CHAPTER 1

Motivation and the Rationale of the Study

1.1 Introduction

Almost after five decades of planning, India’s agricultural sector still offers ample opportunity for overall growth, poverty alleviation, employment generation and sustainable development despite its dwindling share in GDP (which is less than 20% at present). According to 2001 Census, about 53% of total workforce still depends for livelihood on this sector. The sector’s export share is about 10.8% for the period 2003-05\(^1\). Besides being the source of livelihood for the majority of rural poor it plays a catalytic role to the agriculture based industries & the rural non-farm economy either in terms of supply of material inputs or in terms of provision of food & surplus labour.

The agricultural policies in the first decade of planning in India mainly aimed at modernizing the rural economy. During this stage, a modest agricultural growth was achieved mainly through expansion in area. The severe food crisis during the second and the third five year plan periods led the policy makers to look for a quick breakthrough in domestic production by way of widening the technological base of Indian agriculture. So the agricultural policy during the period from mid 1960s to early 1980s mainly directed itself to the promotion of capitalist agriculture in the area experiencing technological breakthrough. A favourable combination of infrastructure, technology, extension, and policy support helped us to attain self-sufficiency in food grain production.

\(^1\) The figure is average for the period 2003-05. (Source: World Development Report, 2008)
A few important changes began to take place from 1980s onwards. First, the spread of yield improving technology to new zones like the Eastern Part of the country. Further, a well known criticism of the Green Revolution is that it led to a cropping pattern biased towards Wheat & Rice only. However, from 1980s policy emphasis shifted to developing a diversified cropping pattern. This is another change that took place since 1980s. In the process crops like oilseeds gained importance in the post 1980 period. Pursuing an effective price & marketing support policy resulted in shift of area from Cereals to Oilseeds & the production of Oilseeds recorded a quantum jump in the 80s (Acharya, 1993). These two aspects gave a new dimension to the agricultural development in the post 1980s.

Ensuring an even economic and agricultural development among various regions of the country has been an important objective of India’s Five-year Plans. As India embarked on the intensive agricultural practices based on High-Yielding Variety technology from the mid-1960s, the changing pattern of regional agricultural development also became conspicuous. In order to have a sustainable growth of agricultural sector, satisfactory performance at the state level is needed. This necessitates a detailed study of agricultural performance for different states of India. As a means to this end the present study attempts to assess performance of West Bengal agriculture quantitatively through econometric model building.

One of the states that had a quite impressive agricultural performance from 1980s onwards is West Bengal. The Land Reforms programme was initiated in the state in the late 1970s aimed at raising production & ensuring equity in land distribution, and the programme has been successful in this state. West Bengal accounted for 11.75 of the total number of tenants conferred ownership rights (or protected rights) up to 2000, despite being home to
only 7.05 per cent of India’s population (Government of India, 2000). As regards implementation of land ceiling laws, West Bengal’s share of total surplus land distributed was almost 20 per cent of the all-India figure (Government of India, 2000), although the state accounts for only about 3 per cent of India’s land resources (Ministry of Agriculture, Government of India). Against this backdrop, West Bengal’s agrarian economy was ready for technological improvement in the early 1980s. The HYV technology enabled farmers with modest holding to experience increase in production. With this changed set-up, West-Bengal acquired an important position in the agricultural scenario of the country. The state recorded the highest rate of growth in foodgrains production for the period 1981-91 (Saha and Swaminathan, 1994).

The Gross State Domestic Product from agriculture in the State over the ten year period from 1993-94 to 2003-04 has grown at an average annual rate of 3.64 per cent which is not only much higher than the average annual rate of growth of Gross State Domestic Product from agriculture for all State (1.53 per cent) but is also the highest among all States (Sources: State Budget, Government of West Bengal, 2008-2009; also Planning Commission and Central Statistical Organization, Government of India). The target rate of growth in agriculture exceeds 4 per cent during the Eleventh Plan period (2007-12) (State Budget, Government of West Bengal, 2008-2009). West Bengal has the third highest average yield in India, which at 2,424 kg per hectare is substantially higher than the national average of 1,739.
The second aspect as mentioned earlier is also prominent in this state. The substantial improvement in agricultural production after 1980s is attributable to, apart from rice, production of crops like Oilseeds & Potato. And both area expansion & yield improvement contributed significantly to this upward trend in production.

1.2 Rationale of the Present Study

The motivation of the present study originates from the fact that despite such spectacular performance of West Bengal agriculture there is a dearth of comprehensive literary works attending to different aspects of growth in this State. There have been studies analysing the trend analysis. But, in recent times, the traditional approach of growth analysis is no longer viewed as a very useful tool. The basic assumption of a deterministic trend made by the traditional approach are criticized of yielding misleading results because over a long period of time both mean and variance of most economic series tend to vary with time. Hence, the concept of stochastic trend has gained relevance in the context of growth analysis.

Another important aspect of agricultural development of a country or a region is the change in its cropping pattern overtime. Any change in this pattern takes place through acreage allocation which in its turn is guided by both price and non-price factors. A supply response analysis captures the changes in area allocation with respect to the aforesaid factors. As with the onset of reform the agricultural sector is more open to the market, it is expected to be more responsive to prices and at this point a supply response analysis becomes relevant.
In order to have a successful agricultural growth the problem of efficiency, productivity and also, total factor productivity growth need to be addressed. At this point the distinction between the concepts of efficiency and productivity is worth mentioning. Productivity is a descriptive measure. The productivity of a firm can be measured as the ratio of the output produced to the input used. On the other hand, efficiency is a normative measure. The measurement of efficiency involves comparison of the actual output with the maximum producible quantity of output from the observed input. The knowledge about the maximum producible output and hence about the production technology is crucial to the measurement of efficiency. The concept Total Factor Productivity Growth is much broader. It is a comprehensive measure of technical change which sums up the partial productivities of all inputs in a production process, so as to capture the contribution of all inputs. It is the combined result of technical progress (shift of production function) and improvements in technical efficiency (catching up). This break up has been elaborately discussed in the Appendix 1.1 to this chapter.

A proper analysis of growth process requires studies of different crops and crop categories. Such an analysis will be helpful to identify the crops that correspond to higher growth rate and also the crops with staggering rates of growth. However, there is a dearth of literature pertaining to analysis of supply response, efficiency and productivity of individual crops in the context of West Bengal agriculture.

It is well known that since 1991 the economy is pursuing a policy of liberalisation for different sectors of the economy. So, the question can be asked: what is the impact of liberalisation on growth rate of output? The present study attempts to look into all these aspects while analysing the growth performance of a few selected major crops of the state.
from 1980 onwards. The reference period spans from 1980-81 to 2002-03. In chapters relating to growth and structural break, the period is further sub-divided in two phases viz., Phase I (the pre-Liberalisation period from 1980-81 to 1990-91) and Phase II (the post-Liberalisation period from 1991-92 to 2002-03) to analyse the impact of liberalisation on the growth of output. The year 1990-91 is used as the break point because various changes in economic policies aiming at liberalisation of the economy began to take place from this point onwards.

For the present study, six major crop categories — like Rice, Cereals, Pulses, Foodgrains, Fibres and Oilseeds — are considered. In addition to these, eight major crops — like Aman (Winter paddy), Aus (Autumn paddy), Boro (Summer paddy), Jute, Wheat, Gram and Rapeseed-Mustard are also selected. The crop-categories and the crops are selected on the basis of proportion of area under them and their contribution to production. For example, Foodgrains account for about 80% of total area under different crops grown in the state. About 97% of Foodgrains area is acquired by Cereals while 90% of Foodgrains area comes under Rice. Cereals and Rice constitute respectively, 76% and 70% of total area under crops. Pulses occupy around 3% of area under Foodgrains and also of total area under crops. Among the non-Foodgrains, Oilseeds and Fibres account for respectively, 8% and 7% of total area under crops. The share of Foodgrains to total production is about 59% while that of Oilseeds and Fibres are respectively 2% and 5%. The shares of Cereals and Pulses are respectively, 58% and 0.65%. Categories like Oilseeds, Fibres and Pulses, though do not account for major shares of either total area under crops or total production, these categories are important in absolute terms and have experienced some important changes over the past decade or so. Similarly, the area under Aman, Aus, Boro, Wheat and Gram together account
for about 96% of total area under Foodgrains while these crops contribute about 93% of total Foodgrains production. Area under Jute is about 98% of area under Fibres and almost 99% Fibre production is attributable to Jute. Potato covers about 71% of area under miscellaneous crop category and contributes about 82% of production under this category. On the other hand, 72% of area under Oilseeds is under Rapeseed- Mustard while 69% of Oilseeds production comes from this crop. Thus, the above analysis on the basis of percentage shares of area and of production substantiate the dominance of the selected eight crops in West Bengal agriculture.

1.3 Objectives of the Study

It has been mentioned above that studying the growth performance of the selected crop entails analysis of different aspects of growth like shift in the growth path, structural break occurring in the growth path, supply response of the producers, efficiency in production of various crops and also, total factor productivity growth of the crops. We lay down the objectives of the present study as follow—

• To understand the process of growth of agriculture through the examination of area, production and yield of different crops and crop categories in West Bengal for the period 1980-81 to 2002-03. We have also examined whether there have been shifts in the growth path of major crop categories and individual crops between pre- and post - Liberalisation period, in West Bengal. In addition, an attempt has been made in the present study to determine the factors affecting the yield of various crops.

• To find out whether there exist any structural break in the growth path of area, production and yield of major crops and crop-categories in West Bengal due to
liberalization. For our purpose we have relied upon both exogenous and endogenous structural break approaches of Modern Time Series Analysis, using unit root test.

- To find out whether there is any long-run equilibrium relationship between the area under the major crops grown in West Bengal and other relevant variables such as absolute price, relative price and the net income over paid-out costs of the crop using the theory of cointegration. Another related objective is to capture the short-run dynamics of adjustments in area and the variables under consideration like prices or income towards the long-run relation following any deviation from the equilibrium. The analysis of partial short-run adjustments is done with the help of error correction mechanism (ECM).
- To measure the levels of technical efficiencies or inefficiencies that might arise in the production of different crops of the state and to identify the specific factors responsible for variations in efficiencies or inefficiencies of a crop.
- To measure productivity growth and also to decompose of the Total Factor Productivity Growth (TFPG) into a technical change component, an efficiency change component and a scale change component. Another important objective is to analyse the factors behind the movements TFPG of different crops in the state.
1.4 Arrangements of the Chapters

The present dissertation consists of eight chapters. Keeping in mind the above objectives the chapterisation of the study has been done in the following manner.

- **Chapter I** deals with Motivation and the Rationale of the Study.
- **Chapter II** entails A Survey of Existing Literature.
- **Chapter III** is concerned with the Growth Performance of Major Crops in West Bengal for the Period 1980-81 to 2002-03 and Analysis of the Factors Influencing Their Yield.
- **Chapter IV** involves A Test of Exogenous and Endogenous Structural Break in Area, Production and Yield of Different Crops in West Bengal during the Period 1980-81 to 2002-03.
- **Chapter V** presents A Supply Response Analysis within the Error Correction Framework for Different Crops in West Bengal for the Period 1980-81 to 2002-03.
- **Chapter VI** presents An Estimation of Technical Efficiency and its Determinants for Different Crops in West Bengal for the Period 1980-81 to 2002-03.
- **Chapter VII** measures Total Factor Productivity Growth and its Determinants for Different Crops in West Bengal for the Period 1980-81 to 2002-03.
- **Chapter VIII** describes Summary and Conclusion of the present study.
Appendix 1.1

The components of Total Factor Productivity Growth (TFPG)

The TFPG as the combined result of scale effect, technical progress (TP) and improvements in technical efficiency (TE) can be represented using the production frontier. Figure 1.1 depicts the decomposition of TFPG into scale effect, technical progress and changes in technical efficiency. Technical progress is denoted by the shift in the frontier where as technical efficiency is said to be achieved when the firm is producing with full productive capacity by adopting the best practice techniques and is on the frontier.

![Figure A1.1](image)

The Decomposition of TFPG into input growth, technical progress and technical efficiency
In the Figure A1.1, $F_1$ and $F_2$ represent the production possibility frontiers for period 1 and period 2, respectively. Now, if the firm in question is technically efficient, its output level in period 1 is $q_1^*$ using input level $x_1$ and is $q_2^*$ in period 2 using input level $x_2$. However, because of various organizational constraints, such as lack of proper management, or of proper incentive structure for the workers, the firm may not operate on the frontier producing the efficient level of output but may actually end up producing somewhere below the frontier. As a result the realized output may be less than the maximum producible output. Let us suppose that in period 1, $q_1$ is the realized output. Now, suppose the firm increases the level of inputs to $x_2$. As a result, the realized output is $q_2$. The output growth from $q_1$ to $q_2$ (denoted by $q_1q_2$) can be decomposed into change in technical efficiency, a technical progress and scale effect or the output growth due to input growth.

$$q_1q_2 = q_1 q_1^* + q_1^* q_2^* + q_2^* q_2$$

$$= (q_1q_1^* - q_2q_2^*) + q_1^* q_2^* + q_2^* q_2^*$$

$$= (q_1q_1^* - q_2q_2^*) + q_1^* q_2^* + q_2^* q_2^*$$ (A 1.1)

The gap between $q_1$ and $q_1^*$ is due to technical inefficiency in period 1 and with respect to the input level $x_1$. Let us denote this gap by $TE_1$. Similarly, in period 2, with respect to the input level $x_2$, the difference between the realized output, $q_2$ and the maximum producible output $q_2^*$ is again due to technical inefficiency. Let us denote it by $TE_2$. The difference between $TE_1$ and $TE_2$ gives the contribution of change in technical efficiency to output growth between two periods.

Now, if the firm increases the level of input, in period 1, from $x_1$ to $x_2$, the resulting increase in output from $q_1^*$ to $q_2^*$ is due to input growth along the frontier, $F_1$. This change captures the effect of scale change.
If there is a technical progress due to improved quality of human and physical capital it results in the shift of the frontier which is depicted by movement from $q_2'$ on $F_1$ to $q_2^*$ on $F_2$ in period 2. Thus, the gap $q_2^* - q_2'$ at the input level $x_2$ measures the technical progress.

Thus the output growth from $q_1$ to $q_2$ can be decomposed into change in technical efficiency (the difference between $q_1^*$ and $q_2^*$), a scale effect or the output growth due to input growth ($q_1^*$ to $q_2'$, denoted by $q_1^* - q_2'$) and a technical progress ($q_2'$ to $q_2^*$, denoted by $q_2' - q_2^*$). Equation (A 1.1.) can be rewritten as

$q_1q_2 = \text{change in TE} + \text{scale effect} + \text{TP}$.