CHAPTER 1
INTRODUCTION

1.1: THE BACKDROP OF THE STUDY

It is widely accepted that the introduction of the seed-fertilizer technology during the mid-sixties brought about significant increases in the levels and growth of agricultural output in India. After the Green Revolution in Indian agriculture and the initiation of new wave of Land Reforms process in the 1970s, Indian agricultural growth seemed impressive till the 1980s. However, after the initiation of the economic reforms process, there has been a remarkable slowdown in agricultural growth since the 1990s onwards, which has been a major concern for the economists. The deceleration appears to have taken up pace especially during the last few years.

This slowing down of agricultural growth has been especially true in the foodgrains sector, particularly in the growth of rice. In fact, the compounded annual average growth rate in production of foodgrains decelerated from 2.85 percent in the 1980s to 2.02 percent in the 1990s, and further to 1.96 percent only during 2000-01 to 2009-10. Over the same period, the deceleration in growth of production of rice has been more pronounced as it dropped from 3.62 percent in the 1980s to 2.02 percent in the 1990s, and further to 1.61 percent only during the last decade, viz. 2000-01 to 2009-10.

More detailed investigation reveals that this deceleration in the foodgrains sectors is more prominent since 1993-94 till date. The compounded annual average growth rate of foodgrains during the period 1994-95 to 2009-10 stands at only 1.70 percent, while that for rice stands even lower at 1.15 percent only. In fact, the slowing down of foodgrains production has been more pronounced during the last decade itself (2000-01 to 2009-10) registering
a growth rate of 0.90 percent only. The corresponding growth rates for rice and wheat during the same period stand at 0.68 percent and 0.76 percent only\(^1\).

This slowdown in agricultural growth has been the centre of attention for most of the recent studies on India agriculture. The problem of deceleration in Indian agriculture has been viewed from a number of socio-economic and political perspectives and various explanations have been put forward. The new policy regime is often alleged by a section of economists to have created conditions for retardation in agricultural production, though there is much controversy in this regard: often factors like reduction in public investment in capital formation in agriculture, particularly reduction in public expenditure in major irrigation schemes and agricultural input and output price policies, as well as agricultural credit policies and policies towards subsidization of inputs and new agricultural policies under WTO- are considered as important influencing factors. From a macro-level perspective, it is argued that such factors remain instrumental in augmenting or retarding the growth of agriculture. More specifically the recent slowdown is very often attributed to the failure of the new policy regime to bring about growth augmenting changes in this sector\(^2\). Our perspective is that while such factors may appear to be responsible in influencing the process of agricultural growth, farm level performance under the new policy regime should be examined in more detail so as to arrive at conclusions regarding impact of new policy regime on agriculture. We shall mainly concentrate on examining the performance of Indian agriculture at the farm level in the context of the changes arising out of the process of implementation of the new set of policies.

The context under which we shall take up our study is created by features of Indian agriculture which continues to characterize the sector under the new policy regime. The two major policy issues causing new trends in

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\(^1\) See annexure for related tables
\(^2\) Desai B M, et al.(2011)
Indian economy in the recent past, viz. liberalization of trade and privatization along with impact of new policies envisaged under the Uruguay round of GATT, have posed newer challenges to the Indian economy. The Doha development declaration, that was meant to emphasize the implementation aspect, was intended to create environment such that developed countries adhere to their commitment to provide greater market access and special and differential treatment to the least developed nations and lower the volume of domestic supports in various forms. But how far such commitment is met in practice remains greatly doubtful. It is a much debatable issue from economic as well as political point of view that how India, especially with its agrarian base, copes up with these economic changes. It is highly questionable whether Indian agriculture has the efficiency to maintain its competitive position in this globalized world; whether it can absorb the shock generated by the new policy changes. The stabilization programme taken up by the government after the initiation of the reforms process in 1991 meant a reduction in government expenditure or a ‘fiscal squeeze’ which has its effect in the form of decline in government expenditure on capital formation in agriculture\(^3\). This in turn has resulted in the reduction of expenditure on major institutional and infrastructural supports like agricultural credit and public irrigation system.

The expenditure on agricultural credit were reduced at a time when it was well recognized that the policymakers are yet to arrive at a banking structure and operational system that could promote modern agriculture, which is revealed by the fact that farmers’ relative dependence on formal credit has reduced vis-à-vis their dependence on informal credit. The informal credit agencies are fast making a comeback in the rural areas with their merchant and usuary capital\(^4\). The reduced role of formal credit resulted not only increased indebtedness of the farmers but also has given rise to market

\(^3\) Gulati A, S Bathla (2001)
\(^4\) Khasnabis R (1994)
interlinkages, leading to distortions in the functioning of markets for credit and agricultural inputs and output.

The expenditure on public irrigation system were reduced at a time while it has been well established⁵ that there has been much scope for further development and utilization of both groundwater and surface water irrigation. However, despite the decline in public investment in agriculture, the private investment in agriculture, especially in minor irrigation schemes, has shown an increasing trend over the last two decades.

The fall in public expenditure, particularly in irrigation, though is accompanied with rise in private investment, has led to reduction in the rate of gross capital formation in agriculture. Moreover, the increased dependence on private irrigation system has led to not only increased price of water for irrigation but also to excessive depletion of groundwater. All these have their impact in the form of declining return per unit of investment from production of water intensive traditional foodgrains. At the same time, there has been a continuous degradation of the fertility of soil resulting from over-use of chemical fertilizers, which in turn has its contribution to the falling growth rates in yield throughout the country⁶.

The fall in publicly provided irrigation in turn has its impact on the pattern of input use and output mix. In fact, the increased role of private irrigation markets has led to a fall in groundwater level and enhanced cost of irrigation for water-intensive traditional crops. All these changes have the impact of reducing the profitability and comparative advantage of the traditional crops, giving rise to increased tendency for diversification of cropping system towards less water intensive high value crops. These are happening within the preexisting agrarian structure characterized by predominance of marginal and small farms; while the tendency of marginalization has not been reversed, rather it has been reinforced.

⁵ Narayanamoorthy A, et. al. (2009)
⁶ Carrasco B, H Mukhopadhyay (2012)
At the same time, there has been a deregulation process of fertilizer industry which has contributed to the increased dependence on trans-national companies. The reduction of subsidies and direct government expenditure and removal of restriction on entry of private enterprises and trans-national companies in business in agricultural inputs have been accompanied by increasing cost of production through increase in price of inputs. The opening up of the agro-based business sector and reduced role of government in seed market has led to significant change in the pattern of use of material inputs, which in turn has resulted into increased cost of production in agriculture. All these have contributed to huge increase in cost of material inputs in traditional agriculture.

Policies were also taken up (under WTO negotiation) for the elimination of quantitative restrictions on imports of agricultural commodities and reduction in tariff rate, while promoting export of farm products. However, the reluctance of the developed countries to reduce domestic support to the desired extent makes it difficult for the developing countries to protect the agrarian economy based on production of traditional crops from cheaper imports, while they find it difficult to expand their exports in the developed countries.

Further, during 1990s policies were taken up to introduce an Intellectual Property Right (IPR) regime for seeds and plant varieties and to allow transnational agribusiness corporations to operate with less restriction in the country. This change has ensured easy access of trans-national companies into the seed market of the developing countries and their control over these markets with huge investment for the development of diverse varieties of genetically modified and transgenic seeds. The process in turn has led to increased dependence of the farmers on purchase of high priced seeds.

7 “A study of ..... costs establishes unequivocally that the costs of farm inputs increased very sharply in the post-reform period”; Raghavan M (2008)
Thus, at the present moment, agriculture is turning out to be less profitable a field of investment\(^8\) lacking the dynamics which may lead to continuous enlargement of average scale of operation of farms through concentration of land under the hand of profit making entrepreneurs. Rather it leads to the reverse process of marginalization of holdings and growth in the number of subsistence oriented marginal and small farms, with continuous fall in average scale of operation.

All these no doubt has threatened the viability of traditional farming\(^9\) itself, especially in the face of uncertainties and volatilities of a globally integrated market. The high cost of inputs and irrigation water coupled with low yield rates and low price make it imperative for the farmers to depend on credit. Again, owing to non-availability of adequate credit facilities from institutional sources, they are compelled to depend on informal sources of credit at high cost and extremely unfavourable terms and conditions. This is reflected in the comeback of rural moneylenders in agriculture with strong presence of interlinked credit, inputs and product markets in states like Punjab, Andhra Pradesh and West Bengal\(^10\).

On the whole, the reform process in India after 1991 significantly weakened the institutional support structure in agriculture. The protection offered to agriculture was reduced, resulting in conditions for maintaining prices of many agricultural commodities at low levels. As part of fiscal reforms, major financial support to agriculture were brought down\(^11\) relative to the size of the agriculture with the removal of restriction on entry of private enterprises and trans-national companies, resulting into a rise in input prices. Public capital formation in agriculture continued to fall\(^12\). The expansion of

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\(^8\) Alagh Y K (2011); Dev S M & Rao C (2010)
\(^9\) Rao C H H (2001)
\(^10\) See literature review (Chapter 2)
\(^11\) “This reduction was at least partially achieved by reducing transfers to state governments. As a result, state government budgets faced crises and agriculture, being largely a state subject, was denied adequate investment” - Jha R (2007)
\(^12\) Gulati A, S Bathla (2001); It should be noted however that public capital formation in agriculture exhibited an increase in the very recent years.
rural credit decelerated, reopening the doors for the informal sector.\textsuperscript{13} Public resources were sought to be channeled away from food crops and towards high-value export-oriented crops.

Given this background characteristics and policy perspective in which Indian agriculture functions at the present moment, we propose to take up a detailed micro-level study with a view to bringing out the emerging features of Indian agriculture along with their impact on productivity, efficiency and surplus generating capacity at the farm level. We shall take up the structural, technological and institutional features which are emerging out of the process of changes undergone by the sector or has been continuing to work and examine the performance at the farm levels in terms of productivity, efficiency and surplus generating capacity. Broadly, our intension is to identify the factors that might have significant impact on productive performance of the farms in the context of changes that are taking place in Indian agriculture after the 1990s. In course of our discussion we shall not only revisit some of the older issues like inverse relationship between production performance of farms and size of farms in the new context, but also take up issues like technical efficiency in using modern inputs apart from allocative efficiency, relationship between farms’ performance and their pattern of involvement in interlinked credit-product-input markets as borrowers, categorization of farms with varying access to productive assets and outside production engagement, into different categories with differing performances, and role of interlinked market operations in influencing performance of these different categories of farmers. We shall take up three agro-economic areas which present different conditions with regard to irrigation, infrastructure and some important socio-economic indicators, in the state of West Bengal, for the purpose of our detailed analysis of factors influencing farm level performances.

\textsuperscript{13} “The exploitative nature of the non-institutional credit, ……, the declining profitability in agriculture are some of the reasons identified for indebtedness” - Working Group Report on Agriculture and Allied Sector; Planning Commission; Government of India; 2001
1.2: Approach to the Problem

Given the process of changes that Indian agriculture is facing at the macro level, the question that we want to take up for investigation is how is the performance of Indian agriculture at the micro level, under the new policy regime. We conduct a detailed study of the probable factors responsible for the relative stagnation in Indian agriculture at the present moment in terms of some aspects of farm economics, under varying infrastructural conditions in West Bengal.

We view agricultural stagnation as the product of interaction among structural, technical and institutional features characterizing present day Indian agriculture. As regards structural characteristics, we observe a continuous process of marginalization is still characterizing Indian agriculture, which has not been reversed under the new policy regime. So we take up the question for investigation whether marginalization of Indian agriculture continues to play a negative impact on agricultural performance still under the new conditions, when agriculture has been relatively modernized in terms of widespread use of modern inputs.

With markets for agricultural inputs and output being more liberalized, and Indian agriculture being more open to international competition, the question of technical efficiency in the use of inputs assumes ever more importance. Under the new system characterized by continuously increasing costs of inputs, output level achieved per unit of vector of input levels applied has assumed enormous importance side by side with allocative efficiency. With diversification of cropping pattern assuming increasing importance, the question that arises is how farms under different size-classes, different categories and different agro-economic conditions are diversifying their cropping pattern and how their involvement in interlinked market transactions influences their technical efficiency as well as their decision to diversify their crop-mix. Overall our aim would be to examine how Indian agriculture is performing in terms of these new set of criteria given the
structural and institutional characteristics. The institutional characteristics of market interlinkage which assumes importance with falling significance of formal credit and comeback of the informal credit system with greater vigour, raises the question whether this institutional feature is exerting negative impact on performance of Indian agriculture, in terms of productivity, technical efficiency and diversification of crop-mix. We propose to take up all these questions for detailed investigation.

In literature there is much debate on farm-size and productivity and the hypothesis of an inverse relationship between farm-size and productivity is widely accepted on the basis of statistical observations. We shall take up a brief re-visit to the issue. Importance of farm-size notwithstanding, after Indian agriculture has become sufficiently modernized, use of inputs in proper doses has become more important a factor determining productivity and surplus generating capacity of the farms. Technical efficiency of the farms has thus become an important point of discussion in the analysis of a farm’s success or failure in contributing to generation of net positive value. We therefore take up a study of technical efficiency of farms and we include technical efficiency as a factor in determining productivity along with other factors including farm-size. However, by ‘technical efficiency’ is meant something other than ‘allocative efficiency’, which is estimated with the help of production function analysis. ‘Allocative efficiency’ measure depends on data on market price of inputs and output. As our analysis would show, regional differences in input and output prices are influenced by institutional factors. We therefore do not restrict ourselves to production function analysis and take up a Data Envelopment Analysis (DEA) to estimate technical efficiency of the farms, and examine how efficiency is influenced by farm-size, what are the determinants of technical efficiency and how it affects agricultural production and productivity across regions having varied characteristics with regard to infrastructure and irrigation.
Thirdly, we think institutional factors are important because of their effects on price of input and output, and through it technical efficiency and productivity. In explaining the institutional factors however we focus our attention on the operation of different markets as institutions. In Indian agriculture, the new policy regime has led to continuously restrictive role of formal credit market, and re-emergence of informal credit market with greater significance. But informal credit markets sometimes operate in interlinked manner along with various other markets, namely output, material inputs, irrigation and labour. We consider interlinked market operations as institutions exerting positive and negative influences on generation of surplus and farm-level productivity and even technical efficiency, and take up an in-depth study of all these aspects.

Lastly, we think apart from farm-size and other inputs, there are various factors which affect agricultural performance at the farm-level. Size of farm is not the only characteristic feature of a farm that determines the behavior of farms. There are various dimensions on the basis of which farms can be categorized into groups with varying capacity and motivation for undertaking productive investment in agriculture. Farms are different with respect to their possession of physical capital goods and with regard to degree of involvement in non-farm activities, and these different types of farms may perform differently under the new institutional and technological conditions. In fact productivity at the farm-level may vary on the basis of access to agricultural implements and farms’ involvement in different income-earning non-farm activities as well, which may be taken to indicate their capacity and motivation for undertaking productive investment in agriculture. In order to examine how far variations with regard to these characteristics of the farms may determine variations in surplus generating capacity of the farms, we classify farms into various categories on the basis of these criteria, and examine the relative performance of these categories with regard to technical efficiency, productivity and profitability.
1.3: Objectives of the Present Study

In this study we shall take up the question of farm level performance of Indian agriculture from three different points of view. First, we shall examine to what extent the structural aspects of Indian agriculture, i.e. the size distribution pattern of holdings, continue to exert its influence on farm level performance. It is a well known fact that Indian agriculture has been in a continuous process of marginalization from the 1970s, and that this process has not been reversed after the 1990s, rather it has been reinforced. Our question is whether size of farm continues to play an important role in influencing agricultural performance still under the new policy regime.

Secondly, with opening up of the agricultural product and input sector there has been remarkable change in the pattern and intensity of use of modern inputs on the one hand, and in the cropping pattern with greater intensification in the degree of diversification of Indian agriculture, on the other. Under this condition technical efficiency in the use of inputs has assumed huge importance. We shall carry out investigation to examine how technical efficiency varies across different size classes of farms under varying infrastructural, technological and institutional conditions. We shall carry out investigation to examine the role of technical efficiency vis-à-vis size of farms in influencing productive performance of farms and find the factors influencing technical efficiency of farms. Side by side we shall also examine the factors that influence farm’s decision to diversify its cropping pattern, and how institutional features affect such decisions, and what is the relationship between crop diversification and technical efficiency of farms. Finally we shall examine whether and to what extent changes in crop-mix affect overall performance at the farm level.

Thirdly, under the new policy regime with reduced role of directed credit policies, informal credit market has assumed a new character with increased role of interlinked market operations, forming one of the institutional characteristics of Indian agriculture. We shall study how the
informal credit market with interlinked credit-input-output market operations continues to operate and influence the growth process through its impact on productivity and technical efficiency and farm’s decision to diversify its cropping pattern. We shall also examine how surplus generating capacity of the farms is affected by institutional factors.

Lastly, we shall attempt to classify farms into different categories according to their access to productive assets and non-agricultural engagement, and examine relative performance and potential of these groups of farmers in the process of development of a technically efficient productive farm sector. Our aim would be to identify groups of farmers playing varying roles in the process of growth, and examine how an enterprising group of farmers’ potential surplus generating capacity is negatively affected by institutional features. Thus while our purpose is not to study the direct impact of the new policies, we intend to study the performance at the micro level, given the broad changes occurring at the macro level as a result of introduction of new policies after 1990s.

Specifically we take up the following hypotheses for empirical examination:

i) With modernization of agriculture how efficiently the technology is used, rather than the size of farms, assumes importance in determining farm productivity.

ii) There is a positive relationship between farm-size and technical efficiency in the use of inputs under modern cultivation practices.

iii) Technical efficiency in input use, with other variables held constant, have significant positive relationship with productivity.

iv) Provision of infrastructure and irrigation facilities, irrespective of institutional condition, may not always guarantee greater efficiency and higher levels of profitability under modern cultivation practices.

v) Institutional process represented by operation of interlinked credit-input-output markets and farmers’ involvement in such markets
simultaneously as borrower, purchaser of input and seller of output adversely affects technical efficiency as well as scale efficiency of farms.

vi) In those areas where farmers have to depend on private sources of water at high cost due to non-availability of publicly supplied irrigation system, they diversify away from water-intensive cereals and other traditional crops.

vii) Diversification in cropping pattern has occurred more in those cases where farm households are in a position to provide more family labour for cultivation.

viii) A farm’s involvement in interlinked credit-input-output market as borrower exerts negative impact on price of output received.

ix) Average productivity as well as average profitability for farms entering into interlinked market operations is much lower than those not entering the interlocking credit-input-output markets.

x) A group of progressive farmers can be identified in agriculture who lead agriculture ahead, as well as a group of farmers who exhibit potentially growth augmenting characteristics and are capable of bringing about growth in agriculture, but are severely constrained by factors under existing institutional framework, particularly the interlinkage in agrarian markets.

1.4: Broad Methodology

As the major objective of this study is to investigate some aspects of farm economics under the new policy regime with a view to identifying factors responsible for the slowdown in growth at the present moment, we start by examining possible factors at the farm-level which may have impact on Indian agriculture at large. We think that the broad changes in agriculture at the national (macro) level play its role on the overall performance of the economy through its impact at the farm level. In fact, as stated earlier, we
view relative agricultural stagnation as the product of interaction among structural, technological and institutional characteristics of Indian agriculture. In our thesis we examine how farms behave and perform under the impact of this interaction. We conduct detailed empirical analysis with data pertaining to different areas representing different infrastructure and irrigation conditions for examining the questions with the purpose of bringing out relative importance of different aspects of farm economics in influencing productivity, technical efficiency and surplus generating capacity of the farms.

First, in order to examine whether continuous marginalization and decline in average size of farms has negatively influenced performance of the sector, we take up statistical and econometric analyses to reexamine the relative impact of farm-size vis-à-vis other factors on productivity and efficiency. We conduct this study under varying technological and institutional conditions, using regression analysis with the use of dummy variables. At the same time, efficiency with regard to proper application of technology is also considered as another important factor in explaining farm-level variation in productivity along with farm-size. We use Data Envelopment Analysis to find technical efficiency of farms, and take up both farm-size and technical efficiency as factors explaining farm-level performances. We carry out repeated experiments with the use of regression analysis to search for factors influencing farm performances. We observe that size-productivity analysis cannot ignore the role of technical efficiency as a separate variable and that inclusion of technical efficiency as a separate variable and controlling its influence results in an inverse relationship between farm-size and productivity. We also take up analysis of technical efficiency separately in a greater detail to search for the factors which act to cause variation in technical efficiency across farms. We use Tobit regression analysis to perform this task. We observe that technical efficiency of farms, side by side with other factors, is negatively influenced by farms’ involvement in interlinked credit operations as borrowers of cash or input or both and
seller of paddy output. In line with this we also take up the issue of diversification of cropping pattern as a technological feature under modern agriculture and examine how farms under different conditions perform with regard to this important criterion.

Second, one of the major objectives of our study is to examine the role of institutional and behavioural characteristics in influencing farm-level performance. We focus our attention on informal credit and interlinked market operations providing one of the institutional characteristics, through which informal credit acts in many cases. We examine how and to what extent market interlinkage acts to exert its influence on generation of surplus and technical efficiency of farms. We observe that farms’ involvement in interlinked credit operations adversely affects the productive behaviour of farms by compelling them to repay earlier loans in paddy output in the immediate post-harvest low prices, which negatively influences their productive performance and surplus generating capacity.

Lastly, we consider certain behavioural characteristics of farms, and classify farms into various categories on the basis of these characteristics. We carry out Analysis of Variance for testing the statistical validity of our classification and also carry out comparative analysis of relative efficiency and surplus generating capacity of these different groups with a view to identifying a group of ‘enterprising farmers’ playing positive role in the process of growth in relation to other groups and testing our hypothesis that existing institutional system operate to a large extent to direct the potential surplus of these farmers away from the field of productive investment in agriculture and act as one of the important factors in obstructing the process of growth. We conduct extensive experiments with techniques of simple regression analysis, tobit regression and logit regression analysis with dependent and independent dummy variables, so as to enable us to draw sharp conclusions on all the relevant questions posed by us. We observe that apart from a group of ‘progressive’ farmers who lead agriculture ahead, a
group of ‘enterprising’ farmers can be identified with the potential surplus generating and growth augmenting capacity, which is largely lost through a system of interlinked markets for products, inputs and credit through its impact on prices.

In order to carry such micro-level analysis, we undertake a case study of some areas of West Bengal with diverse agro-economic conditions, differing primarily with regard to availability of irrigation and other infrastructure, so as to represent the great diversity in Indian agricultural conditions. We undertake a thorough and in-depth primary survey of farms belonging to these different agro-economic regions, differing not only with respect to size of the farm operation, but also in respect of degree of involvement in agriculture against non-agricultural activities. The survey methodology is discussed in Section 1.6. Following a rigorous questionnaire we cover many farm aspects like production, credit, marketing, etc. in great detail. As survey of the entire Indian agriculture sector is not practically feasible, we restrict our study to some areas of West Bengal and we expect that our population covering diverse farm characteristics under different agro-economic conditions could give us immensely useful insights about the structural, technological and institutional characteristics, and allow us to extrapolate the findings applicable for Indian agriculture in general.

1.5: The Study Area

Since the study aims at detailed investigation covering different aspects of farm economics, it covers three purposively chosen areas different in agro-economic characteristics in the state of West Bengal. We have chosen the concerned state as it represents a highly marginalized agriculture with a strong presence of informal institutions. The regions covered by the present study are selected purposively with a view to representing different agro-economic conditions depending upon the advancement in agriculture. In particular, the selected regions of the study approximate a highly advanced, a
moderately advanced and a backward agricultural region, varying primarily in the type and degree of availability of irrigation. While one of the regions represents a highly advanced agrarian economy endowed completely with public canal irrigation sources, another in contrast represents backward agrarian economy completely deprived of irrigation from any source. In between, another region represents a moderately advanced agrarian economy, partly endowed by public canals and private tubewells. A brief description of the survey regions is presented here as follows:

(A): THE ADVANCED REGION

The advanced agro-economic region in our study belongs to the district of Barddhaman, which once was considered as the granary of West Bengal. The selected region falls under the administrative block Golshi-II, which is amongst the first regions in the state to witness the Green Revolution with its seed-fertilizer package with assured public canal irrigation. The survey has been carried out in eleven villages from two Gram Panchayats, namely Golsi G.P. and Masjidpur G.P. under the concerned block. The economy of the region is dominated by agriculture and it represents a highly advanced agriculture with comparatively higher application of modern inputs and farm-machines. Though it is located about 18 kilometers away from the district capital Buddhaman (a big town), but the National Highway No.2 bisecting the region provides superior road infrastructure to the region. Further, the rail infrastructure is also developed in the sense that the nearest station is only 2 kilometers away. It is relevant to note that the region is in proximity to the largest and highly advanced rice-mill cluster in the state.
Table 1.5.1
General Description of the Study Region

<table>
<thead>
<tr>
<th>Agro-economic Regions</th>
<th>Districts</th>
<th>Administrative Blocks</th>
<th>Irrigational Characteristics</th>
<th>Major Source of Irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Barddhaman</td>
<td>Golshi II</td>
<td>Highly Irrigated</td>
<td>Govt. Canals</td>
</tr>
<tr>
<td>Moderately Advanced</td>
<td>Birbhum</td>
<td>Bolpur-Sriniketan</td>
<td>Partially Irrigated</td>
<td>Govt. Canals &amp; Private Groundwater</td>
</tr>
<tr>
<td>Backward</td>
<td>Birbhum</td>
<td>Rajnagar</td>
<td>Non-Irrigated</td>
<td>None</td>
</tr>
</tbody>
</table>

*Source: Field Survey*

**B: THE MODERATELY ADVANCED REGION**

The moderately advanced agro-economic region belongs to the district of Birbhum falling under the administrative block Bolpur-Sriniketan. The survey for the present study covers six villages from two Gram Panchayats, namely Kankalitala G.P. and Sarpolohna-Albandha G.P. under the concerned block. The economy of the region is dominated by agriculture, and it represents a moderately advanced agrarian economy in the sense that the region is partially fed by public canal irrigation and partially by private groundwater irrigation. At the same time, a few pockets of the region completely lack any source of irrigation. The system of farming in the region is a mixed one, with spatial instance of highly advanced and mechanized agriculture in the farming community. It is located about 9 kilometers away from the nearest town Bolpur (a mid-sized town), which accommodates another important rice-mill cluster in the state. The road infrastructure of the region is not as good as the advanced region, as also the nearest railway station is 6 kilometers away.
Table 1.5.2
Coverage of the Study

<table>
<thead>
<tr>
<th>Agro-economic Regions</th>
<th>Blocks</th>
<th>Panchayats</th>
<th>Villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced</td>
<td>Golsh I I</td>
<td>Golsh, Masjidpur</td>
<td>Balnaa, Bompur, Dalpur, Darbarpur, Dayalpur, Gomai, Kalnaa, Palashi, Saarul, Shaonta, Sridharpur</td>
</tr>
<tr>
<td>Moderately Advanced</td>
<td>Bolpur-Sriniketan</td>
<td>Kankalitala, Sarpalohna-Albandha</td>
<td>Bogdoura, Gopalpur, Kunchli, Mahishdhal, Pathorghata, Sarbanandapur</td>
</tr>
<tr>
<td>Backward</td>
<td>Rajnagar</td>
<td>Bhawanipur, Gangmuri-Joypur</td>
<td>Ahmadpur, Asna, Belera, Bhurabali, Bhurkunda, Gobindochawk, Golapganjo, Khurigarah, Mahishagram, Moshabuni, Natungram, Perul, Sundorkhela, Tabadumra</td>
</tr>
</tbody>
</table>

Source: Field Survey

(C): THE BACKWARD REGION

The backward region in our study belongs to the administrative block of Rajnagar, also from district Birbhum, but located in the extreme west of the district bordering Jharkhand. Though the economy of the region is dominated by agriculture, it typically represents a backward type of agrarian economy. The present study covers fourteen villages from over two Gram Panchayats, namely Bhawanipur G.P. and Gangmuri-Joypur G.P. falling under the concerned block. Owing to its topography and poor groundwater table, the region completely lacks irrigation from major sources, only spatial instances of tank irrigation may be found. The system of farming is primarily of the traditional type with lower application of modern farm inputs and machines, and higher use of human and bullock power. It is located about 12 kilometers away from the nearest town Rajnagar (a small town), and modern rice mills can be hardly found in the region. As the road infrastructure is extremely poor, some parts of the region are extreme difficult to access. At the same time, railways infrastructure is extremely poor as the nearest station is more than 20 kilometers away.
1.6: Survey Methodology

The primary survey conducted in these regions technically was a multi-stage stratified simple random sampling without replacement. In the first stage, in order to test our hypotheses in diverse agro-economic conditions, three distinctively different agro-economic regions were chosen purposively, which approximate a highly advanced, a moderately advanced and a backward type of agriculture varying primarily in the type and degree of availability of irrigation. In the second stage, from each of these regions corresponding to particular administrative blocks, two Gram Panchayats were identified such that they reflect the regional characteristics distinctive to the regions. In the next stage, from each of the selected Gram Panchayats, a number of villages were chosen keeping in view of the resemblance to regional characteristics and population of the villages. This is followed in the next stage by the preparation of exhaustive lists of households indicating the size of operational holding of farmer households with the help of the respective Gram Panchayat offices. The set of all these households form our population.

In the next stage of our survey, the population was stratified into four size-strata according the size of operational holding. These size-classes are- a) Marginal (less than 1 hectare), Small (more than 1 hectare to 2 hectares), Semin-medium (more than 2 hectares to 4 hectares) and Medium (more than 4 hectares to 10 hectares). From each of the regions, 150 sample farms were selected following a simple random sampling without replacement such that each of the size strata is represented adequately in proportion to their presence in population. The process is repeated in all the regions to get a total of 450 sample farms (i.e. 150 sample farms for each of the 3 regions) spread across different size-strata.

While conducting the primary survey, a simple and easily comprehensible pre-tested questionnaire was used which included questions on aspects like production, application of inputs, source and availability of credit, marketing of output, non-farming engagement, and various other
aspects. The reference period for the primary data pertains to the crop year 2003-04, which was collected during 2004-05.

1.7: General Description of Regions and Sample Units

Some of the general features of the various agro-economic regions covered under the study (viz. advanced, moderately advanced and backward regions) have been presented here in table 1.7.1. The primary survey covers a total of 725.28 hectares of net sown area, which is more or less evenly distributed among the different regions. However, owing primarily to differences in availability of irrigation, gross cropped area for the regions differs significantly. This is reflected in the varying degree of cropping intensity observed for the regions, ranging from a low of 107.79 percent for the backward region to as high as 204.22 percent for the advanced region.

<table>
<thead>
<tr>
<th>Table 1.7.1</th>
<th>Coverage of Cultivated Area in the Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agro-economic Regions</td>
<td>Net Sown Area (ha.)</td>
</tr>
<tr>
<td>Advanced</td>
<td>258.97</td>
</tr>
<tr>
<td>Moderately Advanced</td>
<td>237.68</td>
</tr>
<tr>
<td>Backward</td>
<td>228.62</td>
</tr>
<tr>
<td>All Regions</td>
<td>725.28</td>
</tr>
</tbody>
</table>

Source: Field Survey

In case of distribution of sample farms by size classes across regions, as shown in table 1.7.2, it can be observed that in total 47.3 percent and 25.1 percent of farms fall respectively under marginal and small size classes of farms. The semi-medium and medium farms account for 18.9 percent and 8.7 percent respectively of all sample farms covered under the study.
<table>
<thead>
<tr>
<th>Agro-economic Regions</th>
<th>Advanced</th>
<th>Moderately Advanced</th>
<th>Backward</th>
<th>All Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal</td>
<td>70 (46.7)</td>
<td>71 (47.3)</td>
<td>72 (48.0)</td>
<td>213 (47.3)</td>
</tr>
<tr>
<td>Small</td>
<td>33 (22.0)</td>
<td>44 (29.3)</td>
<td>36 (24.0)</td>
<td>113 (25.1)</td>
</tr>
<tr>
<td>Semi-Medium</td>
<td>28 (18.7)</td>
<td>25 (16.7)</td>
<td>32 (21.3)</td>
<td>85 (18.9)</td>
</tr>
<tr>
<td>Medium</td>
<td>19 (12.7)</td>
<td>10 (6.7)</td>
<td>10 (6.7)</td>
<td>39 (8.7)</td>
</tr>
<tr>
<td>All Size Classes</td>
<td>150 (100.0)</td>
<td>150 (100.0)</td>
<td>150 (100.0)</td>
<td>450 (100.0)</td>
</tr>
</tbody>
</table>

Figures in Parenthesis show percentages to total
Source: Field Survey

However, a comparison of table 1.7.3 showing distribution of operational area among size-classes with table 1.7.2 reveals that the marginal farms, accounting for 47.3 percent of farms, operate on only about 12.3 percent of operational area and 11.8 percent of irrigated area. On the other hand, the medium farms, accounting for only 8.7 percent of sample farms, command over 30.3 percent of operational area and 34.5 percent of irrigated area.

<table>
<thead>
<tr>
<th>Size-Classes</th>
<th>Operational Area (ha.)</th>
<th>Irrigated Area (ha.)</th>
<th>% Irrigated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal</td>
<td>88.86 (12.3)</td>
<td>60.91 (11.8)</td>
<td>68.55</td>
</tr>
<tr>
<td>Small</td>
<td>172.42 (23.8)</td>
<td>115.64 (22.4)</td>
<td>67.07</td>
</tr>
<tr>
<td>Semi-med</td>
<td>243.87 (33.6)</td>
<td>161.56 (31.3)</td>
<td>66.25</td>
</tr>
<tr>
<td>Medium</td>
<td>220.12 (30.3)</td>
<td>178.29 (34.5)</td>
<td>81.00</td>
</tr>
<tr>
<td>All Size Classes</td>
<td>725.28 (100.0)</td>
<td>516.41 (100.0)</td>
<td>71.20</td>
</tr>
</tbody>
</table>

Figures in Parenthesis show percentages to total
Source: Field Survey

1.8: CHAPTER DESIGN OF THE STUDY

The entire study along with statistical analyses, results and conclusions are presented in eight distinct chapters. Apart from this introductory chapter (Chapter 1), the entire thesis has seven other chapters including a chapter on review of literature on the subject (Chapter 2). We have analyzed relation between farm-size and productivity in Chapter 3. Then in Chapter 4 we take
up technical efficiency of farms belonging to different size classes along with its relationship with other factors like farm-size and productivity. In this chapter we also analyze determinants of technical efficiency and examine to what extent technical efficiency rather than different unobserved variables act as an important factor in determining differences in productivity at the farm-level. Next in Chapter 5 we examine the technological changes in agriculture in terms of changes in the crop-mix and study extent of diversification at the farm-level. We take up the institutional aspects in Chapter 6, that is effect of interlinked market operations on input and output prices, and through it productivity differences among farms belonging to different size-classes. In Chapter 7, we classify farmers among different categories and identify a group of farmers as enterprising farmers. We also take up an analysis of the effect of interlinked farm operations on these different categories of farmers. Lastly, Chapter 8 states the major findings of the present study, draws conclusion based on the findings and prescribe policy suggestions accordingly.