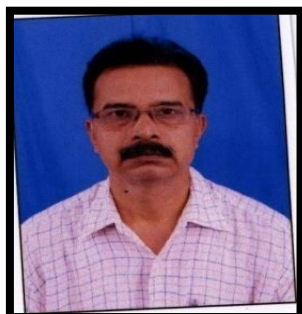# Impact of Trade Liberalisation on Agricultural Products in India: A Comparative Analysis of Pre and Post Reform

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This paper aims to investigate how the 'liberalisation of trade' which is a part of the global synchronisation namely LPG (Liberalisation, Privatisation, and Globalisation) has affected the trend, composition, and pattern of trade in agricultural products in India, by studying 34 years of performance during the post-reform period (1990-91 to 2013-14) and the immediate pre-reform period (1980-81 to 1989-90). It demonstrates that the post-reform period has been characterized by an acceleration in the growth rate of production of tradable agricultural products as well as increasing trend in its share in total national trade. The results are empirically tested with simple descriptive statistics like dummy variable regression model and annual growth model with the help of different variables and their ratios like TAP to TT, TAT to TT, TAT to GDP at factor cost, agricultural export and agricultural import. The economic interpretation of the result reveals that there is positive ascendancy over the concerned ratios and the share of agricultural trade to Total Trade has been increasing in the post-reform period. But in the face of global competitiveness and a shortage of food grains in the domestic market, it is becoming hard to maintain a constant level of contribution in export and earn a surplus in agricultural trade. More solid and consistent trade policies needed to be initiated in order to reap the benefit out of trade liberalization on our primary sector.

Key Words: Trade liberalisation, Agricultural export and import, 1991 Reform

1.1 Introduction:

It is a saying that, "Everything Else Can Wait but Not Agriculture."

LPG (Liberalisation, Privatisation, and Globalisation) is the new buzzword that has come to the world since the dawn of the nineties of the last century. Liberalisation as a part of this worldwide phenomenon (LPG) has become a major component in the reform process of the

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Indian economy in the year of 1991, July 24 with the introduction of New Reform Policy. Liberalisation has initially been employed in the trading sector to bring out changes, but soon has spread and grabbed another sphere of the economy as well. Agriculture is the backbone of Indian society and considered as the primary sector in Indian economy. Thus it is important to study the growth and development of agriculture when the economy is changing through this new phenomenon of trade liberalisation. Liberalisation can be defined as "complete freedom of enterprise, reduction in government regulations for economic activities to the minimum and reduction in tariffs and taxes." In the light of this definition, agricultural trade is already been liberalised. From the pre-British period, India was quite famous for foreign trade and was always a nation of primary products exporter. However, the pattern of trade in the agricultural sector has been changed and this reform process had brought new opportunities for trade in the agricultural sector in India.

1.2 Theoretical Background:

India needed a reform of her agricultural policy-measures as her productivity in agriculture is far below the level of the world's average. India ranks 15th in the paddy production (2145 kg/ha against the world average of 2340 kg/ha), 11th in the wheat production (2032 kg/ha against the world average of 2340 kg/ha), 13th in the maize production (1355 kg/ha against the world average of 3656 kg/ha) and 14th in the pulse production (544 kg/ha against the world average of 807 kg/ha) before 1991. History says that a marked rise in agricultural production always preceded by industrial development. Revolutionary changes in agriculture can bring about a viable base for modern industrial structure in India.

Mr. B.B. Ramaiah, the union minister of state for commerce, had announced a five year Ex-Im policy (1997-2002). This policy significantly cut down the list of quantitative restriction on imports as well as exports, simplifies procedures, and provides special incentives for trade in agricultural products. Among the two-thirds of the items which are removed from the restricted list to Special Import Licence (SIL) and Open General Licence (OGL) lists, some agro-products such as corn flakes, coffee, edible gums etc were the important one. The policy aims at consolidating and tries to restructuring the schemes to achieve further gains from the liberalisation of trade in agricultural products. The national income from agriculture has risen from Rs. 58,921 cores in 1990-91 to 60,934 cores in 1993-94 (1.1% per annum). The food grains production of 21.4 million tonnes in 1991-95 has increased by 189.8 million tonnes in 1994-95 in just four years. India had a 0.6% of total world trade in agricultural products. Liberalisation of trade may involve a rise in the domestic relative prices of food grains by about 15 to 20%. [WB Report: 2000].

1.2.1 Impact of Trade Liberalisation on Agriculture[3]:

It has been one of the principal aims of the government from the beginning of the first Five Year Plan to raise the share of agricultural products in national trade. To ensure free trade and trade openness facilities in agricultural products, several steps have been taken to keep pace with the growing competition created by trade liberalisation. Some of them are, (i) Many of the quantitative restrictions on agricultural trade have been dismantled and decanalised. (ii) The government has recently allowed hedging of agricultural products in global exchanges.

(iii) The government has amended the Forward Market Commission and freed the agricultural prod[4]ucts, to let them enter into the international markets.

Opening up of agricultural trade, among various possibilities, can bring major economic acceleration by exploiting the comparative advantage in the agricultural sector in India. By granting the farmer access to world markets, can increase his incentive to invest in the farming. An important thing to notice is that as the import content of agricultural sector in Total Trade (hereafter TT) is insignificant in comparison to the non agricultural sector, the total gains from trade as well as foreign exchange earned through agro-export, is more.

1.3 Setting objectives for the study

1. While the era of reform was establishing a new economic foundation, the agricultural trading was also in the process of simultaneous change through the help of liberalisation. Therefore it has become necessary to study that "how liberalisation of trade had affected the trend, share, composition and pattern of trade in the agricultural products, by comparing the pre and post liberalisation or reform period". It starts on the foundation of two research questions viz. one is "what is the performance of the agricultural product in the field of trade after being influenced by trade liberalisation?" And second is "how the pattern and composition of agricultural trading products change over time after trade liberalisation?" Based on these said research questions, the following two important objectives are taken in the paper.
2. To measure the influence of trade liberalisation on total agricultural trading products
3. To examine how trade liberalisation had affected the composition and pattern of trade in agricultural products

The paper has been organized into 5 sections. Besides the section-1 of introduction, section-2 deals with the review of the works of literature focusing on nature of the relationship between liberalisation of trade and agricultural production. Section-3 is the brief description about the variable, data sources and proposed methodology used in the analysis. The empirical analysis is explained in section-4. Lastly, the section-5 concerns with the concluding remarks and suggests certain policy implications of the results derived from the present research.

2.1 Reviews of Literatures

The review in this study is restricted mainly to the literature on the impact of trade liberalisation on the agricultural sector. There are also studies at international level, comparing the developed as well as developing countries and studies at the national level. However, with respect to the timeframe, the methodology employed, the nature of data used, the number of variables examined and the estimation procedures adopted, the conclusion of the studies varied widely. The studies reviewed are arranged in chronological order so that it enables us to trace their historical evolution, the improvement in data coverage and estimation procedure, which contribute to the stock of knowledge for researching this study.

The review of voluminous works of literature those are available on the liberalisation of trade and its impact upon Indian agricultural products reveal a strange mixture of outcomes. Here, some of the most relevant works of literature, which focus on positive, negative or both sides of the said relationship, are critically analysed below.

2.1.1 The International Scenarios:

Many variations have been found in the researches done in different developing nations. Brandao and Will Martin (1993) had viewed that, the policy of trade liberalisation imposed a positive impact on the developing economies. Tengku Ahmad, Tawang (1999) as well as Vyas (1996) had tried to find the effects of agricultural trade liberalisation and the issues faced by the policymakers in certain developing countries of Asia. Bureau, Jean, and Matthews (2005) gave very different views suggesting that the impact of agricultural trade liberalisation on developing economies is very unequal. They had found a negative growth trend in agricultural trade over the last few decades after liberalising the trade in agricultural commodities. Giving suggestions Maralusiddaiah et al (2015) suggested that, India has to be carefully guiding its course in order to reap the benefits out of trade liberalisation in the agricultural sector.

2.1.2 The National Scenarios:-

Hanumantha Rao and Ashok Gulati (1994) has also agreed on their findings and reckoned that Indian agriculture is moving in a positive direction towards a new era because of economic reforms and opening up of Indian agriculture into the global market. For achieving this, they suggested broad policy changes as well as a major reform on the supply side. Parikh et al. (1995) have examined the impacts of liberalisation, reduction of input subsidy and safety net programmes for Indian agriculture after the New Economic Policy was initiated in 1991 and found an astonishing result that trade liberalisation in non-agricultural sector is more important for agricultural growth than the trade liberalisation in the agricultural sector. Similarly, Srinivas (1996) analysed the emerging global trade regime and liberalisation of trade and he found a negative impact of trade liberalisation on the sustainability of agriculture. Misra (1998) discussed both the positive and negative effects of globalisation on Indian agriculture from pre-reform (green revolution) period to post-reform till 2006-07 and found a favourable effect of liberalisation on the trade of agricultural commodities. Chand Ramesh (1999) found that liberalisation leads to an opposite or inverse impact on consumer and producer surplus and it earned negative gains from trade with a loss of social welfare.

Meanwhile, Nayyar et al. (1994), Deshpande et al (2004), Ranga Reddy et al (2008), did a comparative study of pre and post-reform period and discovered that performance of the primary sector's contribution in trade for long-term was quite satisfactory during the period of globalisation but it led to a conclusion of bad performance during the nineties while comparing the aggregate growth analysis. They discussed the macro level changes (positive and negative sides) of globalisation on Indian agriculture. Moreover, Krishna Kumar et al (1995), giving emphasis on export of 'tea' showed a supply and price relationship between essential agricultural commodities. Bhalla (1996) introduced a negative growth trend of liberalisation on agricultural trade through examining the demand and supply of agricultural commodities in general and some other commodities like food grains in particular, in domestic as well as in international market. Likewise, Gulati et al (1997) found that India can reap significant gains from trade liberalisation if it frees up imports and exports of agricultural products at zero duty. But, Minocha (1995) pointed out that the trade policies of the government had always discriminated against agriculture. In addition, Vaidyanathan (2000) supported this argument and described the inefficiencies of Indian economy and her incapability of drawing any benefits from the process of liberalisation.

Here some of the works of literature advocated that there is the positive association between trade liberalisation and agricultural trade by following a well-defined mechanism. They were

of saying that trade liberalisation had a positive impact on the export-import indicators of the Indian economy through discarding bans on international trade, farm subsidies, market reforms, and liberalisation of farm input sector, an adaptation of agricultural export promotion & agricultural import substitution etc. Other literatures were there which argued the negative compatibility of said variables. They prescribed the ways of heavy export of agricultural raw materials, heavy import of agricultural proceed items, the departure of agricultural item manufacturing units from the market due to tight competition in the global market etc, by which the trade liberalisation had affected the agricultural trading scenario unfavourably.

After discussing these kinds of arguments, it can be summarised that there is no concrete link between the concerned variables. Thus, the impact of trade liberalisation on agricultural products was very inconclusive, un-simplified as well as conditional so far.

3.1 Variables, Data Base and Its Sources:

The present study comprises annual time series data on the variables like Total Agricultural Trade (hereafter TAT), the total volume of national trade or Total Trade (TT), growth rate of GDP (proxy for economic growth) as well as Agricultural Export (AE) and Agricultural Import (AM) of different crops. The study also includes three critical and proxy variables like TAT to GDP ratio, TAT to TAP ratio and TAT to TT ratio in order to capture the influence of trade liberalisation on total agricultural trading products. The dataset has been sourced from the secondary database namely Planning Commission of India, Indiastat, Hand Book of Statistics (RBI), Ministry of Agriculture (GoI), Directorate General of Commercial Intelligence and Statistics. The data comprises of the periods of 34 years spanning from 1980-81 to 2013-14, classified on the basis of pre-reform (1980-81 to 1990-91) and post-reform (1991-92 to 2013-14) period.

3.2 Specification of Methodology:

So far as the methodology to be applied in the current study is concerned, the simple descriptive statistics (both graphical and tabulation) formulas are employed in order to examine the trend, pattern, and composition of different critical variables. For empirical analysis, the dummy variable regression model and its estimation with Ordinary Least Square (OLS) and annual growth rate model have been used in order to determine the statistical significance of trade liberalization on different variables.

The section-2 explained some description about the data sources and methodology, which is to be employed to give an empirical touch to the theoretical nexus of the interesting variables, inflicted in the study.

3.2.1 Dummy Variable Regression Model:

Dummy variable model can be of two types, ANOVA and ANCOVA. Regression models that contain only dummy explanatory variables are called analysis-of-variance (ANOVA) model. On the other hand, a model is said to be ANCOVA, if the regression equation carries both quantitative and qualitative explanatory variables. The operation and usability for dummy variable analysis can be explained by a simple example. Let us take an example of simple dummy variable regression model implying a relationship between salary 'Y' and graduation 'X'. It is assumed that the salary offered is the function of the educational qualification of the workers, i.e. higher payment with higher qualification. In order to capture

the influence of qualification differentiation of the salary payment, the following regression should be run,

$$Y_i = \beta_0 + \beta_1 D_i + u_i$$

Where, Y_i = salary of the 'i' th worker

D_i = dummy variable for educational qualification

D = 1, if worker has graduation

D = 0, if worker has no graduation

u_i = disturbance term, (satisfying the white noise condition)[5]

Estimation of the Equation:

Mean salary of the workers below graduation equals to,

$$E(Y_i / D_i = 0) = \beta_1 + \beta_2(0) = \beta_1$$

Mean salary of the workers above graduation equals to,

$$E(Y_i / D_i = 1) = \beta_1 + \beta_2$$

Interpretation of the Equation: The intercept term β_1 gives the average or mean salary of non graduated students, and that the slope coefficient β_2 tells us by how much the mean salary of graduate students' counterpart; $(\beta_1 + \beta_2)$ gives the mean salary of graduated students.

Testing of the estimated co-efficient: Here, "student t test"[6] will be entertained in order to ascertain the statistical significance of the estimated co-efficient like β_1 and β_2. In econometrics, it is customary to take null hypothesis to do the said testing.

The null hypothesis is $H_0 : \beta_1 = 0$

The alternative hypothesis is $H_1 : \beta_1 \neq 0$

$$t^* = \text{estimated } \beta_1 / SE_{\text{estimated } \beta_1}$$

The computed t^* value is compared to the tabulated values of t with n-K degrees of freedom.

If $t^* > t_{0.025}$, we reject the null hypothesis and we accept the estimated β_1 is statistically significant.

If $t^* < t_{0.025}$, we accept the null hypothesis and we conclude that the estimated β_1 is statistically insignificant at 5% of level of significance.

Similar testing approach will be followed for testing the statistical significance of other parameter i.e. β_2

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[5] White noise refers to the fulfilment of the usual assumption of the classical linear regression model viz zero mean of error term, no multi-co linearity, no auto-co relation, homoscedasticity

[6] Student t test has been attributed by W. S. Gosset who wrote under the pen name student which gave the name of the 't' distribution. The sampling 't' distribution in $\bar{X} \sim N(\mu, S^2_x)$ and the transmission statistics is $(\bar{X} - \mu)/ SE_x$, and t distribution with (n-1) degree of freedom.

The null hypothesis is $H_0 : \beta_2 = 0$

The alternative hypothesis is $H_1 : \beta_2 \neq 0$

$$t^* = \text{estimated } \beta_2 \, / \, SE_{\text{estimated } \beta2}$$

The computed t^* value is compared to the tabulated values of t with n-K degrees of freedom.

If $t^* > t_{0.025}$, we reject the null hypothesis and we accept the estimated β_2 is statistically significant. It exposes that mean salary of graduated student is higher than non-graduated student by β_2 amount, which is nothing but co-efficient of dummy variable. Finally, we conclude that dummy variable arrests the nominal features of the variables framed in the regression equation.

If $t^* < t_{0.025}$, we accept the null hypothesis and we conclude that the estimated β_2 is statistically insignificant at 5% of level of significance.

Use of dummy variable for measuring structural break: The dummy variable model, as an alternative model to Chow test, examines the structural stability of a regression model, in which either intercept or slope or both parameters undergo a change over time. In simple language, the structural changes demonstrate the value of the parameters of the model doesn't remain the same through the entire time period.

Let us define the model as

$$Y_t = \alpha_1 + \alpha_2 D_t + \beta_1 X_t + \beta_2 (D_t X_t) + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where Y = saving

X = income

t = time

D = 1 for observation belong to 1980-91

D = 0 otherwise (i.e. for observation belong to 1991-2013)

Mean saving function for 1980-91

$$E(Y_t / D_t = 0, X_t) = \alpha_1 + \beta_1 X_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

Mean saving function for 1991-2014

$$E(Y_t / D_t = 1, X_t) = (\alpha_1 + \alpha_2) + (\beta_1 + \beta_2) X_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

In equation (1), α_2 is the differential intercept, and β_2 is the differential slope co-efficient. The slope drifter indicating by how much the slope co-efficient of the second period's (1991 to 2014) saving function, i.e. the dummy variable of 1 differs from that of the first period (1980 to 1991). The main regression equation (equation-1) can be used to test a variety of hypothesis.

Therefore, the dummy variable has a distinct advantage in its use and approach. It not only tell us the two regression equations are different unlikely in Chow test but also explains the sources of the differentiability; whether it is due to change in intercept or slope or both.

3.2.2. Annual Growth Model:

Our Growth Model (4) is as follows:-

$$Log(Y) = C_1 + C_2 (T) + e \qquad .... (4)$$

Here, Y = Sales Volume (in dollar) but in converted to log

C_1 = constant

C_2 = coefficient

T = Time period, 1980 to 2013

e = residual

The equation (4) is a semi-log model as only one variable (in this case the dependent variable) is in log form.

What is the sales growth rate over time?: This paper shall be estimating the equation (4) and to the residual tests. The estimated model (4) should not have serial correlation or auto correlation, residual should be free from heteroscedasticity and residual must be normally distributed. In addition to this, residual of model (4) should be stationary. For testing the stationary, we shall be using correlogram (Q statistics). Here,

Null Hypothesis (H_0): Residual is stationary

Alternative Hypothesis (H_1): Residual is not stationary

The estimation shows,

- There is no serial correlation.
- The residual is normally distributed.
- There is no heteroscedasticity.
- The residual is stationary.

So, we can say that our estimated semi-log model (4) is valid. This model is alright for growth prediction or growth estimation.

4.0 Empirical Analysis

Here different empirical analyses are applied on different variables owing to address the stipulated objectives of the paper.

4.1 Section-1: In this section, the simple descriptive statistics (both graphical and tabulation) formulas are employed in order to measure the influence of trade liberalisation on total agricultural trading products over the periods of 1980-81 to 2013-14.

4.1.1 Analysis of Average Growth Rate of GDP and TAP:
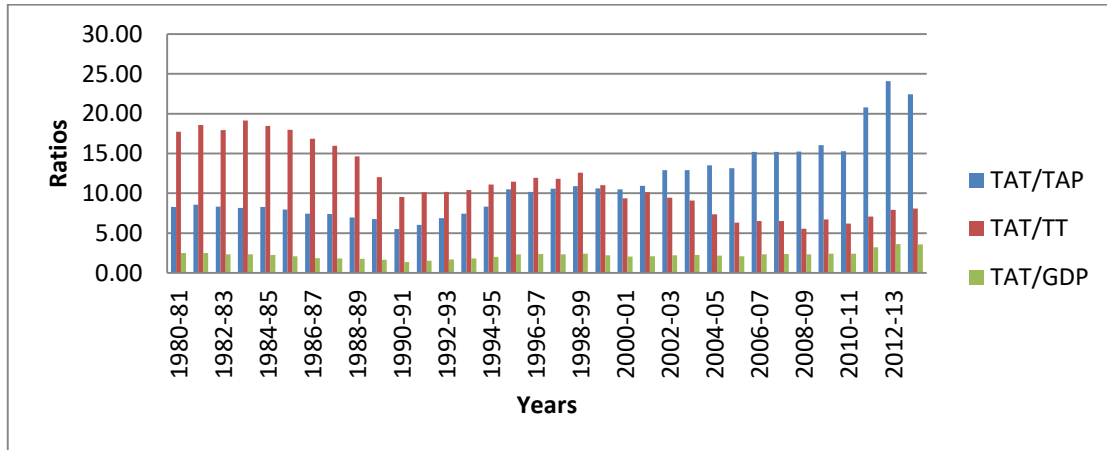
Figure-1
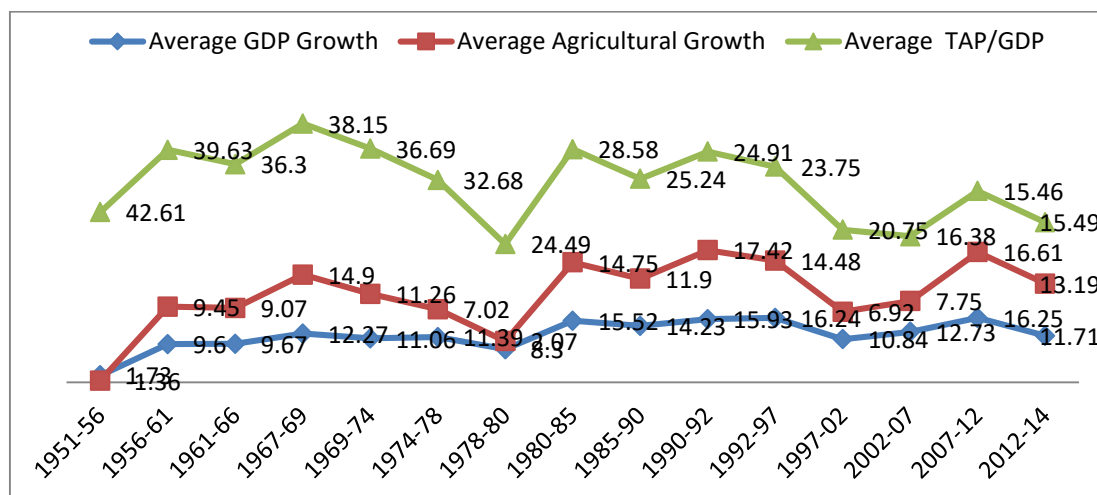
Source: Author's Estimation

This first figure and appendix: table-1 reflects the trend of the average growth rate of GDP, agricultural products and the ratio of average TAP to GDP. It analysed the trend on the basis of division of pre reform into phases of Green Revolution (GR), which are further sub-divided into planning periods. It shows that the Average Growth rate of GDP increased from 1.73% in 1951-56 in pre GR to 12.27% in 1969-74 in early GR period. During the same time period, i.e. the 1st phase of GR, the average agricultural growth increased at a much higher rate i.e. 14.9%. This becomes possible because of prioritising agriculture in the 1st FYP as well as for implementation of GR in Indian agriculture. So that it becomes possible to reach the highest average growth ratio of Total Agricultural Product to GDP of 38.15%, in that 1st phase. After that period, in the 3rd phase of mature GR period, both GDP and agricultural growth has gone down which leads to a fall in the ratio of Total Agricultural Trade (TAT) to GDP to 24.49%. Then the reform has started and new policy of trade liberalisation has lead to a rise in the agricultural production which can be seen in the figure. The New Economic Policy (NEP) in Indian economy was initiated with focusing on the development of agricultural sector by path of trade liberalisation.[7] At the starting of 5th phase, the growth trend was not much significant as it was again decreased to 15.49% by the end of 2012-14. Thus India has to be carefully guiding its course in order to reap the benefits out of trade liberalisation in agricultural sector.[8]

4.1.2 Trend and Growth Analysis of Agricultural Trade to Total Trade:

[7] Krishnaswami, K.S., (1994), "Agricultural Development under the New Economic Regime", Economic and Political Weekly, Vol. 29, No. 26, pp. A65-A71

[8] Maralusiddaiah, H.M., and K.G. Ramesha, (2015), "Impact of globalisation on Indian Agriculture", International Journal of Social and Economic Research, Vol. 5, Issue. 1, p.p. 119-146

Figure-2

Source: Author's Estimation

At the first look, the figure suggests that the ratio of TAT to TAP at the primary stage was down to 8.28%, which reached to 24.10% by the year of 2012-13. It only ever started to fall in the mid-1980s and reached its minimum point in the year 1990-91 at 5% before the liberalisation. By liberalisation, the share of agricultural trade has always been rising up in the post-Economic Reform period. Similarly, the ratio of TAT to TT in the figure indicates that it was just the opposite of the case of TAT to TAP. It was highest at the primary stage and fall down afterward. This suggests that, although the ratio of agricultural trade to agricultural production is increased, the share of agricultural trade to total trade is decreasing. The Economic Reform has touched other two sectors of the economy and increased the productivity more prominently than that of the primary sector. Thus the ratio of TAT to GDP is also not very promising, which is also suggested by the figure. From the above analysis, it is cleared that the percentage of TAT to TT is not very encouraging over the years. The figure demonstrates a downward trend about the share of agricultural products to the total volume of trade.

4.1.3 Empirical Analysis and its Results: The present analysis takes TAT to GDP ratio, TAT to TAP ratio and TAT to TT ratio as proxy variables to be examined in order to know the previously mentioned performance. In addition, it will compute the presence of structural breaks in the series.

4.1.3.1 Dummy variable Estimation and its Results: The three dummy variable equations of three different ratios can be written in the following manner.

$$\text{TAT\_GDP} = \alpha_0 + \beta_0 \, \text{DUMMY (T-1991)} + u_0 \ldots \ldots \text{(1)}$$

$$\text{TAT\_TAP} = \alpha_1 + \beta_1 \, \text{DUMMY (T-1991)} + u_1 \ldots \ldots \text{(2)}$$

$$\text{TAT\_TT} = \alpha_2 + \beta_2 \, \text{DUMMY (T-1991)} + u_2 \ldots \ldots \text{(3)}$$

Where α_s = intercept co-efficient

β_s = dummy variable co-efficient or slope parameter

u_s = white noise stochastic or disturbance term

Here, Dummy = 0, if the time period belong to 1980 -1990 (pre reform)

Dummy = 1, if the time period belong to 1991 – 2013 (after reform)

After performing ordinary least square method of estimation of dummy variable regression co-efficient, the following results tabulated in table-1 have been derived.

Variables	TAT to GDP Ratio (TAT_GDP)		TAT to TAP Ratio (TAT_TAP)		TAT to TT Ratio(TAT_TT)	
Equation	TAT_GDP = α_0 + β_0 DUMMY(T-1991) + u_0		TAT_TAP = α_1 + β_1 DUMMY(T-1991) + u_1		TAT_TT = α_2 + β_2 DUMMY(T-1991) + u_2	
Estimated Co-efficient	$\hat{\alpha}_0$=1.70*	$\hat{\beta}_0$=0.38*	$\hat{\alpha}_1$=6.82*	$\hat{\beta}_1$=2.82*	$\hat{\alpha}_2$=13.80*	$\hat{\beta}_2$=-2.99*
Standard error	0.11	0.14	0.79	0.94	0.79	0.94
t-statistics	14.23	2.74	8.60	2.99	17.31	-3.16
Prob.	0.00	0.01	0.00	0.00	0.00	0.00

Source: Author's Estimation

In equation (1), the value of the intercept co-efficient ($\hat{\alpha}_0$) and slope co-efficient ($\hat{\beta}_0$) are 1.70 and 0.38 respectively. In order to conform the statistical significance of these estimated co-efficient, the 't' test has been entertained. Here, their 't' statistics are 14.23 and 2.74 which are derived from the ratio of the corresponding estimated co-efficient and standard error. However, this test says that both parameters are statistically significant at 1 % level of significance. Therefore, the test reject null hypothesis of $\alpha_0 = \beta_0 = 0$ simultaneously. Thus, there is the structural break TAT_GDP ratio variable in two different periods. The economic interpretation of the result reveals that since the dummy variable co-efficient is positive ($\hat{\beta}_0$=0.38) has a positive ascendancy over the concerned ratio. It implies that after 1991, the share of TAT in GDP, on an average, has been increasing by 0.38 units.

As far as the estimation of the equation (2) is concerned, both intercept ($\hat{\alpha}_1$=6.82) and slope parameter ($\hat{\beta}_1$=2.82) are statistically significant at 1 % level of significance. So, the null hypothesis of there is no structural change in the questioned variable over the time periods is rejected by t test and notice presence of structural breaks in the series. The economic explanation behind the result that as the $\hat{\beta}_1 > 0$, TAT_TAP ratio has been following a upward trend after the emergence of trade liberalization in 1991.

In case of equation (3), it is inferred from the 't' test that there is the presence of structural breaks in the variable because both the intercept parameter ($\hat{\alpha}_2 = 13.80$) and slope parameter ($\hat{\beta}_2 = -2.99$) are statistically significant at 1% level of significance. By referring to the result of negative and significant dummy variable coefficient, it can be inferred that share of TAT

in TT displays a declining direction, implying negative impact of trade liberalization on TAT to TT ratio.

4.1.3.2 Annual Growth Rate Model and its Results: The Annual Growth rate shows the agricultural growth of a variable per unit change over the time. In the other word, the annual growth is nothing but it is per unit change in average growth rate of a phenomenon over the time period.

Here, the four agricultural growth equations of the four variables of the study are given:

$$\text{Log (GDP)} = C_1 + C_2 (T) + u_1 \dots\dots\dots\dots\dots\dots (4)$$

$$\text{Log (TAT)} = C_3 + C_4 (T) + u_2 \dots\dots\dots\dots\dots\dots(5)$$

$$\text{Log (TAP)} = C_5 + C_6 (T) + u_3 \dots\dots\dots\dots\dots\dots(6)$$

$$\text{Log (TT)} = C_7 + C_8 (T) + u_4 \dots\dots\dots\dots\dots\dots(7)$$

Table-2

Variable	Coefficient Of Time	Growth rate	Std. Error	t-Statistic	Prob.
GDP	0.1295	12.95%	0.0010	120.0756	0.00
TAT	0.1411	14.11%	0.0036	38.7399	0.00
TAP	0.1076	10.76%	0.0020	53.3829	0.00
TT	0.1748	17.48%	0.0023	74.2918	0.00

Source: Author's Estimation

The analysis shows that, over the time period, the growth rate of TAT has been increasing than that of growth rate of GDP. Since the statistical significant growth rate of TAT (14.11%) is higher than the statistical significant growth rate of GDP (12.95%), it indicates definitely a positive sign of the development. Similarly, in case of TAT to TAP ratio, the growth rate of TAT is more (14.11%) than that of the growth rate of TAP (10.76%). It also gives statistically significant values and gives an impression of agricultural development. It shows that trade in agricultural product is more than that of agricultural production. But, in case of the ratio percentage of TAP to TT, the contribution of agricultural product to total trade is not significantly increasing. The growth rate of total trade shows 17.48% while growth rate of TAP is only 10.76%, which is not very encouraging, and it needs an improvement in its share.

4.2 Section-2

This section examines how trade liberalisation had affected the composition and pattern of trade in agricultural products, over the periods of 1980-81 to 2013-14.

4.2.1 Composition of Agricultural Trade: The composition of agricultural trade is analysed with the help of estimating Agricultural Export (here after AE) and Agricultural Import (here after AM) with respect to Total Agricultural Trade (here after TAT) over the pre and post

Reform period. In this figure-3 and appendix: table-3, the share of AE and AM in TAT are demonstrated. By taking time periods of 34 years spanning from 1980-81 to 2012-13 (including pre and post Reform period), the ratio of AM to TAT and AE to TAT is calculated. The figure-3, at a first look suggests that the share of AE in TAT was always greater (average of AE/TAT: 67.34%) than the share of AM (average of AM/TAT: 32.66%). In 1990-91 to 1992-93 the share of AE to TAT increased to 84.39% which was possible due to the introduction of New Economic Policy (NEP) on Indian economy which focused on the

Figure-3
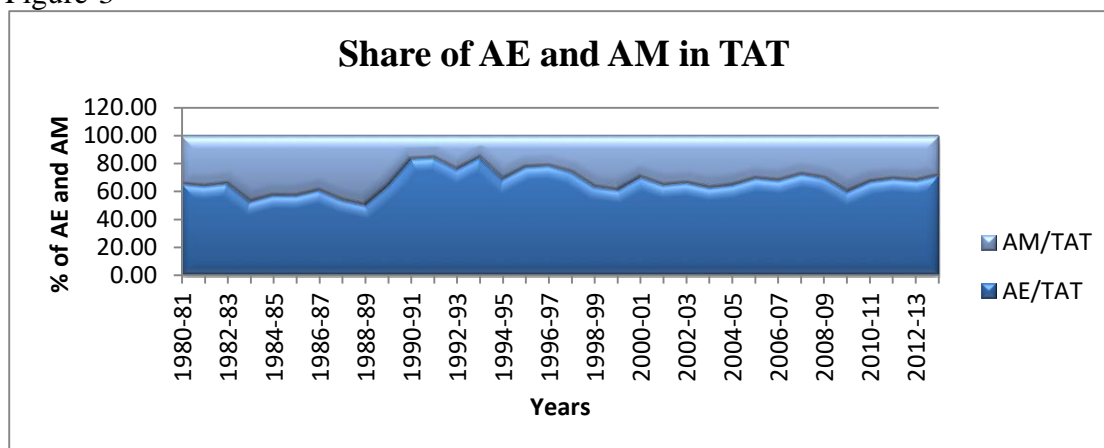
Source: Author's Estimation

development of agricultural sector by path of Liberalisation, Privatisation and Globalisation (LPG).[9] Also the global trading-environment gives opportunity to Indian economy for a favourable Terms of Trade (TOT) for agricultural commodities.[10] The figure also indicates a rise in the share of import of agricultural products in the year of 1988-89 (AM/TAT: 49.60%) in the pre Reform period. Tyagi (1987)[11] has analysed TOT on agricultural sector and finds that it has an adverse effect on the agricultural export during that period. Thus the whole figure gives a favourable picture of Indian agricultural trade during the post reform period.

4.2.2 Analysis on Patterns of Agricultural Trade: Here a comparative study of different types of tradable agricultural crops is taken, as illustrated in the table-3.

Table 3

Periods	Food Crops			Non- Food Crops			All Crops		
	A	P	Y	A	P	Y	A	P	Y
1980-89	126.81	146.54	1156	32.21	988	64953	159.02	1134	66108

[9] Krishnaswami, K.S., (1994), "Agricultural Development under the New Economic Regime", Economic and Political Weekly, Vol. 29, No. 26, pp. A65-A71

[10] Rao, C.H.H., and A. Gulati, (1994), "Indian Agriculture: emerging perspective and policy issues", Economic and Political Weekly, p.p. A158-A169

[11] Domestic Terms of Trade and Their Effect on Supply and Demand of Agricultural Sector, Economic and Political Weekly, Review of Agriculture, Vol. 22, No 13, p.p. A30-A36

1990-99	123.61	188.56	1526	39.94	1297	74936	163.56	1486	76461
2000-09	121.47	210.52	1731	40.72	1544	73595	162.2	1755	75326
2010-14	124	256.48	2059	46.08	46.08	61938	170.08	2094.48	63997

Sources: Computed data from Indiastat and Economic and Political Weekly Research Foundation Note: Here the star (*) value signifies presence of high volatility within the concerned periods.

In this table-3, appendix: figure-1, figure-2 and figure-3, the variable like periods of Reform i.e. pre Reform (1980-89), Reform (1990-99) and post Reform periods (2000-09 to 2010-14) are compared with some selected crop items which includes the major food crops as well as cash crops, in agricultural trade in India. Some other important variables like A=Area (Million Hectare), P= Production (Million Tone), Y=Yield (KG/Hectare) etc. which gives information about the production areas, production and yield of these crops. The table demonstrates that the pattern of crops yield has moved in a singular path till the end. But of course the 1991 trade liberalisation has put its significant effects on the composition by changing the pattern, which at first comprises mostly of food grain crops, but later on shifted to the trade in commercial (non-food grains) crops varieties. Instead of facing increasing competitiveness of production of food grains like rice, wheat, cereals, the farmer opted for cash crops and oil seeds, which deliberately changed the pattern of trade.[12]

5.1 Summary and Implication of the Results:

The result of dummy variable regression model and its estimation with ordinary least square suggests that, although the ratio of agricultural trade to agricultural production is increased, the share of agricultural trade to total trade has been decreasing after trade liberalisation. The causes of slashing down of the TAT to TT ratio traced to impediment of duality (higher subsidy to the industrial sector), strong and worldly competitiveness of agricultural marketing, non-symmetrical treatment to agricultural sector and world food & fuel crisis in 2008. The empirical finding also reveals that though there is a statistically significant increment in TAT to GDP ratio after the reform of 1991, this increment is not promising. The analysis of the second objective shows that the share of agricultural export was always greater (average of AE/TAT: 67.34%) than the share of agricultural import (average of AM/TAT: 32.66%). It has been inferred from the annual growth analysis that, the annual average growth of agricultural trade (TAT) has been substantially higher than the agricultural products (TAP) and GDP in their corresponding value, despite been lower than the annual average growth rate of total trade (TT).

The finding of the study that the percentage share of agricultural products in GDP and in TAP has been increasing, is also is in confinement with the findings of the literatures of Reddy (2009), Sharif (2009), Joshi (2010) and Ghatak (2010). Hence, it can be inferred that although agricultural trade was not very encouraging during pre-reform period, the percentage share of agricultural products in total national trade was very high. Only it has started to fall during

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[12] Chand, R., (1999), "Liberalisation of Agricultural Trade and Net Social Welfare: A Study of selected crops", Economic and Political Weekly, Vol. 34, No. 52, p.p. A153-A159

the reform period due to more policy emphasis was given to industrialisation and service sector growth. But, the commencement of WTO policy measures for the agricultural sector in worldwide developing countries like India, agricultural productivity per area, as well as its yield, has been improvised significantly. The data analysis demonstrates an upward trend about the contribution of agricultural products in GDP after 2000-01 or we can say in the post-reform period. Hence it can be said that in the process of economic development, the period of reform following the path of trade liberalisation, have put a very significant impact on the agricultural sector in India, by raising agricultural productivity as well as increasing its share in international trade.

As the trade policies of the government have always discriminated against agriculture, Maralusiddaiah and Ramesha (2015) suggested that India has to be carefully guiding its course in order to reap the benefits out of trade liberalisation in the agricultural sector. In the face of accelerated GDP growth after reform, the degrading agricultural contribution in trading sector needs an in-depth analysis by the researchers. Moreover, when reforms directly affecting agriculture will be initiated in an economy, only then agriculture can derive the full benefits from those macroeconomic reforms introduced so far after 1991. In addition, India can reap significant gains from trade liberalisation, if it frees up imports and exports of agricultural products at zero duty. Also, India needs formulation of a consistent policy framework on the basis of comparative advantage for export of agricultural products and emphasising on freedom of the exporters to enter into long-term contractual agreements with international farms. Somehow the terms of trade have shown a favourable tendency in influencing private investment in Indian agriculture. Thus, more favourable terms of trade to agriculture would raise the aggregate production/marketed surplus. By reducing the protection of industries, the terms of trade becomes favourable for agriculture. The study reveals that impact of liberalisation differs from crops to crops and there is a scope for increasing its benefits by formulating commodity-specific policies on pricing, production, tariffs, and trade. Overall there is a need for a proper policy framework to close the gap between the potential and actual performance of agricultural trade in the global market.

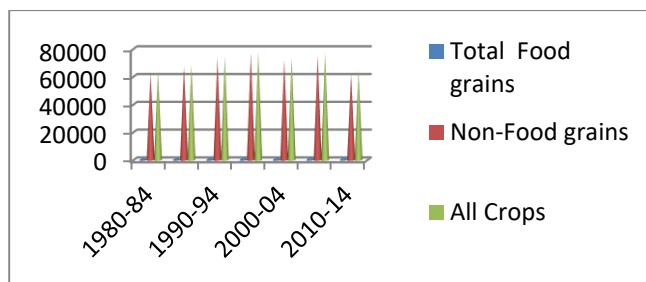**APPENDIX:** Figure-1 (Area in Million Hectares)
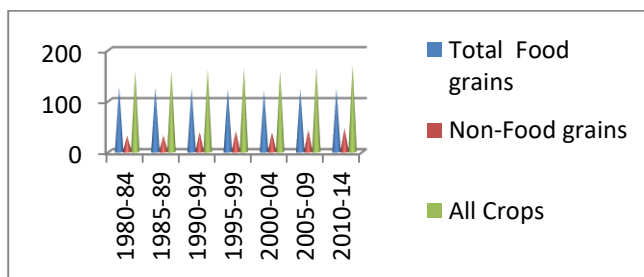
Source: Author's Estimation

Figure-2 (Production in Million Tone)
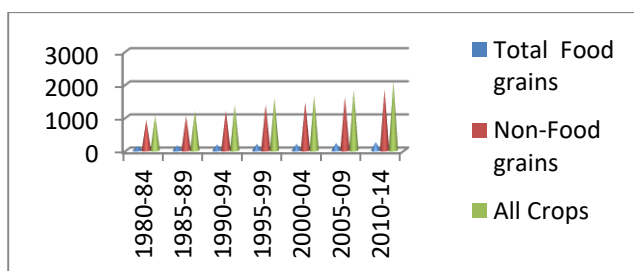
Source: Author's Estimation

Figure-3 (Yield in KG/Hectare)

Source: Author's Estimation

Table-1: (Analysis of Average Growth Rate of GDP and TAP)

		Figures are in percentage (%)		
Phase (Period)	5th year plan (period)	Average GDP Growth	Average Agricultural Growth	Average TAP/GDP
Pre-Green Revolution (1950-51 to 1965-66)	1st (1951-56)	1.73*	-1.36*	42.61
	2nd (1956-61)	9.6	9.45*	39.63
	3rd (1961-66)	9.67	9.07*	36.30
Early Green Revolution (1967-68 to 1979-80)	3 annual plans (1966-69)	12.27	14.9	38.15
	4th (1969-74)	11.06	11.26	36.69
	5th (1974-78)	11.39	7.02*	32.68
	Rolling plan(1978-80)	8.30	2.07	24.49
Mature Green Revolution (1980-81 to 1989-90)	6th (1980-85)	15.52	14.75	28.58
	7th (1985-90)	14.23	11.90	25.24
Early Economic Reforms(1990-91 to 2001-02)	Annual plan(1990-92)	15.93	17.42	24.91
	8th (1992-97)	16.24	14.48	23.75
	9th (1997-2002)	10.84	6.92*	20.75

Post Economic Reforms(2002 onwards)	10th (2002-2007)	12.73	7.75[*]	16.38
	11th (2007-2012)	16.25	16.61	15.46
	2012-2014	11.71	13.19	15.49

Sources: Computed data from Planning Commission of India (GoI), Hand book of Statistics (RBI) and Indiastat. Note: The star (*) value indicates presence of at least one negative value

Table-2: (Share of AE and AM in TAT)

Years	AE	AM	TAT	AE/TAT	AM/TAT
1980-81	2247.1	1172.98	3420.08	65.70	34.30
1981-82	2547.92	1434.94	3982.86	63.97	36.03
1982-83	2727.62	1419.87	4147.49	65.77	34.23
1983-84	2594.39	2302.79	4897.18	52.98	47.02
1984-85	3055.45	2271.97	5327.42	57.35	42.65
1985-86	3142.05	2350.42	5492.47	57.21	42.79
1986-87	3346.62	2141.63	5488.25	60.98	39.02
1987-88	3284.3	2773.44	6057.74	54.22	45.78
1988-89	3581.41	3524.93	7106.34	50.40	49.60
1989-90	4879.8	2685.47	7565.27	64.50	35.50
1990-91	6012.76	1205.86	7218.62	83.30	16.70
1991-92	7838.13	1478.27	9316.4	84.13	15.87
1992-93	9040.3	2876.25	11916.55	75.86	24.14

1993-94	12586.55	2327.33	14913.88	84.39	15.61
1994-95	13222.76	5937.21	19159.97	69.01	30.99
1995-96	20397.74	5890.1	26287.84	77.59	22.41
1996-97	24161.29	6612.6	30773.89	78.51	21.49
1997-98	24843.45	8784.19	33627.64	73.88	26.12
1998-99	25510.64	14566.48	40077.12	63.65	36.35
1999-00	25313.66	16066.73	41380.39	61.17	38.83
2000-01	28657.37	12086.23	40743.6	70.34	29.66
2001-02	29728.61	16256.61	45985.22	64.65	35.35
2002-03	34653.94	17608.83	52262.77	66.31	33.69
2003-04	37266.52	21972.68	59239.2	62.91	37.09
2004-05	41602.65	22811.84	64414.49	64.59	35.41
2005-06	49216.96	21499.22	70716.18	69.60	30.40
2006-07	62411.42	29637.86	92049.28	67.80	32.20
2007-08	79039.72	29906.24	108946	72.55	27.45
2008-09	85951.67	37183.03	123134.7	69.80	30.20
2009-10	89341.33	59528	148869.3	60.01	39.99
2010-11	117483.61	57334.32	174817.9	67.20	32.80
2011-12	187609.33	82819.15	270428.5	69.37	30.63
2012-13	232041.11	109610.68	341651.8	67.92	32.08
2013-14	268469.05	105149	373618.1	71.86	28.14

Source : Ministry of Agriculture, Govt. of India.

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