CHAPTER VI
SUMMARY AND CONCLUSIONS

6.1: Introduction

India has witnessed a significant change during the last six decades in the structural distribution of its GSDP. This points out the relative roles of different sectors in the growth of the economy and so also points towards the lagging sectors. The sectoral contributions to GSDP have changed, but that did not get reflected in the distribution of the workforce. As a consequence share of the agricultural sector in GSDP has declined, but the total workforce has not shifted with the same rate (VKRV Rao, 1984). Agricultural sector continues to be a major source of income for more than half of total working population and sustain almost two third of the dependent population. Even more surprising, the sector still assumes significant importance in determining the levels of growth, poverty, standard of living, food security, and the extent of income inequality. It also dictates the development of other sectors too. Given the extent of influence on a large number of socio-economic indicators, it would, therefore, not be an exaggeration to say that economic development of India still hinges precariously on the performance of agricultural sector. Despite this, agriculture often goes at the receiving end in the key priorities and attracts attention only when it is hit with a crisis in the sector. In the last two decades, the agrarian crisis that manifested to a crescendo through higher incidence of indebtedness and farmers’ suicides, stagnation in the agricultural yield, declining trends in the public investment in the agriculture raised serious concerns in overall development planning (Chand et al 2007; Deshpande and Shah 2007; GoI 2007; Narayamoorthy 2007; Bathla 2014). The policy response of the State this time too remained more on historical lines than that of just, “fire fighting” (Rao and Jeromi 2000). Even, the economic reforms initiated since early 1990s to expand the scope for the market, instead of helping the economy in taking it to the next level of transition seems to have caused a tremendous harm to India’s commitment to sustainable development. During this period, the economy not only witnessed a sharp divergence in the rates of growth across the sectors, but also exposed itself to a higher level of economic
inequalities, causing the lower level of sentiments among agricultural households to continue with the farming (Kar and Sakthivel 2006; Chowdhury 2014).

For respectful and dignified survival, all members of the society seek enough income in their hand to fulfill socio-economic obligations and a standard of living that is more or less at par with other members. We hardly need any reminder here that the net income of the agricultural households significantly depends on a few critical factors, namely the size of holding, access to major inputs and the cost of cultivation, productivity of crops and remunerative prices for the produce. Among these, the scope for expansion in the area is limited and access to inputs, cost of cultivation and crop productivity are quite interlinked. In these circumstances, one can hardly envision a faster growth in the net income of the farmers and growth in the agricultural production without accelerating the growth of per hectare crop productivity and diversification of cropping pattern towards high value crops. There is, however, no need to reemphasize that we still have spatial differences in the productivity of agricultural crops across the states and the existing gap between their potential and actual yield could be brought down to the minimum level. Nevertheless, this would require a series of efforts towards the substantial mobilization of adequate investment and better utilization of available land and water resources while maintaining favourable Terms of Trade for the sector. Further, the promotion of commercial agriculture on the line of modern technology and inputs would also be of a great help in adding some more income to their pockets. In India, on the contrary, despite the satisfactory growth in agricultural production and achievement of arithmetic food security, we have noticed declining trends in public investment since the early 1980s (Bathla and Thorat 2006; Bathla 2014) and deceleration in the growth of agricultural output and per hectare productivity in the subsequent decades (Bhalla and Singh, 1997 and 2010; Chand and Shinoj 2012). The stagnation in the yield and decline in the public investment in agriculture are matters of serious policy concerns and pose significant implications for growth in the net income, investment decisions and overall welfare of a large number of farming communities.

In the recent past some studies highlighted the sluggish trends in the net income of the farmers in the post reform period and underlying factors such as slow growth in productivity, the sluggish price trends in the product market and widespread market
inefficiencies governing them (Sen and Bhatia 2004; Deshpande and Prabhu, 2005; Deshpande and Shah 2007; Narayanamoorthy 2007; Dev 2009). Notably, these developments are rapidly transforming into a widening of the income gap between agricultural and non-agricultural sectors and that between rural and urban sector (Lipton 1977, Ahluwalia 2002; Jha 2004; Ghosh and Chandrasekhar 2003; Ghosh 2010, Desai et al 2012). Further, these are accentuated by the rising prices of inputs and commodities purchased by the farmers (Sen and Bhatia 2004; Raghavan 2008; Dev 2009). Some scholars feel that the role of agricultural price policy in this respect is quite crucial to promote and encourage the private investment in agriculture and its future growth and development (Rao and Deshpande 1986; Rao 1989; Bhalla 1989 and 1995; Nadkarni 1993). If we were to achieve it through the agricultural prices, then monitoring Terms of Trade in favour of the agricultural sector and taking steps to correct that should be at most important policy concerns (Misra 1998 and 2004; Fan and Hazell 2000; Desai and Namboodiri 1999; Acharya 2001; Desai 2002; Rao 2003).

6.2: Review of Major Concerns

The role of inter-sectoral Terms of Trade for achieving higher economic growth and development prominently recognized in the economic literature. While balanced economic growth approach was favoured to maintain parity between ISTT, the lead sector growth approach strongly pitched arguments against maintaining favourable Terms of Trade for the agricultural sector mainly to promote industrialization and higher economic growth (Lewis 1954 and 1955; Kuznets 1955; Hirschman, 1958; Fei and Ranis 1961 and 1964; Schulz 1964; Preobrazhenski 1965; Ishikawa 1967a and 1967b). Even though the latter approach received a strong support across many countries, sporadic events of farmers’ agitations, powerful agriculture-economy growth linkages and socio-economic and political costs of such biased approach aroused significant upheavals in economic policies and led to a fierce debate over the movement (direction) of ISTT in academic and policy circle in India. While the methodological issues in the estimation of ISTT remained the focal point of discussion, it continued to enrich the debate by attracting the attention of several scholars to key areas of research concerning its direct and indirect linkages with the host of factors. These particularly included agriculture-industry growth, inter-sectoral growth differentials, rural wage and poverty, food security, technological (HYV)
adoption, spread of irrigation, capital formation in the sector, government expenditure, growth in total factor productivity and agricultural price policy (please refer chapters 2 to 5 for detail information). Among these, the agricultural policy along with prices concerning input and output subsidies and procurement prices for foodgrains continued to add fuel to the overall debate as these directly or indirectly influence the Terms of Trade for the agricultural sector and decided the future course of policy action. While some scholars earlier argued that, agricultural policy in India always provided enough price incentives to the sector (Dantwala 1967 and 1976; Mitra 1977), others believed that the sector was subject to systematic discrimination as the state deliberately kept agricultural prices low to promote the industrial sector (Lipton 1977; Hazell et al 1995).

The literature on the subject pointedly brings out the significance of ISTT overall growth of the agricultural sector, distribution of income between two sectors, accumulation of wealth and the overall rate of growth of the Indian economy (Thamarajakshi 1994; Venktaraman and Pralhadachar 1978; Mungekar 1992; Misra 2004). Many scholars widely recognized the linkage between the movements in the ISTT and the economic well-being of the farming community. It is in this context that the question related to movement of ISTT in favor or against the agricultural sector assumed a great significance and is subjected to extensive debate in both academic and policy making circles over the past three and half decades. Considering the significance of ISTT, the subsequent farmers’ unrest over the country and arguments in academic circles (Nadkarni, 1987), the Government of India included Terms of Trade as one of the terms of references to the Agricultural Prices Commission (APC) and Commission for Agricultural Cost and Prices (CACP). It still considers index of ISTT at all India level while arriving at the Minimum Support Price (MSP) for major agricultural commodities. The estimates of ISTT, no doubt, remain the subject of controversies and these have been moderated by making some periodical cosmetic revisions in the base period, weights and enlarging commodity baskets. The CACP so far has updated and revised three series as all India ISTT

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106 APC was set up in January 1965 to advise Government on price policy for agricultural commodities. It was mandated to evolve a balanced and integrated price structure in the perspective of the overall needs of the economy and with due regard to the interests of the producer and the consumer (GoI, 1965).

107 APC is renamed as CACP and continues to formulate the price policy for agricultural sector in India (GOI 1980).
estimates having base years TE 1971-72, TE 1990-91 and more recently TE 2011-12. There are growing numbers of studies in the recent past that highlighted the rapid expansion of commercialization, the spread of technology and higher exposure to the market and volatile global economy. Market and commercialization of agriculture in particular have higher influence on the relative development of prices in agriculture vis-à-vis those of other sectors. The agricultural prices tend to be more responsive with the increasing urbanization and income of urban or non-agricultural household population but probably the elasticity is small. Similarly, greater integration of markets within and across the countries plays significant role in determining both agricultural input and output prices. India’s experience across the regions in this regards is quite heterogeneous. The emergence of market and the process of commercialization have set differently in different states. Moreover, priorities and selective interventions of the state concerning agriculture and overall economy have added a new historical dimension to agricultural development, giving rise to relative price differential within and between agricultural and non-agricultural sectors. This is conspicuously reflected in the stark differences in development of agricultural sector across the states. The differences existing in agricultural development across major states of India even though analysed in terms of the determinants of TFP, the question related to how the market and the process of commercialization in agriculture played their roles in widening these differences mainly through factors inducing relative price differential remains out of purview of academic scrutiny.

Given the historical difference in the natural endowments and policy responses of the states, the inter-sectoral Terms of Trade for the agricultural sector is much expected to vary across states. Moreover, the rapid changes in technology, investment and consequent growth pattern are likely to reinforce the differences unless the states lagging in the development process make a great headway on technological adoption, investment in market factor and product markets through active support of the state. The ever-perpetuating problem of regional divergences in agricultural performances and phases of stagnation could be understood with this analysis by analyzing the trends of ISTT for agriculture for major states in India and then explain the internal variation. Besides, it is even more important in the context of several measures taken by the Government to liberalize the economy, including trade in various farm products, which are bound to affect the profitability of agriculture differently in
various regions of the country. In this regard, a few studies have found significant variations in the ISTT for agriculture across the states (Acharya 2001; Misra 2004). Moreover, given the large variation in the growth rates of the agricultural sector and capital formation and changes in poverty across the states, are bound to cast serious doubts over representativeness of all India ISTT as these conceal great amount variations at regional levels (GoI 1995 and 2015; Thippaiah and Deshpande, 1998; Acharya 2001; Misra 2004). Notably, even though some studies have attempted to estimate ISTT at the state level, no comparison is made to bring out how far ISTT of one state differs from that of others and what factors explains the variations. Further, how this information could be used for the state level agricultural policy purpose. In the light of these, we undertook the study with the following objectives–

6. To provide a critical review of the issues associated with inter-sectoral Terms of Trade and the empirical estimation of long-term agricultural Terms of Trade for India. Here we shall attempt to a) analyze the methodology of ISTT used by different authors and their impacts on the results, b) compare and analyse the changes in the series over years and across studies, and review major issues associated with functional relationship between ISTT and policy related variables.

7. To assess agricultural development in the major states of India by analysing the role of market and role of commercialization in agriculture in widening regional differences in growth and development of the sector; mainly through factors inducing relative price differential and changes in Terms of Trade.

8. To estimate the ISTT for agricultural sector for major states of India, identify phases of growth in ISTT and analyse with various phases of growth in the agricultural sector and connect the two.

9. To verify the changes in agricultural different Terms of Trade series estimated in India and understand why these differ from one another’ Also to analyse possible reasons behind the differences, and

10. To investigate into the factors governing the variations in ISTT across the major states and the nexus and growth implications of ISTT for agricultural growth, investment, poverty and income distribution in the selected states
As far as literature on Terms of Trade is concerned, we find three major approaches to estimation of intersectoral Terms of Trade (ISTT) for the agricultural sector in India. In the first approach, the scholars constructed ISTT using an index of wholesale prices of agricultural commodities to that of manufacturing. The index represented a relative change in agriculture and industrial prices. The second approach for estimation of ISTT has been quite simple. Many scholars computed ISTT for the sector using the ratio of agriculture GDP deflator to non-agriculture GDP deflator, and widely referred it as Gross Terms of Trade for the agricultural sector. Lastly, using price indices of agricultural sale to non-agricultural sector and that of purchases of agriculture from non-agricultural sector, scholars computed Net Barter Terms of Trade (NBTT) for the agricultural sector. Some scholars also extended it to a single commodity or commodity groups, but due some inherent limitation in capturing intersectoral exchanges, not many studies were taken up. Among these, Net Barter Terms of Trade for agricultural sector remained to be the most popular and correct measure of ISTT. In the review of studies on ISTT in India, we, however, noticed numerous differences among the scholars on methodological issues of estimation of ISTT based on NBTT. The differences largely correspond to selection of commodity baskets of traded goods, use of weighting diagrams, selection of different units of prices, selection of the base year and aggregation problems. In the recent period, a study by Deb (2002) while analysing different series of ISTTs strikingly point out not much significant difference in the fundamental nature of long-term NBTT indices and that of Gross Terms of Trade (GBTT). The study reported the attributes of NBTT and GBTT indices surprisingly, almost similar to each other over a long and comparable period. Our extended series of NBTT and GBTT indices at all India also lead us to the same conclusions as we observed correlation coefficient (r) between the two series hovering around almost 0.83 for the period 1984-86 to 2006-07 and 0.62 in 1980-81 to 2009-10. This reassures that GBTT index is quite akin to NBTT (also see Figs 6.1a and 6.1b). Since the computations of NBTT required a great amount of information, which in some states was not readily available for a quite long period, we, therefore, resorted to computations at state-level ISTT based on GBTT. Given the objectives of our studies, we believe that GBTT would render us with not only fair estimates of

108 mean, variance, overall movements, peaks and low and high degree of correlation
state-level ISTT for agriculture but also help to explain how the ISTT estimates at All-India conceal a great level of variation across the states.

For construction of ISTT based on GBTT, we used GSDP estimate from the Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Government of India. Subsequently, to maintain uniformity, different base years series were transformed into a single base year, 2004-05 base year and using these deflators of agricultural GDP and Non-agricultural GDP series was arrived at. In the final step, State-level ISTT estimates were arrived by computing ratios of Agricultural GDP deflators to Non-agricultural GDP deflators. Since the period of 2001-02 to 2003-04 was marked by a long spell of droughts in many parts of India, we looked for base year that was normal. The period 1999-00 was normal. Hence, we decided to base our ISTT estimates by taking three years average ending 1999-00. We have estimated ISTT for agriculture for 14 major agricultural states and 6 major regions. Among the 14 states, Bihar, Madhya Pradesh and Uttar Pradesh are considered single and undivided even though Jharkhand, Chattisgarh and Uttarakhal were bifurcated from these states in 1999-00. Similarly, we have clubbed estimates of the newly borne states (in 1999-00) - Jharkhand, Chattisgarh and Uttarakhal into their parental states – Bihar, Madhya Pradesh and Uttar Pradesh respectively to maintain trends in their ISTT series.

In our overall analysis of ISTT, while explaining the factors determining the fluctuations in ISTT for the agricultural sectors of the states, we used panel regression models with three major alternative specifications- pooled OLS, random effect and fixed effect modeling.

The panel models specification with a fixed effect model and the random effect model are expressed respectively in equation 2 and 3. In the fixed effect model, we control for heterogeneity across states in the intercept parameter and random effect these are considered to be a part of the composite error term. The effect of time is captured through a time trend.

\[ y_{it} = (\alpha + \mu_i) + X'_{it}\beta + g_it + \epsilon_{it} \]  \hspace{1cm} (2)

\[ y_{it} = \alpha + X'_{it}\beta + g_it + (\mu_i + \epsilon_{it}) \]  \hspace{1cm} (3)
Where, $\mu_i$ is fixed or random effects specific to the individual (group) or time period. Errors $\varepsilon_{it}$ are independent identically distributed. Fixed effect model accounts for individual differences in intercepts assuming the same slopes and constant variance across individual (group and entity). A random effect model accounts for individual differences rather in composite error term. Here both intercept and slope of the explanatory variables are same over individuals or time period. For equation 3, we have used Feasible Generalized Least Squares (FGLS) Random effect model. Since we have taken the natural log of dependent variable, $y_{it}$, $g_i$ in this case would represent average (roughly) growth rate over a period, holding other explanatory variables constant (fixed).

In the three equations, based on availability of data, we have selected 13 indicators for analysing the behaviour of ISTT. We have used the natural log of gross Terms of Trade to represent intersectoral Terms of Trade estimated (ISTT). In explanatory variables, we have considered eight indicators in natural log forms. These included agricultural GSDP [In(agriGDP)], manufacturing GSDP [In(ManfGDP)], per capita income [In(PCI)], land productivity in terms of per hectare gross value of agricultural output [In(LPV)], area under major commercial foodgrains [In(areaacf)] and commercial non-foodgrain [In(areaaccnlf)], minimum support price index [In (MSPI)] and cropping intensity [In(CI)]. Besides, some of the variables considered for the analysis are per hectare fertilizer consumption (PHFC) of NPK, irrigation intensity (IRRINT), actual rainfall (Rainfall), extent of rainfall surplus/deficit (RainfallSD) and time to capture its effect, if any. Notably, some of these explanatory variables represent the demand and supply factors, as well as the role of commercialization of agriculture and technological progress. It is important, however, to note that since the dependent variable, ISTT, is based on triennium ending average 1999-00, we have adjusted base years of some of the explanatory variables. These included MSP index (1999-00), land productivity (1999-00), agricultural GSDP and manufacturing GSDP (1999-00). Per hectare value of agricultural output represents a change in land productivity or earning capacity of a farmer from standard unit of land in real value term. The per hectare gross value of agricultural output and per hectare fertilizer consumption are based on gross cropped area.
Among these, using the specification test, the fixed effect panel regression with Driscoll-Kraay estimates were selected to capture a region specific variations. Given the differences in agricultural development across the states, we presumed the pooled OLS method may not give us efficient and consistent parameter estimates. Nevertheless, to confirm our presumptions we included pooled OLS regression model and used other alternative model specifications, fixed effects and random effects regression models to account for the desired differences. In the three equations, based on availability of data, we have selected 13 indicators for analysing the behaviour of ISTT. The diagnostic result of the test suggested us to choose a fixed effect model, implying that the differences between coefficients are systematic and highly statistically significant and the fixed effect estimates are more appropriate to its random effect counterpart. Since our fixed effect model estimates indicated the specification bias, including group wise heteroskedasticity, autocorrelation and cross-sectional dependence, to address these problems, we used Driscoll and Kraay (1998) standard errors to correct the biases. The Driscoll and Kraay standard errors are robust to all the three specification problems and are far better than their counterparts (OLS, white, Rogers, and Newey-West standard errors).

6.3: Major Findings and Policy Implications

- The inter-sectoral Terms of Trade studies in India broadly deal with two aspects of the subject matter; i) identifications of functional relationship between Terms of Trade and a few explanatory variables; and ii) issues pertaining to methodological and data related aspects. Our investigation into former aspect indicated that though most of the theoretical and empirical literatures on Terms of Trade began with focus on international trade, development economist during the course of time completely sidelined it in their pursuit of discovering growth and development through sectoral realignment. There are hardly any studies on international Terms of Trade for agriculture on India and most of the studies pertain to intersectoral Terms of Trade and that too at the all India level. Even though some studies have attempted to estimate ISTT at the state level, no comparison is made to bring out how far ISTT of one state differs from others and what explains such differences.
The movement in ISTT for agriculture has also been one of the important components of the policy debate on inter-sectoral growth, poverty, food security, technological adoption, capital formation and agricultural price policy in India. The impact of Terms of Trade for agriculture on agriculture-industry growth; rural wage and poverty; technology (HYV) adoption, spread of irrigation, private investment, government expenditure and total factor productivity growth in agriculture is also examined quite extensively. The agricultural price policy analysis also points out various implications of change in ISTT on the economy. It was also interesting that the ISTT also matches the fluctuations in the Growth behaviour, though not with one to one correspondence.

Much of the methodological debate on estimation of ISTT in the present literature pertains to dispute over selection of representative prices, coverage of commodity baskets and the method of aggregation. In fact, Kahlon and Tyagi’s (1980, 1983) criticisms on the methodology and database adopted by Thamarajakshi (1969 and 1977) dominated the major source of academic debate behind on whether or not ISTT moved in favour of agriculture or not (Fig.6.1a). The debate, despite of being controversial has continued to influence the subsequent attempts of estimating ISTT in India. This is clearly reflected in the Government of India’s initiatives for setting up one Task Force (1995) and Working Group (2012) on Terms of Trade during the last two decades to address methodological issues involved in the estimation of ISTT (Fig 6.1b).

Whether or not inter-sectoral Terms of Trade turned in favour of agriculture in India has been a focal point of the debates in the studies dealing with methodological issues of estimation of ISTT. But none tried to get at the hypothesis that Terms of Trade has an influence on the performance of agriculture sector. Even there are three major approaches for estimation of ISTT in India, Net Barter Terms of Trade (NBTT) remains to be the most preferred and closest indicator of prices used for inter-sectoral exchange of goods and services. It is strange that the major debate on methodological issues of ISTT revolves around estimation of NBTT. The differences in the
movement of ISTT estimates (Figs.6.1a and 6.1b) largely stem due to the
differences in selection of commodity basket of traded goods, use of weighting
diagrams, selection of different prices, selection of the base year and
aggregation issues. Recently, a study by Deb (2002) while analysing different
series of ISTTs strikingly pointed out that not much significant difference in
the fundamental nature of long-term NBTT indices and that of Gross Terms of
Trade (GBTT). In fact, the attributes of NBTT and GBTT indices (mean,
variance, overall movements, peaks and low and high degree of correlation)
were found to be quite similar to each other over a long and comparable
period. This reassures that GBTT index is quite akin to NBTT(also see Figs
6.1a and 6.1b). Moreover, GBTT index can easily stand as a proxy for NBTT
and one could construct and analyse the trends of ISTT at the state level
without worrying about the cost and time to collect the information. The
estimates of ISTT based on GBTT are not only fair estimates of state-level
ISTT for agriculture but also likely to aid in explaining the variation in Terms
of Trade across the states.

![Fig.6.1: Trends of GBTT and NBTT for the agricultural sector in India (series estimated by different scholars)](image-url)
The process of commercialization, technology, extent of capital formation and the markets/prices are the major determinants of growth in the agricultural sector. These are the factors playing significant role in influencing the movements in the relative prices of commodities within a sector as also between sectors and in turn dictate the growth performance of the agricultural sector. The link between these relative price differentials and agricultural growth brings us to the question of existing regional differences in agricultural development and the alleged role of these factors in narrowing or perpetuating these. In Chapter three, we took this question and attempted to explore how the market, process of commercialization in agriculture and augmentation of resources play their crucial roles in widening the existing regional differences in agricultural development through relative price differentials. The differential behaviour in agricultural growth is brought out by looking at the growth behaviour of crops across regions as well as the extent of differences existing in resource augmentation in agricultural sectors. Overall observations suggest that India’s growth experience across the regions is quite heterogeneous and has been pointed out by many. The emergence of market and the process of commercialization have set differently in different states. Moreover, priorities and selective interventions of the state concerning...
agriculture and overall economy have added a new historical dimension to agricultural development, giving rise to relative price differentials within and between agricultural and non-agricultural sectors. This conspicuously gets reflected in the stark differences in the development of agricultural sector across the states. The process of commercialisation is quite active in a few states and shows great inclination towards horticultural crops. The area allocation to food crops although is steadily declining, fortunately it has not affected the aggregate food production. The introductions of new crops and tilt towards horticulture have undoubtedly strengthened the market forces and the market transactions across sectors. This has a strong influence on the behaviour and movements in ISTT.

- The discussions throughout the earlier chapters demonstrated that agricultural growth and commercialisation trends are not secular across states. Some states in fact have been able to take advantage of the situation, whereas others states are still lagged behind. Inter regional differentials in the growth performance have been a historical reality in India and despite long concerted efforts, we have achieved only marginal success in bringing slogging regions into the mainstream growth. The failure in increasing investment in agriculture and also provoking new technological inputs in backward and poor regions appear to be critical factors behind such state of affairs. The question, however, remains why these regions, crops and enterprises do not attract investment despite strong trends in commercialisation and horticulture? It is true that investment is attracted only if the expected value addition and returns are sufficiently good and that needs good demand for the products of the sector. Adverse Terms of Trade against agriculture suppress the incentive and thereby the adoption of new technology or fails to attract incremental investment. It is quite discouraging that most of the studies have been silent in their approaches on this aspect and happy at focusing on macro level economic scenarios. The aggregate country level ISTT for the agricultural sector in fact has a little use in explaining the decentralised growth behaviour due to large variations in ISTT and agricultural growth rates at the state level. Even though there were only sporadic attempts to arrive at the State level Terms of Trade and that has vindicated the hypothesis that movements in Terms of Trade actually provoke
investment and thereby growth, this is reflected by the movements in time series of ISTT. The adverse ToT estimates in preceding year have caused a slump in growth in a succeeding year. Therefore, the explanation of the differential growth behaviour has strong relevance with the relative ToT.

- Our results of the state level analysis (using trends and econometric and statistical measures) of ISTT series for the agricultural sector show significant difference in their behavior and the extent of fluctuations across the states (also see Figs 6.2a to 6.2f). These imply that the aggregated inter-sectoral Terms of Trade fail to account inter-regional changes in the movement of relative prices of agriculture and non-agricultural commodities. The policies based on such misleading indicator may induce further fluctuations and could harm the agricultural growth and welfare of farmers in a few states.

- The inter-sectoral Terms of Trade for agriculture show non-linear trends across the states. In the last 32 years, ISTT for agriculture in Madhya Pradesh, Rajasthan, Haryana, Maharashtra and Uttar Pradesh were better position as compared to the other states. The ISTT in these states found to be in favour of agriculture 17-19 times in the overall period, a success rate of 53 to 60 percent. Following these, the ISTT in Punjab, Gujarat, Himachal Pradesh and Tamil Nadu, were in 7-10 years (21-31 percent) favourable to agriculture. On the other hand, the ISTT in Andhra Pradesh, Assam, Bihar, Orissa, Karnataka and West Bengal were favourable to agriculture merely 4-5 times (13-15 percent) in the total period. In this groupwise analysis, the third group (Maharashtra and MP), and fourth (Gujarat & Rajasthan) as also the first group (Punjab, Haryana, and HP) found to be in a relatively better position in having ToT favourable to agriculture (15-11 times, respectively) as compared to states in sixth, (Bihar, UP & Orissa) fifth (Assam and West Bengal) and second (Andhra Pradesh Karnataka and Tamil Nadu) groups. The groups were hardly able to maintain ISTT in favour of agriculture, 4-7 times in overall period. These results indicate– i) the Terms of Trade for agriculture across the states have largely been unfavourable for the most of the period under observation; and ii) even within favourable periods, ISTT cannot be taken for granted for many states since a few years were marked with high
food inflation, droughts, poor agricultural growth and farm sector distress. Apart from these, the ISTT for agriculture across the states need to be subjected to the explanation of variations in input cost to validate whether widely held input cost stability assumption still holds true. Given the reports of increasing cost of cultivation for many agricultural commodities, the favourable estimates of ISTT for agriculture could be highly misleading.

Even though during most of the years under observations ISTT appears to be unfavourable to agriculture, we found that in many states ISTT for agriculture sector is improving over the years. That is, the ISTT for agriculture showed increasing trends from early 1980s to late 1990s. These include Andhra Pradesh, Karnataka, Tamil Nadu, Assam, West Bengal and Bihar. In case of Gujarat, wherein ISTT showed improving trends up to 1992-93, and from 1985-86 to 1997-98 for Assam. The period between late the 1990s to 2004-05, was not good for agriculture and for almost all the states, ISTT showed declining trends. It is important to note that during this period Indian agriculture was aggressively exposed to international competition and import surges thereafter. Interestingly, this was also the period in which many states affected by droughts in 2001-02 to 2003-04. 2004-05, causing lower yield, less area under crops and witnessing negative rates of growth in the agricultural sector

- In our exercise, we found that average annual compound growth rates of ISTTs for many states even though statistically significant, suffer from lower level of goodness of fit (R²). In our analysis of ISTT for agriculture, West Bengal, Assam, Gujarat and Andhra Pradesh reported significant growth rates between 1.16 to 1 per cent per annum, whereas Karnataka, Orissa, Tamil Nadu report, these were less than one per cent per annum. Rajasthan and Bihar reported negative growth rates and these were statistically significant. The growth rates reported by Maharashtra, Madhya Pradesh, Haryana, Punjab and Uttar Pradesh were statistically insignificant. In terms of the broader group, except fourth and sixth groups all reported positive and statistically significant growth rates.
Fig 6.2a: Extent of Fluctuations (Ratios) in ToTs of Group - I states from all India ToT during 1980-81 to 2011-12

Fig 6.2b: Extent of Fluctuations (Ratios) in ToTs of Group - II states from all India ToT during 1980-81 to 2011-12

Fig 6.2c: Extent of Fluctuations (Ratios) in ToTs of Group - III states from all India ToT during 1980-81 to 2011-12
Fig 6.2d: Extent of Fluctuations (Ratios) in ToTs of Group - IV states from all India ToT during 1980-81 to 2011-12

Fig 6.2e: Extent of Fluctuations (Ratios) in ToTs of Group - V states from all India ToT during 1980-81 to 2011-12

Fig 6.2f: Extent of Fluctuations (Ratios) in ToTs of Group - VI states from all India ToT during 1980-81 to 2011-12

Source- Author’s representation based on Table 3.2
The overall size of fluctuations witnessed in ISTT across States has been quite high during 1980s, low in 1990s and high with the increasing trend during the last decade. The fluctuations witnessed during the 1980s may be contributed to some special policy initiatives to reduce inter-state disparities by promoting agricultural growth in poor states. These initiatives included dissemination of improved agricultural technology, introduction of new crop varieties for rainfed regions, provision of input and price support. Even though these initiatives were taken to bridge the gap between developed and poor states, a study of Chand and Chauhan (1999) showed that regional divergence in agricultural productivity and income in fact continued to increase during this period as some agriculturally underdeveloped states progressed at a faster rate (Sawant and Achutan 1995; Bhalla and Singh 1997). Apart from these, the increasing withdrawal of state from public investment also appears to have contributed towards the fluctuations in ISTT. The fluctuations observed during the last decades are largely determined by successive droughts witnessed in many parts of country, liberalization of agricultural trade and recent food inflation crisis.

The ISTT series of Madhya Pradesh, Karnataka, Uttar Pradesh, Haryana, Himachal Pradesh and Rajasthan showed less variation as compared to ISTT of other states during 1980-81 to 2011-12. These states are largely food crop growing economies and cereals contribute a significant proportion in the cropping pattern system. These crops exhibit stability in the prices as compared to others commercial crops.

The state-specific characters have a role in explaining a large share of fluctuations/ variations in the ISTT series. The fixed or state-specific effect is quite strong and contributes almost 0.9495 percent of the total variation. Apart from these, per capita income and industrial demand for agricultural raw material, market (agricultural GDP, land productivity and area under commercial foodgrains and non-foodgrains), technological progress (cropping and irrigation intensity and per hectare fertilizer consumption), weather (rainfall and distribution of rainfall in terms of surplus/deficit), and state policy (minimum support prices) play a great role in influencing the behaviour
of ISTT at the state level. Both per capita income and GSDP from manufacturing sector show a positive association with ISTT, but only per capita income emerges with a statistically significant coefficient. The results indicate that the growth in manufacturing sector does not influence ISTT partly because agricultural raw material accounts a small proportion of its total output. However, per capita income appears to be the best indicator of aggregate demand for agricultural commodities and does influence their prices. With the increase in per capita income by one percent, ISTT increases by 0.283 percent.

- Among the major representative of market, the growth in agricultural GDP and area under major commercial foodgrains brings out adverse outcomes for ISTT. Our empirical results, in fact, indicate that (keeping other variable constant) one percent increase in the former causes a decline in ISTT to the extent of 0.257 and 0.192 percent respectively. The land productivity and area under major commercial non-foodgrains on the contrary do not show any conclusive results. Their coefficients turn out to be statistically insignificant. Despite an increase in the share of area under commercial non-foodgrain crops in the recent periods, its adverse impact on ISTT seem to have been moderated by the higher level of relative profitability of these crops, keeping the incentives of the farmers to allocate more area under these crops. The unit prices of major commercial crops over 1970-71 to 2011-12, although showing a declining trend, their relative prices appear to be far better to the counterparts.

- The role of technology having a positive influence on ISTT is prominently recognized in the past. In our empirical study, we, however, found that the technology per se in not homogeneous units and therefore can influence the behaviour of ISTT both positively and negatively. Our results pertaining to per hectare fertilizer consumption (PHFC) and cropping intensity in fact show positive impact on ISTT, whereas it appeared to be negative in the case of irrigation intensity. Moreover, the sporadic studies in the past exploring the relation between technology and ISTT or that with agricultural output and investment use area under HYV crops as an indicator of technology. That is an
unstable indicator. The variable even though important covers the area of only
a few crops, mainly paddy, wheat and maize and jowar. Besides, it is arrived
at by dividing the seeds sold divided by the prescribed seed rate than the
actually sown area. Whereas, in the last four and half decades, we have
witnessed several technological improvements on the front of seed of coarse
cereals, pulses, oilseeds, cotton, sugarcane, condiments and spices and fruits
and vegetables. This undoubtedly appears to be a limited indicator of
technology and its adoption. Even though, a few studies (Hazell et al 1995 and
Misra 2004) have used the area under irrigation as an indicator of technology,
it also suffers from errors of inclusion of crops that are not witnessing any
technological intervention or progress and exclusion of crops, which do. As
compared to area under HYV, the use of per hectare fertilizer consumption,
irrigation and cropping intensity ratios appear to be far more appropriate
indicator for technological progress. In fact, our results make a strong case for
evaluating the impact of technology by differentiating it into constituents.

- The Minimum Support Price index (MSPI) shows a positive influence on
ISTT for agriculture. The extent of impact, however, is less than proportional
(0.3959 percent) to change in the MSPI (1 %). This could be due to fact that a
limited number of crops and farmers are able to take the benefits of price
support measures. The results of a recent situation assessment survey of
agricultural household amply demonstrate this.

- Any good monsoon often resulted into bumper agricultural production,
causing agricultural prices to fall. Whereas, bad monsoon created shortages of
agricultural produce and propelled higher prices, but yield loss caused during
these periods often deprived the agricultural sector from taking any additional
advantage. Our empirical results on the extent of rainfall and percentage
deviations (surplus/deficit) from their historical averages provide enough
support to maintain these hypotheses. Our empirical results clearly suggest the
adverse impact of an increase in actual rainfall on ISTT for the agricultural
sector. We, however, like to exercise constraint, as it could also be subjected
to serious misinterpretations. A moderate increase in the actual rainfall on the
wider geographic region may in fact be good for higher agricultural

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production (causing agricultural prices and ISTT to fall), but the same logic does not hold in the case of an extreme amount of rainfall. This could therefore, be supplemented by the distribution of rainfall in terms surplus and deficit events and its implication for ISTT

- Since agricultural production is quite vulnerable to extreme weather events, such deviations (actual rainfall from its historical averages) in general must represent bad outcomes for both agriculture and farmers due to loss of yield/production and that exercises upward pressure on agricultural prices. Our results suggest that 1 percent deviation in actual rainfall from historical mean causes an average increase in ISTT by 0.00162 percent. It is miniscule, but still has an influence. Even though the size of effects of rainfall is marginal, if we factored out rainfall from countervailing factors such as assured irrigation might give us more meaningful results. Nevertheless, we believe that a marginal increase in rainfall may result in an increase in the agricultural production and thereby affect ISTT negatively by posing a downward price risk. Further, increase in surplus or deficit in the rainfall may also increase ISTT, but at the cost of yield loss driven by weather risks.

- A brief review on Terms of Trade, investment (public and private) and growth in agricultural GDP revealed a few phases of ups and down in the trends. In the first phase (1981-82 to 1994-95), both ISTT and GBTT at all India level remained unfavourable to the agricultural sector. Nevertheless, significant growth in productivity and production seems to have helped in raising higher investment in the sector despite of negative growth in the public investment. In the second (1995-96 to 2006-07) ISTT even though turned out to be in favour of the agricultural sector, the agricultural sector witnesses deceleration in the growth of agricultural GDP. Both NBTT and GBTT reported negative growth. In the third phase (2007-08 to 2011-12), GBTT, private investment and agricultural GDP showed a sharp increase in their growth rates. The overall results indicate a close association between agricultural growth performance and private investment and ISTT (GBTT). This, however, does not seem to be true in the case of public investment, agricultural GDP and
ISTT. The public investment decisions in the agricultural sector are not driven by ISTT considerations, but agricultural growth in particular.

- The growth in ISTT for the agricultural sector differs across the states and phases. The growth rates reported in the third phase, although are higher than those of first and second phases, these have largely overshadowed by the growth rate of Maharashtra, and Gujarat (8-12 percent) followed by Tamil Nadu, West Bengal, Uttar Pradesh and Punjab (6-8 percent). In the first phase, annual compound growth rates of ISTT varied between 0.1 to 2 percent. In the second phase except Madhya Pradesh and Gujarat, almost all the states reported negative growth rates. The growth performance even of these two states not praise worthy (less than 1 percent). The impact of ISTT on agricultural GDP despite being positive, it is not statistically significant. In fact, in the overall growth matrix of ISTT and agricultural GDP, we observe almost in 39 percent (Assam) to 68 percent (Maharashtra) cases, ISTT has been inversely related to agricultural GDP. Out of the total 31 years reported cases, we find only 7 to 15 cases in which growth in ISTT led to higher growth in agricultural GDP and in 3 to 6 cases decline in growth of ISTT led to negative growth in agricultural GDP.

- The relation between ISTT for the agricultural sector, poverty and income (monthly per capita consumption expenditure) inequality in India has undergone serious changes over last four decades. The rural and urban poverty ratios in India have come down, but the economic growth with inclusive policies of the states in the recent period has reduced a large number of poor from SC/ST and OBCs. The targeted programmes like MNREGA, subsidized food and housing and other empowering initiatives of course have contributed significantly in poverty reduction. In fact, in the recent past, we have witnessed a lower level of poverty outcomes despite of a significant increase in GBTT. These changes, of course, have come about due to the declining share of expenditure on food, which has reduced an adverse influence of higher prices on poverty, and the diversification of income within the agricultural household. Income inequality in rural area, though show some marginal increase in the recent period, in urban areas it has continued to
increase over time. The growing concentration of wealth and capital in a few hands, a large influx of poor into the urban locations and low level of human capital are some of the major reasons causing continuous rise in urban income inequality.

- The ISTT, poverty and inequality at the state level, even though more or less reflect all India level trends, the correspondence between these, however, appear to be weak due to variations across the states. These variations largely come from historical differences in resource endowment and policy responses, putting them at different growth trajectories. In the first phase (1983-84 to 1993-94), the ISTT for agricultural sector show significant rates of growth across the states ranging from 0.25 to 3.41 percent. Notably, many states despite having Terms of Trade against agriculture benefited immensely from the improvement in their ISTTs and the positive impact of this was felt on reduction in consumption inequality and poverty. In the subsequent phases (1993-94 to 2004-05), the ISTT reported negative growth rates across the states. Moreover, the consumption inequality increased in both the rural and urban areas with a significant decline in the poverty ratios. During the third phase (2004-05 to 2011-12), on the contrary, ISTT has not only shown improvement in favour of agriculture and reported significant rates of growth across the states except in a few like Karnataka, Maharashtra, Rajasthan, Assam and Bihar. The rural and urban poverty ratios during this period reported a remarkable decline with the simultaneous increase in the consumption inequalities. It is not that the increase in ISTT did not influence income of a large number of poor, particularly agricultural casual labourers and marginal farmers, it had also shown a strong influence through social security programmes and declining share of food items in the total consumption expenditure. It was noticed that increased employment opportunities and agricultural wages have compensated the loss incurred due to the price effect. Most importantly, the incidence of inequality within and across the states and regional variations in rural poverty has increased sharply in the post economic reform period. The widening the rate of growth within and across the sectors seems to have increased the structural inequalities. In rural areas, these inequalities to some extent were managed by increasing the
employment opportunities in non-farm sector, but urban areas it appears to have utterly failed. The variations in rural poverty in fact have been closed associated with the agricultural performance and more recently with the expansion of employment generated through various schemes.

- The correlation matrix of ISTT, with poverty and income inequality indicated higher levels of ISTT scores are positively associated with higher levels of rural consumption inequalities but negatively with that of urban. Moreover, higher levels of ISTT scores are also associated with the lower level of rural poverty ratios and higher level of urban poverty ratios. Of course, there are a few some exceptions to this, but in a large number of cases, these observations hold true. As far as the association of ISTT levels with that of consumption inequality and poverty is concerned, these were observed to be ranging from very weak to average level. This in fact suggested that the ISTT does influence the poverty and inequality outcomes, but its strength to affect the outcomes is quite weak. In an alternative scenario, the correlation matrix considering the long period does indicate higher levels of growth in ISTT positively associated with higher levels of change in rural consumption inequality and negatively with that of urban and net changes in poverty in general. The strength of the association in case of the latter, however, appears to be quite on shaky ground to make some conclusive statements.

6.4: Limitation and Future Scope

Our analysis of Terms of Trade for the agricultural sector is mainly based on Gross Barter Terms of Trade (GBTT), which has a few inbuilt limitations. Even though computation of GBTT requires less time and resources and serves better in identifying trends and variations in ISTT at the regional level, it is difficult to decompose the total variations in the series due to data constraints. The efforts for computation of Net Barter Terms of Trade therefore could be additionally made at the State level with a new data set on costs to overcome the limitation of GBTT. Our feeling, however, is that the results of final analysis will not differ, except that it will be a finer exercise. More importantly, as far as the debate over the computation of ISTT is concerned, it has remained more technocratic, farmer unfriendly and directionless in giving proper
policy feedbacks. We tried our best to make the ISTT series usable as a policy tool at the State level policies. The relevance of ISTT in fact cannot be discounted, if it does not serve in giving a fine tuned picture of the changes witnessed by the agricultural sector in general and farming community in particular. Despite of serious efforts of several scholars in setting the indicator right, we have not been able to exactly establish whether so called favourable Terms of Trade for agricultural sector has really been beneficial for farming community. As the exercises are post facto and hence we can only give a historical picture with a warning to observe closely the immediate neighbourhood determinants. Notably, the phenomenon of good harvest bad prices (unfavourable ToT) or bad harvest good prices (favourable ToT) is yet to be factored in the policy while concluding hypothesis or giving further clues for policy. The current exercises or practice of suggesting, whether Terms of Trade for agriculture is favourable or not are inadequate and hence need to be supplemented by indicators such as index of net farm business income from crops at regional and sub-regional level. While referring to index of net farm business income, we of course do not mean the productivity index, which many scholars and policy advocates blindly used. It should be noted that the higher level of productivity in agriculture do not necessarily guarantee higher income as it may bring down the prices or vice versa. In the list of possible outcomes, the chances of higher productivity giving higher net income may be one to infinity, and not one is to one.

The future debate on Terms of Trade for agriculture should look forward to account the growing composition of small and marginal farmers, sustainability of livelihood along with sectoral aspects of growth and development. The large number of unorganized farmers and the predominance of small and marginal farmers are some of the major challenges in managing the stability in the agricultural prices and ISTT for the agricultural sector. Most of these farmers are constrained with the poor infrastructural capabilities and less equipped to deal with weather and market related risks. Even though some of them exercise most efficient production decisions, but returns received to them on higher yield are fraught with glut in the crop production and inadequate infrastructure. The lack of coordination and exposure to weather and market risk seriously undermine their efforts for higher income and overall well being of these group. The normal exercise of linking price with their income is fraught with serious lacunae and therefore, favourable ISTT for agricultural sector cannot
guarantee a good income level for the farmers as it might have come at the cost of loss in the yield. With greater diversification in the production, these problems could be handled to some extent. Nevertheless, there remains still a greater challenge in extracting the meaningful relations between ISTT for the agricultural sector, the factors influencing it and make use of that model for the purpose of tuning the policy indicators. Using information on the number of farmers growing particular crops and prices, net income they received/generated, technology adoption, capital formation at micro level might be useful in making the entire exercise of estimation of Terms of Trade relevant for policy, rather than having broad theoretical arguments fraught with assumptions.