CHAPTER 8
CONCLUSION

The reform process in India after 1991 appears to weaken the institutional support structure in agriculture. With the withdrawal of quantitative restrictions on imports, the protection offered to agriculture from cheap imports was partially reduced creating conditions for maintaining prices of many agricultural commodities at low levels. As part of fiscal reforms, major financial support to agriculture were brought down relative to the size of the agriculture sector, this continues with the partial reduction of restriction on entry of private enterprises and trans-national companies, and result in tendency for the input prices to rise. Public capital formation in agriculture continues to fall until very recently. The expansion of rural credit is decelerated, reopening the doors for the informal sector. Public resources are sought to be channeled away from food crops and towards high-value export-oriented crops. It is under the present context that our study broadly attempts to examine the sources and determinants of productive growth at the farm-level. Broadly, our intention was to identify the factors that might have significant impact on productive performance of the farmers in the context of changes that are taking place in Indian agriculture after the 1990s.

Chapter 1 introduces the subject matter of the thesis along with the context against which the study is undertaken. We find that Indian agriculture particularly its food sector is facing a continuous process of deceleration, particularly after the mid-1990s. It is the period when Indian agriculture has been experiencing the impact of process of Economic Reforms. We discussed the main objective of our research as to conduct a detailed searching for some aspects of farm economics under varying infrastructural and agro-economic conditions, which greatly determine performance
differences at the farm level, in the background of the new economic policy regime. At the same time, we presented the general approach of our analysis where we viewed the relative stagnation of Indian agriculture as the product of interaction among structural, technical and institutional characteristics of Indian agriculture and their impact on farm level performance. In this chapter we also introduce what we mean by structural, technological and institutional factors: as regards structural characteristics, we observed continuous marginalization as the main feature, so that we take up the question for investigation whether marginalization of Indian agriculture is in fact one of the factors affecting productivity, technical efficiency and surplus generating capacity of farms. With regard to technical characteristics, we considered ‘technical efficiency’ at the farm-level in terms of input use efficiency which is taken to imply output level achieved per unit of vector of input levels applied. Moreover, we considered crop diversification as an indicator of technological change in agriculture. Under institutional characteristics, we considered the phenomenon of market interlinkages along with the resultant structure of interrelationship among the farmers that are expected to generate impact on agricultural development.

The broad methodology of the work and the methodology we follow in the collection of primary data along with detailed description of the survey regions and population have been presented in this chapter. As can be seen we purposively collect some areas to represent variation in infrastructural and agro-economic conditions along with differences in pattern and extent of irrigation.

In Chapter 2, we carried out a brief review of existing literature on specific issues with which we are concerned in this study, namely, the relationship between farm-size and productivity, relationship between farm-size and efficiency, diversification of cropping pattern in Indian agriculture, interlinkage in rural credit markets and construct of class in agriculture.
In a brief review of studies relating to the relationship between farm size and productivity, we cover prominent studies since the debate on the subject began in the early 1960s. However, we found that the studies carried out on the relation between size of farms and productivity show contradicting results. While some studies showed an inverse relationship, others failed to confirm it. There are indications that the inverse relationship exists in certain types of farms, but the relation cannot be generalized. In addition, the relationship need not be there for all size groups, for all regions, and for all crops, and hence the debate thus remains inconclusive.

In case of review of studies relating to the relationship between farm-size and efficiency, we take into account of studies pertaining to both allocative efficiency and technical efficiency of farms. After a brief review, we found that there is much controversy regarding the efficiency of farms in relation to size of holding, as different studies yielded differing results in varying agro-economic conditions. As such, no definite relationship between farm-size and efficiency (or inefficiency) can be accepted as valid throughout the country across farms.

Again, in case of studies reviewed relating to diversification of cropping pattern, it is observed that most of the authors argue that diversification in cropping pattern which made rapid strides in recent past is primarily initiated by the marginal and small farms, a feature that is mostly observed throughout the varying regions. However, the authors appear to differ on the rationale behind higher diversification ratio among small farms. At the regional level, factors like availability of infrastructure have exhibited positive relationship with higher levels of crop diversification.

Further, in case of review of literature relating to interlinked credit markets, we first attempted to define the concept of interlinked credit operations as put by different strands of mainstream economics. We discussed at length the theoretical development of ideas based on empirical findings, and observed that only a few have investigated into the actual working of the
interlocking operations and their role in the process of growth. We also carried out a brief review of the empirical evidences relating to interlinked market operations in India, and observed that the particular feature is witnessed throughout the country, even in the agriculturally most advanced states like Punjab.

Apart from this we have also made a brief excursion in the area of class character on Indian agriculture and method of classifying farming households in this context. We observed that most of the studies try to shape an empirical substantiation of theoretical ideas. This has in turn resulted into a debate on the process of commercialization of agriculture with related controversies regarding the characterization of the mode of production in agriculture. However, it should be noted that the studies explaining the general backwardness of agriculture emphasizing on certain aspects of the agrarian structure largely avoid explaining the regional variations in agricultural growth in terms of interaction among socio-economic factors. We also fail to find any study that enumerate the relative importance of different factors in the process of growth and the impact of their actual working on the behaviour patterns of agrarian classes with regard to the degree and pattern of utilization of modern inputs.

In **Chapter 3**, we observed continuous marginalization in Indian agriculture, where we take up the question for investigation whether marginalization of Indian agriculture is in fact one of the factors affecting Indian agriculture. For this, first we tried to answer whether there is any relationship between farm-size and productivity under modern cultivation practices. Our preliminary outcomes of analysis of variance and simple regression models, however, did not indicate presence of an inverse relationship between farm-size and productivity; on the contrary, a positive relationship could not be totally ruled out, particularly under advanced agricultural conditions. In fact, our regression analyses failed to fit to our
specified model separately for the regions. It is here we argued that with modernization of agriculture, how efficiently the technology is used assumes more importance in determining farm productivity; and hence ‘Technical Efficiency’ of farms has become more important a factor determining productivity. After the inclusion of technical efficiency estimated with the use of Data Envelopment Analysis technique as an explanatory variable, it came out that under modern cultivation practices, technical efficiency in input use, with other variables held constant, have significant positive relationship with productivity; and that the alleged inverse relationship between farm-size and productivity holds only when we separate out the impact of technical efficiency and other input variables, and hold them constant. This confirms our hypothesis (i) to be true, which states that with modernization of agriculture how efficiently the technology is used, rather than the size of farms, assumes importance in determining farm productivity. At the same time, our hypothesis (iii) is also confirmed to be true, which states technical efficiency in input use, with other variables held constant, have significant positive relationship with productivity.

In Chapter 4, we argued that with modernization of agriculture, how efficiently the technology is used assumes more importance in determining farm productivity. ‘Technical efficiency’ of farms has become more important a factor determining productivity and surplus generating capacity of farms. We therefore take up a study of ‘technical efficiency’ of farms as opposed to allocative efficiency. We however start with allocative efficiency following conventional production function analysis of Linear and Cobb-Douglas types. However, owing to a number of limitations of the conventional approach, we take resort to Data Envelopment Analysis for estimating technical efficiency of individual farms in relation to the best-practice farms. We define efficiency as a measure of how efficiently the inputs are employed by a farm to achieve a given level of output in relation to the farms using the lowest levels of
inputs per unit of output, i.e. the best-practice farm. A farm is considered inefficient if it could produce the same output using fewer inputs.

After a detailed analysis, we find indications towards over-use of inputs especially in advanced agriculture, which implies that whatever productive surplus could be generated by making use of the better infrastructure and irrigation conditions, would be channeled away from the field of production to the field of agro-business.

Though there is no one to one correspondence between technical efficiency and profitability which depends on prices of inputs and output apart from efficiency in input-use it is observed that profitability rises with technical efficiency in our study. However, it is interesting to observe that in our study profitability appears to fall with advancement of agriculture in terms of irrigation and infrastructure, even at similar levels of technical efficiency. In fact while lack of infrastructure and irrigation facilities may act to lower the productivity and surplus generating capacity of the farms and explain partly the stagnation of Indian agriculture, provision of these facilities, by itself may not guarantee greater efficiency and higher levels of profitability. Hence, our (iv) turns out to be true. It is here that institutional factors seem to play important role in the process of sustaining stagnation in spite of technological modernization.

In determining factors responsible for variation in technical efficiency of farms, we carry out tobit regression analysis which reveals that there is a significant positive relationship between farm-size and technical efficiency, indicating smaller size farms are relatively less efficient, which confirms our hypothesis (ii) with regard to the relationship between farm-size and technical efficiency. At the same time, while increase in the availability of irrigation also leads to increase in technical efficiency, both material input and labour input per unit of land turn out to have a significant negative relationship with technical efficiency. Most importantly, it seems important to find that involvement in interlinked credit operations leads to decrease in efficiency, a
result of immense significance as it indicates that when farms are subject to over-use of inputs, their involvement in a particular institutional system characterized by market interlinkages impact negatively upon their decision making and results in inefficiency.

We also take into account of factors influencing scale efficiency of farms which indicates that involvement in interlinked market operations significantly exerts adverse impact also on scale efficiency of a farm, other things remaining the same. This result appears to confirm our presumption that backward 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 brings about inefficiency by influencing adversely the decision making process regarding expenditure on inputs. Hence, our hypothesis (v) comes out to be largely validated from our analysis.

In Chapter 5, we dealt with the feature of diversification in cropping pattern as a technological change in agriculture. We found that those areas which are endowed with assured water supply at cheap rates (mostly canal irrigation) concentrate more on production of cereals and traditional crops showing lower extent of crop diversification and greater extent of specialization. Again, 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 towards various other high value crops showing greater degree of diversification, which confirms our hypothesis (vi).

Further, diversification in cropping pattern has occurred more in those cases where farm households are in a position to provide more family labour for cultivation, which confirms our hypothesis (vii) to be true. It thus appears that it is the smaller farms with abundant family labour who attempt to maximize their return through diversification, even if it requires a higher
investment for groundwater irrigation. However, both access to institutional credit and efficiency of farms do not reveal any significant impact on the extent of diversification, and that higher diversification index for an individual farm does not automatically ensure non-involvement in interlinked rural credit markets. Lastly, a group of ‘enterprising’ farmers can be identified who are superior in terms of extent of diversification at the farm level as compared to other farmers.

In Chapter 6, we examined whether informal credit institutions in agriculture generate any impact on productive performance of the farms. In fact in this chapter we examined the strong possibility that the investible surplus that could accrue to a farmer might be pre-empted under such interlinked credit transactions via the credit, input and output markets.

After a detailed analysis of primary data, it is observed that there has been an overwhelming dependence of farms on informal credit sources amidst a strong presence of informal credit institutions in the rural agrarian markets. In fact, it is found that credit operations in agriculture are mostly informal in nature, and that informal credit dominates the agricultural credit market. However, the dominance of rural moneylenders in its typical form has diminished significantly over time, while newer breeds of informal loan providers now dominates the agricultural markets by directly dealing with inputs like fertilizers and paddy output. As such, it appears that with changes in production structure and technology, production has increased over the years along with increase in costs of production, though the credit and marketing structure has not kept pace with the developments in production and technology, which in turn has given space for the growth of informal credit operations along with interlinked markets involving credit, inputs and output.

It is thus observed that an overwhelming majority of informal credit operations are interlinked in nature, primarily involving the input and output
markets in agriculture. In case of nature of interlinkage, it is observed that the proportion of farms involved in credit-input-output interlinkage increases steadily with the increase in size of farms, while farms entering into credit-input interlinkages is proportionately higher among the smaller size-classes. However, the dominant form of interlinkage among farms stands out to be the credit-input-output interlinkage, in which borrowing in terms of fertilizers are repaid back in paddy under implicit terms and conditions.

At this juncture, we examined the impact of interlinkage on key aspects in agriculture, namely, marketing of output, price of output and technical efficiency, productivity and profitability of farms. In case of impact of interlinkage on marketing of output, it is observed that a significant part of the marketed output of interlinked farms is sold immediately following the harvest period when the price of paddy is the lowest. Driven by implicit commitments requiring repayments to be made in paddy under interlinked credit transactions, the interlinked farms are often compelled to surrender their output to the informal credit agencies in the immediate post harvest period at low prices. In case of impact of interlinkage on price of output, it is observed that interlinkage appears to have significant negative impact on price of output, and that interlinked credit operations involving repayments made in paddy output have significant dampening effect on price of output, which largely established our hypothesis (viii) to be true. Coming to impact of interlinkage on technical efficiency of farms, it is observed that interlinkage, particularly those requiring repayments to be made in paddy output, comes out to have a highly significant negative impact on technical efficiency of farms. Lastly, in case of impact of interlinkage on productivity and profitability of farms, it was observed that average productivity as well as average profitability for the farms entering into interlinked market operations is much lower than those not entering the interlocking credit-input-output markets, a finding that confirms our hypothesis (ix) to be true. This further indicates that a large part of the surplus that could accrue to the farms is lost
in the process of interlinked market operations, which in turn acts to severely constrain the potential for productive investment in agriculture.

Lastly we take up why a farm enters into interlinked credit operations? We carried out a logit regression analysis which brings out that apart from regional differences in the incidence of interlinkage, the behaviour of farms and its outlook towards farming has significant role to play in determining a farm’s decision of being involved in interlinkage. It is observed that the probability of a farm entering into interlinked credit operation as a borrower is much higher for particular groups of farmers (identified in Chapter 7) like the residual farmers, whose access to resources is very much limited, followed by the enterprising and progressive farmers, whereas the commercial farmers who are more interested in commercial activities rather than productive investments, are least likely to be involved in interlinked credit operations. Apart from these, other factors like availability of irrigation infrastructure and other infrastructure (including formal credit) also affects farmers’ decision in different ways regarding involvement into interlinked credit operations as borrowers.

Lastly, in Chapter 7, 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, yet they are placed in a better position than others with regard to technical efficiency and surplus generating capacity. This observation at large establishes our hypothesis (x) as true.

Chapter 8 concludes our observations. Overall we observe that the hypotheses with which we started our study have been more or less confirmed by statistical analysis.

Thus, in the present globalized agriculture where competitive efficiency is the most important requirement, *policy prescriptions* should be moulded towards ensuring efficiency at the farm-level. Policies should target smaller farms to maximize input-use efficiency under modern agricultural practices requiring balanced and integrated use of inputs. Achieving technical efficiency can compensate for the smallness of size of farm under a continuous marginalization process in Indian agricultural. At the same time proper infrastructure (markets, roads, etc.) should be developed, especially in the unirrigated regions, to promote diversification among the smaller farms; which in turn could promote higher utilization of both land and labour.

However, to achieve efficiency, there is an acute need for further institutional reforms, especially reforms in the rural credit, input and output markets. While agricultural credit delivery system should become more targeted (in place of gross reduction in agricultural credit) so as to generate incentive to undertake productive investment and ensure operation of inputs and output markets free of interlinkage which would facilitate potentially
growth augmenting farmers. The seed-fertilizer-pesticide market should be regularized to make those available to all at fair rates. At the same time, the government should take initiative to organize output markets in agriculture, and explore the possibilities of participatory cooperative marketing approach in this regard to allow all categories of farmers including potentially growth augmenting farmers to perform free of existing institutional hurdles.