CONCLUSION AND SUGGESTIONS

Cropping pattern in the district of Etah has evolved within the environmental framework in which geographical factors like land forms soil and climate have played the vital role. Whether a land would be under agricultural use or not is in the first place a function of environmental factors as elaborated in the opening chapter on physical setting; landforms, drainage, climate and other factors namely socio-economic operate to finally determine the pattern of agricultural land use.

The fact that the region under study (District Etah) is a part of the Ganga-Yamuna doab which is a vast alluvial plain with a very gentle slope from north west to south east well drained by the river Ganga, Kalinadi, Burhganga, Isan and the Rind makes for an ideal setting for agricultural activities in the district.

Land formation in the district Etah is another element which has a good deal of bearing on the land use and agricultural pattern of the area. There are four well defined regions in the district Etah. The Tarai is stretches from the bed of the Ganga to the old high bank of the Ganga. The soils throughout the district are alluvial in character with the difference that they have a large admixture of vegetable matter. Even where the proportion of sand is high, they are soft and resemble rather artificial soils, the composite of gardener than natural earth. The most valuable of the tarai soil is the rich soft loam found along the bank of the Ganga, Similar but less valuable soil is found with along the edge of the Burhgarge (old bed of the Ganga). Central doab comprises the portion of
The character of the soil in this tract depends largely upon the distance from the Kalinadi and old high bank of the Ganga. The bank of the river in this tract are marked by a belt of sand and it is well marked characteristics that whenever they approach one another, these stretches out as though to join hands forming an almost continuous deposits of sand from one river to other. Where on the contrary, they diverge, the sand seems to shrink and the centre of the tract is occupied by a level plain of loam and usar elsewhere the surface is uneven sand being pitted with hollows and depression in which water collect giving rise to a little loamy soil.

The Kalinadi valley on the southern bank and the eastern half of the northern bank of this descent is almost everywhere gradual. But in the western half of the northern bank, the descent in many places is sudden, often with a kind of a steppe between the crest and valley bottom. The soil of these steppes is hard sandy yet fertile. However the central part is inferior to the rest of the valley, if raised it is sandy and if low line it is infected with reh.

Southern tract, the tract south of the Kalinadi comprises Jalesar, particularly the whole Marehra and east Sakeet, two third of pargna Sonhar and a portion of Bilram. The tract is distinguished by the absence of sandy soil, and is also the most stable. The prevailing soil is good loam. The stiffest soil is in the north which followed by good loam and then by lighter loam. In the extreme south west, however the level sinks to a marked degree increasing materially the cost of raising water.

As a consequence of these differentiations in land formations land use and agriculture pattern are affected.

Soils of the district of Etah differ considerably and their role in determining the land use and cropping pattern is quite noticeable. Sandy clay along river courses and of fine silt in level parts, often there are
clay along river courses and of fine silt in level parts, often there are poorly drained which result in formation of a thin salt crust on the surface, water logging is not common. Generally, the soils of Etah are of four type i.e. loamy sand, loam, clayey loam and sandy loam. The agricultural activities are dominated in every where except in the patches of usar and kettory land.

Loamy soils are extensive grasses and shrubs cover varied dark loamy soils where they are thin. Where these soils are deep they use very productive and support a variety of food and Cash crops like wheat, barley, maize, millet, rice and sugarcane. Sandy loam is another type of soil found in the Kalinadi catchments area. Such soil is highly porous and bears a thirsty appearance but with irrigation facilities available, it turns into productive lands. These soils are often deficient in organic matter and in mineral nutrient. This variety of soil results in a cultivation of variety of crops coarse grains on poor soils and wheat barley, maize and rice on a better soils.

Loamy soils (Matiyar) is another variety of soils in the region under study and with their poor water holding capacity and acidic reactions they are not commonly suitable to agriculture and where they are under cultivation coarse grains like sorghum, pearl millet, maize and pigeon pea grow wheat and barley are grown where irrigation facilities are available.

Clayey loam is yet another type of soil in the district. These soils have the tendency to be become hard and compact and yield to plough with difficulty. In these soils sugarcane, wheat, gram and maize are generally grown. It can now be said about the soils that they have direct influence in determining the land use and the cropping pattern.

The role of climate influencing the land use and cropping pattern, is too well known. It plays a significant role in the district Etah also.
three seasons of the district Etah— the cold (November to February) with occasional rain, the hot season (March to mid June) with a little or no rain and the rainy season (mid June to October) with heavy rain, bring their influence to bear upon the cropping pattern of the district Etah. In winters rabi crops mainly, wheat, barley, gram. Peas etc; are grown in the rainy season Kharif crops, maize, millet, fodder crops, sugarcane, etc. are grown. In hot season generally sowing does not take place. Amongst the climatic elements, rainfall has a pronounced influence on the cropping pattern. In the district Etah, where, the rainfall in lower wheat cultivation is followed by the pearl millets and rice, while in the strips along the canal pearl millet gives the way to rice.

Landforms, drainage, soil, climate is the basic environmental factors which sometime separately and sometimes togetherness determines the cropping pattern in the district. But in the present scientifically advanced world there are no necessities everywhere are possibilities, it means man through his technical skills breaks the natural barriers through the development of irrigation facilities, mechanical appliances, use of fertilizers, recovering of sodic or usar land, etc.

The district Etah is one of the most fertile districts of Uttar Pradesh where the new technology of agricultural development was initially introduced in 1970. Since then this district has undergone tremendous changes in the field of agriculture. There has been an increase of net sown area from 302495 hectare in 1975 to 310713 hectare in 1999-2000, Gross cropped area from 446857 hectare to 534051 hectare gross irrigated area from 273202 hectare in 1975 to 412719 hectare in 2000. Fertilizers consumption (NPK) has increased from 23.73 kg per hectare in 1975 to 128 kg, per hectares in 2000. The shallow pump sets per thousands of hectares of net sown area have increased from 36 in 1975 to 215.9 in 2000. The numbers of tractors have gone up to 2.73 per thousand of hectare and 12.6 in 2000. These figures convincingly make
Etah district one of the most agriculturally progressing districts of Uttar Pradesh. However, the cropping pattern has not been uniform throughout the district. Hence a modest attempt has been made to assess the changing cropping pattern of the Etah district at the block level for the years of 1975-2000.

The trends in the land use is that more and more land is brought under the plough, more forest land, pasture and grazing land is being deprived of its vegetative cover. More land is coming indiscriminately under industries and urban activities. Another trend is that with the rise of technological and scientific level of development, those lands which were considered useless are being reclaimed and being brought under agriculture. Soils which were considered unfit are being enriched and are ploughed.

The present study has been probing into dynamic competitive relations of crops in the total crop land since the approach has been through analysing individual crops and crop combination in terms of their relative land occupancy strength. An analysis of the data shows that from time to time changes have taken place in the cropping pattern of the area due to one or the other factors the study spread into two phase i.e. before the introduction of green revolution and after the introduction of green revolution, has established some definite lines of approach to the present cropping patterns which have evolved during the period under study. In many cases, it has been observed that change has been brought about by economic consideration, e.g. low return giving crops (coarse grain crops) replaced by high return giving crops wheat, rice and sugarcane in the area where irrigation facilities are available. It has been observed that in the district Etah the number of crops included in the combination is fairly large and the cropland use diversity quite high.

The present study relating to the changing pattern of crop land use over a period 1950-65 and 1975 to 2000 reveals that wheat has emerged as the first ranking crop in the whole of the district of Etah. This crop has a good share in the combination of area. As it is the staple food crop
of not only of the district Etah but whole of the western Uttar Pradesh. Majority of the population prefers to eat wheat with the result the area under wheat has increased gradually. Yield per hectare has also increased with the help of irrigation facilities, and chemical fertilizers. Prior to introduction of green revolution, more area was given to millets and gram in the district but with the improved economic conditions of the forming community, wheat being a better food crop has become the main diet of the majority of the population. Data reveals that oil seeds, pulses, tobacco, potatoes gained importance in the period after introduction of green revolution, and for the first time tobacco ranked third in the development block of Aliganj. This development block has very much specialized in the cultivation of tobacco fetching good returns.

According to the present study, maize crop is becoming an important crop in the block of Jaithra, Marehra, Patiali, Sirpura, Sheetalpur and Soron, developed irrigation facilities, improvement in the regular supply of manure and chemical fertilizers have helped in the increase of maize cultivation. The increasing market value of superior quality of maize has also been responsible for increase in the cultivated area of maize. Pearl millet remains the second raking crop in most of the development block, Kasganj, Jaithra, Aliganj, Jalesar, Patiali, Soron, Marehra and Nidhaulikalan, due to the quality of soil i.e. Sandy soil. Adequate irrigation facilities and attracting market values provide incentives for increase in the cultivated area. The cultivated area of rice has increase in the development block of Sakeet, Amanpur, Jalesar, Ganjdundwara, Patiali, Sirpura and Sheetalpur, present reveals that rapid rise in urban population in the district Etah calls for an increase in the production of wheat, rice, maize, peas, barley and oil seeds, but wheat has got ascendancy over all the other crops since 1970 because the introduction of high yielding varieties of this crop and the development of supporting factors i.e. irrigation, mechanical appliances
and fertilizer which help to mature in a very short period with high production per hectare. One important thing to note here is that the sugarcane acreage decreasing day by day since 1990 because of the delay of payments by the factory owners. Tobacco has not been so important crop in the cropping pattern of the district Etah but the development block of Aliganj have third rank in its cropping pattern.

An interesting feature emerges from the present study is that the size of land holding being small the farmers are generally interested in producing food grains for their requirements. They would go in for cash crops only after they met their requirements of food grains. It is true that the agriculture of the district Etah being of subsistence type the farmer's community first concern is to cultivate grain crops than cash crops. Thus the need for subsistence crops has traditionally dominated the cropping pattern followed by small farmers. But his marginal need for money can not be less than that of the large farmers. The introductions of green revolution technology make easy marginal adjustment in their crop pattern to maximise their income.

The fragmented and uneconomic size of land holding have brought about just agriculture deterioration at the same time have aggravated poverty of farmers. Another drawback in the small size of land holding is that it initiate against the use of farm machinery e.g. harvesters etc. from the present study it is gathered that the farmers like that the combination of crops which would ensure him maximum income. The relative profitability per hectare is the main consideration which influences the cropping pattern. So the farmer is influenced in the choice of his crops by the consideration which relates to the price parities between different commodities or maximization income per hectare which in turn effect to the coarse gains.

It has been realized that the presence of saline salt in soil affect the cropping pattern in the region to a considerable extent. If some steps are
taken to grow leguminous crops, these crops then will help in neutralising the salt and in the recuperation of soil fertility. Reclamation work should be undertaken by the govt. agencies.

Another factor which requires some consideration is that the soils in the entire region are generally deficient in nitrogen and therefore besides applying nitrogen through chemical manures, some leguminous crops, which instead of depleting soil fertility, help in increasing nitrogen in sufficient quantity. In addition to this sun hemp and *Dhencha* are the two important crops which can be cultivated in all adverse conditions of soil and climate.

The structure of cropping pattern in whole of Uttar Pradesh in general and in the district Etah in particular is based on adopting trial and error methods, and hence unscientific. In the present set of physical and cultural environment, some suitable areas for cultivation of remunerative crops could be explored. Besides multiple cropping systems under proper guidance of agricultural experts can be adopted. At least four crops such as wheat, green gram, maize and potato can be grown in a year from one field. Although the multiple cropping systems are exhaustive, proper watering and manuring can make it possible.

Examining the various factors influencing cropping pattern, it has been observed that besides the physical and socio economic factors, have greatly influenced the cropping pattern in the area where least consideration in given to the suitability of the soil for a particular crop. In the light of the present study it may be remarked that the area needs a detailed survey of the soil, so that the new cropping pattern could be evolved which may ensure better prospects for an overall improvement in the agricultural economy of the area.