FACTORS INFLUENCING LAND CONCENTRATION : A CASE STUDY OF EASTERN UTTAR PRADESH

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Certified that the dissertation entitled "Factors Influencing Land Concentration : A Case Study of Eastern Uttar Pradesh" submitted by Hridai Ram Yadav for the degree of Master of Philosophy is a bonafide work to the best of our knowledge and may be placed before the examiners for their consideration.

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CHAPTER - I

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 The primary activity of agriculture continues to dominate Indian economic scene, where nearly seventy percent of the work force are engaged in extracting food for remaining masses. In India, the agriculture in its distribution and production to a larger extent is at the mercy of the nature associated with economic and sociological factors. The word nature includes a broad gamet of factors like - the quality and quantity of land, climate and vegetation. Various attempts have been made by various Indian Economists and geographers to focus the attention on the impact of these factors over the spatial and temporal variations of agriculture, with particular reference to productivity. Surprisingly no attention has been paid to the quantity of the land and it's impact on agricultural productivity neither there have been any studies regarding the conditions responsible for the uneven concentration of the land. Though the quality of land in terms of its overall fertility is undoubtedly an important parameter influencing agriculture but the quantity of the land in terms of its availability too can have a major impact on agricultural production.

It has been one of our endeavours to assess whether or not the inequalities in the distribution of land ownership induce malnourishment. For this purpose, gini ratios of concentration of land ownership for 1971 were calculated for groups of districts of the selected region. The gini concentration ratios of land ownership occur both in the highest and in the levels of medium productivity on the other hand, lowest inequality in land ownership emerges in both high level of agricultural productivity and lowest level of agricultural productivity. There is hardly any statistical relationship between the two. The study done by Ashok Mitra[1] reveals that the unjust land distribution owes its success to the fact that all the major agricultural investments and inputs (like fertilizers, tractors, pump sets, irrigation channels) are usurped by big land holdings; this helps to maintain a high level of agricultural productivity despite inequality in land ownership pattern. Rather it strengthens the forces of social injustic with a concentration of land ownership and productivity in a few hands. On the other hand high inequality in land ownership is coupled with very low agricultural productivity per hectare. This may mean that very little of agricultural investments and inputs really have gone into this category.

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1. Ashok Mitra & S. Mukherji - Population Food & Land Inequality in India - 1971, An ICSSR/JNU/FPP Study Allied Publishers Pvt. Ltd. New Delhi-1980.

Even the bigger land owners do not have adequate access to them. Production is low and fragmentation of holdings continues unabated. Rasa is of the opinion that " the process of agricultural development in India, is essentially a function of differential doses of technological inputs interacting with environmental constraints of varying severity under the inbibiting influence of institutionnal factors of different intensities where all these three operate together positively i.e. where institutions are less restrictive, environment more permissive and technological inputs high it becomes possible to loosen the grip of inherited underdevelopment and a limited break through is achieved in regional agriculture where the three mark together negatively i.e. where the institutions are highly inhibitive, environment severe and technological inputs small - regional agriculture is unable to go beyond stage of sub marginal subsistance where three operate in different directions or in the same direction with different degrees of intensity, region agriculture plods along at an unsatisfactory pace."[1]

In agricultural sector of economy man interacts with nature and primary activities are relatively stronger, technological intervention in this sector is weaker and the institutions are rooted in heavy traditions of great chronological depth.

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1. Rasa Moonis, "Levels of Regional Development in India, A Paper Presented at Indo Soviet Symposium on Regional Development and National Planning, Tibilisi - Baku, (mimeo) Oct. 1978, P.19.

Thus among these triangular forces in the institution, the quantity of land i.e. unequal distribution of the land ownership or the land concentration may have stronger impact on land productivity. It may however be noted that the operation of triangle forces is variant both spatially and temporally. It is the strength of these forces, relative to each other, which in the final analysis, determines the land concentration at a particular point of time and space. The tringular forces explained by Raza have been followed in this study seeing its impact on land concentration in which technology and nature has been taken as it is but the forces of man is sub divided -

a. Economic
b. Social
c. Institutional

Thus in place of triangular forces, in this study, pentagonal forces have been (viewed) taken to see the variation of land concentration at a particular point of time and space. The present work is an endeavour to analyse the operation of these pentagonal forces, on land concentration, in an enviornmentally diverse districts of the selected region.

1.2 Literature Survey:

The detailed literature survey conducted for this theme of the research, it is found out that the studies which are directly related to the land concentration are very scant except for a few studies by Ashok Mitra[1] and Bhalla[2]. But the other theme of the land productivity has attracted a wider attention and the studies are ennumerous which pertain to all aspects of land productivity, with more stress on factors influencing land productivity. It is strange that though numerous factors have been worked out but the land concentration which may prove significant directly or indirectly over productivity has not still been brought into lime light. It is felt that the concentration of land holdings too can have an impact on land productivity. In the following pages a brief account of the work done on the factors influencing land productivity is discussed which may not entirely be centred round the concentration of holdings or the theme of this research but can give an idea of possible direction to analyse the factors that have an impact over land concentration in the discussion of chapters ahead.

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1. Mitra Ashok & Mukherjee S. - "Population, Food and Land Inequality in India 1981," A geography of Hunger and insecurity, ICSSR/JNU New Delhi 1980.

2. Bhalla G.S. & Chadha G.K. - "Structural and Institutional set up of Rural Punjab in the year 2000, A occassional Paper submitted to CSRD/SSS, JNU. New Delhi.

Agricultural productivity is defined as the ratio of output to input in relation to land, labour, capital and overall resources employed in agriculture.

The crop productivity is a function of physical (relief, altitute, climate and soil) and socio-economic factors (size of operational holdings, tennncy system, occupationnl structure of the population and type of farming and technological organisations, crop rotation, irrigation, use of manmures, fertilisers and mechanisation) which are highly variable and dynamic in nature.

The physical factors are static in nature and play a very important role. It is more so in developing countries where mechanisation of agriculture has not yet taken place to a measurable extent. These factors explain more than three fourths of the total variation on the dependent variable.

Subbiah and Ahmad[1] have studied the social factors such as caste, religion, tennncy system, size of holdings pópulation density, labour which have direct and indirect bearing on land productivity. This study reveals that the environmental, institutionnl and technological factors are the determinants of agriculture and have concluded that the technological inputs determine the land productivity variations.

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1. Subbiah S. & Ahmad A. - Determinants of Agricultural Productivity in Tamil Nadu in India, Transaction of Institute of Indian geographers, No.1, Vol.II, PP. 19-32.

Rana[1] has built an analytical framework viz. regional structure of underdevelopment established by the imperialist power to meet the requirements of its exploitative mechanism during the colonial period in way of essential characteristics, although may positive modifications have been introduced within it, since independence. Based on this he has developed a model of regional structure of modified development.

The work done by Mohammad[2] reveals that agricultural productivity is not a natural phenomena but is a product of human ingenuity which is reflected in individual subjectivity performed in selecting the criteria in determining the agricultural productivity of the region.

The physical factors which are comparatively static play a major role in determining the agricultural productivity of an area. Several imperial studies have proved that environmental factors provide a base and determine the agricultural productivity.

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1. Rana Moonis, "Regional Disparities in India, A preliminary exploration of the Regional Dimension of Agricultural Development Pub. in Perspectives in Agricultural geography ed. by Noor Mohammad 1980.
2. Mohammad N. & Singh R. - "Measurement of Crop Productivity - A Review, Published in Perspectives in Agricultural geography ed. by Noor Mohammad 1980.

The work done by Dandekar[1] reveals that the environmental factors impose constraints on increasing the level of agricultural productivity which man attempts to remove to the extent of competence by adopting a package of technology. Immigration, fertilizers, high yielding variety of seeds, corporation and mechanisation are some of them.

The Study of Burdhan[2] reveals that the size of holdings, tenancy system, agricultural credit, market structure, cropping pattern, type of farming, density of population, supply of labour etc. play an equally important role. But certain other techno-economic inputs employed by social group will largely depend on the social and institutional frame.

Mohammad has explained that the social institution may reduce the agricultural productivity by being inhibitive to the adoption of technology or may increase it by adopting available techno-economic package. Thus the institutional factors like caste religion, social

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1. Dandekar V.M. - Regional Variations in Agricultural Development & Productivity, Indian Journal of Agricultural Economics, Vol. 19, 1964, PP. 253-60.
2. Burdhan P.K. - Labour Absorption in Indian Agriculture Some Explanatory Investigations PP. 1-32, 1978.
3. Mohammad N. - Impact of Economic Factors on Diffusion of Agricultural Innovations in Trans Ghaghra Plain geographical Review of India, Calcutta 1978.

values and norms of education training etc. are also determinnnt of agricultural productivity.

Rasa[1] is of the opinion that the process of agricultural development in India is essentially a function of differential dose of technological inputs interacting with environmental constraints of varying severity under the inhibiting influences of institutional factors of different intensities.

Bhalla's[2] work on levels and growth rate of productivity reveals the technological factors of irrigation, tractorisation, high yielding variety of seeds and fertilizer to explain the differential level and the growth rates in productivity. He admits that the decomposition exercise has yet best given only an indication of the relative importance of included components and it fails to grow much ligh on the causes of growth.

Analysing the trends in agricultural growth, in the country as a whole and in the different states Rao[3] has emphasized on technological and institutionnl factors

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1. Rasa Moonis - "Levels of Regional Development in India A Paper Presented in Indo Soviet Symposium on Regional Development & National Planning.
2. Tiblisi-Baku (mimeo) Oct. 1978, P.19.
2. Bhalla G.S. & Alagh Y.K. - Performance of Indian Agriculture A District wise Study, Sterling Publishers, New Delhi 1979.
3. Rao C.H.H., "Technological changes & Distribution of gains in Agriculture," Macmillan, India 1975.

but environmental factors have been almost completely ignored.

Hopper[1] has emphasized that the traditional inputs like the combination of land, labour, animal power, irrigation and biological processes are the main factors responsible for agricultural productivity and growth rate. He has paid less attention to institutional aspects.

Rao[2] has emphasized that the productivity is basically controlled by natural factors like good quality of soils, timely rainfall and smooth surfaces.

Among the various studies done by the various scholars like Masumdar[3], Masumdar[4], Sen[5], Khusro[6]

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1. Hopper W.D. - "The main springs of Agricultural growth prepared to - Dr. Rajendra Prasad memorial lecture to the 18th Annual Conference of the Indian Society of Agricultural Statistics Jan. 28-30, 1965.
2. Rao V.K.R.V. "Agricultural Production and Productivity During the Plan periods : A Review of the past and some reflections on the future" Indian Journal of Indian Economics Jan-March 1962, No.1 Vol.XVII.
3. Masumdar A.N. - "Economic Analysis of Farm Management Data in cost studies in Indian Agriculture," Indian Society of Agricultural Economics, Bombay 1961.
4. Masumdar D, "Size of Farm & Productivity - A Problem of Indian Peasant Agriculture" Economic, Vol.32, 1965.
5. Sen A.K., "Size of holdings & Productivity" The Economic Weekly, Annual Number, Feb. 1974.
6. Khusro A.M. - "Returns to scale in Indian Agriculture" Indian Journal of Agricultural Economics, July-Dec.1964.

Rao[1], Rao[2] and Bhardwaj Krishna[3] have focussed attention on the institutional factor of farm size in relation to productivity. They are of the opinion that there is by and large an inverse relationship between farm size and productivity.

Vidya Sagar[4] has analysed the growth of agricultural production in Rajasthan in terms of Area, level of productivity and prices. For the analysis of growth of aggregate farm output, a general model was developed where in external movements i.e. change in the gross cropped area, in the level of productivity and in general level of prices where included along with the internal adjustment of these factors.

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1. Rao A.P. - "Size of Holdings & Productivity" Economics & Political Weekly, No.11, 1967.
2. Rao C.H.H. - "Alternative Explanations of inverse relationship between Farm size and output per acre in India" The Indian Economics Review 1 (New Series) Oct. 1966.
3. Bhardwaj Krishna - "Production conditions in Indian Agriculture, Cambridge University Press 1974.
4. Vidhya Sagar, "Component Analysis of the growth of Productivity and Production in Rajasthan 1956-61 to 1961-64". Indian Journal of Agricultural Economics, Vol. XXXII, No.1, Jan-March 1977, PP. 108-19.

Gagli & Shah[1] have worked out the growth rate of agriculture in Haryana. They have highlighted the role of inputs like high yielding variety of seeds, assured means of irrigation use of tractors and other agricultural implements. They have emphasised the par played by wind erosion, soil erosion, sand-dunes and water logging. Institutionnal factors however have been ignored.

Srinivasan[2] has explained agricultural productivity and growth rate for food crops and non food crops where he has emphasised that the growth rate for all crops was more or less uniform over the entire period 1949-51 to 1967-68. He has drawn attention to the factors responsible for these different trends in the two. Rudra[3] and Vadyanathan[4] have also analysed these trends.

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1. Gagli V. & Shah N., "Haryana green Revolution Brings Prosperity" Commerce Annual No.1, 1972, 25, P.65
2. Srinivasan T.N., "Constraints on growth and Policy options Reply by - A. Vaidynathan - Economic & Political Weekly Dec. 17, 1977, Vol. XII No.51, P.2105.
3. Rudra A., "Organization of Agriculture for Rural Development - The India Case," Cambridge Journal of Economics, Dec. 1978.
4. Vaidyanathan A., "Constraints on growth & Policy Options" Reply - Economic & Political weekly, Dec. 17, 1977.

Sen[1] has proved that farm productivity and soil fertility are correlated to each other.

Dharam[2] Narayan has shown that while in the period 1952-53 to 1960-61, the growth of productivity took place within the frame work of traditional technology, the use of fertilizer and high yielding variety of seeds became sizable during the period 1961-62 to 1972-73.

Chakrovarti & Rudra[3] have supported that there is an inverse relationship between farm size and productivity. A survey of this work is available in Bhagwati and Chakravarti[4] Ashok Rudra[5] emphatically contended that although the inverse relationship did operate in some areas, it could not be accepted as a role for Indian agriculture. Bhattacharya and Saini[6]

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1. Sen S., "Farm Productivity and Soil Fertility in Indian Agriculture", Indian Journal of Indian Economics April-June 1967, P.70.
2. Dharam Narayan, "Growth of Productivity in Indian Agriculture." Indian Journal of Agricultural Economics, Vol. XXXII No.1, Jan-March, 1977, P.1-45.
3. Chakravarti A. & Rudra A., "Economic Effects of Tenancy: Some Negative results." Economic & Political Weekly July 21, 1973.
4. Bhagwati J.N. & Chakravarti S., "Contribution to Indian Economic Analysis : A survey," Lalwani Publishing House 1971.
5. Rudra Ashok, "Farm size & yield Per Acre." Economic & Political Weekly, June 24, 1969.
6. Bhattacharya N. Saini G.R., "Farm Size and Productivity: A Fresh Look "Economic & Political Weekly June 24,1969.

and Usha Rani[1] added additional evidence in favour of the inverse relationship. The other latest addition to such studies is that of Chadha[2].

Nature with all its diversities in its physical characteristics relief, climate, soil, drainage and natural vegetation provides a host of differences on earth surface and man with his prevailing level of technological advancement have availed these opportunities. However in all economic activities agriculture is probably one on which the phenomenal environment empings most. Harjit Singh[3] has examined that human response towards nature is generally region specific depending upon the resource base the nature of natural constraints and that of technology available. He has divided Ladakh region into two parts on the basis of human responses to inclement environment as pastoral area of Changthang and agricultural area in river valleys. He has critically studied with the support of the empirical data the impact of relief -

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1. Usha Rani, "Size of Farm and Productivity". Economic & Political Weekly, Review of agriculture June 26, 1971.
2. Chadha G.K., "Tenancy system & Agricultural Productivity A case Study of Punjab (India)". Social Science Research Journal Vol.I, July-Dec.1976.
3. Singh Harjit, "Environmental Constraints on Agricultu e in a cold Desert : A Case Study of Ladakh, Pub. in Perspectives in Agricultural geography ed. by Noor Mohammad, Vol. II 1980.

altitude, slope and other aspects and climate temperature and other associated phenomena.

Many scholars from various disciplines have evolved techniques to regionalise agricultural productivity and applied them at the macro, meso and micro levels. Stamp[1] referred to three methods of measuring agricultural efficiency as indicated by output per unit area in terms of output of labour i.e. per man hour through the input-output ratio and the profitability of farming measured in terms of return for the sum total of human efforts. Shafi[2] brought out the importance of modern technological inputs but has ignored the institutional factors. He modified the ranking co-efficient method by taking the weightage average of ranks. Bhatia[3] evolved the yield efficiency index weighted by the share of crops for the component a real unit in relation to entire study area.

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1. Stamp L.D. "The Measurement of Land Resources, Geographical Review. Vol.48, No.1, 1958, PP.7.
2. Shafi M., "Measurement of Agricultural Efficiency in U.P." economic geography, No.XXXVI No.4, 1960, P 296.
3. Bhatia S.S., "A New Measurement in Agricultural Efficiency in Uttar Pradesh India, Economic geography Vol. 43,No. 3, P.244.

Masid Hussain[1] has described the general distribution of productivity but has not attempted to build up explanatory system. Singh[2] has evolved a comprehensive system to explain variation in the agricultural productivity. He has emphasised that imbalances in productivity area as function of not only one set of constraints but arise out of the combined effect of environmental, technological and institutional factors. He has tried to show the causal relationship between productivity and various parameters. Singh's[3] work may be considered to be the first comprehensive work analysing the operation of triangle forces suggested by Raza in explanation of variations in the levels and growth rates of agricultural productivity. Govind[4] emphasises that yield per hectare is a function of many factor inputs. She has touched upon all the three sets

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1. Masid Hussain, "Agricultural Productivity in India, An Explanatory Analysis, "The National geographical Journal of India, Vol.XXII, Part 3-4, Sept.-Dec. 1976, P.114.
2. Singh Jasbir, "A New Techniques of Measuring agricultural Efficiency in Haryana India, Indian Journal of Agricultural Economics Vol.XXII, No.1, Jan.-March, 1967, P.14.
3. Singh Jasbir, "An Agricultural Atlas of India", Vishal Pub. Kurukshetra, 1974.
4. Govind Nalini, "Variations in wheat and rice Responses - A Study of variations in their production and Productivity in Punjab and Haryana." Occassional Paper No.4, (misco) centre for the Study of Regional Development Jawaharlal Nehru University New Delhi Dec. 1977, P.5.

of factors controlling productivity, while factors like irrigation, availability of human labour and agricultural practices can be controlled by the farmers others like soils and weather are beyond the control of the agriculturist.even though they effect productivity to a great extent. The work of Sharma[1], Dharam Narayan[2] and Surinder Singh[3] is also on the yield per hectare function of many factor inputs and the factor controlling productivity. Nangia, Qureshi and Gogia[4] have presented a report based on field survey conducted in a village of Pataudi Tehsil of Gurgaon district. They have sought to

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1. Sharma J.S., "Measurement of Agricultural Productivity" The Journal of Indian Society of Agricultural Statistics Vol.17, No.2, 1965, P.253.
2. Dharam Narayan, "Growth of Productivity in Indian Agriculture" Indian Journal of Agricultural Economics, Vol.XXXII, No.1, Jan-March 1977, P.14.
3. Singh Surinder & Chauhan V.S., "Measurement of Agricultural Productivity A Case Study of U.P. India, Geographical Review of India Vol.39, Sept.1977, No.3, P.122.
4. Sudesh Nangia, M.N. Qureshi & Ashok Gogia, "Variations in Field Productivity - A Case Study of Khandewala, Haryana (simco) Occasional Paper No.7, CSRO/SSS JNU New Delhi 1977, P.15.

establish the relationship of field capacity with the environmental, technological and institutional factors individually as well as in sets. Kanchan Singh[1] has chosen a number of variables - i) environmental(ii) technological (iii) institutional (iv) the interaction of these three set of factors to explain input output rates. He has shown that rainfall alone explains 52% of variations in productivity and combined with irrigation, fertiliser, tractors and high yielding variety of seeds explains 68% of these variations.

Bharadwaj[2] has explained the components and determinants of agricultural productivity taking different parameters like environmental, institutional and technological which are rooted in a defined analytical frame and which permit a final synthesisation of all the determinants in a complex system of interdependencies. This survey has brought out some of the major works with an undirectional approach i.e. factors, levels of growth and productivity but a couple of studies have also been done on the size OF holdings and its impact on productivity.

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1. Kanchan Singh, "Factors determining Agricultural Productivity in Rajasthan," Geographical Observer, Vol.15, 1979, P.36.

2. Bharadwaj B.K., "Components & Determinants of Agricultural Productivity - A case Study of Gurgaon District," A Dissertation submitted toCSRO/SSS J.N.U. New Delhi 30th June 1981.

The broad survey of literature indicates that inspite of its voluminous character there are serious inadequacies in the studies pertaining to levels and growth rates of agricultural productivity in India. The above discussed studies may be identified as follows:

1. Most of these are not rooted in a defined analytical frame and tend to become purely empirical exercise.
2. They have been by and large tended to either completely ignore or under estimate the role of environmental factors.
3. The institutional factors have generally not been given the importance that they deserve.
4. More work has been done on the land uses and land productivity but no attention has been paid to analyse the concentration of the land.

Considering the above drawbacks an attempt has been made in the present study to focus attention on the size of holdings and factors influencing the variations in land concentration but it has to be admitted that no attempt has been made to relate this aspect with land productivity. The main attention has been given only to the factors responsible for the uneven concentration of land holdings. Still more work

is needed to be undertaken to correlate the land holdings with productivity on a much more broad frame work.

1.3 Objective of the Study:

The objective of this study is to contribute and sharpen our understanding about the variation of land concentration view a view that it may have some impact on land productivity at the meso level of Eastern Uttar Pradesh. To achieve the above objective the present study is carried on the following lines:

1. Identification of land inqqualities and its intra regional variations.
   a) by Lorens Curve
   b) by ginis co-efficient Ratio
2. Formulation of an explanatory system in terms of the factors influencing land concentration by choosing pentagonal forces. These pentagonal forces are - physical, social, Economic, Institutional and Technological in which various variables have been chosen.

1.4 Choice of the Region:

In the present study Eastern Uttar Pradesh is chosen or considered a unit of study as it provides an ideal base on which analysis can broadly be correlated.

The values of land concentration, so obtained range from a value of 0.52 in Jaunpur to 0.67 in Mirzapur district, thereby leading to a clear disparity in land holdings. It is necessary that the region should not only be market by a fairly high degree of disparities in environmental conditions i.e. its various parameters as drainage density, absolute relief, relative relief, stream frequency, slope and ruggedness number and climatic variables of it also. The variations in Social factor, institutional, economic and technological factors each parameters are varying from one district to another.

Thus due to high degree of intra regional disparities as well as diversities Eastern Uttar Pradesh may be considered to be quite suitable for this study which endeavours to analyse the determinants of land concentration. All these diversities within the region lead us to a precise and refined discussion in terms of spatial variations and vast millieu of explanatory variables.

1.5 Choice of the Time-Period:

In the present study of land concentration and its correlate 1971 has been chosen as the base year because of the availability of the data and the fresh data for year 1981 of this region is not yet available. The explanatory variables data has been collected for

different years as for instance agricultural growth rate was taken for 1962-65 to 1970-73 (Trienium average) and for the growth rate of Rural Population growth rate of male agricultural labourers data has been collected for 1961-1971. Rest of the independent variables data depend on 1971. Thus for the present study 1971 has been chosen as a base year.

1.6 Choice of the Indicators:

Explanatory system has been built for land concentration, adopting different types of factors viz. Physical, Social, Institutional, Economical and Technological. From those major parameters different types of variables are selected and are correlated with land concentration.

A. Physical Factors:

1. Drainage Density
2. Absolute Relief
3. Relative Relief
4. Stream Frequency
5. Slope
6. Soil Rating Index
7. Moisture Index
8. Humidity Index
9. Aridity Index
10. Rainfall
11. Ruggedness Number
12. Dissection Index

B. Social Factors:

1. Percentage of Agricultural workers to total workers.
2. Percentage of Agricultural labourers to total agricultural workers.
3. Percentage of cultivators to total agricultural workers.
4. Percentage of S.C. and S.C. Population to total Rural population.
5. Agricultural workers per Hectare.
6. Agricultural workers per number of household.
7. Growth Rate of Rural Population 1961-71.
8. Growth Rate of male cultivators 1961-71.
9. Growth Rate of agricultural labourers 1961-71.

C. Institutional Factors:

1. Cropping Intensity
2. Individual holdings to total holdings.
3. Area of individual holdings to total holdings area.
4. Percentage of cultivated Area to total cropped area.

5. Wholly owned and self operated household to total household.
6. Wholly owned and self operated household's area to total household's area.
7. Household's having less than 5 Hectares of land to total household.
8. Area of household having less than 5 Hectare of land to total household's Area.
9. Household's having above 5 Hectares of land to total household.
10. Area of household having above 5 Hectares of land to total household's area.
11. Growth Rate of Area in Hectares 1962-65 to 1970-73.

D. Economic Factors

1. Agriculturally growth Rate 1962-65 to 1970-73.
2. Agricultural Production Per Hectare in Rs.
3. Total Foodgrain production in average 1970-73 (tonnes).
4. Food Surplus and Food deficit 1971.
5. Output in lakhs (000,000) Rs.
6. Growth Rate of yield in Rs. 1961-71.
7. Growth Rate of output in Rs. 1961-71.
8. Output per Hectare in Rs.
9. Output per cultivator in Rs.

10. Output per labourers in Rs.
11. Output per NPK unit of fertilizer.
12. Output per household in Rs.

B. Technological Factors:

1. Net Irrigated Area to Net Sown Area.
2. Gross irrigated Area to Gross cropped Area.
3. Percentage of tubewells to net irrigated area.
4. Percentage of wells to net irrigated area.
5. Percentage of canals to net irrigated area.
6. Average NPK Fertilizer 1970-73.
7. Tractor per 100 Hectare.
8. Electric Pump per 100 Hectare.
9. Oil Engine per 100 Hectare.
10. Fertilizer Per Hectare in Kg.
11. Area of HYV of Rice crop.
12. Area of HYV of Wheat crop.
13. Use of Agricultural animals per Hectare.
14. Plough (iron/wooden) Per Hectare.

1.7 Data Base:

Primary data for the physical (relief & drainage) parameters has been collected from the various topo sheets belonging to this area on a scale of 1:250,000 Published by Survey of India. The number of toposheets pertaining to this area are 63 to 72. Rest of the physical, social, economic, institutional, and technological parameter's data has been collected from secondary sources which are as follows:

1. Agricultural census of Uttar Pradesh 1971.
2. Agricultural Statistics of Uttar Pradesh 1971.
3. Statistical Abstract of Uttar Pradesh 1971.
4. Rating of Soils of India - Shome K.B. & Ray Chaudhary S.P. IARI, F.N.I. 28th Sept. 1960 New Delhi.
5. Directorate of Agricultural Economics and Statistics Report on Agricultural Census 1970-71 Govt. of U.P. 1971.
6. Population, Food and Land Inequality in India 1971 Mitra A & Mukherjee S., A Geography of Hunger & Insecurity. An ICSSR/ JNU/FPF Study Allied Publishers New Delhi 1980.

7. Data Book on Renewable Resources in India Centre for the Study of Regional Development Jawahar Lal Nehru University New Delhi 1980.

1.8 Methodology:

Land concentration has been measured in two ways:-

1. Graphically (Lorenz Curve)
2. Statistically (Ginis Co-efficient Ratio)

1. Lorenz Curve:

Lorenz Curve was first expounded in 1905. It has long been used to measure the inequality in the distribution of wealth or income.

"Lorenz Curve is the method of measuring the concentration of wealth"[1]. It has also been used to depict the state of concentration of population and other geographic attributes.

It basically deals with the cumulative percentage distribution of two attributes as in this case like Area and Household at different points. The cumulative percentage of variables upto certain points are plotted on a graph against cumulative percentage of the other variable upto the same points.

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1. Quarterly Publication of the American Statistical Association I(70) 209-219 June 1905.

The different points so obtained are then joined by a smooth free hand curve. For a comparison, a diagonal line is also drawn joining the last point and origin showing the line of equal distributions. The deviations of any curve from this diagonal which is proposition to the level of inequality in the distribution of the one attribute in relation to other.

The district-wise total land of various size groups of holdings and Area is shown by the Lorenz Curve (Fig. No.1-4). The steps involved in preparation of Lorenz Curve are as follows:

Step I - Arranging the districts accroding to ascending or descending order of their percentage of Area and Households to total Area and to total households of the size group.

Step II - Percentage of area of each size group to the total Area of the district has been calculated.

Step III - Percentage of household of each size group to the total household of the district.

Step IV - Cumulative percentage is obtained in the step II and III such that the last cumulative % of each columns is 100.00.

Step V - Each of the values of cumulative percentage of Area are plotted on the x axis and the corresponding values of cumulative percentage of household are plotted on the y axis.

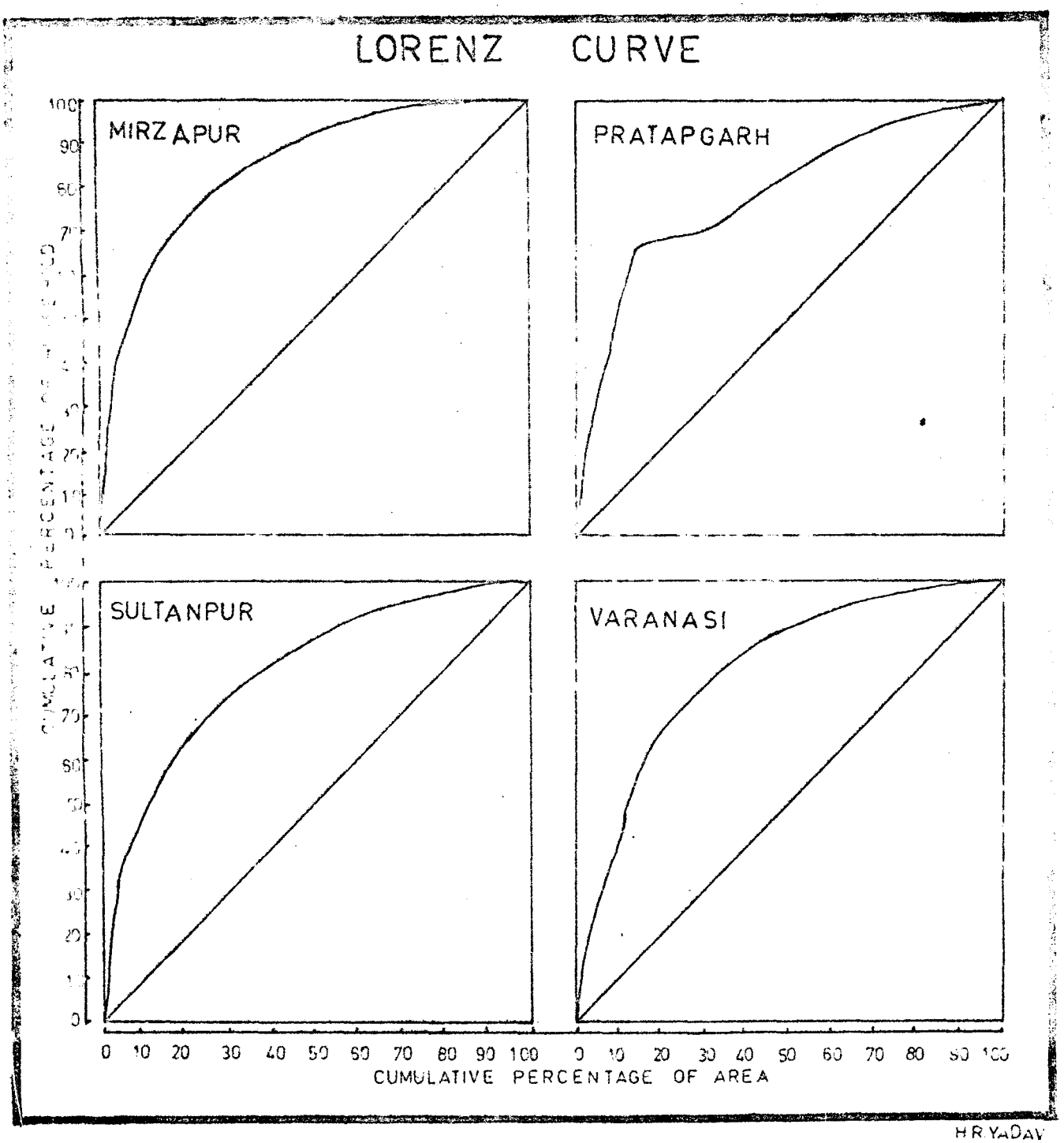
LORENZ CURVE
MIRZAPUR
PRATAPGARH
SULTANPUR
VARANASI
0 10 20 30 40 50 60 70 80 90 100
CUMULATIVE PERCENTAGE OF AREA
H.R.YADAV

FIG. NO. 4

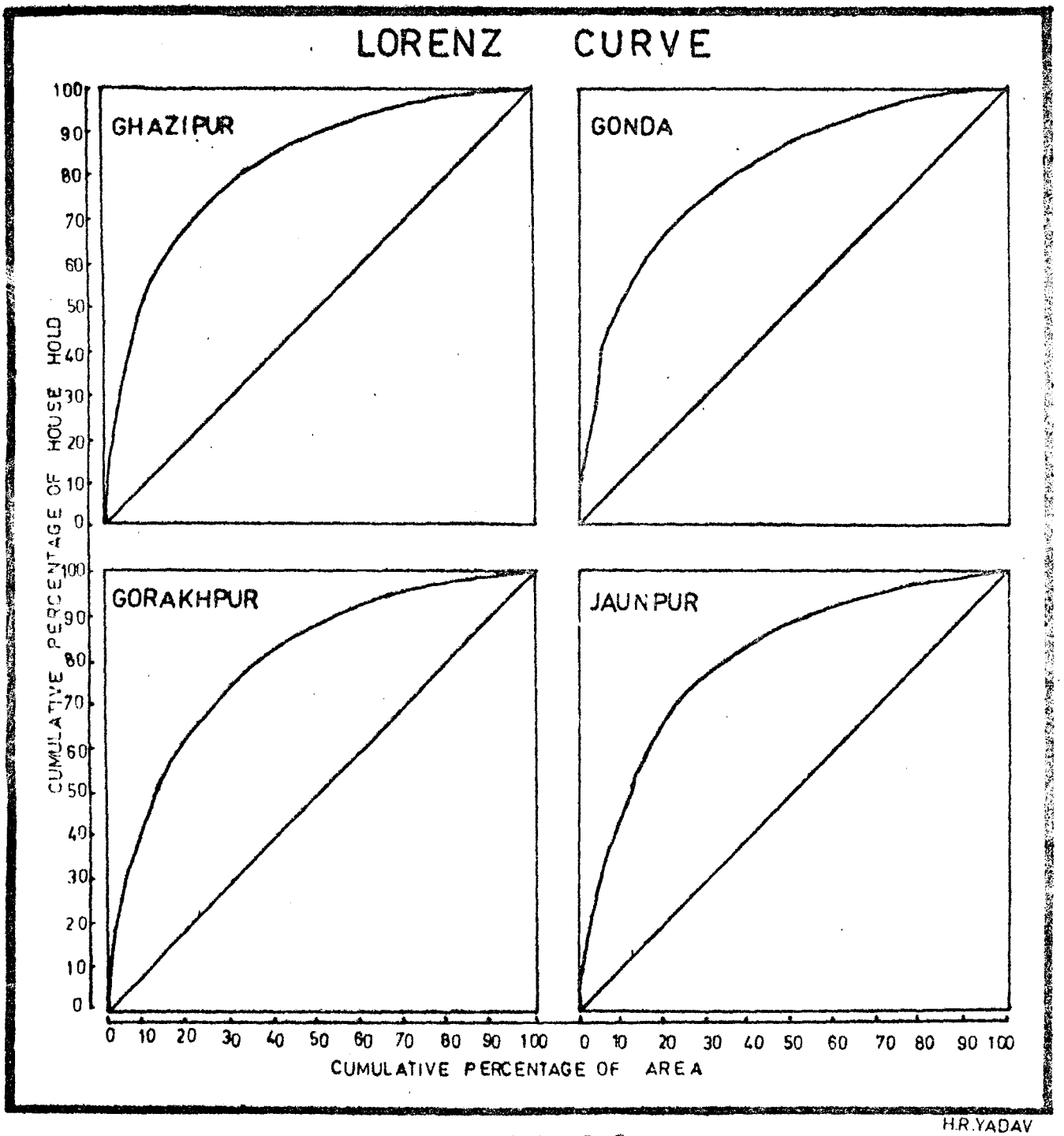
LORENZ CURVE
GHAZIPUR
GONDA
GORAKHPUR
JAUNPUR
CUMULATIVE PERCENTAGE OF HOUSE HOLD
CUMULATIVE PERCENTAGE OF AREA
0 10 20 30 40 50 60 70 80 90 100
H.R.YADAV

FIG. NO. 3

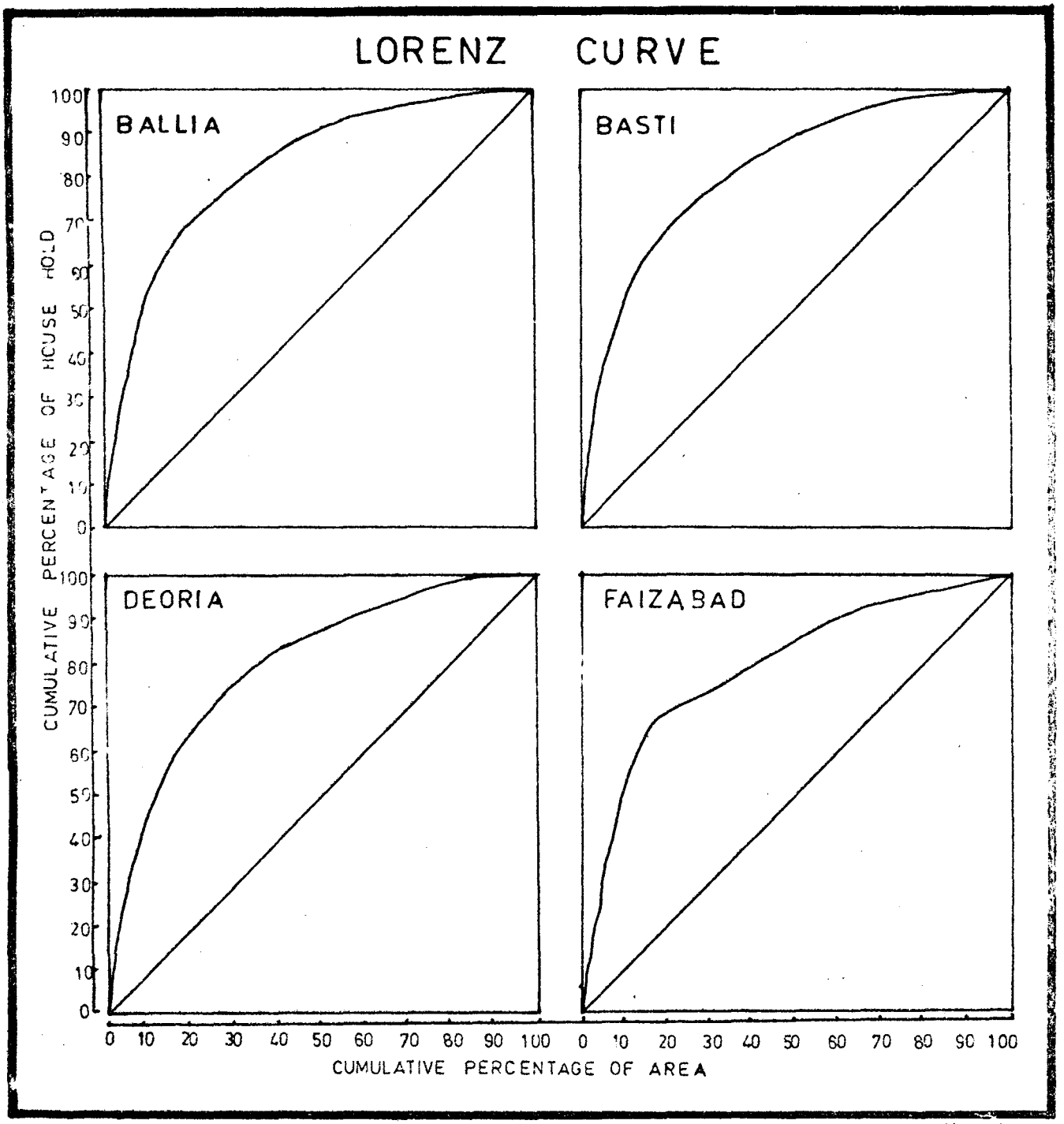
LORENZ CURVE
BALLIA
BASTI
DEORIA
FAIZABAD
CUMULATIVE PERCENTAGE OF HOUSE HOLD
CUMULATIVE PERCENTAGE OF AREA
0 10 20 30 40 50 60 70 80 90 100
H.R. YADAV

FIG. NO. 2

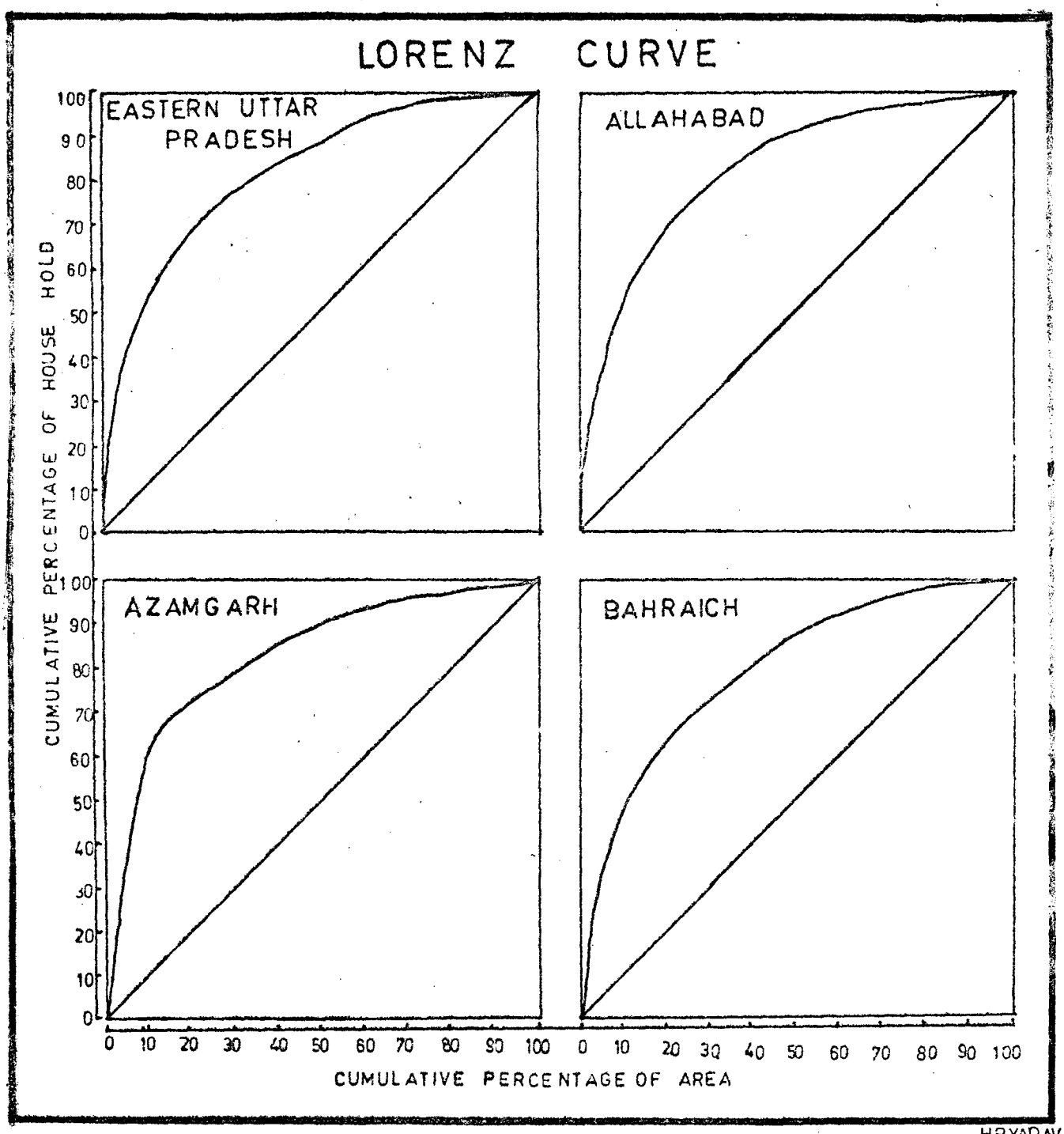
LORENZ CURVE
EASTERN UTTAR PRADESH
ALLAHABAD
AZAMGARH
BAHRAICH
CUMULATIVE PERCENTAGE OF HOUSE HOLD
CUMULATIVE PERCENTAGE OF AREA
0 10 20 30 40 50 60 70 80 90 100
H.R.YADAV

FIG. NO. 1

Step VI - The starting Point is joined with other points in succession till the last Point.

2. Ginis Co-efficient:

The overall concentration found in any such curve may also be measured numerically in terms of the ratio of the area under the curve and the line of equal distribution to the area of the triangle formed by the x axis and y axis and line of equal distribution. In the case of unequal distribution of land, the curve will not fall on the line and the area between the curve and line would be zero where as the area of the triangle would be $\frac{100 \times 100}{2} = 5000$. The ratio in this case would be $\frac{0}{5000} = 0$. In case of highest concentration i.e. when all land is concentrated within a few households, the curve will move along the y axis and then along the x axis, such that the area between the curve and line would be very close to the area of the triangle and the ratio would be nearly unity. This ratio hence varies between zero and one.

The ratio mentioned above is known as ginis co-efficient (G) and can be numerically worked out by following formula:

$$C = \frac{1}{100 \times 100} \sum_{i=1}^{n} X_i Y_{i+1} - \left(\sum X_i + Y_{i+1} \right)$$

Where Xi and Yi are the cumulative percentages of the two attributes (in the present case area and household). The Values Xi+Yi+1 are obtained by multiplying first element of the cumulative percentage of household with second element of cumulative percentage of area and so on to the other Values also. The values Xi+1 Yi are obtained by multiplying the first element of cumulative percentage of area with the second element of the cumulative percentage of household and so on to the other Values and summation of all the Values has been done.

A. Measurement of Physical Factors:-

The Physical Parameters have been calculated by using the following formulae:

1. Drainage Density = $\frac{\text{Total Stream length(miles)}}{\text{Total Area (sq.miles)}}$

2. Contour line or spot heights which have maximum height have been taken for identifying absolute relief.

3. Relative Relief = Maximum Height - Minimum height.

4. Stream Frequency = $\frac{\sum N}{A}$ = $\frac{\text{Total No. of Streams}}{\text{Area}}$

5. Slope = $\frac{\text{Average No. of contours cropping per mile x contour interval}}{5361 \text{ (constant)}}$

6. Soil Rating Index has been calculated adopting the storie index method and even the ripe data for Soil Rating Index have been collected from S.P. Ray Chaudhary's article - Rating of Soils of India.

7. Moisture Index, Aridity Index, Humidity Index and Rainfall data have been collected from the Renewable Resources in India by CSRO/SS JNU. New Delhi 1980.

8. Ruggedness Number = Drainage Density X $\frac{\text{Relative Relief}}{5280}$

9. Dissection Index = $\frac{\text{Relative Relief}}{\text{Absolute Relief}}$

B. Social Factors:

For the Social Variables Percentage has been calculated off the following Variables as follows:

1. Agricultural workers to total workers.
2. Cultivators to total agricultural workers.
3. Agricultural labourers to total agricultural workers.
4. S.C. & S.T. Population to total Rural Population.
5. Agricultural workers per hectare and agricultural workers per number of household has been calculated dividing by the area and household respectively.

6. Growth rate of rural population and growth rate of male cultivators and growth rate of agricultural labourers has been calculated adopting the formula:-

G.R. of Rural Population = $\frac{\text{Rural Population of } 1961\text{-}71}{1961}$

C. Institutional Factors:

The data for cropping Intensity and growth rate of area in hectares 1962-65 to 1970-73 has been collected from the sources mentioned in data base.

2. Percentage has been calculated for the following variables:

i. Individual holdings to total holdings.

ii. Individual holdings area to total holdings area.

iii. Cultivated Area to Net Cropped Area.

iv. Wholly owned & self operated holding to total holdings.

v. Wholly owned & self operated holdings area to total holdings area.

vi. Households having less than 5 Hectares of land to total households.

vii. Area of household having less than 5 Hectare of land to total household's area.

viii. Households having above 5 Hectares of land to total households.

ix. Area of households having above 5 hectares of land to total household's area.

D. Economic Factors:

The variables of the economic factors as Agricultural growth rate, Agricultural production per hectare, Total foodgrain production in average 1970-73 Food Surplus and Food deficit, output in Lakh Rs. Growth Rate of yield, growth rate of output and output NPK unit of fertilizer has been collected from the various sources already mentioned in the data base.

The other variables as output per hectare, output per cultivator, output per labour and output per household in Rs. has been calculated dividing the respective variables by Area, cultivators, labourers and households respectively.

E. Technical Factors:

For the following variables of this factor percentage has been calculated as:-

1. Net irrigated Area to Net Sown Area.
2. Gross irrigated area to gross cropped area.
3. Irrigated area by tubewells to Net irrigated Area.
4. Irrigated area by wells to Net irrigated Area.
5. Irrigated area by canals to Net irrigated area.
6. High yielding variety of Rice crops to total area of high yielding variety of crops.
7. High yielding variety of wheat crop to total area of high yielding variety crops.

8. Tractor, Electric pump, oil engine per 100 hectare has been calculated dividing by the area of the respective variables.

9. Input into agriculture in the form of animals, fertilizers and agricultural implements per hectare is achieved by dividing the Area of the variable.

10. Average NPK unit of fertilizer in 100 tonnes has been collected from the various sources mentioned in the data base.

1.9 Explanatory System

In case of old five sets of variables, the Pearson product moment co-efficient of correlation[1] was worked out and correlation matrix was prepared to see the correlation of independent variables with land concentration.

---

1. Formula for Linear Correlation:-

$$r = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{N}}{\sqrt{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}\sqrt{\Sigma Y^2 - \frac{(\Sigma Y)^2}{N}}}$$

Significance test of correlation co-efficients. using the test of significance of r it is possible to infer whether correlation co-efficient between the variables will be zero or not. Under the null hypothesis the expression as given below will follow the 't' distribution with (n-2) degrees of freedom.

$$t = r\sqrt{\frac{n-2}{1-r^2}}$$

where n is the number of observations used and r is the co-efficient of correlation.

Step-wise Regression analysis[1] was done as the final step. This model was chosen because Aslam Mahmood has pointed out, "when-ever the multiple regression is need, it is useful to know as to how the parameters get changed when new variables are added; one by one."[2].

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1. The form of linear regression analysis between a dependent variable Y and an independent variable X is given as:

$$Y = \alpha + \beta X + U$$

where the constants and are the intercept and slope of the straight line and U is the error term.
The basic objective of a regression analysis is to estimate the values of and . The estimated least square form of the relationship is given by-

$$Y = a + bX$$

where

$$b = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{N}}{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}$$ is an estimate of

and $a = \bar{Y} - b\bar{X}$ is estimate of

Test ofsignificance used is given as:

$$t = \frac{b-0}{S.E.(b)}$$ with (n-2) degree of freedom

Where

$$SE(b) = \frac{\sigma U}{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}$$

and $$u^2 = \frac{\Sigma Y^2 - \frac{(\Sigma Y)^2}{n} - b\left(\Sigma XY - \frac{\Sigma X \Sigma Y}{n}\right)}{n-2}$$

Another important summary statistic in a regression analysis is the co-efficient of determination R^2, which tells us the proposition of variations in Y as explained by X and is given by:-

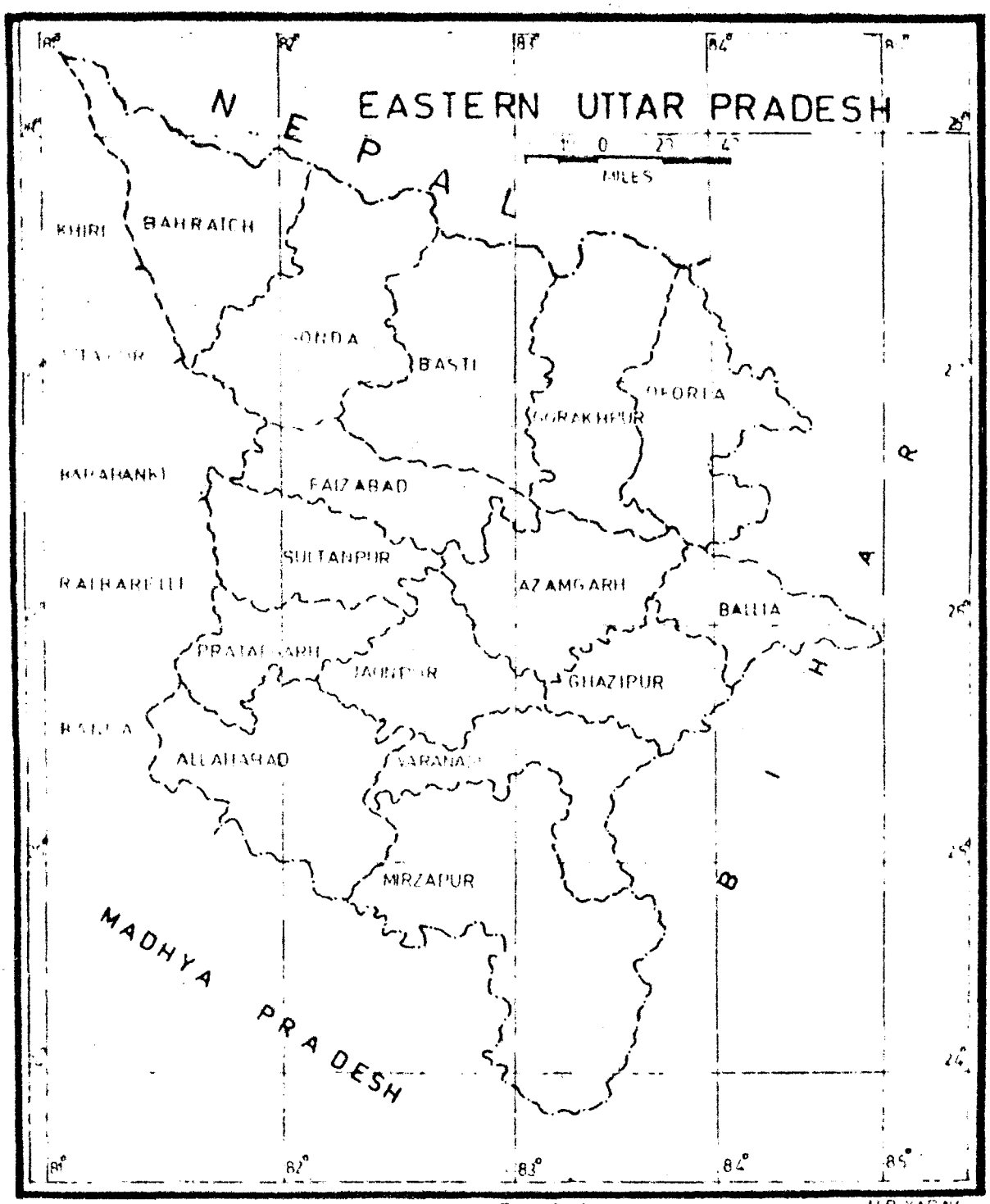
$$R^2 = \frac{\text{Explained S.S.}}{\text{Total S.S.}}$$

Where explaines sum of squares

$$= b\left(\Sigma XY - \frac{\Sigma X \Sigma Y}{n}\right)$$ and

total sum of squares $= \Sigma Y^2 - \frac{(\Sigma Y)^2}{n}$

2. Aslam Mahmood, "Statistical Method in Geographical Studies," Rajesh Publication, New Delhi 1977.)P.34-61.



MAP NO. 1

H P YADAV

1.10 Cartographic techniques:

Various cartographic techniques have been used for the present research work. Choroplething is used for showing the regional variations of land concentration and physical, social, institutional, economical and technological factors. The graphic methods have been adopted for showing the land distribution in Lorens Curve.

1.11 General Characteristics of the Region:

The study area of Eastern Uttar Pradesh is geographically situated between a zone having a longitude extension of 81° E - 85° 30' E and latitude extension of 23°30' N - 28°30'N (map No.1). It is an area with a vast milieu of human, economic, cultural significance, which makes it the heart of India.

1.11.1 Geology

There are two note-worthy features in the physiognomy of the region. This is an almost imperceptible change in elevation and uniform surface materials. It forms the alluvial filled a symmetrical Indo-Ganga trough with a definite divide formed by the subterranean Delhi Ridges which is a protrusion of Peninsular block. The alluvium is one continuous and confirmable series of fluviatile and sub-aerial deposits mainly composed of consolidated bed of clays sand,

EASTERN UTTAR PRADESH

DRAINAGE AND RELIEF

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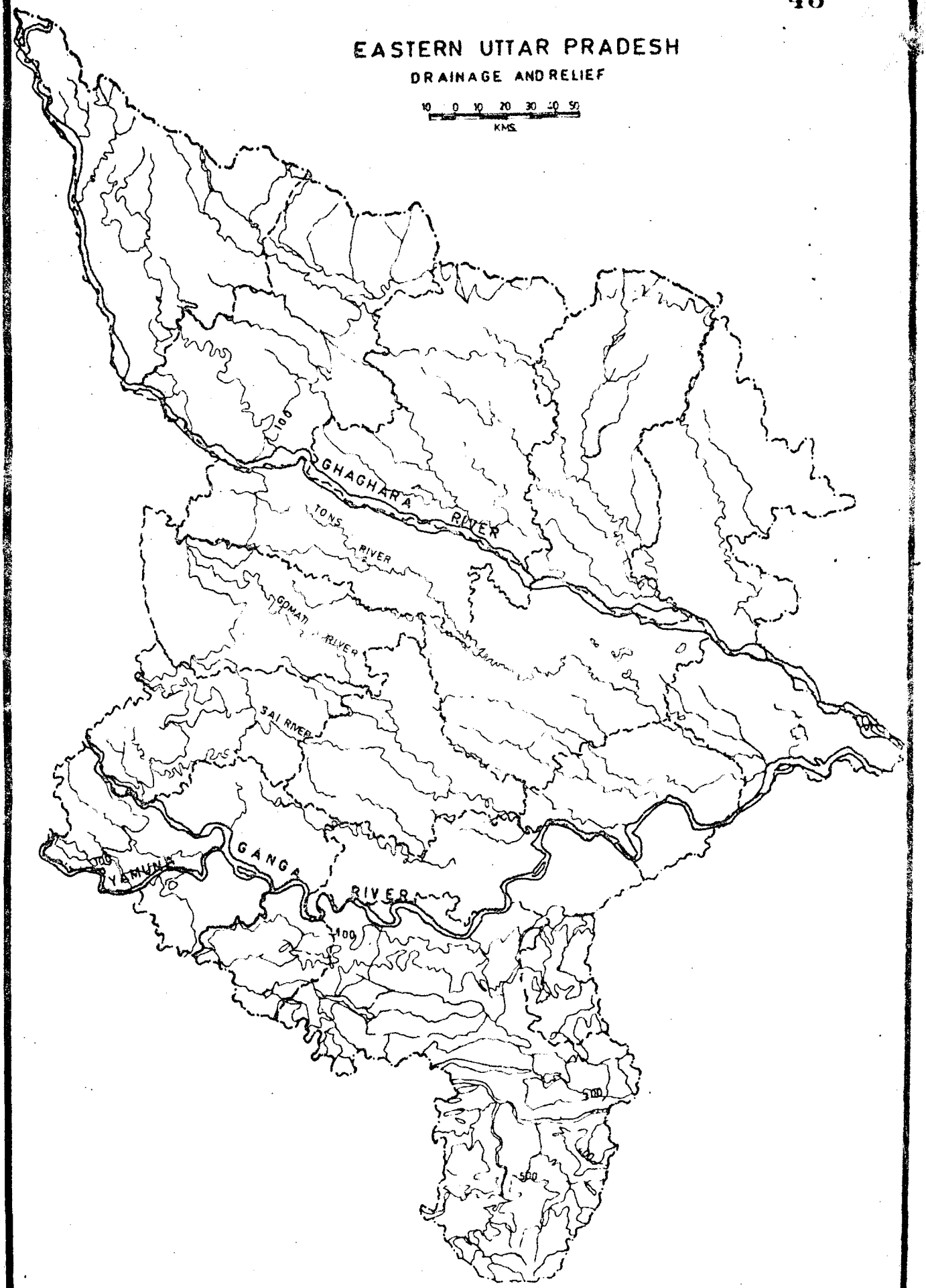
KMS.



MAP NO 2

H R YADAV

gravel and their mixture on varying proposition[1].

1.10.2 Physiography

The seemingly featureless plain lacks topographic preminances and the monotony of the physical landscape is broken broadly by the Tarai Bhabar submontane Belt and on micro level by the river bluffs, levees, dead arms of the river channel, the ravines and river channels themselves. Throughout the region there is preponderance of local slopes over the regional slope (map no. 2).

Topographically most significant and complex part of the region is the sub-montane belt running at the foot of the Siwaliks from West to East across the area on the northern border consisting of parallel strips of the Bhabar and the adjoining relatively gently sloping Tarai belt. This area is the zone of seepage where fine sand, silt and clay are deposited by the emerging streams. Almost level and fertile soil along with high water table has rendered unique physical and cultural land scale to the belt. The

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1. Mathur R.N. - "Some characteristic Features of Water Table in Meerut district U.P." N.G.J.I. VII (4 Dec.), 1961 269.

topographic diversities produced by the changing river courses are predominantly observed in the Ghaghara Valleys particularly in their flood plain. The region is almost a synonym of a homogeneous level seemingly featureless plain from one end to the other and the monotony of the relief maps appear to loose untill the hills are actually approached. Heterogenity in the physical landscape is produced actually by local eminences such as river levees and bluffs or sandy features like Bhus of the Saryapar the oxbolakes, Tals, Chaurs, deadarms or remnants of the river channels or occasionally available bad lands and ravines as those of the Sai and Gomati which are perceptible notches of the Bhangar tracts.

1.10.3 Drainage:

The region in general is a part of the well integrated drainage system of the Ganga although two important tributries, the Ghaghara and Gomati join the master stream in the middle Ganga plain. Almost all the the streams flow in a NW - SE direction. Minor topographic variations in the channel frequencies and the textural patterns ganga and its major tributaries Yamuna & Ghaghara are the only Himalayan rivers which carry sufficient water all the year round though with

with high seasonal fluctuations. Wide flood plains and high banks are the common features in the course of the Ganga and the Yamuna along with the silt and clay deposits while the other two have rather ill defined channels subject to frequent changes which is possible consequence of the nature of deposits & space available to carry coarser materials.

In general, the drainage pattern is dendritic and general characteristic features available throughout the plains is that the river meets at acute angles and several tributaries form parallel or sub parallel lines to the main streams.

In this region while the Ganga received the Saryupar water thoughout, the Ghaghara and most of the water of the Ganga, Ghaghara Doat east are received directly through independent large and small tributaries. The choti Saryu, the Mangai, the Besu and the Gangi in the Gomati, Ghaghara interfluve, while the Varuna is the only important stream in the Gomati - Ganga interfluve. The floods are a recurring feature in the region more particularly in the North Ganga Plain.

These rivers have shifted their courses frequently covering wide areas throughout the historic times as is reflected by the remanants of their former beds in the form of oxbowlakes, meander loops, dead arms, chaurs, tals and ruins of sellements etc.

1.10.4 Climate:

The lie of the land between the Himalaya on the north and the Peninsular fore land in the South and lack of physical undulations to check the sweeping winds and air currents from the east and west conspire to make the region only transitional in character between relatively drier upper & per humid lower Ganga Plains in west and east respectively.

Although the region has a some what continental interior location within the subtropical climatic belt, yet the monsoon regions supreme here and carry a great weight in the overall human occupance pattern and economic development. The mean June temperature at Varannai are 33.7°, 30.0° and 29.1° in June, July & August respectively. In the north also the same trend occurs as evidenced by the recording at Gorakhpur 31.5°, 29.6° and 29.2°. The maximum temperature generally rises in September owing to cessation of rains but the mean minimum temperature shows a slight decrease than in August. The season provides 88% annual rainfall mostly by the bay currents. By November the cold weather sents with an appreciable fall both temperature and relative humidity and the humid easterly winds and replaced by the dry north

westerly or easterly winds.

From the annual amount of rainfall it could be thought that the region is on the safe side, almost free from the drought for agricultural purposes but particularly in the western half and floods throughout suck the economic vitality of the region by their frequent occurrences. What the region suffers most, from is not as much lack of adequate amount of rainfall as its faulty distribution both in space and time.

1.10.5 Soils

Apart from the undifferentiated soils of the Siwalik fringe zone in the north of the region, most of the region has broad alluvial soil cover. The alluviale of the plains have undergone but little pedogenic elvolution since their deposition by fluvial agency in the sub recent times.

The soils are divisible into Khandar and Bhangar throughout the great plains and elsewhere with different terms. The former newer in age covers the flood plains in the vicinity of rivers including the lower reaches of smaller rivers and also the old beds and is replenished annually by new deposits. The Bhangar is the older alluvium and covers the upland tracts beyond the annual flood limit in the valley flats. Unlike the Khadar it is under the process of

denudation and contains the patches of user infestation.

1.10.6 Natural Vegetation:

An almost inhibited human occupance for over three millenia of years and centaries of plough and pastoral culture has induced the natural vegetation in the region except in the pockets of the tarai and some river banks. With a moderate rainfall and fertile soil, the region is a natural habit of a dense forest cover of sal and other species like Mango, Shisham, Jamun, Mahua, Ber etc.

1.11 Land Concentration:-Ginis Co-efficient Ratio (Dependent Variable)

Ginis Ratio is the concentration of operational holdings in preference to the land. In measuring the land concentration two methods have been adopted viz. ginis co-efficient ratio and Lorens Curve. Lorens Curve and ginis co-efficient are not in same but the Lorens Curve ratio and ginis co-efficient ratio are same. Where Lorens Curve ratio is the deviation of curve from the diagonal liner proposition to the level of inequnlity in the distribution of an attribute (cumulative percentage of area) in relation to other

TABLE NO. X

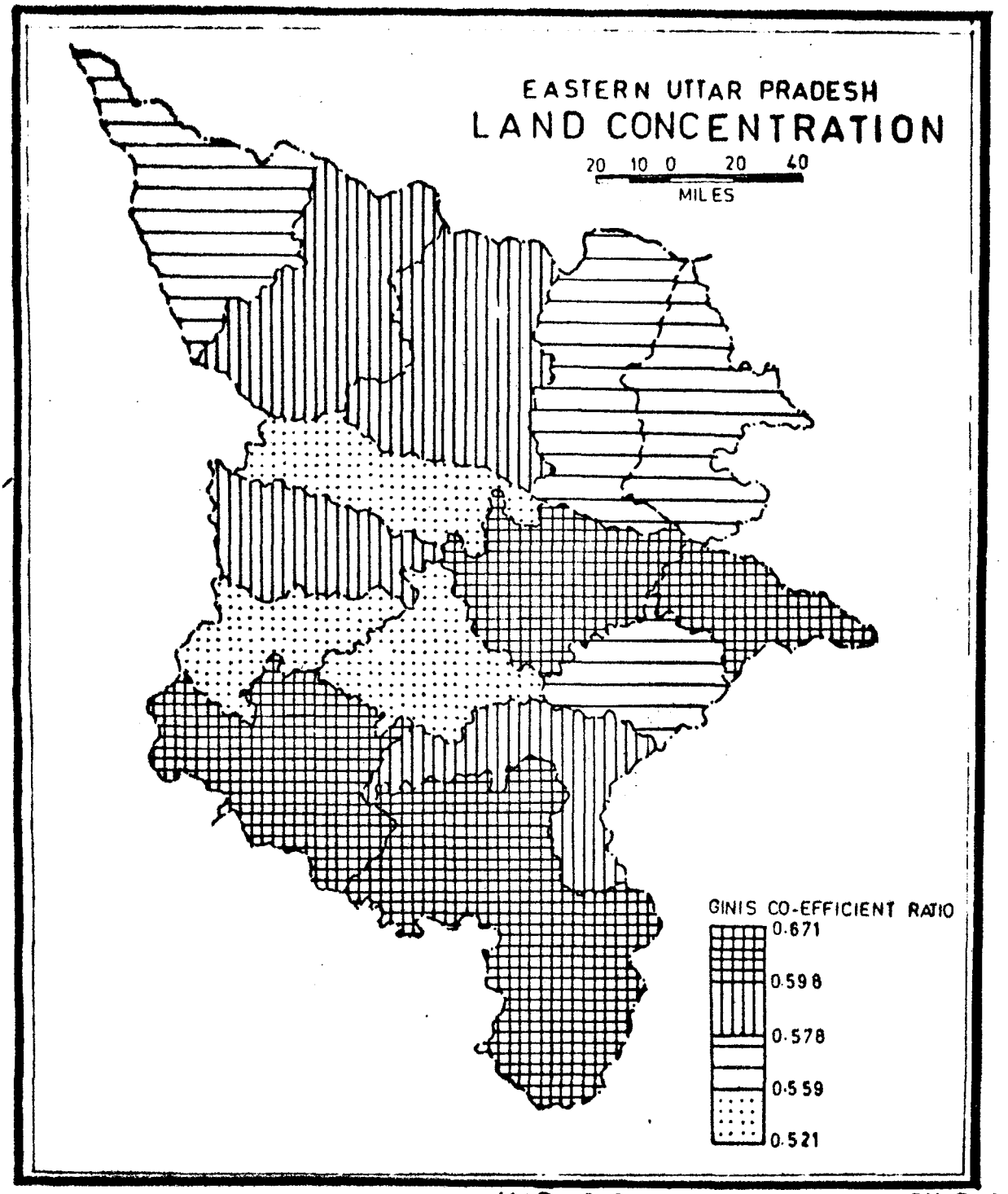
EASTERN UTTAR PRADESH

LAND CONCENTRATION (Gini Co-efficient Ratio)

S.No.	Districts	Gini Co-efficient Ratio
1	2	3
1.	Allahabad	0.598
2.	Azamgarh	0.599
3.	Bahraich	0.563
4.	Ballia	0.613
5.	Basti	0.594
6.	Deoria	0.577
7.	Faizabad	0.545
8.	Ghazipur	0.569
9.	Gonda	0.587
10.	Gorakhpur	0.559
11.	Jaunpur	0.521
12.	Mirzapur	0.671
13.	Pratapgarh	0.535
14.	Sultanpur	0.578
15.	Varanasi	0.588

Attribute (cumulative percentage of household). The overall concentration found in any such curve may also be measured numerically in terms of the ratio of the area under the curve and line of equal distribution to the area of the triangle formed by the x axis and line of equal distribution. The ratio mentioned above is known as ginis co-efficient ratio. The Ginis co-efficient ratio varies between zero to one.

Gini ratio ranges from 0.521 to 0.671 in Jaunpur to Mirzapur district respectively. Firstly at low peak gini ratio ranges from 0.521 to 0.559 and then increases to 0.559 to 0.578. At this level gini ratio takes an upward turn and thereafter improves the production performances untill the gini level reaches roughly around 0.598. Thus indicating a positive relationship between gini's concentration ratios and agricultural production performances. According to collected data, thereafter, finally indices decreases to the level of 0.671, thereby indicating a negative relationship between gini's concentration ratios and indices of agricultural growth and development. If we are permitted to make approximate generalisation on the basis of the collected data for the land concentration and other factors



MAP NO. 3

H.R.YADAV

which influence the land concentration i.e. physical, social, institutional, economic and technological to show minor fluctuations. Keeping all the reservations in mind one is still left wondering, why gini level is so much fluctuating from one district to another (Table No.1). For example District Allahabad (0.598), Azamgarh (0.599), Ballia (0.613) and Mirzapur (0.671) fall within the same gini range though located in contrasting physical terrain which gives a wrong picture as far as land concentration is concerned. So to normalise this gap of the gini ratio, quartiling method has been adopted and that is why fluctuation between the first range of gini ratio is subsumed at this level. Thus to indicate the kind of patterns in gini's level according to quartiling method, all district's gini ration have been generally divided into four major segments (Map.No.3):

1. High land Concentration - Between gini level (0.598 and 0.671).
2. Medium land concentration - Between gini level 0.578 and 0.598.
3. Low land concentration - Between gini level 0.559 and 0.578.
4. Very low land concentration - Between gini level 0.521 and 0.559.

1. High Land Concentration:

The high land concentration indicates a general and steady inverse relationship between agricultural production performance and the measure of land inequality, with small curvilinear patterns within that segment. This segment of land concentration, almost always, suggests that the higher degrees of inequality militate against agricultural growth and development and social justice. High land concentration in the selected region is recorded in Mirzapur (0.671), Allahabad (0.598), Ballia (0.613) and Azamgarh (0.599) districts.

2. Medium Land Concentration:

The districts in which this level of gini land concentration falls indicates a more or less general and somewhat steady positive relationship between gini concentration ratio and some of the indices of agricultural development. However, these general patterns are countered by certain indices of agricultural growth rate, records a negative relationship as the gini ratio increases. Gross irrigated area to gross cropped area and food surplus also show a positive increase as the gini level increases, thereafter it records a steady decline.

Medium land concentration has been observed in Gonda (0.587) Sultanpur (0.578), Varannasi (0.588) and Basti (0.594) districts. Indicators which have positive relationship with the land productivity have negative correlation with the land concentration. At this level, use of agricultural inputs chemical fertilizers and irrigation per hectare of gross cropped area is concerned. These indices record a positive relationship with increasing land inequality upto the 0.598 level, thereafter, they clearly show a downward trend and a definite negative relationship with increasing magnitude of land inequality. In short, this reversal in the general positive and rising trend is achieved at different gini levels for different indices of agricultural productivity, growth and performances at 0.578 and 0.598. But downward trends or negative relationships are clearly visible in all performances as soon as the degree of land inequality crosses the hump of roughly 0.598. Beyond this gini level both agricultural performance social equity have negative impact.

3. Low Land Concentration:

In this segment of gini distribution Bahraich (0.563, Gorakhpur (0.559), Deoria (0.577) and Ghazipur (0.569) districts are falling. This group of gini

distribution is almost always characterised by first, a sudden drop or fall in various agricultural performances and then a gradual improvement in the performances as the gini level rises. In other words, this segment shows a positive relationship between the index of land inequality and indices of agricultural production performances which is contrary to overall general pattern. At the present state of our knowledge it is not clearly known why such a positive relationship between the two should occur especially when the first group records a clear negative relationship.

The protagonists of polarisation and concentration of land ownership in the hands of a few proprietors may find comfort in the findings of this segment of gini distribution. But a final decisive conclusion can be reached for this segment as well as for other segments only after penetrating investigation has been made regarding those factors that are still unidentified which may be of socio-economic, climatic, physical, cultural or political nature. Thus it deserves to be studied in depth especially with respect to their unfavourable crop-soil-rainfall terrain characteristics and their

adverse effects on agricultural productivity and to again correlate this with land concentration that is why for correlating the land concentration all these parmeters have been identified.

4. Very low land Concentration:

The districts which are falling in this segment are Faisabad (0.545), Pratapgarh (0.535) and Jaunpur (0.521). This group is almost always showing the highest agricultural productivity, the highest agricultural growth rate, the highest use of chemical fertilizer and irrigation. In short this segment indicated a general inverse relationship between gini ratios and all the separate indices of agricultural performances. In other words it does support the contention that the lower the degree of land inequality, the higher is the level of agricultural productivity.

1.12 Hypothesis:

A reference had already been made regarding the variables of the selected parmeters in choice of indicators. Following five factors have been hypothesized in following manners:-

1. Physical or environmental factor has positive correlation with the land concentration.
2. Excepting few indicators in social factor but over all relationship with the land concentra-

tion to the social factor is negatively hypothesized because when region is socially developed the productivity with its technology will increase so it has negative impact on land concentration.

3. The economic factor has negative correlation with land concentration.

4. Institution factor has negative relationship with the land concentration.

5. Lastly the technological factors also have negative correlation with the land concentration.

Thus the indicators of the individual factors are correlated with the land concentration to test the above hypothesis. A detailed account of the each set of factors and its various parameters is provided in the fourth coming pages.

1.13 Chapter Scheme:

The present study has been divided into seven chapters keeping in view the nature of the problem.

In the first chapter problem has been introduced. A broad survey of literature in concentration to size of holdings and land productivity, general characteristics of the region and land concentration distribution have been elaborated and major inadequacies of the same have been noted. In this Chapter objective of the study and methodology has also been explained.

In the second chapter attention has been paid on measuring the impact of various physical (viz. climatological and relief selecting 12 variables) parameters on land concentration.

Focus has been drawn in the third chapter to see the impact of social parameters on land concentration selecting 9 independent variables of this factor.

The fourth chapter intends to analyse the role of economic factors (selecting 12 variables) on land concentration.

The fifth chapter, is attributed the institutional factor (chosing 11 variables) to measure the impact of this factor on land concentration.

The sixth chapter is concerned with the assessment of the role of technological factor in determining the land concentration selecting fourteen independent variables of this factor.

The seventh and the last chapter of the present study provides the findings of the study i.e. to see the impact of all above mentioned bentasonal forces on land concentration.

CHAPTER - II

PHYSICAL FACTOR INFLUENCING LAND CONCENTRATION

CHAPTER II

PHYSICAL FACTOR (INDEPENDENT VARIABLES)

2.1 Introduction:

The role of environmental factors in agricultural activity (as well in land concentration) need no fresh emphasis. Nature with all its diversities in its physical characteristics - Relief, Climate, soil and drainage and natural vegetation provides a host of variations on the earth surface and man with his prevailing level of technological advancement has availed these opportunities. Provided by the nature and explored them to a great extent of his advantage. The integrity of the equilibrium of the ecosystem provides the basis of frame work within which man nature interaction proceed. So cooperation with nature and not its conquest should therefore be the basic strategy for the development of land resources. Such type of constraints are particularly prevailing more in the developing countries where the attainment of technological level is still quite low and appropriate technology suited to their varied environments is yet to be developed.

The study of land concentration in an environmentally varied region should commence with an analysis of the natural factors which possibly influence land concentration ratio. It is proposed to

TABLE NO. II

EASTERN UTTAR PRADESH

PHYSICAL FACTOR

S. No.	Districts	Drainage Density	Absolute Relief	Relative Relief	Stream Frequency	Slope in degrees	Soil Rating Index	Moisture Index	Humidity Index	Aridity Index	Rainfall in mm.	Ruggedness number	Dissection Index
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	Allahabad	0.63	855	570	4.35	1.20	60.8	-33.1	16.0	49.1	976	0.068	0.67
2.	Azamgarh	0.29	130	97	5.23	1.60	64.0	-17.0	20.1	38.1	1021	0.004	0.54
3.	Bahraich	0.25	245	177	4.27	2.70	64.0	-23.2	20.8	34.3	1148	0.008	0.72
4.	Ballia	0.36	158	70	5.63	1.40	61.2	-9.0	29.2	38.2	1412	0.005	0.44
5.	Basti	0.20	208	115	4.13	2.70	64.6	-18.3	28.3	39.7	1264	0.004	0.55
6.	Deoria	0.28	219	84	2.58	1.70	61.2	-14.8	23.5	33.2	1045	0.004	0.38
7.	Faizabad	0.45	218	126	2.95	1.10	60.6	-13.2	22.8	34.8	1008	0.011	0.58
8.	Ghazipur	0.28	299	204	6.30	1.20	57.6	-10.4	25.3	36.0	1052	0.006	0.68
9.	Gonda	0.24	183	124	3.64	3.00	57.6	-9.3	26.7	37.2	1150	0.011	0.68
10.	Gorakhpur	0.26	142	69	3.86	2.20	64.0	-18.6	27.3	39.8	1364	0.003	0.49
11.	Jaunpur	0.29	266	136	3.28	3.40	64.0	-21.8	17.8	41.3	1000	0.007	0.51
12.	Mirzapur	2.82	1375	915	10.13	7.00	60.8	-25.3	19.3	43.2	1134	0.49	0.66
13.	Pratap Garh	0.32	315	217	3.89	3.30	57.0	-28.6	20.1	42.9	978	0.013	0.69
14.	Sultanpur	0.38	196	100	1.86	2.90	68.8	-27.8	23.7	46.9	1000	0.006	0.52
15.	Varanasi	0.27	277	146	5.63	3.70	68.8	-26.9	20.0	47.9	1056	0.007	0.53

do so by identifying the characteristics of the following as they vary in the region with a view to relate them with land concentration ratio:-

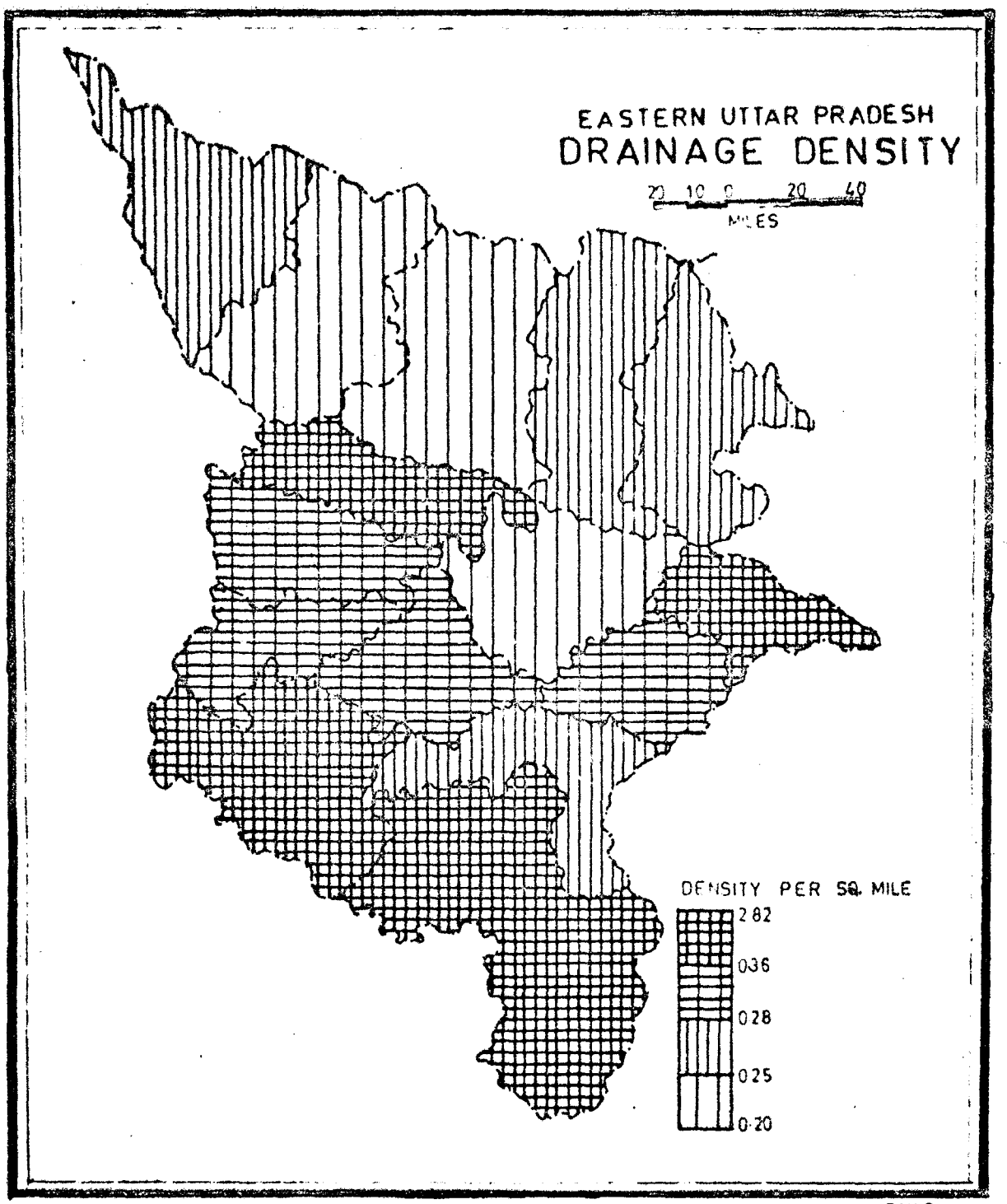
i. Relief

ii. Drainage

iii. Soil

iv. Climate

In general, the environmental factors have a proposed impact on land concentration in the region. For example land concentration tends to be more in areas where relief is high or ruggedness number is more which is dominant in the hilly areas. It has a positive relation with ruggedness of the terrain and similarly the stream frequency. Climate and soil factors also influence the land concentration. In the present study an attempt has been made to study the spatial variations in the incidence of various environmental factors like Drainage Density, Absolute Relief, Relative Relief, Stream Frequency Slope, Soil Rating Index, Moisture Index, Humidity Index, Aridity Index, Ruggedness number and Dissection Index (Table No.2) to explore the relationship between these and variations in land concentration with the help of correlation co-efficient and to assess the explanatory power of the environmental factors in relation to land concentration ratio with the help of stepwise regression.



MAP NO. 4

H.R.YADAV

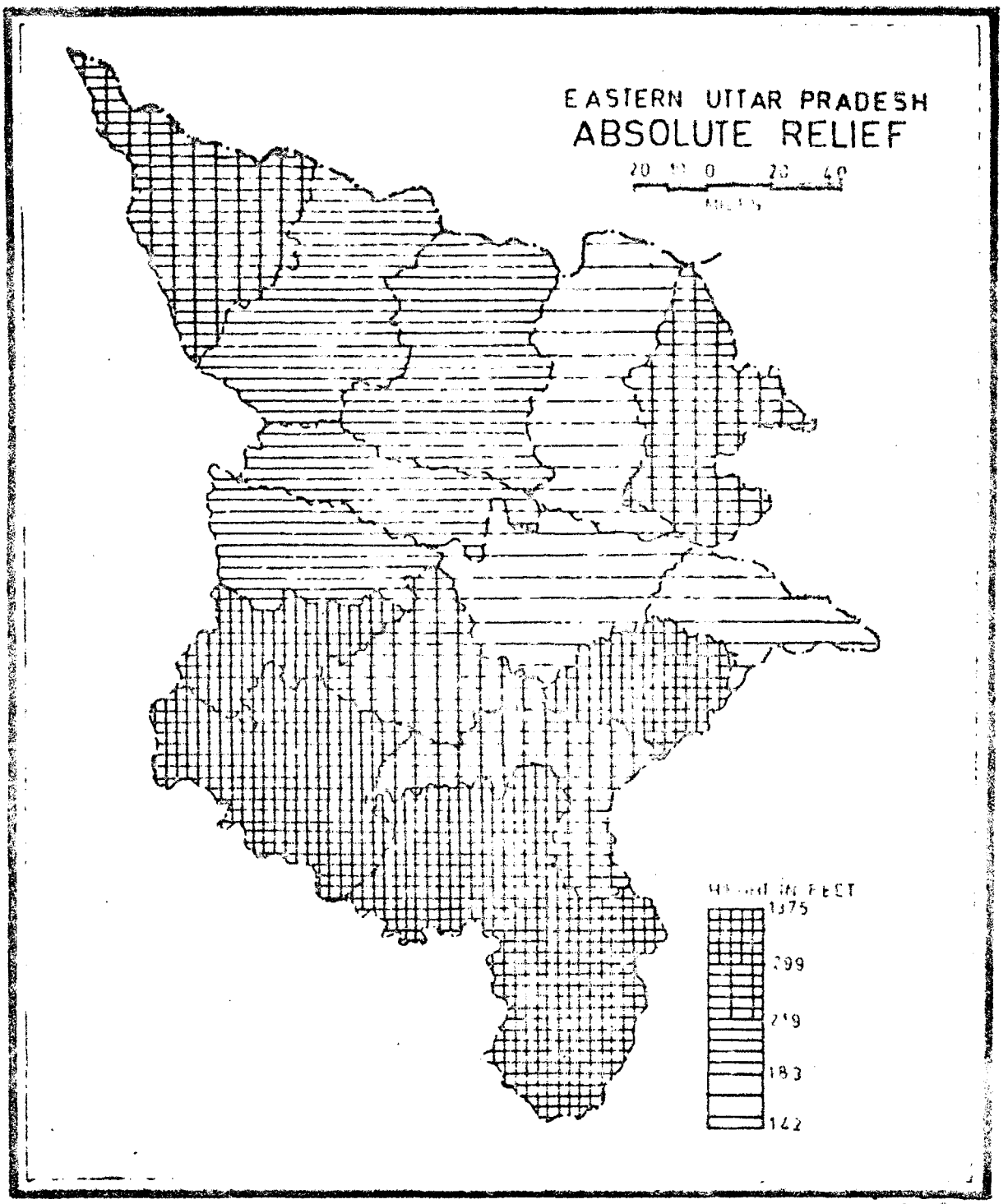
2.2 Drainage Density:

For strengthening of agricultural base of an area drainage lines are as essential as the arteries are essential to circulate blood in the body. The perennial drainage system is obviously more useful as it provides water thoughout the year.

According to the above statement drainage is necessary for the agricultural activities. The drainage lines distribute themselves in varied fashions following the structural alignments. In this region frequency of occurence of drainage lines ranges from meagre values over plain to higher values over hilly rugged terrain. The drainage density defined as length per unit area, has more values in southern part of the region and decreases towards north.

Drainage seems to have a fair correlation with land concentration as high number of drainage lines provide more scope for extensive agriculture, leading to high concentration of land holdings. But the drainage lines which have been taken into account have consideration of both black and blue lines.

In this region the drainage density varies from 0.20 sq. mile in Basti district to 2.82 sq.


EASTERN UTTAR PRADESH
ABSOLUTE RELIEF
20 10 0 20 40
1375
299
219
183
142

MAP NO. 5

mile in Mirzapur district (where the land concentration is more) (Map No.4). The districts seeking high drainage density (0.36 sq. mile to 2.82 sq. mile) are Mirzapur (2.82 sq. mile), Allahabad (0.63 sq. mile), Faizabad (0.45 sq. mile) and Ballia (0.36 sq. mile). Pratapgarh, Jaunpur Deoria and Sultanpur are the districts where drainage density is medium (0.28 sq.mile to 0.32 sq. mile) with a values of 0.32 sq. mile, 0.29 sq. mile, 0.28 sq. mile and 0.28 sq. mile respectively. The low drainage density (0.25 sq. mile to 0.28 sq. mile) is found in the Ghazipur, Varanasi, Gorakhpur and Bahraich districts where the drainage density is varying from 0.28 sq. mile 0.27 sq. mile, 0.26 sq. mile and 0.25 sq. mile respectively. The districts where drainage density is very low are Azamgarh (0.24 sq. mile) Gonda (0.24 sq. mile) and Basti 0.20 sq. mile.

Thus it has been noted that drainage density effects land concentration and it is necessary to quantity its relationship with land concentration ratio.

2.3 Absolute Relief:

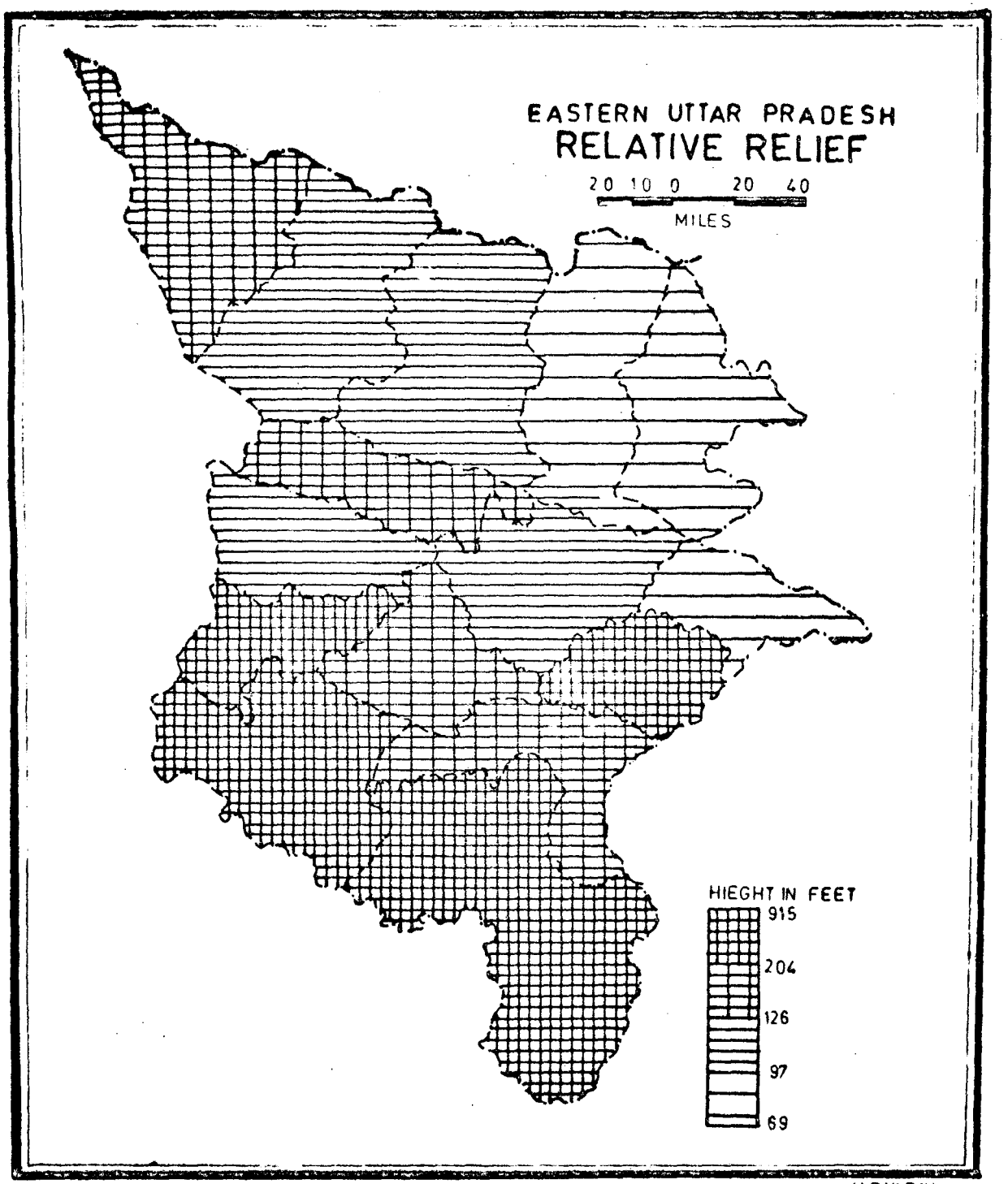
The absolute relief in the Eastern Uttar Pradesh has a value of 1375 feet in the Mirzapur

district in South. In general absolute relief varies from 142 feet in Gorakpur in the north to 1375 feet in Mirzapur district (Map No.6) on the whole rugged topography is restricted to Southern region rather than the north. The 1250 feet contour may be taken as a demarcating line between high & low relief diversities (Map No.5). The medium absolute relief (219 to 299 feet) is found in Varanasi, Bahraich, Jaunpur and Ballia districts but 250 contour line is crossing only from Varanasi districts and rest of the districts have less than this contour's height. There are the districts as Pratapgarh, Gonda, Faizabad and Sultanpur where the absolute relief is low and varies from 219 feet in Deoria to 185 feet in Gonda district. The districts having low absolute relief are Azamgarh, Ballia and Pratapgarh districts. Thus the area is quite level and highly suitable for agriculture in the northern tract excepting the district of Mirzapur. The land concentration values seem to be higher in the zone with high relief i.e. Mirzapur district shows positive correlation, due to high relief and disrupted topography which is not much suitable for agriculture. The people here have more land because poor

people cannot afford so much of technology as is afforded in Israel and other countries of the world. The rugged land need more cultivation, hence the poorer section cannot afford to bear such expenditure. But richer few add more land to their already existing acreage which may prove useful, if extensive cultivation can be carried over. The rest of the districts are flat and are in a position to use agriculturally in a better way hence has low land concentration than the hilly or high relief areas which are rugged or the areas where ruggedness and dissection is more.

2.4 Relative Relief:

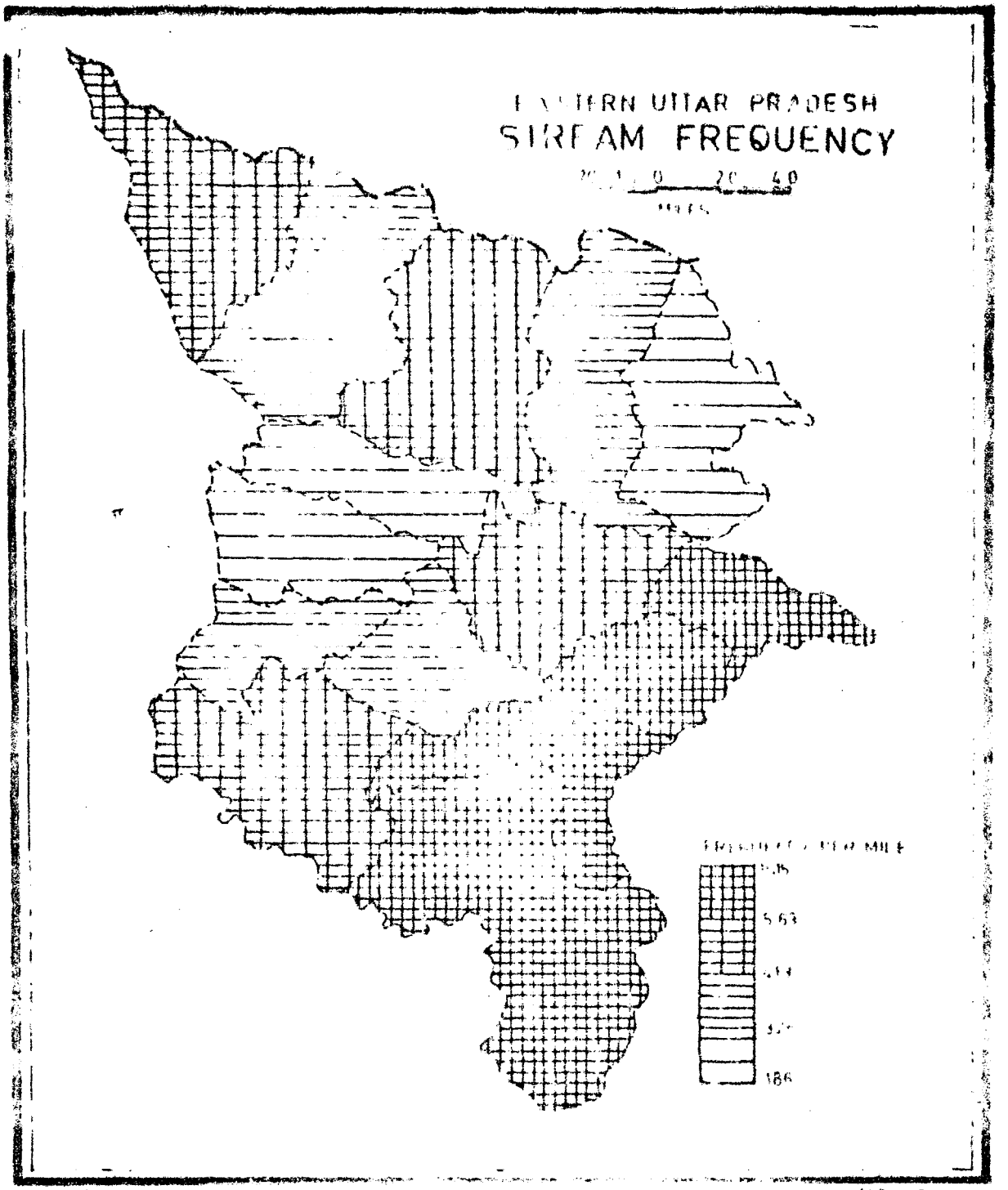
Relative relief has a close relation with land concentration among which the relative relief's relationship is positive and is very close. If there is much variation in relative relief, it will lead to the undulating surface difficult to plough either by tractors or by wooden plough. Moreover it would be-come difficult to provide irrigation on these areas and even slight rainfall may cause soil erosion. Thus these areas of the region which are less suitable for agriculture due to high relative relief are proved to be concentrated more.


EASTERN UTTAR PRADESH
RELATIVE RELIEF
20 10 0 20 40
MILES
HIEGHT IN FEET
915
204
126
97
69
H.R.YADAV

MAP NO. 6

The same factor is being proved in this study where land concentration and relative relief are highly and positively correlated. The relative relief is similar to that of absolute relief where the highest values range from 915 in Mirzapur to 69 feet in Gorakhpur district.

The districts having more relative relief (Map No.6) according to the quartiling method are Mirzapur, Allahabad, Pratapgarh and Ghazipur where relative relief is 255 feet, 577 feet, 217 feet and 204 feet respectively. The districts seeking moderate relative relief are Bahraich 177 feet, Varanasi 146 feet, Jaunpur 136 feet and 126 feet in Faizabad districts. The low relative relief is found in Gorakhpur, Basti, Sultanpur and Azamgarh districts having 124 feet, 115 feet, 100 feet and 97 feet respectively and there are districts as Deoria (84 feet), Ballia (70 feet) and Gonda (69 feet) having very low relative relief. The relative relief in this region is highly variable and even within short distances rise to average land concentration values of moderate levels - neither very low nor very high.


EASTERN UTTAR PRADESH
STREAM FREQUENCY
0 20 40
MILES
5.63
186

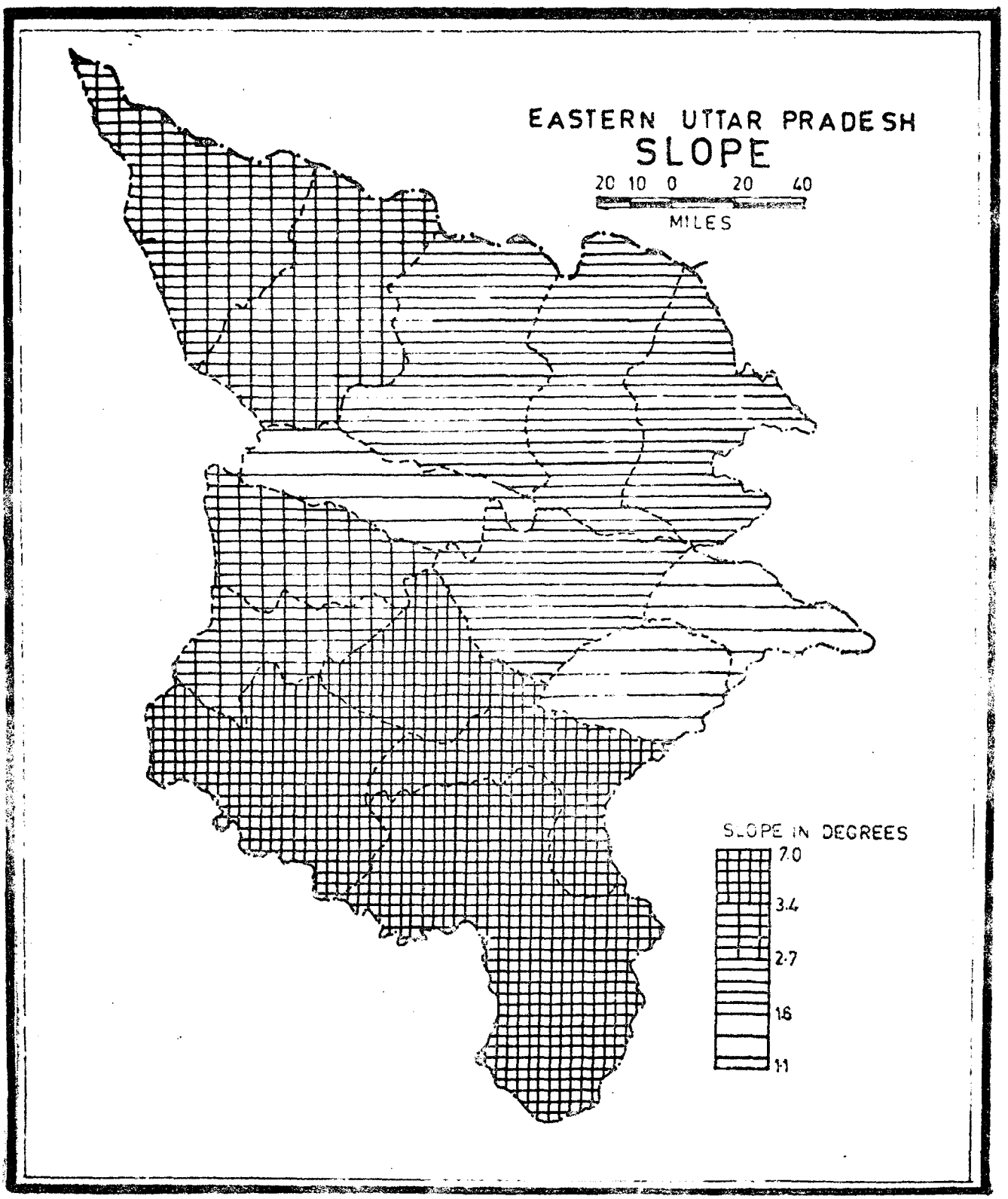
HRYADAV

2.5 Stream Frequency:

Stream frequency is referred as number of drainage lines per unit area. This variable gives an account of frequency of occurence of drainage lines, which in turn is essential for agriculture water potentialities will be more where the stream frequencies are higher. But it is to be noted that higher frequencies are observed on hill slopes where the land concentrations are higher with this reference stream should have a positive relation with land concentration. (Map No.7). The districts having high stream frequency (5.63 per sq. mile to 10.15 per sq. mile) (Table) are Mirzapur, Ghazipur, Ballia and Varanasi districts (Map No.7) where relief is high and topography is rugged and undulating. Azamgarh, Allahabad, Bahraich and Basti districts are falling in the medium stream frequency where stream frequency ranges from 4.13 to 5.23 per sq. mile. The districts having low stream frequency (3.28 to 3.86 per sq. mile) are Gorakhpur, Gonda, Jaunpur and Pratapgarh districts but Faizabad, Deoria and Sultanpur districts depict very low stream frequency i.e. where they range from 1.10 per sq. mile to 1.40 per sq. mile.

2.6 Slope:

Slope is closely associated with land concentration and its significant extent is determined by



MAP NO. 8

H.R.YADAV

the nature of slope. If the degree of slope is too high it will not only create difficulty in ploughing but even the slightest rainfall will lead to erosion. Moreover due to high run off the moisture retaining capacity of the soils would be fairly low, on the other hand if the area lies in a low lying section it may become flooded or water logged and may not be available for cultivation during the rainy season.

The slope in this region is generally high (3.4° to 7.0°) in southern part. The districts falling in this category are Mirzapur 7.0°, Allahabad 4.2°, Varanasi 3.7° and Jaunpur 3.4° (Map No.8). The districs having medium slope (2.7° to 3.3°) are Pratapgarh 3.3°, Gonda 3.0°, Sultanpur 2.9° and Basti 2.7°, low degree of slope (1.6° to 2.7°) is found in Bahraich, Gorakhpur Deoria and Azamgarh where slope is 2.7°, 2.2°, 1.7° and 1.6° respectively. Ballia (1.4°), Ghazipur (1.2°) and Faizabad (1.1°) districts come in the category of low values of slope.

Similar to the impact of relief on land concentration the slope too has an independent impact of positive correlation with land concentration.

2.7 Soil Rating Index:

The Soil Rating Index is the scientific

system of soil evaluation. It is the determination of the productivity ratings which is defined as the capacity of the soil to produce the crops. Soil texture, climate soil management, drainage salinity or Alkalivity, nutrient status are some of the important factors that govern the productivity of the soil.

Storie (1950) used the following factors in the storie Index for evaluation of soil productivity which it is termed as rating based on four general soil characteristics viz.-

Factor A - Soil Profile - 1. Depth of soil.

Factor B - 1) Texture of the soil 2) Permeability, Natural fertility 3) Topography and Structure, degree of weathering.

Factor X - Miscellaneous ie. Factor that can be modified by management.

This basic system of soil rating by storie was modified by additional 3 Factors -

Factor A - Character of the soil profile

Factor B - Topography, texture and structure

Factor C - i) Degree of climatic suitability

ii) Salinity

iii) Storiness

Each factor is evaluated on the basis of 100% for most favourable conditions. The soil Rating Index is obtained by multiplying the 3 factors - AxBxC and final rating Index expressed in %ages.

The soil has been given following % rating for the three factors (Storie 1933) according to the types of soils that are met with:-

Factor A		Rating %
i)	Unweathered or slightly weathered secondary soils	95-100
ii)	Moderately weathered secondary soils	80-95
iii)	Thoroughly weathered secondary soils with clay sub soils developed on unconsolidated parent material	40-80
Factor B		
	Topography	65-95
a)	Medium textured	100
i)	Fine Sandy loam	100
ii)	Loam	100
iii)	Silt loam	100
iv)	Sandy loam	95
v)	Coarse Sandy loam	90
vi)	Loamy Sand	80
b)	Medium Heavy textured	
i)	Silty clay loam	90
ii)	Clay loam	85

c)	Heavy textured	
i)	Silty clay	65
ii)	Clay and soluble clay	50-70
d)	Light textured	
i)	Very fine sand	80
ii)	Find sand	65
iii)	Sand	60
iv)	Wind blown sand	20-70
	Gravelly and Stony	35-70

Factor Q

i)	Climatic suitability with rainfall & temperature etc.	60-95
ii)	Drainage (Fair to well)	70-100
iii)	Moderately water logged	40-70
iv)	Badly water logged	10-40
v)	Alkalinity (with degree)	50-100
vi)	Alkalinity (Strongly affected)	5-25
vii)	Acidity (according to degree)	60-65

Soil Rating indices are average approximations for different kinds of soils.

According to the above scheme of classification the soils of the region have a following pattern.

Soil rating index is more (68% to 64%) in Sultanpur, Varanasi, Azamgarh, Bahraich,

Gorakhpur and Jaunpur districts. The districts having medium soil rating index (60.0% to 62%) are Allahabad (608), Ballia (618), Deoria (680), Faizabad (606) and Mirzapur (608). Below 60% soil rating index which is considered as low soil rating index is in Ghazipur, Gonda & Pratapgarh districts.

Thus soil rating index is the capacity of the soil to produce crop. It is closely associated with agricultural productivity where by higher land concentrations are seen to be negatively correlated with high soil rating index. There is a inverse relationship between soil rating index and land concentration.

2.8 Moisture Index:

Moisture Index and land concentration have a possible inverse relation because high moisture zones are associated with high precipitation zones, a factor which is helpful in high agricultural production. So when the moisture index is more land concentration will be low on the one hand and on the other, when moisture index is low land concentration will be high.

Moisture index is obtained from data

on renewable natural resources varies between 9.0 to 33.10. The higher values of moisture index are found in Allahabad, Pratapgarh, Sultanpur, Varanasi and Mirzapur. The rest of the districts have below 25.0 moisutre index as is clear from the values given below.

2.9 Humidity Index

Humidity too has a similar impact on land concentration ratio i.e. humidity and land concentration have inverse relationship. The humidity in this region ranges from 29.20 Ballia to 16.0 Allahabad. The districts having more humidityindex i.e. above 22.0 are Ballia, Basti, Deoria, Faizabad, Ghazipur, Gonda, Gorakhpur and Sultanpur. Districts having low humidity Index below 22.0 are Allahabad, Azamgarh, Bahraich, Jaunpur and Mirzapur, Pratapgarh and Varanasi.

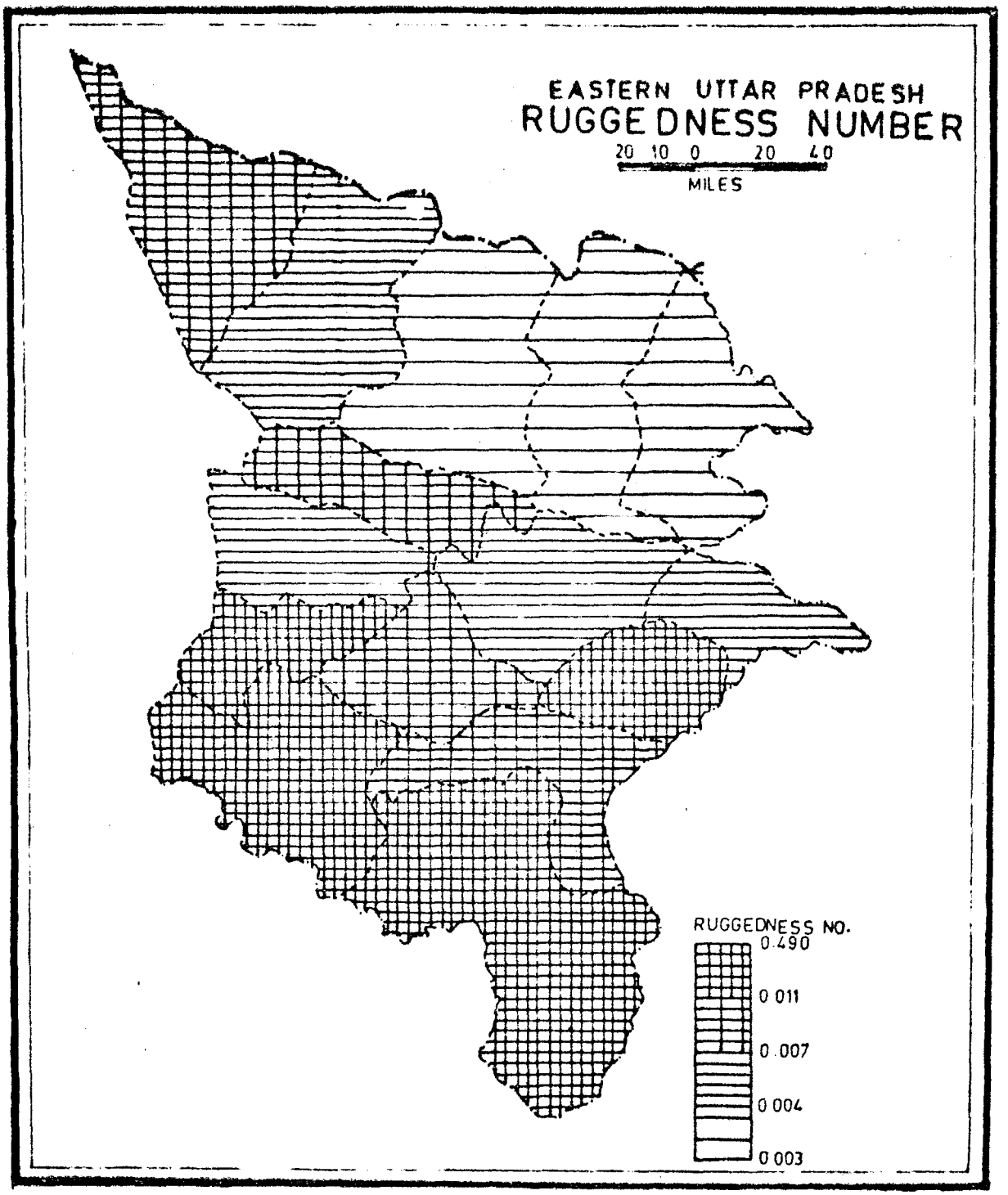
2.10 Aridity Index:

Aridity Index is closely associated with land concentration. It affects land concentration in a positive direction when the aridity index is more land concentration will tend to be more and when aridity index is low land concentration will also be low. The arid regions are generally avoid agriculture unless the irrigation facilities are

provided to them. The aridity in this region varies from a general value of 33.2 in Deoria district to 49.1 in Allahabad district. More Aridity Index is found in Allahabad, Varanasi, Sultanpur, Pratapgarh, Mirzapur and Jaunpur districts where the aridity index is above 40.0°. The rest of the districts as Azamgarh, Bahraich, Ballia, Basti, Deoria, Faizabad, Ghazipur, Gonda and Gorakhpur have low aridity index below 40.0°. Thus the districts having more aridity index have also more land concentration.

2.11 Rainfall:

The variations in rainfall are quite considerable and of the climatic factors, this may be considered to be of crucial significance in influencing levels of productivity. But rainfall and land concentration have no close association. Areas with higher rainfall should have a lower concentration of land as intensive cultivation will be more significant in those zones. At the same time higher slopes are associated with higher stream which drains off in the low areas. Hence flat lands have higher concentration of water and lower concentration of land, varies from 976 mm in Allahabad to 1364 mm in Gorakhpur.



MAP NO. 9

H.R YADAV

Districts having above 1000 mm rainfall are Bahraich, Ballia, Basti, Gonda, Gorakhpur, Jaunpur and Mirzapur. Whereas districts of Allahabad, Azamgarh, Faizabad, Gorakhpur, Jaunpur, Sultanpur and Varanasi districts receive less than 110 mm.

2.12 Ruggedness Number:

Ruggedness number in other words denotes undulation and irregularities should have a possitive correlation with land concentration. This has similar positive correlation with land concentration as did the other relief parameters. In the rugged areas without using the technological innovation no substantial output can be gained.

The ruggedness number in this region varies from 0.003 in Gorakhpur district to 0.490 in Mirzapur district (Map No.9). The districts having high ruggedness number (0.49 to 0.11) are Mirzapur, Allahabad, Pratapgrah and Faizabad, Ghazipur, Bahraich, Jaunpur and Varanasi districts depict medium ruggedness number (0.007 to 0.011). The districts seeking low ruggedness number (0.004 to 0.006) are Gonda, Sultanpur, Ballia & Deoria. Azamgarh, Basti, and Gorakhpur districts have a very low ruggedness number (0.003 to 0.004).

2.13 Dissection Index:

Dissection index in other words is the intensity of cutting by denuding agents in a particular region. Dissection index also has a close association with land concentration and is positively related with it. When the dissection index is more land concentration will also tend to be more and if dissection index is low the land concentration will also be low. So the land concentration and dissection Index have positive impact on each other. The dissection index in this region varies from 0.44 in Deoria district to 0.72 in Bahraich district. The distribution pattern of Dissection Index is provided in the data from which the general trend can be found out.

2.14 Analysis of the Correlation Matrix

Here we have made an attempt to assess the impact of environmental factors on land concentration. It would be interesting to note if the correlation matrix throws up any clue to possible causal relationships between productivity and environmental factors.

TABLE NO. XIX
PHYSICAL FACTOR
CORRELATION MATRIX

	Y	)(1	)(2	)(3	)(4	)(5	)(6	)(7	)(8	)(9	)(10	)(11	)(12
Land Concentration	1.000												
1. Drainage Density	0.706***	1.000											
2. Absolute Relief	0.649***	0.915***	1.000										
3. Relative Relief	0.633***	0.904***	0.996***	1.000									
4. Stream Frequency	0.[illegible]***	0.764***	0.704***	0.718***	1.000								
5. Slope	0.503**	0.784***	0.845***	0.840***	0.545**	1.000							
6. Soil Rating Index	-0.015	-0.157	-0.194	-0.234	-0.193	0.069	1.000						
7. Moisture Index	-0.016	-0.247	-0.464*	-0.463*	-0.030	-0.641***	-0.379	1.000					
8. Humidity Index	-0.070	-0.311	-0.521**	-0.519**	-0.128	-0.520**	-0.065	0.725***	1.000				
9. Aridity Index	0.195	0.222	0.415*	0.402*	0.134	0.609***	0.398	-0.787***	-0.458*	1.000			
10. Rainfall	0.136	0.053	-0.096	-0.097	0.051	0.013	0.113	0.255	0.523	-0.297	1.000		
11. Ruggedness No.	0.718***	0.997***	0.917***	0.907***	0.778***	0.807***	-0.144	-0.262	-0.310	0.230	0.068	1.000	
12. Dissection Index	0.049	0.264	0.404*	0.480*	0.329	0.373	-0.448*	0.256	-0.330	0.092	-0.137	0.286	1.000

NOTE: *Significant at 10% level of significance
**Significant at 5% level of significance
***Significant at 1% level of significance

The indigenous variable (Y) in this study is land concentration (Table No.3). The exogenous variables are as follows:

1.	Drainage Density	(X1)
2.	Absolute Relief	(X2)
3.	Relative Relief	(X3)
4.	Stream Frequency	(X4)
5.	Slope	(X5)
6.	Soil rating Index	(X6)
7.	Moisture Index	(X7)
8.	Humidity Index	(X8)
9.	Aridity Index	(X9)
10.	Rainfall	(X10)
11.	Ruggedness number	(X11)
12.	Dissection Index	(X12)

The inter correlation matrix as mentioned above is given in the table III. A close examination of this matrix is needed to obtain the correlation between land concentration and environmental factors. These are as follows:

1. There is positive correlation between dependent variable land concentration and independent variable drainage density (X1). The relationship

between these two variables is significant at 1% level of significance because high number of drainage lines provide more scope for extensive agriculture, leading to high concentration of land holdings, such type of situation is only possible in undulated surface where higher slope will lead to more no. of drainage lines. So the drainage density will be found more in the areas where land is not suitable for agricultural activity and land concentration will be more.

2. Absolute Relief (X2) has positive correlation with the land concentration significant at 1% level of significance because of the fact that more absolute relief will cause undulated surface, where agricultural activity will be a tedious activity and the land may be concentrated to a few households only. Thus in the areas of high absolute relief, land concentration will also be more.

3. Relative relief (X3) shows a positive correlation (0.633) significant at 1% level of significance. It is clear from the earlier statements that if the relative relief will be high land concentration will also be high due to the fact it has significant correlation at 1% level of significance with drainage

Density (X1) and Absolute Relief (X2). As relative relief and absolute relief are possitively correlated within themselves. There exists positive significant relationship between relative relief (X3) and land concentration (Y).

4. Stream Frequency (X4) has positive correlation with the land concentration (0.721) which is significant at 1% level of significance because stream frequencies are higher in the hill slopes where the land concentrations are higher. With this reference stream frequency has a positive significant correlation with the land concentration.

5. Slope (X5) has positive correlation with the land concentration which is significant at 5% level of significance because high degree of slope will not only create difficulty in ploughing but even the slighest rainfall will lead to erosion. Moreover with high run off the moisture retaining capacity of the soils would be fairly low on the other hand if the area lies in the low lying section if may become flooded or water logged and may not be available for cultivation during the rainy season. Thus such type of land can only be afforded by few households who can use high input of technology for agricultural production. In general, for such type of land on one

bothers to possess. So it is obvious that with high degree of slope, concentration of the land ownership will also be more depicting a positive relationship between these two variables.

6. Ruggedness number X11 has positive correlation with the land concentration, significant at 1% level of significance because ruggedness number denotes undulations and irregularities which are associated with high relief, slope, stream and Drainage which show in turn a high positive correlation with the land concentration. The relationship of these variables has already been discussed in the earlier pages.

7. Aridity Index (X9) Dissection index (X12) Rainfall (X13) have positive correlation with the land concentration which is not significant. This shows that there is week correlation between land concentration and these variables.

8. Soil rating index (X6), moisture index (X7) and Humidity index (X8) show a negative correlation with the land concentration. This relationship with land concentration is not significant. The absence of significant co-efficient of correlation shows that this hypothesis does not hold in the case of Eastern Uttar Pradesh.

TABLE NO. XV

PHYSICAL FACTOR

RESULT OF STEP WISE REGRESSION

Variables	Intercept	Regression co-efficient	S.E.	T	R^2	Increase in R^2	$\bar{R}$	$\bar{R}^2$	F
1	2	3	4	5	6	7	8	9	10
Step 1)(4	0.3211	0.013	0.003	3.75***	0.319	-	0.721	0.519	14.084***
Step 2)(4	0.54120	0.007	0.005	1.387*	0.552	+0.033	0.742	0.539	8.358***
)(11		0.0114	0.085	1.335*					

NOTE:- *Significant at 10% level of Significance

***Significant at 1% level of Significance

2.15 Analysis of Stepwise Regression:

In the above mentioned correlation matrix we have tested 12 variables of physical parameters among which some of the variables show a positive trend with land concentration and others show a negative trend. Among twelve variables relationship of 6 variables are significant and they are positively correlated. For the stepwise regression alaysis it was not possible to programme all the variables. So here only those variables have been selected which have significant relationship with land concentration (Table No.4). Those variables are as follows:

1. Drainage Density
2. Absolute Relief
3. Relative Relief
4. Stream Frequency
5. Slope
6. Ruggedness number

Selecting these 6 variables setpwise regression analysis has been carried for this study. The stepwise regression analysis yield encouraging results. The value of R^2 is 0.552 in the second step for

variable No.11 (ruggedness number) (Table No.4). This indicates that land concentration can sufficiently be explained by a simple linear model. So the explanation cannot be restricted only to a correlation analysis. 2 variables explain a considerable impact on land concentration. Other variables do not show much impact on land concentration as these are inter related among themselves. In the first step variable 5 has been entered though it's correlation is low because other variables are more intercorrelated. A close examination of the matrix though giving explanation similar to earlier correlation analysis indicates some broad clues to explain land concentration.

i) Variable No. X5 (Stream Frequency) explains 52% of variation of the land concentration, where Standard of Error is also less. The relationship of Stream frequency and ruggedness number is significant at 1% level of significance because when the stream frequency is more, the area will be rugged and undulating in hilly areas, leading to a higher land concentration with a particular household.

ii) Stream Frequency and Ruggedness number both explain 55% of variations in the land concen-

tration and it is significant at 10% level of significance. So the Stream frequency and ruggedness number are more important to explain the variations of land concentration.

The subsequent variables coming in stepwise regression analysis are C5 (Stream Frequency) and X11 (Ruggedness Number) not explaining more than 14% of the total variation. In the first step multiple regression analysis explains 72" of the total variation in land concentration. But in the second step both X5 and X12, variables explain 74% of the total variation in land concentration. F value is found to be significant at one percent level of significance.

2.15 Conclusion

The total variations in land concentration explained by the set of environmental factors is 74%. However the interaction between the set of environmental factors and that of land concentration provide a vital clue of greated significance. The soil rating index, moisture index, humidity index affect land concentration negatively. But the impact of these variables on land concentration is not significant. The other climatic and relief

factors as Rainfall, Aridity Index and Dissection Index respectively affect land concentration positively but are not significant. The other physiographical variables as Stream Frequency and Ruggedness number explain 55% of the total variations in land concentration. The correlation matrix shows that the positive relationship between stream frequency & land concentration is significant at 1% level of significance. Even this variable has proved in the stepwise regression along with (11 variable) significant Ruggedness number. The other relief variables have been deleated by the computer because all these variables as Drainage Density, Stream Frequency, Absolute Relief & relative relief have multicollinearity. So we can say that among the environmental factors, climatic factors have not much impact on land concentration which is not significant but physiographic factors and drainage have positive impact on land concentration & are significant at 1% level of significance. Among the physiographic factors, stream frequency and ruggedness number explain the maximum variation in land concentration.

CHAPTER - III

SOCIAL FACTOR INFLUENCING LAND CONCENTRATION

CHAPTER III

SOCIAL FACTOR INFLUENCING LAND CONCENTRATION

3.1 Introduction

Social factors are also equally important and have an impact on land concentration. The agricultural activity cannot be performed having suitable land resources and technology. In this chapter nine variables of social factors are selected (Table No.5) to see the impact of these parameters on land concentration.

1. Agricultural workers to total rural workers
2. Agricultural labourers to total Agricultural workers
3. Cultivators to total agricultural workers
4. Proportion of Scheduled caste and Scheduled Tribes Population to total rural population
5. Agricultural workers per hectare
6. Agricultural workers per No. of household
7. Growth rate of Rural population 1961-71
8. Growth rate of male cultivators 1961-71
9. Growth rate of male agricultural labourers.

In which proportion of agricultural workers to total rural workers, proportion of cultivators to total agricultural workers, Agricultural workers per hectare

TABLE NO. V

EASTERN UTTAR PRADESH

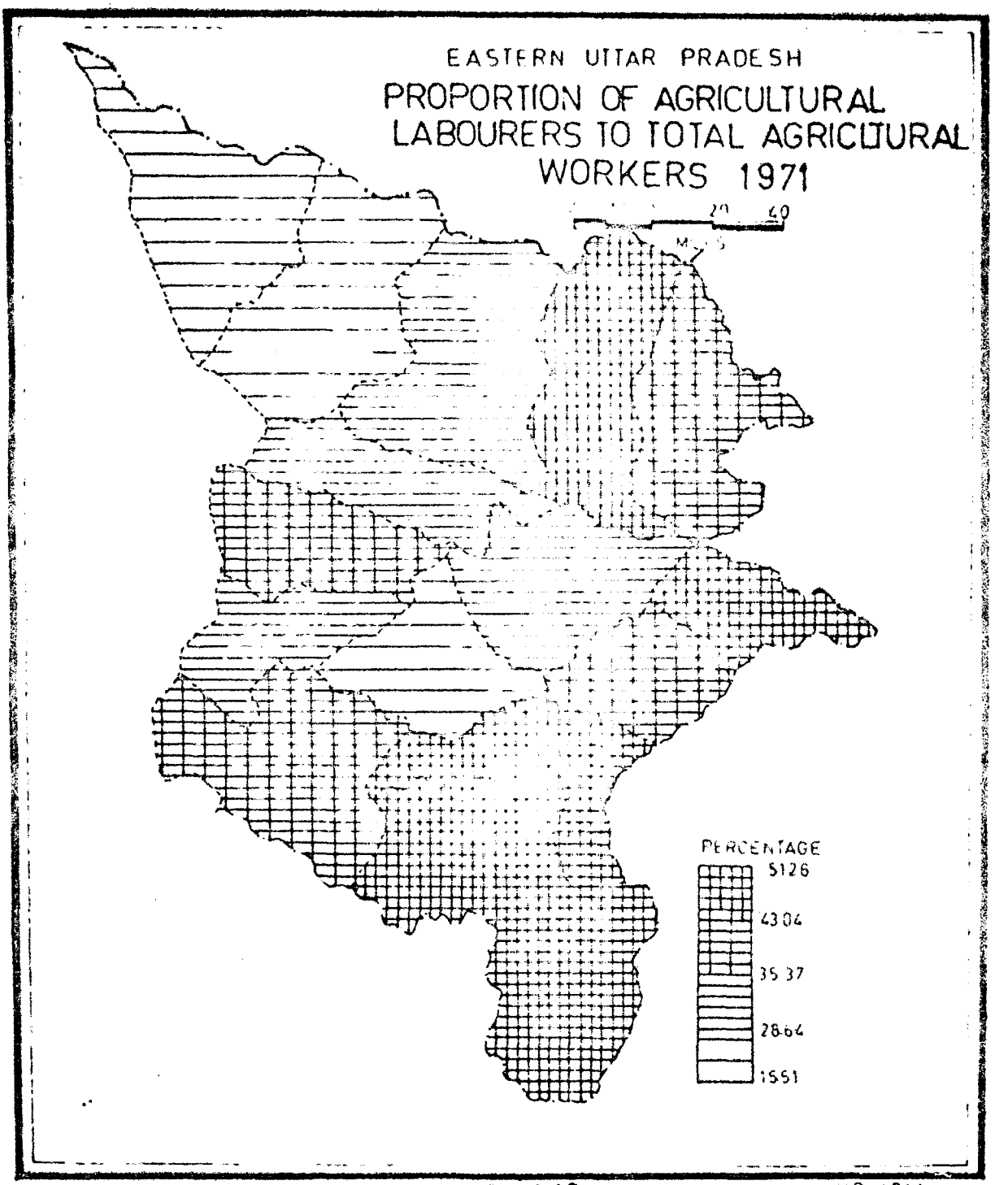
SOCIAL FACTOR

S.No.	Districts	% of Agricultural workers to total rural workers	% of Agricultural labours to total Agricultural workers	% ofCultivators to total Agricultural workers	% of SC & ST Population to total rural Population	Agricultural workers per Hectare	Agricultural workers per No. of House hold	Growth rate of Rural Population 1961-71	Growth rate of Cultivators 1961-71	Growth rate of Agricultural labours 1961-71
1	2	3	4	5	6	7	8	9	10	11
1.	Allahabad	72.92	38.92	69.08	27.03	1.27	1.44	20.09	-5.34	74.93
2.	Azamgarh	82.37	33.93	66.07	25.32	1.52	1.00	18.13	-7.45	101.89
3.	Bahraich	90.96	15.51	84.49	18.47	1.17	1.25	17.98	-14.43	158.11
4.	Ballia	82.39	47.10	52.90	14.23	1.49	1.41	-14.37	-9.92	78.55
5.	Basti	90.77	28.65	71.35	20.49	1.68	1.87	12.36	-4.72	96.58
6.	Deoria	89.26	33.27	64.63	15.83	1.74	1.49	17.76	-11.08	133.76
7.	Faizabad	83.24	31.96	68.04	25.76	1.67	1.21	16.86	-3.90	71.05
8.	Ghazipur	82.05	37.20	62.80	19.80	1.43	1.41	14.58	-7.65	100.62
9.	Gonda	89.76	21.03	78.97	17.47	1.33	1.37	10.13	-3.87	74.48
10.	Gorakhpur	84.50	44.80	55.20	22.51	1.76	1.51	17.67	-14.93	134.87
11.	Jaunpur	83.57	28.47	71.53	21.76	1.45	0.85	14.97	-7.43	79.98
12.	Mirzapur	79.74	51.25	48.74	36.47	0.92	1.70	22.58	-2.14	78.10
13.	Pratapgarh	87.59	29.64	70.36	21.52	1.41	1.15	13.32	-4.29	47.64
14.	Sultanpur	88.12	35.92	64.08	24.20	1.43	1.10	16.12	-2.74	54.49
15.	Varanasi	58.40	43.04	56.96	20.43	1.50	1.11	18.05	-3.87	72.22

growth rate of rural population and growth rate of male agricultural labourers show a negative impact on land concentration. The assumption has been made for other five variables that these have positive impact on land concentration.

3.2.1 Agricultural Workers to total Rural workers

The distribution pattern of agricultural workers to total rural workers shows that the southern ration of this region has less (85%) agricultural workers in which the following districts of Allahabad, Azamgarh, Ballia, Faizabad, Ghazipur, Jaunpur, Mirzapur and Varanasi are fallen. More agricultural workers to total rural workers are found in the northern region which is spread over in Basti, Bahraich, Deoria, Gonda, Gorakhpur, Pratapgarh and Sultanpur districts. The percentage value so obtained for agricultural workers to total rural workers varies from 58.40% in Varanasi district to 90.96 in Bahraich district. Both the districts are located in south and north of this region respectively. According to the distribution pattern of agricultural workers and land concentration, an assumption has been made that both these variables have an inverse relationship with each other because more agricultural workers means that the region has low technology and follows a traditional



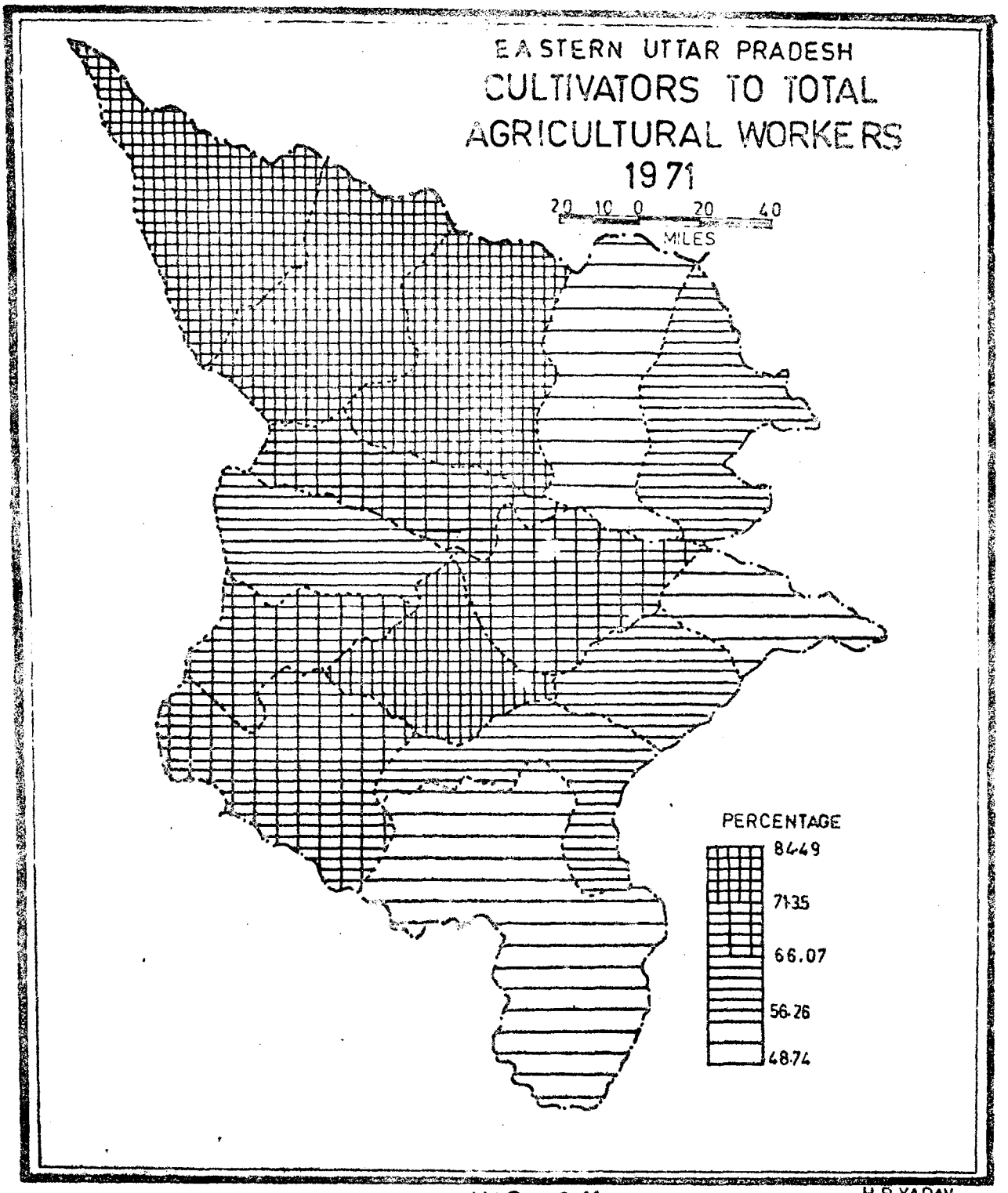
MAP NO. 10

H.R. YADAV

type of agriculture. In such type of agricultural activity the land concentration will be low but this is not the case in present situation. In this case, the situation is different which is due to less suitability of agricultural land. So the areas where land concentration is more shows that the land is less suitable for the agriculture and the recent technological inputs are not used. The traditional type of technology is used in which more manual labour is used. That is why the area where land concentration is more agricultural workers are less. So both these variables have a negative correlation with each other.

3.2.2 Agricultural Labours to total Agricultural Workers

Proportion of agricultural labourers varies in the region from 15.51% in Bahraich district to 51.25% in Mirzapur district (Map No.10). High (51.26% to 43.04%) proportion of agricultural labourer are found in Mirzapur, Varanasi, Gorakhpur and Ballia districts. Medium (43.04% to 35.37%) agricultural labourers are in Allahabad, Sultanpur, Ghazipur and Deoria districts. Districts having low (35.37% to 28.64%) agricultural labourers proportion are Basti, Faizabad, Azamgarh and Pratapgarh districts. There



MAP NO. 11

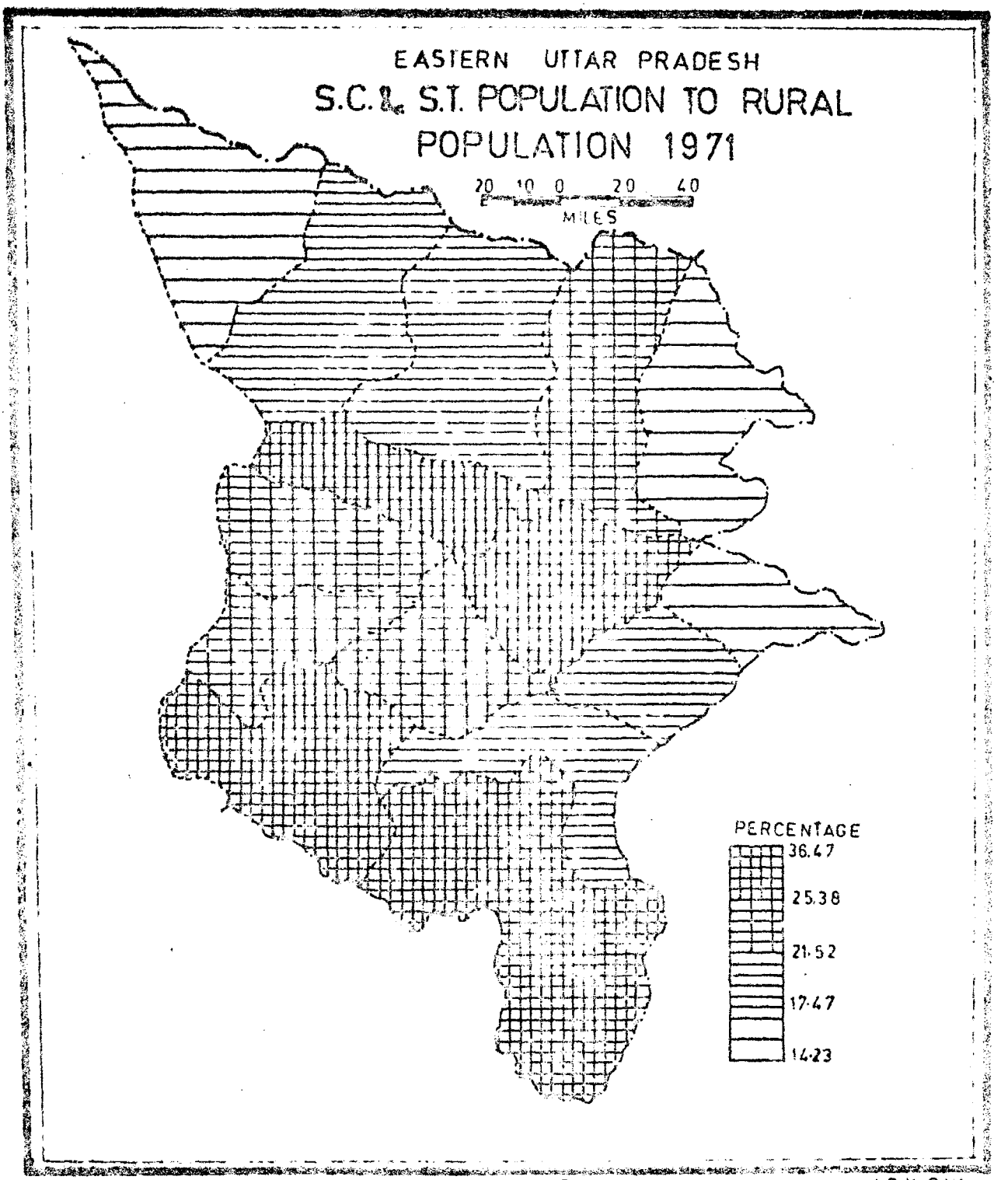
H.R. YADAV

are districts having very low (28.64 to 15.51%) agricultural labourers as Bahraich, Basti and Jaunpur districts. The variation of agricultural labourers from North to South and land concentration as well represents that these variables are inversely correlated. The region having more agricultural labourers presents that the land is concentrated more either with zamirdars or some landlords who have employed labourers to cultivate their land. Even the agricultural labourers will be more in areas where land is not so much suitable for agricultural activities. Thus the districts having more land concentration have more agricultural labourers. Thus one may assume that agricultural labourers have positive impact on land concentration.

3.2.3 Proportion of Cultivators:

Computed values (Percentage) of cultivators to total agricultural workers varies from 48.74% in Mirzapur to 84.49 in Bahraich district.(Map No.11) Proportion of cultivators is high (84.49% to 71.35%) in Bahraich, Gonda, Basti and Jaunpur districts. Medium (71.35% to 66.07%) distribution of cultivators is seen in Azamgarh, Faizabad, Pratapgarh and

Allahabad districts. Share of cultivators is low (66.07% to 56.26%) in Sultanpur, Varanasi, Ghazipur and Deoria districts. Districts having low (56.26% to 48.74%) proportion of cultivators are Mirzapur, Ballia and Gorakhpur. The variation of cultivators and land concentration from one district to another shows that these above mentioned variables have negative correlation with each other. Cultivators will be more in those areas where land will be suitable for agricultural production, for which the cultivator tries to achieve the land, even by the consolidation method, at any cost. So the land concentration will be fragmented and the number of cultivators will become more whether they are proprietory cultivators or tenant cultivators. Number of cultivators will be less in areas where land is not suitable for the agricultural production. In such type of areas cultivators whoever are possessing the land will ultimately leave the land due to less output as they cannot afford more expensive inputs. So ith obvious that the proportion of cultivators may have negative impact on land concentration i.e. the areas having higher percentage of cultivators have low land concentration.

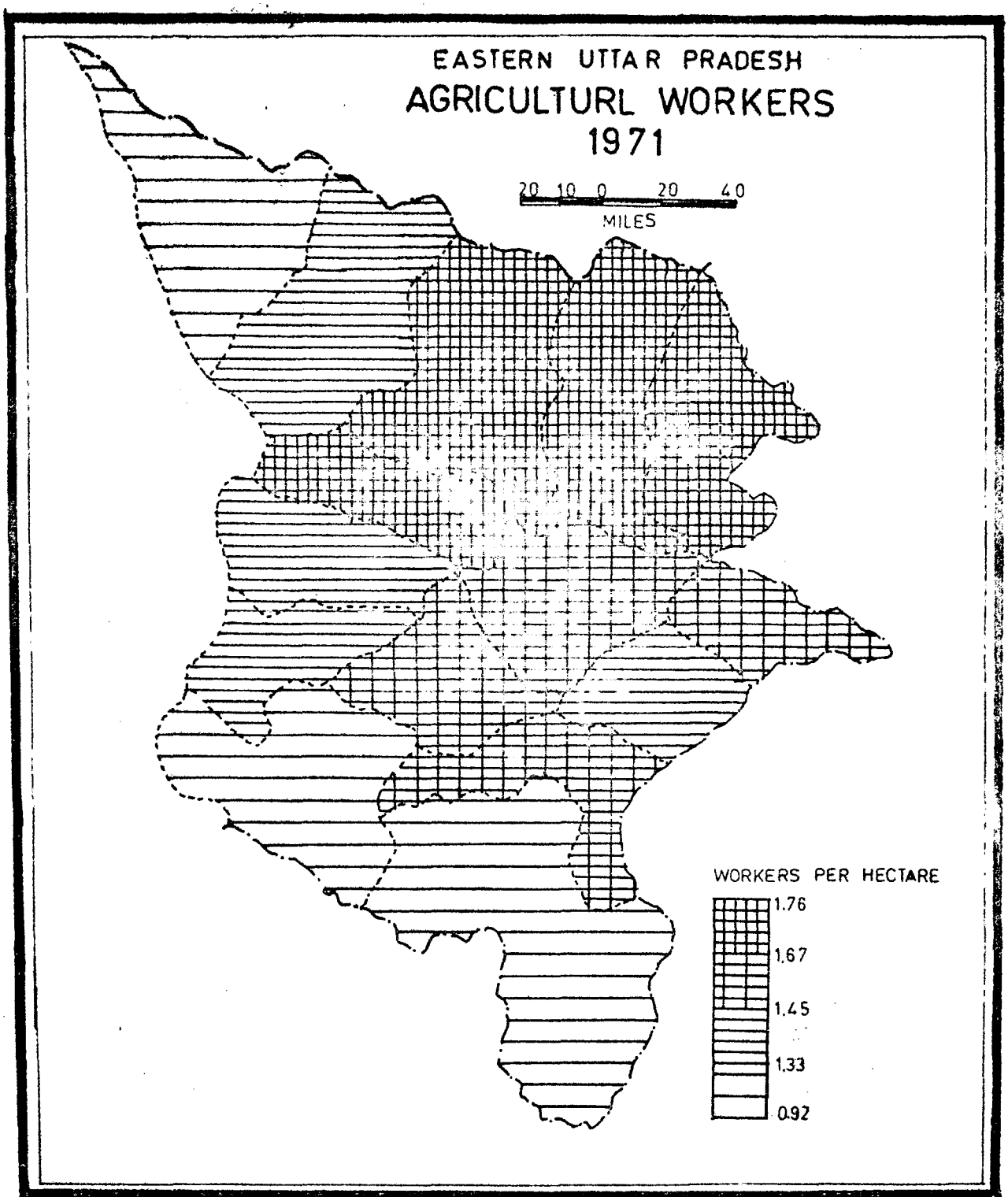


MAP NO.12

H.R.YADAV

3.2.4 Scheduled Caste and Scheduled Tribe Population to total Rural Population

Scheduled caste and Scheduled Tribe have an impact over land concentration. The impact of this variable on land concentration is positive because scheduled caste and scheduled tribe are such type of ethenic group, who have been land less from the historical time. The land was captured from Ain-E-Akbari to recent time by the higher ethenic group as Kshatriyas, Brahmins and Muslims. So from the Zamindari system and Pattitari system to tenancy system, scheduled caste and scheduled tribe have no land because they belong to a lower ethenic group. Due to their poverty, high class people have dominated over the flat land and the land which is suitable for agricultural productivity. Under such type of circumstances, these lower class groups i.e. scheduled caste population and scheduled tribe population started shifting from the flat areas towards the undulated, rugged or the areas where these zamindars influence was less. Few scheduled castes and scheduled tribes have also been allowed as landless labourers in the fields of the zamindars. So the scheduled castes and schoduled tribes population will be more in those areas where land is less suitable for agricultural production. The distribution of Scheduled tribe population is more in the southern districts


EASTERN UTTAR PRADESH
AGRICULTURL WORKERS
1971
20 10 0 20 40
MILES
WORKERS PER HECTARE
1.76
1.67
1.45
1.33
0.92
H.R.YADAV

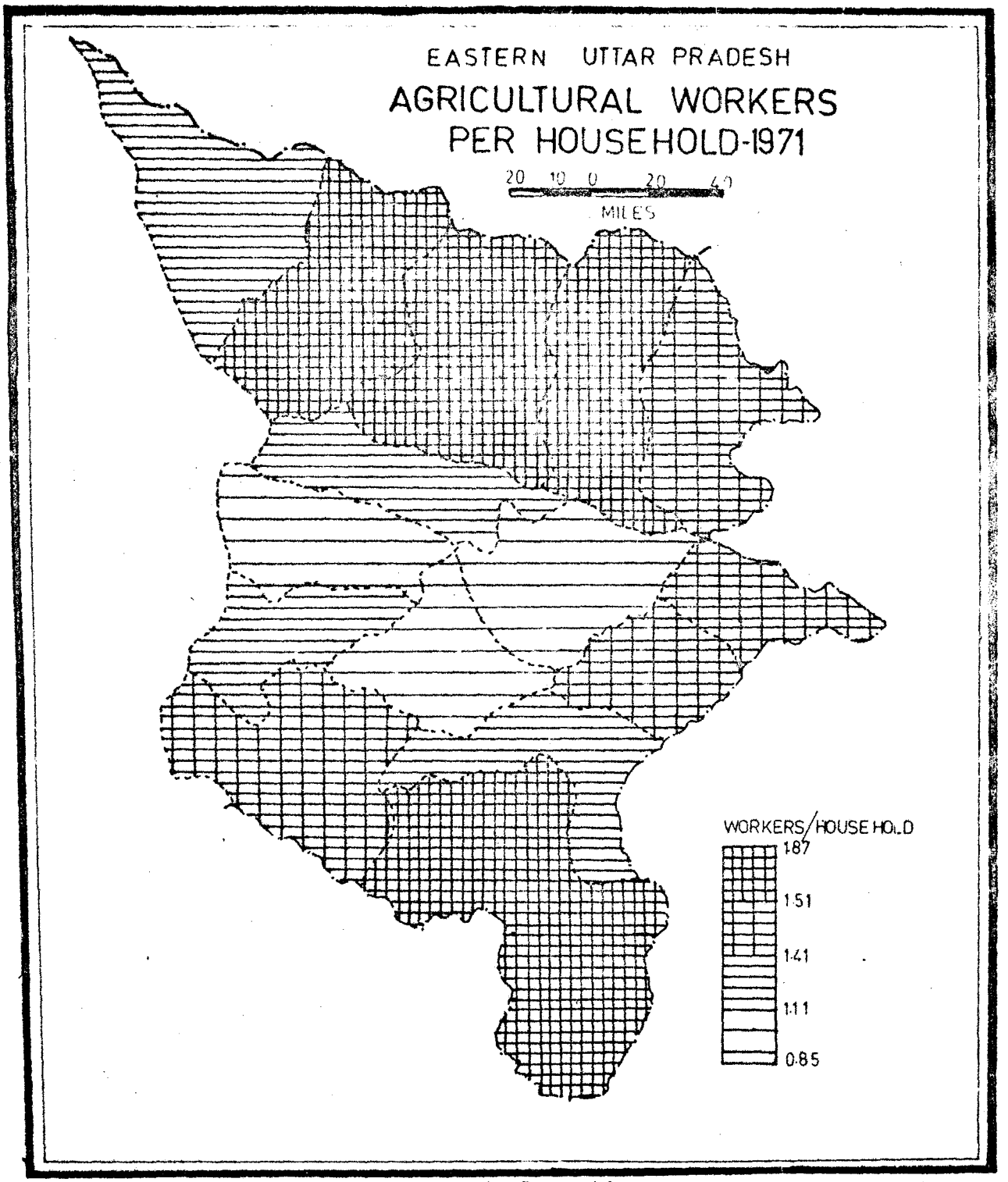
MAP NO.13

of the region but scheduled caste's population to total rural population is more in plain areas situated in middle districts of the region. Joint distribution of scheduled castes and scheduled tribe population to total rural population is more high (36.47% to 25.38%) in Mirzapur, Allahabad, Faizabad and Azamgarh districts. S.C. & S.T. population is medium (25.38% to 21.52%) in Sultanpur, Pratapgrah, Jaunpur and Gorakhpur districts. (Map No.12) It is low (21.52% to 17.47%) in Gonda, Basti, Varannasi and Ghazipur districts. Bahraich, Deoria and Ballia districts have very low (17.47% to 14.23%) scheduled caste and scheduled tribe population in the region. Thus the distribution pattern of scheduled caste and scheduled tribe population represents that these variables are positively correlated with land concentration when the scheduled caste and scheduled tribe population is more the land concentration will also be more.

3.2.5 Agricultural Workers per Hectare:

Agricultural workers per hectare are more in north eastern districts of the region. Southern districts as well north-western district have low agricultural workers per hectare. Agricultural workers per hectare is high (1.76 to 1.67) in Faizabad, Basti, Gorakhpur and Deoria districts. (Map No.13) It is medium (1.67 to 1.45) in Jaunpur, Varanasi, Azamgarh

Azamgarh and Ballia districts. Low (1.45 to 1.33) agricultural workers are seen in Sultanpur, Pratapgarh, Gonda and Ghazipur districts. Districts having very low (1.33 to 0.92) agricultural workers are Mirzapur, Allahabad and Bahraich. Distribution pattern of agricultural workers and land concentration shows that these two are inversely related. This is because agricultural workers i.e. cultivator and agricultural workers i.e. cultivator and agricultural labourers including scheduled caste and excluding scheduled tribe population will be more in areas where land is suitable for agricultural production (plain areas) i.e. where land concentration will be low. If the number of cultivators are more, labourers will be low due to the technological inputs for agricultural production which restricts labourers. When the number of cultivators will be more the land will be distributed in many holdings and they will be distributed in many holdings and they will be employing either their family members or labourers including which the number of workers will be more. The areas where land is suitable for agricultural production agricultural workers per hectare will be more i.e. the land concentration will be low. Thus agricultural workers per hectare may have negative impact on land



MAP NO. 14

H.R.YADAV

concentration.

3.2.6 Agricultural Workers per Household:

Agricultural workers per household is high (1.87 to 1.51) in Gonda, Basti, Gorakhpur and Mirzapur districts. Medium (1.51 to 1.41) agricultural workers are seen in Deoria, Ballia, Ghazipur and Allahabad districts. (Map No.14) There are districts as Pratapgarh, Varanasi, Faizabad and Bahraich which have low (1.41 to 1.11) agricultural workers per household. Agricultural workers per household is very low (1.11 to 0.85) in Sultanpur, Jaunpur and Azamgarh districts. Distribution of Agricultural workers per household and land concentration represents that these variables are positively correlated. When the agricultural workers per household will be more the land concentration will also be more. Agricultural workers per household will be more where technology is not so developed or where technological uses are not possible as in the hilly and rugged areas. The other reason may also be that in the traditional agricultural economy when technology was not so developed people were using more labourers i.e. family labourers for agricultural production while land was concentrated among few households i.e. with zamindars who later on have distributed the land among the tenants. But this is not the case

with present situation. This parameter may have an impact on land concentration, while it is historical and for the present situation it is not suitable and the explanation for higher land concentrations can be done only on the basis of new development of technology on rugged lands. The land which is not suitable for the agricultural production has more agricultural workers per household where technology is less developed and in such type of areas land concentration will be more.

3.2.7 Growth rate of Rural Population:

Growth rate of rural population has negative impact on land concentration. Assuming that if land concentrated householder has two sons on the one hand, on the other household having six sons, in the first case land will be concentrated but in the second case land concentration become low because the same amount of land will be divided into six parts. So when the growth rate of rural population will be more the land concentration will be low. Growth rate of rural population varies from 14-57 in Ballia District to 22-58 in Mirzapur district.

3.2.8 Growth rate of Cultivators:

The growth rate of cultivators and land concentration have negative impact on each other. When

growth rate of cultivator will be more land concentration will be low because of the simple reason that the growth and number of cultivators within the same household will lead to a fragmentation in the cultivated area thereby giving rise to lower land concentrations. But in the region growth rate of cultivator for all the districts is negative. So it is obvious that growth rate of cultivators may have positive impact on land concentration. The growth rate of cultivators region as a whole varies from 2.14 in Mirzapur district to 14.93 in Gorakhpur district.

3.2.9 Growth rate of agricultural labourers:

Growth rate of agricultural labourers and land concentration have positive correlation with each other. When growth rate of agricultural labourer is more, it shows that land concentration will also be more. They may be due to the nature of agriculture where technological innovations cannot be implemented because of the rugged nature of the region. Hence agricultural labourers will be employed in more numbers to carry on the agriculture. The growth rate of agricultural labourers varies from 47.64 in Pratapgarh district to 158.11 in Bahraich district. Growth rate of agricultural labourer is more (above 90.00) in Azamgarh, Bahraich, Basti, Deoria, Ghazipur and

TABLE NO. VI

CORRELATION MATRIX

SOCIAL FACTOR

	Y	1	2	3	4	5	6	7	8	9
Y. Land Concentration	1.000									
1. % of Agr. workers to total rural workers	-0.235	1.000								
2. % of Agr. Labourers to total Agr. workers	-0.548**	-0.539**	1.000							
3. % of Cultivators to total Agr. Workers	0.529**	0.468*	-0.977	1.000						
4. % of SC & ST pop. to total Rural pop.	0.422*	-0.243	0.386*	0.332*	1.000					
5. Agr. workers per Hectare	-0.487*	0.115	-0.006	-0.048	-0.496*	1.000				
6. Agr. workers per No. of Household	0.561**	0.194	0.268	-0.243	0.097	-0.028	1.000			
7. Growth rate of Rural pop. 1961-71	-0.065	-0.144	-0.117	0.157	0.591**	-0.166	-0.061	1.000		
8. Growth rate of cultivators 1961-71	0.268	-0.274	0.119	-0.096	0.477*	-0.297	-0.041	0.145	1.000	
9. Growth rate of Agr. Labourers 1961-71	-0.050	0.299	-0.218	0.189	-0.285	0.178	0.258	0.174	-0.860***	1.000

NOTE: *Significant at 10% level of Significance
**Significant at 5% level of Significance
***Significant at 1% level of Significance

Gorakhpur districts. The low growth rate of agricultural labourers are found in Allahabad, Ballia, Faizabad, Gonda, Jaunpur, Mirzapur, Pratapgarh, Sultanpur and Varanasi districts.

3.3 Result of Correlation Matrix:

Leaving aside the environmental factors, which are already discussed in the second chapter, second major set of factors affecting the land concentration are social factors. The operation has taken into account here the variables of agricultural workers, labourers, cultivators and scheduled caste and scheduledttribe population (Table No.6).

i) Percentage of agricultural workers to total rural workers (X1), growth rate of rural population (X7) and growth rate of agricultural labourers have negative correlation with the land concentration which is not significant at any level of significance.

ii) Growth rate of cultivators (X8) have positive correlation with the land concentration and this relationship is not significant.

iii) Percentage of agricultural labourers to total agricultural workers (X2) have positive correlation with the land concentration which is significant at 5% level of significance.

It is because of the fact that labour intensity is both the cause and effect of lowland concentration. If the farmers have more land, they will employ agricultural labourers if the size of holding is small farmer can cultivate his own land. Thus there exists a positive relationship between agricultural labourers and land concentration.

iv) Proportion of cultivators to total agricultural workers (X3) have negative correlation with the land concentration which is significant at 5% level of significance. This shows a simple fact that households having a small size of land holding will cultivate their own land on the other hand if they have a larger size of holding they cannot cultivate their own land. Thus there exists a negative correlation between percentage of cultivators to total agricultural workers and land concentration of the region.

v) There is a positive correlation between percentage of Scheduled caste and Scheduled tribe population to total rural population (X4) which is significant at 10% level of significance. This follows from the earlier result discussed above as there is a positive correlation between

percentage of scheduled caste and scheduled tribe population to total rural population (X4) and proportion of agricultural labourers to total agricultural workers(X2).

vi) Agricultural workers per hectare (X5) have negative correlation with the land concentration significant at 10% level of significance because of the fact that if the farmers have high output they will employ agricultural workers, otherwise they will carry out all the workers themselves with their families which is possible only in the small size of land holdings. Thus there exists negative correlation between agricultural workers per hectare and land concentration.

vii) There is positive correlation between agricultural workers per number of household (X6) and land concentration, significant at 5% level of significance because of the fact that number of agricultural workers per number of household will be more in the case of large size of land holdings because a larger land owner employes agricultural labourers to perform agricultural activity.

TABLE NO. VII

RESULT OF STEP-WISE REGRESSION

SOCIAL FACTOR

Variables Entered		Intercept	Regression co-efficient	S.E.	T	R^2	Increase in R^2	R	R^2	F
1		2	3	4	5	6	7	8	9	10
Step 1	)(6	0.48068	0.075	0.031	2.441*	0.314	-	0.561	0.314	5.961*
Step 2	)(6	0.59031	-0.073	0.026	2.785*	0.237	-0.076	0.785	0.615	6.955*
	)(5		0.076	0.032	-2.401*					
Step 3	)(6	0.72288	0.059	0.022	2.646*	0.269	0.032	0.844	0.712	9.075*
	)(5		-0.079	0.026	-3.044*					
	)(2		-0.002	0.001	-2.589*					

NOTE: * Significant at 10% level of Significance

But farmer having small size of land holding either will employ less labourer or workers or will carry out all the work by himself. So the agricultural workers per number of household will be more in the case of large size of operational holding. Thus there exists a positive correlation between agricultural workers per household and land concentration.

3.4 Result of Stepwise Regression

The system of explanation by X, independent variable discussed above showed a higher degree of multi-collinearity among themselves. To remove the inconsistancies arising out of this problem of multicollinearity a stepwise regression analysis is attempted.

A stepwise regression analysis is attempted taking land concentration as dependent variable (Y) and nine earlier mentioned independent variables (X). The stepwise regression analysis gave an intercorrelation matrix which is given in the Table VII. It went upto 5 step after which R^2 started declining (Table No.7). The analysis therefore truncated at this step. The three variables found in the optimal regression line are-

1. Agricultural workers per No. of household (X6).
2. Agricultural workers per hectare (X5).
3. Agricultural labourers to total rural workers (X2).

The most dominant variable in explaining variability in land concentration is agricultural workers per household (X6) which explains around 31% variation in the land concentration. It is interesting to note that in subsequent steps variable X4 and X3 could not come because of strong correlation between them.

The next dominant variable is X5 ie. agricultural workers per hectare which explains about 30% of variation in Y i.e. land concentration.

The subsequent variables coming in stepwise regression analysis are X6, X5 and X2 not explaining more than 10% of the total variation in the land concentration. The final form of multiple regression analysis is given in step three, where three variables together explain 71% of the total variation in land concentration. F value is found to be significant at 10% level of significance.

3.5 Conclusion:

Therefore we can conclude that the hypothesis related to this empirical exercise is supported by the above mentioned variables. The high degree of multi-

collinearity among the explanatory variables suggest that the effect of X3 and X4 is subsumed in X5 and X6. Therefore the agricultural workers per household is found to be most dominant factor followed by agricultural workers per hectare (X5) and Agricultural labourers to total agriculturnl workers (x2).

CHAPTER - IV

ECONOMIC FACTOR INFLUENCING LAND CONCENTRATION

CHAPTER IV

ECONOMIC FACTORS INFLUENCING LAND CONCENTRATION

4.1 Introduction:

The economy of any region becomes a deciding phenomenon for production in any sector of economy. To obtain more output the producer uses more input in the form of land, labour and capital. Taking the first production factor land, it is general that productivity is found to be more in the good quality and fertile land which is not homogeneously distributed on the earth surface. It is obvious that the land where agricultural output is more by applying less input, people try to capture such type of land at any cost. Thus the distribution of land among the households is not so equal because every one tries to achieve good quality land i.e. where the agricultural productivity is more. On the other hand, areas where land is not fertile or where it is undulated earth surface and soil is not, suitable for the agricultural production, the farmer shas to use more input either in the form of mechanical or social. Such type of land where more input is needed to produce some output can only be afforded by richer farmer and not

TABLE NO. XX

EASTERN UTTAR PRADESH

INSTITUTIONAL FACTOR

.No.	Districts	cropping intensity	% of individual holdings to total holdings	% of individual holdings area to total holdings area	% of Cultivated Area of total cropped area	% of wholly owned & self operated House-hold to total House-hold	% of wholly owned & self operated holdings area to total area	% of House-hold having less than 5 hect. of land to total House-hold	% of House-hold's Area having less than 5 hect. of land to total holdings Area	% of House-holds having above 5 hect. of land to total House-hold	% of holdings Area having above 5 hect. of land to total holdings area	Growth rate of Area in Hect. 1962-65 to 1970-75
1	2	3	4	5	6	7	8	9	10	11	12	13
.	Allahabad	131	52.126	42.763	69.306	97.239	97.762	96.443	68.956	3.557	31.044	1.020
.	Azamgarh	128	52.709	44.085	74.863	98.099	98.368	98.716	84.763	1.284	15.237	1.100
.	Bahraich	136	01.191	74.461	64.907	91.884	92.814	97.461	79.652	2.539	20.348	1.051
.	Ballia	132	47.171	37.536	70.075	98.323	98.517	97.217	74.743	2.785	25.257	0.986
.	Basti	139	19.543	40.949	74.529	97.989	97.868	98.042	81.003	1.958	18.997	1.102
.	Deoria	138	44.847	34.905	77.159	99.221	98.662	98.241	82.187	1.759	17.813	1.128
.	Faizabad	140	73.536	65.235	66.255	97.823	97.413	98.817	87.155	1.183	12.845	1.039
.	Ghazipur	129	52.077	41.662	73.878	99.077	99.131	97.119	90.026	2.881	25.974	1.278
.	Gonda	139	74.133	64.230	70.304	95.163	96.625	97.353	78.971	2.647	21.029	0.978
0.	Gorakhpur	138	45.169	37.261	71.697	98.921	98.772	98.208	80.967	1.792	19.033	1.098
1.	Jaunpur	131	64.842	54.468	74.023	99.014	98.116	99.089	88.185	0.911	11.815	1.044
2.	Mirzapur	129	66.078	54.521	37.394	88.225	87.403	92.072	51.130	7.928	48.870	0.959
3.	Pratapgarh	134	60.449	50.423	68.325	98.371	98.513	98.201	85.802	1.799	14.198	0.999
4.	Sultanpur	130	65.529	55.951	67.638	96.964	97.467	98.422	83.824	1.578	16.176	1.085
5.	Varanasi	139	56.494	48.880	61.223	96.750	99.937	98.374	81.923	1.626	18.077	0.984

by the poorer. In this case the poorer will sell their land to the richer people at lower price or they leave the land due to its lesser productivity. So it is obvious that such type of land will be concentrated within a few particular household. Thus the areas where economic conditions are more suitable or agricultural production is more the concentration of the land will be low on the one hand where agricultural output is low the land concentration will be more. Thus an assumption can be made that where agricultural output or agricultural production is more, the land concentration will be low. So there is an inverse relationship between land concentration and agricultural economy of the region.

In this chapter an attempt has been made to see the correlation between various parameters of the economic factor and land concentration (Table No.8) which are as follows:

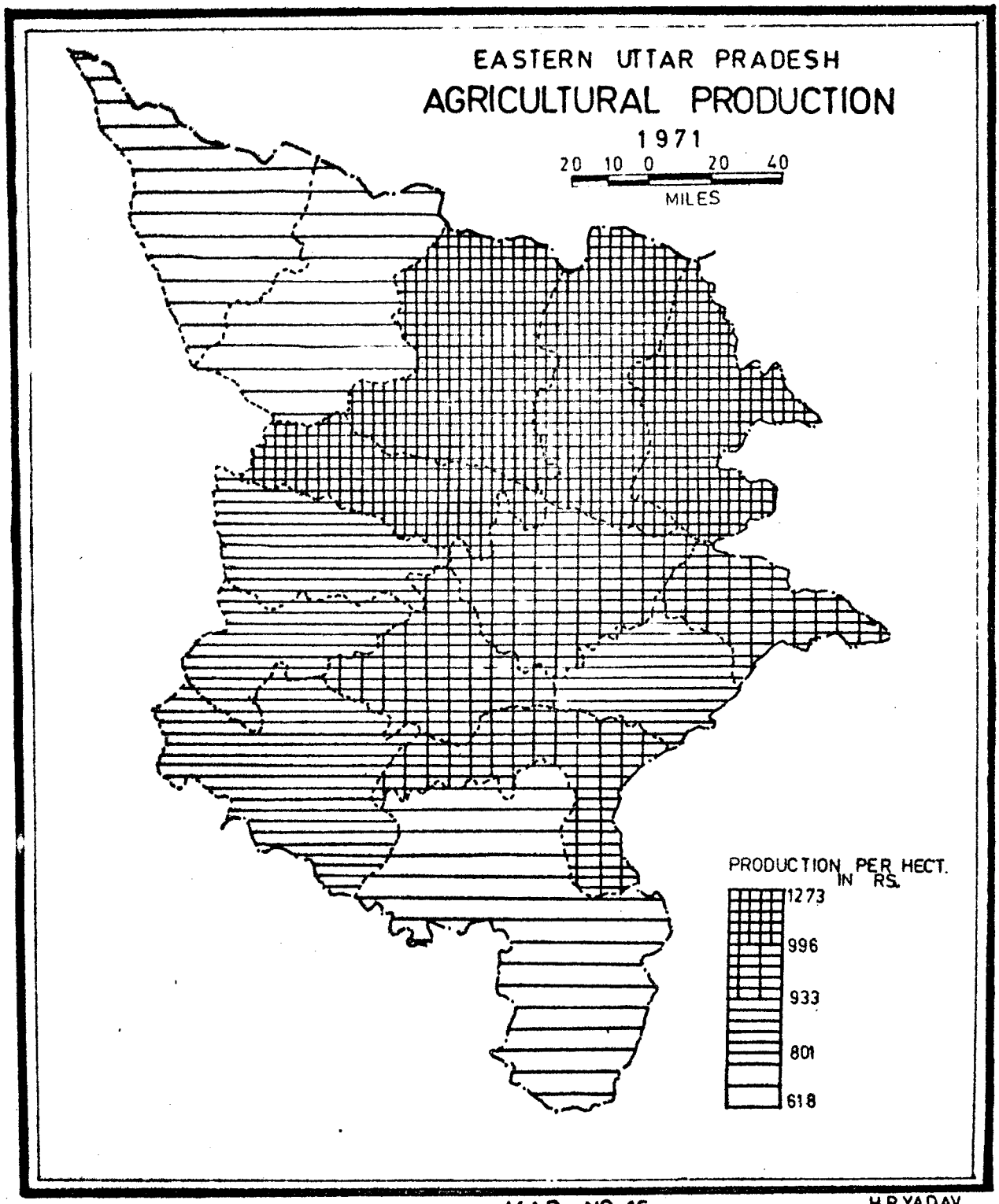
1. Agricultural growth Rate 1962-65 to 1970-73
2. Agricultural production per hectare 1971
3. Foodgrain production (Average 1970-73)
4. Food Surplus and Food deficit 1971
5. Agricultural output in Lakh Rs.1971

6. Growth rate of yield in Rs. 1961-71
7. Growth rate of output in Rs. 1961-71
8. Output per hectare in Rs. 1971
9. Output per cultivator in Rs. 1971
10. Output per labour in Rs. 1971
11. Output per NPK unit of fertiliser 1971
12. Output per household 1971.

4.2 Economic Factor

4.2.1 Agricultural Growth Rate(1962-65 to 1970-73)

The agricultural growth rate is higher in Gorakhpur district where it is 2.69 from 1962-65 to 1970-73. The lower growth rate is seen in Mirzapur and Pratapgarh district where it is 0.49 and 0.48 respectively. But the Varanasi district has negative agricultural growth rate (-0.84). The distribution patter of agricultural growth rate shows that the northern portion of this region seeks more agricultural growth rate because this part has fertile land and the earth surface is homogenous where agricultural activities are performed without much of struction. Using less input, people are above to achieve more output. Thus the region provides more agricultural



MAP NO. 15

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output with less marginal increase of input. But in the southern region where land is not suitable for agricultural production as there is rugged and undulated topography; it is but natural that more input will only gain low output. So the region seeks less agricultural growth rate. When the agricultural growth rate is more the land concentration ratio will be low. It shows that there is an inverse relationship between land concentration ratio and agricultural growth rate of the region.

4.2.2 Agricultural Production per Hectare:

The agricultural production per hectare in this region varies from one district to another. The agricultural production is found more in this year in Deoria district (Rs.1273) Faizabad (Rs.1064), Gorakhpur (Rs.1069) and Basti (Rs.996). Thus above mentioned districts have high Rs.1273 to 996) agricultural production (Map No.15). Medium (Rs.996 to 933) agricultural production is seen in Ballia (Rs.990), Azamgarh (Rs.975), Jaunpur (Rs.984) and Varanasi (Rs.933) districts. The districts having low agricultural production (Rs.933 to 801) are Sultanpur (Rs.890) Pratapgarh (Rs.801), Allahabad (Rs.857) and Ghazipur (Rs.923)

respectively. Very low agricultural production (Rs.801 to 618) is found in Bahraich (Rs.618), Gonda (Rs.794) and Mirzapur (Rs.768) districts. The distribution pattern of agricultural production shows that north-eastern districts have more agricultural production while southern district. Mirzapur and north-western districts of Bahraich and Gonda have very low agricultural production.

The distribution pattern of land concentration and agricultural production represents that there is inverse relationship between agricultural production and land concentration i.e. when the agricultural production is more land concentration will be low and when the agricultural production is low, the land concentration will be more. So the agricultural production has negative correlation with land concentration.

4.2.3 Foodgrain Production:

Foodgrain production and cash crop may have an impact on land concentration. In this less developed region of India cultivators cannot afford to going cashcrops but instead

cultivate food crops which need less inputs. The region having low land concentration has more foodgrain production. Such type of region may have low cash crop production. On the other hand the region having more land concentration may have low foodgrain production and more cash crop production. The production of cash crop is possible only in large extensive areas not is smaller unit areas. So the area of the cash crop will be concentrated with a particular rich farmer either to his firm or to his management. It is not possible with foodgrain production. The areas where land is fertile and production of foodgrain is more people try to achieve such type of land and the land will be distributed in small holdings either by means of land reform or land consolidation act. Foodgrain production is found to be more in Allahabad, Azamgarh, Bahraich, Basti, Deoria, Gonda, Gorakhpur and Jaunpur districts but low foodgrain production is found in Ballia, Faizabad, Ghazipur, Mirzapur, Pratapgarh, Sultanpur and Varanasi districts. The assumption for this variable i.e. foodgrain production with land

concentration can be assumed for their correlation that there is negative correlation between foodgrain production and land concentration i.e. when the land concentration is more, the foodgrain production will be low. Foodgrain has been selected for seeing the correlation with land concentration taking average production from 1970 to 1973.

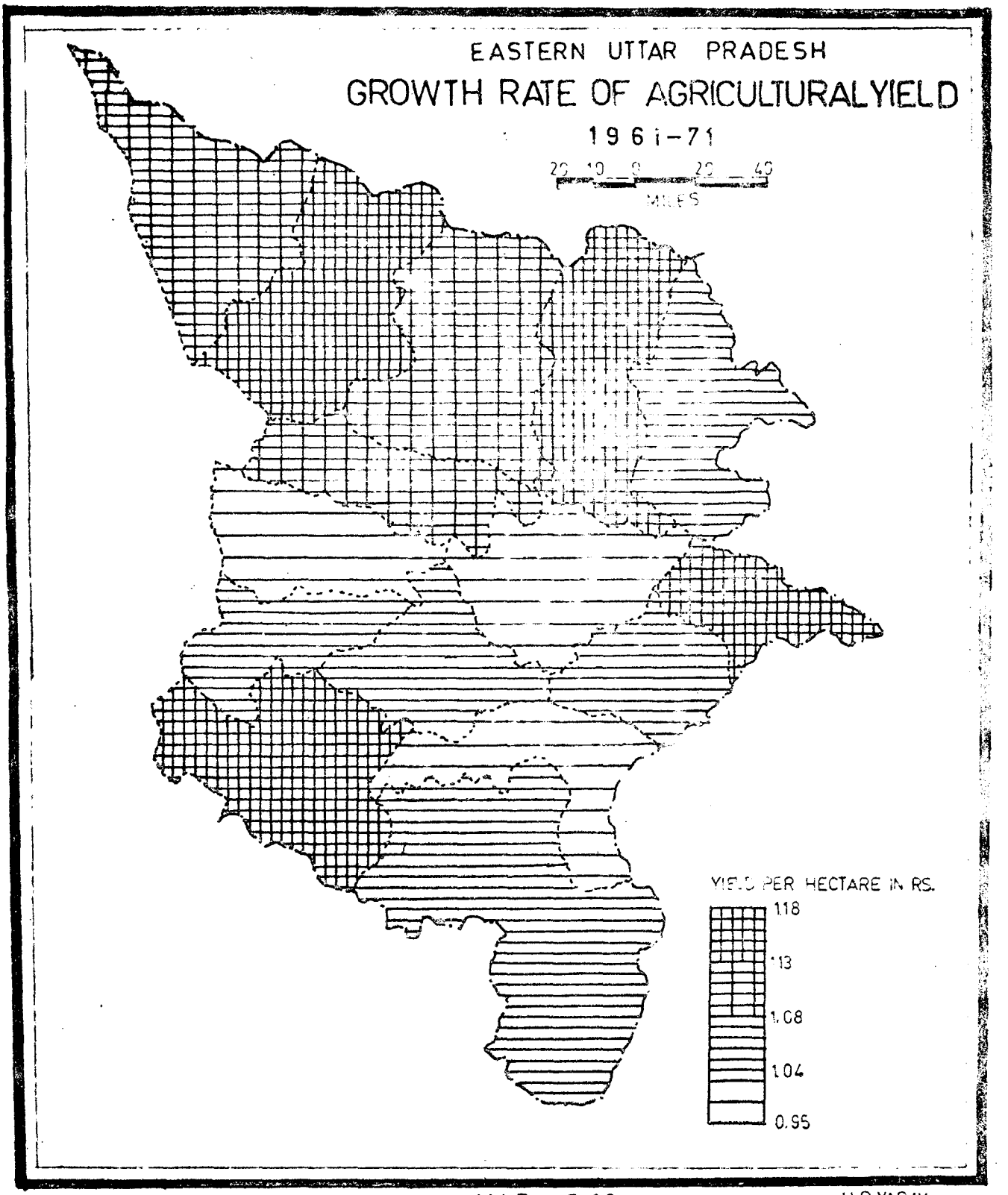
4.2.4 Food Surplus and Food Deficit:

The districts where food surplus is found there will be more foodgrain production and may have low land concentration associated with less cash crop production. The food deficit may take place when there is less productive land or land is not so suitable for agricultural production and land may be used for producing cash crops. Thus the areas having food surplus have low land concentration. So the food surplus has negative correlation with land concentration, on the other hand food deficit is seen due to less foodgrain production because land is less suitable for agricultural (foodgrain) production. So it is obvious that land will be occupied by the cash crop. So there will be more land concentration. Thus there is positive correlation of food deficit

with land concentration. The above discussed points reflect that food surplus has negative correlation with land concentration while food deficit has positive correlation with land, concentration. In this region 55% districts are classified as having food surplus and 45% districts as food deficit. There is food surplus in Allahabad, Bahraich, Basti, Ghazipur, Gonda, Jaunpur, Mirzapur and Sultanpur districts. The districts having food deficit are Azampur, Ballia, Deoria, Faizabad, Gorakhpur, Pratapgarh and Varanasi.

4.2.5 Agricultural Output:

Agricultural output too effects land contration in the same manner as agricultural production has impact on land concentration. When agricultural output is more the land concentration will be low. If the agricultural output is low the land concentration will be more. It shows that the land concentration and agricultural output are inversely interrelated. Agricultural output in Lakh Rs. shows that it is more in Allahabad, Azamgarh, Basti, Deoria, Gonda, Gorakhpur and Faizabad, Jaunpur districts. The other districts as Bahraich Ballia, Ghazipur, Mirzapur, Pratapgarh,



MAP NO. 16

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Sultanpur and Varanasi districts show a lesser output. The distribution pattern of agricultural output shows that the northern district of the region has more agricultural output because the land is flat. The Southern districts of the region have low agricultural output because the land is not so suitable for the agricultural production.

4.2.6 Growth rate of Agricultural yield (1961-71)

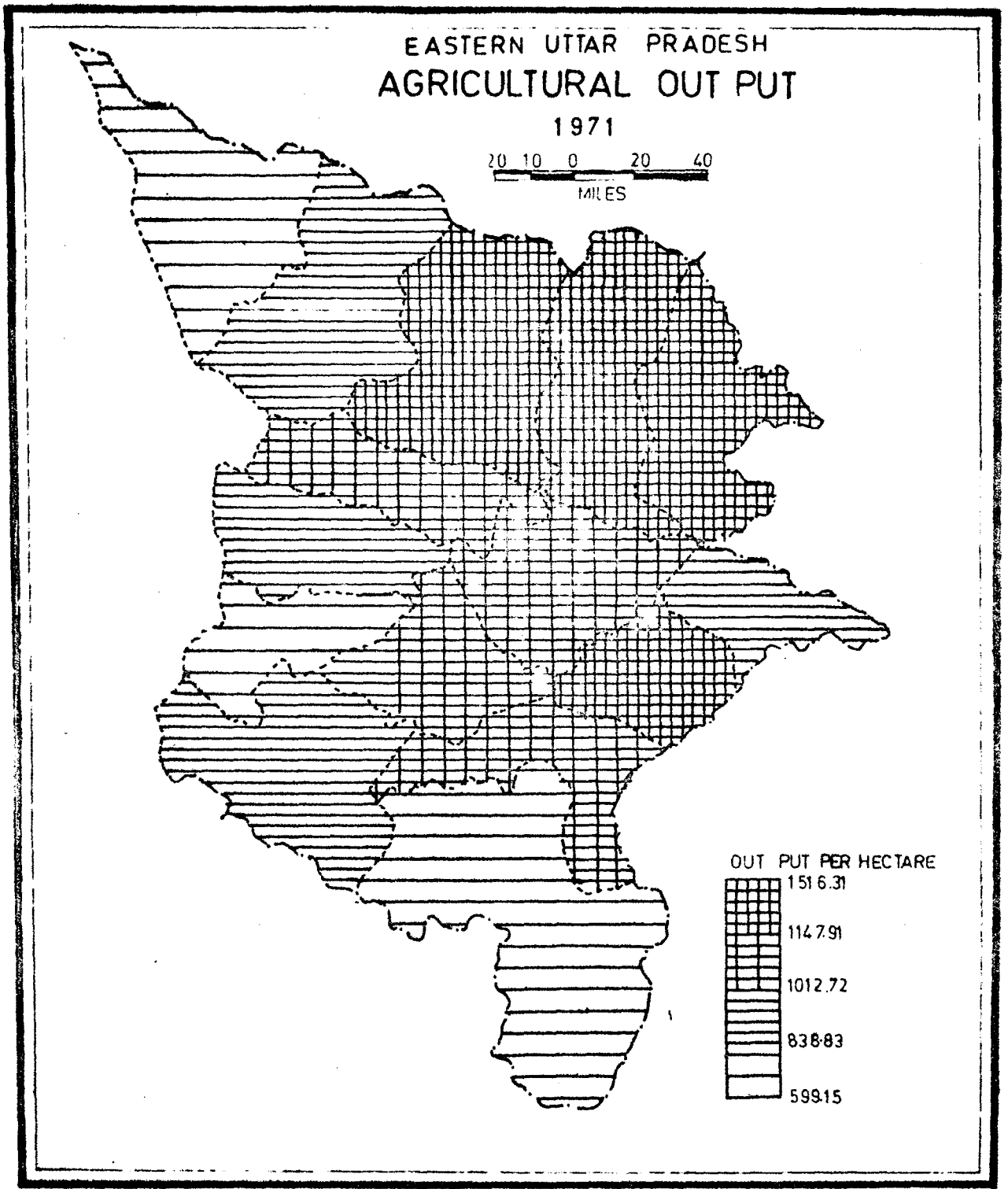
The growth rate of agricultural yield has negative impact on land concentration i.e. when the land concentration is more the growth rate of yield will be low and when the land concentration is low the growth rate of agricultural yield will be more. The growth rate of agricultural yield per hectare in Rs. is high (1.18 to 1.13) in Allahabad, Gonda, Gorakhpur and Ballia districts (Map No.16). The districts having medium (1.13 to 1.08) agricultural growth rate of yield are Varanasi, Faizabad, Bahraich and Basti district. Low agricultural growth rate of yield (1.08 to 1.04) is found in Pratapgarh, Jaunpur, Ghazipur and Deoria districts. There is very low level of agricultural growth rate of yield (1.04 to 0.95) in Sultanpur, Azamgarh and Varanasi districts.

4.2.7 Growth rate of output (1961-71):

The growth rate of output per hectare is Rs. is more which is above 1.15 in Bahraich, Ballia, Basti, Deoria, Faizabad, Ghazipur and Gorakhpur districts. The other districts (Allahabad, Sultanpur, Azamgarh, Gonda, Jaunpur, Mirzapur, Pratapgarh and Varanasi) have below Rs.1.15 growth rate of agricultural output. The distribution pattern of the growth rate of agricultural output shows that the northern districts of this region seek more growth in agricultural output and the southern districts of the regionhave low growth rate of agricultural output. It shows that there is negative impact of agricultural growth rate of output with land concentration, when growth rate of agricultural output is more the land concentration will be low.

4.2.8 Agricultural Output per Hectare:

The agricultural output per hectare shows that North-eastern region has more agricultural output, whereas Southern and north-western portion of the region have low level of agricultural output due to unsuitability of the physical resources. The districts like Basti, Gorakhpur, Deoria and Ghazipur show high (1516.31 to 1147.91 Rs.)



MAP NO. 17

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agricultural output per hectare (Map No.17). Medium (1147.91 to 1012.72) agricultural output is found in Varanasi, Jaunpur, Azamgarh and Faizabad districts. There is low agricultural output (1012.72 to 838.83 Rs.) in Gonda, Sultanpur, Ballia and Allahabad districts. Very low agricultural output (838.83 to 599.15 Rs.) is seen in Bahraich, Pratapgarh and Mirzapur districts.

The distribution pattern of agricultural output and land concentration (ginis co-efficient ratio) presents that there is an inverse relationship between these two variables. Where land concentration is more agricultural output will be low on the other hand when land concentration is low, the agricultural output will be more. It shows that agricultural output per hectare has negative impact on the land concentration of this region.

4.2.9 Output per cultivator:

Agricultural output per cultivator and land concentration have inverse relation with each other. Where land concentration is more the agricultural output per cultivator will be low

on one side, on the other, when land concentration ratio is low, the agricultural output per cultivator will be more. It shows that agricultural output per cultivator has negative impact on land concentration. The agricultural output per cultivator is more (above Rs.1000.00) in Allahabad, Azamgarh, Bahraich, Basti, Deoria, Gorakhpur and Varanasi districts. The agricultural output per cultivator is low (below Rs.1000.00) in Ballia, Faizabad, Ghazipur, Gonda, Jaunpur, Mirzapur, Pratapgarh and Sultanpur districts.

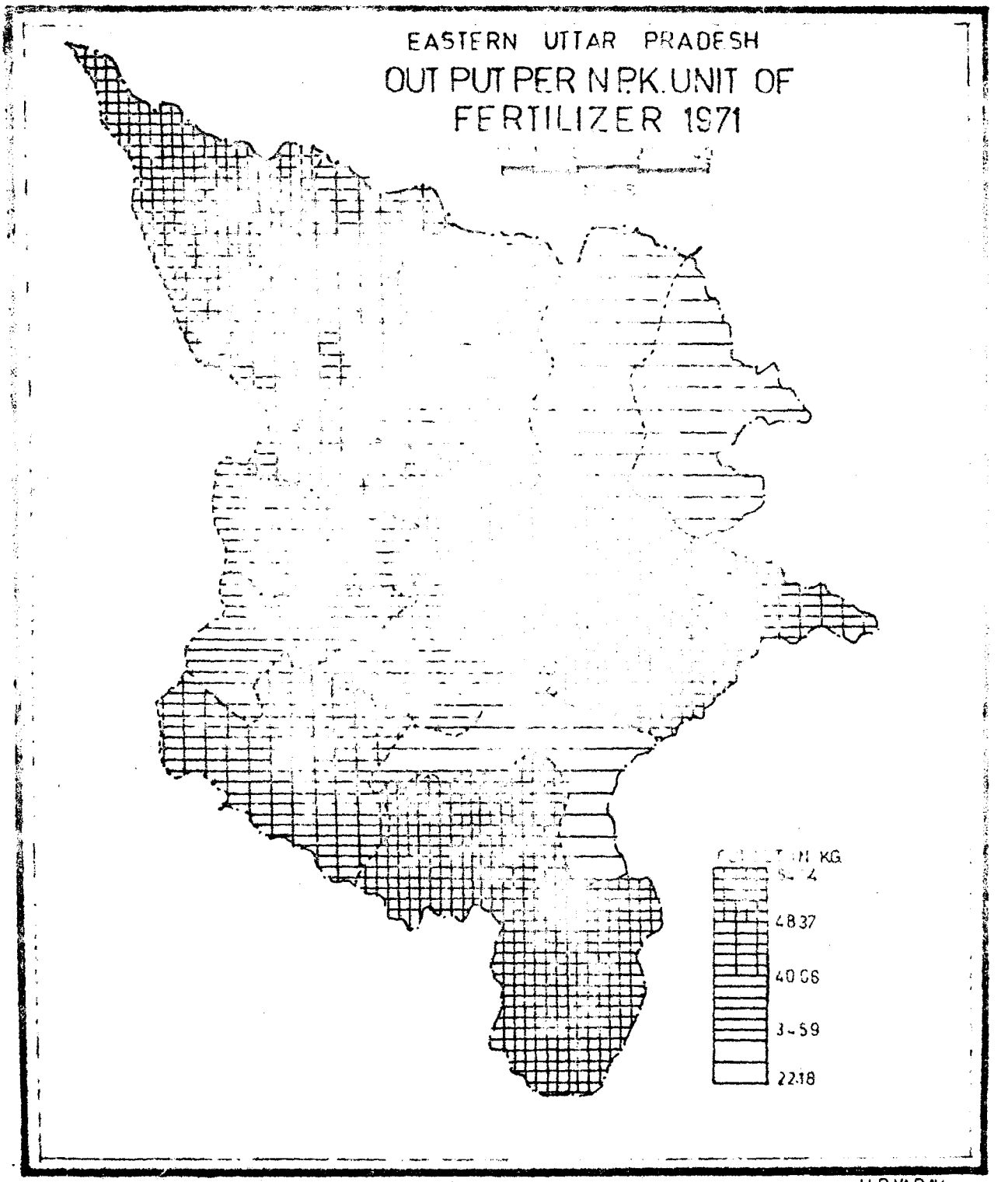
4.2.10 Output per labour:

The agricultural output per labour and land concentration show positive relationship with each other. When the output per labour is more, it means that there are more landlords, with whom the land is concentrated. They might have appointed more labourers to produce much and he will also use more amount of technological inputs. So at this level, agricultural output per labourer will be more. If the agricultural output is low, it means that the land concentration is fragmented or in some way there will be more households who have been owning the land and they

were tilling the land by themselves. In such type of circumstances if any cultivator is using the labour, they will get less output than the cultivator who is tilling (cultivating) himself, because cultivator himself does more sincere labour than the employed labour. So it is obvious that agricultural output per labour will be low. Thus the above statement presents that when the agricultural output per labour is more the land concentration will also be more on the one hand, on the other, when agricultural output per labour is low the land concentration will also be low. It shows that agricultural output per labour has a positive impact on land concentration. The agricultural output is found to be more (Above Rs.2000.00) in Azamgarh, Basti, Deoria, Faizabad, Gorakhpur, Pratapgarh and Varanasi districts. The other districts having low (below Rs.20000.00) agricultural output per cultivator are Allahabad, Bahraich, Ballia, Ghazipur, Gonda, Jaunpur, Mirzapur and Sultanpur districts.

4.2.11 Output per NPK unit of Fertiliser:

The output per NPK unit of fertiliser is more in areas where land is not suitable for



MAP NO.18

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agricultural activities. The output per NPK unit of fertiliser is high (64.54 to 48.37) in Bahraich, Azamgarh, Ghazipur and Mirzapur districts. (Map No.18) Medium output per NPK unit of fertiliser (48.37 to 40.06) is observed in Gonda, Faizabad, Allahabad and Ballia districts. The districts having low output per NPK unit of fertiliser (40.06 to 34.59) are Basti, Sultanpur, Pratapgarh and Jaunpur districts. There are very low (34.59 to 22.18) output per NPK unit of fertiliser in Gorakhpur, Deoria, and Varanasi districts. The distribution pattern of output per NPK unit of fertiliser shows that the districts having more land concentration have more output per NPK unit of fertilizer. Because the areas where land is not suitable for agricultural production, producer has to use more input like fertiliser, technology and labour. On the other hand the areas where land is suitable for agricultural production producer may use less input for getting same amount of output. As the point has been earlier made that the areas where land is suitable for agricultural production have low land concentra-

tion. Thus one may assume that there is positive correlation between land concentration and output per NPK unit of fertilizer i.e. output per NPK unit of fertilizer affects land concentration positively. When the output per NPK unit of fertilizer is more the land concentration will also be more.

4.2.12 Output per Household:

The output per household is more (above 900) in Allahabad, Ballia, Basti, Deoria, Ghazipur, Gorakhpur and Mirzapur districts. Other districts as Azamgarh, Bahraich, Faizabad, Gonda, Jaunpur, Pratapgarh, Sultanpur and Varanasi have low (below 900) output per household. The hypothesis has been made that where the agricultural output per household is more on the other hand when the agricultural output per household is low the land concentration will be low, assuming that agricultural output per household has positive impact on land concentration.

4.3 Result of Correlation Matrix:

Third major set of factors affecting land concentration is the economic factor which is gained by the farmers for various farming operations. The various parameters taken into account are output

TABLE NO. IX

CORRELATION MATRIX

ECONOMIC FACTOR

	X	1	2	3	4	5	6	7	8	9	10	11	12
Land Concentration X	1.000												
1. Agr. growth rate 1962-65 to 1970-73	-0.149	1.000											
2. Agr. Production per Hect. 1971	-0.164	0.268	1.000										
3. Foodgrain Production (Average 1970-73)	0.039	0.368*	0.251	1.000									
4. Food Surplus & Food Deficit 1971	0.026	0.233	-0.540**	0.310	1.000								
5. Agr. output in lakh Rs.1971	-0.040	0.401*	0.592**	0.881***	0.004	1.000							
6. Growth rate of yield in Rs. 1961-71	0.159	0.521**	0.016	0.327*	0.420	0.178	1.000						
7. Growth rate of output in Rs 1961-71	-0.145	0.998***	0.271	0.364*	0.234	0.401*	0.493*	1.000					
8. Out put per Hectare in Rs 1971	-0.322*	0.460*	0.895***	0.279	-0.437*	0.615***	-0.099	0.472*	1.000				
9. Output per cultivator in Rs 1971	-0.043	0.363	0.532**	0.687***	-0.056	0.878***	0.047	0.367*	0.679***	1.000			
10. Output per Labour in Rs 1971	0.099	0.020	0.404*	0.515**	0.008	0.663***	-0.067	0.037	0.437*	0.769***	1.000		
11. Output per NPK unit of fertiliser	0.383*	0.141	-0.598**	-0.254	0.244	-0.339*	0.215	0.122	-0.542**	-0.338*	-0.507**	1.000	
12. Output per Household	0.118	-0.562**	0.032	-0.132	-0.129	-0.087	-0.527**	-0.518**	0.855***	0.014	0.221	-0.471*	1.000

NOTE: * Significant at 10% level of Significance
** Significant at 5% level of Significance
*** Significant at 1% level of Significance

per NPK unit of fertiliser, output per hectare in Rs. Agricultural production per hectare and growth rate of agricultural yield.

Examining the correlation matrix (Table No.9), it would be interesting, whether it throws up any clues to explain the land concentration of the region. The variables having significant correlation co-efficients with the land concentration are output per hectare and output per NPK unit of fertiliser.

1) Agricultural growth rate (X1), Agricultural production per hectare (X2), Agricultural output in lakh Rs.(X5), growth rate of output in Rs.(X7) and output per cultivator have negative correlation with the land concentration. But the relationship between these variables and land concentration is not significant.

2) Foodgrain production (X4), growth rate of yield in Rs.(X6), output per labour (X10) and output per household have positive correlation with the land concentration. But this relationship is not significant between dependent and independent variables. The variables were chosen to test the

controversial relationship between farm size and agricultural productivity. The absence of significant co-efficient of correlation shows that the hypothesis does not hold in the case of Eastern Uttar Pradesh.

3) Output per hectare (X8) has negative correlation with the land concentration which is significant at 10% level of significance. This shows that the output per hectare will be more in such case of household who own the land and cultivate their own land which is possible only by having a small size of land holdings.

4) Output per NPK unit of fertilizer has positive correlation with the land concentration. The relationship between these variables is significant at 10% level of significance. This shows an interesting phenomenan. They higher is the output per NPK unit of fertilizer, higher is the land concentration. This simply can be explained that output per NPK unit of fertilizer can be larger in poor quality of land. In fact

TABLE NO. X

RESULT OF STEPWISE REGRESSION

ECONOMIC FACTOR

Variables		Intercept	Regression Co-efficient	S.E.	T	R	R^2	Increase in R^2	F	R^2	F
1		2	3	4	5	6	7	8	9	10	11
Step 1	)(11	0.52954	0.001	0.001	1.496*	0.383	0.147	-	0.383	0.147	2.258*
Step 2	)(11	0.56679	0.001	0.001	0.942	0.407	0.166	0.020	0.398	0.158	1.189
	)(8		-0.000	0.000	-0.516						
Step 3	)(11	0.46452	0.001	0.001	1.387*	0.551	0.304	0.138	0.433	0.187	1.598*
	)(8		-0.000	0.000	-1.539						
	)(2		0.000	0.000	1.477*						

NOTE: * Significant at 10% level of Significance

output per NPK unit of fertilizer and land concentration, both are the result of poor quality of land and hence explain the positive relationship.

4.4 Result of Stepwise Regression:

A step wise regression analysis is attempted taking ginis co-efficient (land concentration) as dependent variable (Y) and twelve earlier mentioned independent variables (X). The step-wise regression analysis gives an intercorrelation matrix which is given in Table No.10. It goes upto three steps after which R^2 starts declining. The analysis therefore truncates at this step. The three variables which are found in the optimal regression line are:

1. Agricultural production per Hectare (X2)
2. Output per Hectare (X8)
3. Output per NPK unit of fertiliser (X11)

The most dominant variable in explaining the variability of land concentration is output per NPK unit of fertilizer (X11) which explains around 38% variation. The next dominant variable is X8 i.e. output per hectare which explains 2% of variation in land concentration. When both

the variables output per hectare (X8) are combined in the step second, it explains 39.8% of variation in land concentration. The subsequent variables coming in stepwise regression analysis are X11, X8 and X2 not explaining more than 4% of variation. The final form of multiple analysis is given in step three where 3 variables are together explain 43.3% of variation in the total variation of land concentration. F value is found to be significant at 10% level of significance.

4.5 Conclusion:

Thus we can conclude that the hypothesis related to X2, X8 and X11 are supported by this empirical exercise. The hypothesis related to economic variables and land concentration is however inconclusive. The high degree of multicollianirity among the explanatory variables suggest that the effect of variables is subsumed. Therefore the output per NPK unit of fertilizer is found to be the most dominant factor followed by X8 and X2.

CHAPTER - V

INSTITUTIONAL FACTOR INFLUENCING LAND CONCENTRATION

CHAPTER V

INSTITUTIONAL FACTOR INFLUENCING LAND CONCENTRATION

5.1 Introduction:

In the earlier discussions it has been pointed out that either directly or indirectly land concentration is interrelated to agricultural productivity. In the process of production man does not work in isolation but in defined relationship with other men. The relationships of the land concentration provide the institutional frame within which land concentration processes proceed and they exert a profound influence on these processes. This is true for the Indian context because land concentrations are rooted in hoary traditions and wherein from Ain Ne Akbari or Zamindari system to present consolidation system, land concentration has equally undergone. The situation has been further complicated because of the super imposition of the social structure of the caste system on agrarian relations. The caste system thrives as a parasite on land concentration, brings about a close correspondence between economic and social deprivation and institutionalises the inequitious

TABLE NO. XI

EASTERN UTTAR PRADESH

INSTITUTIONAL FACTOR

S.No.	Districts	Cropping intensity	% of individual holdings to total holdings	% of individual holdings area to total holdings area	% of Cultivated Area of total cropped area	% of wholly owned & self operated Household to total Household	% of wholly owned & self operated holdings area to total area	% of Household having less than 5 hect. of land to total Household	% of Household's Area having less than 5 hect. of land to total holdings Area	% of Households having above 5 hect. of land to total Household	% of holdings Area having above 5 hect. of land to total holdings area	Growth rate of Area in Hect. 1962-65 to 1970-75
1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Allahabad	131	52.126	42.763	69.306	97.239	97.762	96.443	68.956	3.557	31.044	1.020
2.	Azamgarh	128	52.709	44.085	74.863	98.099	98.368	98.716	84.763	1.284	15.237	1.100
3.	Bahraich	136	81.191	74.461	64.907	91.884	92.814	97.461	79.652	2.539	20.348	1.051
4.	Ballia	132	47.171	37.536	70.075	98.323	98.517	97.217	74.743	2.785	25.257	0.986
5.	Basti	139	19.545	40.949	74.529	97.989	97.868	98.042	81.003	1.958	18.997	1.102
6.	Deoria	138	44.847	34.905	77.159	99.221	98.662	98.241	82.187	1.759	17.813	1.128
7.	Faizabad	140	73.536	65.235	66.253	97.823	97.413	98.817	87.155	1.183	12.845	1.039
8.	Ghazipur	129	52.077	41.662	73.878	99.077	99.131	97.119	90.026	2.881	25.974	1.278
9.	Gonda	139	74.133	64.230	70.304	95.163	96.625	97.353	78.971	2.647	21.029	0.978
10.	Gorakhpur	138	45.169	37.261	71.697	98.921	98.772	98.208	80.967	1.792	19.033	1.098
11.	Jaunpur	131	64.842	54.468	74.023	99.014	98.116	99.089	88.185	0.911	11.815	1.044
12.	Mirzapur	129	66.078	54.521	57.394	88.225	87.403	92.072	51.130	7.928	48.870	0.959
13.	Pratapgarh	134	60.449	50.423	68.323	98.371	98.513	98.201	85.802	1.799	14.198	0.999
14.	Sultanpur	130	65.529	55.951	67.658	96.964	97.467	98.422	83.824	1.578	16.176	1.085
15.	Varanasi	139	56.494	48.880	61.223	96.750	99.937	98.374	81.923	1.626	18.077	0.984

division of the rural society into the three tiers of those who own the land do not work on it, those who own land and work on it and those who work on land and do not own it.

It is particularly difficult to identify and measure the parameters which articulate the interplay of institutional factors on land concentration with a view to make some preliminary explorations in this difficult area, the following eleven variables (Table No.11) have been selected to analyse the nature of this relationship:-

1. Cropping Intensity
2. Proportion of Individual Holdings to total Holdings
3. Individual Holdings Area to total Holdings Area
4. Percentage of cultivated area to Net Cropped Area
5. Percentage of wholly owned and Self operated Household to total household
6. Percentage of wholly owned and self operated holdings area to total Area
7. Percentage of household having less than 5 Hectare of land to total household

8. Percentage of Household's Area having less than 5 Hectare of land to total holding Area

9. Percentage of household having above 5 Hectare of land to total household

10. Percentage of holdings area having above 5 Hectare of land to total holdings Area

11. Growth rate of Area in Hectares

8.2.1 Cropping Intensity

Cropping intensity of the region varies from one district to another. Cropping intensity is high (above 135) in Bahraich, Basti, Deoria Faizabad, Gonda, Gorakhpur and Varanasi Districts. Cropping Intensity is low in Allahabad, Azamgarh, Ballai, Ghazipur, Jaunpur, Mirzapur, Pratapgarh and Sultanpur districts. The distribution of cropping intensity presents that it is quite high in the northern portion of the region and low in the southern districts of the region excepting Varanasi district. The assumption has been made preferring the earlier discussions that cropping intensity has negative impact on land concentration because when the cropping intensity will be more people will try to capture such type of land at any cost, so the

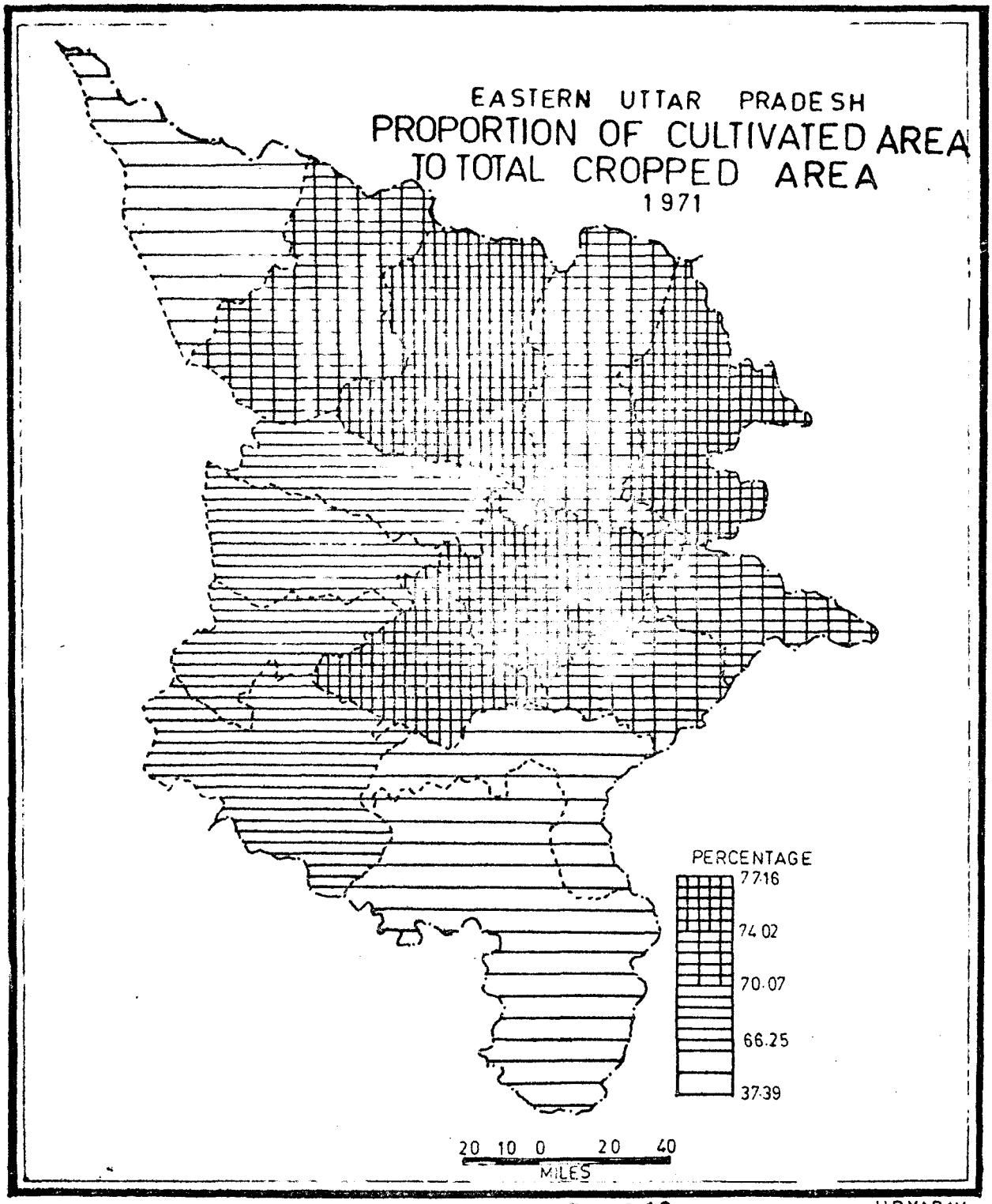
land from the hands of zamindars and landlords gets fragmented and the land concentration becomes less.

5.2.2 Proportion of Individual Holdings to total Holdings

Individual holdings itself shows that it has inverse relationship with land concentration. If the individual holdings are more the land will not be concentrated along a few households. On the other hand if the individual holdings are less the land will be concentrated among households. The concentration of individual holding is more in the northern districts of the region and individual holding concentration is low in the Southern districts of the region excepting few districts.

5.2.3 Percentage of Individual Holdings Area to Total Holdings Area:

Proportion of individual holdings area to total holdings area have negative impact on land concentration. Distribution pattern of individual holdings area to total holdings area shows that the northern districts have more area but southern districts have low area. The distribution pattern is same as individual holdings.



MAP NO 19

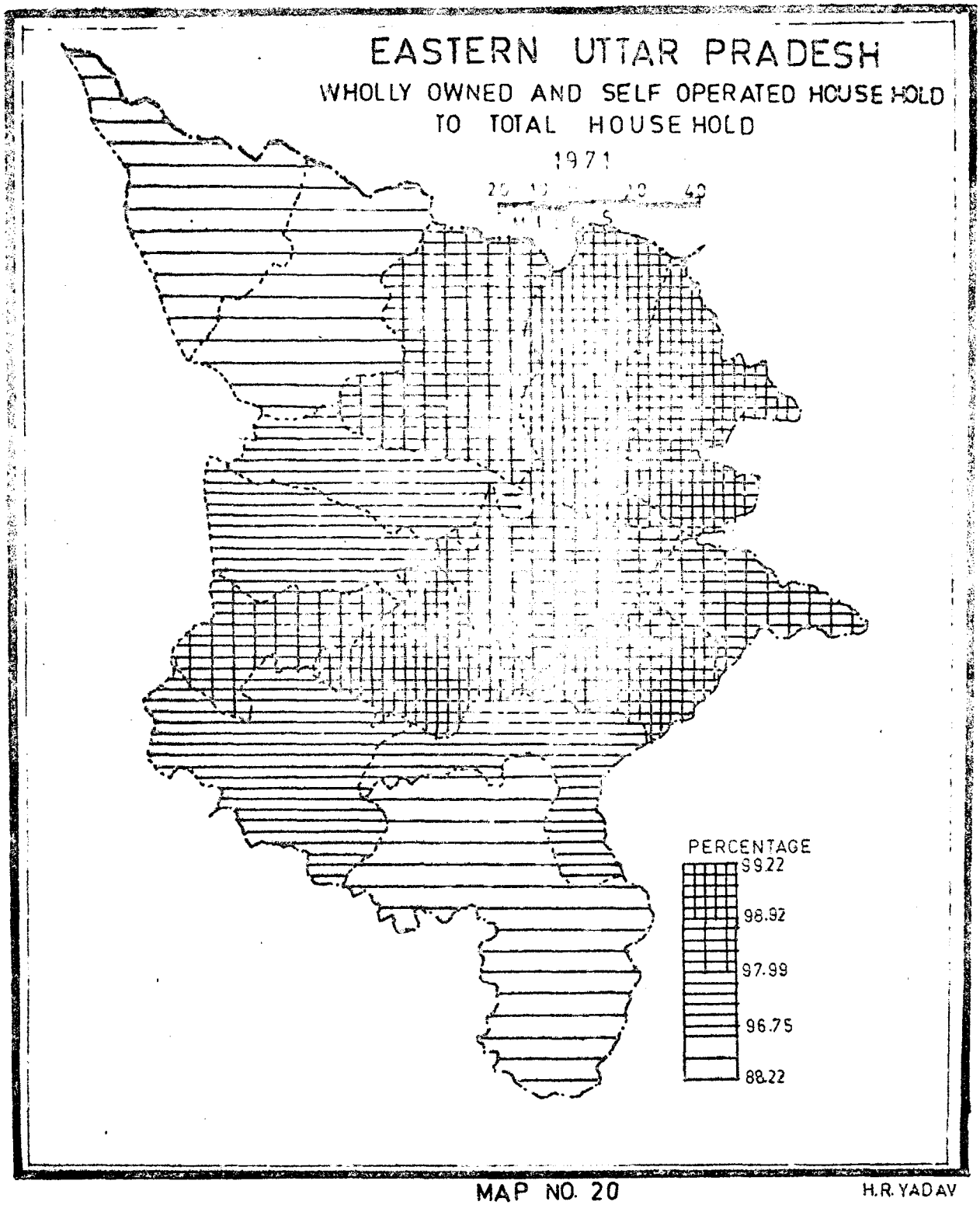
H.R.YADAV

5.2.4 Percentage of cultivated Area to total cropped Area:

In the earlier discussions it has been cleared that land concentration has positive correlation with rugged, undulated and rough land or the land which is not suitable for agricultural uses. So it is obvious that the relationship between cultivated area and land concentration will be negative. Cultivated Area to net cropped area is high (74.02% to 77.16%) in northern district as Basti, Deoria, Azamgarh and Jaunpur (Map No.19). Proportion of cultivated Area to total cropped area is medium (70.07% to 74.02%) in Gonda, Gorakhpur, Ghazipur and Ballia districts. Cultivated Area is low (66.25% to 70.07%) in a sequencial order starting from Allahabad, Pratapgarh, Sultanpur and Faizabad, south to north located in a line. Very low (37.39% to 66.25%) cultivated area is found in Mirzapur, Varanasi and Bahraich districts.

5.2.5 Percentage of wholly owned and self operated Household to total household:

Wholly owned and self operated households are concentrated in the northern district of the region. Districts having high (98.32% to 99.22%) wholly owned and self operated household is in



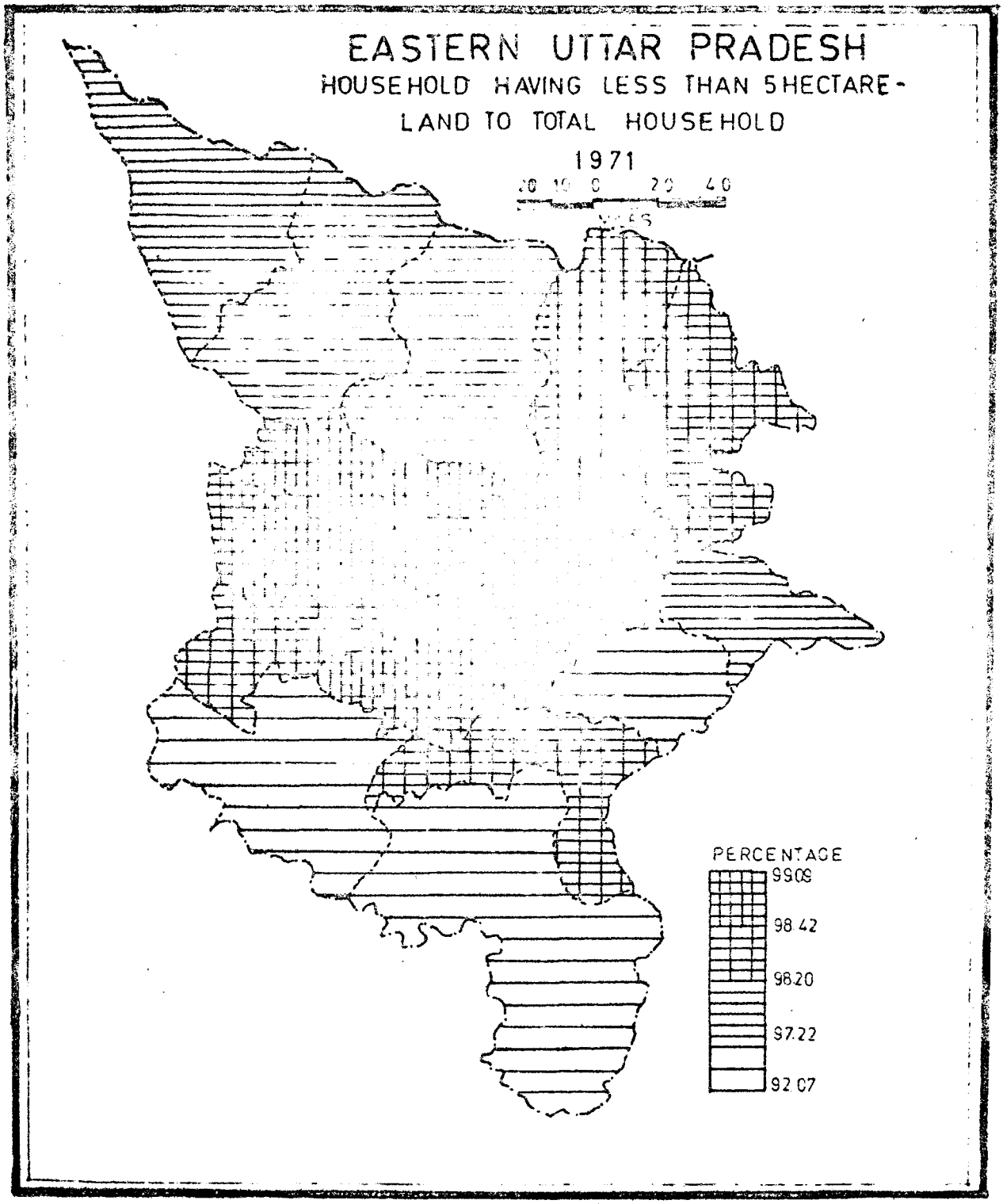
MAP NO. 20

H.R. YADAV

Gorakhpur, Deoria, Ghazipur and Jaunpur districts (Map No.20). It is medium (97.99% to 98.92%) in Basti, Azamgarh, Ballia and Pratapgarh districts. There is low (96.75% to 97.99%) self operated households in Faizabad, Pratapgarh, Varanasi and Allahabad districts. Self operated and wholly owned households are very low (88.22% to 96.75%) in Mirzapur, Bahraich and Gonda districts. Wholly owned and self operated households have negative impact on land concentration because when wholly owned and self operated households are more, the land holdings will be fragmented.

5.2.6 Percentage of wholly owned and self operated holdings area to total area:

Proportion of wholly owned and self operated holding area have also negative impact on land concentration as wholly owned and self operated household have with the land concentration. Wholly owned and self operated holdings area is more in the norther western and south-eastern districts of the region. So where proportion of wholly owned and self operated holding area will be more the land concentration will be low.

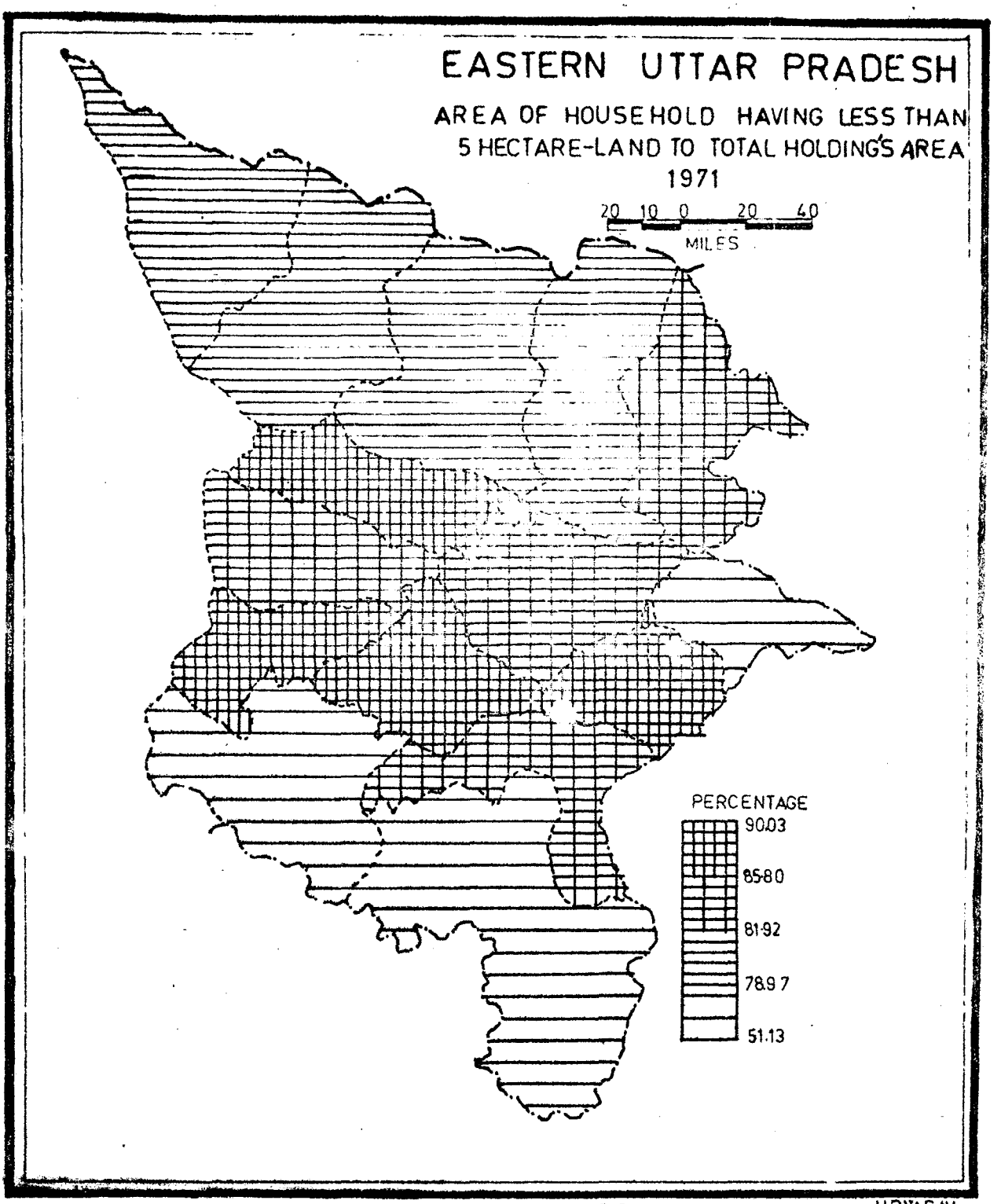


MAP NO. 21

H. RYADAV

5.2.7 Percentage of Household having less than 5 Hectare of land to total household:

Household having less than 5 Hectare of land to total household is concentrated in central districts of the region. Southern districts have low proportion of household having less than 5 Hectare of land. Sultanpur, Faizabad, Jaunpur and Azamgarh districts have high (98.42% to 99.09%) proportion of household under this category. (Map No.21) It has medium distribution (98.20% to 98.42%) in Deoria, Gorakhpur, Varanasi and Pratapgarh districts. There is low (99.22% to 98.20%) concentration of it in Bahraich, Gonda, Basti and Ballia district. Mirzapur, Ghazipur and Allahabad districts have very low (92.07% to 97.22%) proportion of household having less than 5 Hectare of land to total household. When household having less than 5 Hectare of land is more, it shows that land holdings will have smaller unit of land, so the land will be distributed among many smaller units of household. Thus in this situation land concentration will be lowerer we can assume that there will be no land concentration. So it has inverse relationship with land concentration.



MAP NO. 22

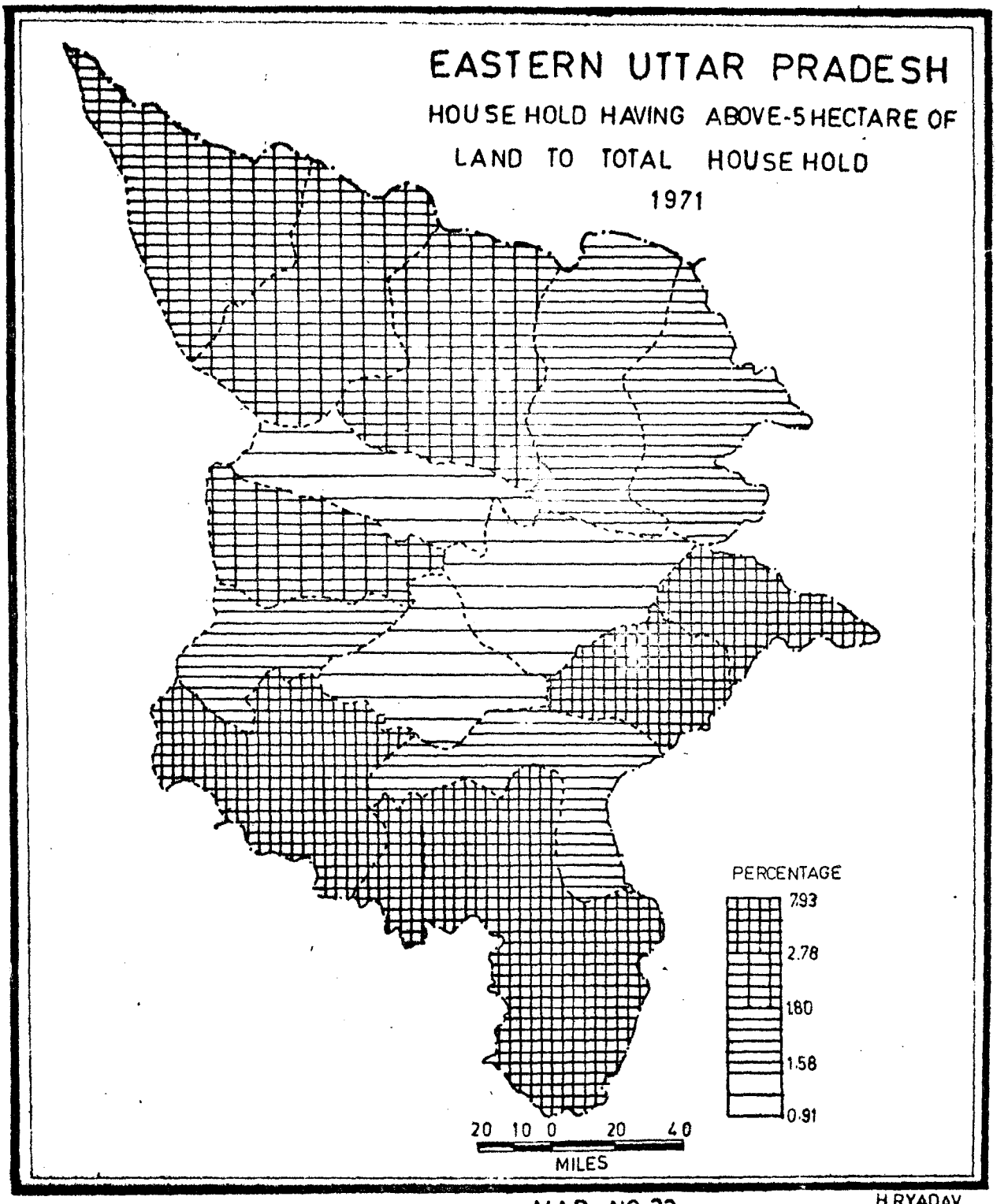
H.R.YADAV

5.2.8 Area of Household having less than 5 Hectare of land to total holdings Area:

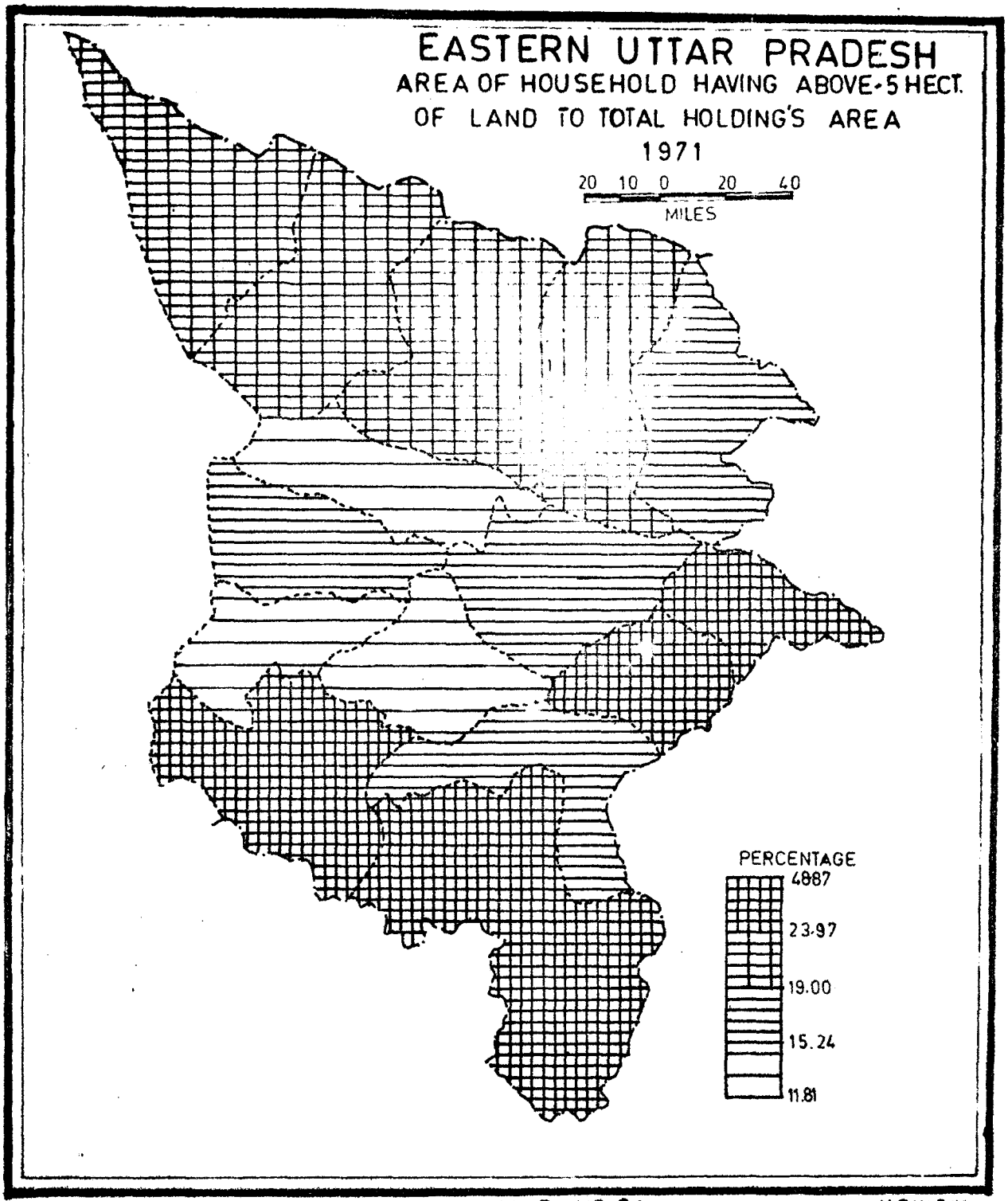
Household's area having less than five hectare of land to total holdings area is high (85.80% to 90.03%) in Faizabad, Pratapgarh, Jaunpur and Ghazipur districts. It is medium (81.92% to 85.80%) in Deoria, Sultanpur, Azamgarh and Varanasi districts. (Maps No.22) There is low (78.97% to 81.92%) distribution of its area in Bahraich, Gonda, Basti and Gorakhpur districts. Very low proportion (51.1% to 78.97%) of area of household having less than 5 Hectare of land to total holding's area has been seen in Allahabad, Mirzapur and Ballia districts. Assumption has been made that area of household having less than 5 Hectares of land has negative impact on land concentration.

5.2.9 Percentage household having above 5 Hectare of land to total household:

Proportion of household having above 5 Hectares of land itself shows that when household's number will be more having above 5 Hectaren of land, it is obvious that the land concentration willalso be more. Household having above 5 Hectare of land is more in southern and eastern districts of the region meaning that Allahabad, Mirzapur, Ballia and


EASTERN UTTAR PRADESH
HOUSE HOLD HAVING ABOVE-5 HECTARE OF
LAND TO TOTAL HOUSE HOLD
1971
PERCENTAGE
7.93
2.78
1.80
1.58
0.91
20 10 0 20 40
MILES
H.R.YADAV

MAP NO. 23



MAP NO. 24

H.R.YADAV

Ghazipur districts have high (2.78% to 7.93%) proportion of household (Map No.23). These are medium (1.80% to 2.78%) in Bahraich, Gonda, Basti and Sultanpur districts. Low proportion (1.58% to 1.80%) of household having above 5 Hectares of land has been seen in Deoria, Gorakhpur, Pratapgarh and Varanasi districts. Very low (0.91% to 1.58%) proportion of households have been observed in Faizabad, Pratapgarh and Azamgarh districts.

5.2.10 Area of Household having above 5 Hectare of land to total Holdings Area:

Area of household having above 5 Hectares of land to total holdings area has positive impact on land concentration as discussed earlier. Area of household having above 5 hectares of land to total household have same type of distribution pattern as household under this category. Area of household is high (23.97% to 48.87%) in Allahabad, Mirzapur, Ghazipur and Ballia districts (Map No.24). Medium distribution of area (19.00% to 23.97%) has been seen in northern districts of Bahraich, Basti, Gonda and Gorakhpur of the region. It is low (15.24% to 19.00%) in Sultanpur, Azamgarh, Varanasi and Deoria districts. Very low (11.81% to 15.24%) proportion of household having above 5 Hectare of land to total household has been seen in Faizabad, Pratapgarh and Jaunpur districts.

5.2.11 Growth rate of Area (1970-73):

Growth rate of area in any region which is under agricultural uses may be due to increase in population. As the population density in rural areas increases the growing population want to capture the land which is distributed within the region. So, it becomes necessary to increase the area under agricultural uses bringing other than agricultural land into cultivation. In these circumstances though the area of the region under agricultural uses is increasing but the unit of area of the household may be smaller which is the indication of low land concentration. Thus the growth rate of area has negative impact on land concentration. Growth rate of area is above one in Allahabad, Azamgarh, Bahraich, Basti, Deoria, Faizabad, Ghazipur, Gorakhpur, Jaunpur and Sultanpur districts. It is low in Ballia, Gonda, Jaunpur, Mirzapur and Varanasi districts.

5.3 Results of correlation Matrix:

We have tried to explain the spatial variations in land concentration while we have paid attention to physical factor, social factor and economic factor but in this chapter we are seeking the impact of institutional factor on land concentration.

7. Percentage of households having less than 5 Hectare of land to total household (X7)

8. Percentage of household's area having less than 5 Hectare of land to total holdings area (X8)

9. Percentage of household having above 5 Hectare of land to total household (X9)

10. Percentage of holding's area having above 5 Hectare of land to total holdings area (X10)

11. Growth rate of area in Hectares (1962-65 to 1970-73) (X11)

The correlation matrix indicates (Table No. 12) some broad clues to explain land concentration. These are as follows:

1) The correlation matrix (Table 12) indicates that cropping intensity (X1), %age of individual holdings to total holdings and percentage of individual holdings area to total holdings area (X3) have negative correlation with the land concentration and X11 ie. growth rate of area in Hectares 1962-65 to 1970-73 also have negative impact on land concentration but the relationship between these variables is not significant. Thus above mentioned four (X) variables give no relation-

TABLE NO. XIX

CORRELATION MATRIX

INSTITUTIONAL FACTOR

	Y	1	2	3	4	5	6	7	8	9	10	11
Land Concentration Y	1.000											
1. Cropping Intensity	-0.292	1.000										
2. % of Individual Holdings to total Holdings	-0.179	-0.067	1.000									
3. % of Individual Holdings Area to Total holdings Area	-0.192	0.159	0.853***	1.000								
4. % of Cultivated Area to total cropped Area	-0.616***	0.175	-0.386*	-0.352*	1.000							
5. % of wholly owned & self operated House-hold to total House-hold	-0.604***	0.127	-0.491*	-0.561**	0.863***	1.000						
6. % of wholly owned & self operated holdings Area to total area	0.025	-0.090	-0.557***	0.757***	0.179	0.586***	1.000					
7. % of Household having less than 5 Hect. of land to total Household	-0.792***	0.354*	-0.122	-0.049	0.819***	0.788***	0.156	1.000				
8. % of Household's Area having less than 5 Hect. of land to total holdings area	-0.837***	0.227	-0.050	-0.004	0.787***	0.761***	0.171	0.913***	1.000			
9. % of Households having above 5 hect. of land to total household	0.792***	-0.354*	0.122	0.049	-0.819***	-0.788***	-0.156	-0.900	-0.913***	1.000		
10. % of holdings Area having above 5 Hect. of land to total holdings Area	0.839***	-0.365*	0.017	-0.072	-0.753***	-0.715	-0.089	-0.980	-0.927***	0.980***	1.000	
11. Growth rate of Area in Hect. 1962-65 to 1970-73	-0.273	-0.181	-0.361*	-0.362*	0.534**	0.468	0.182	0.290	0.530	-0.290	-0.254	1.000

NOTE: *Significant at 10% level of Significance
**Significant at 5% level of Significance
***Significant at 1% level of Significance

Y 1 2 3 4 5 6 7 8 9 10 11

Many economists and geographers who have taken the institutional factor into account in seeking its impact on agricultural productivity have generally not gone beyond qualitative statements and have tended to ignore the institutional factors. We have made an attempt to quantitatively assess the impact of institutional factors.

It would be interesting to see if the correlation matrix throws any clues to possible causal relationships between land concentration and institutional factors. The indigenous variable (Y) in this study is the land concentration. The exogenous variables are as follows:-

1. Cropping Intensity (X1)
2. Percentage of individual holdings to total holdings (X2)
3. Percentage of Individual holding's area to total holdings area (X3)
4. Percentage of cultivated area to net cropped area (X4)
6. Percentage of wholly owned & self operated household to total household (X5)
6. Percentage of wholly owned & self operated holding's area to total area (X6)

ship with land concentration. The absence of significant co-efficient of correlation shows that hypothesis does not hold in the case of Eastern Uttar Pradesh. It is however not positive.

2. Percentage of household having less than 5 Hectare of land to total households have positive correlation with land concentration and which is not significant. Thus insignificant co-efficient of correlation shows that the hypothesis does not hold in this case.

3. Percentage of cultivated area to total cropped area has negative correlation (0.616) with the land concentration which is significant at 10% level of significance. This shows an interesting phenomena. Higher the proportion of cultivated area, lower is the land concentration. This simply can be explained by the fact that proportion of cultivated area cannot be higher on good quality of land. In fact proportion of cultivated area and concentration of land ownership is the result of poor quality of land.

4. Percentage of wholly owned and self operated household to total household (X5) have negative correlation (0.604) with land concentration which is significant at 1% level of significance. It is due to the fact that wholly owned and self

operated households will be more in the good quality land and where the productivity is more so tha land concentration will be low.

5. Percentage of households having less than 5 Hectare of land to total households have negative impact on land concentration which is significant at 1% level of significance. Thus there is a strong correlation between these two variables because proportion of household having less than 5 Hectare of land will be more on good quality land and where productivity is more. This is in accordance with the assumption that the competition for the possession of good land is more, hence the holdings get fragmented and concentration of land becomes low.

6. Percentage of household's area having less than 5 Hectares of land to total holdings area has negative correlation with land concentration and it is significant at 1% level of significance because proportion of holdings area having less than 5 Hectares of land will be more in good land and where productivity is more and in such type of areas land concentration will naturally be low.

7. Percentage of household having above 5 Hectares of land to total households (X9) has positive impact

on land concentration. The relationship between these two variables is significant at 1% level of significance. This is because of the fact that the proportion of households having 5 Hectares of land will be more in poor quality land, rugged and undulated area where agriculture is not easily possible and productivity is low giving rise to more land concentration.

8. Percentage of household's area having above 5 Hectares of land to total holdings area (X10) has strong correlation (0.859) with the land concentration. The correlation between these two variables is positive and is significant at 1% level of significance. This shows an interesting phenomena. Higher the proportion of holdings area having above 5 Hectares of land, higher is the land concentration. This simply can be explained by the fact that the proportion of holding's area having above 5 Hectares of land cannot be more in good quality of land. In fact proportion of holdings area having above 5 Hectares of land to total holdings area and land concentration both are the result of poor quality of land and hence explain the positive relationship.

Thus we find from the correlation matrix that institutional factor has some impact on land concentration. Among the Selected Varinbles of institutional factor few variables are more dominant on land concentration as percentage of cultivated area to total cropped area, percentage of wholly owned and self operated household to total household, percentage of household having less than 5 Hectare of land to total household, percentage of household's area having less than 5 Hectare of land to total holdings area, percentage of household having above 5 Hectare of land to total household and percentage of holdings area having above 5 Hectare of land to total holding area.

5.4 Result of Stepwise Regression:

The essential inadequacy of an exercise based not on causal but statistical relationship is fully recognised. It is nevertheless, noted that a strong mix of the later do indicate causal interdependencies. It would be our endeavour in this to probe into these relationships.

The stepwise regression analysis is attempted taking land concentration as dependent variable (Y) and 11 earlier mentioned independent variables (X). It goes upto 3 step after which the R^2 starts declining due to the multicollinearity among the

TABLE NO. XIII

INSTITUTIONAL FACTOR

RESULT OF STEPWISE REGRESSION

Variables		Intercept	Regression Co-efficient	S.E.	T	R	R^2	Increase in R^2	R	R^2	F
Step 1	)(10	0.51131	0.003	0.001	5.551***	.839	0.704	-	0.839	0.704	30.813
Step 2	)(10	0.67033	0.002	0.002	1.113*	-0.837	0.701	-0.003	0.854	0.729	16.119***
	)(8		-0.002	0.001	-1.061*						
Step 3	)(10	0.65685	0.005	0.003	1.464*	0.792	0.627	-0.074	0.868	0.753	11.215***
	)(8		-0.002	0.001	-1.127*						
	)(9		-0.017	0.016	-1.054*						

NOTE:

*Significant at 10% level of Significance
**Significant at 5% level of Significance
***Significant at 1% level of Significance

exogenous (X) variables (Table No.13). The analysis therefore truncate at this step. The three variables which are found in the optimal regression line are:-

1. Percentage of holdings area having above 5 Hectare of land to total holdings Area (X10)
2. Percentage of household having above 5 Hectare of land to total household (X9)
3. Percentage of holdings area having less than 5 Hectare of land to total holdings area (X8)

The most dominant variable in explaining variability in land concentration is Percentage of holdings area having above 5 Hectares of land to total holdings's area (X10) which explains around 70% of variation. It is interesting to note that downward subsequent variables have come in steps as X9 and X8. Even having strong correlation with X9 and X8.

The next dominant variable is X8 i.e. Percentage of household having less than 5 Hectares of land to total household which explains about 3% of variation in land concentration. Both the variables X10 and X8 together explain about 73% of variation in Y i.e. land concentration.

The variables coming in stepwise regression analysis are X10, X8 and X9 which explain 75% of variation in the land concentration. Variable X9 i.e.

Percentage of household having above 5 Hectares of land to total household (X9) is not explaining more than 2% of total variation in land concentration and it is the last variable in this stepwise regression analysis because after it R^2 is declining due to the multicollinearity among the variables. In this F value is found to be significant 1% level of signifionnee.

5.5 Conclusion:

We can, therefore, conclude that the hypothesis related to X10, X8 and X9 are supported by this empirical exercise. The high degree of multicollinearity among the explanatory variables suggest that the effect of X2, X3, X4, X5 and X6 is subsumed. Therefore the percentage of holdings area having above 5 Hectares of land to total holdings area (X10) is a dominant factor in explaining the variability of land concentration followed by percentage of holding's area having less than 5 Hectares of land to total holdings Area (X8) and Percentage of household having above 5 Hectares of land to total household (X9).

CHAPTER - VI

TECHNOLOGICAL FACTOR INFLUENCING LAND CONCENTRATION

CHAPTER VI

TECHNOLOGICAL FACTOR INFLUENCING LAND CONCENTRATION

6.1 Introduction

It has been made clear in the earlier discussions that Agricultural Production and land holdings or land concentration are correlated with each other. In the third chapter it is found out that land concentration and agricultural productivity are negatively correlated. Various geographers and Economists have explained that technological factor has a positive impact on land productivity. So the factor which effects land productivity positively will effect land concentration negatively because land concentration and agricultural production have inverse relationship which has been observed in the earlier chapter. It is through technology that man interacts with nature and extends the area of "freedom". The specific role of technology in the triangle forces in relation to agriculture and land is as follows :

First - it replenishes the deficiencies of nature as in the case with irrigation or use of fertilisers.

Second - It enables adjustment with specific natural constraints as is the case with the use of drought resistant varieties.

Third - It enhances the utilisation of factor of the positive elements with the use of High yielding variety of seeds (HYV).

TABLE NO. XXX

EASTERN UTTAR PRADESH

TECHNOLOGICAL FACTOR

S.No.	Districts	Net irrigated area to NSA	G.I.A to G.C.A	% of tube-wells to N.I.A.	% of wells to N.I.A.	% of canals to N.I.A.	N.P.K average fertiliser 1970-1973	Tractor per 100 hect.	Electric pump per 100 hect.	Oild Engine per 100 hect	Fertiliser per hect.	% of rice to K.Y.V. crops	% of wheat to K.Y.V. crops	Used agricultural animals per hect.	Plough (Iron-wooden) per hect.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Allahabad	25.479	29.28	30.2	31.9	32.4	112.18	7.0	5.3	57	0.5	26.3	52.1	0.988	0.502
2.	Azamgarh	37.07	43.45	42.5	36.6	11.3	98.97	6.0	13.8	38	22.4	28.6	89.5	1.104	0.979
3.	Baharaich	9.123	12.23	52.8	15.1	0.1	54.65	6.0	2.0	60	12.1	10.0	24.1	0.699	0.588
4.	Ballia	34.526	42.7	45.8	15.6	34.4	55.43	7.0	8.7	28	23.8	25.7	52.7	0.768	0.499
5.	Basti	38.948	50.2	34.2	27.4	0.2	188.36	11.0	2.2	152	33.6	22.1	70.8	1.182	0.702
6.	Deoria	36.111	48.3	67.8	23.6	0.9	208.91	18.0	3.8	155	47.7	33.9	61.7	0.837	0.593
7.	Faizabad	44.159	55.1	45.3	19.0	25.6	144.84	11.0	10.5	107	47.9	32.0	82.7	1.462	0.807
8.	Ghazipur	34.300	39.3	45.4	34.9	13.4	59.21	14.0	13.3	63	22.0	11.6	56.7	0.959	0.618
9.	Gonda	20.533	26.4	37.1	35.9	0.7	117.00	14.0	3.0	177	22.5	30.0	64.5	1.100	0.599
10.	Gorakhpur	36.461	49.4	34.7	20.6	12.1	178.39	19.0	3.7	172	36.9	30.4	82.5	1.704	1.206
11.	Jaunpur	45.143	54.7	23.7	65.3	7.9	94.13	8.0	12.1	100	31.7	25.6	86.3	1.164	0.671
12.	Mirzapur	23.214	27.2	8.7	7.8	74.0	43.31	12.0	2.3	56	6.4	11.6	13.6	0.724	0.378
13.	Pratapgarh	34.060	39.1	3.9	55.2	34.4	52.01	6.0	3.3	97	20.6	12.6	82.7	0.776	0.678
14.	Sultanpur	32.104	40.7	21.2	45.0	20.5	84.73	2.0	3.1	46	27.1	19.1	80.4	1.233	0.620
15.	Varanasi	39.698	49.9	32.6	21.2	41.3	146.88	14.0	13.1	33	43.9	28.6	74.2	1.032	0.685

Fourth - It controls the negative influences of natural phenomena as is the case with the pesticides. Fifth - It increases the output per unit of human labour as is the case with the mechanisation of ploughing or harvesting. [1]

The superimposition of the maps of productivity on those of technological inputs indicates that in this region the variation in productivity corresponds to a great extent with the variation in the use of technological inputs on the one hand, on the other hand the superimposition of the maps of land concentration on those of technological inputs indicates that the variation in this region of land concentration corresponds negatively to a great extent with the variation in the technological inputs. It would therefore , be useful in the search for influence (determinants) of land concentration we look carefully at the spatial distribution of technological inputs in the agriculture(table No.14).

6.2 Technological factor :

It has been discussed that technological factor has an impact on land concentration. In the technological factor, following variables have been selected

---

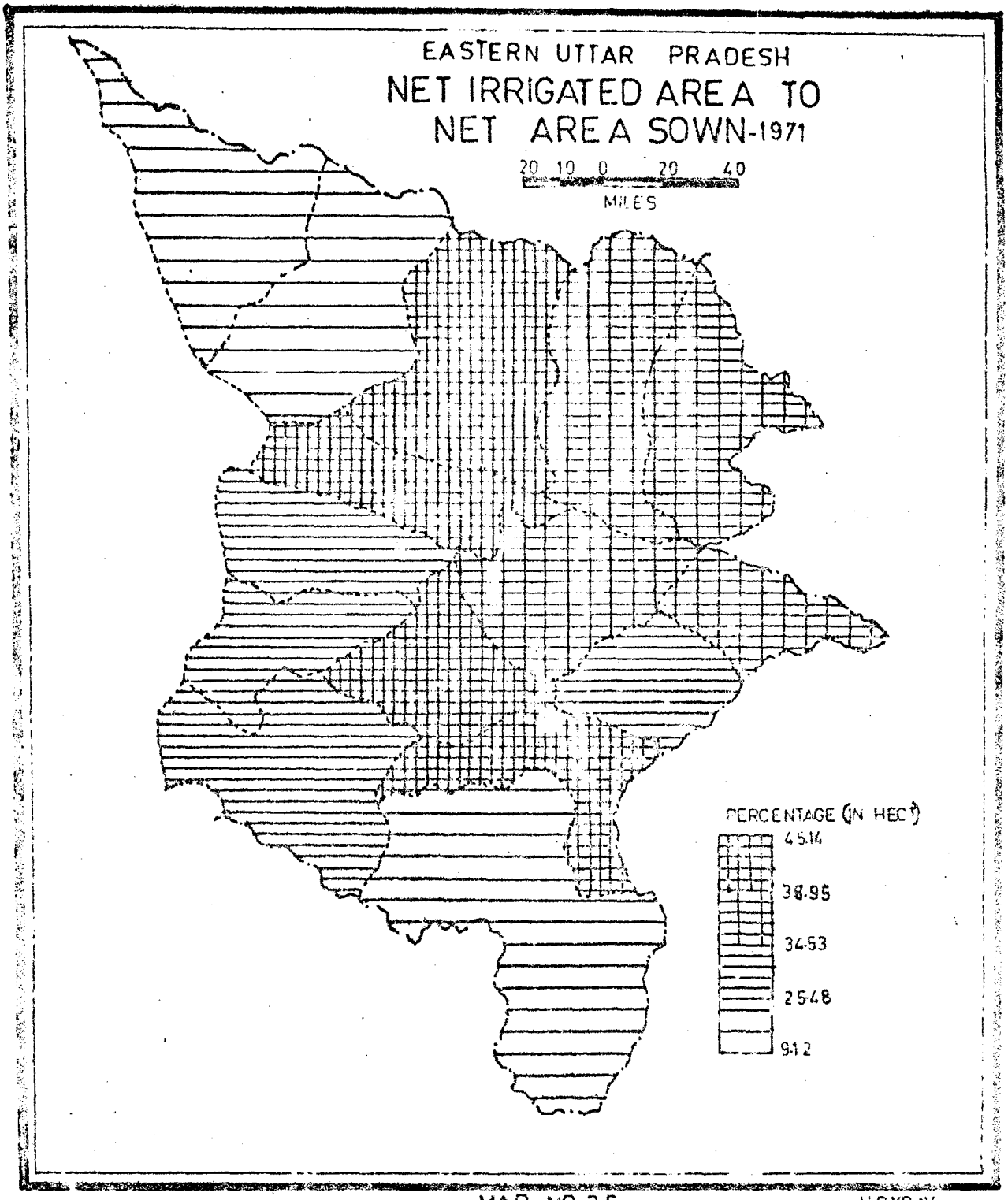
1. Bharadwaj B.K. - "components and determinants of Agricultural productivity - A case study of Gurgaon District.
   A Dissertation submitted to School of Social Sciences - Centre For the Study of Regional Development Jawahar Lal Nehru University New Delhi 1981.

for seeing the impact of technology on land concentration (table no.14):

1- Net irrigated area to Net Sown area
2- Gross irrigated area to Grass cropped Area
3- Percentage of Tubewells to Net Irrigated Area
4- Percentage of wells to Net irrigated Area
5- Percentage of canals to Net irrigated Area
6- NPK Average fertilizer 1970-73(000 tonnes)
7- Tractor 100 Hectares
8- Electric Pump per 100 Hectares
9- Oil Engines per 100 Hectares
10- Fertilizer Per Hectare in Kg.
11- Percentage of Rice-High yielding variety of crops
12- Percentage of wheat - High yielding variety of crops
13- Used Agricultural Animals per Hectare
14- Plough(iron-wooden) Per Hectare.

1. <u>Net irrigated Area to Net cropped Area</u>:

Irrigation, whether it may be provided by canals, tube-wells, wells or by any other source plays a vital role in determining the agricultural typology as well land concentration. In conditions of uncertain, inadequate umee and seasonally concentrated rainfall, agriculture cannot flourish without irrigation and which will cause more land concentration. It has been observed that irrigation facilities are neither adequate nor well distributed in the district.



MAP NO. 25

H.R.YADAV

Before going into a detailed discussion on the role of various modes of irrigation, the strength of gross irrigated area and its spatial distribution in Eastern Uttar Pradesh, it may be useful to commence with the taxanomy of this input into land concentration.

Proportion of net irrigated area to net sown area is high (45.14% to 38.95%) in the northern districts of the region as Basti, Faizabad, Jaunpur and Varanasi districts (map No.25). Share of net irrigated area is medium (38.95% to 34.53%) in Deoria, Gorakhpur, Azamgarh and Ballia districts. Sultanpur, Pratapgarh, Allahabad and Ghazipur districts have low percentage(34.53% to 25.48%) of net irrigated area in the region. Very low (25.48% to 9.12%) proportion of net irrigated area has been observed from the map and data in Mirzapur, Bahraich and Gonda districts.

2. Gross irrigated Area to Gross Cropped Area:

Gross irrigated area to gross cropped area is recorded in the table which presents that gross irrigated area to gross cropped area is very high in the northern districts of the region and lower in the southern districts of the region. The former constitutes a continuous belt parallel to Ganga, Yamuna, Gomati and Ghaghra rivers covering the plains of Ganga and Yamuna. This region is benefited both by lift and gravity flow irrigation. The gross irrigated area

is very high in Ballia, Basti, Deoria, Faizabad, Gorakhpur, Jaunpur, Sultanpur and Varanasi districts. Proposition of gross irrigated area is very low in Allahabad, Azamgarh, Bahraich, Ghazipur, Gonda, Mirzapur and Pratap garh districts. The superimposition of the map of gross irrigated area upon that of land concentration brings out the fact that both correspond negatively with each other. The districts where lower gross irrigated area and net irrigated area have been observed area due to the fact that the lift irrigation would not gain popularity as compared to the other parts of the region and hence are the districts of high land concentration. Moreover due to rocky surface it is difficult to dig wells and some - times non availability of subterranean water disappoints peasants. The another reason is also that due to the undulating topography, gravity flow irrigation also could not be popularised. Thus the yeild per hectare in these districts is recorded to be poor but land concentration is more.

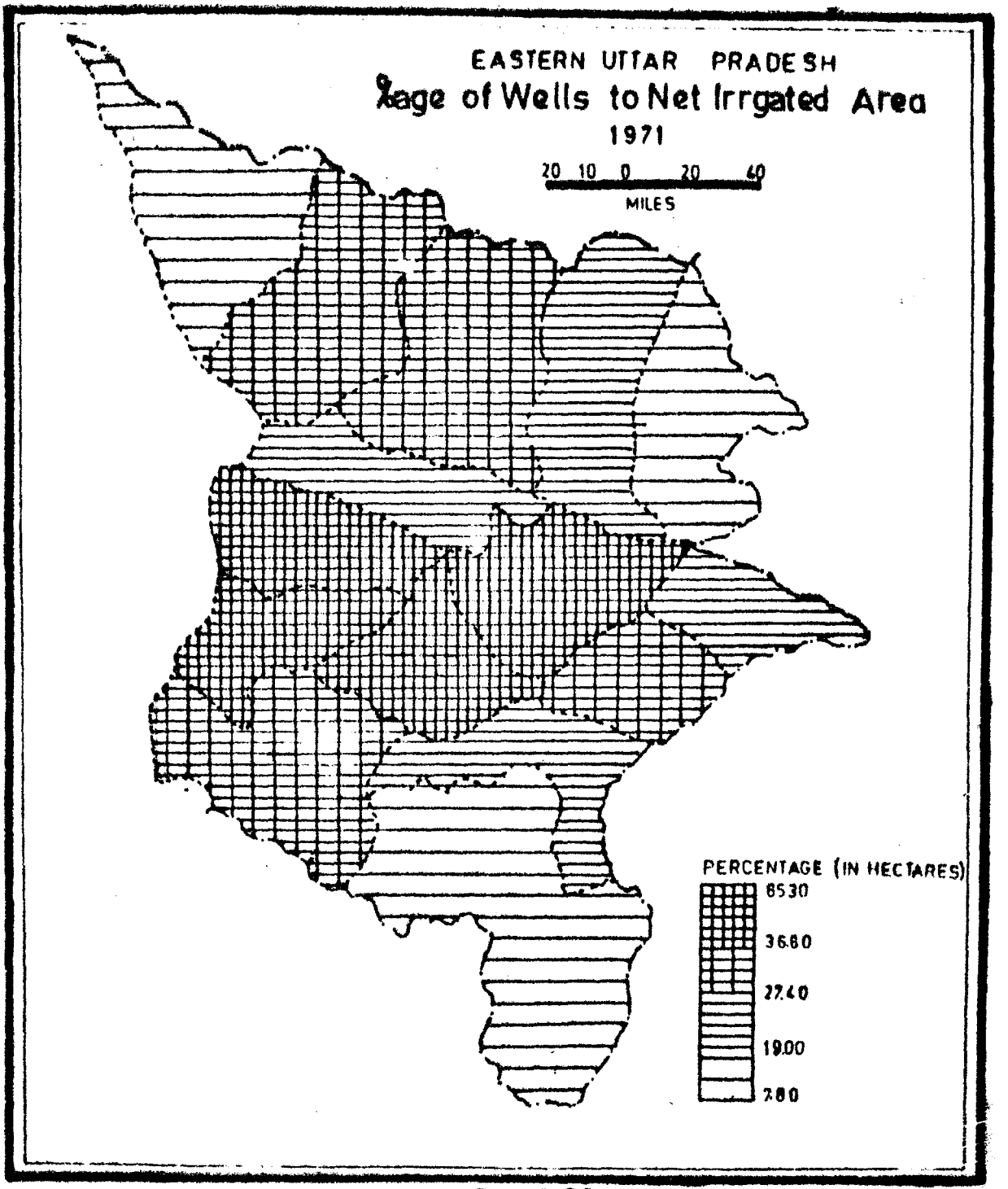
Leaving aside the areas with the highest and the lowest gross irrigated area the entire middle districts of the region have moderate gross irrigated area. These districts receive irrigation through the tube-wells either operated by diesel power or electric currents. Among them pumping sets operated by electric power are more popular. It is because of the fact that due to greater depth of water table, it is difficult to operate ordinary wells by animal force.

After having a detailed discussion in the earlier pages now, we have arrived at the conclusion that the assessment circle having high gross irrigated area are the same which recorded the lowest land concentration in this region and vice versa.

3. Percentage of Tubewells to Net Irrigated Area:

Tubewells and pumping sets which are mainly operated by electricity constitute the most important source of irrigation. The basic advantage of tubewells lies in the fact that it enables the farmers to irrigate the crop when its needs are the most. The cultivator thus becomes independent of the fickleness of the monsoon or of the canal administration. But the major limitation of this mode of irrigation is the heavy capital investment required which takes it beyond the orbit of the mass of peasantry.

Intensity of use of tubewells in irrigated areas is very high in Azamgarh, Bahraich, Ballia, Deoria, Faizabad and Ghazipur districts. Medium clusters of tubewell irrigated area is observed in Allahabad, Basti, Gonda, Gorakhpur, Jaunpur and Varanasi districts. These districts having very low tubewells irrigated area are viz. Mirzapur, Pratapgarh and Sultanpur. This is due to the presence of rocky and sandy outcrops low depth of water table. In these districts the land concentration is recorded to be more. Thus we find that proportion of tubewell irrigated Area had negative impact on land concentration.



MAP NO. 26

H R YADAV

4. Percentage of Wells to Net Irrigated Area

When the rain water gets collected in natural depressions, it is manually lifted with the help of a Dhenkuli, Charkhi, and Dejala and utilized for irrigation purposes. This is the simplest means of irrigation.

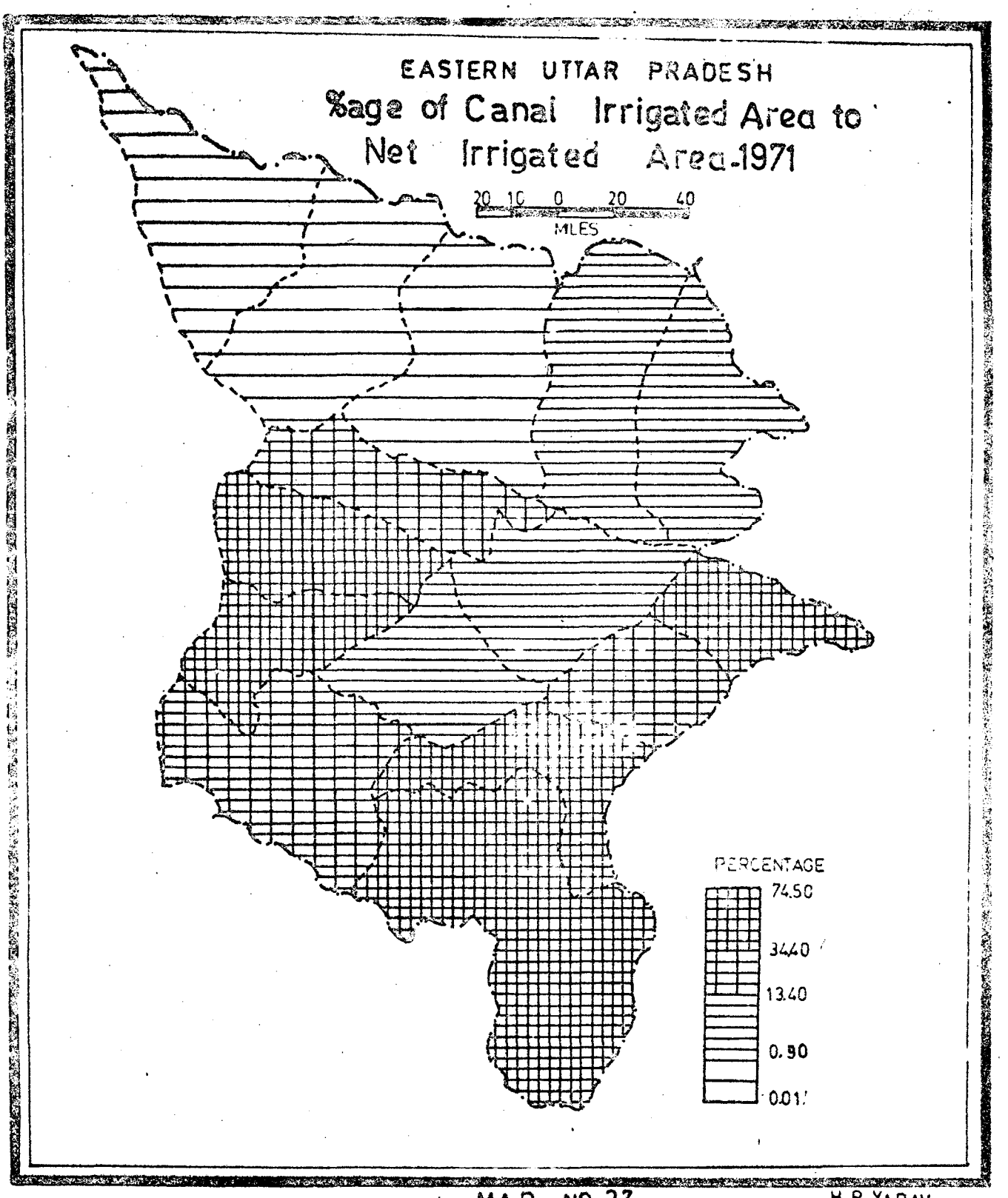
Ordinary wells from where water is lifted with the help of animal force constitute an important source of irrigation. Irrigations by ordinary wells is a low level of technology and has serious limitations. Ordinary wells from where water is lifted with the help of animal force is called by the name of Rahat and Purh in which the former one is considered to be technologically advanced needs investment but lateron is very simple and comparatively cheaper.

The proportion of well irrigated area to Net Irrigated Area is very high in theccentral districts of the region. High percentage (36.60 % to 65.30%) of well irrigated area is found in Sultanpur, Pratapgarh Jaunpur and Azamgarh districts (Map No.26). Medium (27.40% to 36.60%) proportion of well irrigated area is recorded (Map No.26) in Gonda, Basti, Allahabad and Ghazipur districts. Low (19% to 27.40%) percentage of well irrigated area is observed in Gorakhpur, Ballia, Varanasi and Faizabad districts. Very low (7.80% to 19%) share of well irrigated area is recorded in the Bahraich, Deoria and Mirzapur districts. The irrigation

capacity of wells is the lowest in these districts because they are not deep enough to reach large aqueous and water table therein fluctuates seasonally. During the summer season particularly when water is needed most the water table goes down and these are not much useful for irrigation. This is a considerably slow way of irrigation - 24 hours being, taken to irrigate an acre of land. Its chief advantage lies in the low level of capital investment which brings it within the range of the poor farmers. Well irrigation is, therefore, generally prevalent in those areas where the water table is not very low and the size of land holdings are small. Thus the above discussion of percentage share of wells irrigated area to net irrigated area and land concentration of the region represents that both of these variable are negatively related. When the proportion of well irrigated area is more the land concentration will be low.

5. <u>Percentage of canal irrigated Area to Net Irrigated Area</u>:

The irrigation by Perenial canal is operated throughout the year. The seasonal canals operated through Bunds provide seasonal irrigation facility to the farmers. Irrigation by Canal is useful because of the following reasons :-



MAP NO. 27

H. R. YADAV

i) It has a capacity to irrigate a very large area within a short spell of time;

ii) Canal irrigation augments the fertility of boil by the deposition of suspended lead and humus carried by the surface flow;

iii) Irrigation provided by the canals is relatively cheaper as compared to pumping sets or by the diesel operated tubewells. Even an ordinary farmer can afford to utilise this means of irrigation.

Since canal irrigation has lesser degree of size and income bias as compared to the tubewells, it is more suitable for areas with smaller size of land holdings.

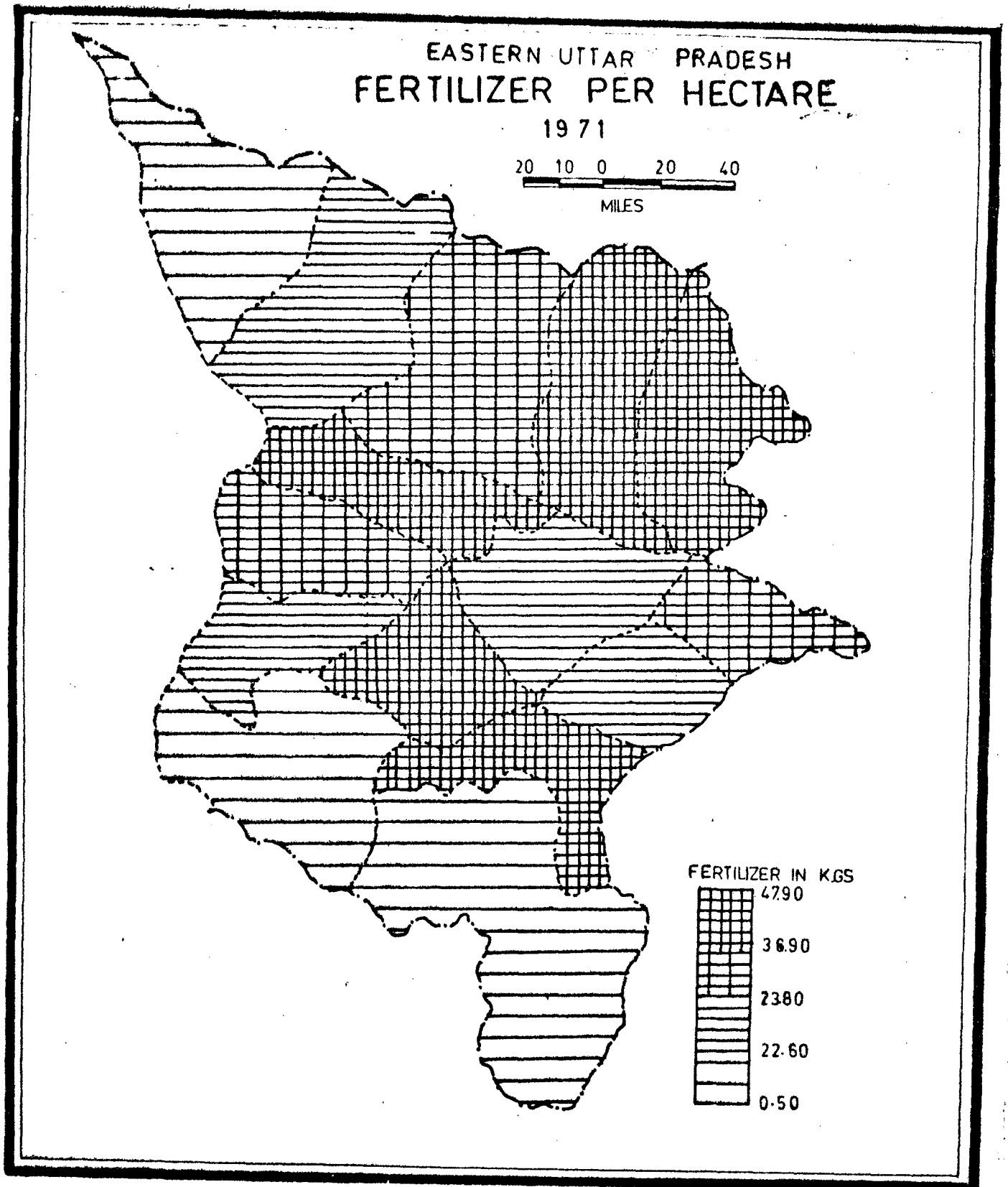
The proportion of canal irrigated is high (34.40% to 74.50%) in Mirzapur district, Varanasi, Pratapgarh and Sultanpur districts (Map No.27). Percentage share of canal irrigated area to net irrigated area is medium (13.40% to 34.40%) in the Allahabad, Faizabad, Ballia and Ghazipur districts. Low (0.90% to 13.40%) percentage of canal irrigated area is recorded in Deoria, Gorakhpur, Jaunpur and Azamgarh districts. Very low (0.01% to 0.90%) percentage canal irrigated area is found in the northern districts of the region i.e. in Bahraich, Gonda and Basti. The distribution pattern of Canal irrigated area to net irrigated area indicates that there is a positive correlation between land concentration and canal irrigated area.

6. NPK Average Fertiliser 1970-73 (100 tonnes).

NPK average fertiliser is very high (above 100 tonnes) in Allahabad, Basti, Deoria, Faizabad, Gonda, Gorakhpur and Varanasi districts. Low average NPK unit of fertiliser is observed in Azamgarh, Bahraich, Ballia, Ghazipur, Jaunpur, Mirzapur, Pratapgarh, Sultanpur districts. The distribution pattern recorded from the data indicates that NPK average fertiliser is very high on the north-eastern and central districts of the region. It is low in the southern and north western districts of the region. The average NPK fertilizer presents that it has negative impact on the land concentration. It may be because the rugged and unfertile lands need more fertilisers to induce some kind of output.

7. Tractor per 100 Hectare :

Tractor per 100 Hectare is high (above 10) in Basti, Deoria, Faizabad, Ghazipur, Gonda, Gorakhpur, Mirzapur and Varanasi districts. It is very low in Allahabad, Azamgarh, Bahraich, Ballia, Jaunpur, Pratapgarh and Sultanpur districts. The distribution pattern of Tractor per 100 Hectares shows that it has positive impact on land concentration because in a small size of holdings, the use of tractor is very sophisticated and unmeaningful. So the number of tractors will be more in areas where the size of holding is large.



MAP NO 28

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8. Electric Pumps per 100 Hectares:

Electric Pump per hectare is high (about 5 per 100 Hectares) in Allahabad, Azamgarh, Ballia, Faizabad, Ghazipur, Jaunpur and Varanasi districts. But it is low in Bahraich, Basti, Deoria, Gonda, Gorakhpur, Mirzapur, Pratapgarh and Sultanpur districts. The distribution of electric pump per 100 hectares and land concentration indicates that both these variables are negatively correlated.

9. Oil Engines Per 100 Hectares :

Oil engines per 100 Hectares have negative impact on land concentration i.e. when the oil engine per 100 Hectares is more, the land concentration will be low. Oil Engine per 100 Hectares is high (above 100 per 100 Hecatare) in Basti, Deoria, Faizabad, Gonda, Gorakhpur and Jaunpur district. Oil Engine per 100 Hectare is low in Allahabad, Azamgarh, Bahraich, Ballia, Ghazipur, Mirzapur, Pratapgarh, Sultanpur and Varanasi districts.

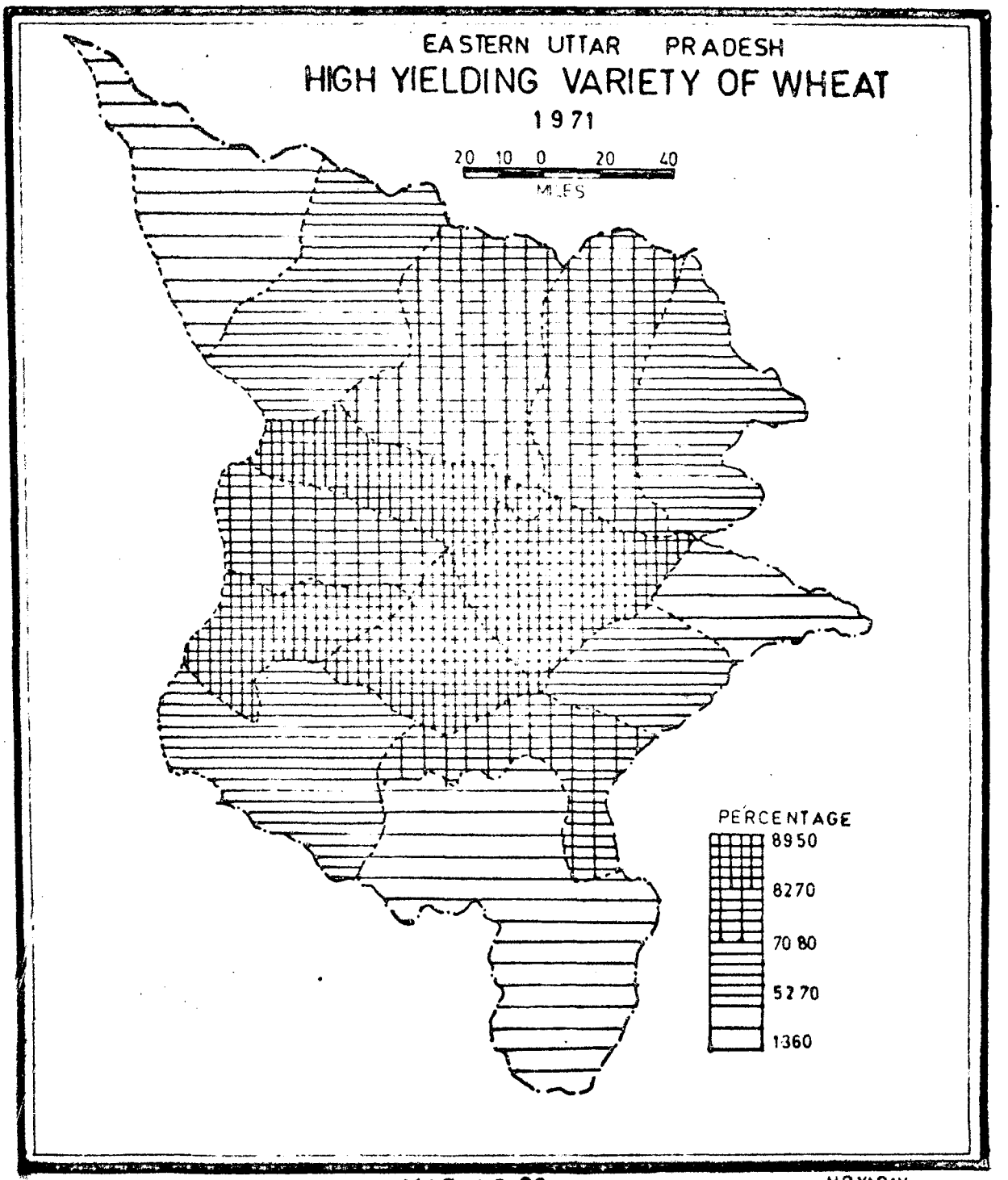
10. Fertiliser per Hectare in Kg:

Fertiliser per Hectare in Kg. is high (36.90 to 47.90) in Deoria, Gorakhpur, Faizabad, Jaunpur and Varanasi districts. Fertilizer per Hectare is medium (23.8 to 36.9) in Ballia, Basti and Sultanpur districts. Fertilizer per hectare is low (22.6 to 23.8) in Gonda, Pratapgarh, Azamgarh and Ghazipur districts. Very low (0.50 to 22.60) Fertilizer per hectare in kg. is seconded in Bahraich, Allahabad and Mirzapur districts (Map No.28). Fertilizer per hectare in kg. will be used

more where farmer may have expectation of more output in terms of lesser input. He will not waste his fertiliser in an unsuitable - agricultural land, where he is aware of the fact that he is not going to get more. But when we see the size of holding one finds that in a small holding farmer uses more input of fertiliser than the larger holdings because large holding farmer has to serve in all the fields in an equal way but small holder uses more to get more output. Thus the areas where fertiliser per hectare is more output will be more but the land concentration will be low. Thus fertiliser per hectare has a negative impact on land concentration.

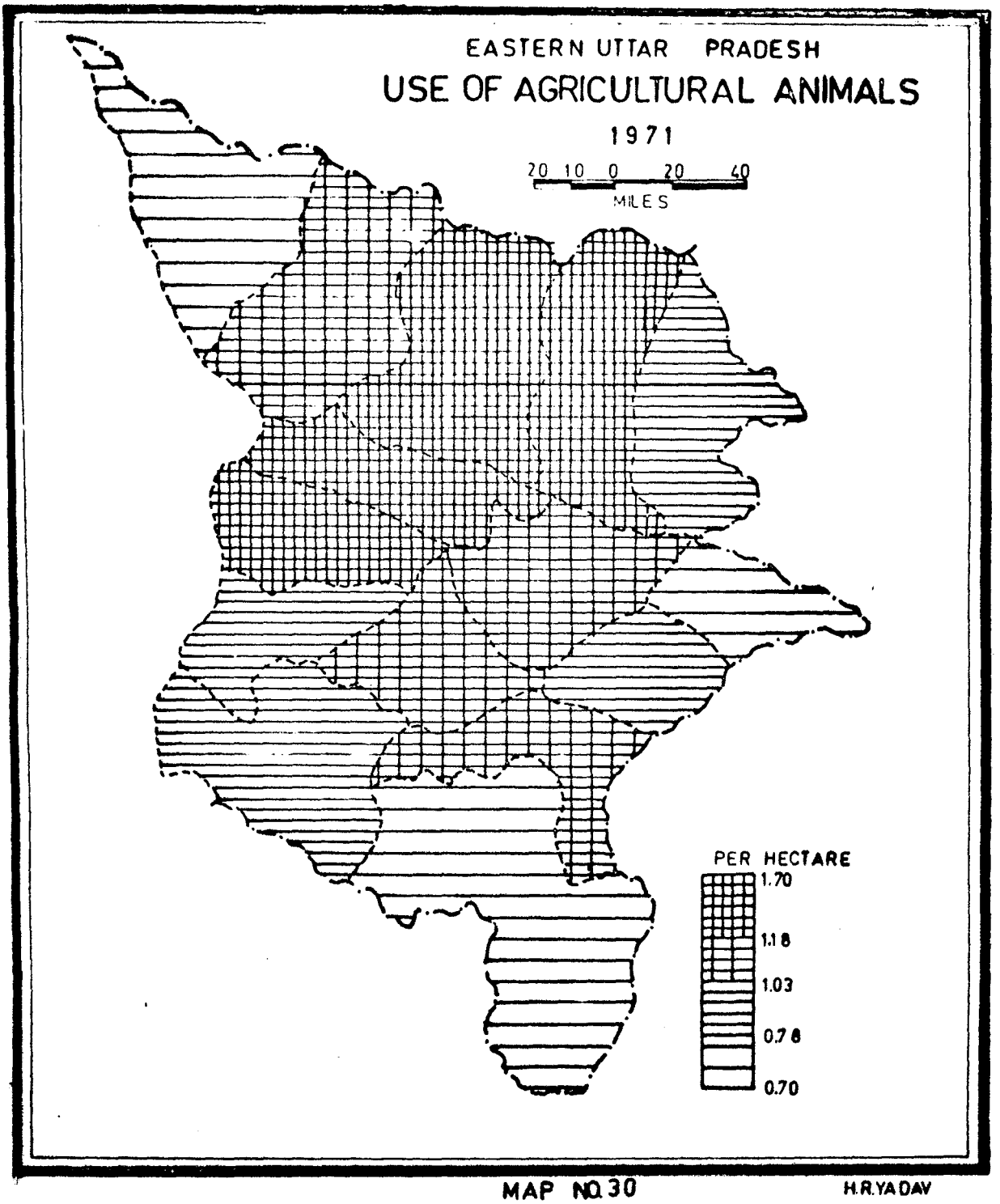
11. Percentage of Rice High Yielding Variety of Crops:

The rice is the major kharif stable crop in the region on which most of its population depends for their diet. Proportion of Rice high yielding variety of crops is very high in Faizabad, Gonda, Deoria and Gorakhpur districts. Percentage share of rice high yielding variety of crops is medium in Allahabad, Azamgarh, Ballia, Basti, Jaunpur and Varanasi districts. Percentage area of high yielding variety of rice crop is low in Bahraich, Ghazipur, Mirzapur, Pratapgarh and Sultanpur districts. When the rice high yielding variety crops are used, the productivity will be more and on the other hand land concentration will be low because in a larger areas where the land is not so suitable to use the costly inputs of rice high yielding variety of crops, the investment does not yield good returns. Hence the farmer doesn't go for such uncertain conditions.



MAP NO. 29

H.R.YADAV



MAP NO. 30

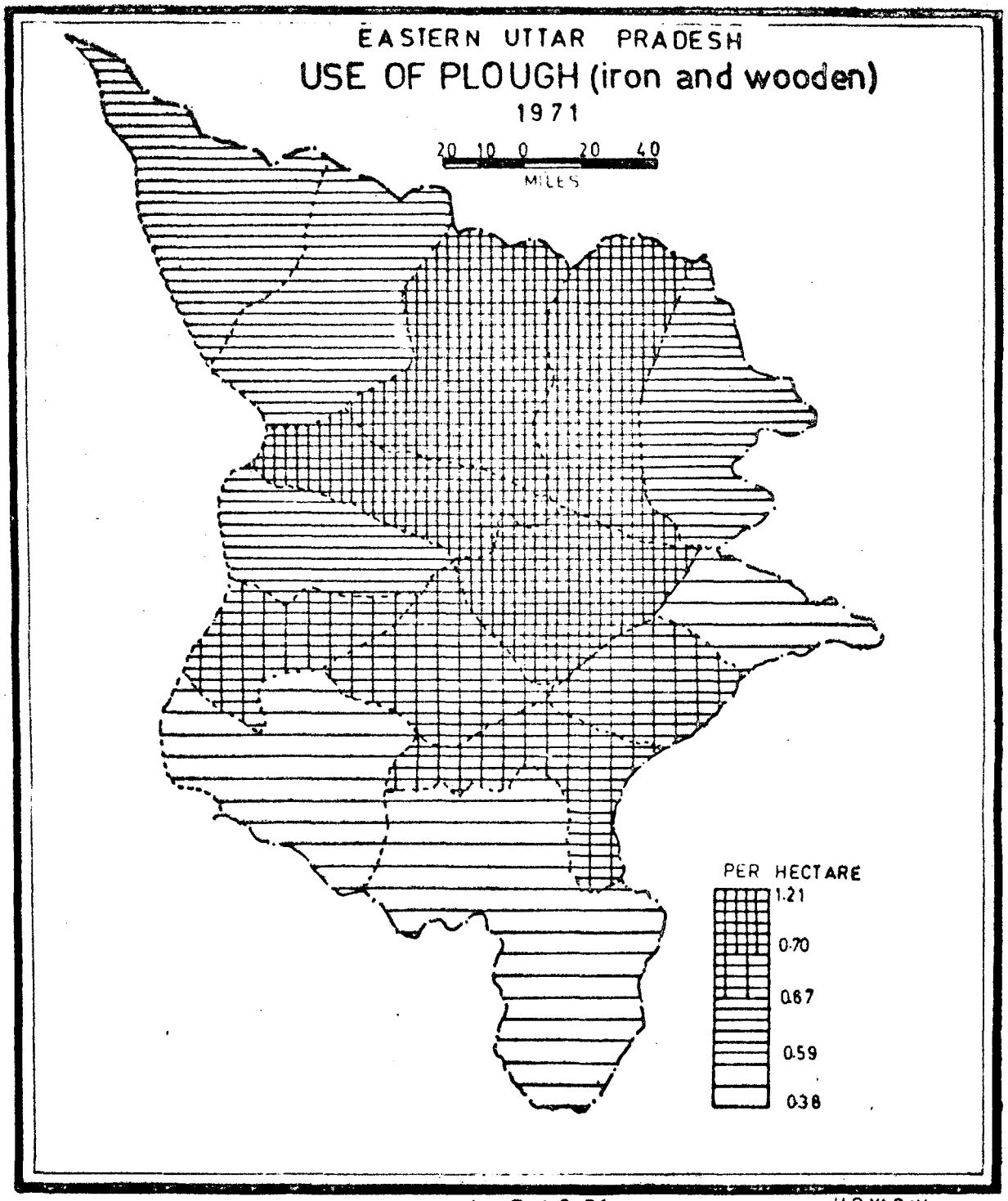
H.R.YADAV

Thus the area of the rice high yielding variety of crops will be more in those areas where land concentration is low.

12. High Yielding Variety of Wheat

The wheat is the major Rabi stable crop in the region on which most of its population depends for this diet. High yielding variety of wheat is very high in central districts of region. The other peripheral districts of the region have low level of high yielding variety of wheat crop. Districts having high (82.70% to 89.50%) yielding variety of wheat crop are Faizabad, Pratapgarh, Jaunpur and Azamgarh. Medium (70.80% to 82.70%) level of high yielding variety of wheat crop is observed in Sultanpur, Gorakhpur, Basti and Varanasi districts (map No.29). There is low percentage (52.70% to 70.80%) of high yielding variety crop in Gonda, Deoria, Allahabad and Ghazipur districts. Very low (13.60% to 52.70%) share of high yielding variety of wheat crop area recorded in Mirzapur, Bahraich and Ballia districts. The distribution pattern of high yielding variety of wheat crop has positive correlation with the land productivity on the one hand and on the other hand it has negative correlation on with the land concentration.

13. Use of Agricultural animals per hectare is high (1.18 to 1.70) in Basti, Gorakhpur, Faizabad and Sultanpur districts (mp No.30). It is medium(1.05 to 1.18) in Jaunpur, Varanasi, Azamgarh and Gonda districts.



MAP NO. 31

H R YADAV

Use of agricultural animals is low (0.78 to 1.03) in Deoria, Ghazipur, Allahabad and Pratapgarh districts. Very low use of agricultural animals per hectare(0.70 to 0.78) is recorded in Bahraich, Ballia and Mirzapur districts. Use of agricultural animals per hectare will be high in those areas where the size of holdings is small and productivity is more because use of animals is not so benefitable or suitable in larger land holding. There traster or other type of mechanisation is needed. Use of agricultural animals will be low in the areas where land is not so suitable for agricultural animals will be low in the areas uses and size of holdings is larger. Where will the animals and plough the clultivation is not possible. So the use of agricultural animals per hectare have negative impact on the land concentration.

14. Use of Plough (Iron and Wooden):

The traditional method of ploughing with the help of wooden plough. It is used where the size of operational holdings is small. The efficiency of wooden plough as compared to other methods of ploughing like tractors and iron plough is certainly less but the productivity of such areas using wooden plough is quite high.

Iron plough is modification of wooden plough. In a iron plough instead of one harrow, there are 2 to 4 harrows in each set of plough and this is the reason that the ploughing capacity of iron plough is two to four times more as compared to that of wooden plough. Strong

bullocks are required to draw the iron plough.

The use of iron and wooden plough per hectare is more in the northern districts of the region. The districts having high (0.70 to 1.21) use of plough is recorded in Gorakhpur, Basti, Faizabad and Azamgarh districts (map No.31). Use of plough is medium (0.67 to 0.70) in Pratapgarh, Jaunpur, Varanasi and Ghazipur districts. Low (0.59 to 6.67) use of agri_ cultural plough per hectare is recorded in Bahraich, Gonda, Sultanpur and Deoria districts. Very low (0.38 to 0.59) use of agricultural plough is seen in Ballia, Allahabad and Mirzapur districts. Both iron and wooden plough have positive relation with the agricurltural productivity. But the use of plough has negative correlation with the land concentration because the use of plough is ply possible in the small size of land holdings.

6.3 Result of Correlation Matrix:

We have discussed till now the impact of physical social, institutional and economic factors on land concentration in the second, third, fourth and fifth chapters respectively, leaving all these factors aside. The sixth major set of factor affecting land concentration is the technology, available to the farmers for various farming operations. The operation taken into account here are iron and wooden ploughs, tractors, wells, tubewells and oil engines.

TABLE NO. XV

CORRELATION MATRIX

TECHNOLOGICAL FACTOR

	X	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Land Concentration Y	1.000														
1.Net irrigated Area to Net Sown Area	-0.356*	1.000													
2.Gross irrigated Area to Gross cropped Area	-0.355*	0.985***	1.000												
3.% of Tubewells to Net irrigated Area	-0.093	-0.025	0.057	1.000											
4.% of Wells to Net irrigated Area	-0.614***	0.326*	0.247	-0.392*	1.000										
5.% of Canals to Net irrigated Area	0.559**	-0.024	-0.095	-0.591**	-0.300	1.000									
6.NPK average fertiliser 1970-73 (100 tonnes)	-0.165	-0.426*	-0.556**	0.430*	-0.149	-0.429*	1.000								
7.Tractor per 100 Hectare	0.048	-0.178	0.267	0.352*	-0.381*	-0.111	0.615***	1.000							
8.Electric pump per 100 Hect.	-0.204	-0.574**	0.485*	0.189	0.208	0.033	-0.078	-0.007	1.000						
9.Oil Engines per Hectare	-0.315*	-0.104	0.209	0.167	0.079	-0.526**	0.651***	0.617***	-0.434*	1.000					
10.Fertiliser per Hectare in Kg.	-0.429*	0.709***	0.793***	0.390*	-0.006	-0.324*	0.703***	0.474*	0.281	0.402*	1.000				
11.% of Rice High Yielding Variety of crops	-0.164	0.501**	0.579**	0.435*	-0.128	-0.216	0.711***	0.369*	0.268	0.376*	0.649***	1.000			
12.% of Wheat H.Y.V. of crops	-0.620***	0.754***	0.751***	-0.060	0.410*	-0.364*	0.414*	-0.027	0.404*	0.248	0.598**	0.519**	1.000		
13.Used Agr.Animals per Hect.	-0.370*	0.501**	0.570**	0.015	0.112	-0.289	0.555**	0.285	0.142	0.447*	0.505**	0.585**	0.684***	1.000	
14.Plough (Iron-Wooden) per Hectare	-0.427*	0.425*	0.475*	0.134	0.096	-0.387*	0.458*	0.278	0.221	0.358*	0.461*	0.424*	0.606***	0.781***	1.000

NOTE: *Significant at 10% level of Significance
**Significant at 5% level of Significance
***Significant at 1% level of Significance

The list of variables having significant correlation coefficients with the land concentrations are classified by the direction of relationship and the level of significance are given below :

1. Net irrigated area to Net sown Area (X1)
2. Gross irrigated area to gross cropped Area(X2)
3. Percentage of wells to Net irrigated Area(X4)
4. Oil Engines per 100 hectare (X9)
5. Fertilizer per Hectare (X10)
6. Percentage of wheat High yielding variety of crops (X12)
7. Used Agricultural animals per Hectare (X13)
8. Use of plough (iron and wooden) per hectare (X14).

The following relationships of land concentration have been shown in table No.15

(i) Net irrigated area to net sown area(X1) and Gross irrigated Area to Gross cropped area (X2) have negative correlation with the land concentration, significant at 10% level of Significance, which essentially emplies that the number of mechanised units per acre decreases in the land concentration. It can be stated in other words that it brings out the negative relationship between the mechanisation of irrigation in relation to the land concentration.

(ii) Proportion of canals to net irrigated area(X5) have positive correlation with the land concentration which is significant at 10% level of significance because land has the capacity to irrigate a very large area and for smaller holdings may have the problem of controlling the water due to the heavy flow of water, on the other hand canal irrigation also augments the fertility of the soils. Irrigation provided by canal is cheaper as compared to pumping sets or by the diesel tubewells which can be afforded only on those areas where productivity is low. Since canal irrigation has a lesser degree of size and income bias as compared to the tubewells but it also may be suitable for areas with smaller size of land holdings with proper controlling management of water but in any case it is more suitable for larger land holdings.

(iii) Recently of tubewells to net irrigated area(X3) NPK average fertilizer (X6), tractor per 100 hectare (X7) Electric pump per 100 hectare (X8) have negative correlation with the land concentration excepting variable X7 which has positive correlation with the land concentration. But all these variables have insignificant correlation with the land concentration.

(iv) Percentage of wells to net irrigated area(X4) has negative correlation with the land concentration which is significant at 1% level of significance because by the well larger areas cannot be irrigated i.e. areas having low productivity and low quality of land. Well irrigation is possible with small size of land holding by which small patches of land can easily be irrigated.

(v) Oil Engine per 100 hectares (X9) has negative correlation with land concentration significant at 10% level of significance because oil engine is the costly modes of irrigation, using it no farmer will try to waste his money in poor quality land where he knows that he will get less surplus. So the oil engines will be more infertile and more productive areas than the bigger land holdings.

(vi) Fertilizer per Hectare (X11) has negative relationship with land concentration which is significant at 10% level of significance. Fertilizer per hectare will be used more in small size of holding to increase productivity but the large farm holders use more fertilizer than the small farmers but when it is calculated per hectare it comes less than the small farmers.

(vii) Percentage of wheat high yielding variety of crops(X12) has negative correlation with the land concentration which is signficant at 1% level of

significance. This is also highly correlated with gross irrigated area, significant at 1% level of significance. Thus high percentage of gross irrigated area use HYV of wheat crops over a large area, resulting low land concentration and increase in output on the other hand high yielding variety of rice crops (X11) have negative correlation with land concentration which is insignificant and the relationship between these two varieties variable is weak but multi-collinarity between X11 and X12 variables has been observed.

(viii) Used agricultural animals per Hectare (X13) and plough (iron-wooden) per hectare(X14) have negative correlation with the land concentration which is significant at 10% level of significance, which essentially emplies that the number of mechanized units per acre decreases with an increase in land concentration. Stated in other words, it brings out the negative relationship between the mechanisation of ploughing and used agricultural animals in relation to the land concentration in the study area.

TABLE NO. XVI

RESULT OF STEPWISE REGRESSION

TECHNOLOGICAL FACTOR

Variable Entered		Intercept	Regression Co-efficient	S.E.	T	R	R^2	Increase in R^2	F	F^2	F
1		2	3	4	5	6	7	8	9	10	11
Step 1	12	0.64422	-0.001	0.000	-2.846***	-0.620	0.384	-	0.620	0.384	8.098**
Step 2	12	0.61563	-0.001	0.000	-2.215**	0.559	0.312	-0.072	0.715	0.511	6.287**
	5		0.001	0.000	1.773*						
Step 3	12	0.61978	-0.000	0.000	-1.135*	-0.614	0.376	0.064	0.762	0.581	5.068**
	5		0.001	0.000	1.678*						
	4		-0.001	0.001	-1.340*						
Step 4	12	0.62799	0.000	0.001	1.106	-0.429	0.184	-0.192	0.796	0.634	4.309*
	5		0.001	0.000	1.353*						
	4		-0.001	0.001	-1.812*						
	10		+0.001	0.001	-1.197*						
Step 5	12	0.65886	0.001	0.001	0.952	-0.427	0.182	-0.002	0.825	0.681	3.835*
	5		0.000	0.000	0.771						
	4		-0.002	0.001	-2.154**						
	10		-0.001	0.001	-1.578*						
	14		-0.070	0.061	-1.159*						
Step 6	12	0.65290	0.001	0.001	0.617	-0.358	0.128	-0.054	0.858	0.702	3.148*
	5		0.000	0.000	0.295***						
	4		-0.002	0.001	-2.151**						
	10		-0.002	0.001	-1.676*						
	14		-0.070	0.062	-1.124*						
	1		0.001	0.001	0.767						

NOTE: * Significant at 10% level of Significance
** Significant at 5% level of Significance
*** Significant at 1% level of Significance

6.4 Result of stepwise Regression:

The system of explanation by the endogenetic variables discussed above also showed a higher degree of multi co-llinearity among themselves. To remove the inconsistancies arising out of this problem of multi collinearity a stepwise regression analysis is attempted.

Stepwise regression analysis is attempted taking land concentration as dependent variable(Y) and fourteen earlier mentioned independent variables (X). The result of stepwise regression analysis gives an intercorrelation matrix which is given in the table No.16. It was upto 6th step after which the R starts declining. The analysis thereafter gets truncated at this step. The six variables which are found in the optimal regression line are :

1. Percentage of wheat high yielding variety of crops(XR)
2. Percentage of canal to Net irrigated area(X5)
3. Percentage of wells to Net irrigated Area(XU)
4. Fertilizer per Hectare (X10)
5. Use of plough (iron and wooden) (X14)
6. Net irrigated Area to Net sown area(X1)

The most dominant variable is explaining variability in land concentration is percentage of wheat high yielding variety of crop which explains around 38% of variation in the land concentration.

The net dominant variable is X5 i.e. percentage of Canal irrigated area to net irrigated area which explains 13% of variation in Y i.e. in the land concentration.

Third dominant variable in explaining the variability of (Y) land concentration is percentage of wells to net irrigated area which explains around 7% of variation.

The fourth dominant variable is (X10) fertilizer per hectare which explains around 5% of variation in the land concentration. All the above mentioned four variables together explain 63% of total variation in the land concentration.

Fifth dominant variable in the technological factor is X14 i.e. use of plough (iron and wooden) which explains around 5% of variation in the land concentration.

The last dominating variable in this factor is Net irrigated area to net sown area (X1) which explains around 2% of variation in the land concentration. All the above mentioned 6 endogenetic variables of technology thus explain 70% of the total variation in the land concentration.

6.5 Conclusion

We can therefore conclude that the hypothesis related to X12, X5, X4, X10, X14 and X1 are supported by this emperical exercise. The high degree of multi collinearity among the variables suggest that the effect of others independent variables is sub sumed Therefore the percentage of wheat high yielding variety of crops (X12) is found to be the most dominant factor in explaining the variability of land concentration

followed by

1. Percentage of canals to net irrigated area (X5)
2. Percentage of wells to net irrigated area (X4)
3. Fertiliser per hectare (X10)
4. Use of plough (iron and wooden) (X14)
5. Net irrigated area to Net sown Area(X1).

CHAPTER - VII

SUMMARY AND CONCLUSIONS

CHAPTER VII

SUMMARY & CONCLUSIONS

Man nature interaction is a phenomena which was and is in the process of operation from immemorial times. Nature provides a resource base and provides a direction in which man has to operate to attain a level of self sufficiency. As the science and technology have progressed, they have helped him to extend his area of freedom in exploring nature to a higher level of optimum use. Accepting the basic inherent principle of nature, it is to be evaluated that how far these factors are playing a role in controlling the cultural sector over the globe.

Different studies have provided as discussed in the literature survey that the size of holding (land concentration) has an impact on land productivity. Many of these studies have discussed and analysed the qualkity of land in terms of productivity but no attention has been paid towards the quantity of the land, while it is assumed to have a sizeable control over the productivity. Thus it becomes necessary that if the size of land holding is the main phenomena affecting the land

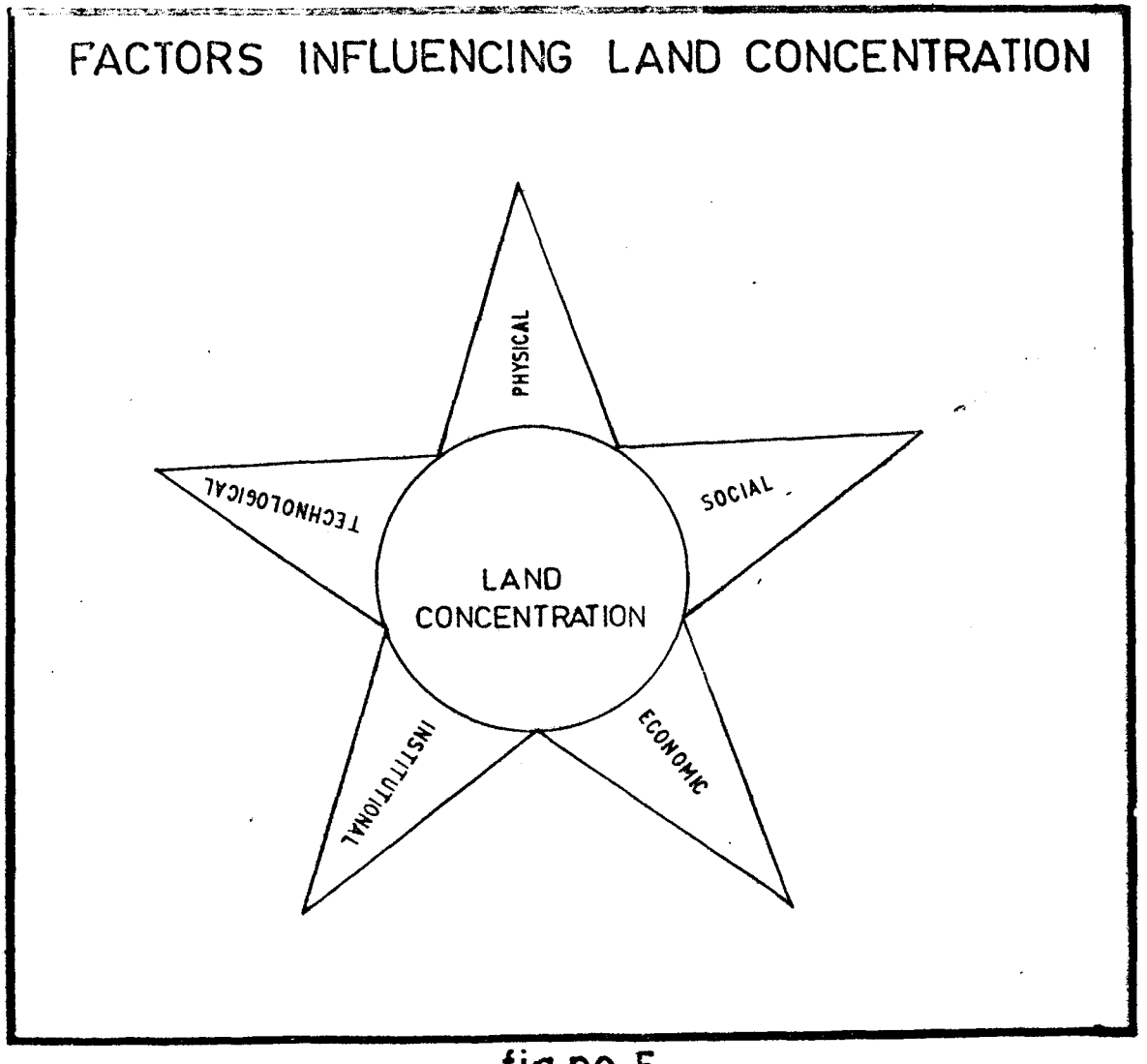

FACTORS INFLUENCING LAND CONCENTRATION
PHYSICAL
SOCIAL
ECONOMIC
INSTITUTIONAL
TECHNOLOGICAL
LAND
CONCENTRATION

fig.no. 5

productivity why cannot land concentration be studied as a separate entity. Having this idea in mind land concentration has been chosen as a dependent variable and different independent variables relating broadly to man nature & technology have been identified which are considered to have an impact on land productivity. Natural parameters have a wide ranging impact on land concentration. But generally the correlations are positive in nature. Assumption has been made here that quality and quantity of land both have negative and positive impact on land concentration respectively. Because of the fact that if the quality of land is good, production will be more, as has already been discussed that under such type of situations land concentration will be less. On the other hand when land is of poorer quality, quantity of land will be more because such a land is owned by few farmers who can afford for more input of technology and capital investment. On the other hand social, economic, institutional and technological factors show a negative impact on land concentration. Thus we can say that the land concentration is a phenomena which is controlled by the pentagonal forces viz. Physical, Social, Economic, Institutional and Technological factors. Though

nature has blessed Eastern Uttar Pradesh with a favourable environment but is still backward region with many constraints. In this study attempt has been made to analyse the land concentration as an index of agricultural productivity. Concentration in Eastern Uttar Pradesh can properly be considered if they are viewed not in isolation but as a function of differential doses of technological inputs in-teracting with environmental constraints of varying severity under the inhibiting influence of the institutional, social and economic factors of differing intensities in the region. Thus all the pentagonal forces seem to have an impact on land concentration of the region which is in turn directly linked with land productivity.

The land concentration is high in Mirzapur, Allahabad, Ballia and Azamgarh districts. It is very low in Pratapgarh, Faizabad and Jaunpur districts. Thus the pattern of land ownership or concentration of land varies from South to North in the region.

Physical parameters in general have a positive correlation with the land concentration. The higher relief, slope or higher undulating rugged terrain gives raise to greater concentration of land which is poor in quality but is bountiful in quantity. In

TABLE NO. XVII

EASTERN UTTAR PRADESH

FACTOR INFLUENCING LAND CONCENTRATION

S.NO.	Districts	Gini co-efficient	Stream Frequency	Slope (in degrees)	Ruggedness Number	% of Agriculture workers to total Rural workers	% of Cultivators to total Agricultural workers	Output per Hect. in Rs.	Output per NPK unit of fertiliser in Rs.	% of cultivated area to Net cropped Area	% of Household having above 5 Hect. of land to total Household	% of Households Area having above 5 Hect. of land to total Holdings Area	% of Wells to N.I.A. in Hect.	Fertiliser Per Hectare in Kg.	% of Area of Wheat H.Y.V.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	Allahabad	0.598	4.35	1.20	0.068	72.92	69.08	858.85	40.64	69.306	3.557	31.044	31.9	0.5	52.1
2.	Azamgarh	0.599	5.23	1.60	0.004	82.37	66.07	1077.14	48.37	74.863	1.284	15.237	36.6	22.4	89.5
3.	Bahraich	0.563	4.27	2.70	0.008	90.96	84.49	738.38	63.58	64.907	2.539	20.348	15.1	12.1	24.1
4.	Ballia	0.613	5.63	1.40	0.005	82.39	52.90	1011.39	44.73	70.757	2.783	25.257	75.6	25.8	52.7
5.	Basti	0.594	4813	2.70	0.004	90.77	71.35	1154.25	34.86	74.529	1.958	18.997	27.4	33.6	70.8
6.	Deoria	0.577	2.58	1.70	0.004	89.26	64.63	1516.31	32.82	77.159	1.759	17.813	25.6	47.7	61.7
7.	Faizabad	0.545	2.75	1.10	0.011	85.24	68.04	1146.42	45.47	66.255	1.183	12.845	19.0	47.9	82.7
8.	Ghazipad	0.569	6.30	1.20	0.006	82.05	62.80	1147.97	50.34	75.878	2.881	25.974	34.9	22.0	56.7
9.	Gonda	0.587	3.64	3.00	0.011	89.76	78.96	864.94	40.64	70.304	2.647	21.029	35.9	22.5	64.5
10.	Gorakhpur	0.559	3.86	2.20	0.003	84.50	55.20	1202.81	31.84	71.697	1.792	19.033	28.6	36.9	82.5
11.	Jaunpur	0.521	3.28	3.40	0.007	83.57	71.53	1051.76	34.99	74.023	0.911	11.815	65.3	31.7	86.3
12.	Mirzapur	0.671	10.13	7.00	0.049	79.74	48.74	599.15	64.54	37.394	7.928	48.870	7.8	6.4	13.6
13.	Pratapgarh	0.535	3.89	3.30	0.013	87.59	70.59	760.66	39.21	68.323	1.799	14.108	55.2	20.6	82.7
14.	Sultanpur	0.578	1.86	2.90	0.006	88.12	64.08	965.19	36.10	67.638	1.578	16.176	45.0	27.1	80.4
15.	Varanasi	0.588	5.63	3.70	0.007	58.40	56.96	1012.72	22.18	61.223	1.626	18.077	21.2	43.9	74.2

this case study of the environmental factors represented by 12 parameters, climatic and soil parameters don't seem to have an impact on land concentration. On the other hand physiographic variables represented by drainage density, absolute relief, relative relief, slope ruggedness number and stream frequency explain the maximum variation in land concentration. But as a step ahead in regression analysis the three left out parameters explain the maximum variation in land concentration at a much higher level of significance. The stream frequency which is higher in Mirzapur, Ballia, Ghazipur and Varanasi districts (Table No.17) is associated with higher slope as well as ruggedness leading to extensive tracts of land concentration. These areas where higher values of above mentioned parameters are found provide an hinderance for the smooth progress of agricultural activity. In such areas neither the mechanisation nor incentive to capital investment will lead to a better agricultural prosperity. As it is, these regions are left barren without paying much attention to them. The only way to bring such areas under cultivation would be to use more input to achieve a better output, which can

only be carried over by the richer few. Hence this factor upholds the general hypothesis that most of the physical variables have a positive impact on the land concentration.

Agricultural activity cannot be performed merely by having suitable land resources and technology. But there should be a proper linkage between these two which is provided by social system. These become the means by which better utilisation of resources can be attained. Under the social factor nine variables have been selected to see their impact on the variations in land concentration. Within the social factor (percentage of agricultural workers to total rural agricultural workers*) %age of agricultural labourers to total workers, percentage of cultivators to total agricultural workers per hectare and agricultural workers per number of household have a significant impact on land concentration. The agricultural workers per hectare, agricultural workers to total rural workers and proportion of cultivators have strong correlation with the land concentration. It is due to the fact that labour intensity is both the cause and effect of

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* In the earlier correlation matrix it has no significant correlation with the land concentration because of multicollinearity with agricultural labourers and cultivators for testing hypothesis this variable has been again chosen.

higher productivity on the one hand and on the other it is the cause and effect of low land concentration. If the farmers have high output and low land concentration, they will employ agricultural labourers otherwise they will carryout all the work by themselves. Thus there exists a negative relationship between agricultural labourers and land concentration.

Man (producer or farmer) interacts with nature (land and environment) to get more surplus. The regions where nature is suitable for agricultural activity (fertile land with availability of other resources) people try to get hold of such areas, a trend which can be noticed from primitives economy to the present surplus economy. Thus in such areas where less resources are available, owners will also be less in number and the area will be more. So it has an inverse relationship with land concentration and good quality of land will beowned by several owners in which inequality in land ownership will be low. Thus productivity and land concentration have inverse relationship with each other in the region. It has already been discussed that twelve variables have been selected to explain the variations in the land concentration. The result of correlation matrix shows that output per hectare and output per NPK unit

of fertilizer have significant relationship with the land concentration. These variables have a negative and a positive impact on land concentration respectively which is significant at 10% level of significance.

In the process of land concentration consolidation man does not work in isolation but in defined relationship with other men. The relationship of these of the land concentration provides the institutional frame within which land concentration processes proceed and they exert a profound influence on the land concentration. Among the institutional factors various variables (percentage of cultivated area to total cropped area, percentage of wholly owned and self operated household to total household, percentage of household having less than five hectares of land to total household percentage of household's area having less than 5 hectares of land to total holdings area, percentage of household having above 5 hectares of land to total household and percentage of holdings area having above 5 hectares of land to total holdings area with strong significant relationship? have been selected to explain the variability of land con-

Among these variables three variables have been further selected for final correlation matrix and stepwise regression analysis viz. percentage of cultivated area to total cropped area, percentage of household having above 5 hectares of land to total household and percentage of holdings area having above 5 hectares of land to total holdings area which are significant at 1% level of significance. Out of these three parameters excluding the first one remaining two show a positive level of correlation. This is because the households with more then 5 Hectares of land will automatically be confined to higher land concentration zones. As far as the negative relationship of the first parameter is concerned it explained by the same logic which is built upon the earlier cases ie. areas with good productivity potential are more fragmented hence lower land concentration.

The discussion has been made in the earlier pages that agricultural productivity has negative correlation with the land concentration, while technology has a positive correlation with the productivity. Thus the logic evolved here is that technology has negative impact on land concentration, for which fourteen variables have been selected

TABLE NO. XVIII
EASTERN UTTAR PRADESH
FACTORS INFLUENCING LAND CONCENTRATION
CORRELATION MATRIX

	X	1	2	3	4	5	6	7	8	9	10	11	12	13
Gini Co-efficient	1.000***													
1. Stream Frequency	0.603***	1.000***												
2. Slope (in degree)	0.718***	0.807***	1.000***											
3. Ruggedness No.	0.841***	0.778***	0.868***	1.000***										
4. % of Cultivated Area to total cropped Area	0.798***	0.736***	0.928***	-0.913***	1.000									
5. % of Household having above 5 Hect.of land to total H.H.	0.843***	0.694***	0.878***	-0.927***	0.980***	1.000								
6. % of holdings' Area having above 5 Hect. of land to total holdings Area	0.509**	-0.074	-0.387*	0.543**	-0.486*	-0.554**	1.000							
7. % of Wells to Net irrigated Area	-0.442*	0.524**	-0.465*	0.575**	-0.631***	-0.605***	-0.008	1.000						
8. Fertilizer per Hectare in Kg.	-0.625***	-0.498*	-0.655***	0.743***	-0.821***	-0.813***	0.610***	0.596***	1.000					
9. % of Area of Wheat High Yielding Variety of crop	-0.325*	-0.693***	-0.532**	0.555**	-0.580**	-0.510**	0.014	0.779***	0.504**	1.000				
10. Output per Hect. in Rs.	-0.401*	-0.217	0.548**	-0.450*	0.618***	0.548**	-0.358*	-0.637***	-0.716***	-0.542**	1.000			
11. Output per NPK unit of fertilizer	0.206	-0.297	-0.154	0.192	-0.125	-0.212	0.177	-0.028	-0.002	0.111	0.297	1.000		
12. % of Agricultural workers to total rural workers	-0.511**	-0.215	-0.472*	0.416*	-0.488*	-0.465*	0.377*	-0.114	0.079	-0.111	0.096	0.468*	1.000	
13. % of cultivators to total agr. workers	-0.426*	0.675***	0.774***	-0.581**	0.599**	0.559**	-0.118	-0.391*	-0.221	-0.460*	0.382*	-0.243	-0.352*	1.000

NOTE: *Significant at 10% level of Significance
**Significant at 5% level of Significance
***Significant at 1% level of Significance

to explain the variation in land concentration in which a strong netative correlation is observed with percentage of wells to net irrigated area, percentage of wheat high yielding variety of crops, fertilizer per hectare, used agricultural animals per hectare, plough per hectare, net irrigated area to net sown area, gross irrigated area to gross cropped area as these technological inputs can, in good land where productivity will also be more and due to which fragmentation on land holdings takes place. Proportion of canal irrigated area has a positive correlation with land concentration because canal irrigation is more suitable in large size of holdings. Among all these variables three variables viz. percentage of wheat high yielding, variety of crops, percentage of wells to net irrigated area and fertilizer per hectare have been choosen for final correlation matrix stepwise regression analysis as they show a higher degree of correlation compared to the other variables.

Thus the selected thirteen parameters from all the factors have a strong correlation with the land concentration (Table No.18). These variables show a higher degree of multicollinearity among themselves. To remove inconsistancies arising out

of this problem of multicollinearity a stepwise regression analysis is attempted with these thirteen variables given in Table No.19. The results are given below:

A stepwise regression analysis was attempted taking land concentration as dependent variable (Y) and thirteen earlier mentioned independent variables (X). The stepwise regression analysis gives an intercorrelation matrix which is given in the table 19. It goes upto step 5 after which R^2 starts declining. The analysis therefore truncats at this step. The five variables which are found in the optimum regression line are:

1. Ruggedness number (X3)
2. percentage of cultivated area to total cropped area (X4)
3. Percentage of agricultural workers to total rural workers (X12)
4. Fertilizer per hectare (X8)
5. Output per hectare (X10)

The most dominant variable in explaining variability in land concentration is ruggedness number (X3) which explains around 71% of variation. It is interesting to note that in subsequent steps variables X1 and X2 would not come because they have

TABLE NO. XIX
EASTERN UTTAR PRADESH
RESULT OF STEPWISE REGRESSION
FACTORS INFLUENCING LAND CONCENTRATION

Variable	Intercept	Regression co-efficient	S.E.	T	R^2	Increase in R^2	$\bar{R}^2$	R^2	F
Step 1)(3	0.51072	0.003	0.001	5.654***	0.711	-	0.843	0.711	31.960***
Step 2)(3	0.53574	0.003	0.001	4.211**	0.746	0.035	0.852	0.725	17.644***
)(4		-0.001	0.000	-1.293					
Step 3)(3	0.48779	0.004	0.001	3.915**	0.779	0.034	0.862	0.743	12.994***
)(4		-0.001	0.000	-1.705					
)(12		0.001	0.000	1.299*					
Step 4)(3	0.60069	0.003	0.002	1.513*	0.792	0.013	0.858	0.736	9.526***
)(4		-0.001	0.000	-1.505					
)(12		0.001	0.000	1.179					
)(8		-0.001	0.001	0.766					
Step 5)(3	0.71214	0.002	0.002	1.375*	0.810	0.016	0.856	0.732	7.625***
)(4		-0.000	0.001	-5.540					
)(12		0.000	0.000	1.042					
)(8		-0.002	0.002	-1.161					
)(10		-0.007	0.007	-0.893					

NOTE: * Significant at 10% level of Significance
** Significant at 5% level of Significance
*** Significant at 1% level of Significance

strong correlation with variable (X3) ruggedness number.

The next dominant variable is X4 ie. percentage of cultivated area to total cropped area which explains about 3% of total variation in (Y) land concentration.

In stepwise regression analysis the next dominant variable is X12 i.e. percentage of agricultural workers to total workers which explains together around 77% of variation in land concentration. The variable X8 i.e. fertiliser per hectare explains 2% of variation in land concentration and X10 output per hectare explains 2% of variation in land concentration. The final form of multiple regression analysis is given in step 5 where 5 variables together explain 81% of total variation in land concentration and F value is found to be significant at 1% level of significance.

We can therefore conclude that the hypothesis related to X1 to X13 are supported by this empirical exercise. The hypothesis related to land concentration is however inconclusive. The high degree of multicollinearity among the explanatory variables suggests that the effect of left variables of X is subsumed in the above mentioned variables. Therefore

the ruggedness number (Physical factor X9) is found to be the most dominant factor followed by (X4) percentage of cultivated area to total cropped area (Institutional Factor), (X12) percentage of agricultural workers to total rural workers (social factor) (X8) Fertilizer per hectare (Technological Factor and (X10) output per hectare (economic factor).

Thus we can say that the variation in land concentration in Easter Uttar Pradesh is essentially a function of physical, constraints of varying severity under the inhibiting influence of economic, social and institutional factors and differential doses of technological inputs interacting with each other. On the other hand it can be concluded that variation in land concentration is a function of pentagonal forces viz. Physical, Social, Economic, Institutional and Technological Factors.

APPENDIX I

EASTERN UTTAR PRADESH

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of Household X	Area Y	% of No. of Household X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	3828852	763088	56.78	13.70	56.78	13.70		1032.43
2.	0.5-1.0	1252819	892085	18.58	16.01	75.36	29.71	1686.93	2651.02
3.	1.0-2.0	934998	1299242	13.87	23.32	89.23	53.03	3996.34	5002.85
4.	2.0-3.0	344219	427201	5.11	7.67	94.34	60.70	5416.26	5864.83
5.	3.0-4.0	154088	526393	2.28	9.45	96.62	70.15	6617.95	6863.48
6.	4.0-5.0	82407	365765	1.22	6.57	97.84	76.72	7412.68	7635.17
7.	5.0-10.0	113130	752276	1.68	13.50	99.52	90.22	8827.12	9013.88
8.	10.0-20.0	26532	347779	0.39	6.24	99.91	96.46	9599.10	9642.14
9.	20.0-30.0	3714	88795	0.05	1.59	99.96	98.06	9797.17	9804.04
10.	30.0-40.0	1179	39800	0.02	0.71	99.98	98.76	9872.05	9875.01
11.	40.0-50.0	443	19670	0.01	0.35	99.99	99.12	9910.02	9912.00
12.	50.0+Above	556	49155	0.01	100.08	100.00	100.00	9999.00	
TOTAL		6742736	5571249					83134.16	772965.85

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_{i+1}) - (X_{i+1} Y_i)}{100 \times 100}$$

$$= \frac{83134.16 - 77296.85}{10000} = \frac{5837.31}{10000}$$

$$= 0.583$$

APPENDIX II

DISTRICT - ALLAHABAD

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	X_iY_{i+1}	$X_{i+1}Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0-5	240416	52772	50.37	9.70	50.37	9.70		682.28
2.	0.5-1.0	95263	67889	19.96	12.48	70.33	22.18	1117.21	1905.93
3.	1.0-2.0	74453	103521	15.60	19.04	85.93	41.22	2899.00	3996.69
4.	2.0-3.0	28767	69608	6.03	12.80	91.96	54.02	4641.94	5123.79
5.	3.0-4.0	13813	47542	2.89	8.74	94.85	62.76	5771.41	6052.57
6.	4.0-5.0	7576	33681	1.59	6.19	96.44	68.65	6511.45	6794.98
7.	5.0-10.0	12119	82089	2.54	15.09	98.98	84.05	8105.78	8384.82
8.	10.0-20.0	3726	50100	0.78	9.21	99.76	93.25	9229.89	9316.61
9.	20.0-30.0	709	17207	0.15	3.16	99.91	96.41	9617.86	9637.14
10.	30.0-40.0	239	8115	0.05	1.49	99.96	97.90	9781.19	9788.04
11.	40.0-50.0	82	3646	0.02	0.68	99.98	98.58	9854.06	9858.00
12.	50.0+Above	100	7670	0.02	1.42	100.00	100.00	9998.00	9858.00
TOTAL		477263	543840					77527.79	71540.85

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_{i+1}) - (X_{i+1}Y_i)}{100 \times 100}$$

$$= \frac{77527.79 - 71540.85}{10000} = \frac{5986.94}{10000}$$

$$= 0.598$$

APPENDIX XII

DISTRICT - AZAMGARH

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	447217	76646	66.25	17.25	66.25	17.25		1409.67
2.	0.5-1.0	104413	74310	15.47	16.72	81.72	33.97	2250.51	3140.19
3.	1.0-2.0	72370	100786	10.72	22.68	92.44	56.65	4629,44	5450.86
4.	2.0-3.0	25528	61985	3.78	13.95	96.22	70.60	6526.26	6909.62
5.	3.0-4.0	11148	38139	1.65	8.58	97.87	79.18.	7618.69	7816.65
6.	4.0-5.0	5729	25842	0.85	5.72	98.72	84.90	8309.16	8473.02
7.	5.0-10.0	7270	47788	1.07	10.75	99.80	95.65	9442.57	9562.13
8.	10.0-20.0	1257	16134	0.18	3.63	99.97	99.28	9908.14	9927.00
9.	20.0-30.0	113	2650	0.02	0.60	99.99	99.88	9987.00	9987.00
10.	30.0-40.0	16	545	0.00	0.10	99.99	99.98	9997.00	9997.00
11.	40.0-50.0	8	361	0.00	0.01	99.99	99.99	9998.00	9999.00
12.	50.0+Above	4	250	0.00	0.01	100.00	100.00	9999.00	
TOTAL		675073						88665.77	82672.14

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_{i+1}) - (X_{i+1} Y_i)}{100 \times 100}$$

$$= \frac{88665.77 - 82672.14}{10000} = \frac{5999.68}{10000}$$

$$= 0.599$$

APPENDIX IV

DISTRICT - BAHRAICH

NUMBEROF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	$X_i Y_i+1$	$X_i+1\ Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	202518	46062	46.10	9.76	46.10	9.76		662.02
2.	0.5-1.0	95444	68894	21.73	14.60	67.83	24.36	1122.99	2091.99
3.	1.0-2.0	79251	111009	18.04	23.52	85.87	47.88	3247.70	4442.78
4.	2.0-3.0	30419	73037	6.92	15.48	92.79	63.36	5440.72	6071.16
5.	3.0-4.0	13326	45080	3.03	9.55	95.82	72.91	6765.32	7105.08
6.	4.0-5.0	7153	31776	1.63	6.73	97.45	79.64	7631.10	7924.18
7.	5.0-10.0	8996	58961	2.05	12.49	99.50	92.13	8978.07	9203.79
8.	10.0-20.0	1757	22827	0.40	4.84	99.90	96.97	9648.52	9693.12
9.	20.0-30.0	255	5999	0.06	1.27	99.96	98.24	9814.18	9822.04
10.	30.0-40.0	76	2591	00.02	0.55	99.98	98.79	9875.05	9878.01
11.	40.0-50.0	23	1014	0.01	0.23	99.99	99.02	9900.02	9902.00
12.	50.0 +Above	48	4629	0.01	0.98	100.00	100.00	9999.00	
	TOTAL	439266	471879					82422.66	76795.97

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_i+1) - (X_i+1\ Y_i)}{100 \times 100}$$

$$= \frac{82422.66 - 76795.97}{10000} = \frac{5626.69}{10000}$$

$$= 0.56$$

APPENDIX V

DISTRICT - BALLIA

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.NO.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	X_iY_{i+1}	$X_{i+1}Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	145001	29185	56.11	11.90	56.11	11.90		885.84
2.	0.5-1.0	47366	33749	18.33	13.76	74.44	25.66	1439.78	2259.88
3.	1.0-2.0	35211	49166	13.63	20.06	88.07	45.72	3403.39	4264.76
4.	2.0-3.0	13468	32475	5.21	13.24	93.28	58.96	5192.61	5648.37
5.	3.0-4.0	6520	22416	2.52	9.14	95.80	68.10	6352.37	6620.00
6.	4.0-5.0	3644	16280	1.41	6.64	97.21	74.74	7160.09	7428.41
7.	5.0-10.0	5645	37842	2.18	15.43	99.39	90.17	8765.43	9007.91
8.	10.0-20.0	1325	17352	0.51	7.08	99.90	97.25	9665.68	5721.11
9.	20.0-30.0	152	3642	0.06	1.49	99.96	98.74	9864.13	9872.03
10.	30.0-40.0	42	1405	0.02	0.57	99.98	99.31	9927.02	9930.01
11.	40.0-50.0	17	726	0.018	0.30	99.998	99.61	9959.01	9961.00
12.	50.0+Above	11	961	0.012	0.39	100.00	100.00	9999.00	
TOTAL		258402	245199					81728.51	75599.91

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_{i+1}) - (X_{i+1}Y_i)}{100 \times 100}$$

$$= \frac{81728 - 75599.91}{10000} = \frac{5128.60}{10000}$$

$$= 0.61$$

APPENDIX VI

DISTRICT - BASTI

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	$X_i Y_i+1$	$X_i+1\ Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	371760	71485	56.39	12.56	56.39	12.56		939.36
2.	0.5-1.0	121303	85842	18.40	15.09	74.79	27.65	1559.18	2467.21
3.	1.0-2.0	95170	132476	14.44	23.28	89.23	50.93	3809.05	4813.59
4.	2.0-3.0	34784	85298	5.28	14.64	94.51	65.57	5850.81	6350.45
5.	3.0-4.0	15401	52565	2.34	9.24	96.85	74.81	7070.29	7341.11
6.	4.0-5.0	7928	35204	1.28	6.19	98.13	81.00	7844.85	8071.65
7.	5.0-10.0	10198	67480	1.52	11.86	99.65	92.86	9112.35	9281.36
8.	10.0-20.0	2335	30047	0.30	5.28	99.95	98.14	9779.65	9813.02
9.	20.0-30.0	281	6706	0.04	1.18	99.99	99.32	9927.03	9931.01
10.	30.0-40.0	55	1845	0.01	0.32	99.99	99.64	9963.00	9963.00
11.	40.0-50.0	26	1131	0.00	0.20	99.99	98.84	9983.00	9984.00
12.	50.0+Above	16	962	0.00	0.16	100.00	100.00	9999.00	
	TOTAL	659257	569041					84898.21	78955.66

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_i+1) - (X_i+1\ Y_i)}{100 \times 100}$$

$$= \frac{84898.21 - 78955.66}{10000} = \frac{5942.55}{10000}$$

$$= 0.59$$

APPENDIX VII

DISTRICT -DEORIA

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	289009	61011	56.79	14.05	56.79	14.05		1062.18
2.	0.5-1.0	95741	69300	18.81	15.95	75.60	30.00	1703.70	2693.10
3.	1.0-2.0	72124	100349	14.17	23.10	89.77	53.10	4014.36	5039.19
4.	2.0-3.0	26124	62974	5.13	14.50	94.90	67.60	6068.45	6563.28
5.	3.0-4.0	11128	37881	2.19	8.72	97.09	76.32	7242.77	7572.47
6.	4.0-5.0	5740	25498	1.13	5.87	99.22	82.19	7979.63	8185.30
7.	5.0-10.0	6988	46305	1.37	10.66	99.39	92.85	9212.58	9277.57
8.	10.0-20.0	1686	22082	0.33	5.08	99.92	97.03	9745.99	9789.08
9.	20.0-30.0	194	4609	0.04	1.06	99.96	98.99	9891.08	9897.02
10.	30.0-40.0	44	1491	0.02	0.34	99.98	99.23	9925.03	9922.08
11.	40.0-50.0	25	1007	0.01	0.24	99.99	99.39	9929.01	9937.00
12.	50.0+Above	21	1881	0.01	0.43	100.00	100.00	9999.00	
	TOTAL	508912	434368					85711.80	79938.27

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_{i+1}) - (X_{i+1} Y_i)}{100 \times 100}$$

$$= \frac{85711.80 - 79938.27}{10000} = \frac{5773.53}{10000}$$

$$= 0.58$$

APPENDIX VIII

DISTRICT - FAIZABAD

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	252369	49870	59.69	16.30	56.69	16.30		1236.68
2.	0.5-1.0	81114	56987	19.18	18.63	75.87	34.93	1980.18	3181.41
3.	1.0-2.0	55855	77048	15.21	25.18	91.08	60.11	4560.55	5727.28
4.	2.0-3.0	17779	42538	4.20	13.90	95.28	74.01	6740.83	7176.75
5.	3.0-4.0	7138	24393	1.69	7.97	96.97	81.98	7811.05	8018.46
6.	4.0-5.0	3560	15803	0.84	5.17	97.81	87.15	8450.93	8494.51
7.	5.0-6000	4229	27710	1.67	9.06	99.47	96.21	9410.30	9616.18
8.	10.0-20.0	674	8551	0.48	2.80	99.95	99.01	9848.52	9899.02
9.	20.0-30.0	68	1623	0.03	0.53	99.98	99.54	9949.02	9953.00
10.	30.0-40.0	17	607	0.01	0.20	99.99	99.74	9972.01	9973.00
11.	40.0-50.0	6	254		0.08	99.99	99.82	9981.00	9982.00
12.	50.0 +Above	8	553		0.18	100.00	100.00	9999.00	
	TOTAL	422817	305937					88703.39	83258.30

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_{i+1}) - (X_{i+1} Y_i)}{100 \times 100}$$

$$= \frac{88703.39 - 83258.30}{10000} = \frac{5445.09}{10000}$$

$$= 0.55$$

APPENDIX IX

DISTRICT - GHAZIPUR

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	X_iY_i+1	$X_i+1\ Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	140977	27933	53.48	10.76	53.48	10.76		982.47
2.	0.5-1.0	49395	35201	18.74	13.56	72.22	24.32	1300.63	2116.33
3.	1.0-2.0	39019	54423	14.80	20.96	87.02	45.25	3267.96	4281.01
4.	2.0-3.0	15536	36980	5.82	14.24	92.84	59.49	4290.74	5686665
5.	3.0-4.0	7249	24805	2.75	9.55	95.59	69.04	6409.67	6705.85
6.	4.0-500	4052	18050	1.54	6.95	97.13	79.99	7646.24	7956.61
7.	5.0-10.0	6159	41014	2.34	15.80	99.47	91.79	8915.56	9174.41
8.	10.0-20.0	1262	16383	0.48	6.31	99.95	98.10	9758.01	9808.04
9.	20.0-30.0	127	2933	0.03	1.03	99.98	99.23	9918.04	9922.01
10.	30.0-40.0	27	912	0.01	0.25	99.99	99.68	9966.01	9967.00
11.	40.0-50.0	14	605	0.01	0.21	99.99	99.89	9988.00	9989.00
12.	50.0+Above	5	399		0.11	100.00	100.00	9999.00	
	TOTAL	263622	259638					81997.86	76309.38

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_i+1) - (X_i+1\ Y_i)}{100 \times 100}$$

$$= \frac{81997.86 - 76309.38}{10000} = \frac{5688.48}{10000}$$

$$= 0.57$$

APPENDIX X

DISTRICT - GONDA

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	X_iY_{i+1}	$X_{i+1}Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	264072	54572	50.05	10.07	50.05	10.07		683.58
2.	0.5-1.0	104109	74689	19.72	13.78	69.75	23.85	1193.22	2050.38
3.	1.0-2.0	85604	120132	16.22	22.17	85.97	46.02	3209.89	4263.75
4.	2.0-3.0	35267	84951	6.68	15.68	92.65	61.70	5304.35	5903.46
5.	3.0-4.0	15990	54448	3.03	10.05	95.68	71.75	6647.64	6985.58
6.	4.0-5.0	8833	39194	1.67	7.23	97.36	78.98	7556.81	7859.29
7.	5.0-10.0	11402	74985	2.16	13.84	99.51	92.82	9036.96	9275.50
8.	10.0-20.0	2233	28543	0.42	5.27	99.93	98.09	9760.94	9806.06
9.	20.0-30.0	213	4966	0.04	0.92	99.97	99.01	9894.07	9899.02
10.	30.0-40.0	78	2642	0.01	0.49	99.98	99.50	9947.02	9949.00
11.	40.0-50.0	29	1297	0.01	0.24	99.99	99.74	9972.01	9974.00
12.	50.0+Above	18	1540	0.01	0.26	100.00	100.00	9999.00	
	TOTAL	527848	541950					82521.91	76649.62

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_{i+1}) - (X_{i+1}Y_i)}{100 \times 100}$$

$$= \frac{82521.91 - 76649.62}{10000} = \frac{5872.29}{10000}$$

$$= 0.59$$

APPENDIX XI

DISTRICT - GORAKHPUR

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	308425	67186	55.89	14.23	55.89	14.23		1081.19
2.	0.5-1.0	110869	78944	20.09	16.72	75.98	30.95	1729.79	2878.81
3.	1.0-2.0	79724	110195	14.45	23.33	90.43	54.28	4124.19	5167.46
4.	2.0-3.0	26334	63115	4.77	13.36	95.20	67.64	6116.68	6523.99
5.	3.0-4.0	10847	37168	1.97	7.87	97.17	75.51	7188.55	7416.59
6.	4.0-5.0	5789	25777	1.05	5.46	98.22	80.97	7867.85	8061.37
7.	5.0-10.0	7558	50511	1.34	10.70	99.56	91.75	9011.69	9166.74
8.	10.0-20.0	1904	25228	0.35	5.34	99.91	97.09	9666.28	9704.08
9.	20.0-30.0	278	6620	0.05	1.40	99.97	98.49	9840.09	9847.03
10.	30.0-40.0	73	2489	0.01	0.51	99.98	99.00	9897.05	9899.01
11.	40.0-50.0	34	1509	0.01	0.31	99.99	99.30	9928.01	9930.00
12.	50.0 +Above	41	3531	0.01	0.71	100.00	100.00	9999.00	
	TOTAL	551876	472273					85569.16	79776.27

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_{i+1}) - (X_{i+1} Y_i)}{100 \times 100}$$

$$= \frac{85569.16 - 79776.27}{10000} = \frac{5592.89}{10000}$$

$$= 0.56$$

APPENDIX XLI

DISTRICT - JAUNPUR

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	$X_i Y_{i+1}$	$X_{i+1} Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	360607	62226	68.24	20.10	68.24	20.10		1688.19
2.	0.5-1.0	83220	58804	15.75	19.00	83.99	39.10	2668.18	3675.45
3.	1.0-2.0	52619	72628	9.96	23.46	93.95	62.56	5254.41	6078.83
4.	2.0-3.0	16750	40236	3.17	13.00	97.12	75.56	7098.86	7438.13
5.	3.0-4.0	6986	23856	1.32	7.71	98.44	83.27	8087.18	8251.22
6.	4.0-5.0	3433	15220	0.65	4.92	99.05	88.19	8681.42	8807.54
7.	5.0-10.0	4131	26960	0.78	8.71	99.87	96.90	9601.82	9689.03
8.	10.0-20.0	620	7929	0.12	2.56	99.99	99.46	9933.07	9945.01
9.	20.0-30.0	44	1043	0.01	0.34	99.99	99.80	9979.00	9979.00
10.	30.0-40.0	14	454		0.14	99.99	99.94	9993.00	9993.00
11.	40.0-50.0	1	47		0.02	99.99	99.96	9995.00	9996.00
12.	50.0 +Above	2	138		0.04	100.00	100.00	9999.00	
	TOTAL	52847	309541					90750.94	85538.10

$$\text{Gini Co-efficient Ratio} = \frac{(X_i Y_{i+1}) - (X_{i+1} Y_i)}{100 \times 100}$$

$$= \frac{90750.94 - 85538.10}{10000} = \frac{5212.04}{10000}$$

$$= 0.52$$

APPENDIX XIII

DISTRICT - MIRZAPUR

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of Household X	Area Y	% of No. of Household X	% of area Y	Cumulative % of No. of Household X_i	Cumulative % of area Y_i	X_iY_i+1	$X_i+1\ Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	105159	21383	41.59	4.58	41.59	4.58		270.76
2.	0.5-1.0	44333	32156	17.53	6.89	59.12	11.47	477.04	874.24
3.	1.0-2.0	43242	61643	17.10	13.21	76.22	24.68	1459.08	2091.88
4.	2.0-3.0	21585	52381	8.54	11.23	84.76	35.91	2737.06	3206.04
5.	3.0-4.0	11436	39520	4.52	8.47	89.28	44.38	3761.65	4086.51
6.	4.0-5.0	7069	31461	2.80	6.74	92.08	51.12	4572.20	4976.53
7.	5.0-10.0	13317	90798	5.27	19.46	97.35	70.58	6499.01	7005.77
8.	10.0-20.0	4835	65043	1.91	13.94	99.26	84.52	8228.02	8424.11
9.	20.0-30.0	1044	25288	0.41	5.42	99.67	89.94	8927.44	8979.61
10.	30.0-40.0	437	14647	0.17	3.14	99.84	93.08	9277.28	9298.69
11.	40.0-50.0	153	6872	0.06	1.47	99.90	94.55	9439.87	9455.00
12.	50.0 + Above	263	25355	0.10	5.45	100.00	100.00	9999.00	
	TOTAL	252873	466547					65377.66	58669.14

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_i+1) - (X_i+1\ Y_i)}{100 \times 100}$$

$$= \frac{65377.66 - 58669.14}{10000} = \frac{6708.52}{10000}$$

$$= 0.67$$

APPENDIX XLV

DISTRICT - PRATAPGARH

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	X_iY_{i+1}	$X_{i+1}Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	179910	38905	67.69	14.51	67.69	14.51		1017.87
2.	0.5-1.0	6533	48741	2.46	18.18	70.15	32.69	2212.79	2991.76
3.	1.0-2.0	48651	67129	18.31	25.04	88.46	57.73	4049.76	5454.91
4.	2.0-3.0	16024	38450	6.03	14.34	94.49	72.07	6375.31	6989.35
5.	3.0-4.0	6630	22486	2.49	8.39	96.98	80.46	7602.66	7901.17
6.	4.0-5.0	3236	14338	1.22	5.35	98.20	85.81	8321.85	8554.39
7.	5.0-10.0	3963	26086	1.49	9.73	99.69	95.54	9382.03	9850.02
8.	10.0-20.0	725	9220	0.27	3.44	99.96	98.88	9867.32	9897.01
9.	20.0-30.0	67	1579	0.03	0.59	99.99	99.57	9953.02	9956.00
10.	30.0-40.0	18	616	0.01	0.23	99.99	99.80	9979.00	9979.00
11.	40.0-50.0	4	181		0.06	99.99	99.86	9985.00	9986.00
12.	50.0 +Above	6	386		0.14	100.00	100.00	9999.00	
	TOTAL	265767	268117					87727.74	82377.48

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_{i+1}) - (X_{i+1}Y_i)}{100 \times 100}$$

$$= \frac{87727.74 - 82377.48}{10000} = \frac{5350.26}{10000}$$

$$= 0.54$$

APPENDIX XV

DISTRICT - SULTANPUR

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	X_iY_{i+1}	$X_{i+1}Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	244399	47754	59.37	15.08	59.37	15.08		1176.08
2.	0.5-1.0	76654	54106	18.62	17.08	77.99	32.16	1909.34	2929.78
3.	1.0-2.0	53976	74891	13.11	23.64	91.10	55.80	4351.84	5331.69
4.	2.0-3.0	18338	44254	4.45	13.97	95.55	69.77	6356.05	6798.38
5.	3.0-4.0	7792	26789	1.89	8.46	97.44	78.23	7474.88	7686.88
6.	4.0-5.0	3979	17734	0.82	5.60	98.26	83.83	8168.39	8346.95
7.	5.0-10.0	5399	35680	1.31	11.26	99.57	95.09	9343.54	9501.39
8.	10.0-20.0	1005	12946	0.35	4.09	99.92	99.18	9875.35	9914.03
9.	20.0-30.0	66	1536	0.04	0.48	99.96	99.66	9958.03	9964.01
10.	30.0-40.0	15	507	0.02	0.16	99.98	99.82	9978.01	9981.00
11.	40.0-50.0	9	403	0.01	0.13	99.99	99.95	9993.00	9995.00
12.	50.0+Above	3	167	0.01	0.05	100.00	100.00	9999.00	
	TOTAL	411635	316767					87407.12	81625.19

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_{i+1}) - (X_{i+1}Y_i)}{100 \times 100}$$

$$= \frac{87407.12 - 81625.19}{10000} = \frac{5781.93}{10000}$$

$$= 0.58$$

APPENDIX XVI

DISTRICT - VARANASI

NUMBER OF OPERATIONAL HOLDINGS & AREA OPERATED BY SIZE CLASS OF HOLDINGS

S.No.	Size class in Hect.	No. of House-hold X	Area Y	% of No. of House-hold X	% of area Y	Cumulative % of No.of Household X_i	Cumulative % of area Y_i	X_iY_{i+1}	$X_{i+1}Y_i$
1	2	3	4	5	6	7	8	9	10
1.	Below 0.5	276723	56098	63.37	17.44	63.37	17.44		1407.93
2.	0.5-1.0	74062	52473	16.96	16.31	80.73	33.75	2138.74	3093.53
3.	1.0-2.0	47729	63846	10.93	19.84	91.66	53.59	4326.32	5129.63
4.	2.0-3.0	17715	41519	4.06	12.91	95.72	66.50	6095.39	6471.12
5.	3.0-4.0	8684	29325	1.59	9.11	97.31	75.61	7237.38	7438.51
6.	4.0-5.0	4686	20307	1.07	6.31	98.38	81.92	7971.64	8167.42
7.	5.0-10.0	5756	38077	1.32	11.84	99.70	93.76	9224.11	9373.19
8.	10.0-20.0	1188	15403	0.27	4.79	99.99	98.55	9825.44	9854.01
9.	20.0-30.0	103	2394	0.02	0.74	99.99	99.29	9926.02	9928.01
10.	30.0-40.0	28	934	0.01	0.29	99.99	99.58	9957.00	9957.00
11.	40.0-50.0	14	617		0.19	99.99	99.77	9976.00	9977.00
12.	50.0+Above	10	733		0.23	100.00	100.00	9999.00	
	TOTAL	436698	321726					86677.04	80797.35

$$\text{Gini Co-efficient Ratio} = \frac{(X_iY_{i+1}) - (X_{i+1}Y_i)}{100 \times 100}$$

$$= \frac{86677.04 - 80797.35}{10000} = \frac{5879.69}{10000}$$

$$= 0.59$$

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Topographical Sheet Numbers
63 - A, B, C, D, E, F, G, H, I, J, K, L,
M, N, O, P.
72 - A, B, C.