Study of irrigation sources and cultivation area for Cereals & Pulses in the district of Meerut, Uttar Pradesh (India)

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Abstract— *Cereals and pulses play a significant role in the diet of population. As per WHO, the recommended ratio is 2:1 for cereals and & pulses. However, there are different reasons which have gone against the production of pulses in general. Cereals on the other hand, have picked up larger portion in overall cultivation and consequently, the gross & net sown area are more under the cultivation of cereals. Currently, the ratio between cereal to pulses production ranges from 8:1 to 6:1. In this paper, it is found that the ratio between cereals and pulses which was 7.3:1 in the year 2012-13 increased to 7.7 1 in the year 2018-19. The study found that there was not much change in the gross & net area sown in the district of Meerut from the year 2012-13 to 2018-19. Irrigated area was also constant in both the years. Furthermore, production of different cereals and pulses are studied to know whether there is any change in their production due to change in the availability of water for irrigation during studied years in the district of Meerut, Uttar Pradesh.*

Keywords— Meerut, Crops, cereals, Pulses, Irrigated area, gross sown area, net sown area, irrigation sources, canals, tube wells.

I. INTRODUCTION

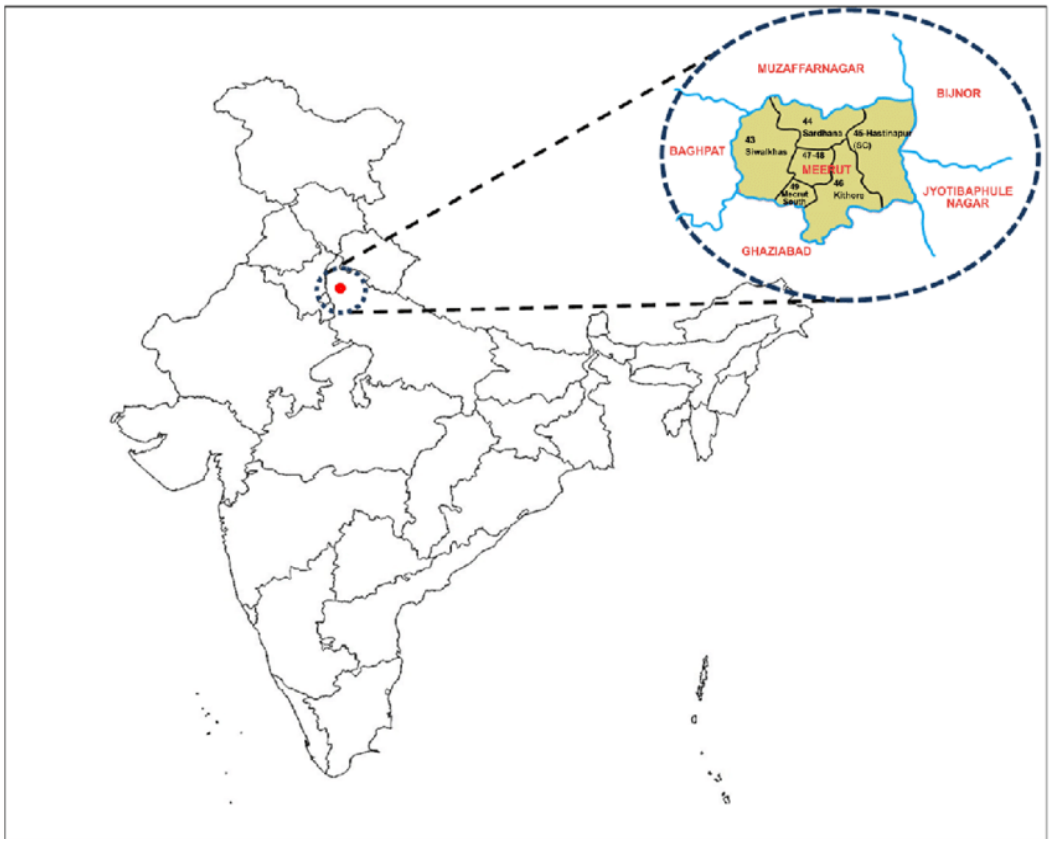
Humankind is primarily fed with agricultural products since ages. Cultivable land and resources required to cultivate crops has been limited to humankind. With ever increasing population, pressure is mounting up to produce more and more from every acre to feed population. For crop production, besides many other resources to ensure higher productivity, water is the most important critical resource. Besides a rain, which still is main source of water for agriculture; people at large have tried to innovate and build mechanical tools to pump out water from ground or taking water from one place to other through canals etc, since ages. History is filled with stances wherein rulers in the past have spent good amount of their revenues on ensuring water to farmers. This is continuing with modern day governments of every country.

All man-made means used to water agriculture fields are termed as irrigation source. Irrigation has become most critical input of agriculture production process. Canal is most critical among others. Canals have been in the past and now remained major resource. However, it is not easy to build canals on one hand and on the other hand, it is not possible to ensure canal reaching every field in nook & corner of the country. It has led to develop ways and means to ensure water reaching every possible field by other sources. In the past, means like Rahat, man-driven pulleys were used to lift water from underground sources. Mechanisation has made it little easy. Diesel generators have become common ways to pump put water now and perhaps easily accessible to farmers.

In general, all above mentioned types of irrigation are termed as Surface Irrigation Method. Surface irrigation has become the commonly used source to ensure water for cultivation. To summarise, surface irrigation includes canals, tube wells of all types, & traditional means of irrigation like Rahat etc. In the year 2018-19, irrigation from canals was 14.9%, government tube well 1.2% & private tube wells was 83.9%.

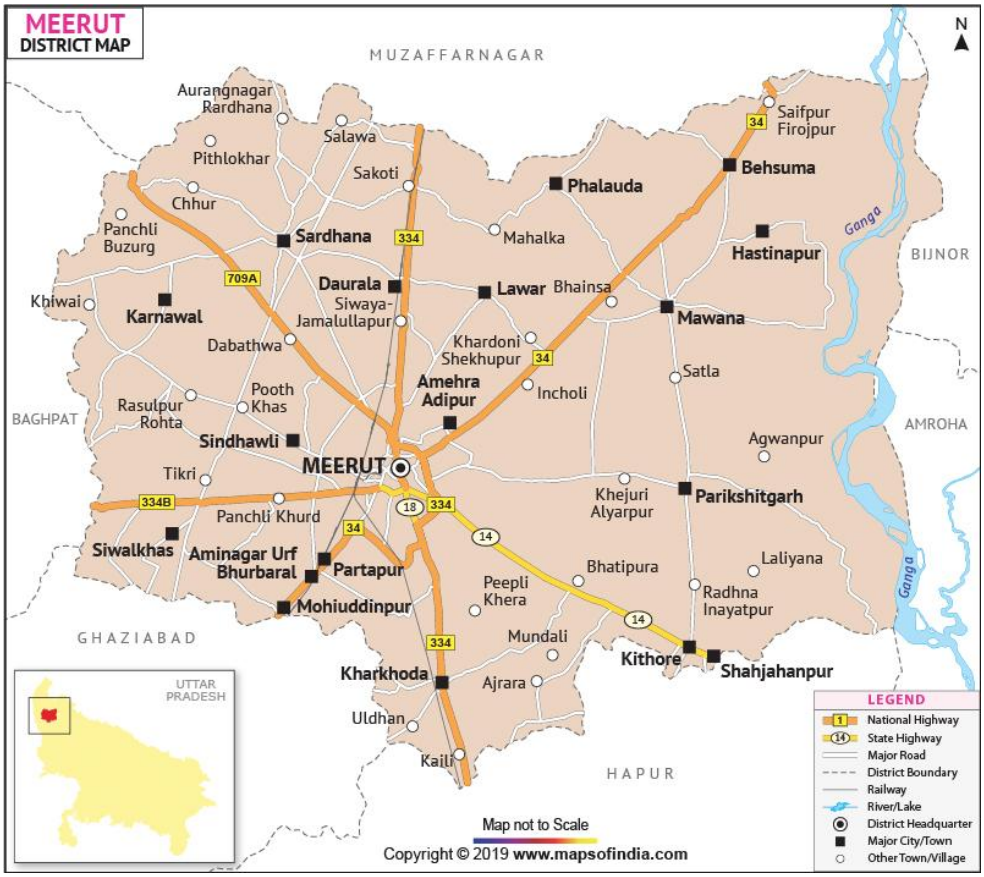
With decreasing level of availability in water at large and water for irrigation has been an area of concern for governments. Per capita availability of water which was around 5247 cubic meter in 1951 has gone down to 1453 cubic meter in 2015. Still with the above change, irrigation has positively influenced agriculture in Uttar Pradesh in general and district of Meerut in particular in last couple of years. Today, including Meerut district, Uttar Pradesh is naturally blessed to have a strong irrigation system, which is having the third highest gross irrigated area of 82.5% in 2014-15. In total, Uttar Pradesh has

around 74659 kms of canals, 28 major and medium-lift canals, 249 minor lift canals, 69 reservoirs/budhis and about 32,000 running tube wells operated by the government. Tube wells are the major sources of irrigation. Tube wells have 80.2% share in the total irrigation sources, followed by canals which is 17.9%. Availability of water in the state and the district has made farmers growing crops like rice and sugar cane which require large quantities of water.



MAP-1: Meerut district on India Map

MAP-2: Meerut district within the state of Uttar Pradesh, India



MAP-3: Meerut district map giving details of irrigation sources etc.

II. OBJECTIVES

1) To study change in areas of coverage under different irrigation sources

2) To study change in cultivation of crop pattern

3) To discuss impact of change in irrigation on cultivation pattern

III. MATERIALS & METHODS

In this paper, relevant data about different irrigation sources for the years 2012-13 and 2018-19 are studied to find out impact of any change in irrigated area on crops under cereals & pulses. The data has been tabulated and presented in such a way that they provide basis of interpretation. Calculation is done based on percentage change in studied variables. This study is done based on secondary data, collected from different sources.

IV. RESULTS & DISCUSSION

4.1 Gross & Net irrigated area

While studying net Irrigated area, the basic definition considered is that net irrigated area is the area irrigated through any source at least once in a year for a particular crop. From the Figure -1 below, the net irrigated area in the district of Meerut has remained mostly unchanged. It was 303 thousand hectares in 2012-13 which was marginally reduced to 300 thousand hectares in the year 2018-19. In percentage terms, there was a marginal decrease of 0.03% in net irrigated area from the year 2012-13 to 2018-19.

For, the net irrigated area had not changed much from the year 2012-13 to 2018-19; correspondingly change was there in the gross and net sown areas for the year 2012-13 to 2018-19 in the district. The gross sown area for the district was 300 thousand hectares in the year 2012-13 which marginally increased to 303 thousand hectares in the year 2018-19. However, no change was there in the net sown area in the years 2012-13 to 2018-19 in the district of Meerut. In absolute terms, net sown area was 196 thousand hectares in the year 2012-13 which remain unchanged in the year 2018-19, as presented in the Figure-2.

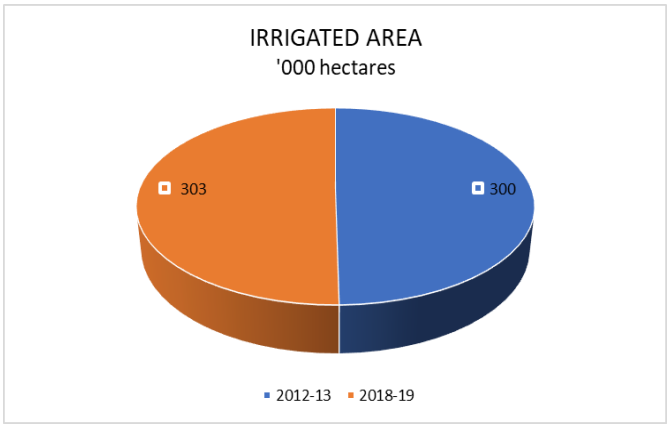


FIGURE 1: Gross Irrigated Area for years 2012-13 & 2018-19 in Meerut District

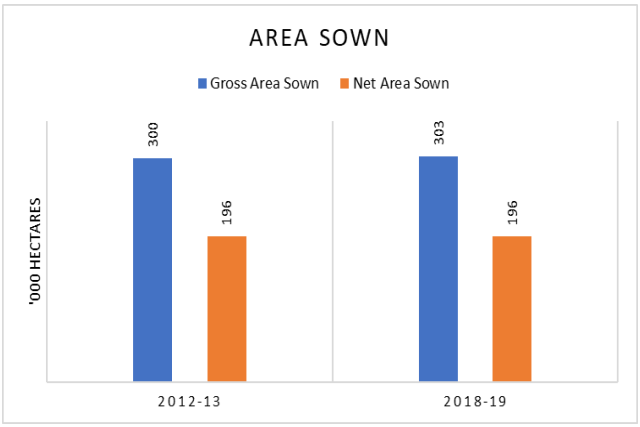


FIGURE 2: Gross & Net Sown Areas for years 2012-13 & 2018-19 in Meerut District

4.2 Irrigation by different sources

Ware availability for cultivation in the district of Meerut, Uttar Pradesh is primarily from canals, government tube wells and private tube wells. There are few other traditional sources of irrigation which were used in the district.

In the year 2012-13, share of different sources of irrigation was like, from canal 33299 hectares of agricultural land was irrigated in the district of Meerut, Uttar Pradesh while government tube wells covered 2459 hectares of agriculture land. However, the maximum irrigation came from private tube wells which covered 160512 hectares of land which was approx. 82% of all irrigation sources in the district. Figure -3 below provides the relevant details.

In comparison, in the year 2018-19, irrigation from canals was reduced to cover only 29353 thousand hectares of land. Likewise, government tube wells share was also reduced to 2289 hectares. On the other hand, the share of private tube wells in overall irrigation increased by around 2% to approx. 84% of total irrigation water from different sources in the district of Meerut as per Figure-4 below.

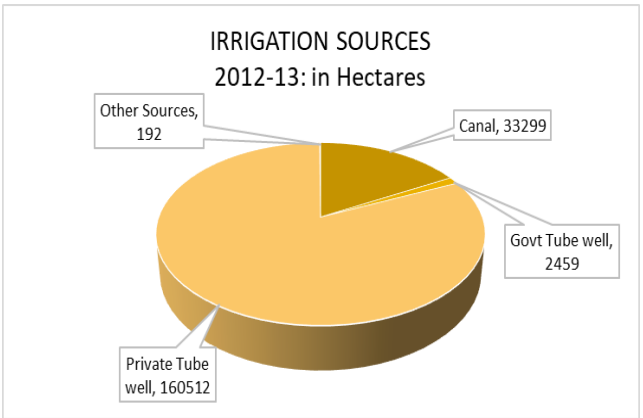


FIGURE 3: Share of different Irrigation Sources in net irrigated area in the year 2012-13 in Meerut district

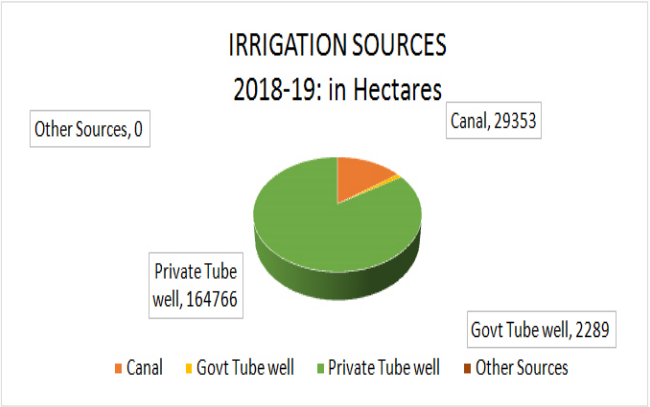


FIGURE 4: Share of different Irrigation Sources in net irrigated area in the year 2018-19 in Meerut district

As mentioned, there was very minimal change in the net irrigated area in the district but the share of private tube wells among all irrigation sources rose to approx. 84% in the year 2017-18. Sources wise, canals saw reduction by 11.9%, government tube wells by 6.91% and other sources were having almost no share among irrigation sources in the district from the year 2012-13 to year 2018-18. In percent terms, the share of private tube wells in the district increased by 2.7% over the year 2012-13 details in Figure-5.

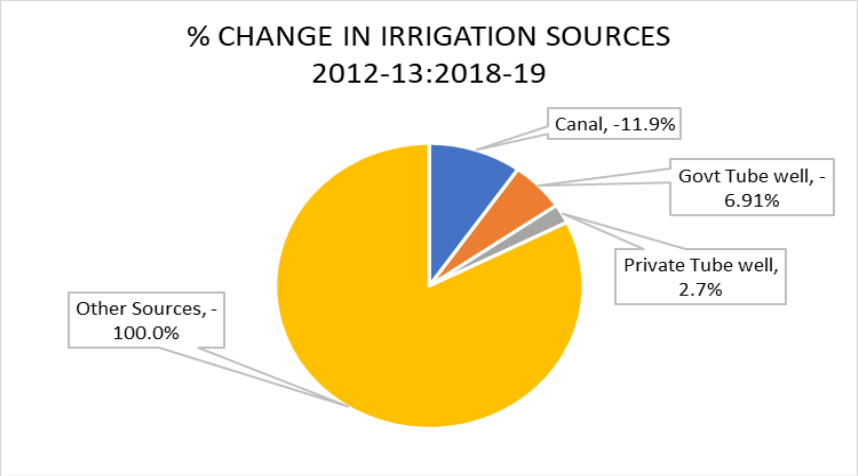


FIGURE 5: Percentage change in Irrigation Sources from 2012-13 to 2018-19 in Meerut district

4.3 Area under cultivation of Cereals

Cereals are one of the major crops which are grown in the district of Meerut. This is the reason that cereals cover major agricultural land in the district. Among all cereals, wheat covers approx. 55% area under cultivation. In absolute terms, wheat had 9785 thousand hectares land under it, followed by paddy at 5923 thousand hectares. Other cereals, namely bajra, maize, juar and barley were having 922, 744, 180 and 165 thousand hectares of area under cultivation in the year 2012-13 as presented in the Figure-6.

In the year 2018-19, wheat as before continued to dominate crops in the district of Meerut to cover area under cultivation. Area under wheat was 9856 thousand hectares which was mostly the same with 55% share among all cereals, as was in the year 2012-13. All cereals however, saw decrease in the areas under their cultivation with respect to the year 2012-13. Paddy at 5924 thousand hectares was the second cereal to have maximum area under cultivation. Bajra at 877, maize at 733, barley at 151 and juar at 147 thousand hectares were other cereals, covering land for cultivation in the district. Details are presented in the Figure-7.

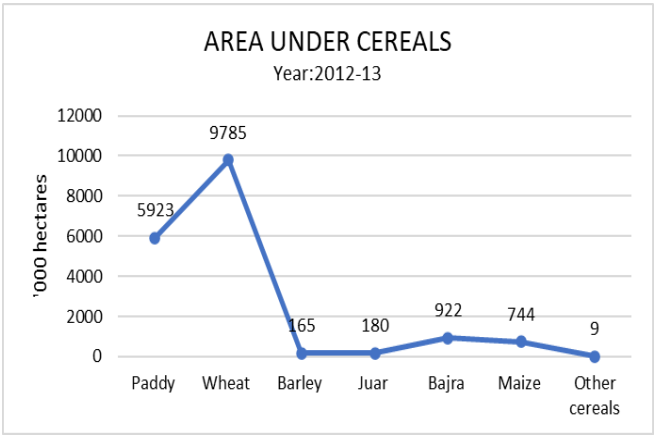


FIGURE 6: Area under Cereals in the year 2012-13 in Meerut district

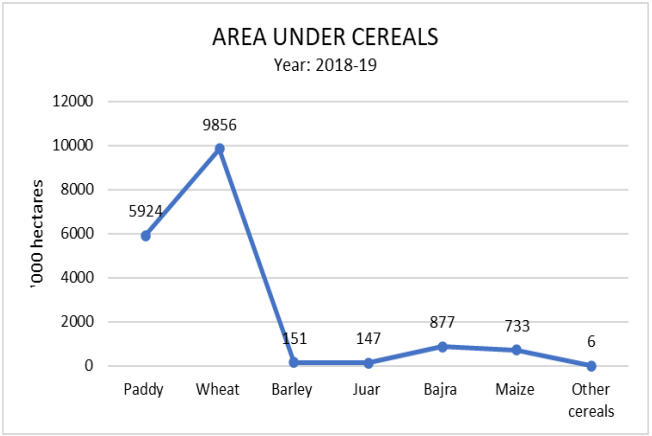


FIGURE 7: Area under Cereals in the year 2018-19 in Meerut district

Although, area under cereals remained constant from the year 2012-13 to year 2018-19; but, area under wheat saw marginal increase of 0.7% in the year 2018-19 whereas, area under paddy was unaltered. Other cereals faced decrease in the area of their cultivation. Juar saw decrease of 18.3% in the tear 2018-19 from the year 2012-13 which was maximum decrease among all major cereals in the district. Area under other cereals namely bajra witnessed decrease by 4.9%, barley by 8.5%, maize by 1.5%. Details are given in the Figure-8 below.

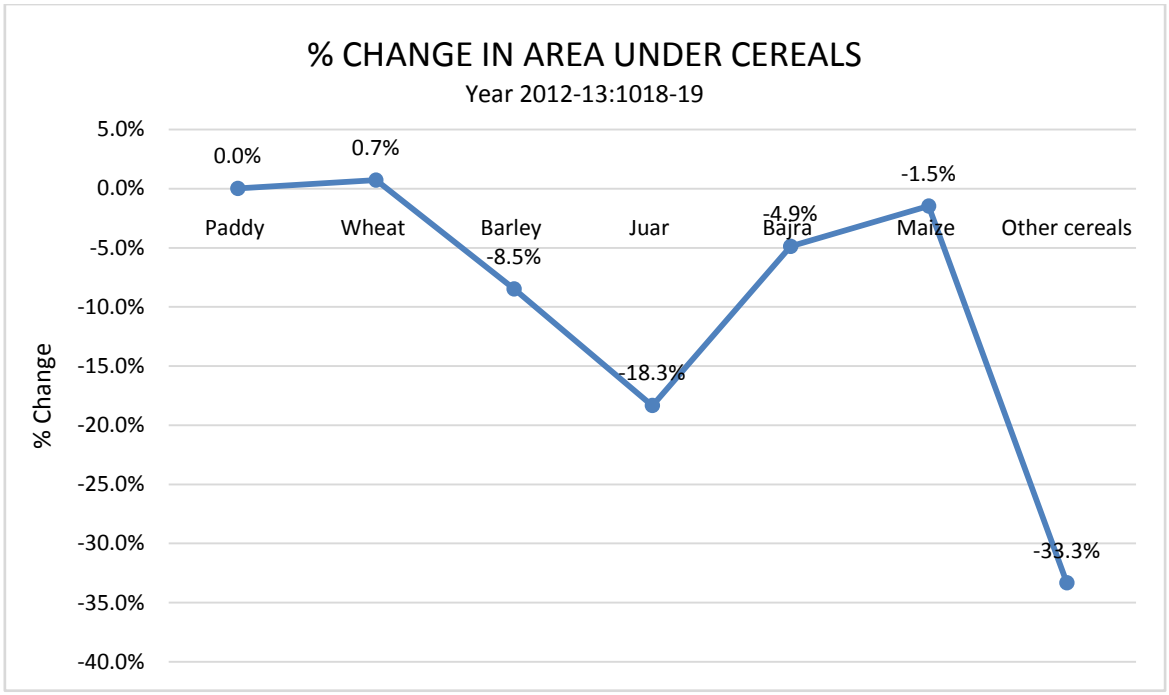


FIGURE 8: Percentage change in Area under Cultivation of Cereals from 2012-13 to 2018-19 in Meerut district

4.4 Area under cultivation of Pulses

Pulses are grown in a major way in the district of Meerut, besides cereals. Arhar, moong, urd and gram are major pulses grown primarily in the district. In the year 2012-13, gram was having 614 thousand hectares area under it. Urd with 569 thousand hectares followed by Arhar with 311 thousand hectares were second and third biggest in terms of covering area under cultivation in pulses category. Remaining crops under pulses were covering total 818 thousand hectares land under cultivation, as shown in the Figure-9.

Area under pulses witnessed decrease in the year 2018-19. Total area under cultivation of pulses decreased to 2291 thousand hectares. Areas under gram and urd were almost equal. It was 572 thousand hectares for gram and 567 thousand hectares for urd. Arhar was having area under cultivation of 251 thousand hectares in the year 2018-19. Other pulses in total covered area of 809 thousand hectares. Details are presented in the Figure-10 below

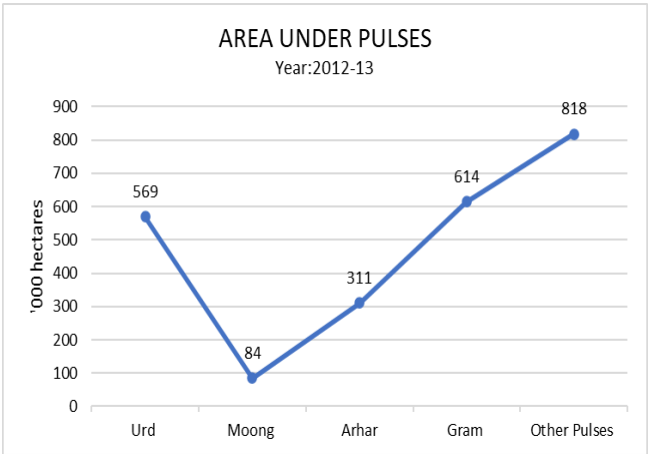


FIGURE 9: Area under Pulses in the year 2012-13 in Meerut district

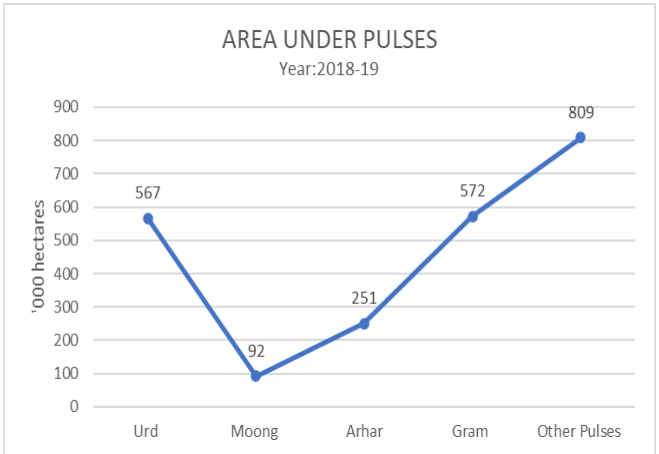


FIGURE 10: Area under Pulses in the year 2018-19 in Meerut district

Study of below Figure reveals that area under pulses was reduced by around 5.2% in the year 2018-19. Maximum decrease in the area was seen for arhar. Decrease was by approx 19% in the year 2018-19 from the year 2012-13. Moong saw dip by 9.5% followed by gram which saw decrease of 6.8% in the area of cultivation, primarily. Details are given in Figure-11.

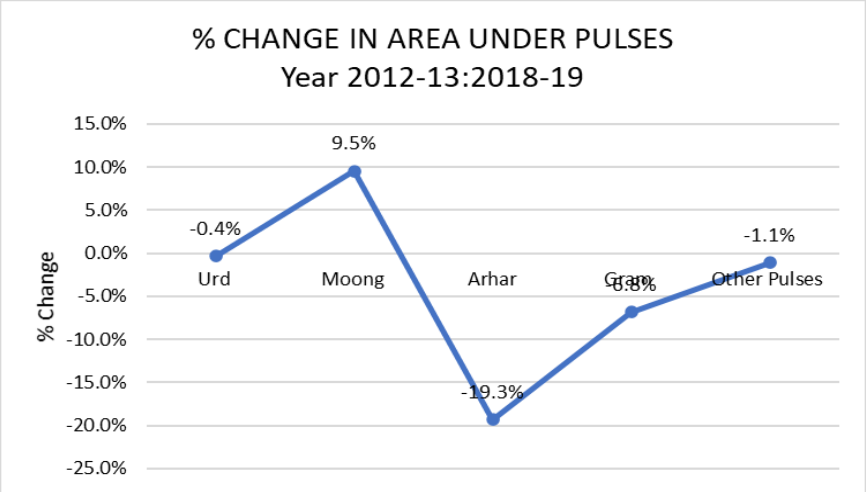


FIGURE-11: Percentage change in Area under Cultivation of Pulses from 2012-13 to 2018-19 in Meerut district

V. CONCLUSION

The paper has studied availability of water through different irrigation sources in the district of Meerut in Uttar Pradesh (India) in the years 2012-13 & 2018-19 and found that there was no change in terms of net irrigated area. In the year 2012-13, the net irrigated area was 196462 hectares which remained almost same in the year 2018-19, i.e., 196408 hectares with marginal decrease of 0.03%. However, among different sources of irrigation, ratio of private tube wells increased in the year 2018-19 while share of canals & government tube wells decreased corresponding to the year 2012-13. The ratio of private tube wells saw a jump of 2.7% from the year 2012-13 to 2018-19. On the other hand, share of canals and government tube wells reduced by 11.9% & 6.9%. It means although there was apparent shift to ensure water for irrigation from private sources, the net irrigated area remained same in both the years. Consequently, it was it was the reason for net area remaining the same in both the years in the district.

Further, it can be concluded as there was no change in the gross & net area sown along with no major change in the availability of water for irrigation different sources in studied years in the district of Meerut, Uttar Pradesh, India, area under cultivation of cereals and pulses largely remained intact in both the years of 2012-13 & 2018-19. Area under cereals saw overall change by 0.2%, but pulses saw a decrease by 5.5% from the year 2012-13 to 2018-19. In absolute terms, where area under cereals was 17728 thousand hectares in the year 2012-13, it was 17696 thousand hectares in the year 2018-19. Among cereals, wheat & paddy were two major crops which were having majority of coverage in both the years. For other cereals, namely Juar, bajra, maize and barley, area under cultivation was reduced corresponding to the year 2012-13 in the year 2018-19. Reduction in the area under cultivation for juar was the highest among all with 18.3%.

Regarding pulses, area under cultivation witnessed a decrease by 5.2% from the year 2012-13 to the year 2018-19. Gram, urd & Arhar were grown primarily in the district of Meerut in both the years of study. In absolute terms, area under gram, urd and Arhar was 614, 569 & 311 thousand hectares in the year 2012-13. In the year 2018-19, it changed to 572, 567 & 251 thousand hectares for gram, urd & Arhar respectively. The study reveals that arhar saw major reduction in the area of cultivation from year 2012-13 to 2018-19. Reduction was by 19.3%. Gram was another pulses, which also observed reduction by 6.8% from year 2012-13 to 2018-19. Moong on the other hand, was one of the pulses in the district whose area under cultivation increased by 9.5% from the year 2012-13 to 2018-19. Urd observed marginal decrease by 0.4% in studied years.

It can overall be construed as there was no considerable change in the gross sown area, net sown area, irrigated area, irrigation sources in the district of Meerut, Uttar Pradesh, India; consequently, the cropping pattern remained almost same in the years of study, leading to area under cereals and pulses also seen no change from the year 2012-13 to 2018-19. However, within crop type, shifting from one crop to another is seen which is also marginal except for juar in cereals and arhar in pulses.

VI. SUGGESTIONS

1. Cereals and pulses play a very significant role in the diet of people in the district and overall, in the country, therefore more attention to be given to pulses as their share is decreasing.
2. It seems that as cereals are seen as means to earn more, farmers are sticking to production of cereals and not pulses. Therefore, governments should motivate farmers to move to cultivation of pulses as well, so that diet can be balanced.
3. As reduction is observed in the contribution by canals in providing irrigation water, state & central governments should pay attention to this fact also. Else, the cost of production will keep increasing.
4. Likewise, government tube wells have seen decrease in their share to net irrigated area in the district of Meerut. It gives the impression that people are not having confidence on government system to ensure water for their crops.
5. Private tube wells are increasing contribution to net irrigated area in the district. It signifies two facts. One, people in the district are becoming self-sufficient and two, they do not believe in government sources of irrigation in fulfilling their needs of irrigation water. Increase in share of tube wells, certainly will increase cost of production. It will have circular repercussions on public at large.
6. It can also be construed from the study that gross sown area has reached its peak in the district of Meerut, Uttar Pradesh India as no change is observed during five years, i.e. from the year 2012-13 to 2018-19. Therefore, local governments should focus on providing training to farmers in the district on how to increase production of different crops by using modern day agricultural means and techniques.
7. Farmers should acquire knowledge about use of fertilisers, agrichemicals etc in such a way that should help in deceasing cost of production, as well as do not impact climate negatively. Local administration to help farmers in this area as well.

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