Chapter 1

Introduction
INTRODUCTION

Agriculture in India dates back to the remote past, ever since it has continued to be the leading occupation and the mainstay of the people of the country. About three-fourths of the population of the country lives in the villages, carries out agricultural, and allied activities.

Primitive tillage farming in all parts of the world is, and in the past has always been, associated with a simple sequence of cropping. In the typical case a section of grass or light scrub-covered land is cleared and cropped with same or similar crops until it ceases to yield the profitable returns, either because of exhaustion of fertility or because of accumulation of weeds. In the former case, the cultivators move on and break up another virgin areas., in the latter case same practice may be adopted on a bare fallow or may be introduce to kill the weeds ,after which the land is cropped as before. The former practice was probably adopted by in primitive times in India. As the needs of the community increases and farming become more intensive some definite sequence is adopted. Thus in the manorial period of this country “when each man had his rood of land” different cropping patterns were adopted. At the present time most of the farmers, when asked what rotation they adopt, will reply that they follow no fixed rotation, but at the same time, when further questioned, they will agree that they adhere to more or less closely to an orderly sequence which is capable of alternative application, as circumstances seem so warrant.
Before we are in position to appreciate the value of new cropping pattern, according to some agricultural economist, cropping pattern means the proportion of area under various crops at a point of time. Quite often the area statistics are used to denote the cropping pattern, no doubt, farmers have evolved the present cropping patterns after centuries of experiences, may be better, but from the national point of view, it is not necessarily the most efficient use of land and other resources. Historically, these cropping pattern were based on the principle of self sufficiency in all commodities in a village where means of communication were very poor and dependence on marketing agency very much limited. Moreover, no cropping pattern can hold good for all times to come. It has to change with improvement in technology and economic factor.

Cropping pattern means both space and time sequence of crops. It includes the intensification of the most efficient crops of the region which is considered a homogenous soil and climatic characteristics, the rotation in which the crop fits in and the intensity of cropping. Thus the term cropping pattern is used in more comprehensive sense when we discuss in term of cropping pattern for farmers it will mean even cropping scheme and cropping intensity best suited to the farmers.

The importance of agriculture has been further underlined by the fact that the population of the country is increasing at a very fast rate, exerting a great pressure on land and adversely affecting the man-land ratio. As a result of cultivation of land over centuries, and as a result of increasing pressure of population on it, the chances of adversely affecting the land in particular and environment in general are also favourable. Thus there is a situation where the land has to be used with great care and where agriculture has to be evolved taking in to cognizance all the environmental and socio-economic factors. Only
scientifically and intelligently, agricultural practices can meet the situation. This is possible only when the existing conditions, practices and the changes which are taking place are studied in a considerable manner then this study in the district of Etah over the period of twenty five years could be more meaningful.

**STUDY REGION:**

The district of Etah lies in the central portion of the Ganga-Yamuna doab, and is bounded on the north by the Ganga which separate it from the Budaun district; on the west by the districts Aligarh, Mathura and Agra; on the south by the districts of Agra, Firozabad and Mainpuri; on the east by the district of Farrukhabad. The district lies between the parallels of 27°18' and 28°2' north latitudes, and 78° 11' and 79° 17' east of longitude. The administrative configuration of the district Etah, as defined in the census of 1991, has been taken as the base for the present research work. The data taken from the district Etah is for the same administrative configuration as in 1991 census, throughout the period under study. This was necessary for making a comparative analysis of the change in the cropping pattern and environmental impact on it at the block level for the period under review. As per 1991 census, the administrative configuration of the district Etah comprised of five tehsil i.e. Etah, Kasganj, Patiali, Jalesar and Aliganj and fifteen development blocks i.e. Soron, Kasganj, Amanpur, Sahawar, Ganjdundwara, Patiali, Sirpura, Jalesar, Awagarh, Marehra, Nidhaul Kalan, Sheetalpur, Sakeet, Jaithra and Aliganj.

The district is subject to wide rainfall fluctuations from year to year and from season to season. Annual precipitation varies between 400 mm to 900 mm. It decreases from north east to south west directions. The average rainfall in the district during 1950 – 2000 was 700.5 mm. Better irrigation facilities and good alluvial soils bestowed
the area with better opportunities for the high level agricultural development. Wheat-pearl millet and wheat-maize cropping system has emerged as the dominant agricultural system after the introduction of Green Revolution. Due to the fluctuations in rainfall and availability of fresh ground water and well developed canal system, farmers depend on ground water for irrigation.

With a population of 2,244,998 as per 1991 census, district ranks 32nd among the districts of U.P. The economy of the district is based primarily on agricultural activities. The district’s industrial base has remained agro-based. The main commercial activity of district is trade in grains.

**STATEMENT OF RESEARCH PROBLEMS:**

Crop production strategy followed in Post Green Revolution Period has considerably helped to expand food (cereal) output and their stocks in India. However, there are a number of other unfavourable trends in this progress that need attention to avert both complacency and deep crises. Serious doubts have been expressed in different quarters regarding suitable cropping pattern and technological progress. The strategy has made food production more unstable. Further, nearly 35 per cent of the rural people or 31 per cent of the overall population is still below the poverty line. The production of pulses and coarse grains is far from satisfactory. These unsatisfactory trends despite technological changes reflect that appropriate changes have not been made in the institutional and policy environment either before or after introducing technological changes. This does not mean that technological change should await appropriate institutional and policy environment change. The former may help bring about the latter and both should be pursued simultaneously. During Post Green Revolution period institutional changes like land reforms received low priority. The expansion of
infrastructure like irrigation, drainage, transportation, market, rural electrification etc. was made mostly in developed regions (denying the expansion of the base of agriculture to the less developed, small and medium farmers). There is a concentration of individual crops, of inputs and mechanization subsidies, positive price policies of crops grown in developed regions and large farms. A considerable number of farmers (small and marginal), areas (resource deficient like unirrigated areas), people, mostly the agricultural labourers, crops and enterprises (coarse cereals, pulses, and oilseeds) were bypassed.

In order to account for the shifting of cropping pattern resulting from techno-organizational changes, a more dynamic conceptualization of changing cropping pattern is required. Such concepts should capture the extent to which environment and economic changes are influencing the capacity of the farmers to various types of natural and socio-economic shocks. While the climatic changes may influence the biophysical vulnerability of Indian farmers, ongoing economic reforms may expose other types of vulnerabilities. With regard to agriculture, the main rationale for economic reforms in India are to remove distortions and create an appropriate structure for increasing agricultural production. However, the short-term and medium-term impact of these reforms may not be exclusively beneficial. For consumers, increase in relative prices for food grains could worsen the conditions of the poorest in both rural and urban areas, exacerbating problems of food security for the most vulnerable sector of the population.

The effect of infrastructural development are also likely to vary across agriculture region in India; particularly irrigation technology, fertilizers and mechanical appliances. In areas, where investments in agricultural infrastructure have lagged, rates of growth in the agricultural productivity and poverty reduction also lagged. Climate
change may further exacerbate these regional differences, because regions with limited irrigation infrastructure are also the areas where agriculture is most vulnerable to climate variability and change.

The problem that the author has studied is the change in agricultural land use. The major agricultural land use categories: fallow land, net sown area and gross sown area; keep on changing their acreage. This has a direct bearing on agriculture. The locational change that takes place in these categories also has a bearing on agriculture. These changes, therefore, have been investigated in the district of Etah, and at six inter-decennial points of time.

AIMS AND OBJECTIVES OF STUDY:

The objective of the proposed research is a systematized and improved understanding of the dynamic forces which induced changes in the cropping patterns. Obviously, these forces broadly involve a dual effort: first defining the basic geography of change and its behavior in terms of rate of acceleration and deceleration, and, secondly, a search for the type's factors that have set discovered changes in motion. In very real sense, of course, individual crop in any agricultural region is in a state of essential competition with one another for the favour of farmer and for a place. However, some more objectives of the study are as follows:

1- To examine the dynamics and trends of crop land use and irrigated land in the Etah district.

2- To examine the spatio-temporal changes in the cropping pattern.

3- To bring out the spatio-temporal variations in agricultural land use efficiency.

4- To assess the levels of agricultural development with the help of selected indicators.
5. To assess the spatial patterns of agriculture and its level of modernization,

6. To suggest suitable strategies for sustainable agricultural development.

HYPOTHESIS:

1. Spread of technology leads to the change in cropping pattern and cropping intensity.

2. Higher the level of irrigation facilities, leads to higher level of cropping intensity.

3. As the technological advancement goes on, the farmers turn from subsistence farming to commercial farming.

4. Through the technological advancement higher giving return crops prefer more and low return giving crops depressed e.g. coarse crops are muted.

5. Higher level of agricultural development (unsustainable development), leads to higher level of environmental degradation.

DATABASE AND RESEARCH METHODOLOGY:

I. DATABASE:

The study is based on the analysis of statistical data covering the period during 1950-51 to 1965-66 for the analyses of cropping pattern, prior to the introduction of green revolution and post period during 1975 to 2000, collected from both primary and secondary sources at block and village level. The primary data were collected through well prepared questionnaire, taking into account all the variables related to agricultural development and cropping pattern.
The village level information was collected from the selected respondents and Grampradhan (Village Head), Sarpanches and Gram Vikas Adhikaries (Village development officers) of the sample households and villages located in different soil characteristics and nearness to the roads and towns.

a- SOURCES OF SECONDARY DATA:

For the present study the secondary data has been obtained from the published literature, government reports and district statistical bulletins, daily and weekly news papers, and unpublished records of the public administration and semi-governmental agencies. The sources of secondary data utilized in the present study are listed in the following:

1. Survey of India Toposheets.
2. Census of India Statistics.
5. Village and Town Directories of District Etah.
6. District Census Hand Book of Etah.
8. Departmental District Head Office Records.
11. District Department of Revenue.

II- METHODOLOGY:

The qualitative and quantitative techniques have been used for the analyses of the present study which are as follows:
I- Descriptive approach has been adopted to describe the physico-cultural characteristics of the study area.

II- For the climatic description the moisture index has been calculated through the formula as under:

\[
\text{Moisture Index} = \frac{100S - 60Q}{PE}
\]

Where 
- \(S\) = the surplus of water
- \(Q\) = the deficit of water
- \(PE\) = is water need or potential evapotranspiration, which is calculated on the basis of the following formula:

\[
e = 1.6 \left(10^t / I\right)^a
\]

Where, 
- \(e\) = monthly evapotranspiration
- \(t\) = monthly temperature in \(^\circ\)C
- \(I\) = summation of 12 monthly heat index \([t/s]^{1.514}\)
- \(a = 0.00000675 I^3 + 0.00007711 I^2 + 0.01792 I + 0.49239\)

III- Ranking of crops is done by employing critical difference technique.

IV- Weaver's minimum deviation method has been used to find out the different crop combinations. Formula as given below:

\[
d = d^2 / n
\]
By calculating the deviation from the real percentage of crops for all possible combinations in the compound area units against theoretical values.

V- To work out the relation of changing cropping pattern and the irrigation facilities regression has been calculated as given below:

\[ Y = a + bx \]

VI- Techniques of composite Z score has been employed to determine the levels of the spread of green revolution and correlation between change in cropping pattern and the speed of green revolution technology.

Standard score ('Z' Score), is represented by

\[ Z = \frac{X - \bar{X}}{SD} \]

\( Z \) = Standard score
\( X \) = original values of the score
\( \bar{X} \) = Mean for all the values
\( SD \) = Standard deviation of \( X \)

**LITERATURE REVIEW:**

The utilization of land for agriculture is conditioned not only on physical and biological factors but also upon the social, cultural and economic value of agricultural activities. Historically, the old world and new world agricultural activities differed probably resulting from the process of human migration (Grigg, 1974, 1992). More recently, a
five-pronged systematic approach uses the following criteria: location, ecology; social and cultural factors; technology; economic framework; physical structure and landscape (Avlan & Eder, 1986). A combination of physical, biological and social factors combine together determine the type of crop which is found in each system.

Scholars from various fields’ viz., geography, agricultural economics and ecology have shown a keen interest on the studies of changing cropping pattern. The process and techniques involved in the changing pattern of crop land use have been studied by many scholars viz., Weaver (1954); Shafi (1965) and Singh (1976). Some geographers have studied the implications of new technology in the changing cropping pattern. Quite a few of them have also tried to study the efficiency of agriculture in different areas viz., Mitra (1964); Pal (1962); and Rao (1973). Shafi (1960) in his article has tried to measure the agricultural productivity of Great Plain. Shafi (1991) studies; Relative magnitude of impacts of crops on different components of the environment, (1) Crop Erosion (risk and contribution), Nutrient loss (leaching and run-off), Water use (soil moisture depletion), Nutrient demand (impact on soil fertility status) and Pesticide use (impacts on biodiversity and pollution). Batterbury, Forsth and Thomson have studied in 1997 about Environmental Transformation in Developing Countries: hybrid research and democratic policy.

Some researchers have studied the impact of globalization on changing agriculture viz., Mwandire (environmental report 1999). The broad assumption of this study is that environmental change and degradation were already taking place in most parts of Malawi; Nsipe included, but were accelerated by a combination of market liberalization and other driving forces. The study carried out in Nsipe Extension Planning Area (EPA) focused on smallholder agricultural
production. Environmental change in an agricultural setting was viewed as exhibiting itself through land use and land cover change as well as increased levels of chemical pollution in surface water bodies. The Nsipe EPA study sought to provide an in-depth analysis of the environmental impacts of cash cropping by small land holder farmers. One of the guiding assumptions of the introduction of cash crops among smallholder farmers, especially tobacco, was that there would be widespread environmental degradation. In order to counter this obvious impact an environmental monitoring program, known as the Malawian Environment Monitoring Program (MEMP) was put into place. The monitoring program described below sought to understand the environmental impacts of cash crop growing and in particular burley tobacco.

Lester Brown (2000) of the World Watch Institute have studied about an impending global food crisis due to increasing population, increasing purchasing power leading to more consumption of animal products increasing damage to the ecological conditions of agriculture, declining per capita availability of land and water and absence of technologies that can further enhance the yield potential of major food crops. Swaminathan (2000) pointed out that India is now in a position to launch an evergreen revolution that can help to increase yield, income, and livelihood per unit of land and water. If we bring about a paradigm shift in our agricultural research and development strategies. The green revolution was triggered by the genetic manipulation of yield in crops such as rice, wheat, and maize. The evergreen revolution will be triggered by farming systems that can help the producers from the available land, water, and labor resources without either ecological or social harms.

Dinar et al. (1998) have studied the net impact of climate change on agricultural output in India are uncertain, yet specific regions and
certain groups of farmers, particularly those farming on marginal, rain-fed lands, are likely to suffer significant damage as a result of climate change. Karen and Bien (1999) have studied the globalization is dramatically transforming the context under which farmers throughout the world participate in the agriculture sector. The changes, in turn, affect how developing world farmers confront climate variability and adopt long term climate change.

A large number of studies have been conducted on the cropping pattern viz., Ali (1985) for higher return growth in intercropping system. Jyaraman and Ramiah, et. al. (1988) studied nitrogen management in maize based intercropping system, Kushwaha (1985) effect of fertilizers on yields of mustered and lentil in intercropping system, Saxena, and Chandel (1986) effect of maize on physico-agronomic attributes of soybean in maize-soybean intercropping system, Singh, Mittal, et.al., (1983) have studies on depletion pattern of soils potassium in pearl millets, wheat rotation.
References:


7- Brien, O., Karen, (1999) 'The Dynamics of Vulnerability to Global Change', karen.obrien@cicero.uio.no


