Chapter One

INTRODUCTION

This chapter presents an introduction to the study. To start with, numerous important issues related to productivity and efficiency are briefly reviewed. The issues take into account the measurement of industrial productivity and efficiency, the relative performance of firm, producers or production units, etc. The fact that productivity and efficiency are theoretically and conceptually different from each other and that higher efficiency may or may not be associated with higher productivity is well elaborated here. In this context the idea of technical efficiency is elaborated and its econometric measurement using the stochastic production frontier is briefly outlined. The rate of technical progress and the rate of growth of total factor productivity are distinguished. Total factor productivity growth and its economic significance is also dealt with. The various measures of Total factor productivity growth are also outlined. Since the study is conducted on the tea industry of Assam, performance of this industry in Assam is reviewed in comparison to that in the rest of India. Further the necessity, scope and importance of the study are pointed out. Finally the objectives and hypotheses of the study are presented along with brief justifications behind their adoption. It is hoped that the introductory chapter would show the exact nature and direction of the study.

1.1 Productivity and Efficiency

Productivity and efficiency are two most important aspects to describe the relative performance of firm, producers or production units. It is necessary in this connection to recognise those factors which are exogenous to the system of production and which can account for inter-firm variations in efficiency and productivity. Identification of the causes of efficiency and productivity loss is important for policy recommendations aimed to improve the performance of production units. A study on relative performance of production units must be justified. Efficiency promotion is necessary from the stand point of survival of a firm (production units) under a competitive set up but its importance diminishes as the market becomes less competitive. It can be argued that competition will improve the performance of a production unit by forcing it to increase its profit raising activities. Besides competition, the reduction or abolition of constraints imposed by rigidities in the market structure can enable the production units to improve their performance in absolute terms but not necessarily in relative terms. Measurement of efficiency and productivity based on empirical observation is vital from the view point of inter-firm comparison of performance.

In judging the performance of production units we commonly examine whether the unit is productive and (or) efficient. However the terms productive and efficient are not synonymous. In the standard theory of production the term productivity (marginal or average) denotes the ratio of output produced to input used. In case of a single output with multiple inputs productivity is implied in the partial sense and the ratio of output produced (measured in suitable units) to the quantity of a single input used (measured in suitable units) is taken as a measure of average productivity of that input. In case of a single input and single output average productivity is simply the ratio of output to input used for the specific output given all other inputs. Productivity can also be measured in the multiple input multiple output case where we can find a weighted aggregate of outputs and inputs by employing an economically suitable logic and then we can find the ratio of the two scalars (Neogi, 2004).

Now days, efficiency is the central issue in the sphere of production economics. Whether we consider a free enterprise economy, a mixed economy, a centrally planned economy, a developed economy, a developing economy, or for that matter the agricultural sector , the manufacturing sector or the service sector, the study of productive efficiency is not only relevant but is important from the view point of policy making both at the micro and macro levels. In a densely populated developing country like India, resources are scarce but the burning economic problems for ensuring the livelihoods of such a huge pool of population require enormous amount of resources. The limited resources, if utilized efficiently, will possibly accelerate the generation of large income and surplus for re-investment. This ultimately can gear up the pace of development (Adhikary, 2004).

Efficiency studies are very important also from the environmental angle. Efficiency promotion is vital if we consider the non-renewable resources used in industrial production. These resources once depleted can never be restored to previous levels. Firms must avoid over-utilization these resources. Conscious efforts must be given to invent and innovate techniques of production which are more non-renewable resource saving in nature. For given technology, however, efficient use of non-renewable resource inputs (as petroleum, coal, minerals etc.) is essential for sustainable development. On the other hand, the polluting industries can promote efficiency in the sense that same output (by quality and quantity) may be produced by emitting lesser amount of pollutants or by using lesser amount of the inputs which are more polluting or cause more emission of pollutants.

However, the most vital question to be settled is how to measure industrial productivity. The measures that are usually available in literature are, labour productivity, capital productivity and total factor productivity (TFP). Labour productivity is generally stated in terms of output per worker or output per unit of labour time worked. Capital productivity is usually measured in terms of some monetary value of capital stock per worker. Sometimes the reciprocal of the incremental capital output ratio (ICOR) is also used. A high value of the reciprocal of ICOR indicates high industrial productivity while a high value of ICOR indicates low productivity. Both labour and capital productivity are partial measures of industrial productivity. To have a comprehensive measure of productivity we must device a composite measure of productivity that relates output to all possible inputs measured simultaneously. Such a measure is provided by total factor productivity (TFP). It was first introduced into economic literature by Jan Tinbergen in 1942. TFP is defined as the ratio of real value added to weighted sum of all the inputs used in the production process. Apparently this is the broadest measure of productivity of resource use. Consequently Total Factor Productivity Growth (TFPG) is simply the growth rate of real value added less the growth rate of weighted sum of all inputs used in the production process. This is precisely the concept of Solow residual after Solow (1957).

Total Factor Productivity Growth (TFPG) provides a measure of performance of production units. TFPG is an index of change in output net of changes in inputs over the same period of time. Alternatively, TFPG is output growth less the sum total of inputs share weighted input growth. A TFPG series can be computed over a period of time by constructing a suitable index that captures the total factor productivity of a production unit. This description of TFPG essentially implies that it is a residual measure – that is, the part of output growth that cannot be accounted for by factor share weighted input growth. This residual actually captures the combined effects of factors (not production inputs) such as change (or improvement) in technology, better capacity utilization, learning by doing, improved input quality, more efficient use of inputs etc.

Productivity growth and productivity differential has been one of the most popular areas of applied economic research as it is based on the well-defined analytical framework of the standard neoclassical economic theory of the production function. But the primary weakness of this approach of measuring performance of production units through productivity growth is that it does not allow for the distinction between changes in technology and those in the efficiency with which a known technology is applied to production. That is technological progress and efficiency of factor use cannot be disentangled. But productivity across firms in an industry may vary due to technological differences, due to differences in efficiency in the process of production and due to differences in the environment in which the production unit or firm operates. The traditional methodology of measuring productivity based on the standard definition of production function implicitly assumes that maximum output is attained by firms or production units for given levels of inputs. That is, output maximization is an implicit assumption.

On the other hand, the efficiency of production unit is related to the comparison between observed and potential output. Potential output may be interpreted either as maximum possible output or optimal output. Comparison may be done by finding the ratio between observed and optimum levels of output for given quantities of inputs or by finding the ratio between observed and optimum levels of inputs for given level of output, or by a combination of the two (Neogi, 2004). The standard analysis of producer behavior assumes that either resources are optimally used in the process of production or there is optimum allocation of resources. The production function gives the maximum possible output that can be produced with a given quantity of inputs. Similarly a cost function gives the minimum level of cost for producing a particular level of output for given input prices. Finally a profit function gives the maximum possible profit for a given output price and for given input prices. Stated otherwise, producer's behavior in standard microeconomics follows the neoclassical approach, which assumes that all producers are efficient –both technically and allocatively.

1.2 An Overview of the Performance of Tea Industry in India

Tea is among the most labour-intensive of all plantation crops. On an average, around 65 per cent of the cost of production is incurred on labour. The Indian tea industry had positive tidings to report in 2008: low carry-forward stock from the previous (2007) season, steadily increasing domestic demand, and shortfall in production in many countries. This led to an increase in exports and the firming up of domestic prices during the year. Average domestic prices during 2008 were up by around 28 per cent over the previous year. With around 65 per cent of the costs of the bulk tea industry being fixed in nature, the increase in prices led to substantial improvements in the profitability of bulk tea players for the fiscal year (FY) 2008-09. In the following fiscal year, that is, FY2009-10, the estimated shortage of carry-forward stocks, increase in consumption and shortfall in production, both in India as well as globally, resulted in further rise in tea prices. This was expected to provide a further boost to the profitability of bulk tea players in FY2009-10. Lack of marketing initiative by the Indian players to look for export markets beyond the European Union countries; proliferation of small growers and bought-out leaf factories (which led to a decline in the quality of tea produced), and failure to check spurious varieties of tea from being traded as premium tea (which affected the image of Indian tea in the export market); higher costs of production of tea in India (as compared with that in Sri Lanka and Kenya) on account of the higher social costs here; and existence of certain non-tariff barriers like residual-pesticide (in tea) specifications imposed by a number of importing countries (especially European nations). All these factors led to the loss of a substantial share of exports, which in turn increased supplies in the domestic market, thereby exerting a downward pressure on domestic tea prices. This apart, tea prices also came to be affected by the quality factor, which came into play during the early part of the decade when the delay of re-plantation activities in the latter half of the 1990s began to tell on quality and hence on prices (Roy and Das, 2009).

The Tea industry occupies an important place in the state economy of Assam and plays a distinct role in the national economy in general. The total area under tea cultivation in Assam accounts for more than half of the country's total area under tea. In addition to the existing large tea gardens owned by reputed Indian and multinational companies, tea plantations in the state of Assam has been taken up by common people as a business venture at present. This is true especially for the educated unemployed youth in the upper Assam region. Assam alone produces more than half of India's annual tea output. The estimated production of tea in Assam was 487.5 thousand tons in 2008, which was about 5.0 per cent less compared to the estimated production of tea in 2007. However, tea production in the State in 2008 constitutes about 50 per cent of the total tea production of the country. During the year 2006, the quantity of production of tea in Assam was 502.0 thousand tons. Although tea industry plays a vital role in Assam vis-a-vis Indian economy but it has faced some serious challenges in recent years. The growth rate of production as well the productivity is also far from satisfactory.

Plantation and farm efficiency, growth of total factor productivity (TFP) and its decomposition, and the question of how to measure them, is an important subject in developing countries' agriculture (Shah, 1995; Hazarika and Subramanian, 1999). The present study attempts to estimate the growth of TFP along with the bias in technical progress on the one hand, and firm level technical efficiency and its determining factors on the other, in the tea industry in Assam on the basis of firm level panel data. Industry level time series data are used to analyse TFPG at the industry level. Suitable indexes of TFPG under parametric and non- parametric approaches are used. Moreover a production and cost function based econometric approach is adopted for the purpose of measuring firm level technical efficiency and its determining factors. The study period chosen is 2001 till 2010.

1.3 Impact of New Economic Reforms on Indian Industries

The New Economic Policy of 1991 reflected some fundamental changes resulting in severe deregulation and de-control over manufacturing industries. The sole objective of these highly liberalized policies was to raise productivity and efficiency levels in Indian manufacturing by creating a competitive environment. Opening up of the domestic market (at the end of the protectionist regime in India) resulted in exposing domestic manufacturers to international competition. Needless to remind, the strong liberalization policy of 1991 was biased heavily towards industries similar to that in the newly developed South East Asian countries.

We do not expect the different phases of liberalization (or different policy regimes for that matter) to have the same impact on different regions or states with respect to factor productivity in manufacturing industries. The productivity growth patterns of different states are likely to differ according to the nature and extent of industrialization in these states. In fact, industrialization alone carries with it the potential of creating regional imbalances.

Throughout the latter half of the 20th Century, all South East Asian countries have been trying to industrialize at a rapid pace. China took up the 'Go Global' slogan (model) long before India did and was able to industrialize faster than most other countries. China's principal growth strategy is based on export-oriented industrialization just like the other south East Asian nations (Dreze and Sen, 1995).

In framing a growth oriented industrial strategy, growth of factor productivity, factor elasticity, structure of technology and the rate of technical progress along with its bias are considered as instrumental. However, growth of factor productivity in the manufacturing sector is likely to vary along with changes in policy regimes. Liberal imports of high-tech capital equipments coupled with worker's advanced training facilities, managerial efficiency and global competence of multinational corporations have the potential of raising both productivity as well as overall efficiency of factor use. This has to be verified in the context of Indian tea industry during the post reform period.

In the last three decades, many studies have analyzed the relative contribution of factor inputs and technical progress to economic growth. Since the seminal work of Solow (1957), total factor productivity—defined as the efficiency with which firms turn inputs into outputs—has been considered as the major factor in generating growth. The availability of firm-level data allowed researchers to investigate the reasons behind the vast dispersion in productivity performances across firms which led to the establishment of policies that would improve productivity and eventually generate growth.

1.4 Necessity, Importance and Scope of the Study

The importance of productivity to economic growth and development can hardly be over emphasized. It remains the basic problem of economic progress, as it is required at both the early stages of development as well as in the permanent process of re-equipping the production apparatus of any nation.

According to Wen (1993), there are three sources of growth. First is the traditional source of growth, that is, captured by input increase. The second source of growth is rooted in institutional innovation that eliminates restraints in resource allocation such that more output is produced with the same amount of inputs. The third source of growth is technological progress, which shifts the production function outwardly.

The key to growth is an increase in productivity (Wonnacott and Wonnacott, (1986). To this effect, productivity is discussed at all levels because of its direct relationship with the standard of living of a people. At the level of an individual, it is rational to argue that, the standard of living of any man is the extent to which he is able to provide himself and his family with the things that are necessary for sustaining and enjoying life. The greater the amount of goods and services produced in any economy or imported into such economy, the higher its average standard of living will be. Uche (1991) identified four important channels by which higher productivity impacts on standard of living, these are:

(i) Larger supplies both of consumer goods and of capital goods at lower costs and lower prices;

(ii) Higher real earnings;

(iii) Improvements in working and living conditions, including shorter hours of work; and

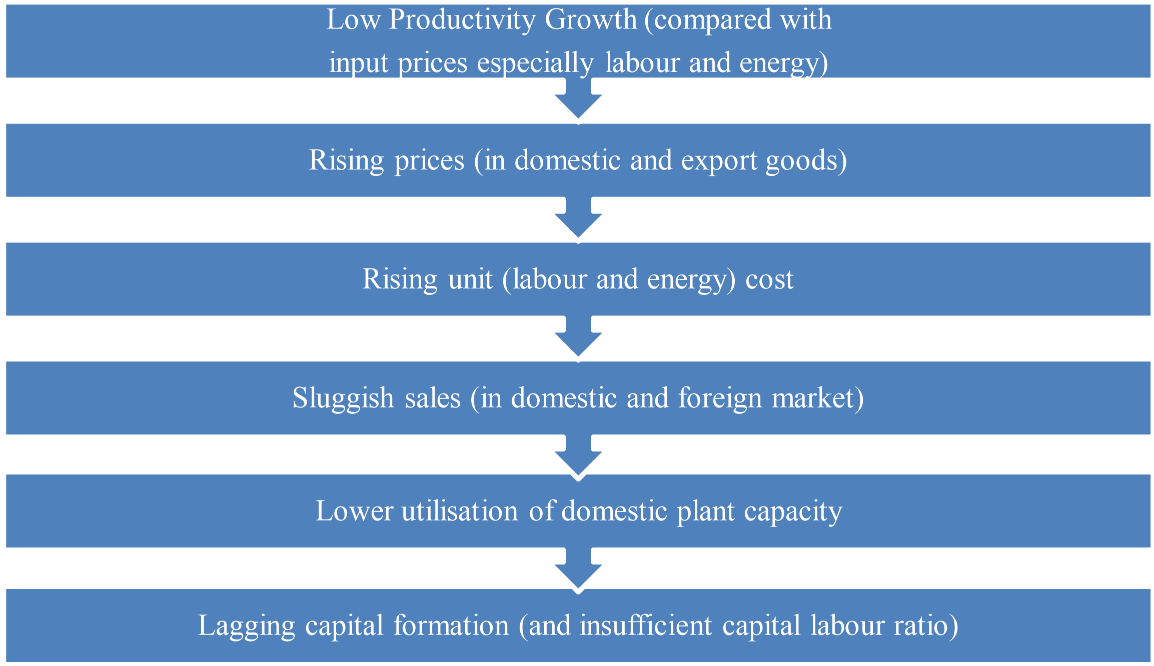
(iv) In general a strengthening of the economic foundations of human wellbeing.

At the national level, steady growth in productivity guarantees non-inflationary increases in wages as well as solves pressing problems of unemployment, increased trade deficit and an unstable currency (exchange rate).

In business, productivity improvements can lead to more responsive customer service, increased cash flow, and improved return on assets and greater profits. As revealed by economic theory, more profits will translate to availability of investible funds for the purpose of capacity expansion and the creation of new jobs; hence, increased productivity becomes a universal remedy to unemployment problem.

Enhanced productivity will equally contribute to the competitiveness of a business or an economy in both domestic and foreign markets. For example, if labour productivity in one country declines in relation to productivity in other countries producing the same goods, a competitive imbalance will be created involving divergence in cost functions. If the higher costs of production are passed on, the economy's industries will lose sales as customers are justified turning to the lower cost suppliers. Alternatively, if the higher costs are internalized by industries, their profit will decrease. The direct implication of absorbing higher costs of production by industries is to decrease production or keep production costs stable by lowering real wages. It goes without saying that notable economic problems like inflation, an adverse balance of trade, poor growth rate and unemployment are offspring of low productivity. Scott (l985) confirmed this supposition in his model for a low-productivity trap as shown in Fig.1.4.1.

Fig.1.4.1. Model for a Low-Productivity Trap



Apart from the link between productivity and the general well being of a nation, productivity is of great importance in economic analysis. For example, when it is combined with population and output trends, it is used in economic growth models to forecast output and employment, as well as the distribution of manpower and other resources between different sectors of an economy or industry. In essence, productivity provides the basis for analyzing the relative dynamism of different economic activities. Again, interests in productivity and what is happening to it are directed towards being able to know something about the process of technical change. This is so because economic growth, technical change and productivity are closely related.

The concept of the technical efficiency of firms has been pivotal for the development and application of econometric models of frontier functions. Although technical efficiency may be defined in different ways [for example, Fare et al. (1985)], we consider the definition of the technical efficiency of a given firm (at a given time period) as the ratio of its mean production (conditional on its levels of factor inputs and firm effects) to the corresponding mean production if the firm utilized its levels of inputs most efficiently [Battese and Coelli, 1988]. Efficiency is an important factor of productivity growth as well as stability of production in developing agricultural economics. In view of slow growth and increasing instability in tea production, the tea economy of India is expected to be benefited to a great extent from the study on technical efficiency studies. Estimates on the extent of inefficiencies could help decide whether to improve efficiency or to develop new technology to raise tea productivity in India.

The present research aims to analyse the production efficiency with the objectives of facilitating the **removal of production constraints** in the tea industry in Assam, and helping policy makers **to strengthen the production base** of the industry. Tea producers of prominent tea growing districts in upper Assam, viz., Golaghat, Jorhat, Sibsagar, Dibrugarh, Tinsukia, and those of the three districts of Barak valley are selected for this purpose. The important issue here is that even under existing technology, there might be **potentials for improving productivity** and scope for **efficient use of existing resources**. Hence extension strategies may be required to train estate owners regarding the **rational use of inputs**. **Cost cutting,** if desired through **mechanisation**, may be required. The study would give a set of necessary policy prescriptions in this direction. The present study contrasts tea producers of upper Assam districts with those of Barak valley districts in terms of TFPG and efficiency change at the firm level. Distinction of technical progress or technological improvements over efficiency improvements (if any), is another important aspect of the present study (Nishimizu and Page, 1992).

A vital issue in this respect is whether time varying technical efficiency is found to exhibit a rising or declining trend over the study period. The study would also estimate the quantity of bias in technical progress with respect to each input. The primary focus here would be on labour as a factor of production. In a labour surplus economy it is important to see not only the trend in labour share in output, but also whether technical progress is biased in favour of labour or against it. The neoclassical view is that bias against labour originates from capital using type of technical progress or labour saving type of technical progress. This provides a direct evidence of mechanisation. Thus it is necessary to estimate the input bias in technical progress and thus search for evidences of labour saving type of technical progress across tea producers in Assam. Estimation of biased technical progress makes the study doubly important.

The output elasticities with respect to inputs and the returns to scale estimation are fundamental to identifying the sensitive inputs and the scale of operations at the industry level. Moreover firm wise analyses of the same would reveal the inter-firm variations in returns to scale and elasticity. The study focuses on labour as the most vital factor of production at the plantation level. Trends in share of labour in total cost and output, along with other factor shares would be analysed. The cost elasticity of output obtainable from the cost frontier analysis would also help in determining the capacity to raise production at lower costs. However the cost efficiency analysis assumes allocative efficiency (Coelli, 1992) is present (not considered in this study).

The study measure time varying technical efficiency across tea producers and will identify the precise causes of technical inefficiency of tea producers in the state. Estimation of cost frontier and cost efficiency would help us to identify the nature and causes of cost inefficiency of tea producers. **Policy prescriptions** from the study on tea industry in Assam, based on the quantitative analysis would focus on the need for **undertaking infilling, replanting and replacement planting at the garden level**, **removal of production constraints, scope for improving productivity and more efficient use of existing resources,** and finally on **cost cutting if desired through mechanisation.**

1.5 Theoretical and Conceptual Framework

1.5.1. Concept of Economic Efficiency

The presence of economic inefficiency in the production process will lead to four major consequences. First, it reduces the quantity of output for a given quantity of inputs. Second, some of the inputs will be either under-utilised or over-utilised. That is inputs may be used in wrong proportions. Third, because of excess use of inputs, it raises the cost of production. Finally, there will be a loss in profit due to rise in costs for given output and revenue. We classify efficiency into three categories, technical, allocative and scale. Technical efficiency refers to producer's behaviour relating to the production of actual output relative to maximum possible output with a given quantity of inputs. Allocative efficiency is related to producer's choice of optimal input combination. And finally, scale efficiency is a situation of choice of right quantity of output, where price and marginal cost of production are assumed to be equal. The concept of optimum is important in standard microeconomic analysis of producers' behaviour. In fact in each of the above mentioned functions, the concept of maximum or minimum is important. In the case of production function there has been a recent attempt to estimate the maximum possible output as a function of input quantities; in the case of cost function the minimum level of cost as a function of given input prices; and in the case of profit function the maximum possible profit as a function of output and input prices. Therefore instead of defining production function, cost function and profit function one should call them **production frontier, cost frontier and profit frontier** respectively.

The word 'frontier' may be meaningfully applied in each case, because the 'frontier' sets a limit to the range of possible observations. For instance, a firm may be observed to produce at a point below the production frontier, or above the cost frontier or below the profit frontier. Expressed otherwise, the firm is producing less than maximum output, incurring cost more than minimum cost and receiving less than maximum possible profit. By this reasoning, no firm can lie above the production frontier or the profit frontier and above the cost frontier. The amount by which a firm lies below the production frontier, the profit frontier and above the cost frontier can be regarded as measures of inefficiency. Hence if a firm stays on the frontier it may be called technically efficient. It implies that deviation of the firm from frontiers – production, cost or profit – can be attributed to the presence of economic inefficiency.

The modern approach to measurement of efficiency has been suggested by Farrell (1957). Farrell's measure of efficiency belongs to the frontier production function approach. For the time being let us assume that the production function is linear homogeneous so that it can be specified in the form of a unit isoquant or efficient unit isoquant. This function is the locus of points that stand for the minimum quantities of the inputs of production required to produce one unit of output with varying input proportions. The monotonic transformation of this function will determine the input requirements for higher levels of output. This isoquant is actually unobservable. Assuming no measurement errors, we may obtain an estimate of this unit isoquant by fitting an envelope from below to a set of observations on inputs where the input utilisation rates are deflated by output level.

Let us first review Farrell's input based measure. To begin with we assume that the firm is producing a single output Y with the help of two inputs or factors X_1 and X_2 respectively. Let us also assume that the production function is subject to constant returns to scale. The production function may be written as $Y = f\,(X_{1,}\ X2)$ so that the unit isoquant is given by all input combinations (deflated by output levels) that satisfy the function, $1 = f\,(X_1/Y,\ X_2/Y)$. This was named by Farrell as the efficient unit isoquant. In figure 1.5.1 (a) the curve UU′ is according to Farrell a conservative estimate of a theoretically efficient unit isoquant.

Farrell's input based approach to measurement of efficiency is illustrated in figure 1.5.1 (a). The efficient unit isoquant or the 'best practice' unit isoquant UU′ is drawn on the $X_1 - X_2$ input spaces.

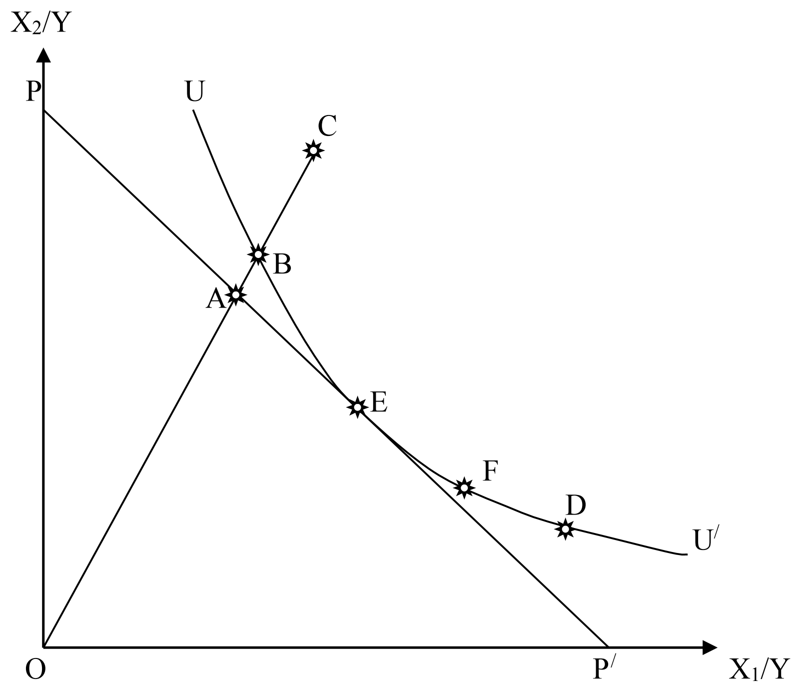


Figure 1.5.1 (a): Farrell's Measurement of Efficiency

Suppose the observed input – output combination is shown by the point C which cannot by definition, lie below UU′. If point C represents the position of a firm in an industry, then technical efficiency of point C is defined as the ratio of the distance between the origin and the point B to the distance between the origin and the point C. The points B and C are on the same ray through the origin, and thus, represent identical factor proportions. The ratio OB/OC is Farrell's measure of technical efficiency. It measures the proportion o inputs actually necessary to produce output. Consequently, 1- (OB/OC) = (BC/OC) is called the technical inefficiency of the firm. It measures

(i) The proportion by which inputs could be reduced without reducing output;

(ii) The possible reduction in cost of producing the same output, holding the factor proportions unaltered;

(iii) The proportion by output could be increased holding inputs constant; and

(iv) The proportion by which profit of the firm could be increased without increasing output, given the input and output prices.

Let PP′ be the lowest possible isocost line tangent to the efficient unit isoquant UU′. Then the price efficiency or the allocative efficiency of point C is defined by the ratio of the cost implied by this isocost line to the cost at point B. Since the cost at point A is the same as the cost at point E, the measure of allocative efficiency is defined as the ratio of the minimum cost given the factor proportions utilized to the minimum cost given efficient utilisation of the optimum factor proportion. Thus the allocative efficiency of the firm is OA/OB. Consequently the allocative inefficiency of the firm is 1- (OA/OB) = (AB/OB). It measures the possible reduction in cost when input proportions are correctly used.

The overall economic efficiency of the firm is the ratio of minimum to actual unit costs. Corresponding to figure 1.5.1 (a), the overall economic efficiency of the firm is defined as OA/OC. Hence, 1 – (OA/OC) = (AC/OC) is defined as the overall economic inefficiency. It measures the possible reduction in cost of moving from the observed point C to the cost minimizing point E. The measure of overall economic efficiency can be broadly decomposed into the product of technical efficiency and allocative or price efficiency. That is, $TE=\frac{OB}{OC};\ AE=\frac{OA}{OB};\ EE=\frac{OA}{OC}$

Hence, $EE=TE*AE \ \ or \ \ \frac{OA}{OC}=\frac{OB}{OC}*\frac{OA}{OB}$

Similarly the total inefficiency can be decomposed roughly as the sum of technical and allocative inefficiencies. That is, $\frac{AC}{OC} = \frac{AB}{OB} + \frac{BC}{OC}, \;\; if \;\; OB = OC$.

The measures of efficiency developed by Farrell are input – based, since they take into account the differences in input use between firms for the standardized unit output on the isoquant UU′.

An output based measure of efficiency has also been proposed by Farrell. The output based measure takes into account the differences in output between firms when inputs are standardized. Let us now assume a generalized non-homogeneous production technology whereby a single output is produced with the help of two inputs X_1 and X_2. To keep the analysis simple we assume that X_2 is fixed at $X_2 = \bar{X}_2$. Then with reference to figure 1.5.1(b) $Y = f(X_1, \bar{X}_2)$ exhibits the 'best practice' production function. Suppose that a firm is at point A. At point A the firm produces output OY^0 by using OX_1^0 units of the factor X_1 and is thus inefficient. This is simply because the same level of output OY^0 may be produced with the help of a smaller amount of the factor X_1, that is, OX_1^*. Hence the 'input saving' measure of technical efficiency is given by OX_1^*/OX_1^0 and the corresponding measure of technical efficiency is given by

$1 - (OX_1^*/OX_1^0) = X_1^0 X_1^*/ OX_1^0$.

Stated otherwise, by using the same level of input X_1 i.e., OX_1^0, it is possible for the firm to increase output from OY^0 to OY^*. Thus OY^0/OY^* may be defined as the 'output increasing' measure of technical efficiency and $1 - (OY^0/OY^*) = Y^0Y^*/ OY^*$ is the corresponding measure of technical inefficiency. Thus for non-homogeneous production functions there are two measures of technical efficiency which are identical in case of a linear homogenous production function (Fare and Lovell, 1978, pp. 150-62).

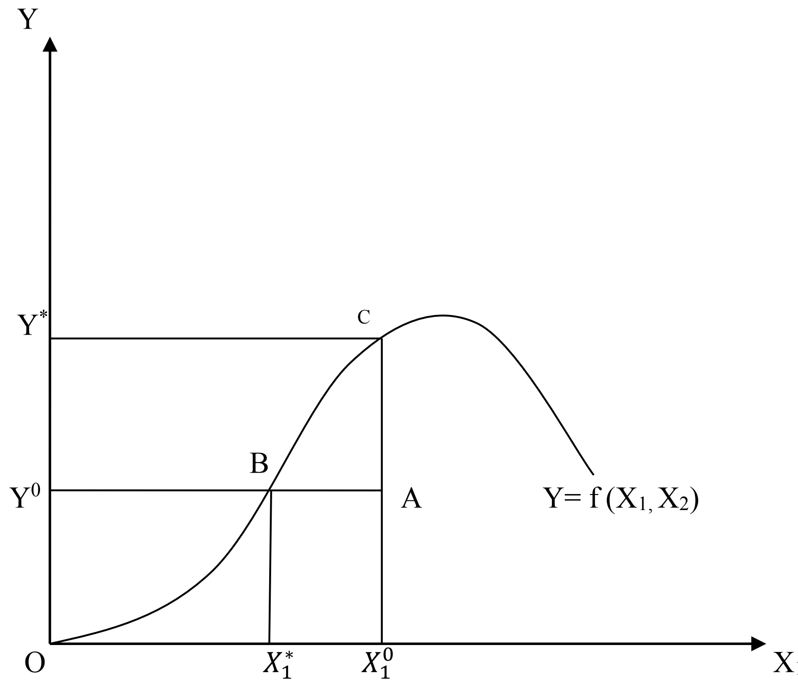


Figure 1.5.1 (b): Output based measure of technical efficiency

Finally a firm is said to be scale efficient if it produces at the point where marginal cost equals price of output under the conditions of perfect competition and profit maximization. If a firm is scale efficient it means that there is no excess capacity to produce and the firm's production is set at the optimal level. But a firm is said to be scale inefficient if it produces at the sub-optimal level either producing output smaller or greater than that corresponding to the profit-maximizing level. Consequently if a firm is found to be producing at the sub-optimal level, it incurs more costs and receives less profit.

1.5.2 The Stochastic Production Frontier

To begin with let us consider a production function of the form $Y = F(x_1, x_2)$ where a single output is being produced with the help of two endogenous inputs. Specifying the exact form of the production function we proceed to collect data on the inputs and output measured in suitable units. We u use ordinary least squares technique to estimate the parameters of the production function and can get the estimated output $\hat{Y}$. The regression residuals or the error

e is simply the difference between observed and estimated output. That is, $e = Y - \hat{Y}$ and these errors have zero means. In other words some of the residuals are positive, some are zero and others are negative such that they sum up to zero. This is simply because a least squares regression is intuitively an averaging technique in the sense that the OLS estimated regression line on an average represents the scatter (from our actual observations) such that the residuals e average out to zero. This directly follows from the first order condition for minimizing the sum of squares of errors.

But does our estimated regression equation satisfy the most fundamental property of a production function? Or else, does the estimated regression equation technically represent a production function? The answer to both questions is 'no'. In an attempt to estimate the production function by the traditional least squares technique, the very definition of a production function is contradicted. The estimated regression line does not give us the maximum output obtainable from a given quantity of inputs. This is because OLS gives us a sort of average such that the least squares regression residuals sum up to zero. Least squares regression does not give us the best practice production function which indicates an ideal situation. The short fall from the maximum output represents inefficiency on the part of the production unit. Conventional econometric practice attributes departures from the OLS estimated production function to random statistical noise only. This issue is related to the measurement of productive efficiency. Since OLS cannot achieve this, it is necessary to develop a modified econometric approach to measurement of productive efficiency or inefficiency. Thus instead of estimating the 'function' we must attempt to estimate the 'frontier'. This frontier sets a 'limit' or a boundary to some specific set of observations. The 'limit' may refer to either a maximum or a minimum. More specifically, actual output may fall short of frontier output, actual cost may exceed 'frontier cost' and actual profit may fall short of 'frontier profit'. These are indications of inefficiencies on the part of the production unit. According to Lovell and Kumbhakar (2000), 'we are in search of a frontier that envelopes data rather than with functions which intersect data.' In other words the OLS estimated regression line passes through the scatter and does not envelop it. It violates the precise concept of a production function which deals with an ideal situation (maximum output) and not with the average. Evidently, since OLS does not estimate the frontier or the best practice production function it cannot give the shortfall from the best situation, which is a measure of inefficiency on the part of the firm or the production unit. That is, by how much are firms' output, profit and cost deviating from the desired or the ideal state? We are interested to estimate the deviation of each firm's position from the desired (maximum or minimum) state. Lets us now consider the following fundamental definitions (Lovell and Kumbhakar, 2000).

Production frontier:

A production frontier represents the minimum input bundles required to produce different levels of outputs, or the maximum output that can be produced with different input bundles given the state of technology. Firms operating on the production frontier are called technically efficient and firms operating below the production frontier are called technically inefficient.

Cost Frontier

A cost frontier represents the minimum cost incurred to produce given bundle of outputs given input prices and given the level of technology. Producers operating on their cost frontier are called cost efficient and those operating above their cost frontier are cost inefficient.

Profit Frontier

A profit frontier represents the maximum profit obtainable from production activity given bundle of inputs, given prices of inputs and outputs and the level of technology. Producers operating on their profit frontier are called profit efficient and those operating below their profit frontier are profit inefficient.

In sum, the real issue with which we are concerned in this dissertation is that, not all firms are technically efficient, cost efficient and profit efficient. In case of failure of firms to optimize it is essential to reorganize our analysis of production, cost and profit away from the traditional 'functions' towards 'frontiers'.

However, the accuracy of the measurement of efficiency strongly depends on completeness and correct specification of the model so that the omitted variables become uncorrelated with the included variables. The rationale behind using the stochastic frontier approach lies in the facts that it takes care of this necessity by accommodating white random noise, though there is doubt (see Schmidt, 1985-86) that in deciding residuals to be inefficiency whether the frontier models have exhausted the effects of all inputs.

Econometricians are of the view that the frontier represents the "best practice" technology whereas non-frontier estimation techniques estimate the "average" technology. This view is sufficient if returns to scale, elasticity of substitution etc, which are the important aspects of technology, are different on the frontier than off the frontier. Since, the difference from the frontiers is assumed to be the consequence of the random error (not white random noise) and which is called *inefficiency*, according to Schmidt (1985-86) the frontier function is a "neutral transformation" of the average function. If the features of the technology varying with distances from the frontier can be determined, this will provide sufficient justification for applying frontier approach to measure *efficiencies*. However, the frontier approach is the best approach and updated to become a method of measuring based on microeconomic approach. The non-frontier approach mistakenly interprets the white random noise as the *inefficiency*, the shortcoming which is well overcome in the frontier approach (Kumbhakar, 2000).

1.5.3 Growth Accounting and Total Factor Productivity Growth

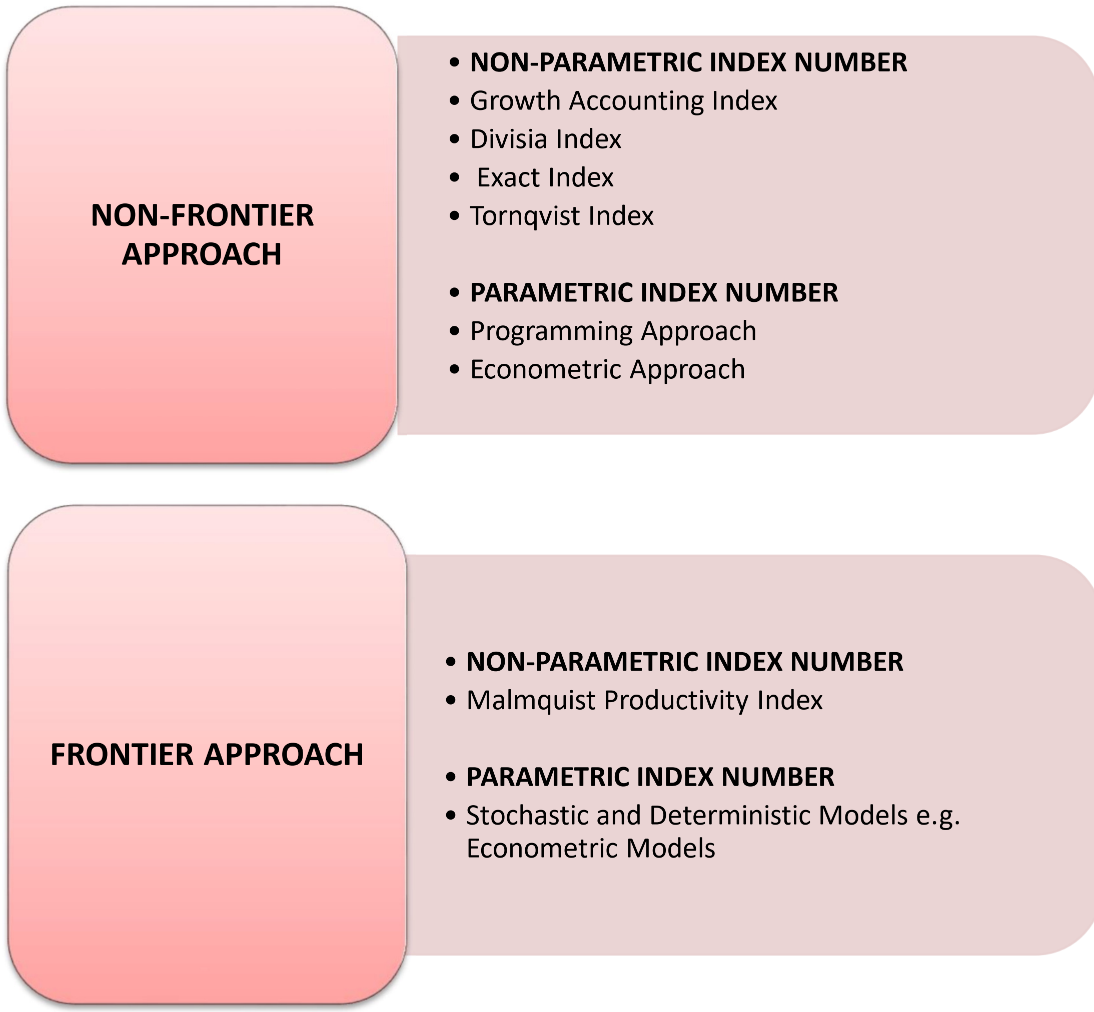
In the formation of growth oriented industrial strategy, productivity growth and the structure of technology have been considered as instrumental. Productivity growth has been identified as the dominant determinant of economic growth. In judging the performance of production units we commonly examine whether the unit is productive and (or) efficient. However the terms productive and efficient are not synonymous. In the standard theory of production the term productivity (marginal or average) denotes the ratio of output produced to input used. In case of a single output with multiple inputs productivity is implied in the partial sense and the ratio of output produced (measured in suitable units) to the quantity of a single input used (measured in suitable units) is taken as a measure of average productivity of that input. In case of a single input and single output average productivity is simply the ratio of output to input used for the specific output given all other inputs. Productivity can also be measured in the multiple input multiple output case where we can find a weighted aggregate of outputs and inputs by employing an economically suitable logic and then we can find the ratio of the two scalars (Neogi, 2004).

Total Factor Productivity Growth (TFPG) provides another measure of the performance of a production unit. TFPG is an index of change in output net of changes in inputs over the same period of time. Alternatively, TFPG is output growth less the sum total of input share weighted input growth. A TFPG series can be computed over a period of time by constructing a suitable index that captures the total Factor Productivity of a production unit. This description of TFPG essentially implies that it is a residual measure – that is, the part of output growth that cannot be accounted for by factor share weighted input growth.

Productivity growth and productivity differential has been one of the most popular areas of applied economic research as it is based on the well-defined analytical framework of the standard neoclassical economic theory of the production function. But the primary weakness of this approach of measuring performance of production units through productivity growth is that it does not allow for the distinction between changes in technology and those in the efficiency with which a known technology is applied to production.

That is technological progress and efficiency of factor use cannot be disentangled. But productivity across firms in an industry may vary due to technological differences, due to differences in efficiency in the process of production and due to differences in the environment in which the production unit or firm operates. The traditional methodology of measuring productivity based on the standard definition of production function implicitly assumes that maximum output is attained by firms or production units for given levels of inputs. That is, output maximization is an implicit assumption. This is overcome in the efficiency adjusted TFPG measure where output growth of the firm is decomposed into technical progress, contributions of input growth and change in technical efficiency by adopting a frontier approach.

Figure 1.5.3. (a) Approaches to Total Factor Productivity Measurements



1.5.4 Inter-linkage between Productivity and Efficiency

The terms productivity and efficiency have been used frequently over the last ten years. The terms are often used interchangeably, but they are precisely not the same thing. To illustrate the distinction between the terms, let us consider a single production process in which a single input (x) is used to produce a single output (y). The line $OF^{/}$ in the figure represents a production frontier which represents the maximum output attainable from each input level. Hence, it reflects the current state of technology in the industry. Firms in this industry either operate on that frontier, if they are technically efficient, or beneath the frontier, if they are technically inefficient. Point A represents an efficient point whereas points B and C represent efficient points. A firm operating at point A is inefficient because technically it could increase output to the level associated with the point B without requiring more inputs.

In figure 1.5.4 (a), the ray through the origin measures productivity at a particular data point. The slope of this ray is $y/_x$ and hence provides a measure of productivity. If the firm operating at point A were to move to the technically efficient point B the slope of the ray would be greater, implying higher productivity at point B. However, by moving to the point C, the ray from the origin is at a tangent to the production frontier and hence defines the point of maximum possible productivity. This latter movement is an example of exploiting economies of scale. The point C is the point of (technically) optimal scale. Production at any other point on the production frontier results in lower productivity.

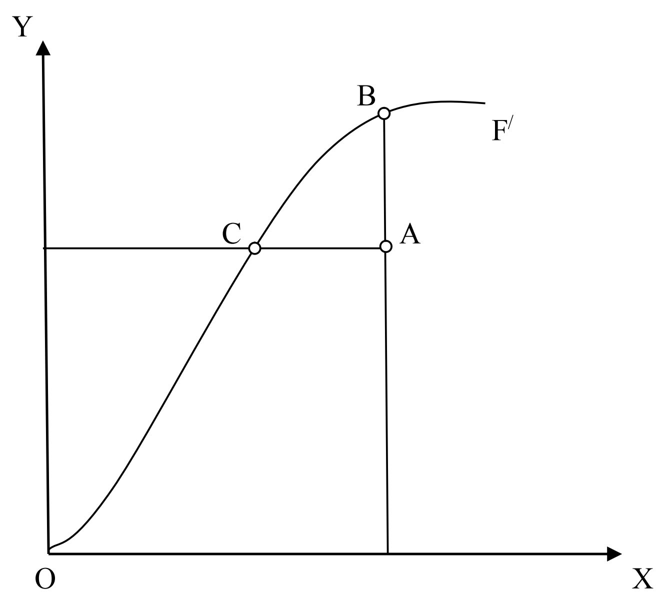


Figure 1.5.4 (a): Production Frontier and Technical Efficiency

From this discussion, we can conclude that a firm may be technically efficient but may still be able to improve its productivity by exploiting economies of scale.

1.6 Measuring Industry-level Efficiency: A Non-Frontier Approach

In case of industry level data, it is worth mentioning that the average production approach is more appropriate than the frontier approach (which is suitable for firm level data) in measuring industry level data. In fact, the average production function approach is used to measure inter-temporal shifts in industry level efficiency under a competitive-static framework (Ghosh and Neogi, 1998).

For the present, a technique is said to be efficient (or inefficient) if there is an upward (downward) shift of the productivity locus over time. Fig. 1.6.1 (a) and 1.6.1(b) illustrate the concept of efficiency and inefficiency respectively, supposedly resulting from some productivity shock, say, some major economic reforms. In fig.(a) the LL curve is the labour productivity locus at some point prior to the implementation of economic reforms. The labour productivity curve shifts to DD at some time point after implementation of the reforms programme. Let A be the actual position of an industry prior to reforms and it shifts to C at some time point in the post reforms period. The movement from A to C is however composed of two parts. A movement from A to B, which implies that higher capital intensity increases labour productivity, on the presumption that reforms augment capital intensity via new technology. However reforms productivity rises to C. Clearly the movement from B to C represents the rise in productivity due to more efficient input usage in the post reform era.

Analogously any downward shift of the productivity locus is a result of inefficient use of inputs. In fig. 1.6.1(b) the drop in productivity from $B^{/}$to $C^{/}$is due to inefficient use of inputs even though productivity rises by$P^{/}C^{/}$. Hence, increases in productivity do not necessarily imply more efficient use of inputs.

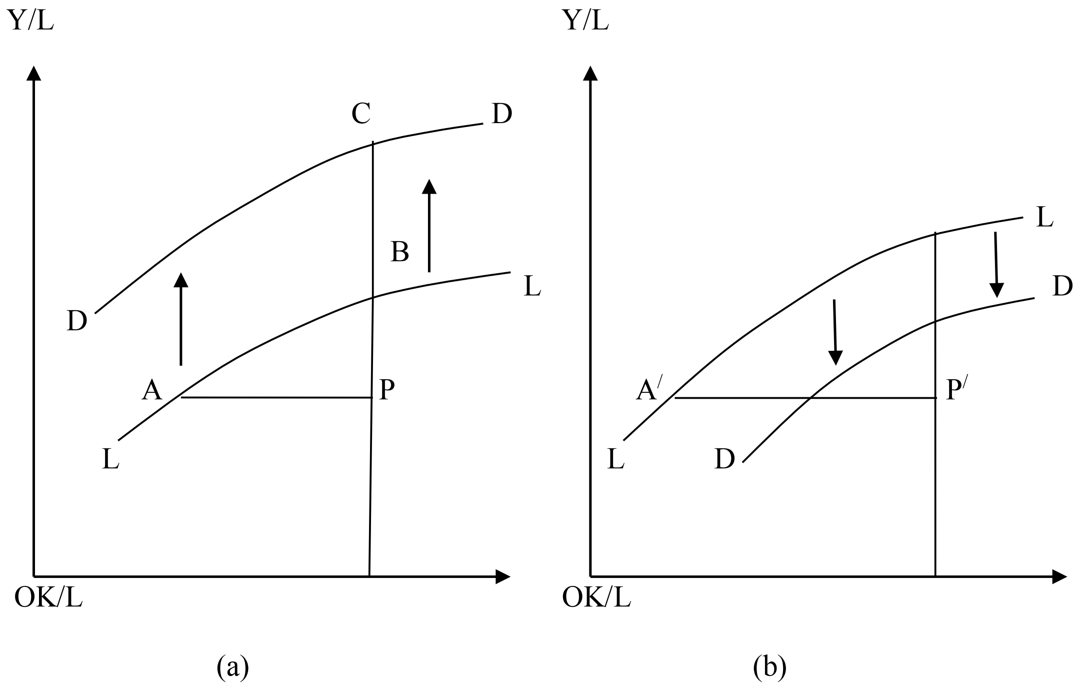


Figure 1.6.1: Measuring Efficiency in a comparative Static Framework

1.7 Technical Progress and Total Factor Productivity

Technical progress may be defined as advances in knowledge with respect to the state of the art of production of output using factor inputs. The Total Factor Productivity Growth (TFPG), however, is a broader concept encompassing the effect of not only technical progress(i.e., shift in production function) but also of better utilization of capacities, learning-by doing and improved skill of labour, etc. (Goldar, 1985). Thus TFPG is a composite measure of technological change and changes in the efficiency with which known technology is applied to production (Ahluwalia 1991). Therefore, TFPG is the combined result of technical progress and technical efficiency change with which the factors are used to produce output (Fan, 1991). These two components of TFPG are analytically distinct and may have quite different policy implications (Nishimizu and Page 1982). High rate of technical progress, on the one hand, can co-exist with the deteriorating technical efficiency performance. On the other hand, relatively low rates of technical progress can co-exist with improving technical efficiency performance.

As a result, specific policy actions are required to address the different sources of variations in productivity. The technical change component of TFP growth captures shifts in 'best practice' techniques production frontier over time and can be interpreted as providing a measure of innovation (Kalirajan and Shand, 1997). This decomposition of TFP growth into technical efficiency improvement (catching up) and technological advance is, therefore, useful in distinguishing innovation or adoption of new technology by 'best practice' firms from the diffusion of new advance technology which leads to improved technical efficiency amongst firms, i.e.; 'catching up'. Coexistence of high rate of technical progress and a low rate of change in technical efficiency may reflect failures in achieving technological mastery or effective diffusion of best technical practices. It may also reflect high levels of technological dynamism in an industry with rapid obsolescene rates for technology.

1.8 Objectives

The objectives of the study are presented below.

(1) To study total factor productivity growth (**TFPG**) patterns in the tea industry in Assam.
(2) To study **rate of technical change** and its **bias** with respect to inputs.
(3) To study **elasticities of output with respect to inputs** and the **scale elasticity of output.**
(4) To examine the trend and distribution of **firm level technical efficiency**.
(5) To estimate firm level **cost efficiency**.
(6) To contrast the **productivity** and **efficiency** patterns of tea producers of **Upper Assam** compared to those of **Barak Valley**.

The first objective examines the performance of tea producers by using a composite measure factor productivity growth over the period 2001 – 2010 (for Brahmaputra Valley and for Barak Valley). The second objective studies whether technical progress in this industry has been biased with respect to certain factors. Bias against labour is the main concern here (as because the industry is labour intensive). The third objective deals with output responsiveness or sensitivity with respect to inputs. Objective three deals with these apart from the time varying technical efficiency. Objective four deals with the measurement of estate level technical efficiency. Both time invariant and the time varying models of technical efficiency are estimated by using the well-known technique of the stochastic frontier. Objective five deals with estimation and analysis of cost efficiency by using a stochastic cost frontier. Finally the sixth objective compares the performance, productivity and efficiency of tea producers of upper Assam with those of Barak Valley over the study period.

1.9 Hypotheses

(1) Total factor productivity growth does not exhibit any rising trend in the tea industry in Assam.

(2) Technical change is not biased with respect to any factor of production.

(3) All tea producers in the selected sample are technically efficient and cost efficient.

(4) Technical efficiency is neither time varying nor is influenced by any exogenous non-input factors.

(5) There is no difference in efficiency and productivity among tea producers of upper Assam compared to those of Barak valley.

1.10 A Profile of Tea Industry

1.10.1Global Scenario

Tea is one of the most popular beverages in the world. It is consumed by a very large number of people. Due to its increasing demand, tea is considered to be one of the major components of world beverage market. The global market for hot beverages (coffee and tea) is forecasted to reach US $ 69.77 billion in value and 10.57 million tons in volume terms by the year 2015 (GIA, 2011). Tea cultivation is confined only to certain specific regions of the world due to specific requirements of climate and soil. Majority of the tea producing countries are located in Asia where China, India, Sri Lanka are the major producers. African tea growing countries are located mostly around the tropical regions where Kenya, Malawi, Rwanda, Tanzania, and Uganda are the major producers. Apart from these regions, some quantities of tea are also being produced in South America (Argentina, Brazil and others), the Near East (Iran and Turkey) and the CIS (Russia and Georgia).Amongst tea producing countries, the principal producers are China, India, Sri Lanka, Kenya and Indonesia. These five countries account for 77 per cent of global tea production and 80 per cent global tea exports.

Tea is the most popular manufactured drink in the world in terms of consumption. Its consumption equals all other manufactured drinks in the world – including coffee, cocoa, soft drinks, and alcohol – put together. Most tea consumed outside East Asia is produced on large plantations in the hilly regions of India and Sri Lanka, and is destined to be sold to large businesses. In contrast to this large-scale industrial production of average quality tea, are many small "gardens," sometimes minuscule plantations that produce a few uncommon varieties of tea that are highly prized by tea connoisseurs and tasters. These varieties of tea are both rare and expensive, and can well be compared to some of the most expensive wines in this respect.

India is the world's largest tea-drinking nation, although the per capita consumption of tea remains a modest 750 grams per person every year. Turkey, with 2.5 kg of tea consumed per person per year, is the world's greatest per capita consumer.

1.10.2 Commonly Cultivated Varieties

Camellia sinensis is an evergreen plant that grows mainly in tropical and subtropical climates. Some varieties can also put up with marine climates. Tea plants are propagated from seeds and cuttings. It takes about 4 to 12 years for a tea plant to bear seeds, and about three years before a new plant is ready for plucking or harvesting. In addition to a warm and humid climate, tea plants require at least 127 cm (50 inches) of rainfall a year, and are better grown on acidic soil. Numerous aromatic and flavoured varieties of tea plants are cultivated at elevations of up to 1,500 meters (4,900 feet) above sea level. At these heights, the plants grow more slowly and the leaves gain better flavour. Only the top 1-2 inches of the mature plants are picked. These buds and leaves are called "flushes". A plant will grow a new flush every seven to 15 days during the growing season, and leaves that are slow in development always produce better-flavoured tea. A tea plant can grow into a tree of up to 16 meters (52 feet) if left undisturbed, but cultivated plants are pruned to waist height for ease of plucking on the one hand and for dense population of leaves within a small area on the other.

Two principal varieties of tea are cultivated by tea planters – the China plant (*C. s. sinensis*), used for most Chinese, Formosan and Japanese tea (but not Pu-erh); and the colonial Assam tea plant (*C. s. assamica*), used in most Indian and other tea (but not Darjeeling). Within these broad botanical varieties, there are many strains and modern Indian colonial varieties. Leaf size is the chief criterion for the classification of tea plants, with three primary classifications being: Assam type, characterized by the largest leaves; China type, characterized by the smallest leaves; and Cambodian, characterized by leaves of intermediate size.

Tea can generally be divided into categories based on how they are processed. There are at least six different types of tea: white, yellow, green, oolong (or *wulong*), black (called *red tea* in China), and post-fermented tea (or *black tea* for the Chinese). The most commonly available types found on the market are white, green, oolong, and black. Some varieties, such as traditional oolong tea and Pu-erh tea, a post-fermented tea, can be used medicinally.

1.10.3 Medicinal Properties

Tea contains catechins, a type of antioxidant. In a freshly picked tea leaf, catechins can comprise up to 30 per cent of the dry weight. Catechins are highest in concentration in white and green tea, while black tea has substantially fewer due to its oxidative preparation. Research by the U.S. Department of Agriculture has suggested that the levels of antioxidants in green and black tea do not differ greatly, as green tea has an oxygen radical absorbance capacity (ORAC) of 1253 and black tea has an ORAC of 1128 (measured in µmol TE/100 g). Tea also contains L-theanine, and the stimulant caffeine of about 3 per cent of its dry weight, translating to between 30 mg and 90 mg per 8 oz (250 ml) cup depending on type, brand, and brewing methods.

Tea further contains small amounts of theobromine and theophylline. Due to modern environmental pollution, fluoride and aluminium have also been found to occur in tea, with certain types of brick tea made from old leaves and stems having the highest levels. This occurs due to the tea plant's high sensitivity to absorption of environmental pollutants. Although tea contains various types of polyphenols and tannin, it does not contain tannic acid. Tannic acid is not an appropriate standard for any type of tannin analysis because of its poorly defined composition.

1.10.4 Origin and History

Tea plants are native to East and South Asia. Although there are numerous anecdotes of the first use of tea as a beverage, no one is sure of its exact origin. The first recorded (documented) drinking of tea is in China, with the earliest records of tea consumption dating to the 10th century BC. It was already a common drink during the Qin Dynasty (third century BC) and became widely popular during the Tang Dynasty, when it was spread to Korea, Japan and possibly Vietnam; although exactly when the Vietnamese began to drink tea is not recorded. Trade of tea by the Chinese to Western nations in the 19th century spread tea and the tea plant to numerous locations around the world. However commercial plantations of tea could not be developed in most settlements in the West as because the agro-climatic conditions were not found to be suitable.

Tea was imported to Europe during the Portuguese expansion of the 16th century. Since then it was termed as *chá*. In 1750, tea experts travelled from China to the Azores, and planted tea, along with jasmines and mallows, to give it aroma and distinction. Both green and black tea continues to grow in the islands, which are the main suppliers to continental Portugal. Tea was not widely consumed in Britain until the 19th century. In Ireland, tea had become an everyday beverage for all levels of society by the late 19th century, but at the beginning it was consumed as a luxury item on special occasions, such as religious festivals, wakes, and domestic work gatherings such as quilting.

1.10.5 Health Effects of Tea

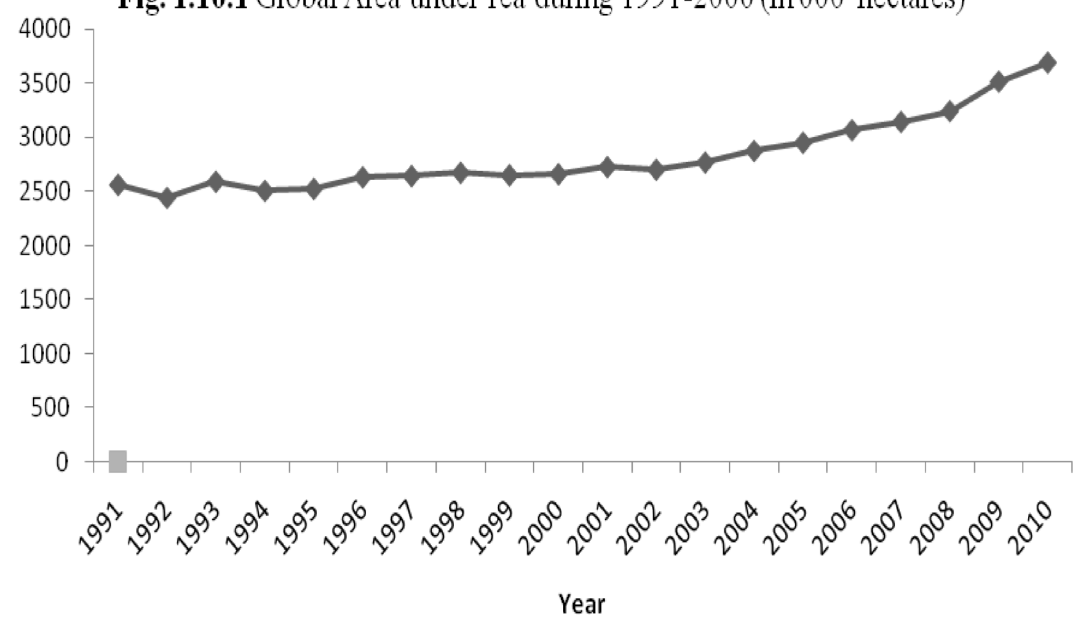
Tea leaves contain more than 700 chemicals, among which the compounds closely related to human health are flavonoids, amino acids, vitamins (C, E and K), caffeine and polysaccharides. Moreover, tea drinking has recently proven to be associated with cell-mediated immune function of the human body. Tea plays an important role in improving beneficial intestinal micro flora, as well as providing immunity against intestinal disorders and in protecting cell membranes from oxidative damage. Tea also prevents dental caries due to the presence of fluorine. The role of tea is well established in normalizing blood pressure, lipid depressing activity, prevention of coronary heart diseases and diabetes by reducing the blood-glucose activity. Tea also possesses germicidal and germistatic activities against various gram-positive and gram negative human pathogenic bacteria. Both green and black tea infusions contain a number of antioxidants, mainly catechins that have anti-carcinogenic, anti-mutagenic and anti-tumoric properties.

1.10.6 World Area under Tea

Globally, tea is presently cultivated in an area of about 36, 91,938 hectares (ha) with an annual production of 40, 66,596 thousand Kg (Anonymous, 2010). Over the years, both area and production has increased substantially along with global trade of tea.

During 1991, tea was cultivated globally under 2563.75 thousand hectares which increased to 2661.88 thousand hectares experiencing a compound annual growth rate of 0.42 per cent during 1991-2000. Since the beginning of the 21st century the global tea industry experienced a steady increase in the overall area under cultivation. During 2001 the area under tea was 2727.42 thousand hectares which increased to 3691.89 thousand hectares in 2010 showing a compound growth rate of 3.42 per cent during the first decade of the new millennium.

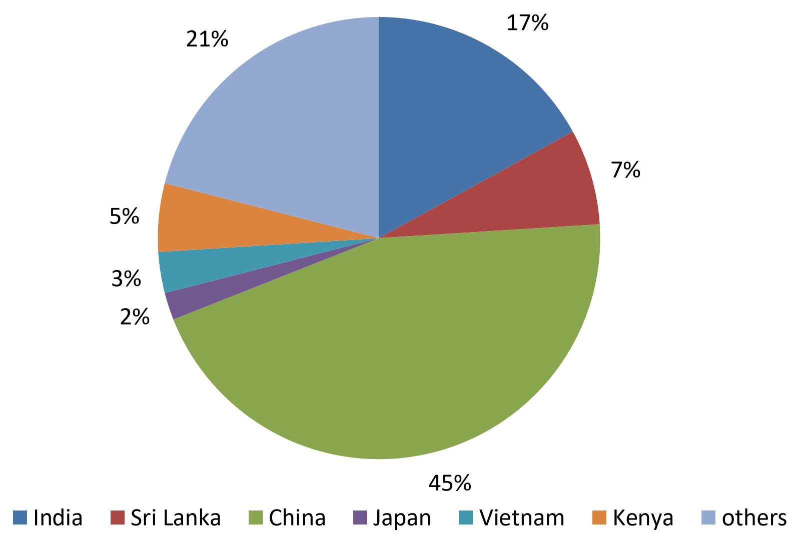
Fig. 1.10.1 Global Area under Tea during 1991-2000 (in 000' hectares)



Source: Tea Board of India

The percentage shares of area under plantations of all major tea growing nations indicate India's relative position in the world in tea. On an average during the last two decades (i.e., during 1991 – 2010), China lead the world having 45 per cent of world area under tea. This is followed by India with 21 per cent, Sri Lanka with 7 per cent, Kenya with 5 per cent, Vietnam with 3 per cent and all other with 21 per cent of world area under tea respectively. This is presented in the pie chart infig.1.10.2.

Fig.1.10.2 Percentage Share of Area under Tea in Major Tea Producing Countries of the World (Average of 1991-2010)

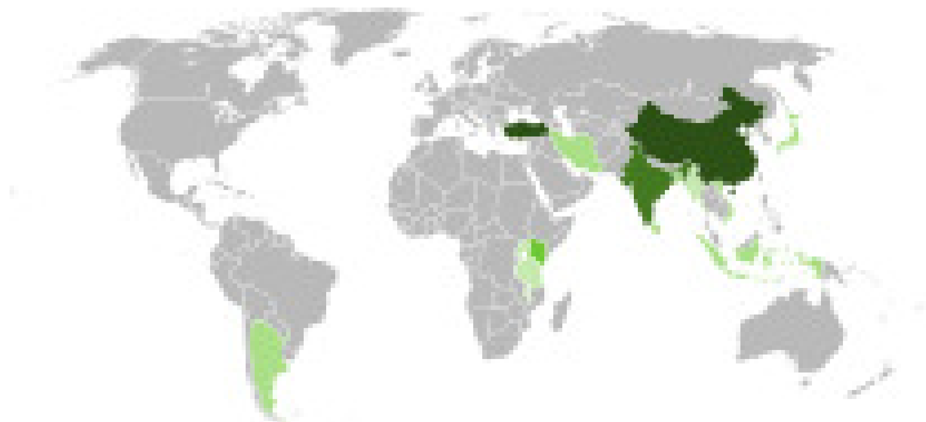


Source: Tea Board of India

1.10.7 World Tea Production

In 2003, world tea production was 3.21 million tons per annum. In 2010, it crossed 4.52 million tons. The largest producers of tea are the People's Republic of China, India, Kenya, Sri Lanka, Turkey and Vietnam. The continents where tea is mainly produced are depicted in the following world map.

Fig. 1.10.3. Map of Continents Mainly Producing Tea in the World



Source: http//en.wikipedia.org/wiki/File:WorldTeaProductionFAO2008.svg

The following table shows the amount of tea production (in tons) by leading countries in recent years.

Table 1.10.1. Tea Production by Leading Countries (tons)

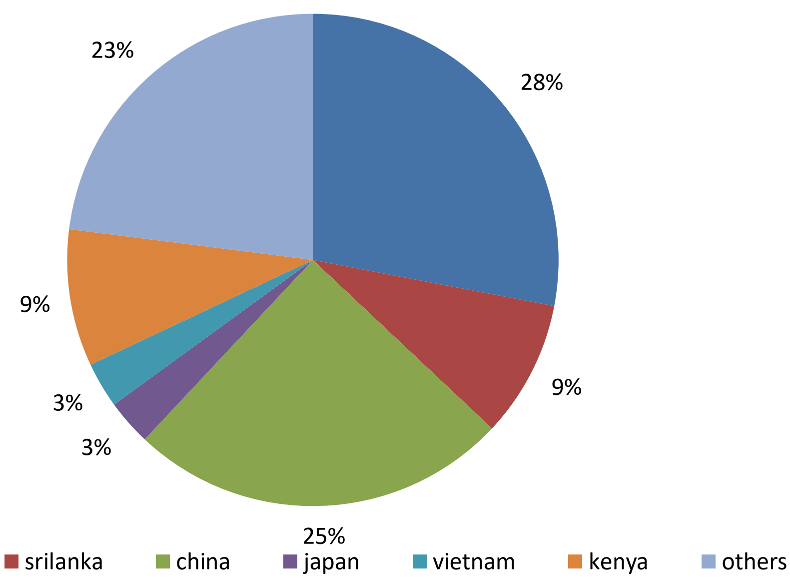
Country	2008	2009	2010
China	1,274,984	1,375,780	1,467,467
India	987,000	972,700	991,180
Kenya	345,800	314,100	399,000
Sri Lanka	318,700	290,000	282,300
Turkey	198,046	198,601	235,000
Vietnam	173,500	185,700	198,466
Iran	165,717	165,717	165,717
Indonesia	150,851	146,440	150,000
Argentina	80,142	71,715	88,574
Japan	96,500	86,000	85,000
Total	3791240	3806753	4062704

Source: Food and Agriculture Organization of the United Nations, February 2012.

The trend of world tea production is very similar to that of world area under tea cultivation. The world tea production increased from 2631.05 million kg to 2928.67 million kg during the period 1991 to 2000 experiencing an average annual compounded growth rate of 1.2 per cent. Again, from 2001 onwards production of tea increased steadily and reached 4162.33 million kg in 2010 showing a compound growth rate of 3.48 per cent per annum during 2001 – 10. Evidently over the last two decades tea production has shown a rising trend due to a host of factors like increase in area under plantations, R & D, advanced methods of cultivation including integrated input packages, controlled and artificial sprinkler irrigation among others. The percentage share of major tea producing nations in world tea production is yet another indicator that can display India's relative position in terms of tea production. On an average during the last two decades India contributed around 28 per cent of world tea output, closely followed by China with 25 per cent, Sri Lanka with 9 per cent (being the world's largest green tea producer) and Kenya with 9 per cent. 23 per cent of global tea output is produced by other countries.

Source: Tea Board of India.

Fig. 1.10.5 Percentage Share of Tea Production in Major Tea Producing Countries of the World (Average of 1991-2010)



Source: Tea Board of India.

Unlike area under cultivation and total production, productivity in tea in terms of yield per hectare did not show any significant increase over the last two decades. The global productivity during 1991 was 1026 kg per hectare which went up to mere 1100 kg per hectare in 2000. In the first decade of the 21st Century, global tea productivity varied between 1100-1160 kg per hectare. Thus, the growth rate of tea productivity for the last two decades remained almost the same.

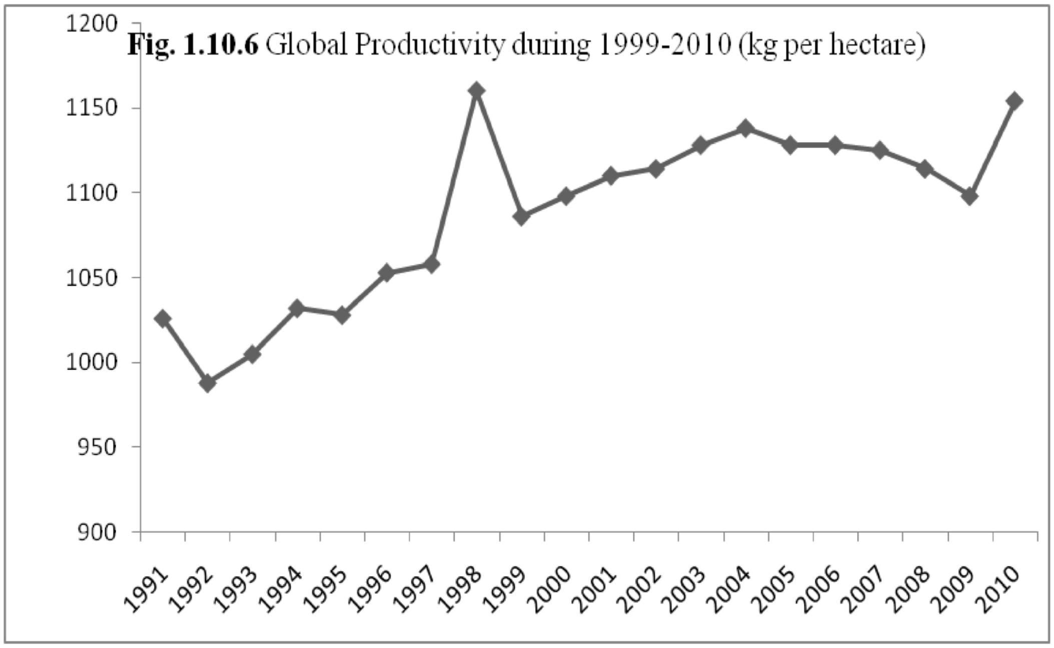


Fig. 1.10.6 Global Productivity during 1999-2010 (kg per hectare)

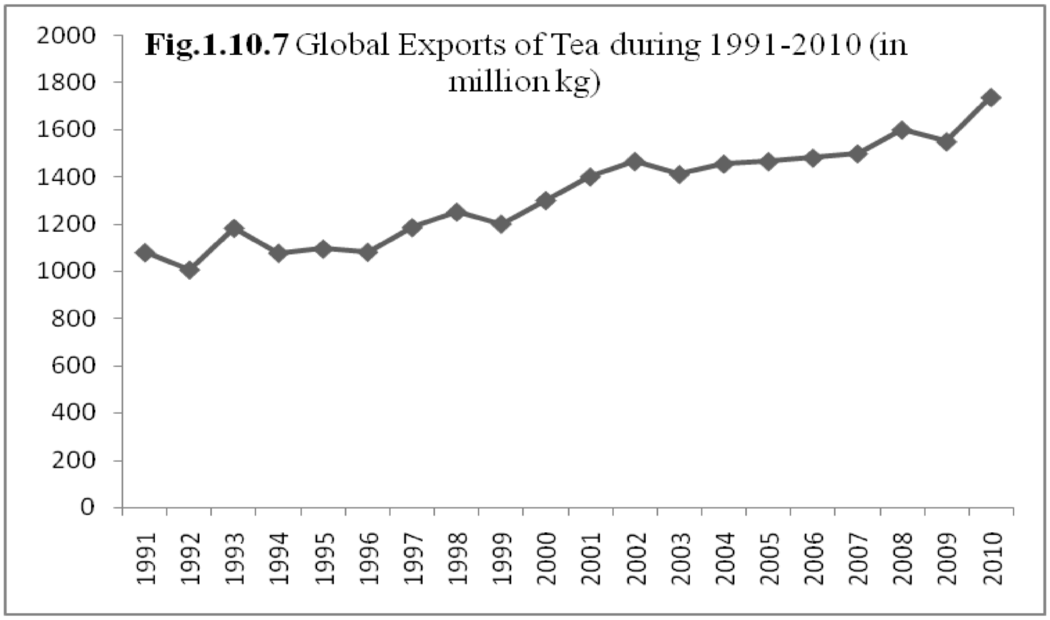
Source: Tea Board of India.

1.10.8 World Tea Exports

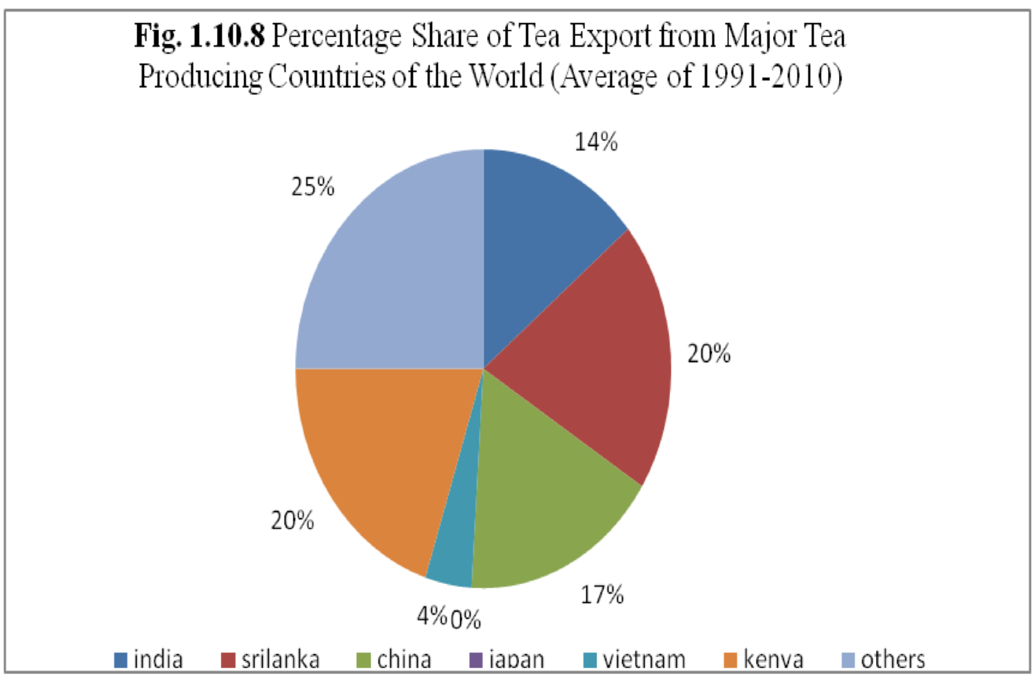
World Tea export recorded a compound growth rate of 2.31 per cent per annum during 1991-2000; exports rising from 1078.17 million kg in 1991to 1324.65 million kg in 2000. An almost similar compound growth rate was observed in the first decade of the 21st Century when export increased from 1400.55 million kg in 2001 to 1738.41 million kg in 2010. Percentage share of tea exports of nations (out of total world exports) provide an indicator of the relative export performance. On an average during the last two decades Kenya and Sri Lanka emerged as world leaders on the export front, each having 20 per cent share of world tea exports. This was followed by China with17 per cent, India with 14 per cent and others with 25 per cent.

During the last five years, it has been observed that total world export averages 41 per cent of total world production. Further, around 84 per cent of exports can be accounted for by six countries, namely India, Sri Lanka, China, Kenya, Indonesia and Vietnam.

The largest tea producers India and China drink away most of their own production and share only a small fraction of exportable tea. Sri Lanka and Kenya, on the other hand, share only 7 per cent and 5 per cent tea growing area respectively, but are world leaders in exports, meeting 20 per cent each of global export requirements.



Source: Tea Board of India.



Source: Tea Board of India.

1.10.9 World Tea Imports

Like world tea export, tea import (either for re-export or for own consumption) has also shown an increasing trend in recent years. From 1093.40 million kg in 1991, it grew to 1272.94 million kg in 2000 with a compound growth rate of 1.7 per cent during 1991-2000. In 2001, around 1333.01 million kg tea was imported worldwide which further increased to 1618.87 million kg at the end of 2010. The annual compound growth rate of world tea imports was 2.18 per cent for the ten year period between 2001 and 2010.

1.10.10 India's Position in the World Tea Market

India is one of the largest tea producers in the world. It perhaps produces some of the finest quality of tea. The country accounts for about 23 per cent of global production. Tea industry is also well-placed in terms of productivity. Since independence, tea production increased over 250 per cent, while area under tea crop increased by 40 per cent. The labour-intensive industry employs over 1.1 million workers and generates income for another 10 million people approximately. Women constitute 50 per cent of the plantations workforce. The per capita consumption of tea in India is low at 750 gm against 1 kg in Pakistan. Of course, within India there are enormous variations in tea consumption per capita. For instance consumption per capita is around 1.4 kilogram in Gujarat. Clearly there still lies a vast scope to boost domestic consumption of tea in India.

India is the largest producer of black tea as well as the single largest consumer of tea in the world. Currently, India produces 23 per cent of total world tea output and consumes about 21 per cent of global tea consumption. Nearly 80 per cent of the tea produced in India is consumed domestically. During the last 20 years, India's ranking as an exporter of tea has come down from one to four, in the face of stiff competition from key global players like Sri Lanka, Kenya, and China.

Table 1.10.2. Status of Indian tea in the World (2010-11)				
Selected Statistics	World	India	Rank	Share (%)
Area under tea (Million hectares)	3.94	0.58	2nd	15
Production (Million Kg)	4162	966	2nd	23
Yield (Kg/Hectare)	1143	1668	-	-
Export (Million Kg)	1738	193	4th	11
Consumption (Million Kg)	3980	837	2nd	21

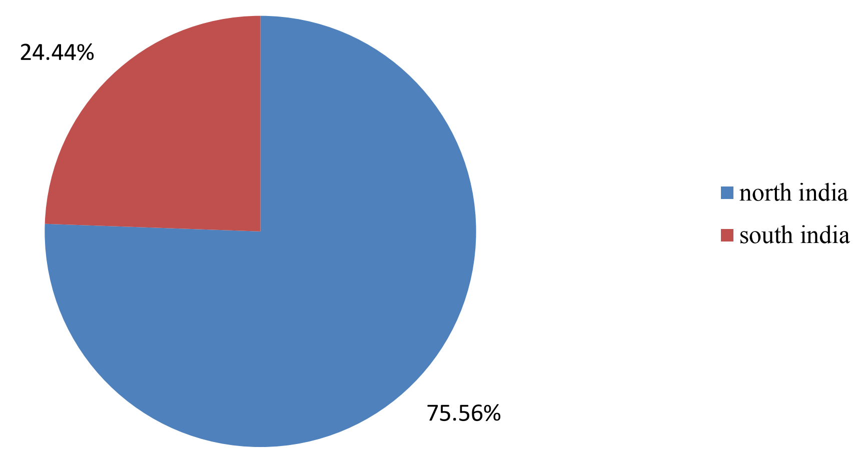
Source: Tea Board of India

1.10.11 Present Scenario of Indian Tea Industry

The tea industry occupies a place of considerable importance in the Indian economy. Producing around one-fourth of the world's annual tea output, the tea industry in India employs around 1.26 million people directly and around 2 million people indirectly. Over the past hundred years a few Indian tea gardens have produced the world's finest and hence some of the world's costliest varieties of tea. India is the single largest consumer of tea globally and has one of the highest per capita consumption levels as well besides a few other Asian nations. Since domestic tea demand accounts for over 80 per cent of the country's tea output, India's exportable surplus of tea is rather limited. This has pegged India's global share in tea trade at a low level.

Although tea is produced in 14 States in India, five of them—Assam and West Bengal in North India, and Tamil Nadu, Kerala and Karnataka in South India account for over 98 per cent of India's tea production. Within that, North India alone accounts for around 75 per cent of India's total tea production, of which 85 – 90 per cent is consumed in the domestic market. The balance, much of it of high quality, is exported.

Fig. 1.10.9. Regionwise Percentage Share of Tea Production in India



Source: Tea Board of India

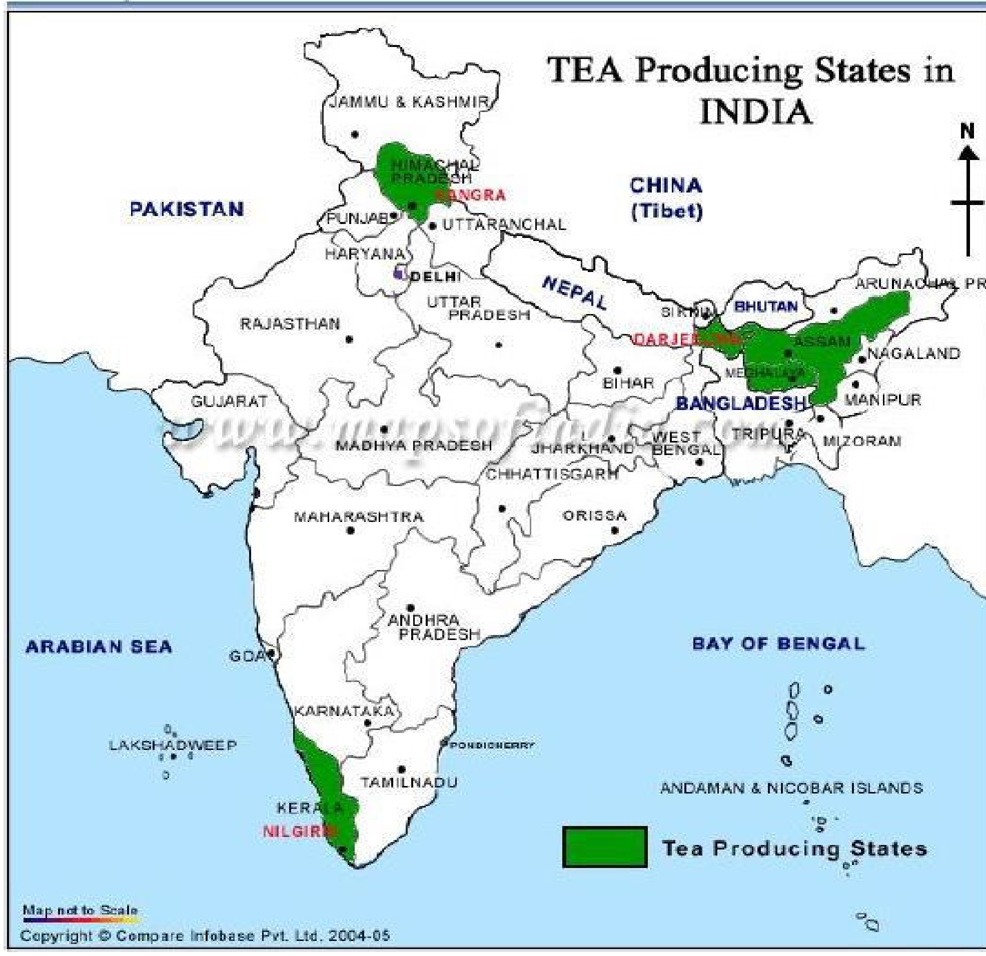
In terms of tea production, consumption and exports, India is one of the leading nations of the world. It occupies an important place and thus plays a very useful role in the Indian economy. It is perhaps the only industry where India has retained its leadership for over the last 150 years.

Tea Industry provides direct employment to more than a million workers mainly drawn from the backward and economically weaker sections of the society. It is also a substantial foreign exchange earner and provides sizeable amount of revenue to the State and Central Exchequer.

Presently, Indian Tea Industry has 1692 registered tea manufacturers, 2200 registered tea exporters, 5548 registered tea buyers and 9 tea auction centers. All-India Tea production rose by 12.3 per cent to 1.62 lakh tons during January-April 2010 (Source: Tea Board of India). The Southern states performed better than the Northern counterparts in recent years. The states of Tamil Nadu, Kerala and Karnataka recorded between 13-24 per cent annual growth rates. Production in Assam, the largest tea producing state in India, recorded around 9.6 per cent growth. In the last few years the tea growing districts of Assam has witnessed excessive rainfall along with frequent pest attacks that have adversely impacted production.

Tea is grown in 14 Indian states. Assam, West Bengal, Tamil Nadu and Kerala together account for almost the entire annual output of the country. Assam and West Bengal taken together, account for almost 90 per cent of national tea output. Though the major part of tea production comes from big estates, the contribution of the small growers has shown an increase in recent years. In fact numerous small planters in Assam, North Bengal and Bihar act as green leaf suppliers to bigger estates having tea factories under their ownership. The various Indian states where tea is mainly produced are located in the following map.

Fig.1.10.10. Tea Producing States in India



Source: http://www.google.com

Tea industry has experienced many structural changes in recent years. These include emergence of small tea growers in place of large plantations and introduction of bought leaf factories (BLF).India's large tea plantations are mostly concentrated in Assam, and north Bengal. Assam alone produces 51 per cent of the national production. As an agro-based industry, the development of plantation industry has contributed greatly towards rural development and partial urbanization of remote and hilly regions by optimum use of land, creation of roadway networks and other communication networks, such as meter gauge railways in such areas.

In India, there are about 1700 processing units engaged in tea production, while around 1671 big planters (having more than 100 hectares of land ownership) produce an output of 700 to 725 million kilogram per year. At least 16 plantations in West Bengal were shut down in last few years after production fell and profits plummeted due to low yields from ageing tea bushes. According to the Tea Board of India, production during the first ten months of 2010 stood at 813 million kilogram as against 830 million kilogram during the same period of 2009.

Table 1.10.3. Consumption of Tea in India during 2001-10

Year	Domestic Consumption (Million Kg)	Per Capita Consumption (gm per head)
2001	673	654
2002	693	663
2003	714	672
2004	735	681
2005	757	691
2006	771	693
2007	786	696
2008	802	701
2009	819	706
2010	837	711

Source: Tea Board of India

Table 1.10.4.Region Wise Tea Production in India during 2007-10			
Year	North India	South India	Total
2007	764.74	221.69	986.43
2008	733.92	246.90	980.82
2009	734.87	244.13	979.00
2010	723.03	243.37	966.40
2011 (E)	747.45	240.88	988.33

Source: Tea Board of India.

As mentioned before, India's export share in the global tea exports has been declining in recent times. The reason for this decline was given by Asopa (2007). India had lost some of its important overseas markets (who are traditional Indian tea buyers) that include Egypt, CIS, UK and Poland. To worsen the situation, Indian tea exports increased by very small volumes in the traditional western markets that include USA, Iran, Syria, Canada, Australia and the Netherlands. India's tea export performance has been poor during the last few years and export prospects for Indian tea seem to be grim until and unless Indian tea exporters improve their export strategies and boost up the availability of exportable surplus by improving both quality and yield.

But unfortunately, in the recent past the productivity performance of Indian tea industry has been far from satisfactory. India's predominance in global tea production is on the decline. Among the many reasons three are well identified. First, most of the older plantations (bushes that are more than 60 years old) are in dire need of replacement by freshly grown bushes. Both quality and yield can be enhanced by investing in fresh plantations. Second, processing facilities (factory sector) require modernization especially in terms of energy saving techniques and third, welfare structures need urgent up-gradation in view of the fact that tea plantations are highly labour intensive. At the global level the Indian tea industry is finding it increasingly difficult to make ends meet, caught between rising costs on one hand and stagnant or declining prices on the other. Low productivity and the increase in the cost of production have become severe challenges for the Indian tea industry. Low productivity and poor overall performance has resulted in the low profitability for most of the tea producers. This in turn has discouraged the owners to invest for productivity improvement, thereby causing a further decline in the yield levels.

A pre-requisite for the improvement of productivity of a particular tea manufacturing unit or the sector as a whole is to identify the exact causes behind low productivity. But the tea industry which is in urgent need for a comprehensive and immediate productivity improvement programme for their long term survival seem to be not interested in the assessment of their productivity status. The reasons for this apparent indifference appears to be lack of knowledge, complex input-output relation, fear of changes, lack of competence, lack of managerial commitment and shortfall of competent personnel and/or the appreciation and understanding of productivity. In the tea industry, which is almost completely under the control and ownership of the private sector, the principal economic objective of profit maximization or sales/revenue maximisation is intricately linked with the objective of improvements in productivity and efficiency. However, no empirical research has been carried out to estimate the productivity and efficiency status and its inter-temporal growth in tea plantations or tea processing in India. Further, no work is reported in literature on the productivity measurement exclusively for this age old plantations based industry, which still occupies an important place in national economy. It is therefore felt that a focused and methodologically sound econometric research on the productivity and efficiency of tea plantations and processing in India is of utmost importance. Without loss of generality the present study focuses on the performance of the tea industry in the state of Assam which is the single largest contributor of processed tea in India.

1.10.12 Problems Faced by the Industry

Indian tea industry carries with it a 170 year old British Colonial history. Thus this industry has been contributing to the country's national income since the early 1840s. But, since late 1990s this industry is passing through a crisis stage (Asopa 2007). The causes of crises are:

(i) Emergence of new tea growing nations (like Vietnam, Indonesia and Kenya) resulting in stiff competition in international market which is flooded with the best tea from other countries.

(ii) Indian tea is gradually losing its position in the export market on account of higher production costs and poor quality.

(iii) Tea is mostly sold through auction. But this is one sided operation which is manly controlled by brokers. Proper price realization is doubtful in this system because it is said that brokers cooperate with the big buyers in the auction houses in order to keep the prices artificially low (Das 2008).

(iv) Existence of higher percentage of ageing bushes is a major problem faced by the industry. It leads to low yield per hectare and degradation of quality.

(v) Higher average costs of production is yet another problem faced by the industry in recent times. Around 80 per cent of the cost of production goes towards fixed expenses like fuel, power and labour (Baruah 2008). Rising energy prices and wages have naturally raised the per unit cost of production.

(vi) There is a complete dearth of sufficient and up-to-date statistical records on tea sector. Proper planning and fund utilization is not possible without this.

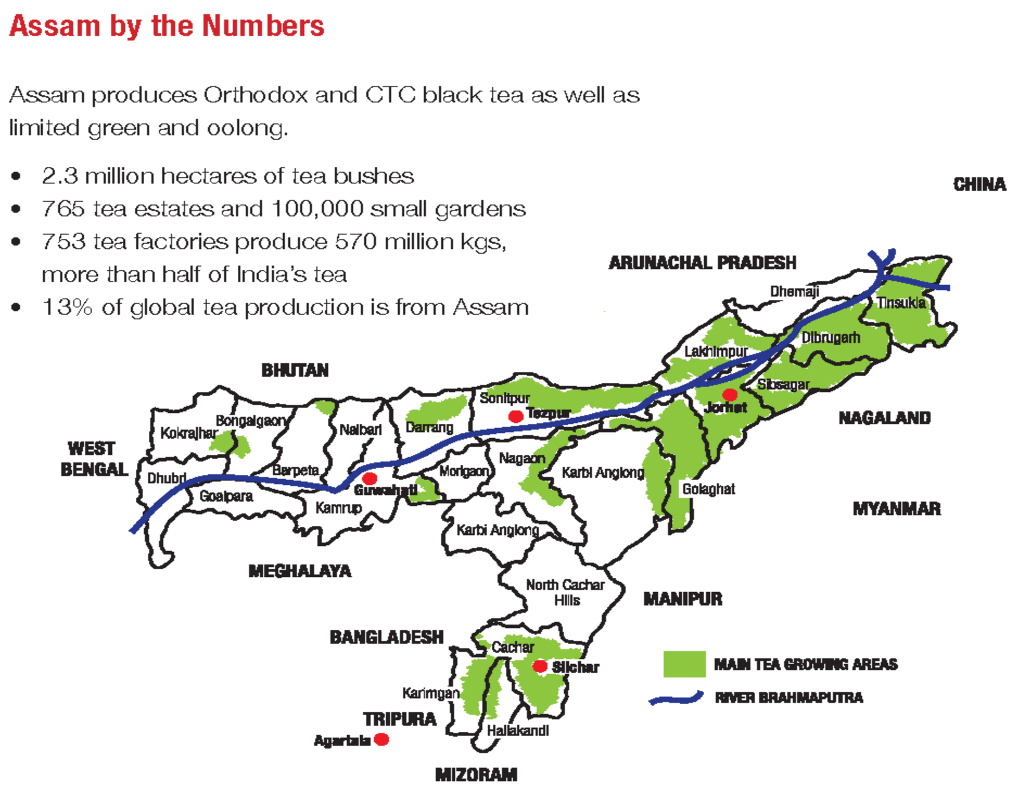
(vii) Ignorance of governments both at the Central and state levels, large buyers, luxury tea consumers and the general public regarding the market structure has not helped the cause of the industry.

1.10.13 Assam at a Glance

Assam, popularly known as the land of the red river and blue hills, is the gateway to the north-eastern part of India. It is located between 90-96 degrees east and 24-28 degrees north. Assam is bordered in the north and east by Bhutan and Arunachal Pradesh. Along the South lie Nagaland, Manipur and Mizoram. Meghalaya lies to her South-West, West Bengal and Bangladesh form the western borders.

The present state of Assam is comprised of three physical divisions, namely, the Brahmaputra Valley, the Barak Valley and the Hilly Range. The Brahmaputra Valley, which forms northern part, is the largest comprising 71.7 per cent of total geographical area of the state. On the other hand the Barak Valley region, which forms the southern part, is comparatively smaller in size. The presence of mighty Brahmaputra River has transformed the land into a fertile zone. Due to its geographical location and climatic conditions, Assam is credited for having high quality alluvial soil. In fact, its economy highly depends on agriculture and allied activities. Crude oil and natural gas are also found in the selected pockets of the state. Assam also has an enormous amount of flora and fauna or what is otherwise known as natural wealth in the form of dense tropical forests, paddy fields and lush tea gardens.

Fig. 1.10.11 Tea Growing Regions in Assam



Source: http://www.google.com

Fig. 1.10.12 Labours Plucking Tea Leaves

Source: http://www.google.com

The profile of Assam is presented in table1.10.5.

Table 1.10.5. Profile of Assam	
Administrative Data	
Establishment	15th August, 1947
Capital	Dispur
Districts	27
Official language(s)	Assamese, Bodo, Karbi
Largest city	Guwahati
Geographical Data	
Population Density	396.8/km² (2011 census)
Area	78,438 km²
State Boundaries	East : Arunachal Pradesh Nagaland and Manipur West : West Bengal and Meghalaya North : Arunachal Pradesh South : Nagaland, Manipur, Mizoram, Meghalaya and Tripura
International Boundary	North : Bhutan West : Bangladesh
Geographic Coordinates	Latitude : 24° to 28° North Longitude : 90° to 96° East
Statistical Data	
Total Population	31,169,272(2011 census)
Male	15,954,927
Female	15,214,345
Literacy rate	73.18 per cent (2011 census)
Male	78.81 per cent
Female	67.27 per cent
Sex Ratio (Male: Female)	1000 : 954

Source: Census 2011.

1.10.13.1 Climatic Conditions

Assam essentially has a sub-tropical type of climate that is largely characterized by heavy downpour and high levels of humidity. The hilly areas usually experience sub-alpine climatic condition, while excessive sultriness is observed in the plains. Though summer, winter and monsoons are the three distinctly observed seasons that visit the state, rainy season marks most of the months of in year. Summers prevail for a few months between April and June.

However, temperature never goes beyond 35°C - 38°C even in the summer months. Rainfall occurs on a more or less regular basis and this keeps the average day temperature under control. However, regular spurts of rain shoot up the humidity levels. Monsoon usually arrives during the first week of June with an oath to flood the state. Usually the intensity of rainfall crosses tolerable limits and leads to frequent floods in both the Brahmaputra Valley and the Barak Valley regions. During the afternoons, thunderstorms are very common. Such heavy precipitation lasts till the month of September or sometimes even early October.

During the monsoon months, rainfall appears at its utmost form in Assam. The state experiences a mild winter during the November to February during which minimum temperatures of around 6°C to 8°C are usually recorded. January is the coldest month in the state. This is only time when Assam observes scanty or sometimes no rainfall. Spring and autumn seasons continue to carry moderate temperatures and scanty rainfall, making Assam a favourite tourist destination during the winter months.

1.10.13.2 Industrial Scenario of Assam

Assam is blessed with a high potential for development of resource based and demand based industries. There are a number of industries in the state viz. Tea, Petroleum, Plywood, Paper, Fertilizer, Cement, Coal, Sericulture, Handloom and Handicraft, Cottage, Tourism, etc. However Assam could not flourish with its resources and accelerate the pace of industrialization as it is subject to a variety of problems. Shyness of capital due to high cost of production, security related vulnerability of the region, inadequate economic and basic infrastructural facilities, dearth of technical personnel, lack of entrepreneurial motivation on the part of local people and low level of central sector investment etc. are responsible for poor industrial development of the state.

The tea industry of Assam is the single largest one of the state playing a dominant role in the economy of the state. It does not only contribute a bigger share in state income but also contribute substantially to the national exchequer every year in the shape of foreign exchange earnings through its exports. Assam tea is not yet officially recognized as a brand or variety of tea by the government due to bureaucratic red tape, depriving the beverage of an exclusive label. As such this industry suffers from an identity crisis in the world market in the absence of official recognition as a unique variety. Moreover, a considerable number of tea gardens of the state have gone sick over the period due to age old gardens, scanty rainfall, increasing trend in the cost of production, general fall in the price of tea, rise in the bed of Brahmaputra, frequent pest attacks, lack of infrastructure, modernization, lukewarm attitude of the tea planters to the tea garden labourers and inefficient management. The demand of Assam tea is already in recession due to better quality tea supplied by the countries like Sri Lanka, Cuba, Kenya and China. India's tea market is facing yet another paradox which could be explained in terms of glaring gulf between the price received by producer and the price charged by dealers and retailers mainly because of unregulated market behaviour.

1.10.14 Tea Industry of Assam

1.10.14.1 A Brief History of Tea Industry in Assam

Long before the commercial production of tea started in India in the late 1830s, the tea plant was growing wild in the jungles of north east Assam. In 1598, a Dutch traveller, Jan Huyghen van Linschoten noted that the Indians ate the leaves as a vegetable with garlic and oil and boiled the leaves to make a brew.

In 1788, the British botanist, Joseph Banks, reported to the British East India Company that the climate in certain British-controlled parts of north east India was ideal for tea growing. However, he seems to have missed the fact that the plant was a native to Bengal and suggested transplanting tea bushes from China. But his idea was ignored.

In 1823 and 1831, Robert Bruce and his brother Charles, an employee of the East India Company, confirmed that the tea plant was indeed a native of the Assam area and sent seeds and specimen plants to officials at the newly established Botanical Gardens in

Calcutta. In 1833 a committee was set up, Charles Bruce was given the task of establishing the first nurseries, and the secretary of the committee was sent off to China to collect 80,000 tea seeds. Because they were still not sure that the tea plant really was indigenous to India, committee members insisted on importing the Chinese variety.

The first twelve chests of manufactured tea to be made from indigenous Assam leaf were shipped to London in 1838 and were sold at the London auctions. The East India Company wrote to Assam to say that the teas had been well received by some "houses of character", and there was a similar response to the next shipment, some buyers declaring it "excellent".

Having established a successful industry in Assam's Brahmaputra valley, with factories and housing settlements, the Assam Tea Company began to expand into other districts of north east India. Cultivation started around the town of Darjeeling in the foothills of the Himalayas in the mid 1850s. By 1857, between 60 and 70 acres were under tea and, whereas the China variety of the tea plant had not liked the conditions in Assam, here at elevations of 2500 to 6000 feet, it grew well. The company pushed on into Terai and Dooars and even into the remote Kangra valley, 800 miles west of Darjeeling.

In the south western tip of the country, experimental plantings had been made in 1835, while the first nurseries were being established in Assam, and by the mid 1850s tea was growing successfully alongside coffee. The climate of the Nilgiri Hills, or Blue Mountains, seemed to suit the plant, and the area under tea steadily expanded.

In 1853, India exported 183.4 tons of tea. By 1870, that figure had increased to 6,700 tons and by 1885, 35,274 tons. Today, India is one of the world's largest producers of tea with 13,000 gardens and a workforce of more than 2 million people.

Barak valley, a geographical territory situated in the southern part of Assam, is full of green tea gardens. Tea cultivation is an indispensable part of the cultural heritage of this land. The tea plantation in the Barak Valley (earlier Surma Valley during British period) was taken up after the annexation of Cachar in 1832. It is reported that for the first time tea gardens in Barak Valley were started in 1855 at Bursangaon and Gungurpar. Subsequently it was developed in Kathal, Silcoorie and Arcattipore and in many other places near Silchar. By the first quarter of the 20th century as many as 100 gardens were established in Barak Valley. During the nineteenth century, Cachar tea was holding the top position in production among the districts of Assam but since then the balance dramatically reversed.

The climate and soil conditions are often cited as the reason but the historical evidences of tea cultivation in Assam in its initial stage (i.e., mid 19th century) do not substantiate such arguments. According to the recent statistics, this valley has 112 tea gardens, out of which 6 are sick and remaining are producing green leafs and made tea

1.10.14.2 Present Scenario of Tea in Assam

Of the agriculture-based industries, tea occupies an important place in Assam which is grown both in the Brahmaputra and Barak plains. Tinsukia, Dibrugarh, Sibsagar, Jorhat, Golaghat, Nagaon and Sonitpur are the districts where tea gardens are mostly found. Assam produces more than 50 percent of the tea produced in India and about 1/6th of the tea produced in the world. Tea industry has contributed substantially to the economy of Assam. About 17 per cent of the workers of Assam are engaged in the tea industry. Assam tea industry is India's largest tea industry and second largest tea production region in the world after China. There are around 2500 small tea gardens and the total production of tea in Assam in 2009 was 500 million kgs, compared to the 487 million kgs produced by the State in 2008. In fact China and Assam are the only two regions in the world with native tea plants. The scientific name for the tea plant is *Camellia sinensis***.** The Assam variety is known as *Assamica.*

The Tea industry occupies an important place in Assam and plays a very special role in the State economy in particular and in the national economy in general. Although the tea cultivation was extended to other parts of the country between 50's and 60's of the last century, as of today, Assam Tea has maintained its international reputation and commands significant share in the World Tea Market.

The total area under tea cultivation in Assam is accounting for more than half of the country's total area under tea. In addition to existing big & large tea gardens owned by reputed both Indian and multinational Companies, the profession of tea plantation in the State has taken up by common people as business venture at present, especially by unemployed youths. According to the Tea Board of India, there are more than 43000 small tea growers in Assam producing about nine percent of the State's total annual production [State focus paper, Assam-2009-10 by NABARD]. As per Tea Board of India information, there are 52000 small tea growers in Assam at the end of March 2011 out of which 4561 were registered with the Tea Board of India covering around 11757 hectare registered area.

According to the State Government reports, there are about 70000 small tea holdings covering approximately 117,000 acres of land in 14 out of 27 districts in Assam. It is important to note that 87 per cent of the cultivation is done in land area measuring less than three acres. [According to the All Assam Small Tea Growers Association, the number of small tea growers has swelled to 65000 in the last two decades and it is on the rise. At present more than 900,000 people are involved in the small tea growing business in Assam. Almost 2,50,000 hectares of land is covered for such plantations. The small tea growers accounted for 30 per cent of the total tea produced in the State, which is 14 per cent of the total tea production of India .With this current growth, 50 per cent of the total tea produced in Assam is expected to come from the small tea growers by 2020].

The conditions of tea estates in the state are not as productive as in the past. Indeed, the tea estate in the state has been facing a major problem due to termite infestation and back-rot diseases. Due to severe outbreaks of pests, the tea plantation has been suffering from both qualitative and quantitative losses. The picture of the tea industry of the state of Assam as a whole is presented in table1.10.15.2.

Table 1.10.6. Tea statistics of Assam and India

	No. of Tea Gardens		**Area under Tea (in000'hectare)**		**Total Tea Production (In 000 kg.)**		**Average yield (kg/ hectare.)**	
Year	**Assam**	**India**	**Assam**	**India**	**Assam**	**India**	**Assam**	**India**
2001	40795	116659	269	510	453587	853923	1685	1675
2002	43272	127801	271	516	433327	838474	1601	1625
2003	43293	129027	272	520	434759	878129	1601	1690
2004	43293	129027	272	521	435649	892965	1603	1713
2005	49102	140712	301	556	487487	945974	1622	1703
2006	NA	NA	312	567	502041	981805	1610	1732
2007	NA	NA	321	578	511885	986427	1593	1705
2008	NA	NA	322	578	487497	980818	1513	1693

Source: Tea Board of India

The present study is presented in the following chapters. After presenting an introduction to the topic in Chapter One, review of literature is presented in chapter two. This chapter deals with both theoretical contributions in the field of measuring Total Factor Productivity Growth along with econometric measurement of farm level technical efficiency and empirical applications to tea industry and other manufacturing sector. Both studies in India and abroad are reviewed. Chapter three deals with the models, methodology and data sources. All parametric and non-parametric measures of TFPG, econometric methods used to measure farm level technical efficiency and cost efficiency etc. are described in this chapter along with the sampling methodology adopted for collection of data on relevant information. Chapter four deals with empirical results with economic analysis and interpretation of the results. Results are presented in a systematic and tabulated manner along with economic interpretations. Chapter five presents summary and policy conclusions of the study. The outline of the entire study is presented first and highlights of key findings are narrated in brief. Finally, the policy suggestions based on the empirical findings of the study are presented. The study concludes by pointing out certain limitations and possible extensions.