



RESEARCH ARTICLE

SPATIAL PATTERN OF TECHNO-BIOLOGICAL INPUTS IN AGRICULTURE IN UTTAR PRADESH: A DISTRICT WISE ANALYSIS

^{1,*}Dr. Sangeeta Sirohi and ²NazishNaz

¹Department of Geography, Dayanand Girls P.G. College, Kanpur-208001, India

²Department of Geography, Aligarh Muslim University, Aligarh-202002, India

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ABSTRACT

Techno-biological infusion in agriculture has become important to supply the increasing food demand of the rapidly increased population. The introduction of these inputs in agriculture resulted in transforming the production process. However the adaption of this technology in agriculture in India has not been uniform. It varies from state to state and even between smaller units such as district to district depending upon many factors resulting in unequal development of agriculture. Therefore, in present study, an attempt has been made to assess the spatial variations of techno-biological inputs in agriculture in Uttar Pradesh. The work is based on secondary sources of data, obtained from Census of India, 2001. The district has been taken as the smallest unit of the study. The regional variations in the techno-biological inputs in Uttar Pradesh have been analyzed by applying the technique of Z-score. The overall findings reveal the considerable disparities in districts/regions of the state. It has been observed that Uttar Pradesh though has the sufficient use of bio-technological inputs in agriculture but it is facing uneven distribution among all districts. The paper also recommends an urgent need of the measurement and mapping of regional disparity in terms of bio-technological inputs responsible for the prosperous and backward areas so that the efforts may be made for the uniform distribution of these modern tools in agriculture and thus the sustain level of development of agricultural may be achieved in the state.

Key words:

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INTRODUCTION

Agriculture in certain areas in India has witnessed an unprecedented change since mid-1960s with the evolution of high yielding varieties of crops and the adoption of modern and improved farm practices. The new agricultural technology consists of a highly complementary package of inputs which includes assured water supply, use of hybrid seeds, chemical fertilizers, pesticides, herbicides and a variety of mechanical equipment, like, seed drills, tractors and combine harvesters (Sidhu, 1991). Introduction of techno biological inputs in agriculture is relatively recent in the history of human civilization. It has revolutionized agricultural production to cope with the rapid population increase on the earth. Indices of the use of techno biological inputs are the good measures of agricultural development. The use of techno biological inputs on large scale weakened the environmental constraints on agriculture and extended its area of freedom yet it is a significant measure of agricultural development which increases overall production by promoting large expenses

on agricultural land, to put it under high yield variety (HYV) seeds and allowing larger double cropped area (Singh and Dhillon, 1994). In the areas where this new technology has been successful it has accelerated the transformation of the agricultural economy from the one characterized predominantly by subsistence farming to the one in which cultivation is undertaken as a profitable farm business (Sidhu, 1991). In Uttar Pradesh techno biological factors have made a significant impact on agricultural patterns and agricultural productivity. This happened during the period of new agricultural strategy, which laid stress on the application on a larger scale of agricultural science and technology to irrigation in dry areas. But there are a number of studies, such as by Sheila, 1987; Bhalla, 1988 and Mishra, 1988 which do not present an encouraging picture about employment and wages in UP's agriculture. Moreover, given the restructured agrarian land relations neither the development of agriculture nor the rate of growth in agricultural output in the state is spatially uniform. The existence of spatial variations in the level of development and output growth may be attributed to this fact that given the pattern of land relations, the emerging relations of production in the post-land reform and green revolution era did not take shape uniformly in the agriculture economy of the state (Mishra, 1993).

*Corresponding author: Dr. Sangeeta Sirohi,

Department of Geography, Dayanand Girls P.G. College, Kanpur-208001, India.

Experiences of recent years have shown that the key factors affecting Indian agriculture are modern inputs, such as farm implements, farm power (human & mechanical), and the use of chemical fertilizers and pesticides with high yielding varieties, which increase overall production by promoting large expenses on agricultural land, further, due to lack of credit awareness and motivation, regional inequalities in the operational aspects of agriculture or levels of agricultural modernization are responsible for regional imbalances in the levels of agricultural performance. Therefore, the need arises for measuring and mapping the regional inequalities to identify backward and advanced areas in terms of agricultural modernization, which are responsible for agriculturally prosperous and backward areas.

Objectives: The main objective of the present work is to analyse the spatial variations in the distribution of technological inputs in agriculture in Uttar Pradesh in terms of tractors, disc-harrows, seed-cum fertilizer, diesel pumpsets, electric pumpsets, consumption of fertilizers, and the consumption of pesticides.

Study Area: The state of Uttar Pradesh has been selected for the present study which is located between the 23°52' and 29°45' N latitudes, and 77°4' and 84°38' E longitudes. It occupies a geographical area of 240, 928 sq. km. (the fifth largest in terms of area). Uttar Pradesh is bounded by Uttarakhand and on the north-west, Haryana and Delhi on the west, Rajasthan on the south-west, Madhya Pradesh on the south, Chhattisgarh and Jharkhand on south-east and Bihar on the east. Forming a part of the Ganga Plain, it contributes a major share to agricultural production in India. The state has a tropical monsoon climate. The average temperature varies in plain areas from 3-4° C in the month of January to 43-45°C in the months of May and June. Average rainfall in parts of the state ranges from 100 to 200 cm in the east and 60 to 100 cm in the west. All the principal rivers, except River Gomti, of the state namely, the Ganga, the Yamuna, the Ghaghara, and the Ramganga rise in the Himalayas and provide canal water to three-fourth of the cultivated area. The total population of the state as per the census of 2011 is 199,812, 314 (the most populous state of India) and the density is 828 persons per sq. km. The literacy rate of the state is 70.69% which is 79.20 percent for the males and 59.30 percent for the females.

MATERIALS AND METHODS

The present work is entirely based on secondary sources of data that have been collected from Census of India, 2001. The district has been taken as a smallest unit of the study. In the present analysis, a set of seven indicators has been taken into account to determine the levels of development of biotechnological inputs in Uttar Pradesh. At first, the raw data for each variable which determines the areal variations of level of development of techno-biological inputs in agriculture in Uttar Pradesh, have been computed into standard score. It is generally known as Z value or Z-score. The score quantifies the departure of individual observations, expressed in a comparable form.

It may be expressed as:

$$Z_{ij} = \frac{X_{ij} - \bar{X}_i}{\sigma_i}$$

Where:

Z_{ij} = Standardised value of the variable i in district j ,

X_{ij} = Actual value of variable i in district j ,

\bar{X}_i = Mean value of variable i in all districts,

σ_i = Standard deviation of variable i in all districts.

Further the results of the standard score obtained for different indicators were aggregated by composite standard (CS) for each district and may be algebraically expressed as:

$$CS = \frac{\sum Z_{ij}}{N}$$

Where:

CS stands composite score,

$\sum Z_{ij}$ indicates Z-scores of all variables i in district j ,

N refers to the number of variables.

In order to classify the districts according to the level of their development the composite z score of all districts have been divided into four categories i.e. high, moderate, low and very low.

Spatial patterns or variations of use of Did you mean: technological input in agriculture in Uttar Pradesh has been analyzed district wise with the help of the following indicators:

1. Tractors per Thousand Hectare of Cultivated Area: Tractor is an agent of modernization in agriculture. It is a multipurpose asset. Its engine can be used in running tube wells or a thresher or a crusher. If a trolley is attached to it, it serves as a transport vehicle. Quite many people purchase tractor to provide 'plough service' on hire, in addition to their personal use (Dubey, 1981). One of the notable features of tractorization in the state has been the great popularity of tractors with farmers owning even medium size of holdings ranging from two to five hectares. Tractor has become the symbol of status to even marginal farmers of western Uttar Pradesh. They purchase the tractors even, if the size of holdings does not warrant it, as a tractor economically viable only on farms having a size of more than about eight hectares. Uttar Pradesh is at a low level of tractorization in 1998-99, as it has only 20 tractors per thousand hectares of net cultivated area. There exists striking district-wise regional disparities in the distribution of tractors in the state. The figure ranges from only 3.70 tractors per thousand hectare of cultivated area in Kanpur Nagar district of Middle Ganga-Yamuna Doab to 66.28 tractors in Muzaffarnagar district of Upper Ganga-Yamuna Doab. In spatial terms the number of tractors is the highest in Upper Ganga-Yamuna Doab and Rohilkhand regions, largely inhabited by enterprising Jat and Gujar Communities. The higher level of tractorization is also noticed in Tarai belt along southern edge of Uttaranchal where, advanced agriculture is practiced by Sikh Jats on the recently reclaimed land (Fig. 2).

Table 1. List of the Selected Indicators of Bio-technological Inputs in Agriculture in Uttar Pradesh, 2001

Indicators	
1.	Tractors Per Thousand Hectare of Cultivated Area
2.	Disc – Herrows Per Thousand Hectare of Cultivated Area
3.	Seed Cum Fertilizer Drills Per Thousand Hectares of Cultivated Area.
4.	Diesel Pump sets Per Thousand Hectares of Cultivated Area.
5.	Electric Pump sets Per Thousand Hectare of Cultivated Area
6.	Consumption of Fertilizers Per Hectare of Cultivated Area
7.	Consumption of Pesticides per Hectare of Gross Sown Area

Table 2. Uttar Pradesh Districtwise Standard Score Values of Tractors Per Thousand Hectare of Cultivated Area (1998-99)

Classes & Z Score Values	No. of Districts	%	Districts (Z Scores)
(i) High <1.00	11	15.71	Muzaffarnagar 3.79, Saharanpur 2.92, Meerut 2.10, Moradabad 2.08, Mathura 1.71, Baghpat 1.68, Deoria 1.52, Bijnor 1.31, Rampur 1.21, Ghaziabad 1.14, Bulandshaher 1.01
(ii) Moderate 0.00 to 1.00	12	17.14	GoutamBudh Nagar 0.87, Bara Banki 0.81, Jalaun 0.72, Pilibhit 0.64, Aligarh 0.47, JyotibaPhule Nagar 0.38, Agra 0.34, Ambedkar Nagar 0.32, Faizabad 0.32, Maharajganj 0.14, Shahjahanpur 0.13, Kanpur Dehat 0.13
(iii) Low -0.00 to -0.50	24	34.28	Bareilly -0.03, Mirzapur -0.04, Chandauli -0.07, S.R. Nagar -0.07, Varanasi -0.07, Kannauj -0.09, Farrukhabad -0.09, Kushinagar -0.13, Gorakhpur -0.13, Sultanpur-0.13, Azamgarh -0.13, Jhansi -0.21, Hathras -0.22, Etah -0.22, Allahabad -0.25, Jaunpur -0.26, Kheri -0.27, Ghazipur -0.37, Mainpuri -0.41, Shravasti -0.45, Baharaich -0.45, Lucknow-0.48, Mahoba -0.48, Hamirpur -0.48.
(iv) Very Low > -0.50	23	32.87	Siddharthanagar -0.51, Mau -0.52, Firozabad -0.56, Gonda -0.63, Balrampur -0.63, Sitapur -0.66, Badaun -0.70, Unnao -0.80, Rai Bareli -0.82, Ballia -0.84, Pratapgarh -0.86, Etawah -0.92, Auraiya -0.92, Hardoi -0.94, S.K. Nagar -0.95, Basti -0.95, Son Bhadra -0.99, Lalitpur -1.04, Fatehpur -1.10, Chitrakoot -1.22, Banda -1.22, Kanpur Nagar -1.33.



Figure 1.

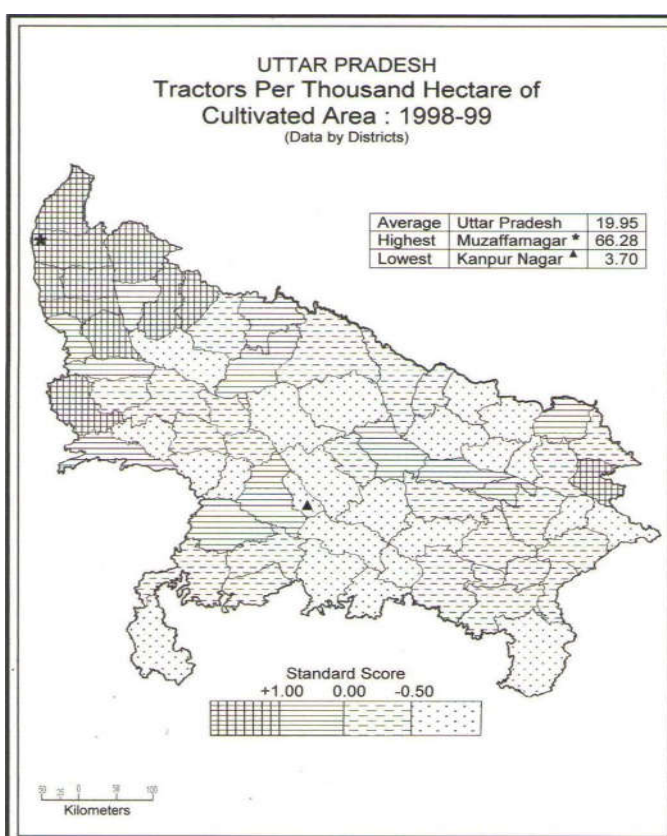


Figure 2.

This is the reason that Rampur, Moradabad, Bijnor, Saharanpur Districts of Terai Region have higher number of tractors. Besides, tractorization is also high in Middle Ganga-Yamuna Doab, Barabanki and Faizabad districts of Avadh plain, Maharajganj and Deoria districts of Trans Ghanghara plains and Jhansi and Jalaun districts of Bundelkhand region. The number of tractors per thousand hectares of cultivated area gradually declines as one moves from west to east. The low level of tractorization is witnessed in almost entire central Rohilkhand, southwestern avadh plain, Lalitpur and Etawah

districts of Bundelkhand and Mirzapur district of Vindhyaal region. The districts of moderate number of tractors are scattered throughout the central part of the state while the districts of low number of tractors are extended over most parts of Avadh plain, Southwest and southeast plateau Regions and Central south part, comprised by Hamirpur and Banda districts. It is also revealed that the areas with low level of underground water have scarcity of tractors. Table 2 explains the spatial set-up of tractorization in the state. High category is comprised by eleven districts, which have their high concentration in west

part of the state. Here, Upper Ganga-Yamuna Doab has the domination of the high use of tractors in agriculture. Muzaffarnagar and Moradabad districts are dominated by Jats and Gujars, and they are prosperous communities. The same incident is observed with Rampur, Saharanpur, Meerut Districts. A high percentage of good quality of agriculture land is also responsible for the high use of tractors in agriculture. Twelve districts belong to moderate group. Barabanki has the highest value of 0.81, whereas Kanpur Dehat and Shahjahanpur districts each have the lowest value of 0.13 as z score. These districts are in a scattered form. They have occupied mainly the central belt and adjoining districts of River Yamuna. The districts of low category are twenty four in number, and have the z score value between 0.00 and -0.50. They jointly form two big patches; one in Middle Ganga-Yamuna Doab and another one in Eastern plain. Low number of tractors is caused in these areas due to frequency of floods in the eastern part and moderate percentage of cultivated land in central Doab. The districts of category are rather poor developed. They are 23 in number and have their setting either near or in the plateau region or in agriculturally poor developed region. Low concentration of tractors is caused due to low percentage of cultivated land, scarcity of irrigation facilities, low productivity, small size of land holdings, domination of poor farmers. The productivity of the crops grown here is not upto the mark. Wheat and millets are the main crops of the area. As a whole, the central part of the state has the domination of these districts. Lower Ganga-Yamuna Doab, South part of Avadh Plain present such characterizes. The analysis reveals that the number of tractors per thousand hectares of cultivated area has positive association with other indicators of techno biological inputs such as irrigation, use of fertilizers, diesel pump sets and harrow-thrillers. It is a noteworthy feature that size of holdings is not much effective in determining the number of tractors as other measures of Green Revolution. This is confirmed from the Upper Ganga-Yamuna Doab region where farmers with medium and small holdings are also possessing tractors. This is the pioneer area of the state experiencing Green Revolution.

2. Disc herrows per thousand hectare of cultivated area:

Tractorization has many allied aspects of mechanization in agriculture. Out of these one of the most important is disc herrow, which is attached to a tractor for the deep, tilling. The use of disc herrow certainly improves over the traditional wooden plough as it, efficiently and deeply plough the land. Therefore, use of disc herrow is one of the important indicator of techno biological development in agriculture. In 1998-99 the state, as a whole, has an average of 18.37 disc herrows per thousand hectares of cultivated area. At district level, the figure varies from as low as 0.46 disc harrow per thousand hectares of cultivated area in Varanasi district of eastern part to as high as 123.06 in Bareilly district of Rohilkhand region. The district-wise analysis reveals that all the districts with higher number of disc harrow are forming a compact area in the western part of the state (Fig. 3). This compact area is extending over the entire Upper Ganga-Yamuna Doab, Rohilkhand Region. This is the area, which has also recorded higher level of tractorization. There are only ten districts, which have recorded high number of disc-herrows per thousand of cultivated area. Among them as mentioned earlier Bareilly district is on top, and Meerut with 39.15 is the district of lowest percentage of the category. It is observed that rice and sugarcane producing areas have much concentration of disc herrows. There are only nine districts with moderate

number of disc-herrows per thousand hectares of cultivated area with a z score value of 0 to 0.70. The districts of this category are forming an extension in the western part of area of higher concentration. These are extending over Middle Ganga-Yamuna Doab, Bijnor of Terai Region and Sitapur district of Avadh plains.

These are the areas where the effect of Green Revolution is recently experienced. The eastern and central parts of the state have the poor concentration of the technique. In this category Aligarh and Hathras districts have the ratio of 35.17 percent each of disc-herrows on their agricultural lands.

The lowest percentage (20.72) of the category is observed in Bijnor district. The low number of disc-herrows per thousand hectare of cultivated area, i.e. less than the average between 4.01 in Kanpur Dehat and 17.53 in Agra is recorded in 24 districts of the state. These are mainly concentrated in the lower Ganga-Yamuna Doab, Upper Ganga-Ghaghra Doab, east of Trans Ghaghra Plains and in the east of Rapti plains. Eastern Terai Plain has continuous extension of these districts. These are the areas, where low level of agricultural development with subsistence food grains agriculture is practiced. Terai districts have recently been developed by Sikh community for the cultivation of rice and sugarcane, after the reclamation of the marshy lands. Twenty seven districts have recorded the very low z score values i.e. less than -0.50. The entire Purvanchal, Bundelkhand and Mirzapur most parts of trans- Ghaghra plain have recorded a very low number of disc harrow. The sloppy and uneven topography of Vindhyanal and BundelKhand Regions do not permit operation of disc-herrows in Purvanchal and Gomti-Ghaghra Region is attributed for poor economic status of farmers in the Region. Low agricultural productivity in these areas is either caused by the scarcity of water or by the frequency of floods in the Ghaghra Region.

3. Seed cum fertilizer drills per thousand hectares of cultivated area:

Among other dominant aspects of mechanization of agriculture in Uttar Pradesh, seed-cum-fertilizer drills have also played an important role. It is used to sow the seeds in furrows especially of wheat. Drills are gradually replacing the traditional time consuming means of sowing and fertilization. The number of seed cum fertilizer drills is very low in the state that is only 11.38 seed cum fertilizers drills per thousand hectares of cultivated area are found in 1998-99. At district level this figure ranges from the highest in Jalaun district of Bundelkhand Region i.e. 48 seed cum fertilizer drill per thousand hectare of cultivated area to the lowest of 0.04 in Faizabad district of Ganga-Ghaghra Doab. Like other mechanical inputs in agriculture seed cum fertilizer drills are also largely concentrated in western and southern parts of the state, yet these are making more fragmented patterns as compared with tractors and disc herrows. Out of seventy districts, twenty nine are having the number of these drills above the average of the state. Those districts .Which have the domination of wheat cultivation, have their number above the average.

Category wise statement that reveals the variations in the development of this agricultural technique is as follows:

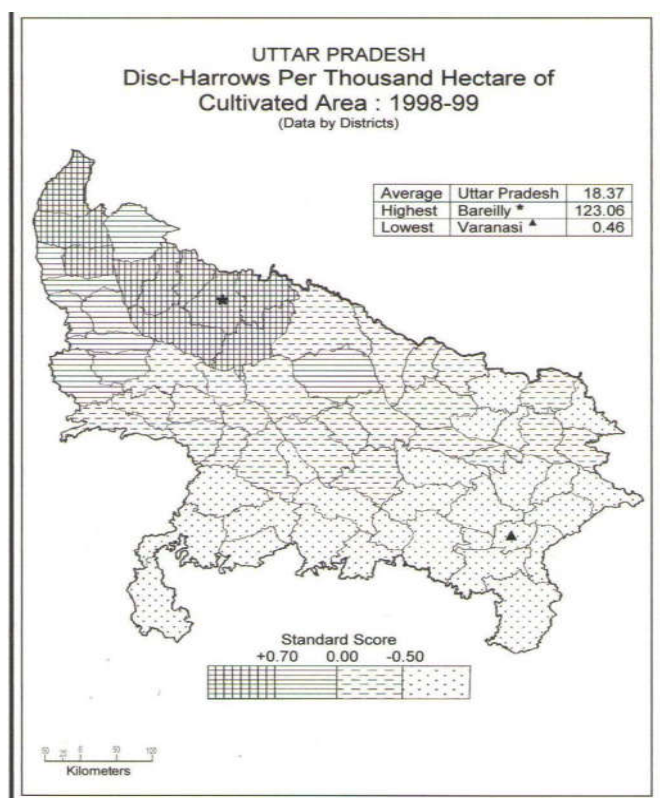
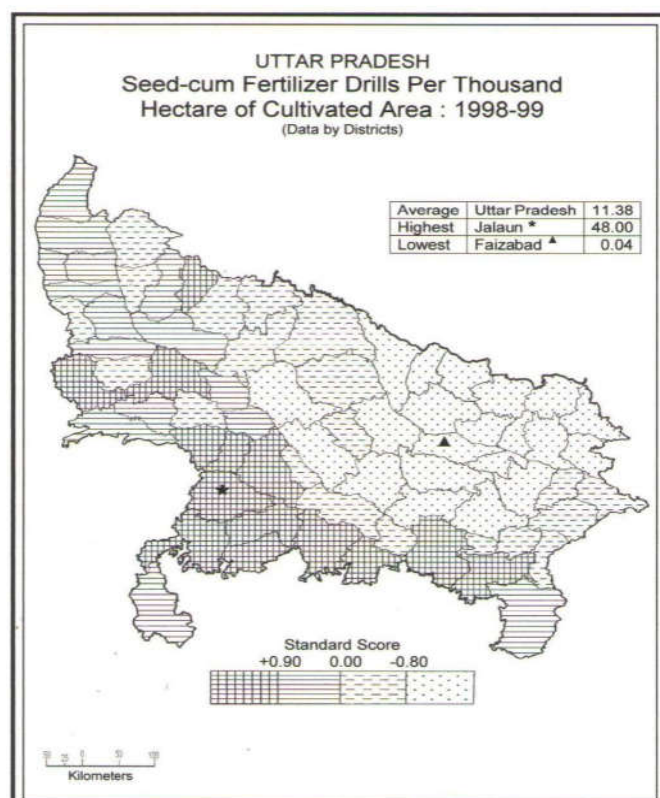
Fourteen districts have recorded the high percentage of seed-cum fertilizer drills per thousand hectare of cultivated area in the state. Their ratios have a range of 48.00 in Jalaun and 24.03 in Kanpur Dehat. The Z score value of these districts has the range between 1.00 and 2.90 (Fig. 4).

Table 3. Uttar Pradesh Districtwise Standard Score values of Disc Harrows Per Thousand Hectare of Cultivated Area: 1998-99

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.70	10	14.29	Bareilly 3.64, Rampur 3.24, Pilibhit 3.24, Moradabad 2.84, JyotibaPhule Nagar 1.83, Saharanpur 1.76, Muzaffarnagar 1.57, Shahjahanpur 1.21, Badaun 1.10, Meerut 0.72
(ii) Moderate 0.00 to 0.70	9	12.86	Mathura 0.66, Aligarh 0.58, Hathras 0.58, Baghpat 0.49, Bulandshahr 0.40, Ghaziabad 0.25, Sitapur 0.13, Bijnor 0.08, GoutamBudh Nagar 0.06
(iii) Low -0.00 to -0.50	24	34.28	Sharvasti -0.03, Agra -0.03, Etah -0.05, Rai Bareilly -0.06, Farrukhabad -0.27, Firozabad -0.27, Lucknow -0.29, Hardoi -0.29, Kannauj -0.33, Etawah -0.36, Auraiya -0.36, Kheri -0.39, Mainpuri -0.39, Gorakhpur -0.43, Barabanki -0.44, Unnao -0.45, Maharajganj -0.45, Faizabad -0.46, Ambedkarnagar -0.46, Bahraich -0.46, Gonda -0.47, Balrampur -0.47, Deoria -0.48, Kanpur Dehat -0.50.
(iv) Very Low > -0.50	27	38.57	Jhansi -0.51, Kushinagar -0.51, Siddharthanagar -0.51, Fatehpur -0.53, Lalitpur -0.55, Pratapgarh -0.55, Mirzapur -0.55, Jalaun -0.56, Kaushambi-0.58, Mau-0.58, Sultanpur -0.59, Ballia -0.59, S.K. Nagar -0.60, Basti -0.60, Jaunpur -0.60, Ghazipur-0.60, Mahoba -0.61, Hamirpur -0.61, Chitrakoot -0.61, Banda -0.61, Kanpur Nagar -0.62, Allahabad -0.62, Azamgarh -0.62, Varanasi -0.62, Chandauli -0.62, Sonbhadra-0.62, S.R. Nagar-0.62.

Table 4. Uttar Pradesh Districtwise Standard Score Values of Seed-cum Fertilizers Drills Per Thousand Hectare of Cultivated Area: 1998-99

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.90	14	20.00	Jalaun 2.90, Mirzapur 2.52, Jhansi 2.13, Banda 1.96, Chirakoot 1.96, Allahabad 1.88, Auraiya 1.59, Etawah 1.43, Hamirpur 1.37, Etah 1.33, Mahoba 1.33, Mathura 1.20, Rampur 1.02, Kanpur Dehat 1.00
(ii) Moderate 0.00 to 0.90	15	21.43	Agra 0.82, Badaun 0.72, Baghpat 0.64, Meerut 0.64, Farrukhabad 0.41, Kannauj 0.39, Lalitpur 0.28, Sonbhadra 0.27, Moradabad 0.22, Firozabad 0.21, Ghaziabad 0.10, Aligarh 0.06, Bulandshahr 0.06, Saharanpur 0.04, Muzaffarnagar 0.02,
(iii) Low -0.00 to -0.80	20	28.57	JyotibaPhule Nagar -0.08, Hathras -0.09, Shahjahanpur -0.15, G.B.Nagar -0.18, Bareilly -0.34, Ghazipur-0.38, Mainpuri -0.43, Fathepur -0.47, Pilibhit -0.50, Bijnor -0.52, Ballia -0.56, Lucknow -0.61, Kaushambi -0.62, Mau -0.63, Kheri-0.64, Kanpur Nagar -0.70, Varanasi -0.79, Chandauli -0.79, S.R. Nagar -0.79, Sitapur-0.80.
(iv) Very Low > -0.80	21	30.00	Gorakhpur -0.81, Unnao -0.84, Hardoi -0.86, Sultanpur -0.86, Janpur-0.87, Maharajganj-0.87, Barabanki -0.88, Siddarth Nagar -0.88, Gonda -0.88, Balrampur -0.88, Kushinagar-0.89, Rai Bareilly -0.89, Deoria -0.89, Pratapgarh-0.89, Faizabad -0.90, Ambedkar Nagar -0.90, Shrivasti -0.90, Bahraich -0.90, S.K. Nagar -0.90, Basti -0.90, Azamgarh-0.90.

**Figure 3.****Figure 4.**

These districts are mainly concentrated on the west side of River Yamuna, and, thus occupy the trans-Yamuna Plain and Plateau Region of the state. Mathura and Etah districts are also the part of the category occupying the central part of middle. Entire Ganga-Yamuna Doab and Rampur of Rohilkhand also belong to the high category. Fifteen districts have recorded moderate number of seed cum fertilizer drills.

These districts are concentrated in nearby districts of higher number of seed cum fertilizer drills largely in the western part of the state. The upper Ganga-Yamuna Doab has all its own districts of this Category. This has also included Badaun and Moradabad of Rohilkhand Region, Kanauj and Farrukhabad districts of Avadh Plain and Lalitpur and Sonbhadra Districts of plateau region. Twenty districts have this facility less than

the average of 11.38 in number. In low category, the number varies from 1.33 in Sitapur to 10.26 in Hathras district. Most of the central part i.e., of Avadh Plain has recorded the low number of these drills. The lower part of Ganga-Ghaghra Doab also present such peculiarity, Ganga-Yamuna Doab, Mainpuri and GoutamBudh Nagar districts along with Hathras enjoy such characteristics. Kanpur Nagar, Fatehpur and Kaushambi of the lower Ganga-Yamuna Doab are also the districts of the category. The number of less than 1.30 seed-cum fertilizers per thousand of cultivated area is observed in twenty one districts of the state, which have scored the standard score values less than -0.80. The number of very low category variates from 0.05 in Basti and SantKabir Nagar district to 0.13 in Gorakhpur. Most of the districts of Purvanchal occupy this category. These districts are dominated in rice cultivation, hence, have poor concentration of seed cum fertilizer drills used mainly wheat cultivation. These districts have spread in a large patch also in the south part of Avadh Plain. All the eastern tarai districts have such peculiarity. The analysis reveals that the distribution of seed cum fertilizer drills per thousand hectares of cultivated area is very discrete in the state as only 29 districts out of a total of 70 have obtained positive standard score values. It is also observed that the higher incidence of seed cum fertilizer drills is found in those districts, which largely produce food, grains especially wheat. It is moderate in sugarcane growing areas, as it is not required for such cultivation. The entire eastern Uttar Pradesh, which is largely lacking in modernization of agriculture, has recorded very low number of seed cum fertilizer drills. Therefore, the size of holdings, geomorphology, soil conditions, economic status and tractorization as it is attached to tractors, are associated factors to regulate the number of seed cum fertilizer drills in the state.

4. Spatial patterns of diesel pumpsets per thousand hectare of cultivated area

Almost half of the districts of the state have recorded the number of diesel pump sets above the average number of the state, and thus have scored z score values in positive. It depicts that more than half of the districts of the state have low concentration of this means of irrigation. Their distribution is high in those districts, which have low network of canals. On the basis of their standard scores, they are put into four categories (fig.5). Seventeen districts belong to high category. Rohilkhand Region has the domination of high number of diesel pumps. Moradabad district of this region comes at the top with 245.07 diesel pumpsets. The eastern part of Avadh Plain has also the concentration of those districts. In Ganga-Yamuna Doab, Agra, Etah, Kanpur Dehat and Unnao districts have also high number of diesel pumps. Bahraich, Shravasti and Barabanki districts are situated in the east part of Avadh Plain. The lowest number 139.5 of the category is observed in Agra district, situated in Trans-Yamuna plain. The moderate number of distribution of diesel pumpsets is found between 134.29 in Kushinagar district and 106.70 in Faizabad district. Most of the districts are spread in the adjoining areas of distribution of high number of diesel pumps. They occupy mainly Avadh plain, north part of Purvanchal. Ghaziabad and Mathura districts of Ganga-Yamuna Doab, Lalitpur of Bundelkhand region. Rohilkhand Region, Bijnor and Badaun districts also have moderate number of Diesel pumps. Nineteen districts have recorded the low number, less than the average and have scored the z score values between -0.70 to 0.00. Among them, SantKabir Nagar district has 72.64 diesel pumpsets per thousand hectare, the lowest of the category

while Mainpuri has 104.92 diesel pumps, the highest number of the category. The Ganga-Yamuna Doab, mainly its upper part, South west part of Purvanchal have the domination of these districts. In Gomti-Ghaghra Doab-Sitapur, Sultanpur and Ballia districts belong to the category. In Ghaghra-Rapti Doab Basti and SantKabir Nagar district have such domination. Eighteen district have the number of diesel pumpsets less than 72 and thus occupy the very low category. Their numbers vary from 72 in Aligarh district to 17 in Jalaun district. The districts of very low, occupy most of the part of the Ganga-Gomti Doab and south-east part of Purvanchal. In plateau region; Sonbhadra, Jhansi, Mahoba, Banda Chitrakoot and Kaushambi districts have noted very low number of diesel pumps. Being dissected these areas do not present favorable conditions for digging tube wells (Fig. 5).

5. Spatial pattern of electric pumpsets per thousand hectare of cultivated area

The table 6 clearly depicts that the number of electric pumps (25.43) is four times less than the average number of diesel pumps (106.15) per thousand hectare of cultivated area. There are 27 districts of the state, having the number of electric pumps above average of the state. The table shows that nearly two third districts have the low development of the facility. Their distribution according to the categories is as very uneven. Two contiguous belts of high concentration of electric pumpsets have been reflected clearly. One of them is found in Upper Ganga-Yamuna Doab and western Ruhilkhand region while second one is found in lower Ganga-Ghaghra Doab. First area has the presence of ten districts among sixteen districts. One of them is found in Upper Ganga-Yamuna Doab and western Ruhilkhand region while second one is found in lower Ganga-Ghaghra Doab. First area has the presence of ten districts among sixteen districts of the Category. The lower part of Gomti, Ghaghra and Ganga Rivers in the state has four of these districts i.e., Jaunpur, Azamgarh, Mau and Ghazipur. In central part, Farrukhabad and Unnao districts are located along Ganga River.

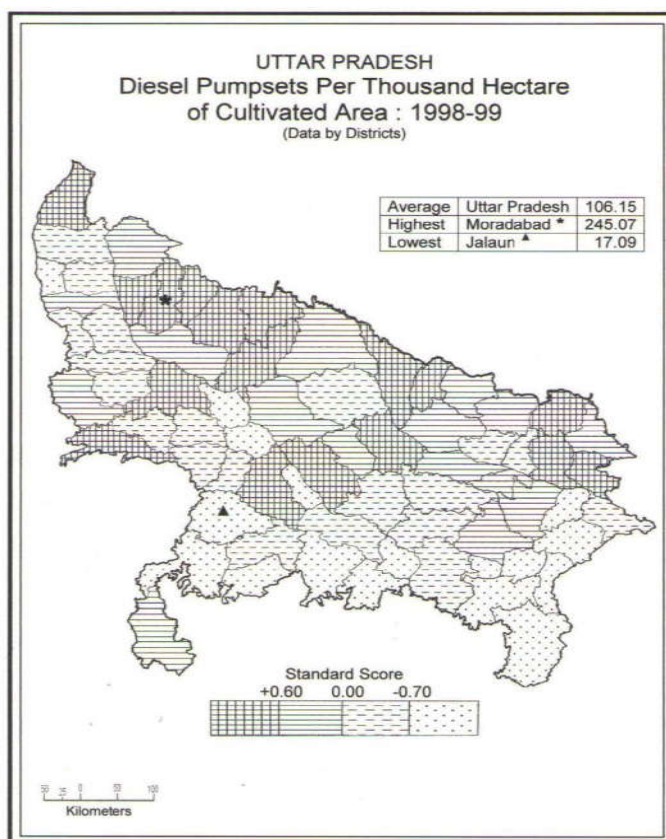
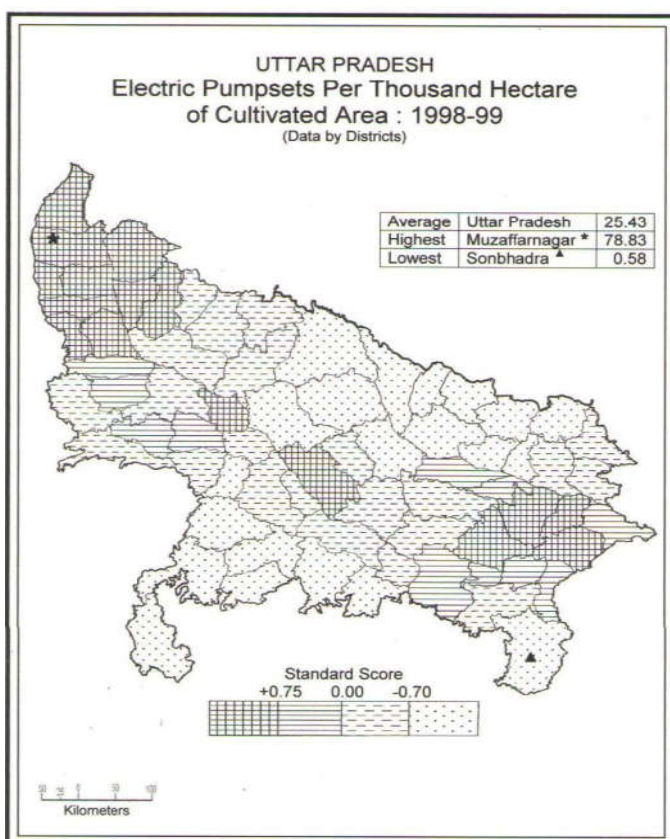
Muzaffarnagar recorded the highest value i.e. 78.83 electric pump sets per thousand hectare of cultivated area. The high concentration of this indicator is caused due to the mechanization as well as the developed structure or agriculture. The moderate standard score value between 0.00 and 0.75 is scored by eleven districts. The ratio has a range from 25.87 in Mainpuri to 41.89 in Faizabad and Ambedkar Nagar districts to 25.87 in Mainpuri. These districts occupy the lands of Middle Upper Ganga-Yamuna Doab, Lower Gomti-Ghaghra Doab and along Ganga River on its south side. Here Allahabad, S.R. Nagar, Varanasi and Chandauli present such Characteristics. The low category with a standard score value between 0.00 and -0.70 is obtained by twenty two districts. The east Rohilkhand, middle and lower parts of Ganga-Yamuna Doab have low concentration of electric pumps. These areas have mix type of development i.e., diesel pump and a sufficient network of canals. In Purvanchal, they are scattered on its eastern margins. Here Kushi Nagar, Deoria and Gorakhpur occupy this category. The ratio has a range from 9.21 in Etawah to 23.72 in Mathura district. Twenty one districts of the state have very poor development of this agriculture service. Fig 3.5 reveals that the northern and southern parts of east U.P. have the domination of very low category's districts.

Table 5. Uttar Pradesh district wise standard score values of diesel pump sets per thousand hectare of cultivated area: 1998-99

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.60	17	24.28	Moradabad 2.80, JyotibaPhule Nagar 2.74, Barabanki 2.05, Rampur 1.96, Bareilly 1.31, Maharajganj 1.25, Pilibhit 1.19, Saharanpur 1.14, Shahjahanpur 1.02, Deoria 0.97, Unnao 0.97, Shravasti 0.89, Gorakhpur 0.89, Kanpur Dehat 0.89, Bahraich 0.88, Agra 0.67, Etah 0.64
(ii) Moderate 0.00 to 0.60	16	22.86	Kushinagar 0.57, Lalitpur 0.53, Mathura 0.51, Bijnor 0.50, Azamgarh, Badau 0.49, Gonda 0.49, Siddharthanagar 0.45, Lucknow 0.44, Balrampur 0.43, Kheri 0.39, Ghaziabad 0.32, Ambedkar Nagar 0.29, Jaunpur 0.23, Hardoi 0.03, Faizbad 0.01
(iii) Low -0.00 to -0.70	19	27.14	Firozabad -0.07, Mainpuri -0.02, Hathras -0.09, Muzaffarnagar -0.23, Sitapur -0.29, GautamBudh Nagar -0.33, Sultanpur -0.34, Rai Bareli -0.41, Bulandshahr -0.44, Auraiya -0.52, Pratapgarh -0.53, Allahabad -0.55, Etawah -0.57, Meerut -0.59, Mahoba -0.62, Ballia -0.66, S.K. Nagar -0.68, Basti -0.68, Fatehpur -0.68.
(iv) Very Low > -0.70	18	25.72	Aligarh -0.09, Baghat -0.72, Kaushambi -0.82, Mirzapur -0.85, Ghazipur -0.89, Hamirpur -0.89, Jhansi -0.95, Chitrakoot -1.08, Mau -1.10, Sonbhadra -1.22, Varanasi -1.23, Chandauli -1.23, S.R. Nagar -1.23, Banda -1.23, Kanpur Nagar -1.51, Kannauj -1.66, Farrukhabad -1.66, Jalaun -1.80.

Table 6. Uttar Pradesh district wise standard values of electric pump sets per thousand hectare of cultivated area: 1998-99

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.75	16	22.86	Muzaffarnagar 2.30, Meerut 2.21, Bulandshahr 1.99, Ghaziabad 1.87, GoutamBudh Nagar 1.80, Azamgarh 1.65, Baghat 1.61, Unnao 1.48, Saharanpur 1.43, Ghazipur 1.43, Moradabad 1.31, Mau 1.30, Bijnor 1.25, JyotibaPhule Nagar 1.16, Jaunpur 1.13, Farrukhabad 0.93
(ii) Moderate 0.00 to 0.75	11	15.71	Aligarh 0.74, Hathras 0.74, Ambedkarnagar 0.71, Faizabad 0.71, S.R. Nagar 0.59, Chandauli 0.59, Varanasi 0.59, Firozabad 0.33, Allahabad 0.15, Ballia 0.04, Mainpuri 0.02
(iii) Low -0.00 to -0.70	22	31.43	Agra -0.14, Rai Bareli -0.15, Sultanpur -0.15, Etah -0.30, Rampur -0.31, Lucknow -0.33, Bareilly -0.33, Pilibhit -0.40, Badaun -0.48, Fatehpur -0.52, Gorakhpur -0.55, Deoria -0.55, Kaushambi -0.56, Kanpur Nagar -0.57, Shahjahanpur -0.60, Pratapgarh -0.60, Mirzapur -0.65, Kannauj -0.65, Kushinagar -0.69, Kanpur Dehat -0.70, Etawah -0.70, Mathura -0.70.
(iv) Very Low > 0.70	21	30.00	Auraiya -0.78, Barabanki -0.81, Kheri -0.85, Maharajganj -0.89, Jhansi -0.92, Gonda -0.92, Balrampur -0.92, Shravasti -0.93, Bahraich -0.93, S.K. Nagar -0.96, Basti -0.96, Chitrakoot -0.98, Banda -0.98, Sitapur -0.99, Hardoi -0.99, Siddharthanagar -1.02, Jalaun -1.03, Mahoba -1.05, Hamirpur -1.05, Sonbhadra -1.07, Lalitpur -1.07.

**Figure 5.****Figure 6.**

A belt in the west from Kheri to Hardoi is continuously extended upto Maharajganj and S.K. Nagar in the east. It has noted the presence of twelve districts. In south, the districts of Bundelkhand and Vindhyachal Regions have the domain of very low number of electric pump sets. The highest number of the category, 6.63 is found in Barabanki district. The districts of plateau are very poor in comparison of the Terai districts.

Terai districts have high water table than the plateau districts of the state. These districts have dry and less fertile soils. In this way, the depth of underground water, availability of canal irrigation, commercialization of agriculture, density of electric lines and economic standard of farmers are some factors which positively affect the concentration of pumping sets in the state.

Table 7. Uttar Pradesh district wise standard score values of consumption of fertilizers per thousand hectare of cultivated area: (in Kgs.) 1998-99

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.85	16	22.86	Moradabad 2.35, Pilibhit 2.02, JyotibaPhule Nagar 1.95, Varanasi 1.78, Ghaziabad 1.65, Mau 1.52, Muzaffarnagar 1.41, Basti 1.21, Deoria 1.19, Bulandshahr 1.04, Meerut 1.04, Baghpat 0.97, Mirzapur 0.97, Ambedkar Nagar 0.90, Faizabad 0.90, Saharanpur 0.88
(ii) Moderate 0.85 to 0.00	16	22.86	S.K. Nagar 0.84, GoutamBudh Nagar 0.73, Bareilly 0.71, Firozabad 0.65, Farrukhabad 0.61, Rampur 0.56, Bijnor 0.55, Barabanki 0.52, Mainpuri 0.49, Kanpur Dehat 0.46, Chandauli 0.37, Kannauj 0.35, Gorakhpur 0.33, Ghazipur 0.17, Badaun 0.10, Lucknow 0.06
(iii) Low -0.00 to -0.60	18	25.72	Maharajganj -0.02, Kushinagar-0.06, Gonda -0.14, Pratapgarh -0.20, Mathura -0.28, Agra -0.34, Jaunpur -0.38, Hathras -0.38, Sitapur -0.39, Aligarh -0.42, Rai Bareli -0.44, Sultanpur -0.45, Unnao -0.50, Kaushambi -0.50, Etawah-0.53, Auraiya -0.53, S.R. Nagar -0.56, Etah -0.58.
(iv) Very Low > -0.60	20	28.57	Shravasti -0.61, Fatehpur -0.65, Behraich -0.66, Allahabad-0.70, Kanpur Nagar -0.71, Siddhartha Nagar -0.75, Ballia -0.82, Shahjahanpur -0.86, Balrampur -0.98, Hardoi -1.00, Azamgarh -1.02, Kheri -1.12, Lalitpur -1.30, Jhansi -1.48, Mohoba -1.54, Sonbhadra-1.56, Chitrakoot -1.64, Jalaun -1.65, Banda -1.75, Hamirpur -1.79.

Table 8. Uttar Pradesh district wise standard score values of consumption of pesticides per hectare of gross sown area: (in Kgs.): 1998-99

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.80	14	20.00	Kaushambi 3.08, Varanasi 2.96, Kushinagar 1.78, Mathura 1.77, Kannauj 1.74, Basti 1.73, Hathras 1.52, S.R. Nagar 1.52, Deoria 1.44, Jaunpur 1.27, Farrukhabad 1.16, Mau 1.15, Auraiya 0.88, Etawah 0.88
(ii) Moderate 0.00 to 0.80	13	18.57	Chandauli 0.76, Ambedkar Nagar 0.74, Faizabad 0.74, Maharajganj 0.70, Gorakhpur 0.68, Siddharthanagar 0.55, Agra 0.31, Azamgarh 0.27, Jalaun 0.27, Sonbhadra 0.16, Fatehpur 0.15, Rai Bareli 0.07, Unnao 0.04
(iii) Low -0.00 to -0.65	21	30.00	Lucknow -0.14, Lalitpur -0.15, Firozabad -0.15, S.K. Nagar -0.16, Chitrakoot -0.22, Barabanki -0.23, Mirzapur -0.30, Mahoba -0.32, Ballia -0.32, Aligarh -0.34, Pratapgarh -0.45, Hamirpur -0.46, GautamBudh Nagar -0.51, Kanpur Nagar -0.52, Pilibhit -0.57, Ghazipur -0.59, Hardoi -0.59, Gonda -0.60, Muzaffarnagar -0.62, Banda -0.64, Sitapur -0.65.
(iv) Very Low > -0.65	22	31.43	Sharvasti -0.67, Kanpur Dehat-0.69, Bareilly -0.69, Bulandshahr -0.70, Jhansi -0.70, Ghaziabad -0.73, Shahjahanpur -0.74, Sultanpur -0.76, Allahabad -0.76, Mainpuri -0.83, Etah -0.89, Saharanpur -0.91, Meerut -0.97, Baghpat -0.97, Kheri -0.97, Badaun -1.03, Bijnor -1.06, JyotibaPhule Nagar -1.09, Moradabad -1.10, Rampur-1.15, Balrampur -1.19, Bahraich -1.20.

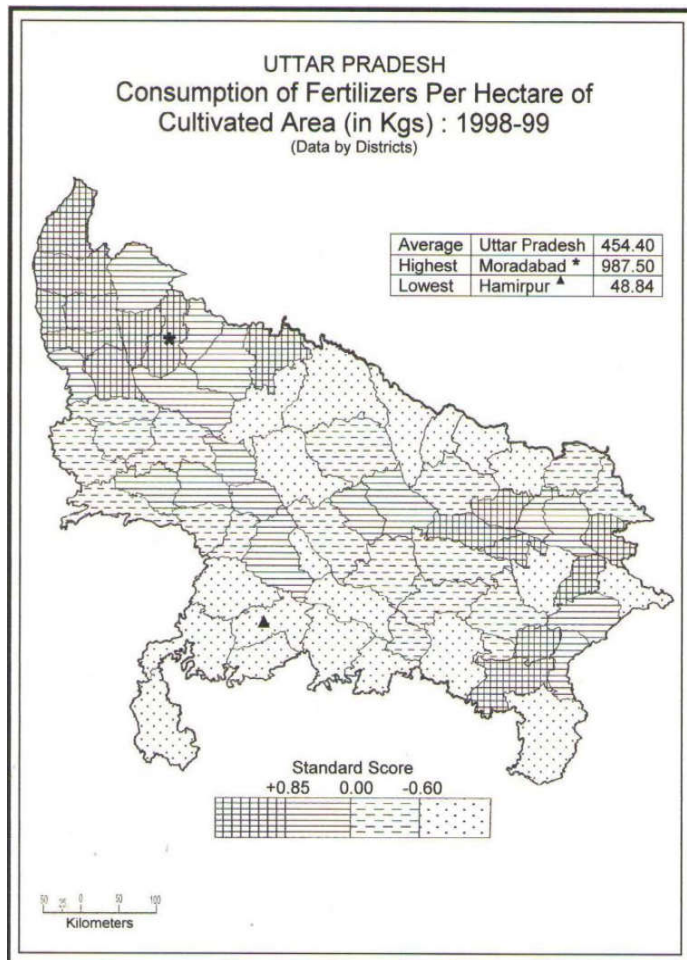


Figure 7.

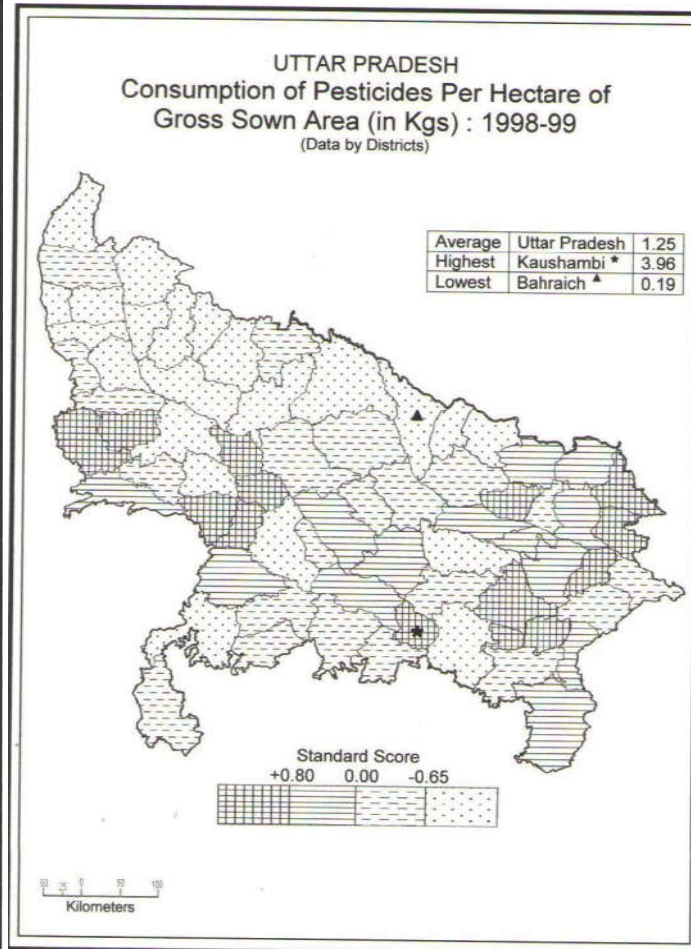


Figure 8.

Thus, it seems to be an important indicator of development of techno-biological inputs in agriculture as well as agricultural development itself.

6. Consumption of fertilizers per hectare of cultivated area

Fertilizers constitute the most vital bio-chemical input after water, contributing to agricultural productivity. They increase the soil fertility. They can be used on large as well as on small farms with an almost equal efficiency. Green Revolution has considered as an outcome of fertilizers use in Uttar Pradesh. The input of fertilizers is more suitable for high yielding variety (HYV) seeds, which respond more to them. In Uttar Pradesh on an average use of chemical fertilizers is 454.40 kilograms per hectare; whereas inter-regional disparities of fertilizers' use are very high. It is interesting to note that the districts having lowest consumption of fertilizers per hectare belong to the most backward part of the state. In 1998-99, the lowest use of fertilizers is observed 48.84 kgs. Per hectare in Hamirpur district of Bundelkhand Region, whereas the highest use of fertilizers is found 987.50 kg. Per hectare in Moradabad district of Rohilkhand Region.

It depicts that there is a high disparity among the districts on the basis of the use of fertilizers. There is a range of nearly 20 times in the figures. The districts with good quality of soil, and certainty of irrigation water, have much higher use of fertilizers. An examination of table 7 reveals the fact that the high category is composed by sixteen districts, having the lowest value of 654.99 Kg. of fertilizers per hectare. It shows that districts have the range between 654.99 kgs. and 987.50 kgs. All these districts have the high percentage of cultivated land and assured supply of irrigation water. These districts are located mainly in Upper Ganga-Yamuna Doab, and along Ganga River in its lower course. Pilibhit is the only district of Terai Region of this category. In Purvanchal Faizabad, Mau, Ambedkar Nagar districts are located in Gomti-Ghaghra Doab. Mirzapur and Varanasi districts also have high use of fertilizers. Moderate score values are obtained by 16 districts of the state. These are situated in Rohilkhand Region, Middle Ganga-Yamuna Doab. Barabanki and Lucknow of Avadh Plain, Gorakhpur, S.K. Nagar of Ghaghra- Burhi Gandak Doab, Ghazipur and Chandauli districts also belong to this category. The ratio has a range from 467.88 kg. in Lucknow to 644.18 kg. in S.K. Nagar district. All these districts have the consumption above average of the state (Fig. 7).

Eighteen districts of the state have scored low value between 322.41 kgs. In Etawah and 449.45 Kgs. in Maharajganj district. The presence of such districts is observed in mid part of Upper Ganga-Yamuna Doab and Avadh Plain. Purvanchal has also the presence of six such districts Maharajganj and Kushinagar districts in Terai Region, whereas Sultanpur, Jaunpur, Pratapgarh and Kaushambi districts in South Purvanchal. The type of crop, the quality of soil, and economic set-up of the farmers are the main controlling factors of the low use of fertilizers. The very low category is composed by 20 districts, which have the use of fertilizers less than 322 kg. per hectare. Bundelkhand Region has the predominance of such districts. In Vindhyaachal Region Sonbhadra, and Allahabad districts also have very low use. All these districts have low percentage of cultivated land, scarcity of irrigation water, effect on agriculture of the changing course of rivers. Terai Region has also the predominance of these districts. Here, farmers use less quantity of fertilizers, due to two reasons; either they are poor

farmers, or the land does not require much fertilizers. As a whole, Terai districts use much fertilizer than the districts of Bundelkhand Region.

7. Consumption of pesticides per hectare of gross sown area

It is necessary to use pesticides to check or control pests, otherwise they (pests) may cause losses in agricultural production and infections to crops. They can destroy crops at any stage and turn all inputs unyielding. Therefore, pesticides are very important biological inputs for modern agricultural system. The analysis reveals that very low quanta of pesticides are used overall in Uttar Pradesh. For the whole of the state the average use of pesticides per hectare of Gross cultivated area is 1.25 kg. per hectare. Striking disparities are observed in the state for use of pesticides. At district level, it ranges from as low as 0.19 Kg. per hectare in Bahraich district of Avadh region to as high as 3.96 Kg. in Kaushambi district of Terai Region of Purvanchal. Out of seventy districts only twenty seven districts have recorded the score value above the average score value of the state. Thus, it shows that 43 districts have very low and low use of pesticides in agriculture (Fig. 8). Fourteen districts have scored the very high value of pesticides use. These are located in four different parts of the state. Mathura, Hathras, Etawah and Auraiya districts are occupying the Middle Ganga-Yamuna Doab.

The Purvanchal region has high use of pesticides. It has seven districts of the category. Mau has 2.27 Kg. pesticides used after per hectare of gross sown area. It is observed that the lower parts of Ghaghra and Ganga Rivers have high use of pesticides. The moderate use of pesticides is observed in 13 districts. Among them Unnao district has the least use of 1.28 Kg. pesticides while Chandauli district use 1.92 kg. per hectare, the highest of the category. These districts occupy mainly the Purvanchal and South part of Avadh Plain. In Vindhyaachal Sonbhadra, Chandauli, and in Bundelkhand Region Jalaun district have the moderate use of pesticides. In central part-Fatehpur, Unnao and Rai Bareli present such feature. The higher and moderate use of pesticides clearly debunks their association with high level of technological based agriculture. Twenty one districts have scored the low value of pesticides. These are concentrated in the east, and south part of the state. Among them Lucknow has the highest use of 1.13 kg and Sitapur district has the least use of 0.67 kg. of pesticides of the category. The very low category is comprised by twenty two districts.

Most of these districts are spread in Upper Ganga-Yamuna Doab, Rohilkhand and Region. These areas seem to be free from any agricultural disease. Farmers take every precaution during the harvesting period of their crops. The range of the category is from 0.58 kg. in Allahabad to 0.19 Kg. in Bahraich district. Western Terai districts use fewer pesticides than the eastern Terai districts (Fig. 8). Contrarily, very low use of pesticides be attributed to its poor level of subsistence agriculture without any advancement in technobiological inputs. It seems that low use of pesticides in western Avadh and Purvanchal plains is also an outcome of its poor agricultural levels. However, Rohilkhand region is an exception to it. The very low use of pesticides in this part of the state may be explained for its positive ecological conditions requiring lesser protection of crops from pests.

Table 9. Uttar Pradesh district wise standard score values of development of techno-biological inputs in agriculture

Classes & Z Score Values	No. of Districts	% of Total	Districts (Z Scores)
(i) High < 0.25	17	24.28	Moradabad 1.50, Muzaffarnagar 1.18, Saharanpur 1.04, JyotibaPhule Nagar 0.98, Rampur 0.93, Pilibhit 0.81, Mathura 0.79, Meerut 0.74, Ghaziabad 0.66, Bareilly 0.61, Baghpat 0.53, Bulandshahr 0.48, Deoria 0.46, Varanasi 0.38, GoutamBudh Nagar 0.35, Hathras 0.30, Bijnor 0.30
(ii) Moderate 0.00 to 0.25	15	22.86	Agra 0.23, Ambedkar Nagar 0.23, Faizabad 0.19, Mau 0.16, Farrukhabad 0.16, Mirzapur 0.16, Barabanki 0.15, Aligarh 0.14, Kanpur Dehat 0.09, Jaunpur 0.07, Badaun 0.03, Firozabad 0.02, Kushinagar 0.01, Shahjahanpur 0.00, Gorakhpur 0.00
(iii) Low -0.00 to -0.40	19	27.13	Unnao -0.01, Etah -0.01, Maharajanj -0.02, Azamgarh -0.03, Kannauj -0.04, Auraiya -0.09, Etawah -0.11, Allahabad -0.12, Chandauli -0.14, S.R. Nagar -0.16, Jalaun -0.16, Basti -0.16, Kaushambi -0.16, Ghazipur -0.18, Lucknow -0.19, Mainpuri -0.22, Jhansi -0.37, Siddarth Nagar -0.38, Rai Bareli -0.39
(iv) Very Low > -0.40	19	27.13	Shravasti -0.45, Gonda -0.45, Lalitpur -0.47, Sultanpur -0.47, Mahoba -0.47, S.K. Nagar -0.49, Sitapur -0.52, Bahraich -0.53, Ballia -0.54, Chitrakoot -0.54, Fatehpur -0.54, Kheri -0.55, Hamirpur -0.56, Pratapgarh -0.58, Banda -0.64, Hardoi -0.66, Balrampur -0.66, Sonbhadra -0.72, Kanpur Nagar -0.85.

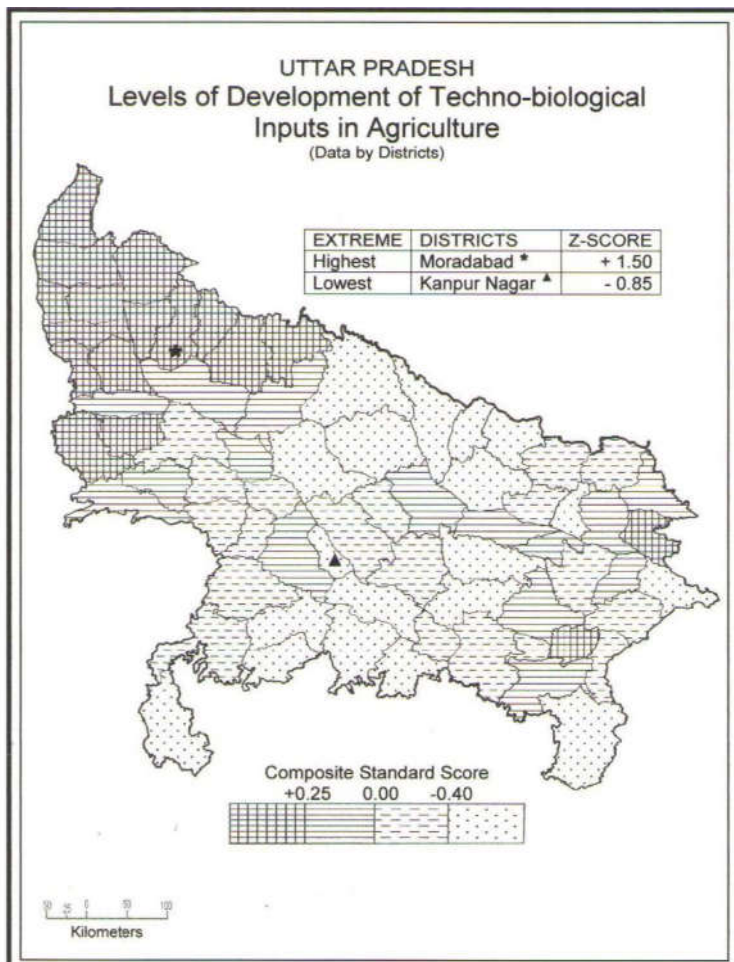


Figure 9.

Composite index of technobiological inputs in agriculture

The standard scores of all the seven indicators of techno biological inputs are aggregated to find out the composite standard scores of overall levels of development of techno biological inputs in agriculture. All the districts are grouped into four categories viz. high, moderate, low and very low and accordingly Fig. 9 and Table 9 are prepared.

This analysis suggests following generalizations

- Out of Seventy districts of the state only twenty six have scored positive composite standard z score values. Moradabad district of Rohilkhand Plain has obtained highest composite standard score (+1.50) while it is

lowest (-0.85) in Kanpur Nagar district of lower Ganga-Yamuna Doab.

- The range between highest and lowest composite standard scores is very high i.e., two times which shows that the values are highly discrete in nature and thus gives an evidence of high disparities among the districts on the development of techno biological inputs in agriculture.
- There are Seventeen districts of high level of development of techno biological inputs in agriculture, forming a contiguous belt in western Uttar Pradesh extending over entire Upper Ganga-Yamuna Doab, most parts of Rohilkhand, and in Hathras and Mathura districts of Middle Ganga-Yamuna Doab region. In east Uttar Pradesh, Deoria and Varanasi districts have

recorded such high development, because of the impact of urbanization in their nearby areas.

- Out of Seventy districts of the state only twenty six have scored positive composite standard z score values. Moradabad district of Rohilkhand Plain has obtained highest composite standard score (+1.50) while it is lowest (-0.85) in Kanpur Nagar district of lower Ganga-Yamuna Doab.
- The range between highest and lowest composite standard scores is very high i.e., two times which shows that the values are highly discrete in nature and thus gives an evidence of high disparities among the districts on the development of techno biological inputs in agriculture.
- There are Seventeen districts of high level of development of techno biological inputs in agriculture, forming a contiguous belt in western Uttar Pradesh extending over entire Upper Ganga-Yamuna Doab, most parts of Rohilkhand, and in Hathras and Mathura districts of Middle Ganga-Yamuna Doab region. In east Uttar Pradesh, Deoria and Varanasi districts have recorded such high development, because of the impact of urbanization in their nearby areas.

Conclusion

The present study reveals that the spatial distribution of bio-technological inputs in Uttar Pradesh is not uniform. The study highlight that the majority of the districts lie in the low and very low category of the level of development of bio-technological inputs while the high level of the development of bio-technological inputs is observed in the districts lying in the western part of the study area. The districts lying in the eastern boundary of the state are moderately developed in bio-technological inputs. This regional variations in the level of development of bio-technological was found closely associated with quality of agricultural land in the state. It is confirmed that good quality of land attracts more use of techno-biological inputs. While it is more required to make agricultural productivity in extensively agricultural use lands but the economic conditions of the farmers perhaps not permit them to use such inputs.

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