DISPARITIES IN AGRICULTURAL INFRASTRUCTURE IN HARYANA : 1966-67 TO 1982-83.

Dissertation submitted to the Jawaharlal Nehru University
in partial fulfilment of the requirements for
the award of the Degree of
MASTER OF PHILOSOPHY

LALLI

CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT
SCHOOL OF SOCIAL SCIENCES
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI—110067
INDIA
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C E R T I F I C A T E

This is to certify that this dissertation entitled" Disparities in Agricultural Infrastructure in Haryana:1966-67 to 1982-83", submitted by Mr.Lalli in partial fulfilment of the requirements for the award of Master of Philosophy(M.Phil). degree of this University, has not been previously submitted for any degree of this or anyother University and this is his own work.

We recommend this dissertation be placed before the examiners for evaluation.

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CHAPTER - I

AGRICULTURAL INFRASTRUCTURE : AN INTRODUCTION

Historical experience of the world has demonstrated that low productivity in agriculture can seriously limit economic growth. It has also been increasingly realised that industrialisation and agricultural development per-se are not valid alternative propositions. In the Western World, the role of agriculture in economic development has traditionally been viewed as largely passive and supportive. In this scheme, therefore, agriculture's primary role was to provide sufficiently low priced food and manpower to the expanding industrial sector which was thought to be the dynamic and leading sector in the overall economic development.[1] Johnston and Mellor (1961),[2] Ragnar Nurkse (1952)[3] and several other writers have come out with a number of broad interrelationships between agricultural and non-agricultural sectors in the process of economic development.

Bearing these broad inter-relationships in mind most of the development economists of the latter period

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1. Arthur Lewis' famous two-sector model is an outstanding example, among others, in this context.

2. Johnston, B.F. and Mellor, J.W., "The Role of Agriculture in Economic Development", American Economic Review, vol. 51, 1961.

3. Ragnar Nurkse, Problems of Capital Formation in Under Developed Countries, London, Oxford, 1952.

seem to be less sanguine about the desirability of placing heavy emphasis on rapid industrialisation and have increasingly come to realise that far from being a passive and a supporting sector agriculture needs to be viewed as the dynamic and leading element in the overall strategy of economic development. Rightly, therefore, Gunnar Myrdal (1968) writes in his celebrated book Asian Drama, "it is the agricultural sector that the battle for long term economic development will be won or lost".[4] There are large number of studies on the subject of economic development which opined that without agricultural development, industrial growth will either be stultified or if it succeeds, will create such severe imbalances in the economy that problems of widespread poverty, inequalities and unemployment will become even more pronounced. Therefore, agricultural development is seen by many development economists as a sine-qua-non of overall economic development.

In order to fulfillthis tstrategic role, in a country with a rapidly growing population, widespread poverty, malnutrition and unemployment, and other related characteristics, agricultural output must be increased. However, the agricultural output canbe increased either or both by expansion of area under cultivation and by increasing agricultural yields. In a situation where expansion in area under cultivation is extremely limited, the accent has to be on increasing agricultural yield.

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4. Gunnar Myrdal, Asian Drama, Pantheon, 1968, p. 1033.

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The increase in agricultural productivity depends upon the technology used in the farm operations and upon its organisation and management, among other things. (Schultz(1964)[5] points out that the scope of increasing agricultural productivity, simply by better management of labour, land and limited capital, using only the existing technology in the farm operations in extremely limited. It has also been proved by the experiences of several underdeveloped countries that techniques of farm operations are seldom simply transferable from temperate to tropical agriculture. (Johnston and Mc Pherson (1967)[6] found that differences in crops, soils types, temperature and rainfall patterns require different application of agronomic principles and these require research in the area of application.

Some of the underdeveloped countries have witnessed substantial improvements in agricultural productivity by taking advantage of research in the area of application. It brought out that a few well selected 'new' inputs that had high complementarity with the existing technology can be a blessing for the underdeveloped countries. This

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5. Schultz, T.W., Transforming Traditional Agriculture, New Havean, Yale Univ. Press, 1964.

6. Johnston, B.F., and Mc Pharson, W.W., "Distinctive Features of Agricultural Development in the Tropics", in Southworth and Johnston (Eds.): Agricultural Development and Economic Growth, New York, 1967.

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combination of 'new' inputs i.e. improved seeds, fertilizers and controlled irrigation, is a widely accepted source of 'Green Revolution'. Several studies found that this scheme of raising agricultural productivity is heavily loaded in favour of the use of increasing quantities of purchased 'new' inputs from non-farm sources.[7]

In order to make these 'new' inputs available inadequate quantities and at reasonable prices, needed either to improve upon or to supplement the existing technology in the farm sector through some additional factors which are important in influencing the farmers decisions regarding farm operations. These additional factors are nothing but agricultural infrastructural facilities which serves as a source of dissmination of information pertaining to the opportunities open to them in the form of agricultural credit, improved seeds, fertilizers, pests and insects control, irrigation, power, transport and marketing network, timings of agricultural operation, weather forecast etc. Therefore, a system of agricultural infrastructural facilities need to be created which would permit and offer incentives to induce the farmers to work for an increase in agricultural productivity.

A large number of writers have, therefore, argued

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7. United Stares Development Agency, U.S. Department of Agricultural Economic Research Service, The Farm Income Situation, Washington, 1963; Ohkawa Kazushi, et. al. The Growth of the Japanese Economy Since 1878, Tokyo, 1957.

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for the necessity of an investment in agricultural infrastructure to overcome the low productivity in agriculture.[8] A careful scrutiny of the literature on the subject of 'infrastructure' or what is more popularly called as 'Social overhead capital' reveals that these studies can be grouped into two broad categories, which have led to a lively debate on economic policy. On the one extreme of the spectrum, Rostow sets out 'infrastructure' as a pre-condition to economic development in his widely acclaimed title Stages of Economic Growth.[9] The strategy of building infrastructure ahead of demand relies on the role of infrastructure in stimulating the demand for it. This line of reasoning has also been strongly advocated by Ragnar Nurkse, who is mostly known for propounding the 'balanced growth doctrine' in other respects.[10] This strategy is based on the basic premise that it will play an active role in promoting faster growth, by enabling to economy to absorb new technology more rapidly. It should , therefore, be noted that expansion of infrastruc-

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8a. Mellor, J.W. "Towards a Theory of Agricultural Development", in Southworth and Johnson (Eds.): Agricultural Development and Economic Growth, New York, 1967.

b. Schultz, T.W., Transforming Traditional Agriculture, New Haven, Yale Univ. Press, 1964.

9. Rostow, W.W., The Stages of Economic Growth, London, 1960, Cambridge Univ. Press.

10. Ragnar Nurkse, The Problems of Capital Formation in Underdeveloped Countries, London, Oxford, 1962.

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ture, by itself, will not produce growth, in that sense, it is only a permissive factor. It will stimulate growth by increasing the profitability of directly productive investments and thereby stimulating a larger volume of investments in these activities. Youngson (1967) has also studied the subject and throws his weight in support of this approach maintaining that "overhead capital is facilitating investment which promotes innovations".[11] Following the same line of reasoning World Economic Survey (1959) points out that "appropriate policies for the development of overhead capital in transport, communications and public utilities are a pre-condition for economic growth."[12]

Similarly, the Planning Commission of India, also subscribes to this view and notes in the Fourth Five Year Plan Draft document that "Growth and diversification of economic activity in an underdeveloped area can take place only if the infrastructure required for conservation and development of natural resources is strengthened".[13]

On the other extreme, Hirschman (1958)[14] completely rejects this strategy in favour of demand approach to

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11. Youngson, Overhead Capital, Edinburgh, 1967, p. 71.

12. United Nations': World Economic Survey, New York 1959, p. 38.

13. Govt. of India, Planning Commission, Fourth Five Year Plan, New Delhi, 1969.

14. Hirschman, A.O., The Strategy of Economic Development, New Haven, Yale Univ. Press, 1958.

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economic development. He opined that infrastructure should be provided under growth impulses generated in the economy and observed that "most of the low income countries tend to invest too much in power and transport infrastructure ahead of demand and too little in directly productive activities". He therefore, favours a policy of building 'factories' first and then letting the pressure of 'excess demand' and 'public opinion' break the resulting bottlenecks in infrastructure.

The differences in these two approaches are very lucidly summed up by Myint (1960) that "apart from being a very impressinistic way of Treating political factors, demand approach assumes that the government policies can stimulate directly productive investments without providing infrastructure for them, whereas, alternative approach assumes that directly productive activities are constrained by the lack of infrastructure, the sole of building it ahead of demand is precisely to stimulate such activities.[15]

DEFINITION AND SCOPE OF AGRICULTURAL INFRASTRUCTURE

In the earlier studies, there was no clear consensus on the meaning of 'infrastructure' and the term was used with considerable imprecision in the literature on the subject. A careful scrutiny of the literature

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15. Alla Myint, "Demand Approach to Economic Development", Review of Economic Studies, vol. 27, 1960, p. 129.

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clearly reveals that for most of the writers it has become fashionable to use the term 'infrastructure' and 'social overhead capital' interchangeably. Wharton referring to his personal communication with Rosenstein Rodan writes that according to him, the term 'infrastructure' originated as a military term during World War II and was applied to such items as oil pipelines. However, the term 'infrastructure' was bradened to include various other capital items and adopted more generally as preferable to 'social overhead capital' in the early days of the Marshall Plan, precisely to avoid confusion with hospitals, schools, and other similar welfare type of facilities.

Although, earlier works preferred to use the term 'social overhead capital' in place of 'infrastructure', there had been considerable variations in the content of the concept. For instance, Lewis (1955) appears to include Public utilities, docks, water supplies and electricity,[16] Higgins (1959) includes transport, public utilities, schools and hospitals in his scheme of 'social overhead capital'.[17] For Hirschman(1958) the term 'Social overhead capital' was as much comprehensive as to cover law and order, education, public health, transport, communications, power

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16. Lewis, A.W., The Theory of Economic Growth, Allen and Unwin, London, 1955.

17. Higgins, B., Economic Development, New York, 1959.

water supplies, irrigation and drainage.[18]

In the latter period, however, the term 'infrastructure' has been used much more indiscriminately as compared to the 'Social overhead capital' and both the terms carry identical message to the writers in relation to its meaning and contents. In a more recent work, Komarck (1964), a leading World Bank expert on the subject, defines "infrastructure" as "the basic services or public utilities which are necessary to the commodity producing sectors of the economy".[19] Youngson (1967), in his very comprehensive work on the subject writes that "the correct conclusion is that overhead capitalis not a set of things, but a set of properties.[20] According to him, most important property of infrastructure is that it is a source of external economies. It is precisely for this reason that Adam Smith (1776) included the provision of infrastructure among the "Duties of the Sovereign".[21]

Attempts at conceptualisation of infrastructure specifically for agricultural sector have been rare in the literature on the subject. However, implicit references are there in some of the works.Very few studies

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18. Hirschman, A.O., The Strategy of Economic Development, Yale Univ. Press, New Haven, 1958.

19. Kamarck, A.M., "The Development of Economic Infrastructure", in Herskovits(M.J.) and Hoswitz(M) Eds: Economic Transition in Africa, Evanston, 1964, p.263.

20. Yongson, The Overhead Capital, Edinburgh, 1967, p. 68.

21. Adam Smith, Wealth of the Nation, 1776, p. 214.

attempt to deal with the subject comprehensively. For instance, Nicholls (1963) refers to 'Social overhead capital' in the early stages of development to mean implicity agricultural infrastructure. He includes transport, education, agricultural research and extension services, banking and credit institutions in the agricultural infrastructure.[22] While, DeVeries (1958) includes transportation, communications, power, health services, education, water supplies and housing in his scheme of agricultural infrastructure.[23]

Wharton (1967), on the other hand, takes a broader view on the subject and defines agricultural infrastructure as "the physical capital and institution or organisations, both public and private, which provide economic services to and which have significant impact, directly or indirectly upon the economic functioning of the individual farm firms".[24] On the basis of the ratio of capital costs to total costs per unit of service, he divided the agricultural infrastructure into 'Capital intensive' and 'capital extensive' categories. In the first category he included those items of infrastructure which heavily involve reproduction of capital for the procisionof services, such

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22. Nicholls, W.H., "An Agricultural Surplus as a factor in Economic Development", Journal of Political Economy, vol. 71, 1963.

23. DeVeries, E., "Finance for Development", Proceedings of the 10th International Conference of Agriculture Economists, London, 1958.

24. Wharton, C.W. "The Infrastructure for Agricultural Growth", in Southworth and Johnston (Eds.) : Agricultural Development and Economic Growth, Cornell Univ. Press, 1967.

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as transport, communications, power installations, irrigation and institutions or organisations which operate and provide facilities like marketing, storage and processing. On the other hand, 'Capital extensive' infrastructure are those items in which capital component is relatively low, such as agricultural research and extension, education, conservation schemes, agencies catering to provide pland and animal protection, disease and pest control organizations. By and large, following the same kind of criterion De Varies (1958) classified agricultural infrastructre into 'economic' and 'social' categories.

The studies that have been carried out so far on the subject in India, can be classified into two broad groups. One, which have been carried out by taking a few selected infrastructural facilities for the whole economy and second those which take one single infrastructural facility in isolation with respect to a particular segment of the economy. However, very little attention has, so far been paid to agricultural infrastructure separately. Important among the first group of studies are that of Shah (1969), Healey (1965), Shri Prakasa(1977), Hemlata Rao(1984) and V.K. Singh(1986). T he problem with most of these studies is that either the regional dimension is completely overlooked or the dybamic aspect is ignored. For instance, Shah (1969)[25] made an attempt to

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25. Shah, N. "Infrastructure for the Indian Economy", Commerce, Annual Number, 1969.

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construct a composite index by taking all types of infrastructural facilities across the states for the year 1967-68. He assigned subjective weightages to different type of facilities and then clubbing them together, finally arrived at a composite index. He ranked the states according to their respective indices so obtained only at one point of time. The study, therefore, lacks an attempt to see the impact of infrastructure on economic development in a dynamic time frame. Similarly, Shri Prakasa (1977)[26] takes each type of infrastructural facility, separately, and so no attempt is made to look at aggregate impact on a dynamic setting. Hemlata Rao (1984)[27] attempts to study the inter-regional disparities in each type of infrastructural facilities at the taluka level in Karnataka. This study is valuable in so far as it attempts to integrate the various tupes of facilities in arriving at an overall composite index of development but again ignores the sectoral aspect and dynamic time frame. Similarly, Singh's (1985)[28] work, too, ignores the sectoral aspect and takes an overall view of the economy.

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26. Shri Prakasa, "Regional Inequalities and Economic Development with Special Reference to Infrastructural Facilities in India", Indian Journal of Regional Sciences, vol. 9, no. 2, 1977.

27. Hemlata Rao, Regional Disparities and Development in India, Banglore, 1984.

28. Singh. V.K. Infrastructure and Economic Development in India, M.Phil Dissertation (unpublished), CSRD/ JNU, New Delhi, 1985.

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Thus, no serious attempt has, so far, been made to study the agricultural infrastructure and its regional dimensions in a dynamic time frame. All most all works[29] that have dealt with this subject have dealt mainly with one single type of agricultural infrastructural facility in isolation. However, Kainth (1987)[30] made an attempt to study agricultural infrastructural facilities and agricultural productivity across the districts of Punjab. But the problem with this study is that it has made use of a number of proxy variables in place of most of the physical infrastructural facilities as the basic input of the study and lacks in dynamic time frame.

Need for the Present Study

The need for the present study grows out of the paucity of comprehensive studies on agricultural infrastructure in the context of dynamic and spatial dimensions. Most of the works on the subject dealt with separate components of agricultural infrastructure separately. Very few studies are there which attempt to look at these components together in relation to agricultural sector but these, again, lack in dynamic and regional dimensions.

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29. Gadgil, D.R. (1948); Extension Project Report, Allahabad, 1956; Gupta (1961); Raj, K.N. (1960); Shah and Shukla (1961); Sovani (1960); Report on Ramnad Mandapam Road (1962); Agro Economic Research Centre (1961); and several other studies.

30. Kainth, G.S. "Infrastructure and Agricultural Productivity - A case study of variations in Punjab" Journal of Social and Economic Studies, vol. 4, no. 1, 1987.

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It is, therefore, felt that there is a strong need for such a study which intends to fill in this gap by taking care of dynamic and regional aspects.

Furthermore, the need for such a study arises in the light of emerging importance of agricultural infrastructural facilities, in some of the recent studies,[31] as a policy variable to develop less developed regions, reduce instability in agricultural output and to combate problems of poverty.

The objectives of the present study, therefore, are:

a) To identify the indicators of agricultural infrastructure;

b) To study the disparities in the distribution of agricultural infrastructural facilities among various areas;

c) To present a changing scenario of agricultural infrastructural facilities among various areas over time and;

d) To suggest the action plan to be followed in the future in various areas.

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31. a. Hamumanta Rao, C.H., Ray, S.K., and Subharao, K. Unstable Agriculture and Drought-Implications for Policy, Vikas, New Delhi, 1988.

b. Govt. of India, Planning Commission, Report of Study Group on Agricultural Strategies for Eastern Region of India, New Delhi, 1985.

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The Choice of Area

For the purpose of this study state of Haryana has been selected precisely because it is one of the few states where 'Green Revolution' technology in agriculture was put into use and also that its inception and policy initiatives at modernising agriculture in India happen to coincide. Moreover, Haryana is one of the few states where agricultural infrastructure network was fairly well developed at the time of initiation of new technology in agriculture particularly in power and transport. It is, therefore, thought that a study of this area would serve as a guide to agriculturally less developed areas.

Bearing the objectives of the present study in mind, the term 'agricultural infrastructure' is used in its broad sense. In fact, it is very difficult to segragate the items of infrastructure which are exclusively related to agricultural sector. In the present study an attempt has been made to separate the items of infrastructure which are related to agricultural sector, but the ultimate choice is conditioned by the availability of data at the district level. Thus, as many as eight broad groups of agricultural infrastructural facilities have been identified so as to be utilised as the basic input in the present study. These broad groups of agricultural infrastructure are as follows:

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I Irrigation

II Power

III Transport

IV Marketing

V Banking

VI Cooperation

VII Veterinary Health and,

VIII Agricultural Mechanisation and Technological Infrastructure.

However, education (agricultural research and extension services) have been left out from the present study precisely because of the paucity of data at the district level.

Data Base

The relevant data, used in the present study, were collected for three points of time i.e. 1966-67, 1972-73 and 1982-83, from various issues of Statistical Abstract, published by Statistical Organisation, Govt. of Haryana. While, most of the data comes from this source, some of the remaining snags in the data were removed by approaching concerned offices, directly, at the state headquarters. However, in case of some of the infrastructural indicators for which either the data were not published or published only for the latter periods, attempts have been made to collect the data directly from the state headquarters.

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Despite the best efforts, data for some of the infrastructural indicators such as the length of canals and field channels, number of high yield varieties seeds sale points, number of agricultural scientists and extension service centres, at the district level, were not made available even at the state headquarters. The refore, an attempt is made to complete the study with the help of proxy indicators, especially in the case of irrigation infrastructure. The data for these eight broad groups of agricultural infrastructural facilities were collected at the district level.

At present, the State of Haryana has twelve districts. From the view point of comparability of data over time at least five districts have been merged into their respective parent districts, ultimately getting seven districts in total. Districts of Sirsa and Bhiwani have, therefore, been merged into district Hissar, district Kurukshetra into Karnal, district Sonepet into Rohtak and District Faridabad into Gurgaon district. Again, for the sake of analysis, these seven districts have been classified into high, medium and low productivity regions on the basis of agricultural productivity per hectare of gross cropped area. Thus, districts of Karnal, A mbala and Rohtak constituted high productivity region, districts of Hissar and Jind Medium productivity region and district of G urgaon and Mahendergarh as low productivity region, in each of the time periods, respectively.

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The study covers a period from 1966-67 to 1982-83. Keeping the story of 'Green Revolution' in mind, the entire period have been subdivided into two parts, i.e. from 1966-67 to 1972-73 and 1972-73 to 1982-83. The present study, therefore, makes use of two break periods along with the entire period under consideration.

Hypotheses:

1) The areas which had relatively higher agricultural productivity also had relatively higher provision of agricultural infrastructural facilities.
2) Provision of More agricultural infrastructural facilities lead to increase in agricultural yields.
3) The growth in agricultural infrastructural facilities is found to be relatively higher in the high agricultural productivity areas.
4) Disparities in agricultural infrastructural facilities among various areas tend to result in inequalities in agricultural productivity amongst them.
5) A reduction in the disparities in agricultural infrastructural facilities tend to narrow down the disparities in agricultural productivity among various areas.
6) Disparities in the distribution of agricultural infrastructural facilities are found relatively more acute at the level of districts than at the level of group of districts.

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Methodology

It would be in the fitness of things to outline the detail of variables included in the eight broad groups of agricultural infrastructural facilities, identified in the present study and for which relevant data were collected, to test these hypotheses.

I. Irrigation Infrastructure

1. Irrigation by source:
   a. Percentage of net area irrigated by canals
   b. Percentage of net area irrigated by tubewells and other wells.
2. Percentage ratio of gross area irrigated to gross cropped area.

II. Power Infrastructure

1. Number of transformers per thousand hectares of net sown area,
2. Length of L.T. Lines (circuit kms) per thousand hectares of net sown area,
3. Length of 11 K.V. lines (circuit Kms) per thousand hectares of net sown area.

III. Transport Infrastructure

1. Length of surfaced roads (sq. kms) per thousand sq. kms of area.

IV. Marketing Infrastructure

1. Number of principal agricultural regulated markets per thousand hectares of net sown area.

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2. Number of agricultural sub-yards per thousand hectare of net sown area.

3. Number of fertiliser sale counters per thousand hectares of net sown area.

V. Banking Infrastructure

1. Number of central cooperative banks per thousand sq. kms of area.

2. Number of total banks per thousand sq. kms. of area.

VI. Cooperative Infrastructure

1. Number of agricultural Primary Cooperatives Credit Societies per thousand sq. kms of area.

2. Number of agricultural cooperative non-credit societies per thousand sq. kms. of area.

3. Cooperative credit (Short plus medium term) per hectare of net sown area.

VII. Veterinary Health Infrastructure

1. Number of veterinary hospitals and dispensaries per thousand of cattle population.

2. Number of livestock development centres per ten thousand of cattle population.

VIII. Agricultural Mechanisation and Technological Infrastructure

1. Number of tracters per thousand hectares of gross cropped area

2. Number of tube wells per thousand hectares of gross cropped area.

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3. Fertilisers consumption (tonnes) per thousands hectares of gross cropped area.
4. High Yield varieties seeds (Qtls.) per thousand hectares of gross cropped area.

The whole exercise to test the hypothesis in the present study is based on the use of two main statistical techniques, namely, 'Coefficient of variation' and 'multiple correlation'. However, in order to analyse the behaviour of change of an individual district or a group of districts with respect to agricultural infrastructural facilities, over time. these statistical technqiues have also been supplemented by the 'compound annual rates of growth'. The cartographic technique have also been used to delineate productivity regions and crop regions, respectively. Some of the recent empirical studies using different statistical tools calls for a reorientation of the existing agricultural strategy by giving greater emphasis to physical infrastructure like irrigation and its management, land development, strengthening of co-operative societies and marketing infrastructure especially in the less developed regions.

For instance, Hanumanta Rao and others found that the proportion of population below poverty line is higher in the unirrigated areas and declines with the increase in irrigation facilities. They empirically tested that

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the irrigation contributes to reducing instability in agricultural output. Bringing out the importance of agricultural infrastructure to reconcile the goal of self-sufficiency through growth with stability, equity and efficiency, the conclude that "the poor have lower staying capacity and credit worthiness, instability in food grains output and drought hit them severely which may explain, among other things, the decline in poverty ratio with the increase in irrigation facilities".[32] Similarly, the Study Group constituted by the Planning Commission after empirically analysing the performance in respect of major food crops in the eastern region of India came to the conclusion that there is a significant potential for raising agricultural output if farmers' resource position is strengthened, the various uncertainities facing farmers are reduced, new varieties of seeds and improved practices are evolved to suit different agro-climatic conditions and infrastructure, both physical and institutional, is provided.[33] Using the 'Stepwise Multiple Regression' analysis the study found that water management emerges as a key factor in the development of this region. In the present study, disparities in the distribution of

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32. Hanumanta Rao, C.H., Ray, S.K. and Subha Rao, K. Unstable Agriculture and Drought - Implications for Policy, Vikas, New Delhi, 1988.

33. Govt. of India, Planning Commission, Report of Study Group on Agricultural Strategies For Eastern Region of India, New Delhi, 1985.

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each of the infrastructural facilities are analysed with the help of 'Coefficient of Variation' in Chapter III. The growth and inter-linkages in the agricultural infrastructural facilities are dealt with in Chapter IV of the present study which uses 'Compound annual rates of growth' and 'Multiple coorelation'. While Chapter II is devoted to the general introduction of the region which ~~was~~ uses cartographic technique, the final chapter deals mainly with the summary of conclusions and suggestions.

CHAPTER - II

INTRODUCTION TO THE REGION

Haryana is the seventeenth state in terms of geographical area, with an area of 44,212 sq. kms.[1] in the Union of States of India. It came into being in November 1966, as a result of bifurcation of the erstwhile state of Punjab, under reorganisation Act of 1966. The region now comprising Haryana was comparatively less developed within the erstwhile State of Punjab. The three major perennial rivers, viz., Ravi, Beas and Sutlej which formed the well developed irrigation system and main source of irrigation in the region remained in the new State of Punjab, though Haryana shares these water with it. Moreover, most of the small scale industries, for which erstwhile Punjab was famous, concentrated in the north western parts, went to the Punjab side. Therefore, at the time of its inception Haryana was found to be almost backward industrially, poor in mineral resource base, deficient in irrigation facilities but well served by other overhead capital facilities such as power and transport.[2]

Haryana is located on north-west side of the Indian Union adjoining Delhi. The State extends from $27^{o}3'$ to

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1. Govt. of Haryana, Department of Statistics, Statistical Abstract, Chandigarh, 1983-84.

2. N.C.A.E.R., Techno-Economic Survey of Haryana, Delhi, Nov. 1970.

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$31^{o}9'$ north latitude and $74^{o}5'$ to $77^{o}6'$ east longitude. In the east of the state are Uttar Pradesh and Delhi, to the South-West lies Rajasthan and in the north bounded by Punjab and Himachal Pradesh.

Physiography[3]

The state has two basic physical divisions, namely, the Plains and the Aravalli range. The Plains cover the entire state except Souththern Mahendergarh and the South-west parts of the Gurgaon district. On the basis of aridity, the plain can be sub-divided into eastern and western plains. The 50 cms isohyet line serves as the dividing line between the two plains. The Western Plain, which covers most of the Hissar, Bhiwani, Sirsa, and Western Mahendergarh district is characterised by having a higher degree of aridity. It has well defined boundary on the east marked by the Aravalli range. It is generally a dry land region covered by 'Steppe' vegitation and with sand dunes of various shapes and sizes. The eastern Plan, on the other hand, is remarkably flat, with a general elevation varying between 200 and 230 metres above sea level, which extends from the west of the Yamuna upto 50 cms. isohyet line. .The entire plain has fertile, light and loamy soil.

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3. Most of the facts on this section have been derived from Techno-Economic Survey of Haryana, Prepared by N.C.A.E.R., New Delhi..

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The Aravelli range is a narrow ridge streeling into Haryana far about 90 kms in the northeast-south west direction upto Delhi. It covers the southern parts of Mahendergarh and adjoining areas of the Gurgaon district. This physical division is characterised by rocky surface with soil poor in fertility.

Rainfall

T he annual rainfall in the state is unevenly distributed both over space and time. It varies from 25 cms in the western Hissar district to 110 cms in the eastern Ambala district. More than 80 per cent of annual rainfall is accounted for in the quarter of July-September. The amount of rainfall varies in the direction of south-west to north-east, in the state.

Soil Types

In the western plain, the soil is generally sandy which is not very much fertile. The soils in eastern plain on the other hand, is found to be light and loamy which is very fertile. While, the soils in the Araville range is found to be rocky and poor in fertility.

Population

According to 1981 Census, Haryana has a population of 1.29 crores with a density of population of 291 persons per sq. km. The pressure of population on land varies

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widely from district to district, it being the lowest in Hissar (199) and highest in Gurgaon (378). The rural-urban composition of population reveal that about 78 percent of population lives in the villages. District Ambala turns out to be the most urbanised with 43.1 per cent of population living in towns and district Mahendergarh as the least urbanised with just 13 per cent of population living in towns.

Occupational Structure

The State reveals significant changes in the occupational pattern since its inception. The agricultural sector engaged about 66.7 per cent of the working force in 1981 as against 71 per cent in 1966. Nevertheless, agriculture still continues to be the mainstay of the state economy. The proportion of agricultural lanourer to the working force increased from about 12 per cent in 1966 to 16.2 per cent in 1981. The secondary and tertiary sectors in the state engaged about 12 per cent and 21.3 per cent of the work force, respectively, in 1981.

State Income

Within the erstwhile state of Punjab, which was the most prosperous state in the country, the present Haryana region was quite behind its counterpart Punjab region in economic prosperity. The Haryana Development Committee estimated per capita income of Haryana area as

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Rs 339 (at 1960-61 prices) in comparison to Rs 467 for the Punjab region in 1961-62 as against all India average of Rs 334.[4] The per capita income of Haryana in 1966-67 estimated to be Rs 589 (at 1960-61 prices) in comparison to Rs 482 for all India.[5]

Recently, Central Statistical Organisation has brought out estimates of State domestic product (net) for various states which clearly nrings out the fact that Haryana ranks second, next only to Punjab, in terms of per capita income right from 1970-71 through 1984-85.[6] It reports that per capita income in Haryana in 1970-71 (at 1970-71 prices) was Rs 877 in comparison to Rs 1070 in Punjab as against Rs 633 for all India. The State of Punjab being highest in per capita income in the whole country. In 1984-85, per capita income in Haryana (at 1970-71 prices) works out to be Rs 1,111 in comparison to Rs 1,538 in Punjab as against Rs 722 for all India. Again, Punjab and Haryana being first and second respectively, in per capita income in the country.

Agriculture

The agricultural sector[7] which contributed about

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4. Govt. of Punjab, The Haryana Development Committee Report (Final) Chandigarh, 1966.

5. Govt. of Haryana, Statistical Abstract, Candhgarh 1968-69.

6. Govt. of India, Min. of Planning, C.S.O. Estimates of State Domestic Product 1970-71-1984-85, Delhi, Nov. 1986.

7. The Agricultural Sector included animal husbandry, forestry, fisheries etc.

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59 per cent to State demostic product in 1966-67 and employed about 71 per cent of working population in the state-contributed 64.6 per cent to State's domestic product and engaged 70.7 per cent of the working population in 1970-71.[8] However, contribution of agricultural sector to net domestic product of the state and proportionof working population engaged in it declined significantly in the following decade. Agricultural sector contributed about 49 per cent to net domestic product of the State in 1984-85 and employed about 66.7 per cent of the working population. Being major contributor to the State's domestic product, this sector has, therefore, been accorded prime importance in the development strategy of the state. As a consequence, this sector has witnessed a major transformation in terms of growth in the value of agricultural output and yield, during the period under consideration i.e. between 1966-67 and 1982-83.

Moreover, the inception of the state of Haryana and major policy initiatives at modernising agriculture in India, commonly referred to as 'Green Revolution' happen to coincide these policy thrusts in agriculture resulted in significant area expansion under crops and improvements in agricultural yield.

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8. Govt. of India, Ministry of Planning, C.S.O. Estimates of State Domestic Product, Delhi, Nov. 1986.

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Productivity Region

Table 2.1 presents an account of area under crops, agricultural productivity per hectare of gross cropped area and value of agricultural outpur of the twelve major crops (calculated at 1980-81 harvest prices) undertaken in the present study for triennium ending 1966-69, 1970-73 and 1980-83, respectively. However, table 2.1 shows only seven districts instead of twelve at present in the state. This is precisely because that atleast five districts have been merged into their respective parent districts in order to make the data comparable over time. Again, for the sake of analysis, these seven districts have been classified into high, medium and low productivity regions on the basis of the level of agricultural productivity obtained in different districts at various points of time.

The high productivity region comprised of those districts for which the value of agricultural output per hectare of gross area was found to be more than Rs 2,100, Medium productivity region included those districts for which it was found between Rs 1,800 to 2,100 and low productivity region covered rest of the districts which reported value of agricultural output per hectare of gross area less than Rs 1,800, in triennium ending 1966-69. In the second triennium i.e. 1970-73, the value of agricultural output per hectare of gross area for high, Medium and low productivity regions were taken as more than

TABLE NO. 2.1

Profile of Area, Value of Agricultural Output and Productivity

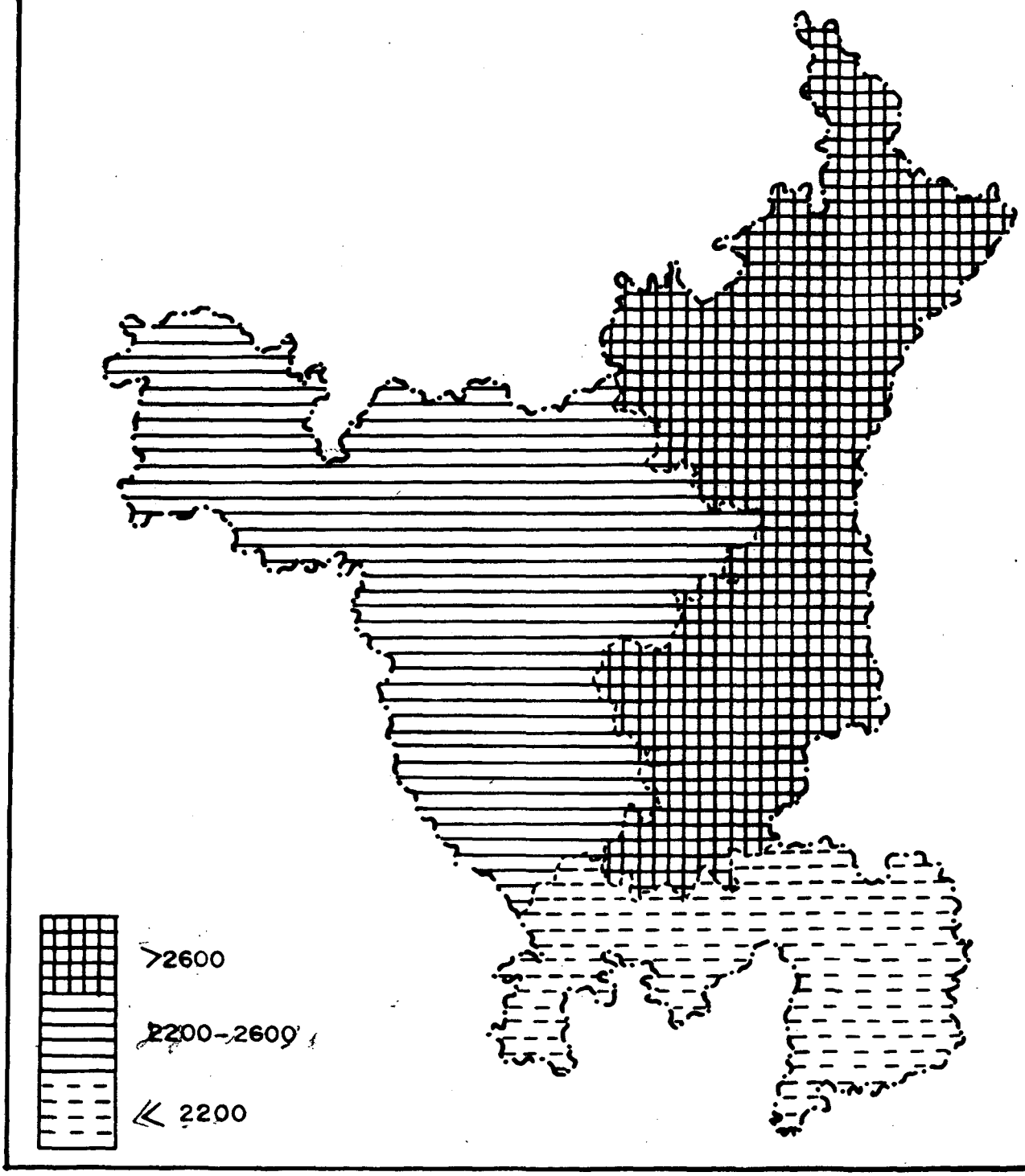
	Area ('000 hectares)			Agricultural Productivity (Rs./ hectare)			Output (Rs. in Lakhs)		
	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83
Haryana	3971.1	4404.6	4649.2	1894	2325	2796	7995.0	10244.0	13000.0
1. Karnal	736.4	820.1	907.4	2361	2888	3389	1739.0	2368.0	3075.0
2. Ambala	242.6	284.6	295.3	2102	2550	3311	510.0	726.0	978.0
3. Rohtak	613.6	626.1	617.9	2334	2611	2904	1433.0	1635.0	1609.0
4. Jind	289.1	325.9	381.4	2002	2456	2716	661.0	800.0	1036.0
5. Hissar	1207.5	1420.5	1676.7	1849	2326	2832	2232.0	3302.0	4748.0
6. Gurgaon	540.6	526.8	442.7	1653	1752	2215	894.0	923.0	981.0
7. Mahender-Garh	342.9	365.6	328.7	966	1296	2520	331.0	474.0	828.0
Productivity Regions									
High	1592.6	1730.8	1820.6	2311	2732	3110	3681.0	4729.0	5662.0
Medium	1496.6	1746.4	2058.1	1933	2349	2811	2893.0	4183.0	5784.0
Low	883.5	892.4	771.4	1387	1565	2345	1225.0	1397.0	1809.0

Rs 2,600, between Rs 2,200 and 2,600 and less than Rs 2,200, respectively. Similarly, in triennium 1980-83, high productivity region comprised of those districts for which the value of agricultural output per hectare of gross area was found to be more than Rs 2,900, districts for which it was found between Rs 2,600 and 2,900 were included in medium productivity region and rest of the districts for which it was found less than Rs 2,600 formed low productivity region.

The map nos. 2.1 - 2.2 and 2.3 depict the various productivity regions, so delineated, in the state for triemnium 1966-69, 1970-73 and 1980-83 respectively. It is interesting to note from the maps nos. 2,1, 2,2 and 2,3 that the group of districts turns out to be the same which constitutes different productivity regions in each of the trienniums. Thus, districts of Karnal, Ambala, and Rohtak found to have constituted high productivity region, districts of Hissar and Jind Medium productivity region and districts of Gurgeon and Mahendergarh constituted low productivity region, in each of the triennium periods. Whereas, these districts maintained uniformity over time with respect to productivity regions, there had been considerable changes with respect to the level of agricultural productivity among the districts, as shown in table no. 2.1. Highest agricultural productivity per hectare of gross cropped area was reported for district

MAP No. 2.2

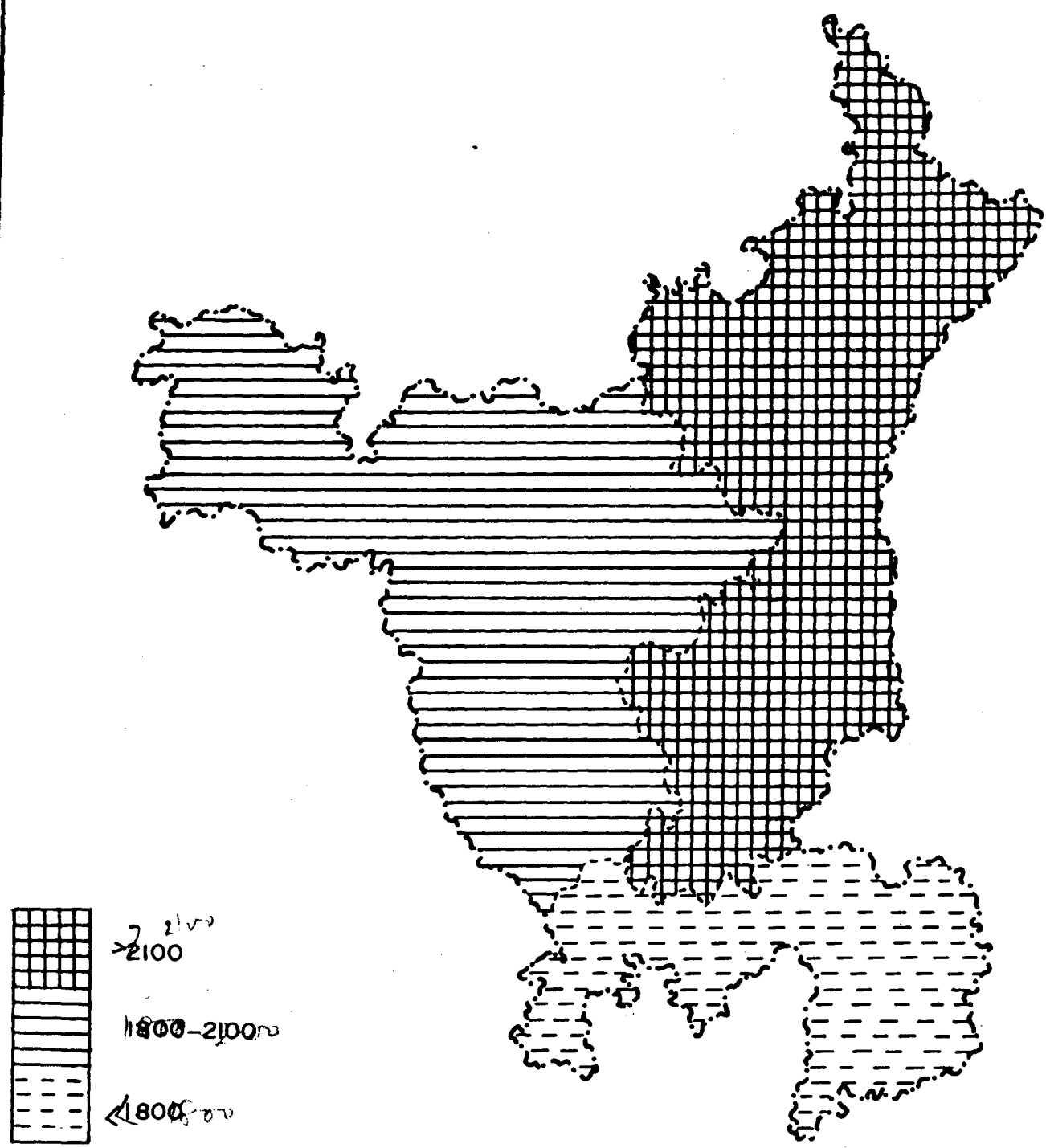
PRODUCTIVITY REGIONS IN HARYANA
1970-71/1972-73



MAP No 2.2

PRODUCTIVITY REGIONS IN HARYANA

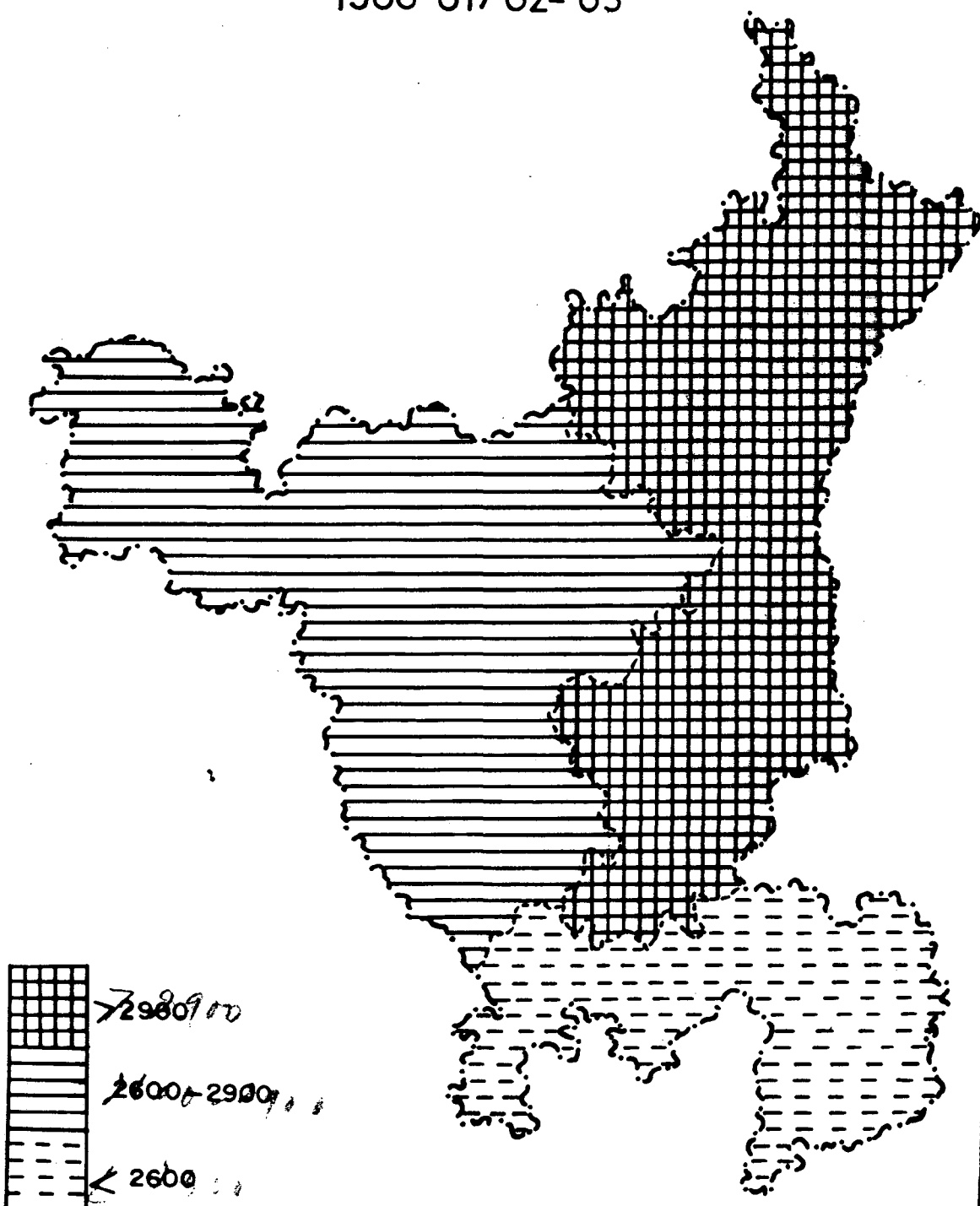
1966-67/1968-69



MAP No 2.3

PRODUCTIVITY REGIONS IN HARYANA

1980-81/82-83



Karnal (Rs 2,361 in 1966-69, Rs 2,888 in 1970-73 and Rs 3,389 in 1980-83) and it was found to have maintained the position of the first ranking district over the entire period. The lowest agricultural productivity per hectare of gross area was reported for district Mahendergarh (Rs 966 in 1966-69, Rs 1,296 in 1970-73 and Rs 2,520 in 1980-83) but it had improved position from seventh to sixth and district Gurgaon which stood sixth in 1966-69 and 1970-73 scaled down to the lowest rank in 1980-83 triennium. Similarly, district Rohtak scaled down and district Ambala scaled up in the rank in terms of level of productivity per hectare of gross area within high productivity region. Districts of Hissar and Jind also interchanged the ranks within Medium productivity region, Hissar scaling up and Jind scaling down in terms of level of productivity per hectare of gross cropped area.

Land Use Pattern

Given the limited area of land, its use has to be made in a way so as to maximise the current returns and does not damage its potnetialites for yielding better returns in future. Land utilisation is, therefore, of great importance particularly in a smallsized state such as Haryana. Table No. 2.2 gives an account of land-use pattern for the whole state, for different districts and productivity regions in 1972-73 and 1982-83, respectively.

TABLE NO. 2.2

LAND USE PATTERN IN HARYANA

	('000 hectares) Total Area		LAND NOT AVAILABLE FOR CULTIVATION						Other uncultivated Land Excluding Fallow Land		Fallow Land		TOTAL		Net Sown Area	
			Forests		Land put to Non-Agr.Uses		Barren and uncultivated Land									
	1972-73	1982-83	1972-73	1982-83	1972-73	1982-83	1972-73	1982-83	1972-73	1982-83	1972-73	1982-83	1972-73	1982-83	1972-73	1982-83
Haryana	4404	4393	117 (266)	136 (3.10)	305 (6.93)	329 (7.49)	117 (2.66)	88 (2.0)	82 (1.86)	75 (1.71)	162 (3.82)	170 (3.87)	783 (17.93)	798 (17.17)	3621 (82.07)	3595 (82.83)
1. Karnal	743	740	14 (1.88)	23 (3.11)	50 (6.73)	53 (7.16)	43 (5.49)	03 (0.41)	25 (5.4)	13 (1.8)	004 (0.54)	001 (0.14)	136 (18.3)	93 (12.58)	607 (81.7)	647 (87.42)
2. Ambala	374	374	39 (10.43)	41 (10.96)	67 (17.91)	64 (17.11)	06 (1.6)	02 (0.53)	07 (1.57)	08 (2.14)	012 (3.21)	011 (2.94)	131 (35.03)	126 (33.68)	243 (64.97)	248 (66.32)
3. Rohtak	604	598	25 (4.14)	17 (2.84)	44 (7.08)	40 (6.69)	09 (1.49)	05 (0.84)	18 (3.0)	26 (4.35)	016 (2.65)	013 (2.17)	112 (18.54)	101 (16.89)	492 (81.46)	497 (83.11)
4. Jind	330	322	04 (1.21)	08 (2.48)	05 (1.52)	06 (1.86)	26 (7.88)	04 (1.24)	01 (0.3)	18 (5.6)	17 (5.15)	27 (8.39)	53 (16.05)	63 (19.57)	277 (83.95)	259 (80.43)
5. Hissar	1565	1547	15 (0.96)	25 (1.62)	46 (2.94)	64 (4.14)	70 (4.47)	49 (3.17)	13 (0.83)	00 (0.0)	102 (6.52)	97 (6.27)	246 (15.72)	235 (15.19)	1319 (84.28)	1312 (84.81)
6. Gurgaon	486	492	15 (3.09)	16 (3.25)	66 (13.6)	69 (14.03)	15 (3.09)	13 (2.64)	10 (2.06)	05 (1.02)	08 (1.62)	19 (3.86)	114 (23.47)	122 (27.78)	372 (76.53	370 (72.22)
7. Mahendergarh	302	321	05 (1.66)	06 (1.87)	27 (8.94)	33 (10.28)	08 (2.65)	12 (3.74)	08 (2.65)	04 (1.25)	09 (3.0)	02 (0.62)	57 (18.18)	57 (17.74)	245 (81.82)	264 (82.26)
Productivity Regions																
High	1721	1712	78 (4.53)	81 (4.73)	161 (9.36)	157 (9.17)	58 (3.37)	10 (0.58)	50 (2.91)	47 (2.75)	32 (1.86)	25 (1.46)	379 (22.03)	320 (1869)	1342 (77.97)	1392 (81.31)
Medium	1895	1869	19 (1.03)	33 (1.77)	51 (2.69)	70 (3.75)	96 (5.07)	53 (2.84)	14 (0.74)	18 (0.96)	119 (6.28)	104 (5.58)	299 (15.81)	278 (14.88)	1596 (84.19)	1591 (85.12)
Low	788	813	20 (2.54)	22 (2.71)	93 (11.8)	102 (12.55)	23 (2.92)	25 (3.08)	18 (2.22)	09 (1.11)	17 (2.16)	21 (2.58)	171 (21.64)	179 (22.03)	617 (78.36	634 (77.97)

The table reveals that the net sown area as a proportion of total area shows a tendency to increase for the whole state (83 per cent) in 1982-83 as compared to (82 per cent) in 1972-73 as against the 48 per cent for all India in 1982-83. Whereas, most of the districts in the state reported significant increases in the proportion of net sown area to total area, districts of Jind and Gurgaon experienced a decline in it due to increases in the proportion of area under current fallow over the same period. Similarly, high and medium productivity regions reported significant increases in the proportionof net sown area to total area, it increased relatively sharply for high productivity region. Low productivity region experienced a marginal decline in it over the entire period due to increase in the proportion of area under forests, non-agricultural uses, barren land and current fallow. Districts which reported significant increases in the proportion of net sown area to total area in the state were that of Karnal (87.5 per cent in 1982-83 as compared to 81.7 per cent in 1972-73), Ambala (66.5 per cent in 1982-83 as compared to 64.9 per cent in 1972-73), and Rohtak (83.1 per cent in 1982-83 as compared 81.5 per cent in 1972-73), mostly due to decline in the proportionof area under barren and current fallow because with agricultural prosperity opportunity cost of land lying unused becomes high. However, district Hissar and Mahendergarh districts also

reported marginal increases in the proportion of net sown area to total area over the same period. The Table clearly brings out that the net sown area as a proportion of total area is found to be the highest in district Hissar (82.3 per cent) in 1972-73 but highest is being reported for district Karnal (87.4 per cent) in 1982-83. The lowest proportion of it is being reported for district Ambala (66 per cent) and district Gurgaon (72 per cent in 1982-83) party due to physiographic reasons and also due to relatively higher proportion of land put to non-agricultural uses. The net sown area as a proportion of total area is found to be relatively higher in high and medium productivity regional as compared to the productivity region, again for the reasons of physiographic characteristics and higher proportionof land area put to non-agricultural uses in low productivity regions. The proportion of area under forests to total area showed a tendency to increase in the state and also in most of the districts excepting Rohtak district whereas the porportion of area under forest in the state is found to be very low (3 per cent) as against (32 per cent) for all India. The proportion of total area devoted to forests is found to be highest in district Ambala (11 per cent). The other districts which devoted significantly higher proportion of total area to forests were that of Karnal (3.11 per cent), Rohtak (2.8 per cent) and Gurgaon (3.25

per cent). All of the productivity regions reported significant increases in the proportion of area under forests, the highest proportion being reported for high productivity region followed by low productivity region Whereas, Medium and Low productivity regions reported significant increases in the proportion of area put to non-agricultural uses, it declined for high productivity region between 1972-73 and 1982-83. On the other hand, proportion of total area under barren land declined substantially in high and medium productivity regions, it showed a tendency to marginally increase in low productivity region especially in district Gurgaon. Similarly proportion of total area under current fallow declines for high and medium productivity regions, it increased for low productivity region.

Thus, proportion of net sown area to total area is found to be generally higher in districts with high irrigation levels.

Land Holding Structure

Haryana is one of the few states in the country which have relatively larger size of land holdings. The average size of land holding in Haryana in 1970-71 was found to be 3.90 hectares in comparison to 2.89 hectare for Punjab, 4.28 hectare for Maharashtra and 5.46 hectare for Rajasthan as against 2.30 hectares for all India.

The average size of land holding in Haryana shows a tendency to decline like many other states due to mainly to increase in population and also in response to the implementation of land ceiling measures. The total number of operational holdings in the state increased from 9, 13, 470 in 1970-71 to 10,11,564 in 1980-81. In 1975-76, average size of land holdings in Haryana was estimated to be 3.58 hectares in comparison to 2.74 hectares for Punjab, 3.66 for Maharashtra and 4.65 hectares for Rajasthan as against 2.00 hectares for all India. The average size of land holdings in Haryana further declined to 3.52 hectares in 1980-81.

Table No. 2.3 gives the average size of land holdings for the state, different districts and productivity regions in 1970-71 and 1980-81, respectively. It clearly reveals that the lowest size of land holding is found to be in Gurgaon district (2.23 hectares) followed by Ambala district (2.77 hectares). While, largest size of average holdings is foundin district Jind (5.51 hectares) followed by district Mahendergarh (5.32 hectares) and district Hissar (4.98 hectares) in 1970-71. Districts which found to have relatively larger size of land holdings than the average for the whole state (3.90 hectares in 1970-71) were that of Jind, Hissar and Mahendergarh. The average size of land holdings in 1980-81 is found to be largest in district Hissar (4.68 hectares) followed by district

Table 2.3

Average Size of Land Holdings in Haryana (Hectares)

		1970-71	1980-81
	HARYANA	3.90	3.52
1	Karnal	3.86	3.42
2	Ambala	2.77	2.86
3	Rohtak	3.54	2.96
4	Jind	5.51	4.59
5	Hissar	4.98	4.68
6	Gurgaon	2.23	2.32
7	Mahendergarh	5.32	3.18
Productivity Regions			
	High	3.39	3.08
	Medium	5.25	4.64
	Low	3.77	2.75

Jind (4.60 hectares) and Karnal district (3.42 Hectares) However, districts of Gurgaon (2.32 hectares in 1980-81 as against 2.23 hectares in 1970-71) and Ambala (2.86 hectares in 1980-81 as against 2.77 hectares in 1970-71) reported lowest size of holdings in 1980-81 and showed a tendency to increase in the size though marginally over the previous period as the total number of operational holdings declined in both the districts between 1970-71 and 1980-81. Since, the marginal and small farmers have lower staying capacity and credit worthiness, therefore, most of them tend to sell their uneconomical small-sized land holdings as a result the number of large sized holdings show a tendency to accentuate rather than decline. The table no. 2.3 also reveal that Medium and High productivity regions enjoyed relatively larger average holdings than low productivity region, largest size is being reported for Medium productivity region.

Cropping Pattern

Cropping pattern means the proportion of area under different crops, the rotation of crops, and area under double cropping in a district or region. The analysis of cropping pattern is necessary for an identification of the major crops that are grown in the district of region by its farmers. Further, any change in the cropping pattern may reflect infouence of demand arising

from an increase in the level of incomes, government policies, farm technology, quality of inputs and the development of agro-industries.

Table No. 2.4 gives the percentage area under major crops in 1966-69, 1970-73 and 1980-83 trienniums, respectively, for the while state, for various districts and productivity regions. On the basis of proportion of area under crops to total cropped area, major crop regions have been delineated in the state for different triennium periods, respectively, as shown by map no. 2.4 and 2.5. It reveals that rice growing region which included Karnal, Ambala and Jind districts in 1966-69 triennium showed a tendency to expand to include districts of Hissar and Rohtak by 1980-83 triennium. Similarly, wheat region which included almost all the districts excepting that of district Mahendergarh in 1970-73 triemnium reported an expansion so as to include all the districts by 1970-73 triennium. Bajra growing region which included mostly districts of Jind, Hissar, Gurgaon and Mahendergarh in 1966-69 triennium reported expansion and included districts of Rohtak and Karnal also in 1980-83 triennium period. Similarly, oil seeds, sugar cane and cotton growing regions in the state reported significant expansion over time. Gram growing region turns out to be the only region which included a;l the districts in 1966-69 triennium reports contraction over time and shrinked

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only to include districts of Rohtak, Jind, Hissar, Gurgaon and Mahendergarh. The other crops which reported considerable shrinkage in geographical coverage were that of barley, pulses and maize.

Cropping pattern in the state, as shown in table 2.4 reveal that, in triennum period 1966-69, rice, bajra and cotton in the Kharif and wheat gram and barley in the rabi season found to be important crops. However, rice is found important only in Karnal and Ambala districts, all other districts devoted less than one per cent of total cropped area to it. On the other hand, bajra is found to be the most dominant crop in the Kharif in most of the districts excepting that of Karnal, Ambala and Rohtak. Cotton is also found to be an important in Kharif crops but most of it was grown in districts of Hissar and Jind. In the case of rabi crops, gram emerged as the single most important crop grown in all of the districts in the State. Gram was followed by wheat for which proportion of area devoted was found to be considerably higher in all the districts excepting that of Mahendergarh district. Barley is another important rabi crop but most of it was found to have grown in Gurgaon district. Some of the other crops grown in various districts were maize (district Ambala), Sugarcane (grown mostly in districts of Rohtak and Ambala), Pulses (in districts of Rohtak, Jind and Gurgaon) and oilseeds (grown mostly in Hissar, Gurgaon and Mahendergarh districts).

TABLE NO. 2.4

Cropping Pattern in Haryana

(Percentage of Area Under Various Crops)

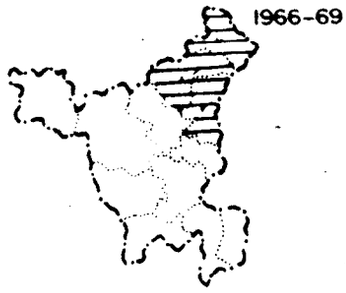
	Rice			Wheat			Bajra		
	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83
Haryana	5.36	6.45	10.61	20.83	26.36	34.15	22.32	16.2	16.35
1. Karnal	18.51	23.30	36.27	33.3	45.0	49.75	00.5	03.65	02.0
2. Ambala	17.7	16.8	21.69	29.64	30.6	40.64	00.24	01.51	01.4
3. Rohtak	00.2	02.08	03.4	27.8	31.5	42.8	00.16	15.93	17.12
4. Jind	02.32	03.53	09.4	20.0	26.5	35.7	19.38	21.17	20.05
5. Hissar	01.08	01.33	02.4	12.68	15.45	20.27	28.83	20.0	17.95
6. Gurgaon	00.15	00.44	00.68	21.8	30.0	46.15	26.85	19.73	23.53
7. Mahendergarh	00.09	00.01	00.0	00.3	07.65	05.25	56.05	33.61	46.5
Productivity Regions									
High	14.87	15.41	22.84	37.86	41.42	46.16	00.36	08.2	06.95
Medium	01.32	01.74	03.69	14.05	17.53	23.15	26.99	20.22	18.33
Low	00.13	00.26	00.39	14.48	20.81	35.71	38.12	25.45	33.39

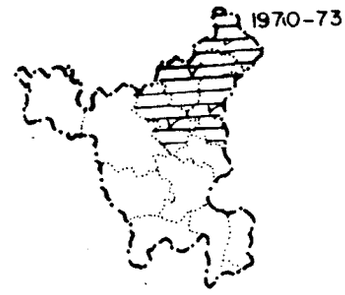
	Maiza			Barely			Pulses			Gram		
	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83
	2.44	2.62	1.42	5.46	2.68	2.35	1.46	1.04	0.65	23.55	24.03	16.46
	0.6	6.70	2.37	0.47	1.63	0.70	0.2	1.43	0.8	15.4	8.96	1.7
	13.58	14.77	11.86	0.3	0.95	1.0	0.5	4.0	2.71	16.05	14.46	6.0
	1.02	1.12	0.5	0.04	2.2	2.25	0.33	0.25	0.2	23.3	21.49	11.8
	1.14	0.92	0.36	3.46	1.69	1.6	1.18	1.23	1.05	29.45	26.70	17.0
	0.39	0.25	0.13	2.9	1.1	1.23	1.14	0.89	0.34	30.41	34.30	31.19
	0.87	0.98	0.56	14.45	9.67	8.37	0.5	0.36	0.68	19.07	19.5	4.86
	0.15	0.05	0.00	0.90	4.43	6.75	1.78	0.96	0.00	24.00	36.9	14.9
	6.5	6.36	3.32	5.1	1.83	1.29	2.47	1.52	0.97	22.85	15.25	5.90
	0.53	0.37	0.16	3.01	1.2	1.29	1.14	0.97	0.47	30.23	32.87	28.57
	0.58	0.58	0.33	11.88	7.51	7.58	1.00	0.61	0.42	20.96	26.41	9.08

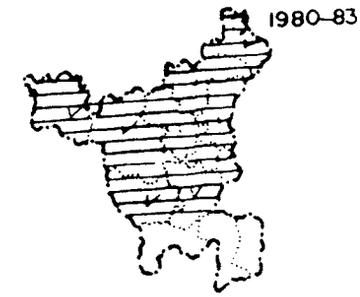
	Oil Seeds			Sugar Cane			Cotton		
	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83	1966-69	1970-73	1980-83
	3.34	3.49	4.77	3.62	3.11	2.90	5.35	5.20	7.70
	0.30	1.88	0.80	0.47	3.84	3.30	0.30	1.44	1.30
	0.20	1.58	2.50	0.90	7.37	10.95	0. 10	0.67	1.20
	1.35	1.98	1.95	7.28	6.70	6.23	2.65	1.55	2.05
	1.73	2.48	2.50	4.74	4.29	3.67	6.45	5.21	6.40
	4.86	4.50	7.33	1.35	1.05	0.58	12.70	13.15	18.07
	4.62	5.62	6.11	1.85	2.37	1.69	0.40	0.34	0.35
	3.12	5.46	8.40	0.67	0.27	0.00	0.23	0.05	0.00
	2.54	1.98	1.55	7.84	5.82	5.75	3.06	1.43	1.53
	4.25	4.12	6.43	2.00	1.65	1.17	11.36	11.67	15.94
	4.04	5.56	7.01	1.39	1.51	0.97	0.32	0.22	0.26

M.P No 2.4

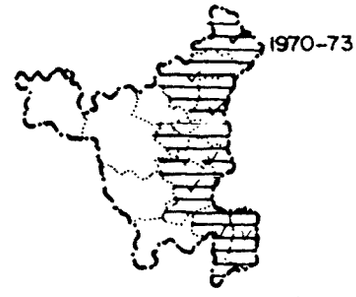
RICE – REGION



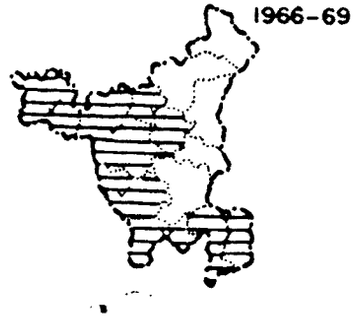


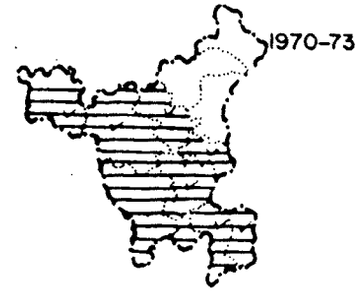


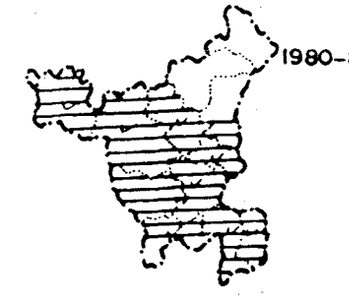
WHEAT – REGION



BAJRA – REGIOIN



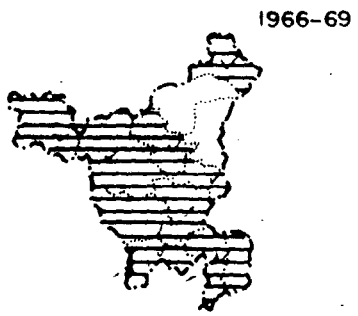


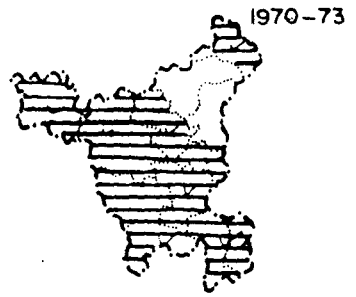


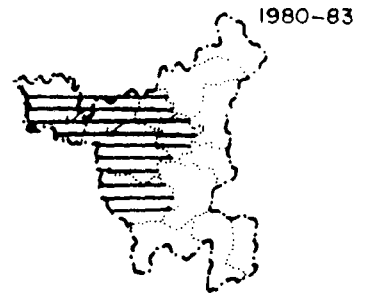
GATEWAY

Map No. 2.1

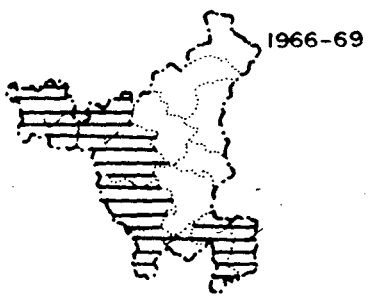
GRAM – REGION

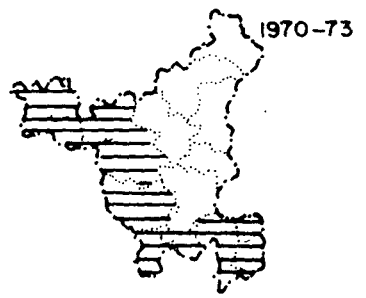




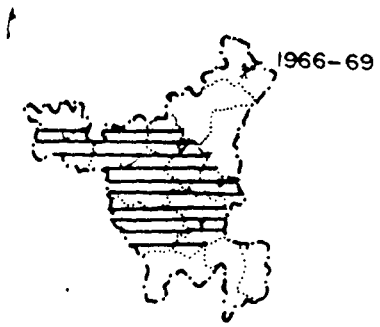


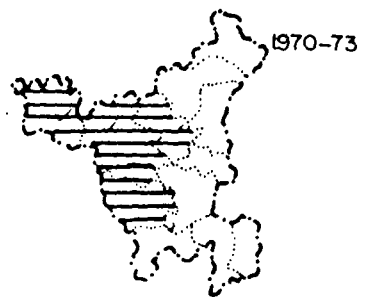
OIL SEEDS – REGION

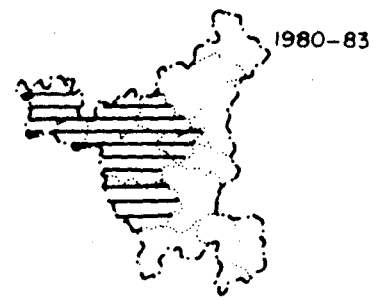




COTTON – REGION







Thus, the most dominant crop, in high productivity region in 1966-69 triennium period, turned out to be wheat followed by gram in the rabi season and the most dominant in Kharif crops in rice. Gram turned out to be the most dominant crop followed wheat in the rabi season both in medium and low productivity regions and in Kharif bajra turned out to be the most dominant crop as these regions are found to be relatively drier areas. However, cotton constituted as an important Kharif crop only in medium productivity region.

In response to the growth in irrigation, high yielding variety seeds and improved agricultural practices, as expected, wheat turned out to be the most dominant crop followed by gram in the rabi season at the state level, during the 1970-73 triennium. However, bajra still continues to be the most dominant among the Kharif crops followed by rice. Whereas, proportion of area under crops like wheat, rice and oilseeds improved considerably at the state level, it registered substantial decline in the case of bajra, barley and pulsesm. Few significant changes had occurred in the cropping pattern in 1970-73 triennium over the previous triennium period. What emerged as the most dominant crop in this period as against gram in the last triennium and relatively more proportion of area is found to have been devoted to crops like oilseeds and maize.

The proportion of area under wheat increased substantially while it significantly declined for gram in high productivity region. As compared to the previous triennium period, proportion of area devoted to both rice and bajra reported substantial increases consequent upon the improvement in irrigation and hubrid varieties of seeds. However, most of the increase inthe area under bajra is found to have occurred in district Rohtak which devoted a negligible proportion of area in the previous Triennium period.

While, gram still continues to be the most dominant crop in the rabi season followed by wheat in medium productivity region, wheat revealed a dramatic improvement in the proportion of area devoted to it. Similarly, bajra continues to be the most dominant crop in the Kharif season but rice displayed considerable improvements in terms of area devoted to it. Again, gram and bajra are found to be the most dominant among the rabi and Kharif crops, respectively, in low productivity region. Although there seems to be no significant change found to have occurred in the cropping pattern but wheat experienced considerable expansion in the area devoted to it and bajra reported significant decline in it over the previous triennium period. Therefore, low productivity region do not display any significant change in the cropping pattern excepting that wheat and oilseeds are slowly emerging as important crops in the rabi season.

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A comparison of proportion of area under various crops among various districts, productivity region and for the whole state is shown in table No. 2.4 It reveals that districts of Karnal and Ambala devoted 18.5 per cent, 23.3 per cent and 17.7 per cent, 16.8 per cent, respectively in 1966-69 and 1970-73 to rice as against 5.4 per cent and 6.5 per cent for the whole state in the same periods. The proportion of area under rice was found to be 0.2 per cent and 2.08 per cent in 1966-69 and 1970-73 respectively in district Rohtak, 2.34 per cent and 3.53 per cent, respectively in district Jind and 1.08 per cent and 1.33 per cent, respectively in district Hissar. Districts of Gurgaon and Mahendergarh devoted a negligible proportion of area to it. The proportion of area under rice is found to be highest (14.87 per cent in 1966-69 and 15.4 per cent in 1970-73) inhigh productivity region as against 1.32 per cent and 1.74 per cent in medium and 0.13 and 0.26 per cent in low productivity regions, in the same periods. The proportion of area under wheat in high productivity region is found to be the highest (37.9 per cent in 1966-69 and 41.4 per cent in 1970-73) as against the 14 per cent and 17.5 per cent in medium and 14.5 per cent and 21 per cent in low productivity region. Districts which devoted very high proportion of area to wheat were Karnal (33.4 per cent and 45.0 per cent), Ambala, (29.6 per cent and 20.6 per cent), Rohtak

(28 per cent and 31.5 per cent), Jind (20 per cent and 26.5 per cent) and Gurgaon (22 per cent and 30 per cent) While proportion of area devoted to it by districts of Hissar (12.7 per cent and 15.5 per cent) and Mahendergarh (0.3 per cent and 7.7 per cent) was found to be relatively lower. The proposition of area under bajra was as much as 56 per cent and 33.6 per cent respectively in 1966-69 and 1970-73 trienniums in district Mahendergsrh, 28.8 per cent and 20 per cent in district district Hissar, 26.9 per cent and 20 per cent in district Gurgaon and 19.4 per cent and 21.2 per cent in district Jind. District Rohtak which devoted just 0.2 per cent of area to it in 1966-69 triennium devoted more than 15 per cent to it in the 1970-73 triennium. All other districts devoted very low proportion of area to bajra in each of the time periods. The highest proportionof area under bajra was found in low (38.0 per cent and 25.5 per cent) followed by medium productivity region (27 per cent and 20 per cent). The high productivity devoted less than 1 per cent and 10 per cent to it respectively in 1966-69 and 1970-73 trienniums.

The proportion of area under maize is found to be highest in high productivity region, devoting 6.5 per cent in 1966-69 and 6.4 per cent in 1970-73 triennium as against less than one per cent each in Medium and low productivity region. The highest proportion of area under maize is

found to have devoted by district Ambala (13.6 per cent and 14.8 per cent) all other districts devoted about one per cent or less to it in each of the time periods. In contrast, proportion of area under barley is found to be highest in low productivity region devoting 12 per cent in 1966-69 and 7.5 per cent in 1970-73, other productivity regions devoted relatively lower proportion in each of the time period. In the case of b arley district Gurgaon found to be devoting highest proportion of area (14.5 per cent and 9.7 per cent) to it. The proportion of area under pulses reveal that high productivity region devoted highest proportion to it among the productivity regions which devoted 2.5 per cent, 1.5 per cent, 1.2 per cent, 0.97 per cent and 1 per cent, 0.6 per cent, respectively, in 1966-69 and 1970-73 trienniums. With the exception of Mahendergarh, Hissar and Jind district in 1966-69 and with the exception of Karnal, Ambala and Jind in 1970-73 triennium all other districts in the state devoted less than one per cent of total area to pulses. The highest proportion of area under gram is reported by Medium productivity region (30.2 per cent in 1966-69 and 33 per cent in 1970-73). The proportion of area under gram is reported to be 23 per cent and 15.3 per cent in high productivity region and 21 per cent and 26.4 per cent in low productivity region, in the same period. The highest proportion of area under gram is reported by Hissar dis-

trict (30.4 per cent in 1966-69 and 34.3 per cent in 1970-73) and lowest being reported for Karnal district (15.4 per cent and 8.9 per cent). Similarly, proportion of area under oilseeds is found to be relatively higher in medium and low productivity regions, devoting 4.25 per cent, 4 per cent and 4 per cent, 5.6 per cent, respectively in 1966-69 and 1970-73 trienniums. Almost all of the districts showed a tendency to increase in the proportion of area under oilseeds between 1966-69 and 1970-73 On the other hand, proportion of area under sugarcane is found to be relatively higher in high productivity region devoting 7.8 per cent in 1966-69 and 5.8 per cent in 1970-73 triennium as against 2.0 per cent and 1.7 per cent in medium productivity region and 1.4 per cent and 1.5 per cent in low productivity region. The highest proportion of area under sugarcane is found to have been devoted by district Rohtak (7.3 per cent) in 1966-69 and by district Ambala (7.4 per cent) in 1970-73 triennium. While, most of the districts reported considerable increase in the proposition of area under sugarcane district. Mahendergarh reported a decline in it and devoted least of all in each of the time periods. The proportion of area under cotton is found to be highest in medium productivity region reporting 11.4 per cent in 1966-69 and 11.7 per cent in 1970-73 triennium as against 3 per cent and 1.4 per cent in high and 1 per cent and 0.3 per cent in low

productivity regions. The highest proportion area under cotton is reported by district Hissar - 12.7 per cent in 1966-69 and 13.2 per cent in 1970-73 triennium followed by Jind which devoted 6.5 per cent and 6.2 per cent in the same periods. All other districts reported very low proportion of area devoted to it in each of the periods. In the triennium period 1980-83, bajra (16.4 per cent), rice (10.6 per cent) and cotton (7.7 per cent) in the Kharif and wheat (34.2 per cent), gram (24 per cent) and oil seeds (4.8 per cent) in the rabi season turned out to be the most dominant crops at the state level. In high productivity region, importa nce of gram on the rabi grops suffered a further setback as wheat turned out to be the most dominant among all the crops in the region. Other crops which suffered considerable decline in the proportion of area in this productity region were bajra, maize, barley and pulses. Again, rice emerged as the most dominant among the Kharif crops in high productivity region. Similarly, medium productivity region revealed significant changes in favour of wheat among the rabi crops and rice among the Kharif crops although gram in the rabi and bajra in the Kharif crops continue to be the most dominant. The proportion area devoted to rice increased from 1.7 per cent im 1970-73 to 3.7 per cent and for wheat from 17.5 per cent to 23.2 per cent in the same period. On the other hand, propor-

tion of area under bajra declined from 20.2 per cent in 1970-73 to 18.4 per cent in 1980-83 and for gram from 32.9 per cent to 28.6 per cent. Unlike in the previous trinnium periods, low productivity region witnessed a marked change in the cropping pattern in favour of wheat and oilseeds. Although b ajra still remains the most dominant among the Kharif crops, wheat emerged as the most dominant among the rabi crops. The crops which suffered significant decline in the proportion of area were gram, pulses, sugar cane and maize in the low productivity region. The proportion of area under wheat increased from 20.8 per cent in 1970-73 triennium to 35.7 per cent in 1980-83 triennium, from 25.5 per cent to 33.4 per cent in the case of bajra and from 5.6 per cent to 7 per cent in oilseeds. Whereas, proportion of area under gram declined very sharply from 26.4 per cent in 1970-73 to 9.1 per cent in 1980-83 triennium.

Table 2.5 brings out the proportion of area under food and non-food crops for different districts, productivity regions and for the whole state in 1966-69, 1970-73 and 1980-83 trienniums, respectively. It clearly reveals that proportion of area under good crops which require generally more irrigation tends to increase in high productivity region throughout the period under consideration and it tends to increase marginally for medium productivity region between 1966-69 and 1970-73.

Table 2.5

Cropping Pattern in Haryana
(Area Under Food grain and Non-Food grain Crops

('ooo hectares)

	Food grain Crops			Non-Food grain Crops		
	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83
Haryana	3483 (87.71)	3885 (88.20)	3934 (84.62)	488 (12.29)	520 (11.80)	715 (15.38)
1. Karnal	662 (89.57)	761 (92.84)	854 (94.14)	75 (10.43)	59 (7.16)	53 (5.86)
2. Ambala	212 (87.54)	257 (90.37)	252 (85.30)	30 (12.46)	27 (9.63)	43 (14.70)
3. Rohtak	544 (88.71)	562 (89.76)	555 (89.77)	69 (11.29)	64 (10.24)	63 (10.23)
4. Jind	254 (87.76)	287 (88.0)	333 (87.34)	35 (12.24)	39 (12.0)	48 (12.66)
5. Hissar	979 (81.09)	1155 (81.32)	1241 (74.0)	228 (18.96)	265 (18.68)	436 (26.0)
6. Gurgaon	504 (93.20)	483 (91.67)	407 (91.91)	37 (6.80)	44 (8.33)	36 (8.09)
7. Mahendergarh	329 (95.98)	344 (94.20)	301 (91.48)	14 (4.02)	21 (5.80)	28 (8.52)
Productivity Regions						
High	1419 (99.09)	1481 (90.79)	1661 (91.73)	174 (10.91)	150 (9.21)	160 (8.27)
Medium	1233 (82.38)	1442 (82.57)	1574 (76.47)	264 (17.62)	304 (17.43)	484 (23.53)
Low	833	827	708	51	65	64

However, proportion of area under food grain crops tends to decline in Medium productivity region in the latter triennium period and it declines continuously for the low productivity region. The proportion of area under food grain crops in high productivity region increased from 89 per cent in 1966-69 to 90.8 per cent in 1970-73 and further to 91.7 per cent in 1980-83 triennium. The proposition of area under food grain crops in medium productivity region increased from 82.4 per cent in 1966-69 to 82.6 per cent in 1970-73 which declined rather sharply to 70.8 per cent in 1980-83 triennium. Although, proportion of area under food grain crops is found to be the highest in the low productivity region in each of the periods but it tends to decline from 94.3 per cent in 1966-69 to 92.7 per cent in 1970-73 and further to 91.7 per cent in 1980-83 triennium. The maximum proportion of area devoted to non-food grain crops is found to be in medium productivity region followed by high productivity region, in each of the time periods. The highest proportion of area devoted to non-food grain crops is found to have been contributed by districts Hissar and Ambala. Thus, a shift in favour of foodgrain crops in high productivity region and in favour of non-food grain crops in medium and low productivity region is taking place over time. However, in medium productivity

region from which crop shift is taking place in favour of cotton and in low productivity region in favour of oilseeds among the non food grain from foodgrain crops.

Cropping Intensity

T he new strategy of agriculture development emphasised intensive cultivation to bring about rapid increases in agricultural output. Therefore, supply of short duration improved varieties of seeds, provision of better infrastructural facilities and selective mechanisation among other things were ensured to effect improvements in cropping intensity. In response to these policy initiatives along with imprevements in irrigation cropping intensity has witnessed a considerable improvements in the state over time. Table No. 2.6 gives an account of cropping intensity for different districts, productivity regions and for the whole state in 1966-69, 1970-73 and 1980-83 triennions, respectively. Surprisingly, it brings out relatively higher cropping intensity for low productivity region in 1966-69 triennium. The cropping intensity there is found to be 139.8 per cent as compared to 135.2 per cent in high and 138.2 per cent in medium productivity region. Since, most of the low productivity region is comprised of dry areas with low irrigation, the cropping intensity is found to be high on account of farmers behaviour who tend to sow the crops in low moisture

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Table 2.6

Cropping Intensity

	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83
HARYANA	134.4	142.2	152.8
1. Karnal	133.9	147.2	161.7
2. Ambala	134.8	147.8	148.9
3. Rohtak	137.3	142.8	143.8
4. Jind	144.4	158.2	163.3
5. Hissar	132.3	135.4	153.3
6. Gurgaon	132.0	134.7	147.2
7. Mahendergarh	147.6	151.4	145.4
Productivity Regions			
High	135.2	145.8	151.4
Medium	138.3	147.0	158.6
Low	139.8	143.0	146.3

conditions anticipating rain in the near future. Thus, high cropping intensity in low productivity region resulted in this process may be treated as spurious. The cropping intensity in the following triennium periods i.e. in 1970-73 and 1980-83 is reported to be higher for the high and medium productivity regions. Although, cropping intensity showed a tendency to increase in all of the productivity regions in response to improvements in irrigation, it increased relatively more sharply for high and medium producrivity regions. A comparison of table no. 2.6 with 2.7 reveal that the cropping intensity is found to be relatively higher in those districts which enjoyed relatively better irrigation. Districts of Karnal (161.6 per cent), Jind (163.6 per cent) and Hissar (153.3 per cent) reported very high cropping intensity in comparison to other districts in the state precisely on account of high irrigation, while districtss of Gurgaon (147.2 per cent), Ambala (148.9 per cent), Rohtak (144 per cent) and Mahandergarh (145.4 per cent) reported relatively lower cropping intensity.

Irrigation

The distribution of rainfall in the state reveal wide variations both over space and time. Moreover, the vagaries of nature give rise to frequent drought and scarcity. Therefore, there is an increased need for

providing assured supplies of water through development of irrigation infrastructure. Irrigation in the state as indicated by the percentage ratio of gross area irrigated to total cropped area reveal that in 1966-67 medium productivity region was found to be the most irrigated with 50 per cent of its gross cropped area as irrigated. The percentage of gross cropped area irrigated in high and low productivity regions were found to be 35.5 per cent and 25.4 per cent, respectively. In the subsequent periods, however, high productivity region is found to have outpaced the medium productivity region, irrigating more than 75 per cent of its gross cropped area in 1982-83. The percentage of gross cropped area irrigated in medium and low productivity regions in 1982-83 is found to be 68 per cent and 45 per cent, respectively. While, proportion of gross area irrigated to gross cropped area increased substantially in all the productivity regions, it is found to have increased relatively more sharply in high productivity region. District which found to have enjoued relatively higher irrigation in the state were Karnal (93 per cent), Hissar (65 per cent), Jind (84 per cent) and Rohtak (63 per cent). District Ambala of high productivity region and Gurgaon and Mahendergarh districts of low productivity region experienced very lower irrigation in the state, throughout the entire period. However, most of the increase in irrigation in

these districts is found to have occurred only in the latter period i.e. between 1972-73 and 1982-83.

Sources of Irrigation

The irrigation by source, as shown in the table no. 4.7, reveal that almost all the irrigation was done by canals and tubewells, other sources of irrigation had a very little role to play, excepting in 1966-67, where it irrigated about 5.4 per cent of net cropped area. Districts where other sources of irrigation were found to be of some significance were those which reported low irrigation such as districts of Gurgaon, Ambala and Mahendergarh. However, other sources of irrigation even in these districts is found to be indreasingly marginalised over time. The canals as a source of irrigation is found to be most important in the state, irrigating as much as 76.6 per cent in 1966-67 and 53.6 per cent of net cropped area in 1982-83. On the other hand, tubewells and other wells taken together irrigated 17.6 per cent and 46.3 per cent of net cropped area in 1966-67 and 1982-83, respectively. Therefore, tubewells and other wells had been emerging as an important source of irrigation over time, canals still continues to be the most dominant source of irrigation at the state level.

Irrigation by source in various districts and productivity regions reveal that the canals as a source

TABLE NO. 2.7

Irrigation

	Percentage of Gross Area Irrigated to Gross Cropped Area			Percentage of Net Area Irrigated by Sources: Canals			Tube wells		
	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83
Haryana	33.8	41.87	63.27	76.64	58.39	53.57	17.63	41.18	46.26
1. Karnal	55.4	73.4	93.3	67.8	28.8	26.3	32.2	71.2	73.7
2. Ambala	13.6	28.1	51.3	19.4	08.6	03.2	67.7	87.9	93.8
3. Rohtak	37.5	40.8	63.2	71.1	59.3	60.5	20.0	40.7	39.5
4. Jind	57.2	65.6	83.9	97.4	94.6	76.8	00.9	05.4	23.3
5. Hissar	42.9	50.8	64.6	95.8	92.3	82.8	04.2	06.8	17.1
6. Gurga-on	21.6	25.0	51.6	21.6	17.6	24.7	31.2	82.4	74.7
7. Mahender-garh	08.4	09.4	36.0	40.0	00.0	02.8	43.3	100.0	97.2
Productivity Regions									
High	35.5	56.9	75.6	52.7	32.3	30.0	39.9	66.6	69.0
Medium	50.0	51.8	68.0	96.6	93.5	79.8	02.5	06.1	20.2
Low	25.4	27.5	45.0	30.8	17.6	13.7	37.3	82.4	86.0

of irrigation is found to be the most dominant in medium productivity region and districts (Hissar 95.8 per cent in 1966-67, 92.3 per cent in 1972-73 and 82.8 per cent in 1982-83; Jind 97.4 per cent in 1966-67, 94.6 per cent in 1972-73 and 76.8 per cent in 1982-83), irrigating as much as 96.6 per cent in 1966-67 and more than 77 per cent in 1982-83. Tubewells and other wells, on the other hand, are found to be the most important sources of irrigation in high and low productivity regions, especially in the latter periods i.e. 1972-73 and 1982-83 Tubewells and other wells irrigated as much as 69 per cent of the net area in high productivity region and 86 per cent of net area in low productivity region, in 1982-83. Moreover, it can also be observed from Ta ble no. 4.7 that importance of canals as a source of irrigation even in medium productivity region is found to be declining and that of tubewells and other well is increasing over time, as net area irrigated by tube wells increased from a level of 2.5 per cent in 1966-67 to 20.2 per cent in 1982-83. Districts where canals as a source of irrigation is found to be the most important were Hissar, Jind and Rohtak irrigating more than 60 per cent of net area in each of these districts in each of the time period. On the other hand, tubewells as a source of irrigation are found to be the most dominant in districts of Karnal, Ambala, Gurgaon and Mahendergarh, irrigating more than

70 per cent of net area in each of these districts in 1982-83.

The general introduction of the region reveals that high productivity region and most parts of medium productivity region and their respective districts are relatively better placed in terms of physiographic characteristics, climate conditions, types of soil, irrigation and its infrastructure, average size of land holdings etc. As a result these regions and most of the districts had enjoyed relatively higher cropping intensity and agricultural productivity per hectare of gross cropped area. On the other hand, low productivity districts and region is characterised by rugged and rocky topographical attributes with hard sandy surface, soil poor in fertility, scanty rainfall with lower irrigation infrastructure. Therefore, thus region is generally found co-terminus with dry land area, unfavourable for intensive cultivation.[9] The average size of land holding is also found to be relatively lower than in other regions of the state. All of these factors have contributed to relatively lower cropping intensity and agricultural productivity per hectare of gross cropped area.

Moreover, cropping pattern of this region also land support to the contention of its backwardness as

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9. Although Farm Management studies and most of the other studies using this source of data came out that relatively small sized holdings are found to have enjoyed more productivity due to relatively more intensive cultivation.

more than 90 per cent of gross cropped area is found to have devoted to food grain crops. Although, a shift is found to be taking place in favour of non food grain crops ower time but for crops which require low irrigation. In contrast, cropping pattern of high productivity region reveals that it devoted relatively lower proportion of gross cropped area to food grain crops particularly in the beginning it is found to have been increasingly devoted to rice and wheat in response to improvements in irrigation and availability of other technological inputs. Similarly, medium productivity region is also devoting significantly higher proportion of gross cropped area to food grain crops but it is found to be declining in favour of non food grain crops especially for those crops which require relatively more irrigation such as cotton.

Thus, low productivity districts and region turns out to be a problem area which require special attention on the part of policy makers and administrators to develop these districts and whole region through area specific programmes of development.

CHAPTER - III

DISPARITIES IN AGRICULTURAL INFRASTRUCTURE

Regional disparities in agricultural facilities offer unequal access to the opportunities of facilities and incentives and thereby to adopt new technology in agriculture by the forming community of different areas. Disparities in agricultural infrastructural facilities are bound to result in economic ineqalities and uneven agricultural development among various regions. Although, new technology inagriculture was in operation in the early sixties as pilot projects in the form of I.A.D.P. (Integrated Agricultural District Programmes) initially started in seven districts in 1961 and latter extended to sixteen districts with one project in each state, which emphasised an immediate and rapid increase in production in most favourable areas through the application of a package of inputs and associated improved practices. The principle of intensifying area through the application of a package of practices was extended, in 1964, to I.A.A.P. (Intensive Agricultural Area Programme), which covered about 1200 community development blocks in addition to the 300 community development blocks already covered under I.A.D.P. The lack of adequate infrastructure was soon identified as a major limiting factor in most of the I.A.D.P.

districts. The infrastructure for agricultural development differed very widely among the I.A.D.P. districts. The review of the I.A.D.P. districts brings out clearly that "the districts (or areas) that they were often found, on closer examination, to vary in many respects in their agricultural resource base, in infrastructure, in technological base, etc."

The working of agricultural sector during the early sixties showed that a new technology in agriculture was very much needed if Indian economy was to be freed from food imports. The Draft outline of Fourth Five Year Plan, therefore, asserted that "it is necessary to make a far greater use of modern methods of production to bridge the gap between demand and production, by the application of the latest advances in the science of agriculture".[1] A similar view was expressed by an another government publication in April 1965, where it says, "History of economic development in general and agricultural development in particular of the countries of the world shows that transformation of traditional agriculture is possible through strong injection of modern technology and scientific techniques on a massive scale".[2]

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1. The Planning Commission of India, 4th Five Year Plan - A Draft Outline, 1969, p. 175.

2. Govt. of India, Ministry of Agriculture : Agricultural Development - Problems and Perspective, April 1965, p. 3.

Against this background the new agricultural strategy which was aimed at rapid and spectacular increase in foodgrains production was adopted from 1966-67. There was a fundamental departure from the precious agricultural strategy in that it emphasised intensive cultivation using high yielding variety seeds, more use of fertilizers, effective plan protection and adequate water supplies. Since the new agricultural technology had built-in-bias in favour of resource rich areas, therefore, it tended to result in regional inequalities. There are a number of studies which made an attempt to study the impact of new technology in agriculture, in India. Most of these studies found that the impact of new technology has not been uniform in different regions and even among different type and sizes of farms within the same region. For instance, Uma Srivastava and others (1971) argued that "embodied technical changes like that of Green Revolution will exaggerate existing integarm income disparities. The gap will grow because the initial pre-technological change in income distribution means an unequal opportunity for farmers to attempt to adopt the technology".[3] G.S. Bhalla (1974) made an empirical study in the state of Haryana in which he studied 723 cultivators and 142 agricultural labour households. Dipicting the income

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3. Uma Srivastava, R.W. Crown and E.D. Heady, "Green Revolution and Farm Income Distribution", Eco. and Pol. Weekly, vol. VI, No. 52, Dec. 1971.

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data of adopters (of new tecnnology) and non-adopters on Lorenz curve of income distribution, concludes that there are very large income inequalities. But for adopters, he says, "that contrary to the generally held view, the green revolution has tended to reduce rather than aggravate income disparities".[4] Nandal (1972) studied 49 demonstration farms in Hissar, Jind, Gurgaon and Mahendergarh districts and he found that both absolute and relative income gains have tended to increase with the increase in the size of holdings, level of mechanisation, formal education and number of earners in the family. He was, therefore, of the opinion that "this variation in socio-economic factors seems to have accentuated inter-regional and intra-regional income inequalities which might involve serious socio-political implications".[5] Similarly, Walter Falcon (1971) argues that whereas seed-fertilisers revolution has augmented the physical output as well as farmers income, it has given rise to generation problems.[6] Ministry of Home Affairs

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4. Bhalla, G.S. Changing Agrarian Structure in India, Meenakshi, Meerut, 1974.

5. Nandal, D.S. "Pattern of Income, Investment, Expenditure and Saving of Selected Demonstration Farms in Haryana", Indian Journal of Agricultural Economics, vol. 27, Oct-Dec. 1972.

6. Walter Facon, P., "The Green Revolution - Generation Problems", American Journal of Agricultural Economics, Vol. 50, Dec. 1971.

has also confirmed the view that "the new agricultural technology, having been geared to goals of production, with secondary regard to social implications, have brought a situation in which elements of disparity, instability and unrest are becoming conspicuous with the possibility of increase in tensions".[7] Many more studies could be quoted such as C.H. Hanumanta Rao (1975)[8] and others, which have supported the contention that new agricultural technology has resulted in widening the disparities among various regions and within the same region.

When economic development over different regions occurs unequally, it becomes politically imperative to resort to corrective policy measures. Therefore, the need for reducing regional inequalities has been argued from various angles. The first and foremost arguments is in terms of social justice. The Draft of 4th Five Year Plan recognised that "the pace of development within agricultural sector set limit on the growth of industry, exports, and the economy as a whole, and constituted a major condition for achieving economic and social stability.[9]

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7. Govt. of India, Ministry of Home Affairs, "The Causes and Nature of Current Agrarian Tensions" Mimeo.

8. Hamumanta Rao, C.H., Technological Change and Distribution of Gains in Indian Agriculture; Macmillan, Delhi, 1975.

9. The Planning Commission of India, Fourth Five Year Plan - A Draft Outline, Delhi, 1969.

It groups the priority programmes for agricultural development into two categories. One, those aimed at maximising production and second, those aimed at remedying imbalances under the thrust on growth with social justice. This led to programmes like S.F.D.A., M.F.A.L., C.A.D.P. and D.P.A.P. and several other special programmes aimed at reducing inequalities among the regions and within the same region. Although, most of the equity oriented programmes were initiated during the 4th Plan period, they began to take shape during the 5th Plan. Thus, eliminating poverty and attaining self-sufficiency were the major tests proposed by the fifty plan, with growth for social justice being the principal objective.[10] Similarly, in the later periods also equity oriented programmes received even greater attention in the form of food for work converted into N.R.E.P., R.E.E.G.P., etc. Thus, government of India viewed the reduction in inequalities important not only from the view point of the social justice but also from the point of view of accelerating the growth of the whole economy, maintaining national integration, unity and socio-political stability. The various other strategies which were adopted to achieve these objectives were inter-governmental financial transfers, policies of specialised financial institutions, licensing polities and various incentives and attraction

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10. The Planning Commission of India, Fifth Five Year Plan, Delhi, 1974.

to the private enterpreneurs and direct investment programmes by the government in the backward regions. It was recognised that infrastructure for the economy play an important role in all of these strategies to be successful. Therefore, reduction in desparities in infrastructural facilities have thought to be indispensible.

In consonance with the plan objectives, Haryana also formulated its own development strategy and implemented it with great vigour. Consequent upon these programmes, disparities on the overall infrastructural facilities in general and agricultural infrastructural facilities in particular tended to narrow down significantly over time. Table No. 3.1 gives indices[11] of agricultural infrastructural facilities under various heads and overall agricultural infrastructure for various districts and productivity regions, in the state, in 1966-67 1972-73 and 1982-83, respectively. The table reveals that high productivity region turned out to be enjoying first rank in overall index of agricultural infrastructure, while the second and third ranks were reported for low and medium productivity regions, respectively, in each of the time periods. Districts of Ambala and Karnal were

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11. The indices of agricultural infrastructure, for each district and productivity region, is obtained by dividing the facilities under various heads by their respective mean and then adding them together to arrive at an overall index of each broad group of infrastructure and overall agricultural infrastructure.

found to have enjoyed first and second ranks, respectively, in most of the infrastructural facilities and also in overall index of agricultural infrastructure. District of Hissar and Jind, both belonging to medium productivity region, were separated to have enjoyed relatively lower agricultural infrastructural facilities excepting that of irrigation infrastructure. District Gurgaon, of low productivity region, was found to have ranked third in 1966-67 and 1972-73, it slid-down to fourth rank in 1982-83. District Mahendergarh, of the same productivity region, on the other hand, improved its position dramatically from seventh rank in 1966-67 to fifth in 1972-73 and to third in 1982-83. While, district Rohtak was found to have strengthened its position in term of overall agricultural infrastructure, idstricts of Hissar and Jind were reported lower ranks in the latter period than enjoyed by them in the earlier periods. The table also brings out the ranks of different districts in the state with respect to agricultural infrastructural facilities under various heads, in different time periods. It clearly reveals that the most important agricultural infrastructural facilities in high productivity regions were found to be that of power, irrigation, marketing, banking and mechanisation. However, various other infrastructural facilities were also found important in different districts such as transport, cooperative and

veterinary health in Ambala district, veterinary health and transport in Rohtak district and cooperatives in district Karnal. Similarly, irrigation, marketing, transport and banking were found important in medium productivity region. However, veterinary health and mechanisation, respectively, were found important in Hissar and Jind districts. On the other hand, in the low productivity region, almost all infrastructural facilities excepting that of irrigation were found important.

Table nos. 3.2 to 3.4 present an account of disparities in the distribution of agricultural infrastructural facilities under various heads among various districts and productivity regions, respectively, in 1966-67, 1972-73 and 1982-83. The distribution of each broad group of infrastructural facilities reveal that the disparities inits distribution showed a tendency to narrow down over the entire periodm in both the cases. However, the disparities in the distribution of transport, marketing and veterinary health facilities both among various districts and productivity regions had, in fact, tended to accutuate marginally, between 1966-67 and 1972-73. In order to bring out the complete picture of disparities in the distribution of agricultural infrastructural facilities an attempt is made to study infrastructural facilities under various heads at the level of district and also at the level of productivity region.

Irrigation Infrastructure

The indices of irrigation infrastructural facilities as indicated by the ratio of gross area irrigated to gross cropped area, shown in table no. 3.1 reveal relatively higher irrigation infrastructure in high and medium productivity regions. However, medium productivity region accounted for the Ist rank in irrigation infrastructure in 1966-67 and ranked second in each of the subsequent periods as the first rank was enjoyed by high productivity region in 1972-73 and 1982-83. The irrigation infrastructure is found to have beenstrengthened most in the districts of Karnal and Ambala within the high productivity region. The irrigation infrastructure in low productivity region is found to have significantly improved over the entire period, most of it is found to have improved in the latter period i.e.' between 1972-73 and 1982-83.

The irrigation commission observes that "the minor irrigation works have a special relevance to the drought affected areas. The construction of minor works is to be given priority as they supplement the canal irrigation and fill the deficiencies of large irrigation works."[12]

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12. Govt. of India, Ministry of Irrigation and Power, The Report of the Irrigation Commission. vol. 1, New Delhi, 1971.

TABLE NO. 3.1.

INDICES OF AGRICULTURAL INFRASTRUCTURE IN HARYANA

	Irrigation			Power			Transport			Marketing			Banking			Cooperation			Veterinary			Agricultural Tech.& Mech.			Overall Index	
	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	66-67	72-73	82-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	66-67	72-738
Districts																										
1. Karnal	1.64	1.75	1.46	4.01	3.37	4.24	0.80	0.95	1.08	4.60	4.69	3.74	1.74	2.09	2.01	2.67	2.87	3.06	1.85	0.95	1.64	13.62	11.58	10.14	30.95	28.25
2. Ambala	0.40	0.67	0.81	4.72	3.90	3.89	1.18	1.22	5.49	1.18	5.38	5.40	3.33	3.15	2.67	5.49	5.29	3.67	2.06	1.96	2.56	8.45	7.79	9.59	31.10	29.26
3. Rohtak	1.11	0.97	1.00	2.63	3.22	2.17	1.20	1.01	0.93	1.94	2.28	2.15	1.81	1.98	2.04	2.66	2.51	2.96	2.74	2.51	1.89	3.97	4.63	4.96	17.99	19.11
4. Jind	1.69	1.57	1.33	2.46	2.24	2.28	0.72	0.81	0.77	2.14	1.83	2.57	2.06	1.96	1.40	2.50	3.36	2.89	1.34	1.98	1.63	3.33	3.72	5.61	16.28	17.47
5.Hissar	1.07	1.21	1.02	1.26	1.55	1.55	0.82	0.70	0.79	2.36	2.01	1.97	0.98	1.48	1.47	1.09	1.80	2.35	2.15	2.39	2.07	3.46	2.73	2.01	13.18	13.87
6. Gurgaon	0.64	0.60	0.91	4.45	3.30	3.47	1.25	0.92	1.11	2.75	2.39	2.59	2.60	1.76	2.49	2.84	2.81	2.77	2.63	1.83	1.92	6.46	6.22	4.88	23.62	28.25
7. Mahender Garh	0.25	0.27	0.57	1.36	3.40	3.41	1.02	1.44	1.09	2.48	2.46	2.57	1.26	1.59	1.93	2.90	2.36	3.31	1.23	2.49	2.33	2.63	5.34	5.13	13.13	19.35
Productivity Regions																										
High	1.05	1.36	1.20	3.82	3.41	3.45	1.06	1.02	1.06	3.02	3.85	4.58	2.29	2.31	2.18	3.62	3.22	3.15	1.23	2.03	1.89	8.73	8.34	8.38	25.85	25.54
Medium	1.48	1.24	1.07	1.87	1.69	1.72	0.77	0.72	0.78	2.29	2.24	2.49	1.53	1.68	1.44	2.21	2.42	2.44	1.74	2.94	1.95	3.39	3.07	3.53	15.28	16.90
Low	0.75	.066	0.71	2.90	3.33	3.40	1.14	1.10	1.10	2.16	2.49	3.43	2.06	1.71	2.30	2.89	2.65	3.11	1.93	2.22	2.07	4.58	5.02	4.40	18.41	19.18

It estimated net underground water recharge available for further exploitation and irrigation development in Haryana as 2.7 million acre feet. Therefore, in pursuance of the recommendation of the Irrigation Commission as ambitious programme to tap the underground water was undertaken and digging of tubewells received an additional fillip in the canal infrastructure dificient areas such as districts of Ambala, Gurgaon, Mahendergarh and Rontak, especially in the latter period.

The distribution of irrigation as indicated by the ratio of gross area irrigated to gross cropped area among various districts and productivity regions, shown in table no. 3.2, reveal that the disparities in its distribution are found to be glaring both among the districts and productivity regions. The disparities in its distribution are found to be relatively more acute among the districts than among the productivity regions, and it tended to narrow down, in both thecases, over the entire period. However, disparities in its distribution had, in fact, accutuated marginally between 1966-67 and 1972-73 among the productivity regions as most of the improvement in the irrigation infrastructure wasexperienced by high productivity region consequent upon the adoption of district Karnal under I.A.D.P. in 1967-68. It can also be noted that the disparities in the distribution of irrigation infrastructure are narrowed down relatively more

TABLE NO. 3.2

DISPARITIES IN THE DISTRIBUTION OF:

	Irrigation: Percentage of GAI to GCA			Power: Number of Transffarmers Per '000 hects.of NSA			Length of Lt. Lines(Circuit Kms)per '000 of NSA			Length of 11 KV lines(Circuit Kms) per '000 of hects. of NSA			Transport: Length of Surface Road Sq.Kms.per '000 Sq.kms.Area			Marketing Number of Principal Agricultural Regulated markets '000 hects.of NSA			Number of Agricultural subyards per '000 hects.of NSA			Number of Fertiliser sale counters '000 h hects of ns NSA		
	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	66-67	72-73	82-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	82-83
Haryana	33.80	41.87	63.27	1.65	6.22	11.14	3.23	14.08	23.82	2.37	8.88	12.04	126.62	342.39	453.00	19.64	20.84	27.74	17.71	23.37	31.68	3.91	6.62	14.65
1. Karnal	55.04	73.04	92.3	2.53	9.13	16.83	3.04	14.53	37.48	3.64	7.77	13.93	101.21	325.01	489.14	20.70	23.06	34.00	23.89	29.65	32.31	8.65	15.44	21.90
2. Ambala	13.6	28.1	51.3	2.90	8.75	16.06	4.02	17.04	27.27	4.06	11.42	15.73	149.92	404.95	553.50	34.63	37.50	48.39	30.30	37.50	56.00	7.88	12.92	27.62
3. Rohtak	37.5	40.8	63.2	1.50	4.68	7.13	2.56	18.26	16.16	2.30	10.30	10.22	152.15	343.99	423.19	12.50	18.37	18.37	10.42	16.22	20.41	2.78	4.70	12.52
4. Jind	57.2	65.6	83.9	0.85	4.07	6.96	4.64	8.96	16.41	1.19	8.66	11.56	91.45	277.76	348.46	21.84	18.05	27.03	4.37	7.22	19.31	3.06	4.37	14.32
5. Hissar	42.9	50.8	64.6	0.45	3.46	6.00	1.92	5.23	9.34	0.95	5.51	7.51	103.81	238.48	356.72	13.64	13.08	17.70	15.45	15.39	22.31	3.12	4.89	9.26
6. Gurgaon	21.6	25.0	51.6	2.52	6.55	12.32	5.15	17.27	30.88	3.15	9.08	12.77	158.56	313.43	502.67	15.05	18.92	29.73	15.05	24.32	29.73	1.42	2.04	8.57
7. Mahendergarh	8.4	9.4	36.0	0.77	6.93	12.69	1.31	17.24	29.19	1.13	9.41	12.53	129.25	493.10	497.34	19.09	16.33	18.93	24.48	36.76	41.67	0.49	0.98	8.33
Coefficient of Vari	58.08	54.87	30.90	60.61	35.98	40.20	44.06	35.65	42.00	54.65	21.28	21.99	21.93	24.65	17.32	38.28	38.36	39.93	50.81	48.18	42.02	79.84	81.32	50.75
Productivity Regions																								
High	35.50	56.94	75.64	2.31	7.43	13.24	3.21	16.36	27.99	3.38	9.36	12.93	134.42	348.82	480.45	22.61	23.80	30.90	21.54	24.60	32.30	6.44	11.04	19.57
Medium	50.00	51.78	68.03	0.65	3.57	6.16	3.28	5.97	10.51	1.08	6.05	8.17	97.63	244.80	355.40	17.74	15.60	19.10	9.91	18.20	21.70	3.09	4.80	10.10
Low	25.40	27.54	45.03	1.65	6.70	12.47	3.25	17.26	30.18	2.15	9.21	12.69	143.90	378.36	500.38	17.80	19.40	25.20	19.77	29.20	34.70	0.96	2.22	8.47
Coefficient of Vari	33.45	34.60	25.05	53.39	34.76	36.55	1.08	47.55	47.09	52.33	22.78	23.81	19.50	21.65	17.64	14.42	26.38	23.54	36.70	23.02	23.40	79.00	75.33	47.15

sharply in the latter period as compared to in the first period because most of the low productivity districts experienced growth in it only during the latter period, as districts of Mahendergarh and Gurgaon were adopted under D.P.A.P. and S.F.D.A. programmes, respectively, in 1970-71, on the recommendations of Rural Credit Review Committee (1969). Similarly, irrigation infrastructure is found to have been strengthened most in the latter period in the district of Ambala as it was adopted both under S.F.D.A. and M.F.A.L. programmes in 1970-71 and also in district of Hissar which was adopted under both D.P.A.P. and M.F.A.L. programmes in the same period. As a result of these programmes the above mentioned districts received relatively more attention and finance were arranged for the development, including irrigation infrastructure.

Power Infrastructure

Power is considered as one of the most important infrastructural facilities not only in agricultural sector but in the whole economy. Most of the agricultural operations are directly or indirectly related with the availability of power. Moreover, power as an infrastructural facility is most crucial in the areas where major irrigation facilities are different and underground water is available for irrigation. The Draft 4th Five Year Plan

emphasised the rural electrification and it points out that "it was contemplated to supply electricity for agricultural and agro-industries".[13] In response to emphasis upon rural electrification in the Plan, Haryana was the first state in the country to achieve hundred per cent electrification of all its 6731 villages and 65 towns by 29 November 1970.[14] Table no. 3.2 presents an account of distribution of important indicators of power among various districts and productivity regions, respectively, in 1966-67, 1972-73 and 1982-83. The distribution of number of transformers per thousand hectares of net sown area reveal that the disparities in its distribution were found to be very much glaring both among the districts and productivity regions and it is found to be relative more acute among the districts than among the productivity regions. Although, disparities in its distribution tended to narrow down substantially over the entire period, it showed a tendency to accutuate between 1972-73 and 1982-83, both among the districts and productivity regions. The distribution of the length of L.T. lines (circuit kms) per thousand hectare of net sown area reveal acute disparities in its distribution

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13. The Planning Commission of India, Fourth Five Year Plan - A Draft Outline, Delhi, 1969.

14. Govt. of Haryana, Statistical Abstract, Chandigarh, 1983-84.

among the districts while very low disparities in its distribution among the productivity regions. Whereas, the disparities in the distribution of L.T. lines among the districts tended to decline over the entire period, it showed a tendency to accutuate between 1972-73 and 1982-83. On the other hand, disparities in the distribution of L.T. lines among productivity regions, which were very low in 1966-67, tended to accutuate dramatically by 1972-73 and remained almost as much acute in 1982-83 as were reported in the previous period. The distribution of 11 K.V. lines (length circuit kms) per thousand hectares of net sown area, although, revealed relatively more glaring disparities than in the distribution of L.T. lines both among the districts and productivity regions, it tended to narrow down much more sharply than the L.T. lines between 1966-67 and 1972-73. However, disparities in its distribution revealed a marginal increase in the later period i.e. between 1972-73 and 1982-83. Again disparities in the distribution of both L.T. lines and 11 K.V. lines is found to be relatively more glaring among the districts than among the productivity regions.

The distribution of most of the power infrastructural indicates reveal relatively more concentration in districts of Gurgeon, Ambala, Karnal and Mahendergarh.

This is precisely because these districts are found to be poor in canal irrigation infrastructure, and therefore, most of the irrigation is done by tubewells operated by power. As irrigation infrastructure indicated by gross area irrigated to gross cropped area showed a significant improvement in these districts in the latter period, consequently therefore, power was given top priority in these districts.

Transport Infrastructure

Transport is an another important agricultural infrastructure as it supply the farm sector with essential inputs in adequate quantities and in time and also helps to dispose of the agricultural output to the markets. The transport infrastructure, measured in terms of length of surfaced roads, for the purpose of this study, play an important role in development of agricultural sector, dispensing industries in the backward areas, creating a link netween industries and agriculture ensuring closer ties between producers and consumers in rural and urban areas and also provides productive employment. Out of the various modes of transport, road transport is the only mode which is complete in itself and most suited for agricultural operations, because of its inherent advantages of flexibility, reliability and speed. It is suited for short and medium distance movements and volumeus of goods as well as passenger traffic.

The road development in the country was planned for 20 years, first in 1943 at the Chief Engineer's Conference held at Nagpur, which covered the period upto 1961 and subsequently, under another 20 years plan upto 1981 at the Chief Engineer's conference held in 1957 at Shillong. The Nagpur plan aimed at achieving 26 miles of roads per hundred sq. miles of area of the country, and Shillong Plan envisaged doubling of that figures to 52 miles per hundred sq. miles. To achieve this target they alloted different road lengths for different level of development of the country viz. developed and agricultural areas (60.5 per cent), semi developed areas (20.5 per cent) and undeveloped and cultivated area (19 per cent). The also took into account all towns and villages by size of population and provided different road length which decreased with size and also provided for additional road length (5 per cent) for development.[15] The planning Commission of India envisaged that under the minimum needs programmes, by the end of the Fifth Plan "all villages or group of villages with a population of about 1500 are to be connected with all weather roads except in hilly areas and ghat regions".[16]

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15. Govt. of India, Min. of Shipping and Transport, Basic Road Statistics of India, 1974-75.

16. The Planning Commission of India, Fifth Five Year Plan, N. Delhi, 1974.

Consequent upon the recommendation of Chief Engineer's Conference (1957) lesser developed areas received relatively more attention in the provision of road infrastructural facilities, therefore, low productivity regions turned out to be enjoying relatively higher road infrastructural facilities in the state. Table no. 3.2 gives distribution of the length of surfaced roads sq. kms per thousand sq. kms of area among various districts and productivity regions, respectively, in 1966-67, 1972-73 and 1982-83. It brings out that the road infrastructure is found to be concentrated more in high and low productivity regions. Districts which enjoyed relatively higher road infrastructure in the state were that of Karnal, Ambala, Gurgaon and Mahendergarh. The table also makes it very clear that disparities in the distribution of road infrastructure is found to be relatively lower than the disparities in any other infrastructural facility, both among the districts and productivity regions. However, disparities in the distribution of surfaced roads is found to be relatively higher among the districts than among the productivity regions. S Although, disparities in is distribution tended to decline over the entire period, it showed a tendency to accentuate between 1966-67 and 1972-73. Moreover, table no. 3.2 reveals that disparities in the distribution of surfaced roads had a tendency to narrow down relatively more

sharply among the districts than among the productivity regions, over the entire period. The disparities in the distribution of transport infrastructure before 1970's were recognised by the Committee on Transport policy and coordination in its final report (1966) and argued that "to the extent possible, attention had also to be given to measures for accelerating the pace of economic advance in the less developed regions. More recently, the key role of transport in stimulating the development of agriculture and rural industry is being stressed increasingly.[17]

Marketing Infrastructure

Marketing infrastructural facilities are very much important to agricultural sector as it enables the farming community to procure the required necessary input in adequate quantities and time and helps in realising the benefits of their hard work. In accordance with the provisions of Agricultural Produce Markets Act, 1966, 50 regulated markets were set up in the state. The marketing infrastructure received further filling in pursuance of the recommendations of the Administrative Reforms Commission on Agricultural Administration and the Food Grains Policy Committee, whereby government decided to purchase food grains at minimum support prices in 1967-68.

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17. Govt. of India, Ministry of Transport and Shipping Report of the Committee on Transport Policy and Coordination (Final), 1966.

Table No. 3.2 presents an account of the distribution of principal agricultural regulated markets per thousand hectare of net sown area, number of agricultural sub-yards per thousand hectares of net sown area and number of fertilizer sale counters per ten thousand hectares of net sown area among various districts and productivity regions, respectively, in 1966-67, 1972-73 and 1982-83. T he table brings out the fact that while the number of both regulated markets and sub-yards were found to be concentrated most in high and low productivity regions, fertilizer sale counters concentrated most in high and medium productivity regions. Districts which reported relatively more concentration in the number of regulated markets were that of Karnal, A mbala, Jind, Gurgaon and Mahendergarh. Districts of Ambala, Karnal, Hissar Mahendergarh and Gurgaon reported relatively more concentration of agricultural sub-yards. While, the distribution of fertilizer sale counters reveals relatively more concentration in the districts of Ambala, Karnal, Rohtak, Jind and Hissar.

The table clearly indicates that each of the marketing infrastructural facilities reveal gloring disparities in its distribution, with disparities reported to be relatively more acute among the districts than among the productivity regions, in each of the time periods.

moreover, disparities in the distribution of the number of agricultural sub-yards and fertilisers sale counters is found to be relatively more acute both among the districts and productivity regions than in the case of regulated markets. Whereas disparities in the distribution of agricultural sub-yards and fertiliser sale counters tended to narrow down over the entire period both among the districts and productivity regions, it had, in fact, accuntuated in the case of regulated markets. However, disparities in the distribution of fertilisers sale counters showed a tendency to accentuate between 1966-67 and 1972-73 among the districts.

Banking Infrastructure

Banks are vital financial institutions and their role in economic development is very crucial. Therefore, banks are considered as a catalytic agent that can set pace to the rate of development in the economy. In a country where three-fourth of farmers are marginal and small farmers with a land holding less than 5 acres, their agricultural credit requirements can very well be imagined. Moreover, the changes in agricultural practices and the progressive adoption of more modern production technique which needs more inputs have enlarged the role and purpose of credit.[18] All India Rural Credit Survey, 1951-52,

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18. N.C.A.E.R., The Role and Purpose of Credit in Agriculture, New Delhi, 1974.

revealed that the cooperative credit institutions, major formal institution to finance agricultural operations, played an almost insignificant role in providing credit to agriculture. Only 3 per cent of the total credit needs of the cultivators were met by them.[19] In view of the poor institutional credit facilities available in the country, the National Credit Council was set up in February 1968, to access credit priorities on an all India basis. One of its function was to access the demand for bank credit from the various sectors of the economy and in particular agriculture. After considering a whole gamut of problems facing agriculture, the National credit council fixed the minimum target for expansion in commercial banks lending to agriculture. In the light of decisions of National Credit Council the branch licensing policy was further liberated in order to effect expansion programme of the banks to the rural areas. The commercial banks were asked to open one-third branches than in the earlier expansion programmes with a provision of at least 50 per cent of the total should be at unbanked centres and not less than 10 per cent in under developed areas. The branch expansion scheme gained momentum after

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19. Reserve Bank of India, All India Rural Credit Survey, Bombay, 1951-62.

the nationalisation of major commercial banks and introduction of the Lead Bank Scheme.[20]

The R.B.I.'s Review Committee (1969) observed that "... a sub-stantial proportion of small cultivators did not obtain cooperative credit at all and that those who did, received too little of it in relation to their needs."[21] The Committee recommended small farmers development agency (SFDA) and Marginal Farmers and Agricultural Labourer Agency (MFAL) to meet the problems of marginal and small farmers in select districts on an experimental basis. Haryana adopted districts of Gurgaon and Ambala under SEDA and districts of Hissar and Ambala under MFAL. Consequent upon these measures and other related directives from the R.B.I. banks introduced a numbers of schemes to help agriculturists.[22]

Table No. 3.3 gives the distribution of numbers of central cooperative banks and total number of banks per thousand sq. kms of area among various districts and productivity regions, respectively in 1966-67, 1972-73

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20. Under this scheme all the 336 districts in the country, excepting the Metropolitan areas of Bombay, Calcutta, Madras and U.T. of Chandigarh, Delni and Goa, were distributed among the major scheduled banks, to play the 'Lead Role".

21. All India Rural Credit Review Committee, 1969, p. 563.

22. The Report of the Banking Commission, 1972.

TABLE NO. 3.3

DISPARITIES IN THE DISTRIBUTION OF:

	Banking: Number of Central Banks per '000 sq. kms.of Area			Number of Banks (Total)per'000 sq. kms.of Area			Cooperation: Number of Agricultural Coop.Credit Societies '000 sq.Kms.of Area			Number of Agr.Coop.Non-Credit Societies per'000 sq.Kms.Area			Agr.Coop.Credit (Rs/hects) of NSA			Veterinary Services: Number of Veterinary hospitals & Dispensaries per '000 cattle population			Number of Live stock development centres per'000 cattle population		
	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83
Haryana	0.99	3.22	4.95	4.66	12.26	29.01	234.67	167.23	61.81	20.27	28.75	58.82	23.92	81.23	452.23	8.00	4.98	9.65	10.71	12.79	18.39
1.Karnal	0.76	3.40	4.83	4.51	12.61	29.89	220.90	148.39	57.63	15.60	20.55	35.79	22.99	102.50	685.76	8.36	2.77	10.42	8.60	5.00	10.00
2.Ambala	1.35	4.43	5.74	9.19	21.63	43.84	397.90	259.84	69.68	46.70	50.30	76.76	35.63	161.98	639.56	9.00	5.44	8.55	10.30	10.50	30.65
3.Rohtak	0.83	2.98	4.80	4.50	12.92	31.09	233.50	159.90	66.81	15.70	28.00	62.35	21.53	46.84	369.65	10.88	5.15	11.65	14.70	18.95	12.73
4.Jind	1.11	3.69	3.93	4.44	9.96	17.85	181.80	139.80	51.72	31.70	57.91	67.76	12.36	41.40	409.36	3.39	6.10	7.90	9.80	9.76	14.52
5.Hissar	0.72	2.48	4.14	1.17	8.33	18.16	121.30	103.42	47.48	5.30	17.65	33.59	18.59	46.66	454.95	6.64	5.20	10.75	14.00	17.33	17.64
6.Gurgaon	1.31	2.61	5.55	5.98	11.75	39.66	297.30	183.55	95.90	10.20	22.84	48.50	25.62	74.45	252.16	9.86	3.60	7.22	15.00	13.00	21.52
7.Mahender Garh	0.85	2.88	5.69	2.86	8.63	22.59	190.00	175.68	53.48	16.70	4.03	98001	30.70	94.77	354.18	7.87	6.60	11.09	2.60	14.89	21.74
Coefficient of Variation	26.52	20.70	14.89	53.80	36.86	35.09	41.10	29.04	21.52	70.66	65.86	37.69	32.15	53.11	34.72	30.62	27.13	17.97	41.10	37555	37.86
Productivity Regions																					
High	0.98	3.60	5.12	6.06	14.66	33.39	284.10	176.29	63.50	26.05	29.49	51.57	26.72	92.83	564.66	9.42	5.00	10.45	11.20	13.14	14.92
Medium	0.92	3.14	4.04	2.81	8 59	18.11	151.55	109.31	48.24	18.50	24.20	39.55	15.50	45.75	447.43	5.02	6.87	10.00	11.90	20.00	16.80
Low	1.10	2.75	5.62	4.42	10.61	33.12	243.65	180.65	73.48	13.50	16.02	67.39	28.15	82.51	253.00	8.88	5.16	8.64	8.80	15.04	21.60
Coefficient of Variation	9.17	13.45	15.30	36.68	27.39	31.00	26.07	25-73	19.44	32.65	29.10	26.40	29.53	33.59	23.30	19.85	18.31	9.72	15.29	22.23	19.44

and 1982-83. The table clearly brings out the fact that as a result of the recommendations of the National Credit Council regarding branch expansion scheme relatively more concentration of number of banks is found to have occurred in the low and high productivity regions. Moreover low productivity region accounts for the industrial concentration in Faridabad and Ballabhgarh and more recently at Gurgaon, Sohna and Dharukera which attracted more number of banks.

The table clearly brings out the fact that disparities in the distribution of both central cooperative and total number of banks are found to be relatively sharper among the districts than among the delineated productivity regions. It, further, reveals that the disparities in the distribution of central cooperative banks are found to be realatively lower thandisparities in the distribution of total number of banks both among the districts and productivity regions. Whereas, disparitiessin the distribution of both type of banks tended tonnarrow down over the entire period among the districts, it showed a tendency to accentuate in the case of central cooperative banks among the productivity regions.

Cooperative Infrastructure

Although, efforts ar strengthening the cooperative infrastructure in the country started as early as First

Five year Plan wherein it notes that "to overcome institutional impediments, attention was focussed on land-reforms, promotion of cooperative institutions and marketings",[23] it received further attention with the visit of the Second Team of Agricultural Experts, sponsored by the Ford Foundation, in October 1959.

On the recommendations of the Committee on Cooperative credit (1960) the programme for revitalisation and reorganisation of small sized societies into viable units were pursued, as a consequence, the number of co-operative societies declined very drastically in 1972-73. The main objectives of the cooperativesocieties were redefined as to help farmers, including small and marginal farmers, rural artisans and agricultural labourers by providing them credit and other services required to promote tneir economic interest in accordance with the cooperative principles. An account of the distribution of number of agricultural primary cooperative credit and service societies and number of agricultural cooperative non-credit societies per thousand sq Kms of area and also distribution of cooperative credit (short plus medium term) per hectare of net sown area, among various districts and productivity regions, respectively, in 1966-67, 1972-73 and 1982-83, is shown in table no. 3.3

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23. The Planning Commission of India, First Five Year Plan, New Delhi, 1950

The table reveals that prior to the reorganisation of the cooperative credit societies most constration was reported for districts of Karnal, Ambala, Rohtak and Jind but after reorganisation more concentration is found to have occurred in most of the districts of high and low productivity regions. Similarly, distribution of non-credit societies revealed relatively more concentration in high and medium productivity regions in 1966-67 but in the latter periods low and high productivity regions accounted for more number of non-credit societies.

The distribution of both credit and non-credit societies reveal relatively higher disparities among the districts than among the productivity regions. Moreover, disparities in the distribution of agricultural non-credit societies turned out to be relatively higher than disparities in the distribution of coope ative credit societies both among the districts and productivity regions. However, disparities tended to decline in both the cases over the entire period.

The same table gives the distribution of agricultural cooperative credit per hectare of net sown area among various districts and productivity regions at different points of time. It clearly brings out that in the initial periods cooperative credit was found to be concentrated relatively more in high and low productivity regions but in the latter periods most of the concentration of it

was found to have occurred in high and medium productivity regions. Since, advancement of agricultural cooperative credit had a built-in-bias in favour of relatively larger land holdings, the high and medium productivity regions enjoyed relatively more agriculrural credit per hectare on account of this factor among otners. The highest agricultural cooperative credit per hectare of net sown area was reported for district Karnal (Rs 686) and lowest for district Gurgaon (Rs 252) in 1982-83.

Reconciling with the patterns of disparities as revealed in the case of most of the other infrastructure facilities, the distribution of agricultural cooperative Credit reveal relatively higher disparities among the districts thanamong the productivity regions. It, further reveals that disparities in its distribution tended to accentuate between 1966-67 and 1972-73 both among the districts and productivity regions and it had accentuated relatively more sharply among the districts than among the average value of the productivity regions. However, disparities in the distribution of agricultural cooperative credit showed a tendency to narrow down over the entire period among the productivity regions, while it had accentuated among the districts.

Veterinary Health Infrastructure

Animal husbandry plays an important role in Haryana's

economy. It contributed well over 12 per cent to state's income as against about 6 per cent for all India. The state has a highly developed livestock sector which is foremost among the states in the country and is noted for its well known breeds. Haryana is an important supplier of cattle and buffalos to other states in the country.[24] Since, most of the districts and regions in Haryana still follows traditional mixed type of farming for the reasons of physiographic characteristics, climate, deficient rainfall and irrigation infrastructure, poorly fertile soil types etc. farmers of these areas have a severe tendency to supplement their lower farm income by cattle rearing. Therefore, districts of Mahendergarh, Gurgaon, Hissar, Rohtak and Ambala found to have large cattle population as compared to other districts in the state. In view of its importance in the state's economy, the government formulated major programmes in the sphere of improvement of breeds and disease control. Under the breeding scheme emphasis was lid on the intensification of existing facilities by popularising the artificial insermination method. Veterinary aid was considerably improved by opening additional hospitals and dispensaries.[25]

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24. N.C.A.E.R., Techno-Economic Survey of Haryana, Delhi, 1970

25. Govt. of Haryana, Directorate of Animal Husbandry, Intensive Cattle Development Projects in Haryana, Chandigarh, 1982-83.

The sheep and wool development, paultry, piggary and dairying farming received greater attention inthe latter period under various developmental programmes aimed at specific areas and section of population.

Table no. 3.3 gives an account of distribution of veterinary hospitals and dispensaries per thousand of cattle population and number of livestock development centres per ten thousand of cattle population among thevarious districts and productivity regions, respectively, in 1966-67, 1972-73 and 1982-83.

The table clearly reveals that the veterinary health facilities are found to be concentrated relatively more in the districts of Ambala, Rohtak, Gurgaon, Hissar and Mahendergarh, as farmers of these districts are relatively more interested in supplementing their lower farm incomes by animal husbandry. The distribution of both of the veterinary health facilities reveal glaring disparities both among the districts and productivity regions. The disparities in the distribution of these facilities are found to be relatively more acute among the districts than among the productivity regions which showed a tendency to decline over time in the case of veterinary hospitals and dispansaries and accentuate in the case of livestock development centres.

Agricultural Mechanisation and Technological Infrastructure

The formulation of the Fourth Five Year Plan followed the enunciation of the new agricultural strategy of production, the role of technology as a major input in agriculture was recognised. It made detailed referecne with regard to pricing, land reforms, mechanisation and credit and their implications. After a thorough consideration, selected mechanisation was also advocated in the plan document.

The Draft outline of the Fourth Plan, therefore, asserted that "it is necessary to make a far greater use of modern methods of production to bridge the gap between demand and production by application of the latest advances in the science of agriculture."[26] Consequent upon these policy recommendations, Haryana also formulated a development strategy for agriculture and, experienced spectacular improvements in the application of agricultural technology and mechanisation.

Table no. 3.4. presents an account of the distribution of number of tractors per ten thousand hectares of gross cropped area, number of tubewells per thousand hectares of gross cropped area, fertilisers consumption (tonnes) per thousand hectares of gross cropped area and

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26. The Planning Commission of India, Fourth Five Year Plan - A Draft Outbine, 1969, p. 175.

TABLE NO.3.4

DISPARITIES IN AGRICULTURAL MECHANISATION & TECHNOLOGY

	Number of Tractors per '000 hectares of G.C.A.			Number of Tubewells with pumping sets per '000 hects.of GCA			Fertiliser Consumptions(Tonnes) per '000 hects.of GCA			High Yielding variety seeds(Qtls) per '000 hects.of N.S.A.		
	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	1966-67	1972-73	1982-83	66-67	73-73	82-83
Haryana	10.56	39.02	125.46	5.60	32.85	7586	2.98	21.99	48.09	5.51	7.22	33.21
1. Karnal	20.50	62.40	150.70	15.64	70.40	136.47	5.45	51.71	109.66	9.85	11.27	30.97
2. Ambala	17.20	46.50	153.60	6.98	36.05	84.89	6.27	41-33	78.12	7.05	7.84	51.80
3. Rohtak	13.60	62.70	159.70	2.63	17.77	65.22	2.60	13.49	34.39	2.99	4.04	31.10
4. Jind	7.00	39.10	168.30	2.16	14.93	37.22	1.02	12.90	38.92	5.94	8.40	33.75
5. Hissar	6.60	20.40	91.70	1.67	9.12	24.11	1.96	11.80	32.81	6.40	6.61	28.19
6. Gurgaon	7.00	28.50	106.30	6.81	44.14	101.92	2.41	17.32	26.07	2.13	4.98	27.54
7. Mahendergarh	2.00	13.50	47.90	3.30	37.53	81.17	1.15	5.38	16.89	4.20	7.43	29.09
Coefficient of Variation	63.12	49.88	35.59	87.98	64.35	50.33	59.35	79.07	69,13	47.84	32.82	25.48
Productivity Regions												
High	17.10	57.20	154.18	8.42	45.24	104.03	4.77	36.08	79.22	6.62	8.00	36.81
Medium6	6.80	29.80	105.40	1.92	10.25	26.45	1.55	10.02	33.90	6.17	6.92	29.11
Low	4.50	21.00	81.76	5.10	41.43	93.19	1.78	12.43	22.21	3.17	5.95	28.19
Coefficient of variation	70.88	59.50	32.45	63.15	59.42	56.35	67.55	68.29	66.75	35.30	14.74	15.09

use of high yielding variety seeds (Qtls.) per thousand hectares of net sown a rea, among various districts and delineated productivity regions, respectively, in 1966-67, 1972-73 and 1982-83.

The distribution of all of these indicators reveal relatively higher concentration in high and medium productivity districts and regions excepting that of tubewells which report higher concentration in low productivity regions excepting that of tubewells which reporthigher concentration in low productivity region on account of relatively poor infrastructure pertaining to canals irrigation. Disparities in the distribution of number of tractors is found to be glaring both among the districts and productivity regions and it showed a tendency to narrow down significantly over time in both the cases. Contrary to the general pattern of disparities as observed in most of other infrastructural facilities under various heads, disparities in the distribution of tractos are found to be relatively more acute among the productivity regions than among the districts.

The distribution of number of tubewells, on the other hand, reveal glaring disparities both among the districts and among the productivity regions and tended to narrow down in both the cases in each of the time periods and over the entire period. As expected, disparities in its distribution are found to be relatively

more acute among the districts than among the productivity regions. Similarly, the distribution of fertilisers consumption reveal glaring disparities both among the districts and productivity regions and relatively more acute among the districts than among the productivity regions. The distribution of fertilisers consumption further reveal that it had in fact accentuated between 1966-67 and 1972-73 as a result of especial attention givento specific areas such as district Karnal under I.A.D.P. and I.A.A.P. schemes in the new strategy of agricultural development. T he table No. 3.4 brings out that the disparities in its distribution remained virtually unchanged over the entire period among the districts it showed a tendency to narrow down marginally among the productivity regions.

The table No. 3.4 brings out that high yielding variety seeds were used relatively more in quantities in high and medium productivity districts and regions. This pattern is well in confirmity with the fact that relatively higher irrigation, more fertilisers consumption, more agricultural credit and more use of high yielding variety seeds go hand in hand. Although, districts of Gurgaon and Mahendergarh both of which belong to low productivity region used large quantities of improved seeds in the initial period but tended to lag far behind other districts and regions in the latter periods. The

use of high yielding varieties seeds, therefore, revealed glaring disparities both among the districts and productivity regions, again disparities are found to be relatively more acute among the districts than among the producitivity regions. The use of high yielding variety seeds among the districts and productivity regions, further, revealed that it tended to decline over time in both the cases. Thus, most of the indicators of agricultural technology and mechanisation revealed glaring disparities in the distribution both among the districts and productivity regions, relatively more acute among the districts excepting the number of tractors and tended to decline over time excepting fertilisers consumption for which disparities remained virtually unchanged over the entire period.

The distribution of infrastructural facilities under various heads reveal that high productivity districts and region is found to have enjoyed relatively more physical infrastructural facilities. Although, low productivity districts and region is also found to have enjoyed relatively more physical infrastructural facilities ecepting irrigation and few other as compared to medium productivity districts and region but found to have been very poor in technological inputs such as irrigation, fertiliser consumption, agricultural cr dit and use of nigh yielding variety seeds. The distribution of infrastructural facilities under various heads taking whole

of them on one plane reveal glaring disparities both among the districts and productivity regions, relatively more acute among the districts than among the productivity regions and tended to decline over time, in both the cases.

Disparities in Agricultural Productivity

The whole thrust of new technology in agriculture was on intensive cultivation, therefore, productivity per hectare experienced spectacular improvements during the period under conside ation. Table no. 3.5 gives an account of productivity per nectare of gross cropped area for various districts and delineated productivity regions, respectively, in 1966-69, 1970-73 and 1980-83, trienniums.

T he agricultural productivity per nectare of gross cropped area, too, reveals glaring disparities both among the districts and productivity regions. Table 3.5 brings out the fact that disparities are found to be relatively more acute among the districts than among the productivity regions. It, further, reveals a tendency to decline over the entire period in both the cases. Thus, in consonance with the decline in disparities in the dostrobution of most of physical infrastructural facilities under various heads in general and technological indicators in particular disparities in agricultural

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Table 3.5

Disparities in Agricultural Productivity

	Productivity (Rs/hectare)		
	1966-67 1968-69	1970-71 1972-73	1980-81 1982-83
HARYANA	1894	2325	2796
1. Karnal	2361	2888	3389
2. Ambala	2102	2550	3311
3. Rohtak	2334	2612	2904
4. Jind	2002	2456	2716
5. Hissar	1849	2326	2832
6. Gurgaon	1653	1752	2215
7. Mahendergarh	966	1296	2520
Coefficient of Variation	26.22	24.36	14.62
Productivity Regions			
High	2311	2732	3110
Medium	1933	2349	2811
Low	1387	1565	2345
Coefficiant of Variation	24.75	26.85	13.99

productivity tended to decline both among the districts and among the delineated productivity regions. Therefore, it turns out that in order to further reduce the regional disparities in agricultural development level of physical infrastructural facilities have to be increased in the medium productivity districts and region and attention is to be paid to be problem areas in low productivity region so as to ensure any increase in the technological inputs in general and irrigation infrastructure in particular.

CHAPTER - IV

INTER-LINKAGES AND GROWTH IN AGRICULTURAL INFRASTRUCTURE

Haryana ranks second, next only to Punjab, in terms of per-capita state domestic product and agricultural productivity. A cursary glance at the economy of the state clearly reveals that agricultural sector is the major contributor to the state's domestic product. Therefore, this sector has been accorded prime importance in the development strategy. As a consequence, agricultural sector, in the state, has witnessed a major teansformation from a nearly stagnant and traditional agriculture to a one carried on the modern line, during the period under consideration.

A close scrutiny of the trends in the agricultural sector would reveal that growth in the agricultural output is found to be tremendous and it is made possible both by the area expansion and improvements in yield levels. Table no. 4.1 gives the area under crops, value of agricultural output and agricultural productivity per hectare of gross cropped area, of twelve major crops under-taken in the present study, for 1966-69, 1970-73 and 1980-83, trienniums, respectively, for the whole state, districts and delineated productivity regions. The value of agricultural output and producti-

TABLE NO. 4.1

	Area ('000 hectares)			Productivity (Rs./hect.)			Output (Rs. in Lakhs)		
	1966-68	1970-72	1980-82	1966-68	1970-72	1980-82	1966-68	1970-72	1980-82
Haryana	3971.1	4404.6	4649.2	1894	2325	2796	7995	10244	13000
1. Karnal	736.1	820.1	907.4	2361	2888	3389	1739	2368	3075
2. Ambala	242.6	284.6	295.3	2102	2550	3311	510	726	978
3. Rohtak	613.6	626.1	617.9	2334	2612	2904	1433	1636	1609
4. Jind	289.1	325.9	381.4	2002	2456	2716	661	801	1036
5. H-issar	1207.5	1420.5	1676.7	1849	2326	2832	2232	3302	4748
6. Gurgaon	540.6	526.8	442.7	1653	1753	2215	894	923	981
7. Mahendergarh	342.9	365.6	328.7	966	1296	2520	331	474	828
Productivity Regions									
High	1592.6	1730.8	1820.6	2311	2732	3110	3681130	4729131	5661778
Medium	1496.6	1746.4	2058.1	1933	2349	2811	2892747	4102650	5784308
Low	883.5	892.4	771.4	1387	1565	2345	1224977	1396686	1808762

Compound Annual Growth of Area, Productivity and Output

	Area			Productivity			Output		
	1966-69 1970-72	1970-72 1980-82	1966-67 1980-82	1966-69 1970-72	1970-72 1980-82	1966-69 1980-82	1966-69 1970-72	1970-72 1980-82	1966-69 1980-82
Haryana	1.7	0.6	1.0	3.5	1.9	2.4	4.2	2.4	3.0
1. Karnal	1.8	1.0	1.4	3.4	1.6	2.3	5.3	2.7	3.6
2. Ambala	2.7	0.3	1.3	3.3	2.7	2.9	6.0	3.0	4.2
3. Rohtak	0.3	-0.1	0.1	1.9	1.0	1.4	2.2	-0.2	0.8
4. Jind	2.1	1.6	1.7	3.5	1.0	2.0	3.2	2.6	2.8
5. H-issar	2.8	1.6	2.1	3.9	2.0	2.7	6.8	3.7	4.8
6. Gurgaon	-0.4	-1.7	-1.3	0.9	2.3	1.8	0.6	0.6	0.6
7. Mahendergarh	1.0	-1.0	-0.2	5.1	6.9	6.2	6.1	5.8	5.9
Productivity Regions									
High	1.4	0.5	0.8	2.8	1.3	1.9	4.2	1.8	2.9
Medium	2.6	1.6	2.0	3.3	1.8	2.3	6.0	3.5	4.4
Low	0.2	-1.5	-0.9	2.1	4.1	3.4	2.2	2.6	2.4

vity per nectare of gross cropped area have been calculated at 1980-81 harvest prices. It brings out that the value of agricultural output in the state grew at a compound annual rate of 3 per cent over the entire period i.e. from triennium period 1966-69 to 1980-83. The area under crops and value of output per hectare increased at compound annual rates of 1.0 per cent and 2.4 per cent, respectively, during the same period. It also brings out the fact that the area expansion and growth in productivity is found to be relatively more significant in the first period i.e. triennium ending 1966-69 and 1970-73, growth in the area under crops and agricultural productivity was considerably slowed down in the latter period i.e.triennium ending 1970-73 and 1980-83. The area under crops grew at compound annual rates of 1.7 per cent and 0.6 per cent, respectively, in the first and in the latter period. The value of output per nectare of gross cropped area increased at compound annual rates of 3.5 per cent and 1.9 per cent respectively, in the same period.

Since, area under crops and agricultural productivity reparted considerably lower rates of growth in the latter period as compared to in the first period, consequently therefore, growth in the value of agricultural output in the state experienced significant deeentration in the latter period.

In an attempt to bring out the importance of the provision of agricultural infrastructure in the determination of performance of agricultural sector it would be worthwhile to study the patternof growth at the level of districts and delineated productivity regions.

Table 4.1 makes it very clear that most of the growth in the value of agricultural output has been contributed by the medium productivity region. The compound annual rate of growth in the value of agricultural output is found to be substantially higher for this productivity region as compared to compound annual rates of grwoth in it in other productivity regions and in the whole state, in each of the time periods. However, nigh productivity region also contributed significantly to the value of agricultural output, its growth was pushed down by Rohtak district, which reported negligible growt in the value of agricultural output during the second period due to decline in the area under crop.[1] While, district Rohtak reported an annual compound rate of growth of 0.8 per cent in the value of agricul ural output over the entire period precisely on account of decline in the area under crops,

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1. District Rohtak experienced a decline in area under crops partly on account of a decline in the total area in the district from 604 thousand hectares in 1972-73 to 598 thousand hectares in 1982-83 due to reorganisation of villages for administrative convenience and transferred to districts of Gurgaon and Bhiwani and also on account of increase in area under uncultivated land other than current fallow land not available for cultivation.

other districts of high productivity region experienced relatively faster growth in it. Districts of Karnal and Ambala experienced compound annual rates of growth of 3.6 per cent and 4.2 per cent, respectively, over the entire period.

In contrast to the growth in the value of agricultural output in high and medium productivity regions which reported compound annual growth rates of 3.0 per cent and 4.4 per cent, respectively, over the entire period, low productivity region reported compound annual growth rate of 2.4 per cent. In the low productivity region, growth in the value of agricultural output was pulled up by Mahendergarh district because it reported exceptionally high rate of growth due mainly to low base level, at least in the initial period. Gurgaon turns out to be only district reporting lowest compound annual growth rate (0.6 per cent) in the value of agricultural putput.

Both the high and medium productivity regions experienced considerably high compound annual rates of growth in the area under crops over the entire period, the growth in the area is found to be relatively higher in the first period i.e. between triennium 1966-69 and 1970-73. Districts which experienced significant growth in area under crops were that of Hissar, Jind, Karnal and Ambala. Again, all these districts reveal relatively higher compound annual growth in the area under crops in the first

period i.e. 1966/69 and 1970/73 as compared to the latter triennium period i.e. 1970-73 and 1980-83. Moreover, compound annual rates of growth in the area under grops is found to be higher in districts of Hissar and Jind, both belinging to medium productivity region. Similarly agricultural productivity per hectare of gross cropped area grew relatively more sharply in the first triennium period as compared to the latter trinnium period. However, low productivity region reported exceptionally higher growth in agricultural productivity in the latter period because of lower level of base in the initial period and tremendous growth in irrigation which found to have occurred only in the latter period. Again, medium productivity region is found to have experienced significantly higher compound annual rate of growth in agricultural productivity on account of higher irrigation and more use of other technological inputs in agriculture as compared to low productivity region, in each of the time period.

The compound annual rate of growth in agricultural productivity in high productivity region was again pushed down by Rohtak district which experienced a compound annual rates of growth of 2.0 per cent amd 1.0 per cent, respectively, in the first and second triennium periods. However, compound annual rates of growth in agricultural productivity in other districts of high productivity

region is found to be well comparable with the districts of medium productivity region.

Thus, growth in the area under crops, agricultural productivity and value of the agricultural output clearly discern a significant deceleration in the latter period when compared with the first period.

Superimposing the growth in the provision of agricultural infrastructural facilities on the trends observed in the area under crops, agricultural productivity and value of agricultural output it may be argued that these trends were considerably determined by the growth in agricultural infrastructural facilities.

A careful scrutiny of table no. 4.2 to 4.4 reveal the fact that most of the agricultural infrastructural indicators had relatively higher compound annual rates of growth in the first period as compared to in the latter period. It also brings out that most of the agricultural infrastructural indicators grew at relatively higher rates for high and medium productivity regions with a few exceptions where ra es of growth were reported to be relatively higher for low productivity region.

Inrigation Infrastructure

In the absence of data on the length of canals and field channels a complete picture of irrigation infrastructure is not possible, therefore, growth in

gross area irrigated is used as a proxy variable to show the growth in the irrigation infrastructure. The compound annual rates of growth in the gross area irrigated reveal the fact that high and medium productivity regions experienced relatively higher growth in it and that the rates of growth in it were found to be relatively higher in the first period as compared to in the latter period, both for high and medium productivity regions. Although, compound annual rates of growth in the gross area irrigated was considerable in all the productivity regions, it is found to be especially high for low productivity region inthe latter period on account of heavy growth in the number of tubewells during this period.

Thus, irrigation infrastructure as indicated by gross area irrigated revealed relatively higher growth in high and medium productivity regions and it is found to be relatively higher in the first period as compared to in the latter period excepting that of low productivity region which reported high growth in it in the latter period.

Table no. 4.2 gives the percentage of gross area irrigated to gross cropped area for various districts and delineated productivity regions,respectively, in 1966-67, 1972-73 and 1982-83. It brings out the fact that the percentage ratio of gross area irrigated to gross cropped area is found to be substantially higher, in high and

TABLE NO. 4.2

IRRIGATION

	Percentage of Net Area Irrigated by Source: Canal			Tube-wells			Percentage of gross area Irrigated to gross eropped area.		
	1966-67	1972-73	1982.83	1966-67	1972-72	1982-83	1966-67	1972-73	1982-83
Haryana	76.64	58.39	53.57	17.63	41.18	46.26	33.8	41.87	63.27
1. K arnal	67.61	28.82	26.29	32.04	71.18	73.71	55.4	73.44	92.34
2. Ambala	19.35	08.62	03.13	67.74	87.93	93.75	13.6	28.1	51.27
3. Rohtak	71.14	59.34	60.49	20.0	40.66	39.5	37.5	40.81	62,17
4. Jind	97.37	94.57	76.77	00.87	05.43	23.23	57.2	65.63	83.89
5. Hissar	95.82	92.33	82.80	04.18	06.8	17.20	42.9	50.83	64.57
6. Gurgaon	21.6	17.56	24.71	31.2	82.44	74.71	21.6	24.96	51.62
7. Mahender-garh	40.0	-	02.75	43.33	100.0	97.25	08.4	09.35	35.96
Productivity Regions									
High	52.7	32.26	29.97	39.93	66.59	68.99	35.5	56.94	75.64
Medium	96.6	93.45	79.78	02.53	06.12	20.22	50.0	51.78	68.03
Low	30.8	17.56	13.73	37.27	82.44	85.98	25.4	27.54	45.03

medium productivity regions as compared to in low productivity region, in each of the time periods. Disctricts which reported relatively higher percentage of gross area irrigated to gross cropped area were Karnal, Hissar, Jind and Rohtak. However, districts of Gurgaon and Ambala reported lowest irrigation in each of the time periods.

Power Infrastructure

An account of growth in the power infrastructural indicators among various districts and delineated productivity regions, respectively, at different points of time is given in table no. 4.3. It clearly brings out that compound annual rates of growth in the number of transformers, length of L.T. lines and 11 K.V. lines is found to be relatively higher in the first period as compared to in the latter period, both for districts and productivity regions. The growth in the number of transformers and length of 11 K.V. lines reveal relatively higher compound annual rates of growth for medium productivity region on account of low base level in the initial period, as most of power infrastructure is found to be concentrated in high and low productivity regions. The reason for relatively high concentration in high and low productivity regions, in the initial period, as compared to lower power infrastructure in medium productivity retion is precisely because of differences in the source of irrigation among

the productivity regions,as shown in table no. 4.2. It may be argued that most of the irrigation in medium productivity region is done by canals and most of it in high and low productivity regions by the tube wells, therefore, these two productivity regions were provided with better power infrastructure. Moreover, ancillary activities are found to be most concentrated in the districts of Ambala and Gurgaon and also in other districts which were declared industrially backward after 1970 such as Mahendergarh districts. therefor , relatively better provision of power infrastructure was made available. The power infrastructural indicators reveal relatively higher compound annual rates of growth in the first period also on account of achieving onjective of hundred per cent rural electrification by the end of the Fourth Five Year Plan period.

Transport Infrastructure

Table no. 4.3 gives an account of growth in the transport infrastructure as indicated by the length of surfaced roads per thousand sq. kms of area, for various districts and productivity regions, respectively, at differnt points of times. The table clearly reveals that compound annual rates of growth in the length of surfaced roads is found to be substantially higher in the first period for each districts and productivity region as compared to in the second period. Districts which

experienced relatively higher growth in the length of surfaced roads were Karnal, Ambala, Jind, Hissar and Mahendergarh. Again, high and meddium productivity regions turned out to be enjoying relatively higher compound annual rates of growth in the length of surfaced roads as compared to low productivity region.

Marketing Infrastructure

While, most of the concentration in the distribution of number of principal agricultural regulated markets and agricultural sub-yards is reported in high and medium productivity region, relatively higher concentration is reported in high and medium productivity regions in the case of fertiliser sale counters. Table no. 4.3 gives compound annual rates of growth in the number of principal agricultural regulated markets, agricultural sub-yards and fertiliser sale counters in different districts and productivity regions, respectively, over time. It reveals that the growth in the number of regulated markets behave erratically and do not follow the observed pattern of growth as in the case of other infrastructural indicators. In fact, in the case of principal agricultural regulated markets most of the growth is experienced in the latter period, whereas all other marketing infrastructural indicators reveal relatively higher growth in the first period. In response to

TABLE NO. 4.3

COMPOUND ANNUAL GROWTH

	Power: Number of Transformers per '000 hects. of N.S.A.			Length of LT lines (Circuit Kms.) per '000 hects. of N.S.A.			Length of 11 K.V. lines (Circuit Kms.) per '000 hect of N.S.A.			Transport: Length of Surface Roads Sq.Kms. Per '000 sq.kms. of Area			Number of Principal Agricultural Regulated Markets Per '000 hects of N.S.A.			Number of Sub-yards Per '000 hect. of N.S.A.			Number of Fertilisere Sale Counters Per '000 hects of N.S.A.		
	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-72 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83
Haryana	24.7	06.0	12.7	27.8	05.4	13.3	24.7	03.0	10.7	18.0	02.8	08.2	01.0	02.9	02.2	05.1	02.9	03.7	09.1	08.2	08.6
1. Karnal	23.9	06.3	12.6	29.7	09.9	17.2	13.4	06.0	08.4	21.4	04.2	10.4	01.8	04.0	03.1	03.6	00.9	01.9	15.5	03.5	05.9
2. Ambala	20.1	06.3	11.2	27.2	04.8	12.7	18.8	03.2	08.8	18.0	03.1	08.5	01.4	02.6	02.1	03.6	04.1	04.0	08.6	07.9	08.1
3. Rohtak	20.9	04.3	10.3	18.8	-1.2	12.2	27.2	-0.1	09.3	14.6	02.1	06.6	06.7	00.0	02.4	07.6	02.3	04.2	09.1	10.3	09.8
4. Jind	29.8	05.5	14.0	11.6	08.8	08.2	39.2	02.9	15.3	20.2	02.3	08.7	-3.2	04.1	01.4	08.7	10.4	09.7	06.1	12.6	10.1
5. Hissar	40.5	05.6	17.6	18.1	05.9	10.4	34.1	03.1	13.8	14.9	04.1	08.0	-0.7	3.0	01.6	-0.1	03.8	02.3	07.7	06.6	06.9
6. Gurgaon	17.2	06.5	10.4	22.4	05.9	11.9	19.4	03.5	09.1	12.0	04.8	07.5	03.9	04.6	04.3	08.3	02.1	04.3	13.5	10.9	09.3
7. Mahendergarh	44.2	06.3	19.1	53.7	05.4	21.4	42.3	02.9	16.2	25.0	00.1	08.7	-2.7	01.5	-0.1	07.0	01.3	03.4	13.0	23.3	13.3
Productivity Regions																					
High	21.5	05.9	11.5	31.1	05.5	14.5	18.5	03.3	08.7	17.2	03.2	08.2	00.9	02.7	02.0	02.2	02.8	02.6	09.4	05.9	07.9
Medium	32.8	05.6	15.1	10.5	5.8	07.5	33.2	03.0	13.4	16.5	03.8	08.4	-2.2	03.3	00.5	10.7	01.7	05.1	07.4	07.7	07.4
Low	26.3	06.4	13.4	32.1	16.1	19.6	27.6	03.2	11.8	17.5	02.8	08.1	01.4	02.7	02.2	04.1	01.7	03.6	15.0	14.3	14.6

government's decision to procure good grains at a minimum support price the number of agricultural sub-yards and in response to improvements in irrigation the number of fertiliser sale counters reveal relatively higher compound annual rates of growth in high and medium productivity regions. However, exceptionally higher growth in the number of fertiliser sale counters in the low producrivity region in the first period is precisely on account of low base in the initial period and not onaccount of improvements in irrigation as most of the improvement in irrigation is found to occurred only in the latter period. Districts which experienced relatively higher compound annual rates of growth inmarketing infrastructure were Karnal, Ambala Rohtak, Hissar and Gurgaon.

Banking Infrastructure

The distribution of number of banks among various districts and productivity regions revealed relatively higher concentration in high and low productivity regions and districts. The highest concentration of number of banks is found in high productivity region followed closely by low productivity region. The compound annual rates of growth in the number of banks for various districts and productivity regions, respectively, is shown in table no. 4.4. It clearly brings out that compound annual rates of growth in the number of banks is found

to be relatively higher in the first period as compared to in the second period. Although, medium productivity region is found to have enjoyed relatively lower banking infrastructure, it is found to have experienced relatively higher compound annual rate of growth in the number of banks in the first period. Districts which experienced relatively higher growth in the banking infrastructure over the entire period were Karnal, Rohtak, Hissar, Gurgaon and Mahendergarh.

Thus, growth in the banking infrastructure is found to follow the well established pattern of growth in agricultural infrastructure under various heads.

Cooperative Infrastructure

The distribution of agricultural cooperative credit societies and non-credit societies among various districts and productivity regions revealed relatively higher concentration in high and low producrivity districts and regions while agricultural cooperative credit per hectare reported relatively more concentration in high and medium productivity districts and regions, in 1982-83. It also reveals that the number of cooperative credit societies shows a decline due to reorganisation of cooperative societies while non-credit societies show a tendency to increase over time in response to growth in the agricultural sector. Relatively higher number of agricultural

cooperative societies in low productivity region may be explained in terms of well developed cooperative structure created by the government in relatively less developed areas to free the farmers from exploitative financial and trade market relations. Relatively more number of cooperative societies in low productivity districts and region as also in other regions may also be attributed to the growth in milk, labour, irrigation and marketing societies in response to growth in the agricultural sector as a whole.

An account of compound annual rates of growth in the number of agricultural cooperative credit societies, agricultural cooperative non-credit societies and cooperative credit per hectare of net sown area is given in table no. 4.4. It clearly brings out that agricultural cooperative credit soci ties reveal a negative compound annual rate of growth on account of revitalisation and reorganisarion both for districts and productivity regions, and it is found to have declined relatively more sharply in the latter period as compared to in the first period. Agricultural cooperative non-credit societies revealed significant growth in each of the time period and reported relatively higher compound annual rates of growth in the latter period as compared to the first period. The high and medium productivity districts and productivity regions found to have experienced relatively higher com-

TABBE NO. 4.4

Compound Annual Growth :

	Banking: Number of Banks Per '000 Sq.Km. of Area			Cooperation: Number of Agricultural Coop. Credit Societies '000 Sq.Km. of Area.			Number of Agricultural Coop. Non-Credit Societies '000 Sq.K. of Area.			Agricultural Coop. Credit (ST+MT) Per hect. of NSA.			Number of Veterinary hospitals and dispensaries '000 Cattle Population			Number of Live Stock development centres Per '0000 Cattle Population		
	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83
Haryana	17.5	09.0	12.1	-5.8	-10.5	-08.6	06.0	07.4	06.9	22.6	18.8	20.1	-08.2	06.9	01.2	03.0	03.7	03.5
1. Karnal	18.7	09.0	12.6	-6.9	-09.9	-08.7	04.7	05.7	05.3	28.3	20.9	23.7	-20.1	14.1	01.4	-09.4	07.2	-02.6
2. Ambala	15.3	07.4	10.3	-7.4	-14.1	-11.5	01.3	02.7	02.2	28.7	14.8	19.8	-08.7	04.6	-05.2	00.2	11.3	07.0
3. Rohtak	20.0	09.0	12.8	-6.5	-09.1	-08.1	10.1	08.3	09.0	13.6	23.1	21.1	-04.9	03.6	02.8	04.2	-04.1	-00.9
4. Jind	14.4	06.0	09.1	-4.5	-10.5	-08.1	10.6	01.6	04.8	22.3	25.7	24.5	10.3	02.6	05.4	00.0	04.1	02.5
5. Hissar	38.7	08.1	18.7	-2.7	-08.1	-09.8	22.1	06.7	12.2	12.8	25.6	22.1	-04.2	07.5	03.0	03.6	01.9	01.5
6. Gurgaon	11.9	12.9	12.6	-8.3	-07.9	-08.1	14.4	07.8	10.3	10.9	18.2	15.3	-18.2	07.2	-02.0	-02.4	05.2	02.3
7. Mahendergarh	20.1	10.1	13.8	-1.4	-12.7	-08.7	-26.3	37.6	10.7	26.7	14.1	16.5	-03.0	05.3	02.2	33.8	03.9	14.2
Productivity Regions																		
High	15.8	08.6	11.4	-8.2	-10.8	-09.8	02.1	05.8	04.3	23.1	19.8	21.0	-11.1	07.6	00.7	02.7	01.3	01.8
Medium	20.5	07.7	12.4	-5.6	-08.5	-07.4	04.6	05.1	02.7	19.8	25.6	23.4	05.4	03.9	04.4	03.3	-01.7	02.2
Low	15.7	12.0	13.4	-5.7	-09.4	-7.7	02.9	15.7	10.6	19.6	15.6	17.1	-09.5	05.3	-00.2	09.3	03.7	05.8

pound annual rates of growth in agricultural cooperative credit societies as compared to in low productivity districts and region. In contrast, the compound annual rate of growth in agricultural cooperative non-credit societies is found to be relatively higher in high and low productivity districts and regions. While, compound annual rates of growth in agricultural cooperative credit is reported relatively higher for high and medium productivity region over the entire period. The compound annual rates of growth in cooperative credit reveal relatively higher growth in the first period than in the latter period in most of the districts and productivity regions.

Veterinary Health Infrastructural Facilities

The distribution of the number of veterinary health centres revealed relatively more concentration in medium and low productivity regions as people of these areas have relatively more sharp tendency to supplement their lower level of farm incomes by cattle rearing for physiographical reasons and poorly fertile type of soils etc. Since, animal husbandry is quite important in the state's economy it received government's attention and several livestock development programmes were initiated. The compound annual rates of growth in veterinary health services in different districts and productivity regions is shown in table 4.4. It reveals that while most of the

districts in the state have experienced a negative growth in the number of veterinary hospitals and dispensaries in the first period excepting Jind district, a negative growth is recorded for district Karnal and Gurgaon district in the case of livestock development centres. Contrary to general pattern of growth in other infrastructural indicators, number of veterinary hospitals and dispensaries reported most of the growth in the latter p periods whereas compound annual rates of growth in the number of livestock development centres is found to have occurred in the first period. The districts which experienced relatively higher compound annual rates of growth in veterinary health facilities turns out to be those which constituted low and medium productivity regions.

Agricultural Mechanisation and Technological Infrastructure

The distribution of most of the agricultural mechanisation and technological indicators revealed relatively higher concentration in high and medium productivity regions, excepting the number of tubewells, which reported relatively more concentration in low productivity region on account of poor canal irrigation infrastructure. Table 4.5 presents a profile of compound annual rates of growth in the number of tractors, number of tubewells, fertilisers consumption and use of high yielding variety of seeds for different districts and delineated productivity regions, respectively.

TABLE NO. 4.5
COMPOUND ANNUAL GROWTH

Agricultural Mechanisation and Technology:

	Number of Tractors Per '0000 hects. of GCA.			Number of Tubewells and Pumping Sets '000 hects. of G.C.A.			Fertilisers Consumption (Tonnes Per '000 hects. of G.C.A.			High Yielding Variety Seeds (Qtls.) per '000 hects. of NSA		
	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83	1966-67 1972-73	1972-73 1982-83	1966-67 1982-83
Haryana	24.4	12.4	16.8	34.3	08.7	17.7	39.5	08.1	19.0	04.6	16.5	11.9
1. Karnal	20.6	09.2	13.2	28.5	06.9	14.5	45.5	07.7	20.2	02.3	16.4	10.9
2. Ambala	18.0	12.7	14.7	31.4	01.9	11.2	37.0	06.5	17.0	01.8	20.8	13.2
3. Rohtak	29.0	09.7	16.6	37.5	13.9	22.3	31.2	09.8	17.5	05.2	22.7	15.8
4. Jind	33.2	15.7	22.0	38.0	09.6	19.5	52.7	11.7	25.5	05.9	14.9	11.8
5. Hissar	20.7	16.3	17.9	32.7	10.3	18.1	34.9	10.8	19.2	00.6	15.6	09.7
6. Gurgaon	26.4	14.1	18.5	36.6	08.7	18.4	39.0	04.2	16.1	15.3	18.7	17.3
7. Mahender-garh	37.5	13.5	22.0	50.0	08.0	22.3	29.3	12.1	18.2	10.0	14.7	12.8
Productivity Regions												
High	22.3	10.0	14.8	32.3	08.6	17.0	40.2	08.1	19.2	03.1	16.5	11.3
Medium	27.9	15.9	18.7	32.2	10.0	17.9	41.5	10.9	17.4	02.0	15.4	10.2
Low	29.3	13.9	19.9	41.8	08.4	19.9	38.2	05.9	17.0	11.1	16.6	14.7

It clearly brings out the fact that compound annual rates of grwoth in the number of tractors, number of tube-wells and fertiliser consumption is found to be relatively higher in the first period as compared to in the latter period while compound annual rates of grwoth in use of high yielding varieties seeds reported to be found relatively higher in the latter period, in most of the districts and in each of the productivity regions. However, compound annual rates of grwoth in number of tractors and use of high yielding variety seeds turns out to be higher in low productivity region on account of low base level in the initial period. Again, compound annual rates of growth in almost all the indicators of agricultural mechanisation and technology reveal relatively higher growth in high and medium productivity districts and regions.

Therefore, it may safely be concluded that most of the agricultural infrastructural facilities excepting a few are found to have grown relatively more sharply in the first period and for high and medium productivity districts and regions.

In order to bring out the importance of a particular agricultural infrastructural facility in the determination of legel of agricultural productivity, selected infrastructural indicators and technological inputs are correlated with productivity at the district level in 1966-67, 1972-73

and 1982-83, respectively. The coefficient of correlation are given in table nos. 4.6, 4.7 and 4.8 respectively, for 1966-67, 1972-73 and 1982-83. The correlation matrix for each of these periods reveals the fact that agricultural productivity is found to be positive and strongly correlated with irrigation, fertiliser consumption, use of high yielding variety seeds and agricultural credit, in almost all the time periods. Whereas, agricultural productivity and crucial technological inputs are found strongly correlated most of the agricultural infrastructural indicators are found positive correlated but correlation between them turns out to be not significant in most of the cases. While, irrigation infrastructure including tubewells, indicators of power, marketing, banking and indicators of mechanisation are found positively correlated with agricultural productivity, most of the indicators of cooperation are found poorly correlated with it. The correlation matrix brings out the fact that agricultural productivity and irrigation infrastructure are found to be very strongly correlated and it is found significant at 5 per cent and 2 per cent levels of confidence in 1966-67, in 1972-73 and 1982-83 respectively.

Correlation between agricultural productivity and tubewells has turned out to be positive but not significant in each of the time periods. Similarly, agricultural productivity and indicators of power are found to be posi-

tively correlated but correlation turns out to be insignificant even at 5 per cent level of confidence. While, correlation between agricultural productivity and indicators of transport is found to be negative in the initial periods, it turns out to be positive in 1982-83. Probably, it is via marketing and other infrastructural heads that transport infrastructure influence agricultural productivity, as regulated markets and agricultural subyards are found strongly correlated with agricultural productivity. Similarly, agricultural productivity and fertiliser sale counters are foundstrongly and significantly correlated. While, agricultural productivity and number of banks are found to be positively correlated in most of the periods, the correlation turns out to be insignificant even at 5 per cent level of confidence.

The correlation between agricutural productivity and number of agricultural cooperative credit societies is found to be weak but correlation turns outbe positive and strong in the case of number non credit societies and agricultural cooperative credit.

Agricultural productivity and most of the indicators of mechanisation and technology in agriculture reveal positive and strong correlation, excepting a few.

Therefore, it may be argued that although most of the agricultural infrastructural indicators do not bear positive and strong correlation with agricultural produc-

tivity but these infrastructural indicators strongly influence the supplies of those crucial technological indicators which are found to be strongly correlated with it. Again, agricultural infrastructure turns out to be a necessary but not sufficient condition for development in agriculture, as it operate indirectly rather than directly in enhancing agricultural productivity.

However, low productivity districts and region found to have enjoyed relatively higher agriculrural infrastructural facilities but lower level of crucial technological inputs such as irrigation, fertilisers and high yielding variety seeds and also agricultural credit per hectare suggests that even lower level of infrastructural facilities may supply more crucial technological inputs as revealed by medium productivity districts and region. Therefore, it is found that since irrigation bears very strong correlation with all of these technological inputs highly irrigated districts and regions received relatively more technological inputs in agriculture. Since, low productivity districts and region enjoyed relatively lower irrigation and unfavourable physiographical setting and other related attributes it attracted lower technological inputs.

Inter-Linkages in Agricultural Infrastructural Facilities

The main thrust of new technology of production

in agriculture was on intensive cultivation to achieve rapid increase in the agricultural output through increasing yield levels. Therefore, efforts were made to provide technological inputs such as irrigation, fertilisers and high yielding variety seeds along with agricultural credit to agricultural sector, affecting improvements in agricultural yield. In rder to make these inputs adequately available and in time to the farm sector, agriculrural infrastructural facilities werr strengthened. For instance, to provide sufficient and assured supplies of water, irrigation infrastrucrure was strengthened by constructing canals and field channels, digging tubewells and other wells and to operate these tubewells power was made available by strengthening power infrastructure. Transport and marketing infrastructure was also strengthened to make fertilisers, high yielding variety seeds and other inputs available and agricultural credit institutions were strengthened toprovide agricultural credit to finance most of these inputs.

Tables 4.6, 4.7 and 4.8 present multiple correlation matrices of agricultural productivity, all the major technological inputs and indicators of agriculrural infrastructure for 1966-67, 1972-73 and 1982-83. The matrices bring out the correlation of selected indicaters of agricultural infrastructure with productivity and with each of the crucial technological inputs including agricultural credit and also with each other.

CORRELATION MATRIX

1966-67

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Aggral. Productivity	1.000	.504	.662	.715	.446	.145	.379	-386	.322	-462	.381	.535	.393	.379	.139	.750	.677
2. Fertilisers Consump.	.504	1.000	.895	.367	.733	.690	.544	.467	.679	.213	.829	.191	889	645	690	911	.591
3. Nos.of Tracters	.662	.895	1.000	.297	.727	.485	.353	.193	.532	.053	.718	.195	.807	.417	.374	.914	.606
4. Irrigation	.715	.367	.397	1.000	.182	-520	-859	-183	-347	-748	-210	.142	.114	-270	-585	.293	.470
5.Tubewells	.446	.733	.737	.182	1.000	.338	.269	.045	.343	-068	.731	.195	.741	.289	.315	.728	.605
6. Coop.Credit Socities	.145	.690	.485	-520	.338	1.000	.711	.654	.970	.699	.864	.537	.841	.677	.510	.424	-058
7.Coop.Credit	.379	.544	.353	-859	.269	.711	1.000	.353	.559	.653	.550	-123	.546	.538	.884	.217	-036
8. Coop.Non-Credit Socities	-386	.467	.193	-183	-045	.654	.353	1.000	.767	.096	.386	.396	.388	.916	.288	.478	2.77
9. Banks	.322	.679	.532	-347	.343	.970	.559	.767	1.000	.558	.842	.651	.818	.745	.378	.494	.036
10.Surf.Roads	-.462	.213	.053	-738	-.068	.699	.653	.096	.558	1.000	.505	.180	.485	.041	.269	-187	-650
11.Nos.of Transfermers	.381	.829	.718	-210	.731	.864	.550	.386	.842	.505	1.000	.554	.987	.504	.508	.629	.185
12.L.T.Lines	.535	.191	.195	.142	.105	.537	-123	.396	.651	.180	.554	1.000	.463	.305	-264	.172	-109
13.11 KV Lines	.393	.889	.807	-164	.741	.841	.546	.388	.818	.485	.987	.463	1000	.501	.531	.703	.252
14.Regul.Mkt.	.379	.645	.417	-270	.289	.677	.538	.916	.745	.041	.504	.305	.501	1000	.591	.629	.484
15.Agrl.S.yds.	.141	.690	.364	-585	.515	.410	.884	.288	.387	.269	.508	-264	.531	.591	1000	.498	.400
16.Fertiliser Sale	.750	.911	.914	.293	.728	.424	.317	.478	.494	-187	.629	.172	.703	.629	.498	1000	.836
17.HYVS	.677	.591	.606	.470	.605	-.058	-036	.277	.036	-.650	.185	-109	.252	.484	.400	.836	1000

CORRELATION MATRICS

1972-73

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Aggral. Productivity	1.000	.646	.836	.795	.055	-084	.035	.521	.416	.076	-508	-218	-053	.378	.304	.750	.347
2. Fertilisers Consumption	.646	1.000	.641	.414	.717	.390	.668	.236	.657	-005	.763	.200	.156	.738	435	.977	.654
3. Nos.of Tracters	.836	.641	1000	.541	.303	.155	.130	.386	.502	-153	.306	.311	.334	.441	-090	.671	.194
4. Irrigation	.795	.414	.541	1000	.061	-543	+360	-334	-131	-711	-148	-560	-489	-086	-564	.496	.539
5. Tube wells	.055	.717	.303	.61	1000	.313	.566	-279	.253	.329	.886	.497	.141	.382	.645	.578	.569
6. Coop.Credit Socities	-084	.390	.155	-543	.313	1000	.846	.319	.859	.623	.670	.697	.862	.863	.694	.318	-034
7. Coop.Credits.	.521	.668	.130	.360	.566	.846	1000	.106	.789	.596	.876	.490	.539	.880	.828	.617	.387
8. Coop.Non-Credit Soc.	.035	.236	.386	-334	-279	.379	.106	1000	.522	-292	-078	-160	.370	.512	-353	.293	.118
9. Banks	.416	.657	.502	-131	.253	.859	.789	.522	1000	.265	.605	.471	.704	.967	.652	.081	.479
10. Surfaced Rds.	.076	-005	-153	-711	-329	.623	.596	.292	-265	1000	.554	.715	.647	.334	.795	-067	.039
11. Nos.of Transformers	-.508	.763	.306	-148	.886	.670	.876	-078	.605	.554	1000	.610	.442	.724	.852	.677	.528
12. L.T.Lines	-218	.200	.311	-660	.497	.697	.490	-160	.471	.715	.610	1000	.812	.427	.617	.076	-.234
13. 11 KV lines	-053	.156	.334	-484	.141	.862	.539	.370	.704	.647	.442	.812	1000	.658	.533	.100	-222
14. Regulated Mkt.	.378	.738	.441	-086	.382	.863	.880	.512	.967	.334	.724	.427	.658	1000	.752	.723	.302
15. Agr. Subyards	.304	.435	-090	-564	.645	.694	.828	-353	.479	.795	.852	.617	.433	.572	1000	.349	.265
16. Fertiliser sale	.750	.977	.671	.496	.576	.318	.617	.293	.652	-067	.677	.076	.100	.723	.349	1000	.665
17. HYVS	.347	.654	.194	.539	.569	-034	.387	.118	.081	.039	.528	-.234	-.222	.302	.265	.665	1000

CORRELATION MATRIX

1982-83

	1	1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Agral.Productivity	1.000	.855	.345	.669	.682	-118	.706	-.478	.095	.207	.539	.549	.309	.274	.025	.502	.597
2. Fertiliser	.855	1.000	.549	.595	.596	-018	.923	- 069	.663	.037	.455	.446	.243	.453	.373	.761	.393
3. Nos.of Tractres	.345	.549	1.000	.682	.059	.147	.424	- 315	.254	-138	-083	-075	+239	.476	-179	.628	.448
4. Irrigation	.669	.595	.682	1.000	.075	-319	.471	- 596	-290	-459	-081	-038	-087	.097	-.506	.327	.105
5. Tube wells	.682	.596	.059	.075	1.000	.486	.348	- 093	.601	.777	.876	.955	.729	.480	.440	.399	.064
6. Coop Credit Socit.	-.118	-018	.147	-319	.486	1.000	.281	- 076	.864	.599	.353	.425	.451	.409	.246	.081	.162
7. Coop Credit	.706	.923	.424	.471	.348	.281	1.000	- 316	.183	.266	559	.298	.440	.630	.440	.876	.581
8. Coop Non Credit Socities	-.478	-069	-315	-596	-093	-076	-.316	1.000	-072	.238	.050	.089	.276	-103	.368	-138	.179
9. Banks	.095	.669	.254	-290	.601	.864	.183	- 072	1.000	.817	.638	.536	.691	.719	.606	.512	.549
10.Surfaced Rds.	.207	.037	-138	-459	.771	.599	.266	.238	.817	1.000	.891	.813	.833	.639	.853	.457	.455
11.Nos.of Transfarmers	.539	.455	-003	-081	.876	.353	.559	.050	.638	.891	1.000	.921	.888	.733	.787	.630	.429
12.L.T.Lines	.549	.446	-075	-038	.955	.425	.298	.089	.536	.813	.921	1.000	.815	.520	.558	.367	.111
13.11 KV Lines	.309	.243	.239	-087	.729	.451	.440	.276	.691	.833	.888	.815	1.000	.842	.773	.699	.629
14.Regulated Mkts.	.274	.453	.469	097	.480	.409	.630	-103	.719	.638	.733	.520	.842	1.000	.704	.813	.826
15.Agral.Subyards	.025	.273	-179	-.506	.440	.246	.440	.368	.606	.853	.787	.558	.773	.704	1.000	.585	.717
16.Fertiliser Sale	.502	.761	.628	.327	.399	.081	.876	-138	.512	.457	.630	.367	.699	.873	.585	1.000	.839
17.HYVS	.597	.393	.448	.105	.064	.162	.581	.179	.549	.455	.429	.111	.629	.826	.717	.839	1.000

It is found that agriculrutal productivity bears a strong correlation with each of the technological indicators including agricultural credit. It follows that improvements in agricultural infrastructure related with these inputs will greatly improve their availability to the farming community. It is, therefore, important to study the inter-linkages between infrastructural facilities to suggest area specific policies to overcome problem of low productivity in agriculture. The correlation matrices bring out that irrigation is found to be positively correlated with the number of tractors, tubewells and power. Fertiliser consumption is found to be pesitively correlated with irriga ion, number of tractors, tubewells, cooperative non-credit societies, number of banks, surfaced roads, power and marketing indicators especially the fertilizer sale counters. The high yielding variety seeds are found positively correlated with irrigation, the number of tractors, number of tubewells, cooperative credit societies, non-credit societies, banks, transport, power and marketing indicators. Similarly, agricultural credit is found to be positively correlated with irrigation, the number of tractors, tubewells, cooperative credit societies, banks, transport, power and indicators of marketing infrastructure.

Each of these matrices also bring out the fact that these technological inputs and also agricultural

credit are found to have high degree of complementarity i.e. bear very strong correlation among themselves. It turns out that most of the indicators of agricultural infrastructure are found to have positive correlation with at least one or most of the technological inputs, therefore, a lack of infrastructural facility under any head may prove to be a bottleneck in infrastructure and impair improvements in agricultural yield. While, irrigation infrastructure bears a positive coorelation with some of the indicators of mechanisation and the correlation is found to be significant at 10 per cent level of confidence, excepting in 1972-73, it bears a positive c correlation only with the indicators of power but the correlation between them turns out to be insignificant even at 10 per cent level of confidence.

The power indicators are found to be strongly correlated with the number of tubewells, banks, and indicators of marketing infrastructure. Trahsport infrastructure as indicated by the length of surfaced roads is found to have significant correlation with the number of tubewells, cooperative credit societies, banks and indicators of power and marketing infrastructure. Similarly, the marketing infrastructural indicators are found to be strongly correlated with banks, transport and power indicators. The cooperative infrastructural indicators are found to be strongly correlated with banks and transport.

The banking institutions are found to be strongly and significantly correlated with most of the indicators of mechanisation, cooperative credit societies, cooperative non-credit societies, transport and indicators of power and marketing infrastructure. The indicators of mechanisation are found to have strong coorelation with irrigation, banks, transport, power and most of the indicators of marketing infrastructure.

Significantly enough, it is also found that cooperative credit, fertilizer and high yielding variety seeds are used relatively more in areas which enjoyed relatively higher irrigation larger size of land holdings and cropping pattern which needed more irrigation. The important combination of infrastructure which emerges, therefore, is that of irrigation, banks, power, marketing and transport, irrigation being most important to attract more technological inputs in agriculture.

CHAPTER - V

SUMMARY AND CONCLUSIONS

Main thrust in the present study was to evaluate the importance of infrastructure in agricultural development, study the spatial dimensions in its distribution over time and to study inter-linkages in agricultural infrastructural facilities given under various heads.

The first three hypotheses were directed to test the contention of its importance in agricultural development. It is found that agricultural infrastructure is a necessary condition but does not produce development by itself i.e it is not found to be a siffucient condition for agriculture to develop. The first of these hypotheses that the areas which had relatively higher agricultural productivity also had enjoyed more agricultural facilities is found valid only high productivity districts. Low productivity districts and region, on the other hand, are also found to have enjoyed relatively better infrastructural facilities excepting irrigation as compared to medium productivity districts and retion. It, therefore, implies that there are some other factors also along with infrastructural facilities which play an important role inthe determination of agricultural development as indicated by agricultural productivity in the present study. Hence,

agricultural infrastructure is a necessary but not a sufficient condition for development in agriculture.

The second of these hypotheses is also directed to evaluate the role of infrastructure in the determination of productivity level, which is dealt within Chapters III and IV respectively, It brings out that provision of more agricultural infrastructural facilities leads to an increase in productivity levels in all the districts and delineated productivity regions and particularly in those districts and regions which are found to have favourable physiographic setting, climatic conditions, pattern of rainfall, soil types and large sized land holdings.

The third hypotheses brings out the importance of agricultural infrastructure, in terms of its growth, in the determination of agricultural productivity growth, which is dealt with in Chapter IV. It is found that infrastructural facilities are found to have grown relatively more sharply in relatively higher productivity regions and its districts excepting few stray cases. It, further, brings out that growth in most of these infrastructural facilities is found to be the most sharp between 1966-67 and 1972-73. Consequently, therefore, area under crops, agricultural productivity and value of agricutural output (at constant prices) grew at a relatively higher annual compound rates in the said

period as compared to in the latter period, in most of the districts and delineated productitity regions. Although agricultural infrastructural facilities grew in all the districts and productivity regions if grew relatively more in high and medium productivity districts and regions. However, third hypothesis is supported and found valid in high and medium productivity districts and regions, as a relatively sharp growth in agricultural infrastructural facilities coincided with a sharp growth in productivity between 1966-67 and 1972-73.

The fourth and fifth hypotheses are related with disparities in the distribution of agricultural infrastructural facilities and its impact on agricultural development as indicated by agricultural productivity, which have been dealt with in Chapter III. It is found that disparities in the distribution of agricultural infrastructural facilities tended to result in inequalities in the agricultural productivity among differrnt areas and a decline in disparities in its distribution tended to narrow down inequalities in agricultural productivity amongst the districts and delineated productivity regions. These hypotheses are supported and found to be valid in the present study.

The sixth hypothesis is related with the measurement of disparities at the district and at the level of delineated productivity regions, respectively. Chapter IV

of the present study brings out that disparities in the distribution of agricultural infrastructural facilities are found to be relatively more acute at the district level.than at the level of delineated productivity regions. The hypothesis is supported and found to be valid in the present study. Chapter IV further, revealed that technological inputs in agriculture such as irrigation, fertilizers consumption, high yielding variety seeds and agricultural credit are found to have high degree of complementary among themselves. i.e. found to have strongly correlated with each other. These technological inputs are found to have strong correlation with agricultural productivity and cropping intensity, respectively, in each of the time period. The infrastructural indicators which were found to have strong correlation among themselves were irrigation, power, transportation, banking and marketing. Most of these infrastructural indicators are also found to be strongly correlated with the technological inputs.

Infrastructure being a necessary condition for development of agricultural sector has to be strengthened in all the districts and delineated productivity regions. However, low and medium productivity districts as well as these delineated productivity regions turn out to be problem areas, in the present study.

Whereas low productivity districts and region are found to have enjoyed relatively higher physical infrastructural facilities excepting irrigation, medium productivity districts and region are found to have relatively poor physical infrastructure excepting irrigation. Whereas, physiographical attributes and setting, climatic conditions, rainfall, soil types and average size of land holdings favour medium productivity districts and region these factors are found to be unfavourable to low productivity districts and region. Whereas, relatively lower provision of physical infrastructural facilities are in a position to supply the medium productivity districts and region with relatively more technological inputs in the form of fertilizers, high yielding variety seeds and agricultural credit along with high irrigation, low productivity districts and region is poorly supplied with these technological inputs.

These different characteristics of these problem areas suggest that a uniform policy with regard to the provision of agricultural infrastructure will not be effective in solving the problems of agricultural under development of these respective regions.

Moreover, the distribution of number of tractors, number of tube wells, fertilizers consumption, use of high yielding variety seeds and agricultural credit in different districts of the state makes it abundantly clear

that the farmers of these respective areas are more or less equally responsive to adopt modern, practices in agriculture.

SUGGESTIONS

Low Productivity Region

Low productivity retion is the most important among the problem areas in the state. Not only that physiographical setting of the region is unfavourable it is characterised by poor soil fertility, low irrigation, deficient rainfall and average smallsize of hand holdings along with high density of population, among other things What has, in fact, been found to be happening in this region is that the crucial technological inputs in agriculture are not forthcoming in required quantities which can accelerate the pace of development in agriculture. As these technological inputs are found to have strong correlation among themselves, therefore, irrigation and supplies of these inputs needed to be strengthened.

However, because of rugged and rocky topographical characteristics of the region a well laid canal infrastructure is both costly as well as difficult ito pursue as a blanket measure to strengthen irrigation, selected plain areas in the eastern parts of Aravalli range can be provided with a good canal irrigation without any major cost involved in it. Since, ground water recharge

available for further expliitation is found in some of the pockers of Aravali range and in most parts of the plain areas digging of tubewell should be given top priority to make good of deficient major irrigation infrastructure in the region.

Although, irrigation infrastructure is badly needed to be strengthened in this problem area so that other technological inputs are used extensively in the region, crops should be promoted which calls for lower irrigation and give relatively better economic returns to the farmers. In view of physiographical characteristics of the region animal husbandry is required to be promoted in a big way which would not only supplement the lower level of farm incomes of the farmers but also generate gainful employment for the people of the region. Therefore, paultry farming, fisheries, piggary and dairy farming should be given special attention.

Since, average size of land holding is found to be lowest in this retion as compared to other regions in the state it refelcts the pressure on cultivable land area. Therefore, area specific cropping patterns suited most from the view point of future potentialities are to be evolved and promoted so that its fertility is not depleted. Special progra mmes to promote agro-small and cottege industries is called for to ease the pressure on land and to combate the problem of poverty in the region.

Medium Productivity Region

Medium productivity districts and region is relatively better placed in terms of physiographic attributes and setting, rainfall, irrigation infrastructure, climatic conditions (excepting south western parts), soil types, averages size land holding and also in terms of supplies of technological inputs in agriculture as compared to low productivity districts and region. In fact, actual preference of this region is still lower than the potentialities that exists in it. Therefore, agricultural infrastructure should be strengthened particularly of marketing, banks, transport, power and veterinary health so that potential that exist in this region is fully utilised. Since, some of the areas in south-western parts of the region are dry land areas with deficient rainfall and soil poor in fertility, therefore, irrigation infrastructure and veterinary health facilities should be strengthened on an urgent basis.

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