

# Spatial Pattern of Farm Mechanization: A Micro Level Study of Western Trans-Ghaghara Plain, (U.P.), India

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**Abstract**—Agriculture in India in the pre-green revolution period was mostly controlled by terrain, climate and edaphic factors. But after the Green revolution, India's agriculture witnessed great change with the introduction and adoption of modern agricultural implements. The author attempts to investigate extensively the agricultural mechanization and the change in the Trans-Ghaghara plain. The study area which includes the districts of Gonda, Balrampur, Bahraich and Shrawasti had been dealt block-wise for the year 1997 and 2007. It may be observed that there is a wide range of variations and change in farm mechanization i.e., agricultural machineries such as wooden and iron ploughs, advance harrow and cultivator, advance thrasher machine, sprayers, advance sowing instrument, and tractors etc. It may be noted further that due to continuous decline in size of land holdings and out flux of people for the same nature of works the magnitude and direction of agricultural systems are affected in the study area.

**Keywords**—Agricultural implements, agricultural systems, farm mechanization, land holdings

## I. INTRODUCTION

FARM mechanization is an important element of modernization of agriculture. The level, appropriate choice and subsequent proper use of mechanized inputs into agriculture has a direct and significant effect on achievable levels of land productivity, labour productivity, the profitability of farming, the sustainability, the environmental and, on the quality of life of people engaged in agriculture (Olaoye, J.O., 2010). The word "Mechanization" in agriculture means the development of land and the improvement of productivity by ameliorating adverse conditions through modern farm technology. The mechanization of agriculture is the "application of mechanical implements or as a whole, the application of the state-of-the-art technologies in agriculture to increase productivity and to reach sustainable agriculture". (Sharabiani, V.R. 2008). It is a well known fact that prior to the onset of green revolution, Indian agriculture was backward

and there had always been the problem of adequate supply of food in the country. But after the green revolution in the mid-sixties, technological and institutional advancement took place in agriculture. This has changed the entire outlook of agriculture. Traditional agricultural is being transformed into a worthwhile enterprise. (Singh, S. 1992). Mechanization, properly implemented, will be instrumental particularly in saving energy and resources and promoting use-efficiency and productivity of other farm inputs. (Viegas, E, 2003). The mechanization of farm power is becoming extremely important day by day for the survival, efficiency and competitiveness of all field and plantation crops of the country. (Dharmawardene, M. 2006). Agriculture sector occupies the centre stage of India's social security and overall economic welfare. Agriculture in India in the pre-green revolution period was mostly controlled by terrain, climate and edaphic factors. But after the introduction of innovative factors and technological inputs, Green revolution occurred and agricultural scene witnessed great change. Since then, by the virtue of its inherent edge over the conventional means of farming, agricultural mechanization has been gaining popularity. The increased use of farm machines has found expression in the phenomenal expansion of cropped area and cropping intensity and the countries agricultural production on all fronts. The shift has also helped in diversification of agriculture from conventional crops to commercial crops. The application of modern technology in agriculture was introduced in eastern Uttar Pradesh around 1980s. Agricultural Mechanization directly affects the production of food crops which in turn affect the food security and sustainability of a nation. Hence, it is important to study the status of agricultural mechanisation in one of India's most fertile plain i.e., the Devi Patan plain which includes the districts of Bahraich, Gonda, Balrampur and Shrawasti.

## II. OBJECTIVES

- A. To investigate and understand the level of mechanization of agriculture in different parts of the study area.
- B. To find out the spatial variations in agricultural Mechanisation in different parts of the study area.

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### III. DATABASE AND METHODOLOGY

The study is based on the secondary sources of data. Broadly, the agricultural machines which were used to find out the spatial variations in the Level of Mechanization in the different blocks of the study area are Wooden plough, Iron plough, Sowing instrument, Thresher machine, Sprayer, Tractor, Harrows & Cultivators, and Tube Wells. The data of total Agricultural implements, block wise machineries in the study area to calculate the total block wise distribution of total Agricultural implements, and decadal growth have been obtained from the Statistical bulletin and Statistical offices of the districts of Bahraich, Balrampur, Gonda and Shrawasti.

### IV. THE STUDY AREA

Devi Patan plain is the most backward region of Uttar Pradesh, which lies at the foothills of the Shiwalik range. The plain comprises of four districts namely Bahraich, Balrampur, Gonda and Shrawasti which jointly constitute a total of 44 blocks. Its latitudinal extent is 26° 40' 30" N to 28° 24' 30" N and 81° 03' E to 82° 49' E longitude. The total geographical area of Devi Patan is 14,229 sq.km. The study area comprises of 44 blocks. Its northern boundary touches Nepal. In the east it touches the Ayodhya city of Faizabad division, and Siddharthnagar, and in the south lays the districts of Barabanki, and Sitapur.

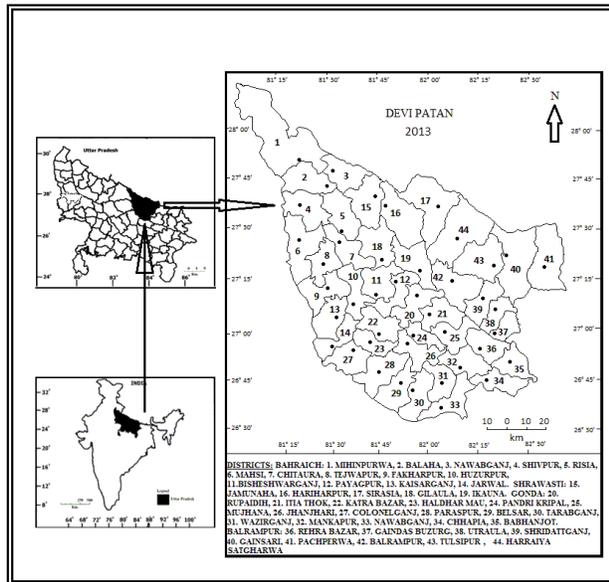


Fig. 1 Location Map of Devi Patan (2013)

### V. RESULTS AND DISCUSSIONS

The result obtained reveals that there is considerable variation among the blocks in terms of application of various agricultural implements.

#### A. Wooden Plough

The use of wooden plough in 1997 in the blocks of Devi Patan Plain is highly uneven. The blocks which show maximum wooden plough are Sirasia followed by Harraiya

Satgharwa. The blocks which come at the lowest are Huzurpur and Kaisarganj. In terms of wooden plough per hundred hectare of Net Sown Area (NSA) in 1997, there are nine (9) blocks which come under the category of very high group namely where Rehra Bazar is on the top. There are ten (10) blocks in the high category and eight (8) blocks in the medium group. There are ten (10) blocks in the low category namely Balaha, Mahsi, Fakharpur, Rupaideh, Colonelganj, Paraspur, Belsar, Mankapur, Babhanjot and Gaindas Buzurg. In comparison to all the categories, the very low category of blocks constitutes only seven (7) blocks, where Huzurpur is the lowest. The use of wooden plough in the year 2007 in the blocks of Devi Patan Plain is highly variable. The blocks which contribute the highest number of wooden plough are Harraiya Satgharwa and Jamunaha while Tarabganj and Gaindas Buzurg blocks contribute the lowest number of wooden plough. In terms of wooden plough per hundred hectare of Net Sown Area (NSA) in the year 2007, there are nine (9) blocks which come under the very high category where Jamunaha is the highest scorer. There are six (6) blocks each in the high and medium category both. The low category has twelve (12) blocks in the low category followed by eleven (11). Both categories combined show, Jarwal block at the highest and Huzurpur block at the lowest.

#### B. Iron Plough

In terms of use of iron plough per hundred hectare of Net Sown Area (NSA), in 1997, there are five (5) blocks which comes under very high category such as Mihinpurwa, Balaha, etc. There are eight (8) blocks in the high category where Payagpur block is highest. There are six (6) blocks the medium category where Nawabganj block is the highest. Twelve (12) blocks lie in the low group and thirteen (13) blocks in the very low category, Ikauna block being the lowest. There are huge variations among the blocks in the study area in terms of iron plough per hundred hectares of Net Sown Area (NSA) in 2007 as well. 12 blocks are included under the category of very high group in which Jamunaha block is highest followed by Balaha, Nawabganj, etc. There are only four (4) blocks under high category namely Shivpur, Fakharpur, Payagpur and Sirasia. Mihinpurwa and Huzurpur are the only blocks which come under the medium category group. There are six (6) blocks in the low and twenty (20) blocks in the very low category. The very low category accounts for 20 blocks, Ikauna block being the lowest followed by Paraspur, Tarabganj, etc.

#### C. Harrows and Cultivators

In terms of harrows and cultivators per hundred hectare of Net Sown Area (NSA), the study shows that in 1997 there are six (6) blocks which comes under the very high category namely Mihinpurwa, Balaha, Fakharpur, Pandri Kripal, Balrampur and Tulsipur. The high category incorporates six (6) blocks. Shivpur block contributes the highest share in this range. The other blocks under this are Risia, Tejwapur, Huzurpur, Kaisarganj and Jarwal. The medium category is contributes six (6) blocks in which Payagpur block is the

highest. The low category contributes the maximum number of 18 blocks of which Bisheshwarganj block contributes the highest. The other remaining blocks include Nawabganj 5.17, Mahsi 6.73, Chitaura, Hariharpur, Belsar, etc. There are eight (8) blocks in the very low category namely Sirasia, Ikauna, Katra Bazar, Haldhar Mau, Colonelganj, Paraspur, Rehra Bazar and Gainsari. In terms of harrows and cultivators per hundred hectare of Net Sown Area (NSA), it increased from 9.35 in 1997 to 15.82 in 2007. Jamunaha block is highest at 80.08. The other remaining blocks in the study area which comes under the very high category are Nawabganj, Kaisarganj, Hariharpur and Gilaula. There are five (5) blocks in the high category namely Risia, Mahsi, Chaitaura, Tejwapur and Jarwal block in which Mahsi is the highest. There are nine (9) blocks each in the medium and the low category. There are sixteen (16) blocks in the very low category, the lowest being the Rehra Bazar block.

#### *D. Thresher Machine*

In terms of number of thresher machine per hundred hectare of Net Sown Area (NSA) in the year 1997 was 5.15 in Devi Patan Plain. There are twelve (12) blocks which come under the very high category namely Huzurpur, Jarwal, Itia Thok, Pandri Kripal, Mujhana, Jhanjhari, Mankapur, Chhapiya, Babhanjot, Rehra Bazar, Utraula and Shridattganj. There are two (2) blocks each in the high and the medium category. The group of very low category includes maximum number of sixteen (16) blocks namely Balaha, Nawabganj, Shivpur, Risia, Mahsi, Chitaura, Tejwapur, Payagpur, Jamunaha, Hariharpur, Sirasia, Gilaula, Ikauna, Paraspur, Tulsipur and Harraiya Satgharwa. In terms of concentration of thresher machine in the study area, there are variations among the blocks. In the year 2007, the concentration of thresher machine was maximum in Chhapiya block which is 807. On the contrary, the lowest concentration was found at Tulsipur which is 118. In terms of number of thresher machine per hundred hectare of Net sown Area (NSA) in the year 2007. There are four (4) blocks which are grouped in the category of very high. Chhapiya block is highest followed by Utraula, Jhanjhari and Mankapur. The high category includes six (6) blocks namely Kaisarganj, Rupaidih, Itia Thok, Pandri Kripal, Wazirganj and Babhanjot block. The medium category incorporates the maximum of fifteen (15) blocks like Balaha, Nawabganj, Risia, Mahsi, Chitaura, Tejwapur, Jarwal, Jamunaha, etc. The low category includes thirteen (13) blocks where Tarabganj block is highest and Gainsari is the lowest. There are six (6) blocks in the very low category where Tulsipur is the lowest.

#### *E. Sprayers*

The variations found in the number of sprayers in 1997 was hefty in the study area, where the highest concentration is found in Tejwapur block where it is 2530 sprayers and the lowest concentration in Sirasia where it is only 10. There are nine (9) blocks each in the very high and high category of sprayers per hundred hectare of Net Sown Area (NSA) in the

study area, where the concentration of sprayer was found to be highest in Tejwapur block and lowest in Shivpur. There are four (4) blocks each in the medium and the low category, Rupaidih being the highest and Rehra Bazar the lowest. The rest of the remaining eighteen (18) blocks stood in the very low category. Some of them are Mihinpurwa, Nawabganj, Risia, Huzurpur, Bisheshwarganj, etc. The number of sprayers in Devi Patan Plain reduced from 21674 in 1997 to 5886 in the year 2007. In the year 2007 the concentration of sprayer was found to be maximum in Fakharpur block, where it is 355 sprayers and minimum in Sirasia where it is only 6. Eleven (11) blocks lie in the very high category, namely Balaha, Nawabganj, Risia, Mahsi, Chitaura, Tejwapur, Fakharpur, Bisheshwarganj, Payagpur, Kaisarganj and Jarwal. Only two (2) blocks namely Mihinpurwa and Shivpur fall under the high category. Huzurpur is the only block which falls in the medium category. There are ten (10) blocks in the low category where Pandri Kripal, Babhanjot and Gainsari Buzurg are at the lowest. There are twenty (20) blocks in the very low category like Jamunaha, Hariharpur, Sirasia, Ikauna, Rupaidih, Itia Thok, Katra Bazar, Haldhar Mau, Mujhana, Colonelganj, Belsar, etc.

#### *F. Sowing Instrument*

The concentration of sowing instrument in Devi Patan Plain is highly uneven. The total concentration of sowing instrument in the study area in the year 1997 is 3033. Jamunaha block contributes highest share of 1231 sowing instruments. On the contrary the lowest share is as low as 2 in Mahsi block. Only three (3) blocks are concentrated in the very high category namely Jamunaha followed by Risia and Nawabganj block. There are six (6) blocks each in high and medium category in which Balaha and Belsar block are the highest and Wazirganj and Rehra Bazar are the lowest. The category of the low group includes ten (10) blocks like those of Shivpur, Rupaidih, Haldhar Mau, Colonelganj, Tarabganj, Chhapiya, Gainsari Buzurg, etc. The remaining nineteen (19) blocks are concentrated in the very low category. The study reveals that the sowing instrument increased from 3033 in 1997 to 8556 in 2007. The highest concentration in the year 2007 is 541 in Chhapiya block followed by Mankapur and Rupaidih which accounts for 507 and 482 instruments respectively. In terms of number of sowing instruments per hundred hectare of NSA in Devi Patan Plain there are ten (10) blocks which comes under the very high category of which Chhapiya is the highest and Rupaidih is the lowest. There are seven (7) blocks which lie in the high category where Haldhar Mau is highest and Paraspur the lowest. There are eight (8) blocks in the medium category where the highest value is found in Jarwal block. Six (6) blocks comprise the low category. The group of very low category has a maximum of thirteen (13) blocks. The blocks under this group are Hariharpur, Sirasia, Ikauna, Rehra Bazar, etc.

### G. Tractors

There are hefty variations in the use of tractors among the different blocks in the study area. The total concentration of tractor in the year 1997 was 11065, which increased to 23299 tractors in the year 2007. The concentration of tractor was highest in Mihinpurwa block which was 578 and was as low as 4 tractor in Mahsi block. In the year 1997 there were ten (10) blocks in the very high category. It was highest in Rehra Bazar and lowest in Chhapi. Only three (3) blocks lay in high category namely Mihinpurwa, Itia Thok and Babhanjot. There are maximum of thirteen (13) blocks in the medium and twelve (12) blocks in the low category. The very low category comprise of six (6) blocks where Mahsi is the lowest followed by Tejwapur, Jamunaha and Hariharpur. In terms of number of tractor per hundred hectare of NSA in the year 2007, there are thirteen (13) blocks which are concentrated in the very high category where Rehra Bazar block is highest and Itia Thok the lowest. There are eight (8) blocks in the high category namely Jamunaha, Katra Bazar, Haldhar Mau, Mujhana, Colonelganj, Nawabganj, Pachperwa and Harraiya Satgharwa. The medium category group accounts for only five (5) blocks where Belsar is the highest and Tarabganj block the lowest. The low category includes a maximum of eleven (11) blocks namely Balaha, Nawabganj, Risia, Mahsi, Chitaura, Tejwapur, Jarwal, Hariharpur, Ikauna, Gainsari and Balrampur blocks. The very low category accounts for seven (7) blocks where Sirasia is the highest and Mihinpurwa the lowest.

### H. Tube Wells

The concentration of tube wells in Devi Patan Plain in the year 1997 was 323873, which increased to 458693 in the year 2007. In the year 1997, the highest concentration of tube wells was found in Mankapur block which was 15304 while the lowest was found in Katra Bazar with only 979 tube wells. In the year 1997, there are ten (10) blocks which come under the very high category where Mankapur is the highest and Bisheshwarganj the lowest. Six (6) blocks namely Payagpur, Gilaula, Ikauna, Gaindas Buzurg, Utrala and Balrampur lie under the high category. The category of medium group contributes a maximum of eleven (11) blocks in which Risia is the highest and Tulsipur the lowest. Seven (7) and ten (10) blocks fall in the low and very low category respectively among which Katra Bazar scores the lowest. In terms of number of tube wells per hundred hectare of NSA in the year 2007, there are twenty one (21) blocks which come under the very high category namely Risia, Mahsi, Chitaura, Jamunaha, Gilaula, Rupaidih, Itia Thok, Katra Bazar, Haldhar Mau, etc. Four (4) blocks come under the high category among which Wazirganj block is the highest. Eight (8) blocks namely Balaha, Nawabganj, Shivpur, Bisheshwarganj, Payagpur, Ikauna, Rehra Bazar and Gaindas Buzurg fall in the medium category. There are only two (2) blocks namely Mihinpurwa and Hariharpur which falls in the low category. Nine (9) blocks such as Fakharpur, Huzurpur, Kaisarganj, Jarwal, Sirasia, Gainsari, etc fall in the very low category.

## VI. CONCLUSIONS

The result obtained with the help of simple percentage method show that there is much variation among the different blocks in terms of use of different agricultural implements like wooden plough, iron plough, harrows & cultivators, thresher machine, sprayer, sowing instrument, tractor and tube wells. Besides, there is also regional variations in the agricultural infrastructure, the economic condition of farmers, the agricultural inputs, fertility of the land, availability of other inputs like high yielding varieties of seeds, chemical fertilisers, insecticides and pesticides which determines the overall agricultural production and prosperity for the farmers. Though a considerable increase is observed in the use of agricultural implements, over a span of ten years i.e., from 1997 to 2007, the paper aptly shows that agricultural mechanization, in the real sense, is still a far cry in the Devi Patan plain of Uttar Pradesh.

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