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# Socio-Economic Characteristics of Beneficiary and Non-Beneficiary Respondents in Mahanadi Basin, Chhattisgarh

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**Abstract:**

The present investigation entitled **"A study on impact of Mahanadi reservoir canal irrigation system on socio-economic upliftment of farming community in Chhattisgarh''** was conducted in Mahanadi reservoir canal irrigation system of Chhattisgarh state during the years 2017-18 and 2018-19. The methodology and the findings were culled out from the detailed study in the area.

The independent variables in the study were education, size of family, social participation, occupation, size of land holding, annual income, credit acquisition, cosmopolitans, level of aspiration, economic motivation, scientific orientation, adoption of modern agricultural practice, cropping intensity, irrigation timing for rice crop, no. of irrigation for rice crop, indirect benefit of canal irrigation and irrigation availability. Socio- economic status of farm families and productivity of major crop (rice) were considered as dependent variables for the study.

**Keywords:** Economic, Agriculture, dependent-Independent variables, upliftment, Irrigation, Investigation, farming, reservoir, Income, Education.

## Introduction:

As per the records of Government of India, Reservoirs can be classified generally as small, medium and large with the area of (<1000 ha), (1000 to 5000 ha) and (> 5000 ha) respectively. In India, number of small reservoirs is approximately 19134 ha which has a total water surface area of 1485557 ha. In the similar manner, 180 medium with 527541 ha and 56 large have an area of 1140268 ha reservoirs in the country. Thus, the country has 3153366 ha covered by 19370 reservoirs. (Global aquaculture alliance 2016).

Chhattisgarh, on an average receives 1,292 millimeters (50.9 in) of rainfall, which is un equally distributed, and mostly affects agricultural production, therefore irrigation facilities are needed. During the time of formation of state, the irrigation potential was 1.844 million ha. (Ministry of Agriculture & Farmers Welfare 2015-16). Chhattisgarh state has minimal irrigation system with dams, embankment, reservoir and canals. There are 51 medium and major irrigation projects and few minor are under construction. After construction of major irrigation projects like Mahanadi reservoir project in Dhamtari, Hasdeo Bango in Korba & Kodar in Mahasamund, the life of farmers had administered a complete change in the adjoining district, due to improved agriculture. Also, these projects are supplying drinking water in the associated districts. Severe scarcity would have created in absence of these projects resulting in

major losses to the indwellers of these areas.

Mahanadi reservoir project is comprises of 7 canals namely Mahanadi main canal, Mandhar branch canal, Abhanpur lift canal, Bhatapara branch canal, Baloda branch canal, Lawan branch canal and Mahanadi feeder canal and their length in km are 116.40, 52.00, 19.00, 45.00, 7.00, 69.00 and 42.00 onwards. Canals are the constructed structures basically water path or open channels which are connected mainly to agriculture field over widespread areas. In the state of Chhattisgarh, the Mahanadi canal System constituting the new Rudri weir, the Tandula canal and Ravishankar Sagar dam network irrigates the districts of Raipur, Durg and Dhamtari. These 7 canals are created to irrigate 2,64,311 hectare of land of Baloda Bazar, Dhamtari and Raipur district. Out of these 7 canals we will considered 4 canals which are irrigating maximum area of land under this project. Accordingly, Mahanadi main canal with its irrigation capacity of 96233 ha, Lawan branch canal with its irrigation capacity of 53866 ha, Mandhar branch canal with its irrigation capacity of 43734 ha and Baloda bazar branch canal with its irrigation capacity of 24506 ha were selected.

**Objectives:**

- To study about socio-economic profile of beneficiary and non beneficiary farmers of Mahanadi reservoir canal irrigation system.
- To study the cropping pattern, productivity and income of beneficiary and non beneficiary farmers of Mahanadi reservoir canal irrigation system.
- To identify the existing irrigation pattern followed by farmers for various crops.
- To study the adoption of rice production practices by the farmers of different water reaches.
- To study the impact of Mahanadi reservoir canal irrigation system on socio- economic upliftment of farm families.
- To find out the problems confronted by the farmers of different water reaches and to obtain their suggestions to overcome the problems confronted by them.

**Scope of the study**

Irrigation is the valuable sources for crop production and for rural development. So as to effective utilization of irrigation , this study would help to understand and examine the impact of canal irrigation system on socio economic status and productivity of major crops of beneficiaries and non beneficiaries farmers of Dhamtari, Raipur and Balodabazar districts of Chhattisgarh state.

This study will also represent the different independent variables with relationship between beneficiaries and non beneficiary farmers. Result of this study would also be helpful constraints faced by the farmers to taken into account consideration and suggestions obtain to overcome the constraints faced by using canal irrigation.

**Independent variables:**

It finding revealed that majority 45.42 per cent beneficiaries and 56.67 per cent of the non-beneficiaries belonged to the age between 35 to 50 years, maximum 38.33 per cent of the beneficiary and 35 per cent of non- beneficiary farmers were found to be educated between $6^{th}$ to $10^{th}$ standard about 48.33 per cent of beneficiaries were having 6 to 8 members in their families and 54.17 per cent of the non-beneficiaries had the family size up to of 5 members, majority of the families under the category of beneficiaries (52.92%) as well as non- beneficiaries (52.50%) were having nuclear families. It was

also found that majority of the beneficiaries (78.75%) were having sprayer, and 61.67 per cent of non-beneficiaries had deshi plough. Regarding to the farming experiences, 47.08 per cent beneficiary had, experience of 31 to 45 years and 33.33 per cent of non- beneficiaries had above 45 years, about 59.61 and 55.83 per cent of beneficiaries were having pakka houses respectively, while 97.08 and 98.33 per cent of beneficiaries and non- beneficiaries had mobile. Majority 32.50 per cent beneficiaries and 28.33 per cent of non- beneficiaries had farm yard manure (FYM) pit.

Both beneficiaries (91.67%) and non-beneficiaries (84,17%) were obtaining the information from neighbors / progressive farmers, they used 4 to 6 sources to obtain the information. The maximum amount (56.25%) of beneficiaries found to be below the medium level of risk-bearing capacity category and the low level was 35.83 per cent in non-beneficiaries. While the members of more than one organizations in the villages were 91.67 percent beneficiaries and 93.33 percent non-beneficiaries.

The results stated that the primary occupation was noted as agriculture in beneficiaries (92.08%) and 85.83 percent in non-beneficiaries. It was also taken by approximately 7.92 percent of beneficiaries as the subsidiary occupation. Service was discovered among the beneficiary participants to be the second most significant primary occupation (5.42 percent). It was also found that 88.75 per cent of the beneficiary and 91.66 per cent of the non-beneficiary participants had obtained credit and the remaining 11.25 and 8.33 per cent had not obtained any kind of credit, respectively. Approximately 66.63 per cent of beneficiaries and 75.22 per cent of non- beneficiaries took credit from cooperative societies, the bulk of loan acquisitions was 95.83 per cent of beneficiaries and 36.03 per cent of credit acquiring non-beneficiaries used credit for purchasing the seeds.

It was noted that the beneficiaries majority (48.33 percent) and non- beneficiaries ' 53.33 percent were cow / bullock rearing. Mostly 70.83 and 55.56 percent of the recipients and non-recipients had between 3 and 6 cows. Approximately 42.92 per cent of beneficiaries and 45 per cent of non-beneficiaries of animal rearing followed the following suggested feeding methods. With regard to the implementation of breeding procedures, the bulk of b e n e f i c i a r i e s 40.83 and per cent of non- beneficiaries followed the suggested procedure, 46.25 per cent of beneficiaries and 67.50 per cent of animal rearing non-beneficiaries were following below recommended methods. Findings regarding health care management shows that animal rearing beneficiaries (53.75%) and animal rearing non- beneficiaries (64.17%) followed below recommended practices.

**Socio-psychological characteristics of the beneficiary and non- beneficiary respondents**

Most of the beneficiary (63.75%) interacted twice in a month, while non- beneficiaries (50.83%) were interacted twice in a month. Majority (85%) of the beneficiaries and 51.67 per cent of the non-beneficiaries had medium level of aspiration. Most of the (56.67%) beneficiary respondents showed a medium level of economic motivation. On the other hand with respect to non- beneficiaries majority (53.33%) showed low level of economic motivation. Relatively higher proportion of the beneficiaries (68.33%) were belonged to medium level of scientific orientation .While 61.67 per cent of non-beneficiary respondents were found in the category of low level of scientific orientation. Higher proportions of the non-beneficiaries (43.33%) had medium level of attitude towards modern agricultue practices of farming. Half of the non- beneficiaries had low level of attitude towards modern agriculture practices.

**Farming practices undertaken by the beneficiary and non- beneficiary respondents**

Relatively higher proportion (45.42%) of the beneficiaries possessed small size of land holding i.e. 1.1to 2 ha. About one third of the non -beneficiaries were having marginal land holding (up to 1 ha) and around 45.00 per cent of beneficiaries and 54.17 per cent non- beneficiaries had their land holding in two locations. Total land holding of beneficiary respondents was 357.92 ha and of non beneficiary respondents was 144.44 ha. Maximum area coverage of Vertisols (43.93%) had been occupied by 55.42 per cent of beneficiaries, similarly maximum coverage of Vertisols (34.82%) had been occupied by 54.17% of non-beneficiary farmers. Majority 31.80 per cent, land holding was covered by Inceptisols. One third per cent land holding had been covered with vertisols in non beneficiaries.

Out of the total beneficiary respondents, about half of them (54.18%) were practicing farming on irrigated mid land situation and 23.75 per cent in irrigated lowland. Among the non- beneficiary respondents, it was found that 40.54 per cent farmers were doing farming in rain fed midland.

More than half and nearly half of the beneficiary and non-beneficiary respondents were adopted Rice-Fallow- Fallow cropping pattern respectively. Majority of the beneficiaries were growing rice on 321 ha irrigated area and 29.41 per cent non- beneficiaries were growing rice in 20.91 ha irrigated area.

The table also shows that maximum irrigated area amongst beneficiaries was found under rice (75.65%). Relatively higher proportions of the non- beneficiaries (44.21%) were found to be maximum irrigated area was covered by the rice. Three fourth of beneficiaries had reported towards the availability of irrigation facilities for kharif crops. On the other side, among non- beneficiaries, 56.47, per cent had irrigation facilities from ground water for both kharif and rabi crops. Majority of the beneficiaries (88.56%) per cent irrigate their rice crop from canal. Followed by 11.44 and 29.41 per cent beneficiaries and non- beneficiaries were irrigate through tube well respectively. At the moment of sowing, approximately 92.08% of the beneficiary participants irrigate their rice crop. With regard to non-beneficiaries, at the moment of sowing, 29.20 percent of participants irrigated the rice crop. Cent per cent of the beneficiary and 29.14% of the non- beneficiary flood technique used for rice field irrigation

**Present scenario of different water reaches of canal**

Majority of the head reach (21.75%), mid reach (76.25%) and tail reach (78.75%) respondents were adopting Rice- Fallow- Fallow. Rice - Wheat- Fallow cropping pattern were adopted by the 27.50 per cent from head reach, 10 per cent from mid reach and 7.50 per cent from tail reach respondents. In kharif season, rice growers used to grow rice in 129.65, 106.23 and 85.26 ha from total cultivated area in head, mid and tail reach, respectively. In head reach, pigeon pea growers used

1.12 ha area of total cultivated area in head reach and mid reach with an area of 1.12 ha.

**Adoption of rice production practices in different water reaches**

Majority (81.25%) of the head reach rice growing respondents were using transplanting method. Moreover, 60 per cent of the mid reach respondents were using transplanting and majority (32.50 %) of the tail reach respondents were using broadcasting method. Out of total respondents, majority of the 56.92 per cent from head reach, 54.17 per cent from mid reach and 65 per cent from tail reach respondents were using more than 50 kg/ha seed rate in transplanting method.

Out of total respondents using broadcasting method, more than 90 kg/ha of seed rate was used by 50 per cent, 22.81 per cent and 23.53 per cent of head, mid and tail reach respondents, respectively. In case of lehi method, 53.33 per cent,10.71 and 80.77 per cent of head, mid and tail reach rice growers

were using up to 70 kg/ha seed in lehi method. In head reach region average 45 kg/ha seed rate was used in transplanting method. Followed by 98 kg/ha, 7 kg/ha, 73 kg/ha seed rate were used in broadcasting, SRI, and lehi method respectively. The average seed rate was used in mid reach, 48 kg/ha in transplanting, 97 kg/ha in broadcasting, and 63 kg/ha in lehi method. It was also apparent that 49 kg/ha seed rate was used in transplanting, 100 kg/ha in broadcasting and 85 kg/ha in lehi method used by tail reach respondents. Majority of the farmer did not use seed treatment in their field. Only 15 per cent of the beneficiaries treated their seeds with chemical method. Whereas majority 11.10 per cent from head reach, 16.67 per cent from mid reach and 30.56 per cent from tail reach respondents used carbendazim + mancozeb for seed treatment.

Relatively higher proportion of the head reach (40%), mid reach (35%) and tail reach (36.25%) respondents were growing Swarna variety with an area of 25.31, 23.65 and 20.81 ha respectively. Majority of the 51.25 per cent from head reach, 48.75 per cent from mid reach and 47.50 from tail reach farmers recommended quantity of phosphorus. In case of phosphorous, majority 43.75 per cent of the head reach, 45 per cent of the mid reach and 46.25 per cent of the tail reach beneficiaries who applied recommended dose of phosphorus. About mid reach growers, 33.75 per cent used below recommended, 45 per cent were using recommended and 21.25 per cent were applying above recommended dose of potash. Similarly, 38.75, 42.50 and 18.75 per cent of the respondents were applying below recommended, recommended and above recommended dose of potash in tail reach, respectively.

In case of manures application, majority (50%) of the head reach, 66.67 per cent from mid reach and 63.64 per cent from tail reach respondents, were using below recommended quantity. Also 27.27 per cent of head, 22.22 per cent of mid and 18.18 per cent from tail reach respondents used recommended, and 22.73, 11.11 and 18.18 per cent respondents were using above recommendation of manures in head, mid and tail reach, respectively. Average 97, 94 and 92 kg/ha nitrogen was applied in head, mid and tail reach respondents respectively. Further, 64 kg/ha phosphorus was used in head, 62 kg/ha in mid reach and 61 kg/ ha in tail reach respondents. In case of potash, 55, 52 and 50 kg/ha were used in head, mid and tail reach respondents respectively.

Majority of the respondents perceived that Motha (*Cyperus difformis* 82.50%) was the major weed followed by Sanwa (*Echinochloa spp.* 58.75%), which were reported to be important weeds that occurred during rice cultivation in head reach. In mid reach, Sanwa (*Echinochloa spp.*81.25%), Chirchita (A*chyranthes aspera* L. 63.75%), were found to be important weeds occurring in rice field. In tail reach, Sanwa (*Echinochloa spp.* 88.75%), Motha (*Cyperus difformis* 47.50%), Chirchita (*Achyranthes aspera* L. 47.50%), were revealed important weeds occurring in rice field.

Majority of the respondents reported that Sanwa (*Echincola spp.*) (63.08%) in mid reach and Motha (C*yperus difformis*) (48.48%) in head reach, were regularly occurred in the fields of rice, It was also found that severity of Chirchita (*Achyranthes aspera*) was 70.59 per cent in mid reach and Doob (*Cynodon dactylon)* was 58.82 per cent in tail reach as reported. Regarding the yield losses, all of the respondents perceived that maximum weeds caused yield loss up to 25 per cent. Majority of the respondents were applying traditional method (hand weeding) + chemical method for controlling weed in rice. Majority of 48.75 per cent of head reach respondents, 51.25 per cent of mid reach and 36 per cent from tail reach respondents were using traditional + chemical methods for weed management in rice cultivation. About 38.75 per cent of respondents perceived major effects to crops by stem borer (38.75%), head reach respondents. Among the mid reach respondents' severe effects were seen from stem borer (32.50%). In tail reach majority 38.75 per cent of the respondents were affected by brown plant

hopper (38.75%).

Majority (67.74%) of the respondents reported that stem borer were regularly occurring insect in head reach, followed by brown plant hopper (54.84%) in tail reach. In case of severity, stem borer (61.54%) was highest in mid reach, followed by brown plant hopper (54.50%) in mid reach, while medium severity was recorded by leaf folder (57.14%). It was also found that cent per cent of the respondents supposed that leaf folder caused yield loss in head, mid and tail reach up to 25 per cent. None of the respondents were perceived yield losses between 51 to 100 per cent. Regarding chemical control, cent per cent of respondents were using control measures for BPH, leaf folder and, rice gandhi bug in head reach. In head reach, mid and tail reach respondents, majority 33.75, 23.75 and 31.25 per cent of respondents were used Chlorpyrifos. Majority of the respondents perceived that neck blast was the major disease in head and mid reach. Regarding tail reach respondents, most of rice crop were affected by BLB (32.14%).

In case of severity brown spot was perceived by 75 per cent in tail reach, followed by 35.29 per cent in mid reach and 29.41 per cent in tail reach for neck blast and false smut respectively. Cent per cent of brown spot and false smut in tail reach disease were causing yield losses below 25 per cent, comparatively higher affects from sheath blight and bacterial leaf blight causing yield loss between 26 to 50 per cent. Few respondents were using traditional method and almost all beneficiaries were using chemical method for diseases control in rice cultivation. It was shows that the majority of the head reach growers (52.50%) used mancozeb, where in mid reach, 60 per cent respondents using captan. While, 35 per cent tail reach respondents using captan.

Majority of the participants sold their rice to cooperative societies.. Regarding productivity of rice, majority of the head, mid and tail reach rice growers obtained the productivity of rice above 40 q/ha respectively. While average productivity 45.05 q/ha for head reach, 43.42 q/ha for mid reach, and 41.14 q/ha for tail reach was found. Maximum 53.75, 51.25 and 46.25 per cent of head, mid and tail reach respondents getting profitability above 30000 (Rs/ha) respectively.

**Dependent variables Impact of Mahanadi reservoir canal irrigation system:**

Finding towards average cropping intensity, among beneficiary respondents was 117.92 per cent as compared to 102.03 per cent cropping intensity amongst the non- beneficiary farmers and found significant difference between them. Regarding productivity of rice, majority 64.17 per cent beneficiaries and 38.33 per cent of non-beneficiaries obtained productivity of rice above 40 q/ha. The average productivity among beneficiary respondents was 43.20 q/ha as compared to 38.09 q/ha average productivity among the non - beneficiaries' farmers. The test of significant between beneficiary respondents and non- beneficiary respondents (Z test) was calculated and difference was found significant at 0.01 level of probability which means, the null hypothesis is rejected.

Finding towards average net income of beneficiaries was ₹ 47200 /ha with benefit cost ratio was 1.66 as compared to net income of ₹ 41885 /ha with benefit cost ratio was 1.59 amongst the non- beneficiaries farmers from rice. The test of significant between B: C ratio of beneficiary respondents and non-beneficiary respondents (Z test) was calculated and difference was found significant at 0.01 level of probability which means, the null is rejected.

The finding pertaining that (39.58%) beneficiaries had the annual income between Rs.50,000 to 1,00,000, as compared to (44.16%) non-beneficiaries earned their annual income up to Rs.50,000. The average per family annual income from all occupations was found Rs.128518 in beneficiaries and Rs.113291 in non-

beneficiaries. The test of significant between overall annual income of beneficiary respondents and non-beneficiary respondents (Z test) was calculated and difference was found significant at 0.01 level of probability which means, the null hypothesis is rejected.

In case of socio-economic status, majority of the 47.50 per cent beneficiaries belonged to middle class; it was also observed that 70 per cent of the non- beneficiaries belonged to lower middle class. The average socio-economic status among beneficiary respondents was 29.12 as compared to 23.58 average socio economic status among the non- beneficiaries farmers. The test of significant between socio economic status of beneficiary respondents and non- beneficiary respondents (Z test) was calculated and difference was found significant at 0.01 level of probability which means, the null hypothesis is rejected.

The overall adoption index among beneficiary respondents was 80.33 per cent as compared to 69.67 per cent overall adoption index among the non- beneficiary respondent. The test of significant between cropping intensity of beneficiary respondents and non- beneficiary respondents (Z test) was calculated and difference was found significant at 0.05 level of probability which means, the null hypothesis is rejected.

out of total 17 variables of beneficiaries and non-beneficiaries, family size, material possession, animal possession, occupation, aspiration, scientific orientation, area under irrigation and farming situation, house type, sources of information, social participation and economic motivation attitude towards modern agriculture were found significant relationship. Remaining three variables viz, risk bearing ability, credit, and cosmopolitans had no significant relationship between beneficiaries and non- beneficiaries.

Indirect Benefits from canal irrigation Regarding indirect benefits from irrigation indicates that there are many benefits found from irrigation. Among beneficiary respondents, cent per cent from head reach, 92.50 per cent from mid reach and 88.75 per cent from tail reach respondents benefited by, increase in water table, followed by 90, 82.50 and 62.50 per cent from head, mid and tail reach respondents were from increase in income.

**Relationship between dependent and independent variables**

Relationship between independent characters and the dependent variables socio economic status in beneficiaries and non- beneficiaries farmers. out of all selected thirty characteristics, family type, house type, material possession, social participation viz, were found to be positive and availability of irrigation had negative and highly significant correlation at 0.01 level of probability, while cast, education, farming experience, no. of irrigation for rice crop, method of irrigation for rice crop and cropping intensity were positive and animal possession was found to be negative significant correlation with socio economic status at 0.05 per cent level of probability in beneficiaries.

Coming to the non- beneficiaries, out of total, eleven variables viz. cast, education, material possession viz, were found negative and highly significant correlation at 0.01 level of probability. While farming experience, social participation, credit, soil type and availability of irrigation were positive and aspiration were significant correlation with socio economic status at 0.05 level. In case of productivity of major crop (rice) of beneficiaries and non- beneficiaries social participation, overall annual income, attitude toward modern agriculture, land holding, land fragmentation, no. of irrigation for rice crop, time of irrigation for rice crop, availability of irrigation, indirect benefit of irrigation and farming situation were found positive and house type, occupation, scientific orientation and animal possession were negative and highly significant correlation with productivity of major crop (rice) at 0.01 per cent level. While indirect benefits of irrigation and cropping intensity were positive and education and sources of information were

found negative significant correlation at 0.05 per cent level.

Regarding non- beneficiaries out of total thirty variables, sources of information, time of irrigation, indirect benefits of irrigation, farming situation and cropping intensity were found positive and family type, risk bearing ability, social participation , occupation, scientific orientation, and credit were found negative and highly correlation significant relationship at 0.05 level.

It was also found that attitude towards modern agriculture, economic motivation and availability of irrigation were negative significant at the 0.01 per cent level.

Result of multiple regressions with socio-economic status of beneficiaries and non- beneficiaries was depicts that out of total thirty variables, cast, education, family type, house type, risk bearing ability, social participation, occupation, annual income, attitude towards modern agriculture, land holding and method of irrigation for rice crop and time of irrigation for rice crop had positive and scientific orientation, cropping intensity and availability of irrigation had negative and highly significant at 0.01 per cent while two variables age and farming situation had positive significant at 0.05 per cent level in beneficiaries farmers.

In case of non- beneficiaries caste , education, material possession, house type, social participation, attitude towards modern agriculture and land holding contributed positive and soil type had negative and highly significantly towards at 0.01 per cent level. Similarly family size, annual income, occupation and cropping intensity contributed positive and sources of information, indirect benefits of irrigation and farming situation had negative significantly towards socio economic status at 0.05 per cent level.

Result of multiple regressions with productivity of major crop (rice) was revealed that in beneficiaries age, family size, overall annual income, credit acquisition, attitude towards modern agricultural , land holding, soil type, no. of irrigation for rice crop, indirect benefits of irrigation and availability of irrigation for rice crop and cropping intensity contributed positive highly and house type, source of information, risk bearing ability, occupation and time of irrigation for rice crop contributed negative and highly significantly towards productivity of major crop (rice) at 0.01 per cent level. Variables scientific orientation had negative and farming situation was positive significant with the productivity of major crop (rice).

In non- beneficiaries cast, education, family type, occupation, farming situation, availability of irrigation for rice contributed positive and highly significantly towards productivity of major crop (rice) at 0.01 per cent level. Similarly house type, overall annual income, attitude towards modern agricultural, land fragmentation, time of irrigation for rice, cropping intensity contributed positive and cosmopolitans, method of irrigation contributed negation significant at the 0.05 per cent level.

**Problems and their suggestions**

As regards the distribution of respondents according to problems faced by beneficiaries' farmer in canal irrigation system, it was observed that out of total beneficiaries, problems faced by beneficiaries' farmer in farming system, it was observed that out of total beneficiaries, one of the main problems is that, irregular water supply (100%) had expressed, followed by 58.75 per cent had opined that poor water supply due to long distance channel.

With regard to the suggestions received from the respondents to overcome the constraints faced by the beneficiaries' farmers in canal irrigation. As the first and foremost suggestion is to water should be timely available as per need, opined by 84.17 per cent of respondents, followed by adequate quantity of water should be supplied (72.50%). About 70.42 per cent respondents had opined out payment of water charges

should be equal.

**Conclusions:**

- Maximum beneficiaries and non-beneficiaries belonged to the age between 35 to 50 years, belonged to other backward classes. Most of the beneficiaries and non- beneficiaries were found to be educated between 6th to 10th standard. Majority of the beneficiaries had medium family size and non-beneficiaries had small family size. Both beneficiaries and non- beneficiaries were belonged to nuclear family. Farming experiences of beneficiaries were having 31 to 45 years and above 45 years in non- beneficiaries respondents. Most of the beneficiaries had pakka house and in non-beneficiaries had kaccha houses.
- 92.08 per cent beneficiaries and 85.83 per cent non-beneficiaries had the main occupation as agriculture. About 7.92 and 14.17 per cent beneficiaries and non- beneficiaries also took it as the subsidiary occupation. 81.67 per cent beneficiaries and 70 per cent non-beneficiaries had 2-3 occupations, it was also observed that 88.75 per cent of beneficiary and 91.66 per cent of non-beneficiary respondents acquired credit.
- Relatively higher proportion (45.42%) of the beneficiaries and non- beneficiaries possessed small size and marginal size of land holding respectively.
- Out of the total beneficiary respondents, about half of them (54.18%) were practicing farming on irrigated mid land situation and 40.54 per cent of non- beneficiaries were doing farming in rain fed midland.
- Majority of the head and mid reach rice growing respondents were using transplanting method. Only 15 per cent of the beneficiaries treated their seeds with chemical method.
- Most of the respondents sold their rice to cooperative society. Regarding productivity of rice, majority of the head, mid and tail reach rice growers obtained the productivity of rice above 40 q/ha.
- The result of correlation analysis shows that in case of socio- economic status out of all selected thirty characteristics, thirteen variables viz. family type, house type, material possession, social participation were found to be positive and availability of irrigation had negative and highly significant correlation at
  0.01 level of probability in beneficiaries farmers. While indirect benefits of irrigation and cropping intensity were positive and education and sources of information were found negative significant correlation at 0.05 per cent level of probability.
- Coming to the non- beneficiaries, out of total, twelve variables *viz*. cast, education, material possession were found highly significant correlation at 0.01 level of probability. While six variables were significant correlation with socio economic status at 0.05 level of probability. In case of productivity of major crops of total thirteen variables viz. overall annual income, attitude toward modern agriculture, and farming situation were found at 0.01 per cent level of probability. While four variables viz. were found significant correlation at 0.05 per cent level of probability.

**Suggestions and recommendations for future works**

- Suitable cropping pattern - Farmers need to schedule the cropping pattern for the agricultural year well in advance depending on the monsoon and water storage situation in the reservoir.
- Remove encroachment from canal area- It is necessary to remove the encroachment produced in streams, field channels and channel banks. These intrusions stop the smooth flow of water and

cause water to starve the farmers in the tail-end region.

- Water use efficiency should be encourage- Adoption of technology is very essential to enhance effectiveness in water use. The farmers can irrigation methods such as sprinkler and drip irrigation. Government subsidies to buy these irrigation tools will assist farmers buy them at affordable rates and institutional financing is also accessible to buy these tools.
- Sustainable farming - Farmers are now passionate about electricity-driven pump sets they negligible regard in keeping the channel system. This ultimate result will be at stake in decrease water table and sustainable farming as occurred in some areas of this region of research.

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