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Dr. Naima Umar
Department of Geography,
Aligarh Muslim University,
Aligarh, Uttar Pradesh, India

Correspondence
Dr. Naima Umar
Department of Geography,
Aligarh Muslim University,
Aligarh, Uttar Pradesh, India

Status of new agricultural technology at farm level in Aligarh District

Dr. Naima Umar

Abstract
The New Agriculture Technology is a unique event in agriculture, this saved peoples from hunger and starvation. It is the modern agricultural development technology which were occurring during the year between 1930s and late 1960s which has been increased agricultural production worlwidey. New agricultural technology initiatives, including such as HYVs of seeds, especially wheat and rice dwarf, use of chemical fertilizers, use of insecticides and pesticides, and assured water-supply and new farm machinaries. These are commonly called as a 'package of practices' which replace traditional agricultural technology. Proposed work analyses the status of new agricultural technology in Aligarh district by adopting the percentage method and during 2014-15 year of data has been followed.

Keywords: Agriculture, technology, land use patterns, crop land use patterns

1. Introduction
Land is the most significant as by far the larger proportion of inhabitants depend to carry out economic activities on it. Land use presents on extremely complex pattern, falling into different types. Land has markedly limited resource and which is important to needs and activities of mankind. Land provides the base for 3/4th of our food, all our timber and all our natural fibres. It provides the space for homes, offices, factories, schools, hospitals and other facilities that make up cities, towns and villages. The land use pattern which emerges in any area is resulted in by human settlement and its development represents due to the interaction of physical, historical, and socio-economic factors.

A) General Land Use Pattern
It is clearly shown from Table and Fig. 1 the district has occupied 82.22 percent net sown area. Net sown area shows that agriculture is the main source for their livelihood. It is followed by the area land put to non–agricultural uses include the area under buildings and factories, water bodies (river, lakes, canals, tanks, ponds, etc.), roads and railways. which occupied 11.08 percent area, Barren cultivable waste land 1.84 percent, Barren and uncultivable land 1.58 percent, Other fallow land 1.28 percent. The area under Forest, Pasture, Current Fallow land and Area under bush, forest & garden occupied below 1 percent.

Table 1: Percentages of Land use in Aligarh District (2014-15)

Land use	Percent
Net Sown Area	82.22
Forest	0.69
Barren Cultivable waste	1.84
Current Fallow land	0.76
Other fallow land	1.28
Barren and uncultivable land	1.58
Land put to non agricultural Uses	11.08
Pastures	0.47
Area under bush, forest & garden	0.09
Total Reported Area	100

Source: DiDistrict Statistical Bulletin, (Sankyikiya Patrika) District Aligarh, 2014-15

Table and Fig. 2 shows the blockwise land use in Aligarh district. Highest net sown area is reported in Khair block i.e. 87.06 percent followed by Gonda. Lowest net sown area is reported in Bijouli block i.e 75.72 because it is most urbanized block of the district and the area is steadily engulf by the urbanization. The area under forest is very low with maximum percentage are shown by Akrabad i.e. 3.01, while the lowest in Tappal block.

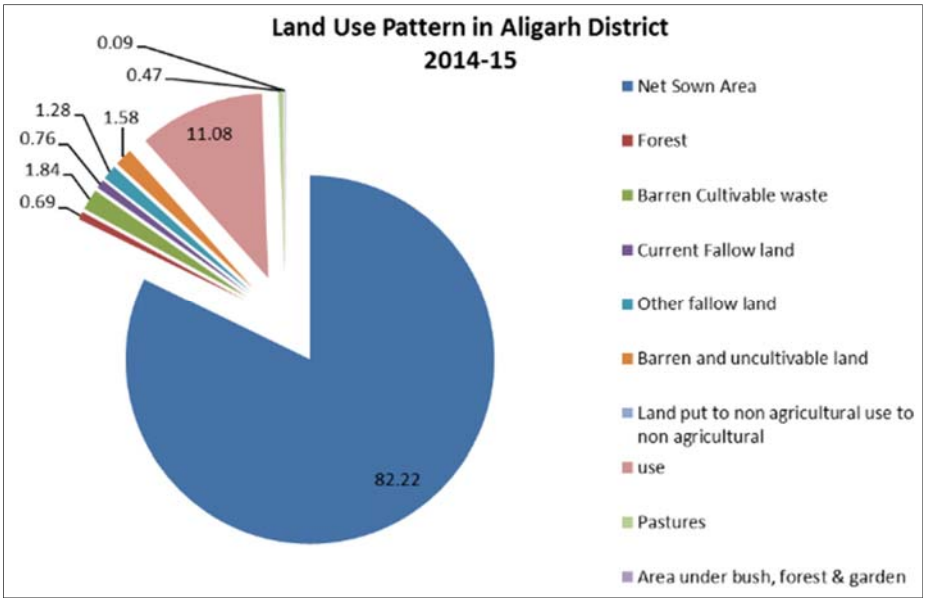

Fig 1

Table 2: Blockwise Percentages of Land Use in Aligarh District (2014-15)

Blocks	Total Area	Net Sown Area	Forest	Barren Cultivable Waste	Current Fallow Land	Other Fallow land	Barren and uncultivable land	Land put to non agricultural use	Pastures	Area under bush, forest & garden
1. Tappal	37429	83.43	0.12	2.73	0.49	0.73	0.94	11.01	0.55	0.00
2. Chandaus	33367	85.79	0.39	2.21	0.56	1.05	1.31	8.18	0.48	0.03
3. Khair	32002	87.06	0.14	1.97	0.52	0.83	1.17	7.80	0.46	0.04
4. Jawan Sikanderpur	31605	78.09	2.64	1.02	0.85	1.47	1.73	13.45	0.61	0.13
5. Lodha	27227	79.67	0.18	1.63	1.35	4.38	2.12	9.79	0.85	0.03
6. Dhanipur	30036	80.14	0.17	3.20	0.87	1.49	3.00	10.69	0.40	0.04
7. Gonda	29210	86.31	0.24	0.71	0.55	1.30	0.58	10.03	0.27	0.02
8. Iglas	25535	85.70	0.33	0.26	0.41	1.25	0.60	11.00	0.41	0.04
9. Atrouli	27325	85.31	0.77	0.78	0.39	0.81	0.85	10.25	0.49	0.35
10. Bijouli	24914	75.72	0.80	2.36	1.10	0.04	2.13	17.11	0.59	0.14
11. Gangiri	34757	84.98	0.18	1.95	0.64	1.08	1.25	9.42	0.45	0.05
12. Akrabad	25871	83.08	3.01	1.33	0.38	0.31	3.30	8.26	0.11	0.22
Total District	371261	82.22	0.69	1.84	0.76	1.28	1.58	11.08	0.47	0.09

Source: District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh, 2014-15

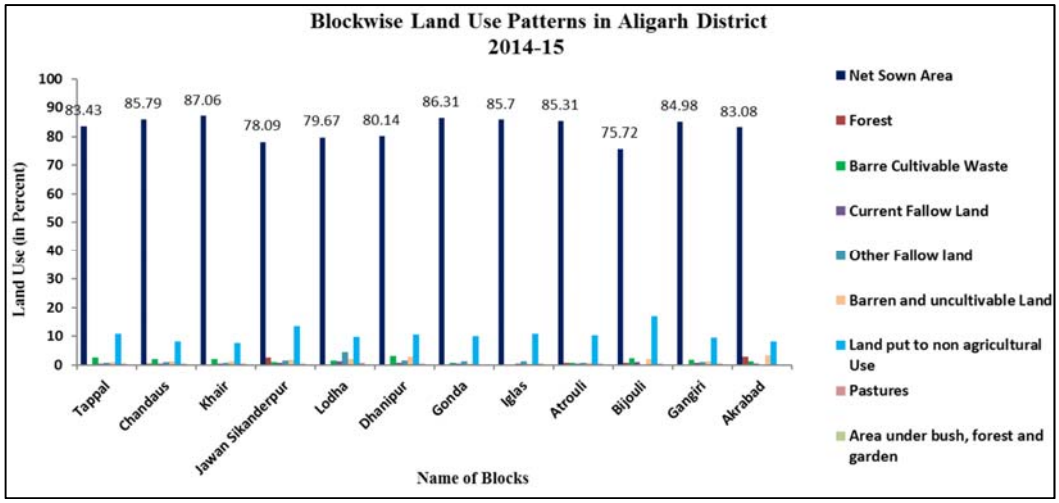

Fig 2

Table 3: Blockwise Percentage of Total Area under various seasons in Aligarh District.

Name of Blocks	Total Area	Area More than Once (%)	Total Gross Cropped Area	Gross Cropped Area (%)		
				Rabi	Kharif	Zaid
1. Tappal	37429	68.33	56803	52.33	44.81	2.86
2. Chandaus	33367	62.11	49350	53.01	44.47	2.52
3. Khair	32002	66.33	49087	57.25	37.97	4.78
4. Jawa Sikanderpur	31605	58.47	43159	50.01	46.20	3.78
5. Lodha	27227	60.34	38120	53.22	41.41	5.37
6. Dhanipur	30036	52.37	39803	50.59	43.22	6.18
7. Gonda	29210	69.01	45367	53.49	39.99	6.52
8. Iglas	25535	64.18	38272	51.87	35.07	13.06
9. Atrouli	27325	71.00	42712	49.37	45.20	5.43
10. Bijouli	24914	60.54	33947	51.27	45.68	3.05
11. Gangiri	34757	62.21	51161	49.88	46.59	3.52
12. Akrabad	25871	77.49	41540	51.02	45.23	3.76
Total District	371261	63.74	541907	51.88	43.15	4.97

Source: District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh, 2014-15

A) Crops Land Use Pattern

Cropping land use pattern refers to the proportion of area under devoted to crops at any given point of time in an unit area or the sequence and spatial arrangement of crops follow on a given area. Before assessing the cropping land use pattern, it is need to know about crops, their sowing and harvesting seasons. There are two main crop seasons in which crops are grown in the state, e.g., *kharif* or the summer crop season, and the *rabi* or the winter crop season. Therefore, sowing in *kharif* season begins generally with the onset of southwest monsoon in mid-June, while the *rabi* season sowing starts with the beginning of cold weather season, i.e., by the end of the month of October or early November, when the monsoon has receded. The food crops grown in *kharif* season are: rice (*Oryza sativa*), jowar (*Sorgum vulgare*), bajara (*Penniselum typhoidieum*), maize (*Zea mays*), pizeon-pea (*Cajanus indicus*), green gram, (*Phaseolus dureus* roxb), black gram (*Phaseolus mungo*), groundnut (*Arachis hypogea*) and sugarcane (*Saccharum officinarum*). These crops require high temperatures and plentiful supply of water. The food crops of rabi season are: wheat (*Triticum sativum*), lentils (*Lens esculenta*, also Erven lens) barley (*Hordeum vulgare*), Bengal gram (*Cicer arientinum*), peas (*Pisum sativum*) and potatoes (*Solanum tuberosum*). These crops require cool weather and moderate supply of water. The harvesting period of kharif crops starts at the end of monsoon, i.e., September to October (may continue till November in some cases), and the rabi crops are generally harvested.

Agriculture is well developed specially in doab region which is fertile and vast alluvial plain. For analyzing crop land use pattern, the data during 2014-15 have been taken. Table 3 shows the percentage of area more than once and gross cropped area in different seasons. The highest area more than once recorded in Akrabad block (77.49%) and lowest in Dhanipur (52.37%). The highest gross cropped area of rabi season has been recorded Gonda (53.49%) followed by Lodha (53.22%) and Chandaus (53.01%) respectively. In Kharif season Gangiri (46.49%) and Jawan Sikanderpur (46.20%) have highest gross cropped area and in zaid season Iglas block (13.06%) is marked by highest gross cropped area. Lowest gross cropped area in rabi season has been marked in Atrauli (49.37%) and Gangiri (49.88%) blocks, in Kharif season is recorded in Iglas (35.07%) and Khair (37.97%), in Zaid season Chandaus (2.52%) and Tappal (2.86%) blocks are marked by lowest gross cropped area.

Table 4: Cropwise Area of Major Crops to Gross Area Sown (2014-15)

S. No.	Major Crops	Area in Percent
1	Rice	16.53
2	Wheat	40.73
3	Maize	3.62
4	Barley	1.39
5	Millet	15.90
6	Pulses	3.00
7	Oilseeds	3.01
8	Sugarcane	1.24
9	Potato	4.80
Total		100.00

Source: District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh, 2014-15.

In Table 4 clearly shown that highest area occupied by wheat 40.73% followed by rice i.e. 16.53% and millet 15.90%. and lowest area are occupied by barley (1.39%) and sugarcane (1.24%) in Aligarh district. Bockwise analysis indicates that the highest area under rice is occupied by Dhanipur (30.73%), Akrabad (30.38%) and Jwan Sikanderpur (26.17%) and lowest occupied by Gangiri l(2.14%) and Bijouli (2.84%) respectively. The highest percentage of area under wheat is marked by Tappal (45.66%), Akrabad (44.42%), Bijouli (42.86%), Jawan Sikanderpur (42.35%) and Dhanipur (42.24%) and lowest found in Iglas block (27.94%). In the case of maize, the highest area are occupied by Atrouli (10.43%), Gangiri (8.41%) and Bijouli (7.16%) and lowest by Gonda (0.29%) and Khair (0.75%). Barley occupies highest area in Gangiri (2.96%) and Bijouli (2.07%) and lowest in Iglas (0.66%), Tappal (0.87%) and Dhanipur (0.93%). Millet has covered highest area in Gangiri (28.29%), Bijouli (25.05%) and Lodha (22.50%) and lowest in Jawan Sikanderpur (7.72%) and Tappal (8.67%). Comparatively, Pulses have covered less area than wheat and rice. The highest area under pulses have been marked in Dhanipur (5.25%) and Jawan Sikanderpur (4.03%) and lowest in Gonda (1.58%) and Bijouli (1.90%). Highest area under oilseeds occupied by Lodha (4.42%) and Chandaus (4.28%) and lowest by Iglas (1.45%) and Gonda (1.78%). Sugarcane has highest area in Bijouli (2.63%), Tappal (2.54%) and Jawan Sikarderpur (2.52%) and lowest in Iglas (0.02%) and Gonda (0.04). Potato occupied higher area than Maize, barley, pulses, oilseeds and sugarcane. The highest area under potato occupied by Iglas (24.90%) and secondy by Gonda (12.60%) and lowest by Jawan Sikanderpur i.e. 0.94%

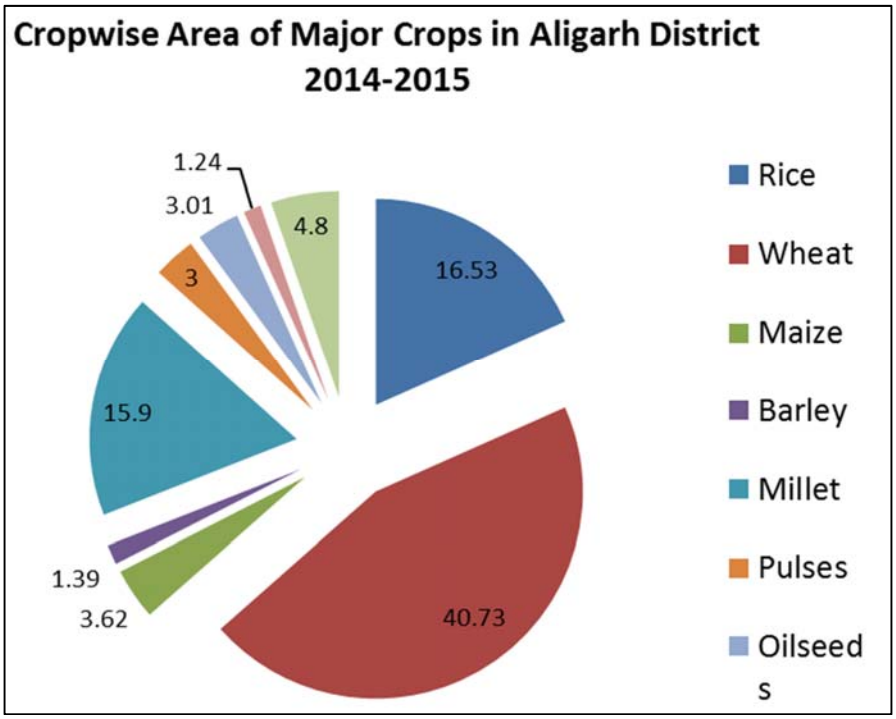

Fig. 3

Table 5: Blockwise Percentage of Area under Major Crops to Total Gross Area Sown in Aligarh District-2014-2015

Name of Blocks	Total Gross area sown	Rice	wheat	Maize	Barley	millet	Pulses	oilseeds	Sugarcane	Potato
1.Tappal	56803 (10.48 %)	11.84	45.66	1.01	0.87	8.67	2.29	3.65	2.54	1.52
2. Chandaus	49350 (9.11 %)	20.99	41.96	1.34	1.25	15.41	3.47	4.28	1.95	2.09
3. Khair	49087 (9.06 %)	14.89	41.04	0.75	1.21	11.16	2.53	3.96	1.31	4.24
4. Jawa	43159 (7.96 %)	26.17	42.35	7.31	1.31	7.72	4.03	2.89	2.52	0.94
5 Lodha	38120 (7.03 %)	9.34	38.11	1.69	1.62	22.50	3.64	4.42	0.36	5.79
6. Dhanipur	39803 (7.34 %)	30.73	42.24	2.41	0.93	12.29	5.25	2.61	0.69	2.71
7. Gonda	45367 (8.37 %)	19.23	38.36	0.29	1.02	18.67	1.58	1.78	0.04	12.60
8. Iglas	38272 (7.06 %)	10.26	27.94	0.30	0.66	18.94	2.75	1.45	0.02	24.90
9. Atrouli	42712 (7.88 %)	13.04	40.41	10.43	1.74	14.86	2.75	3.43	0.58	1.47
10.Bijouli	33947 (6.26 %)	2.84	42.86	7.16	2.07	25.05	1.90	2.50	2.63	1.16
11. Gangiri	51161 (9.44 %)	2.14	41.55	8.41	2.96	28.29	2.26	2.38	1.23	1.08
12. Akrabad	41540 (7.67 %)	30.38	44.42	2.50	0.94	12.35	3.43	2.59	0.76	1.22
Total Districts	541907 (100.00 %)	16.53	40.73	3.62	1.39	15.90	3.00	3.01	1.24	4.80

Source: District Statistical Bulletin, (Sankyikiya Patrika).

Average production of major crops quintal per hectare is given in the table 6. During 2012-13, the production of rice has been increased 24.52 quintal/hectare from 21.8 quintal/hectare during 2011-12. Average production of wheat has been shown decrease from 37.61quintal/hectare during 2011-12 to 34.96 quintal/hectare during 2012-13. Average production of maize, millet, pulses, oilseeds and potatoes has been increased during 2012-13.

Table 6: Aligarh District: Average Production of Major Crops (quintal/hectare) in Aligarh District. (2011-12 and 2012-13)

S. No.	Name of Crops	2011-12	2012-13
1	Rice	21.8	24.52
2	Wheat	37.61	34.96
3	Maize	20.08	26.67
4	Barley	35.06	32.23
5	Millet	19.34	24.94
6	Pulses	8.36	10.05
7	Oilseeds	13.41	20.46
8	Sugarcane	N.A	615.68
9	Potato	230.92	276.18

Source: District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh, 2011-12, 2012-13

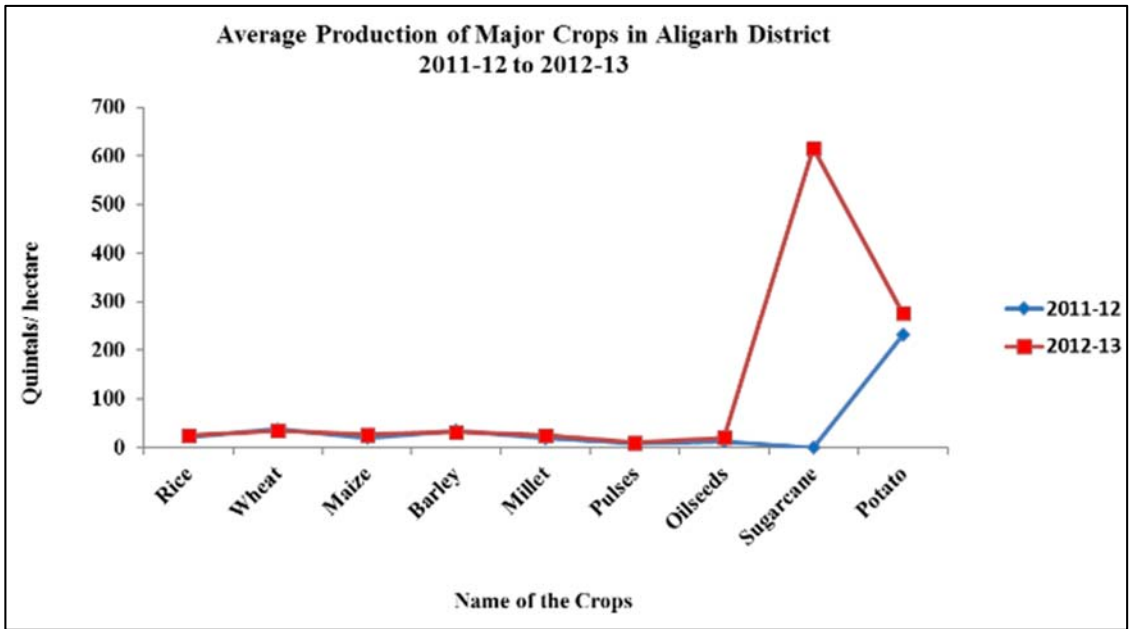

Fig 4

A) Sources of Irrigation

Irriagation is one of the basic input for agriculture development but its utilization depends on physical, social and technological factors. Water may be available to crops by rainfall, and it can also supply to fields through human efforts. The process of supplying water to crops by means of canals, well, tube-wells, tanks, ponds or tapping water from underground sources. Irrigation has been one of the most important factors which in increasing agricultural production, new agricultural technology was entirely dependent upon it. It is realized that assured and controlled water supply is an essential requirement for achieving the full potentials of high-yielding varieties (HYV) of seeds. It is estimated that, more than five tonnes of water is needed to grow one kilogram of rice. The introduction of new agricultural technology, particularly the high yielding varieties of seeds and use of chemical fertilizers are are required much water. Rainfall is erratic and uncertain, Due to this reason, appropriate irrigation facility is necessary for agriculture production (Ashfaq, M., Hassan, S., *et al*, (2008) [2].

There are no well and pond irrigation system in Aligarh district found only canal and tubewell irrigation system that farmers have followed. On the basis of blockwise analysis, the highest canal irrigation are found in Akrabad (19.34%), Dhanipur (17.43%) and Khair (14.76%) and Lowest in Atrauli (0.13%), Lodha (0.16%) and Gangiri (0.42%) blocks. There are two types of tubewell irrigation system are particularly following in

Table 7: Blockwise Status of Sources of Irrigation in Aligarh District (2014-15)

Blocks	Canals (%)	Tubewells (%)		Total
		Public	Private	
1. Tappal	4.57	0.00	95.43	31706 (10.42%)
2. Chandaus	2.54	1.92	95.54	28039 (9.21%)
3. Khair	14.76	1.50	83.73	27051 (8.89%)
4. Jawan Sikanderpur	9.09	1.06	89.85	24514 (8.05%)
5. Lodha	0.16	1.25	98.59	22253 (7.31%)
6. Dhanipur	17.43	0.52	82.05	23159 (7.61%)
7. Gonda	7.64	0.17	92.19	25327 (8.32%)
8. Iglas	3.12	0.00	96.88	21965 (7.22%)
9. Atrauli	0.13	3.86	96.02	23841(7.83%)
10. Bijouli	3.80	1.87	94.33	19055(6.26%)
11. Gangiri	0.42	3.79	95.79	29848(9.81%)
12. Akrabad	19.34	1.74	78.93	20513(6.74%)
Total District	6.98	1.48	91.52	304337 (100%)

Aligarh district i.e. Public and Private tubewell irrigation systems. Percentage of public irrigation system is very low below 2% in Aligarh districts. Private irrigation system is currenty at the top with highest percentage more than 90% are followed by Tappal, Chandaus, Lodha, Gonda, Iglas, Atrauli, Bijouli and Gangiri blocks and lowest is marked by Akrabad block (78.93%).

Fig. 5 clearly shows that the irrigation sources in Aligarh district is high in five blocks i.e Tappal, Chandaus, Khair, Gonda and Gangiri having percentage above 8.32 and medium irrigation are found in four blocks namely, Jawan Sikanderpur, Atrauli, Lodha and Dhanipur with percentage in between 7.31 and 8.32 and low sources of irrigation with value below 7.31 percent are marked by Bijouli, Akrabad and Iglas.

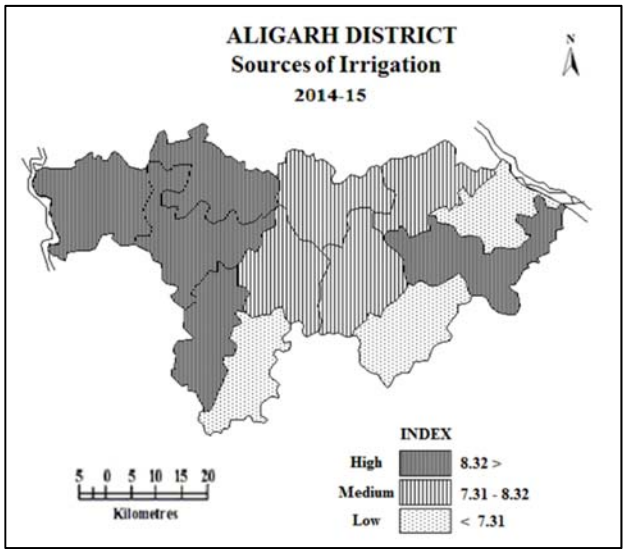

Fig 5

A) Chemical Fertilizer

Fertility of land declines usually with the passage of time. For improving and maintaining fertility, soils are enriched by applying manures (compost and green manure) and chemical fertilizers (NPK). HYV give rise to short stemmed, sliff strawed plants that respond well to heavy dozes of fertilizers. These dwarf verities give much higher yield per unit area. Recommended doses of chemical fertilizers for the new seeds of wheat and rice (in terms of NPK) were 90-45 Kg per hectare. Khullar (2006) has identified serious problems of soils which can be improved with the help of manures and fertilizers. Hussain (2002) is of the opinion that, soil fertility can be improved with the use of chemical fertilizers (NPK).

Table 8: Blockwise Consumption of Chemical Fertilizer (metric tonnes) in Aligarh District- 2013-14.

Blocks	Nitrogen	Phosphorus	Potash	Total
1. Tappal	4730	2349	260	7339 (8.45%)
2. Chandaus	4729	2257	248	7234 (8.33%)
3. Khair	4723	2257	250	7230 (8.32%)
4. Jawa	4721	2258	254	7233 (8.33%)
5. Lodha	4729	2259	261	7249 (8.35%)
6. Dhanipur	4705	2243	248	7196 (8.29%)
7. Gonda	4739	2251	231	7221 (8.31%)
8. Iglas	4737	2280	231	7248 (8.35%)
9. Atrouli	4736	2278	244	7258 (8.36%)
10. Bijouli	4726	2262	255	7243 (8.34%)
11. Gangiri	4727	2178	249	7154 (8.24%)
12. Akrabad	4782	2204	256	7242 (8.34%)
Total Districts	56784	27076	2987	86847 (100%)

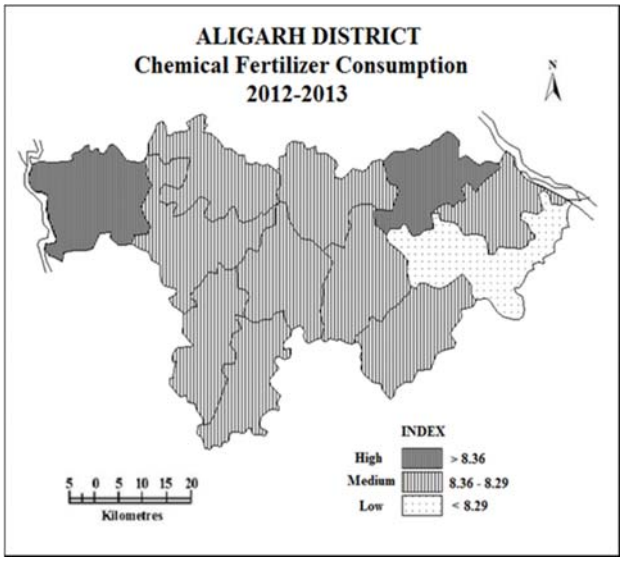

Fig 6

Table 8 and Fig.6 clearly reveal that consumption of chemical fertilizer is highest in only two blocks i.e Tappal and Atrauli with a value above 8.36 percent. Medium chemical fertilizer consumtion found in 10 blocks of Chandaus, Khair, Jawan, Lodha, Dhanipur, Gonda, Iglas, Bijauli, and akrabad with ranged in between 8.36 and 8.29 percent and low found only in one block of Gangiri with value less than 8.29 percent.

A) Agricultural Impliments

Much success of farming during the green revolution depends upon farm mechanization. Mechanization saves a lot of human labour and quickens the farm operations, thereby adding to farm efficiency and productivity. Modern farming tools and machines like tractors, threshers and sprayers are imperative for successful realization of the potential of HYV of seeds. These varieties as stated at the very outset require elaborate arrangement of water from canals and tube-wells. Rising of three and four crops from the same field in one year is possible only if, modern farm technology is available to farmers.

Traditional ploughs and bullock carts seem less efficient to work for and finish farm operations in time. Modern machinery, like tractors, tillers, threshers, chaff cuttures, pumping sets, etc. are required and use for timely operations of sowing, weeding, spraying and harvesting. Mechanization of agriculture also helps in judicious use of complementary inputs like irrigation water, chemical fertilizers, insecticides and pesticides.

Studies conducted by various organizations and individuals have highlighted the impact of agricultural mechanization on farm production and productivity. Singh and Singh (1972) [21] concluded that, use of tractors farms gave higher

yields of wheat, paddy and sugarcane, and produced a higher overall gross output per hectare than non-tractor farms. NCAER (1973) [17] attempted to compare values of annual farm output per hectare of net sown area under different levels of mechanization. As per results, output per hectare was found increased as the level of mechanization increases from irrigated non - mechanized farms to tubewell, tractor-thresher farms.

Singh and Chancellor (1974) [22] found that, though, tractor and tubewell farms had significantly higher yields than bullock operated farms in the cultivation of wheat, much difference was accounted for by difference in other factors such as level of irrigation. The use of modern methods of irrigation, modern machineries like combined harvesters and threshers, tractors etc. have contributed a lot in increasing the agricultural output due to their timeliness and efficiency of operations (Hassan, 2013) [9].

Table.9 and Fig. 7 shows that the highest percentage of *wooden ploughs* are marked in Gangiri (32.13%) and lowest in Iglas (1.83%) blocks. *Iron ploughs* also noticed highest in Gangiri (22.70%) but lowest in Gonda (2.53%) and Iglas (2.99%) blocks. In the case of *advanced harrows and cultivator*, show highest percentage in Tappal (13.37%) and Gangiri (12.68%) but but lowest marked in Bijouli (5.48%) block. Highest percentage of *advanced thrasher machines* is found in Atrauli (29.72%) and lowest in Akrabad (3.15%) and Dhanipur (3.59%) blocks. Tappal (19.30%) and Khair (17.71%) show highest percentage in *Sprayers* and lowest in Gangiri (1.78%) and Bijouli (1.89%). *Advance Sowing Instruments* are commonly found in every blocks but highest percentage hown by Tappal (19.36%) and Akrabad (14.50%) and lowest by Atrauli (1.43%) blocks. The highest block variation in *tractor* have been seen in Tappal which has value 44.02% and Bijouli 2.29%.

Table 9: Percentage of blockwise Agricultural Implements in Aligarh District (2013-14)

Blocks	Plough		Advance Harrow & Cultivator	Advance Thrasher Machine	Sprayer	Advance Sowing Instruments	Tractor
	Wooden	Iron					
1. Tappal	5.63	7.94	13.37	5.94	19.30	19.36	44.02
2.Chandaus	6.28	7.20	7.86	4.20	7.50	11.16	6.87
3. Khair	4.89	6.65	9.22	4.90	17.71	12.06	5.81
4. Jawa	2.68	4.46	7.38	11.89	4.60	4.38	5.39
5. Lodha	6.70	7.10	8.10	4.55	6.34	9.61	5.57
6. Dhanipur	6.32	8.34	7.48	3.50	9.59	7.14	5.02
7. Gonda	2.81	2.53	7.14	4.90	8.82	5.63	5.93
8. Iglas	1.83	2.99	6.07	5.59	10.90	7.82	5.97
9. Atrouli	6.65	8.55	6.33	29.72	6.50	1.43	3.69
10. Bijouli	15.23	13.70	5.48	11.19	1.89	2.57	2.29
11. Gangiri	32.13	22.70	12.68	10.14	1.78	2.35	4.33
12. Akrabad	8.29	6.96	7.66	3.15	3.29	14.50	4.04
Total District	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: District Statistical Bulletin, (Sankyikiya Patrika) District Aligarh, Projected from census, 2003

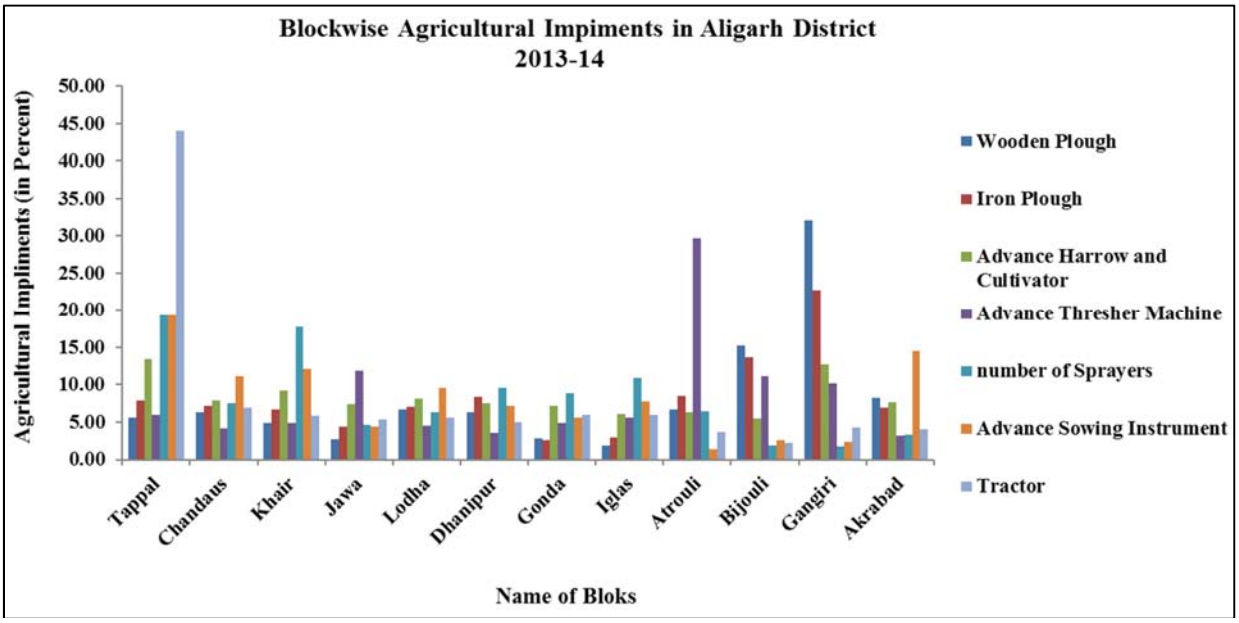

Fig 7

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