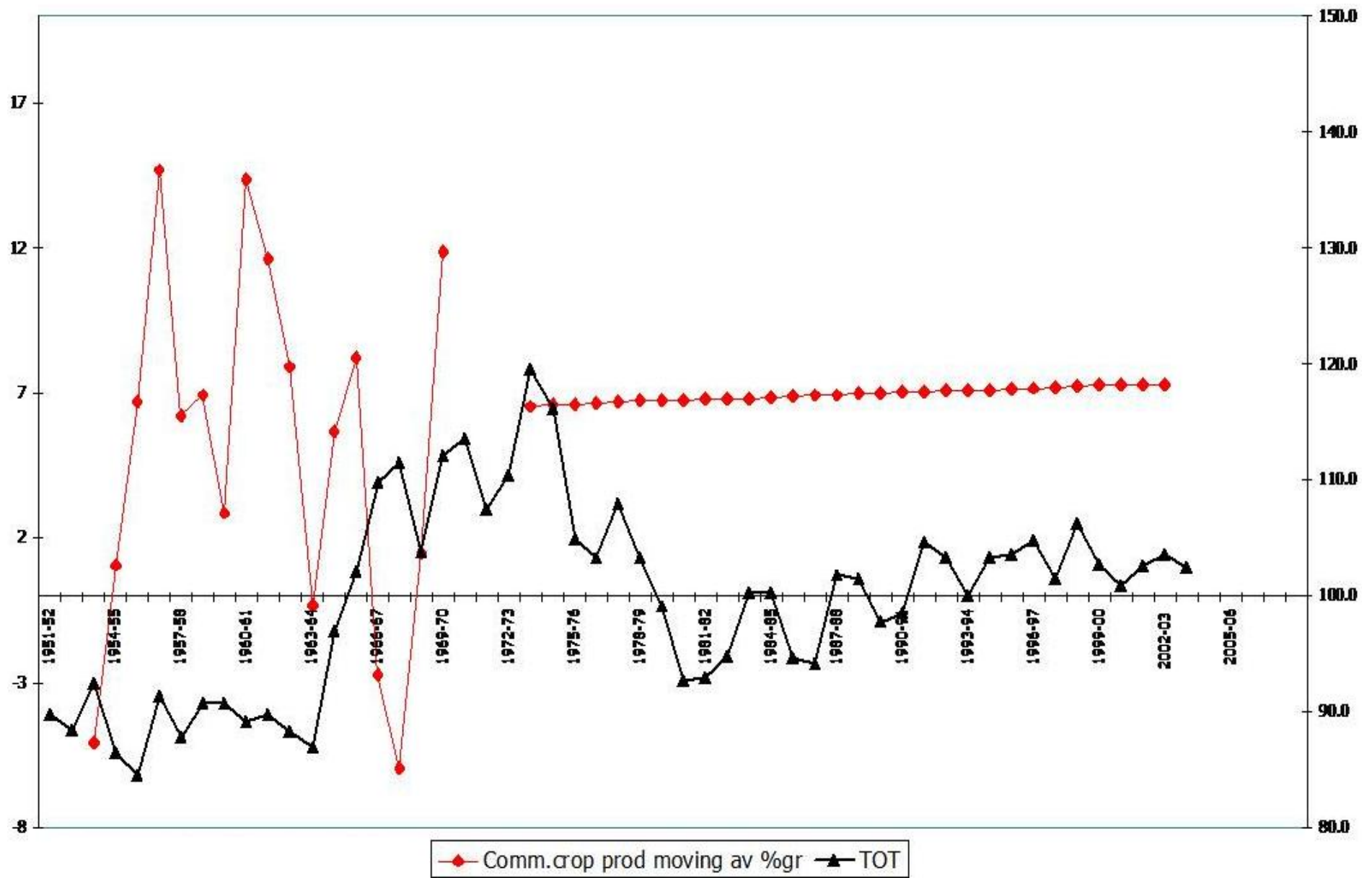


Figure 10. Growth rate of commercial crops against TOT.
 Source: Ministry of Agriculture, GOI.

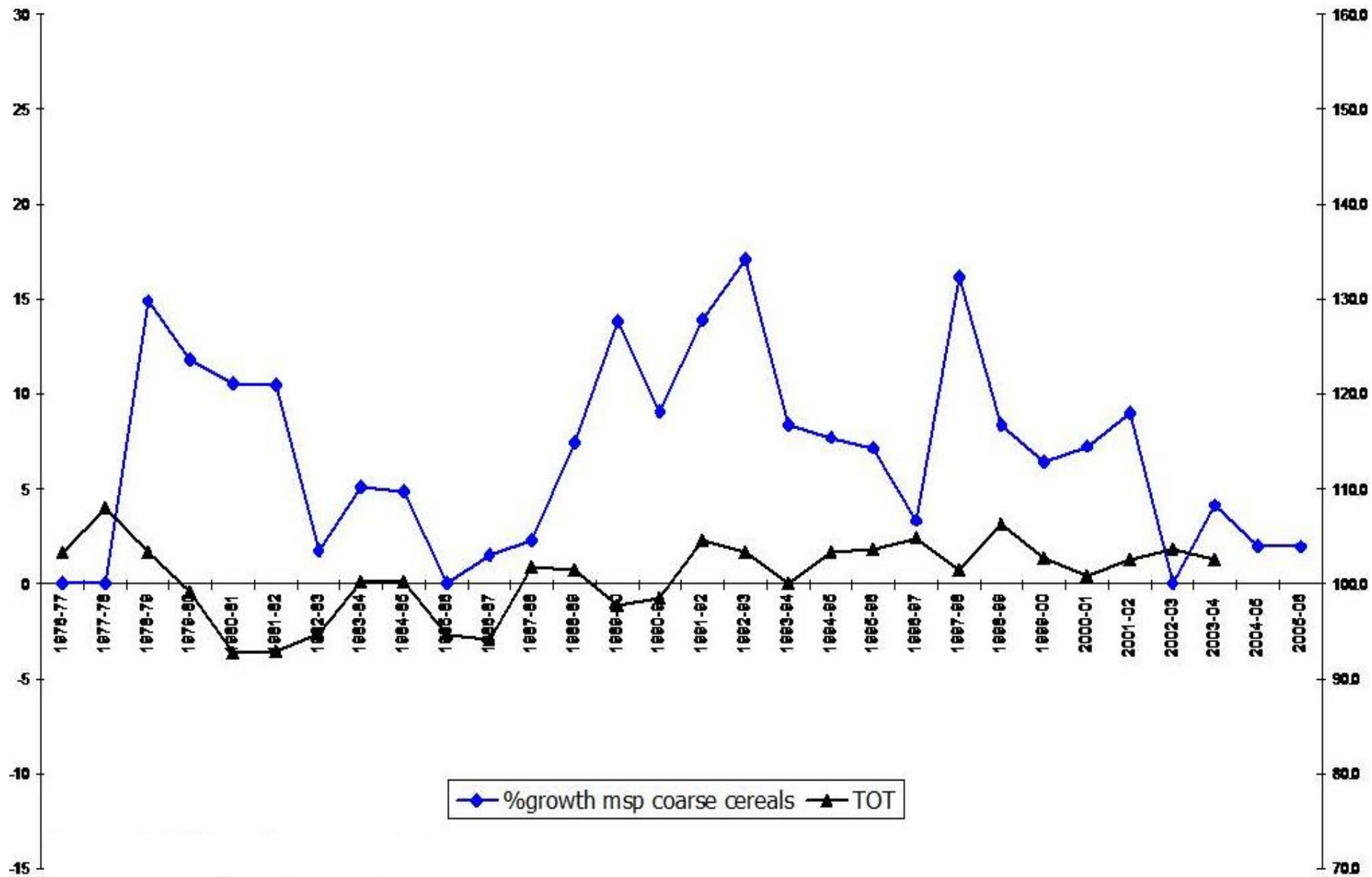


Figure 11. Growth rate of minimum support price (3 year moving average) of coarse cereal against TOT. Source: Ministry of Agriculture, GOI.

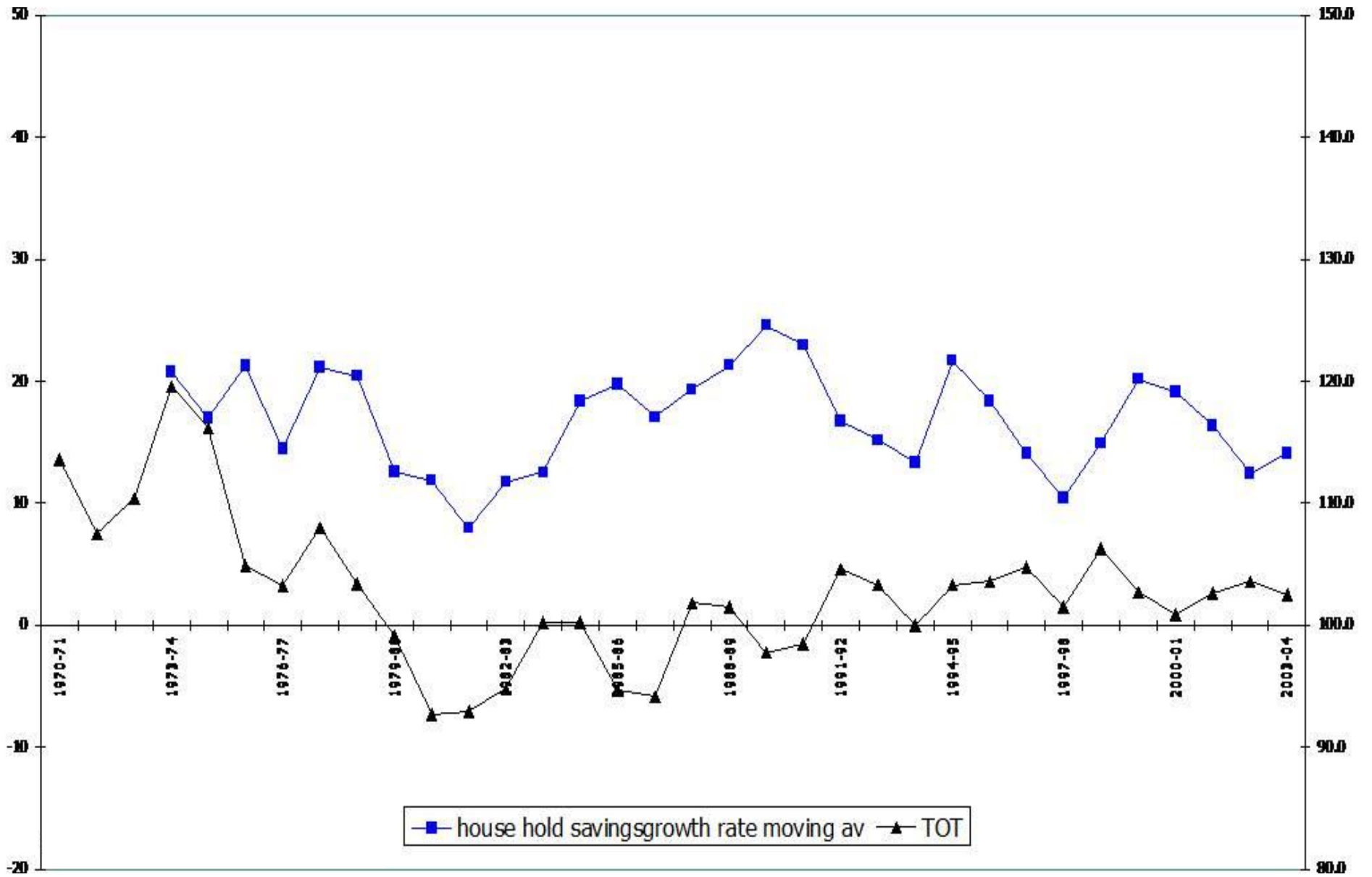


Figure 12. Growth rate of household savings against TOT.
 Source: Ministry of Agriculture, GOI.

addition, per capita income grew at a rate of 3.7% per year during 1980-1998. This indicates that purchasing power and consumption of food has increased during the post reforms period. This situation is sufficient to induce price hike for agricultural products and lead to favorable TOT. But it is to be remembered that public sector investment is in the decline, almost giving way to private investment in agriculture even though the current account investments (subsidies) have increased. The integration with international market and its possible impact on agricultural prices is still under debate. The downward trend in growth rate of minimum support prices in the post reform period should be considered in the light of the above.

Conclusion

The movement of intersectoral terms of trade in India since independence has been characterized by periodical shifts in favor and against agriculture. The intersectoral *terms of trade* have been favorable during 1967-68 to 1977-78 and during the post reforms period. However, the indicators of performance and growth of the sector has been showing unimpressive trends in the post reforms period. While considering the slow pace of reforms in the country, it was also observed that policy changes in agriculture were still slower. It was revealed here that while the favorable swing in *terms of trade* has caused increased private gross fixed capital formation in agriculture, it has not led to any perceptible improvement in agricultural production or growth rate of agriculture GDP. Moreover, while the favorable TOT during 1967-68 to 1977-78 is speculated to be the result of government price support mechanism, it may be argued that the favorable TOT in the post reforms period is a result of decline in the aggregate crop output rather than government policies. The government price policies could be well directed to ensure favorable TOT to agriculture. In the future, government intervention by way of appropriate price policies could be crucial in determining the well being of the agriculture sector especially since the apparent shifts in *terms of trade* could be deceptive.

REFERENCES

- Acharya SS (2001). Terms of trade for the Agricultural Sector in India at the State Level, in S. S. Acharya and D.P.Chaudhri (Edt): Indian Agricultural Policy at the Cross Roads, Rawat Publishers: New Delhi. p 25.
- Adam S (1776).An Inquiry Into The Nature and Causes of The Wealth of Nations, pub. Clarendon Press, Oxford (1979) p. 18-21.
- Chand R (2007) Capital formation in Indian agriculture. National and state level analysis (un published article).
- Deb S (2002). The Debate on Agriculture-Industry *Terms of trade* in India. Working Paper Centre for Development Economics Department of Economics, Delhi School of Economics. p. 109.
- Dorrance D (1950). Income Terms of Trade, Rev. Econ. Stud. 16(1).
- Government of India (GOI) (1995). Report of the Task Force on Terms of trade between Agriculture and Non-agricultural Sectors, Directorate of Economic and Statistics, Ministry of Agriculture: Delhi.
- Government of India (GOI) (1998). Report of the Commission for Agricultural Costs and Prices for Crops Sown in 1998-99 Season, Commission for Agricultural Costs and Prices, Ministry of Agriculture, New Delhi.
- Government of India (GOI) (1999). Index of Terms of trade between Agriculture and Non-agricultural Sectors, Directorate of Economics and Statistics, Ministry of Agriculture: New Delhi.
- Kahlon A S, Tyagi (1980). Intersectoral Terms of Trade, Economic and Political Weekly, 15(52).
- Kahlon AS, Tyagi DS (1983). Agricultural Price Policy in India, New Delhi: Allied Publishers Private Limited. p 20.
- Misra VN (2004) Terms of Trade, State of the Indian Farmer, A millennium study. Pub. Academic foundation, New Delhi.
- Mitra A (1977) Terms of trade and Class Relations, An Essay in Political Economy. Frank Cass and Co Pub. England, p.25
- Mungekar BL (1992).The Political Economy of Terms of Trade, Himalaya Publishing House: Mumbai
- Mungekar BL (1993). Intersectoral Terms of Trade: Issues of Concept and Method, Economic and Political Weekly 28:39.
- Palanivel T (1999).The Long run Trends in the Terms of Trade between Agriculture and Non-Agriculture in India: Some Alternative Methods, Indian J. Econom. 69:315
- Persaud S, Rosen S (2003). India's consumer and producer price policies: implications for food security. Food security Assessment/ Econ. Res. Serv. GFA-14.
- Rao CHH (2004). Preface to the millennium study. State of the Indian Farmer, A millennium study. Pub. Academic foundation, New Delhi. p.30.
- Ricardo D (1817).The Works and Correspondence of David Ricardo, Vol. 1 Principles of Political Economy and Taxation. Pub. LIBERTY FUND, INC. 8335 Allison Pointe Trail, Suite 300. p. 25.
- Staehele (1951). Some Notes on the Terms of Trade, Int. Soc. Sci. Bull. (UNESCO), 3(1).
- Thamarajakshi R (1969). Intersectoral Terms of trade and Marketed Surplus of Agricultural Produce, 1950/51 to 1965/66, Economic and Political Weekly 4(26).
- Thamarajakshi R (1977). 'Role of Price Incentives in Stimulating Agricultural production in a Developing Economy' in Ensmnger, Douglas (ed), Food Enough or Starvation for Millions? Tata McGraw-Hill.p.215
- Thamarajakshi R (1990). Intersectoral Terms of trade Revisited, Economic and Political Weekly, Rev. Agric. 25(13).
- Thamarajakshi R(1991). "The Relation Between Rice Prices and Wage Rates in Bangladesh." Food Policy in Bangladesh, Working Paper No. 2. IFPRI.PP.1-29
- Thamarajakshi R (1994). Intersectoral Relationships in a Developing Economy, Academic Foundation: Delhi.P.25
- Thamarajakshi R (2000). National Agricultural Policy: Confusion on Ends and Means, Economic and Political Weekly 35(35, 36).
- Tyagi DS (1987). Domestic Terms of trade and their Effect on Supply and Demand of Agricultural Sector, Economic and Political Weekly, 22(13).
- Vittal N (1986). Inter sectoral terms of trade in India a study of concept and method, EPW 21(52).