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Water is the Most Essential Component for the Agriculture and Family Environment

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Abstract:
Agriculture makes a pre-eminent contribution in the Indian economy. About seventy per cent of the rural families depend on it. According to the reports of Indian economic survey 2017-2018 more than 50 per cent of the work force in India is involved in agriculture and has a share of 17 to 18 per cent in the total GDP. (India economic survey 2018). Many factors influences on agricultural production like soil, climate, genetic diversity, abundance of micro-organisms, water etc, among which water play an important role because it is required from seed germination to other physiological stages of crop growth.

Introduction:
Water is the most essential component of the environment and holds a unique status in it. One-third of our country's total geographical area is drought - prone because we are dependent upon the monsoons which can be wavering. Water should be provided in drought-prone areas not only for human and cattle consumption but also for irrigation. Water has inimitable characteristics that determine that it can be allocated and use as a resource in agriculture. For irrigation, agricultural use of water is itself contingent on land resources. Water is the most exquisite and essential source of ecosystems and agricultural production. However, the world constitution, water being the most essential natural resource. About 97.39 per cent of total 1,384 million cubic kilometers water of it is present in the oceans, which natures is salty. Out of total (i.e. 36 million km3) 2.61 per cent is fresh water, out of which, 77.23 per cent (27.82 million km3) is present in the form of polar ice caps, glaciers and snow bergs and very little amount of water (0.59% or 8.2 million km3) is present on the earth (i.e atmosphere, rivers, lake, ground) can be utilize by mankind. Whereas, less than 99 per cent of water present on the earth is not suitable for the use of mankind. (U.S. global survey 2016)
Since the origin of the earth, water has always been the most required and demand for it has been increasing since ever. To meet and cope up with this ever increasing demand, water resources development projects have been started in almost all countries of the world. The impact of all such projects on environment may change with abiotic factors like climate, soil, physiographic, and other factors like characteristics of river flow and size of irrigation project. River development projects give both positive and negative affects of obvious themselves in a number of ways on the environment. It can be observed of diverse types of ecological impact. Irrigation projects are the most important method which offers protection from floods. According to an estimate, the flood prone area in India is nearly about 40 m ha and out of which 80 per cent (32 m ha) can be protected. (Word meteorological organization 2007)
Total net cultivated area of India is 143 million ha. About 96 million ha land from the total net cultivated area is rainfed / dryland, covers 67 per cent and 33 million ha land is irrigated which is 40

per cent area covers. (Ministry of Agriculture & Farmers Welfare, India 2017-18). In the country annual average rainfall ranges from 400 to more than 2000 mm is recorded. So, to capture and restore this rain water, reservoir has very beneficial and probable to be implemented in different programmes of central or state government.

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). Irrigation, municipal's water supply, industrial water supply, navigation, hydropower, large scale fisheries, tourists development etc. are provided by the major irrigation projects. The projects are having the potential of changing the total agriculture's scenario of the area as enormous benefits can be received by them. Keeping of above fact canal irrigation is the almost cheaper method for irrigation demand in farming community. Canal irrigation influence the civilization, productivity of crops, agricultural based industrial progress too.

Chhattisgarh, on an average receives a 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.

Lifelines of farmers have changed by major projects that are benefitted from irrigation facility. Mahanadi reservoir project is located (headwork) in Dhamtari district of Chhattisgarh state, which lies in the Chhattisgarh plain agroclimatic zone and constitutes of a network of reservoirs. The Mahanadi reservoir project has been in function since the year of 1915. Across river Mahanadi at Rudri in Dhamtari tehsil of Raipur district a pickup weir was constructed then to irrigate area of 85000, hectare. It has undergone frequent remodernized with supplementary stages of Murrumsilli (1923), Dudhwa (1962) and Ravi Shanker Sagar (1978). The total irrigation potential of 2,64,000 hectare has been created by the present time. Construction of two reservoirs across Sondur and Pairi rivers in Pairi sub-basin of Mahanadi canal system under the Mahanadi reservoir project. The present project also includes construction of some new lined canal systems, lining and expansion, remodeling of existing canal systems and construction of some new lined canal systems. The aim of the project is to increase the current irrigation potential of 2,64,000 hectare to 3,40,171 hectares also using the most modern and scientific methods of micro distribution system and lining the canals of the entire command of 3,40,171hectares will be brought to International standards of productive irrigation.

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.

Reservoirs are the structures especially constructed to harvest rainwater which can be used for many purposes of farm requires. Reservoir is used for collecting the monsoon rain water, which is mainly used in irrigation. A Reservoir is observed to be significantly important in the rainfed agriculture. Economical change, technological change and social change of the farmers are the impact which can be expected from reservoirs. The present study was carried out the study of **" A SYUDY ON IMPACT OF MAHANADI RESERVOIR CANAL IRRIGATION SYSTEM ON SOCIO-ECONOMIC UPLIFTMENT OF FARMING COMMUNITY IN CHHATTISGARH"**. Reservoirs are constructed in different varying size and are capable of fulfilling various farm needs of utmost importance like supply of the water to crops. Thus, taking all the view of the need and importance of the study, the present study was carried out with the following specific objectives was undertaken during 2016-17 and 2017-18.

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.

Location of the study area

The present study was carried out in Mahanadi reservoir canal irrigation system of Chhattisgarh state during the years 2017-18 and 2018-19. Mahanadi reservoir canal irrigation system comprise of seven canal systems namely, Mahanadi main canal, Mandhar branch canal, Abhanpur lift canal, Bhatapara branch canal, Baloda branch canal, Lawan branch canal and Mahanadi feeder canal system.

Objectives:

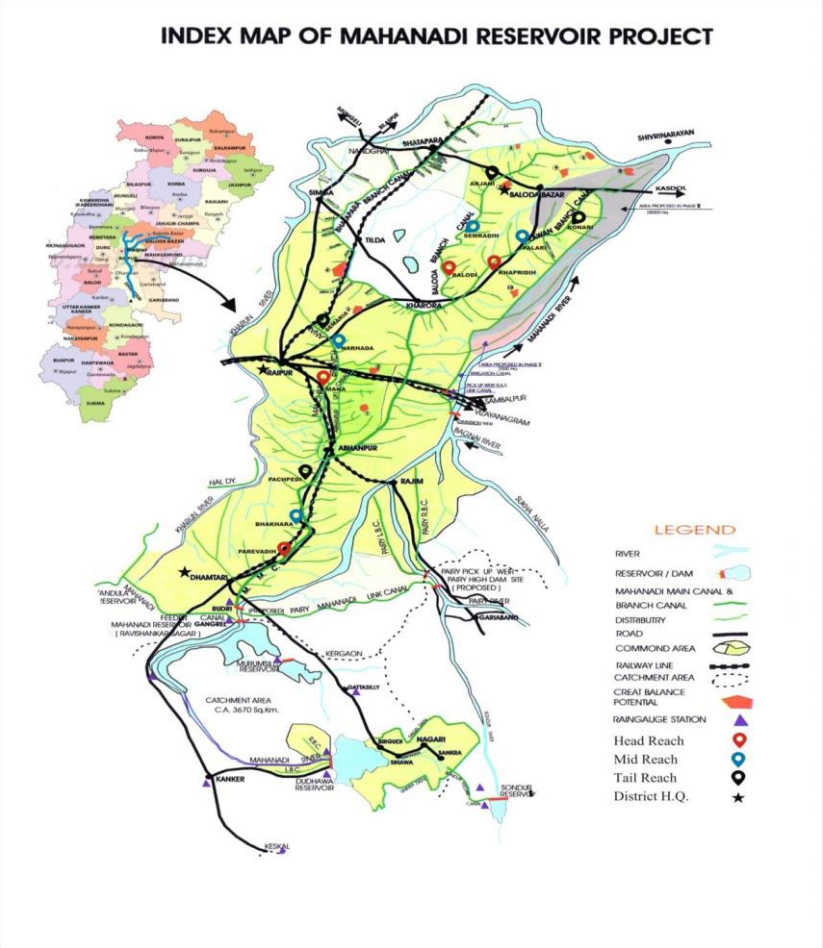
1. To study about socio-economic profile of beneficiary and non beneficiary farmers of Mahanadi reservoir canal irrigation system.
2. To study the cropping pattern, productivity and income of beneficiary and non beneficiary farmers of Mahanadi reservoir canal irrigation system.
3. To identify the existing irrigation pattern followed by farmers for various crops.
4. To study the adoption of rice production practices by the farmers of different water reaches.

5. 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.

Limitations of the study

1. The boundaries of time and resources were faced by the researcher for the present study.
2. Limited items are incorporated in the study for detailed examine because all the segments cannot be cover in such a very short time.
3. The present investigation is based on the individual's opinion and expressed attitude of the respondents as they perceived hence there is chances of occurrence of biasness which generally occurs in such type of field study.
4. All possible efforts were made to make the best use of standardized tools and techniques of data collection, yet their truthfulness may not guarantee.
5. Although all possible preventative measure were taken to make the study specific and accrued, as per the objective and trustworthy. As the present study was restricted to Mahanadi reservoir canal irrigation of Chhattisgarh, therefore, the direction of finding might not give real picture of all the Chhattisgarh, which has no resemblance with the present situation of locations.



Sample and sampling procedure

Selection of canal :- Out of the 7 canal system, 4 canals were randomly selected for this study namely Mahanadi main canal, Mandhar branch canal, Baloda branch canal and Lawan branch canal, as, it is very difficult to cover entire 7 canal system. For the purpose of study, each canal is divided into three parts, on the basis of their reach, i.e. head, Mid and tail. Accordingly, total 28, 14, 17 and 21 distributaries belonging to Mahanadi main canal, Lawan branch canal, Mandhar branch canal and Baloda branch canal, respectively were taken for sample collection.

Selection of districts, blocks, villages and number of respondents from beneficiaries and non beneficiaries

	Beneficiaries Farmers			Non Beneficiaries Farmer		
	Selected Blocks	**Selected Villages**	No.of respon-dents	**Selected Blocks**	**Selected Villages**	No. of respon-dents
	Kurud	Parevadih	20	Balodabazar	Dhangaon	10
Head	Dharsiwa	Manabasti	20	Balodabazar	Bitkuli	10
Reach	Palari	Khapradih	20	Balodabazar	Charauti	10
	Balodabazar	Balodi	20	Palari	Khapri	10
	Kurud	Bhakhara	20	Palari	Kusmi	10
Mid	Arang	Narhada	20	Magarload	Budeni	10
Reach	Palari	Palari	20	Arang	Pacheda	10
	Arang	Semradih	20	Palari	Mudiyadih	10
	Kurud	Pachpedi	20	Palari	Paraswani	10
Tail	Dharsiva	Semaria	20	Dharsiva	Boriakala	10
Reach	Tilda	Konari	20	Magarload	Bhendri	10
	Balodabazar	Arjuni	20	Arang	Dhrampura	10
			240			120

Selection of villages: - Three villages belonging to each identified distributary canal had been selected randomly so as to make a total of 24 village as beneficiary village and half (12) of the total beneficiary villages had been selected from same locality as non beneficiary village.

Selection of the respondents:- 20 farm families (beneficiary of canal irrigation) had been selected randomly from each of the selected village. In this way, total 240 beneficiary families (80 from Head reach, 80 from Mid reach and 80 from the tail reach) and 120 non beneficiary farm families has been selected randomly (40 head reach, 40 mid reach and 40 tail reach).

Collection of data: The data was collected personally through pre-tested interview schedule.

Statistical method: Collected data was tabulated and processed by using appropriate statistical tools and methods.

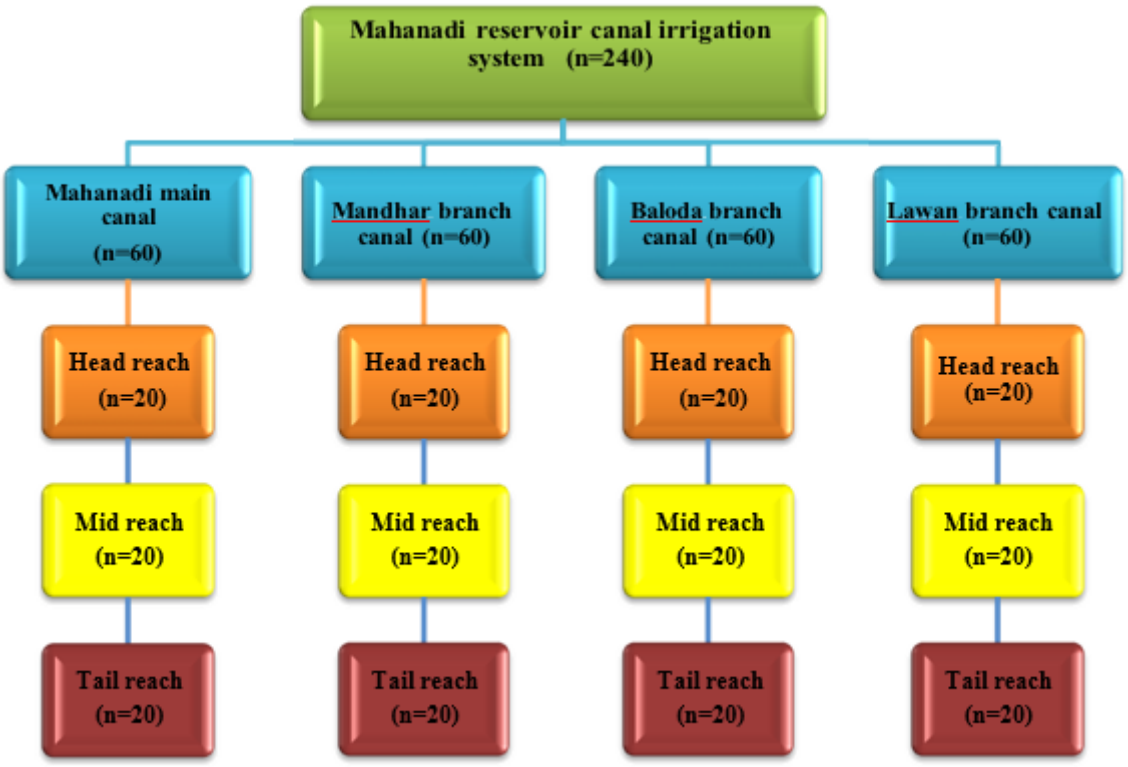


Fig 2 : Selection procedure of beneficiary respondents

Occupation

The data collected from the individual on the sources of income over a period of time from any activity, such as agriculture, MGNREGA, parental business, agricultural labour etc. and the score assigned to it as under:

Occupation	Score
• Agriculture only	1
• MGNREGA	2
• Non-agricultural labour	3
• Agricultural Labour	4
• Service	5
• Fishery	6
• Animal husbandry	7

Overall annual Income

Annual income was considered as total income from all the available sources of income of the respondents and its categorization and score is done under the following subheads:

Category	Score
• Up to Rs. 50000	1
• Rs. 50001 to Rs.100000	2
• Rs.100001 to Rs. 200000	3
• Rs. 200001 to 500000	4
• Above 500001	5

Credit acquisition

The availability of credit facility to respondents, purpose and duration, as availability of credit needed to purchase the vital input may influence the adoption behavior of the farmers. Hence, a question was asked to individual respondents, in order to know the source from where they get loan and how easily they can get it. Further, measuring the source of credit on a four-point scale as follows:

Category	Score
• Acquired	0
• Not acquired	1
Duration of credit	
• Short term	1
• Medium term	2
• Long term	3

Risk bearing ability

Risk bearing ability refers to an individual's ability to face risky or uncertain situation in farming. This investigation was scored with the help of scale developed by Supe (1969) with slight modifications for this study. The scale consists of one negative item and five positive items. The responses for positive items were scored as 5, 4, 3, 2, and 1, while, for negative items the scores were reversed in the order of magnitude, respectively. Scores obtained for each statement were summed up to get the score of each individual respondent. Thus, the respondents were grouped into three categories as given below.

Category	Score
• Low (Upto 33.33%))	1
• Medium (33.34- 66.66 %)	2
• High (more than 66.66 %)	3

Cosmopolitans

Cosmopolitans is the tendency of an individual to be in contact with outside of his own community based on the belief that all the needs of an individual cannot be satisfied within his own community. To measure cosmopoliteness of respondents, they were asked to indicate their extent of contact with outside to their social system by their own efforts. The respondents were classified into following categories.

Category	Score
• Nil (Never)	1
• Fortnightly	2
• Twice or more in a year	3
• once in a year	4
• Twice in a month	5
• Once in a week	6
• Trice or more in a weak	7

Level of aspiration

It is an individual performance that assumes he can reach on the ladder of life, some years from now. Further, the respondents were categorized on the basis of their obtained scores:

Category	Score
• Low (33.33%)	1
• Medium (33.34 % to 66.66 %)	2
• High (Above 66.66 %)	3

Scientific orientation

It is the degree to which a farmer is oriented towards agriculture and allied activities for getting higher return with the help of scientific and modern techniques. Scientific orientation scale developed of Supe (1975) was used to determine the scientific orientation of respondent with slightly modification. Out of these six items, number 1, 2, 3, 4, were positive items and number 5 and 6 were negative item. The score for positive item were 5, 4, 3, 2 and 1 and for negative item scores were 1, 2, 3, 4, 5 for the response categories strongly agree, agree, undecided, disagree and strongly disagree, respectively. The total scores of all the eight statement were worked out. The respondents were categorized into following manner.

Category	Score
• Low (Upto 33.33%))	1
• Medium (33.34- 66.6 %)	2
• High (more than 66.6 %)	3

Economic motivation

It refers to the occupational success in terms of profit maximization and the relative value placed by a farmer through his own field. The scale consists of nine sentences. The responses from the respondents were taken on the basis of five degrees strongly agree, agree, undecided, disagree, strongly disagree with scores 5, 4, 3, 2, 1, 0 respectively. The score was measured by the scale developed by Supe (2007) with slightly modification.

Respondents were divided into based on their obtained scores was classified under following categories.

Category	Score
• Low (Upto 33.3%))	1
• Medium (33.34- 66.6 %)	2
• High (more than 66.6 %)	3

Attitude towards modern agriculture:

Attitude of farmers towards modern Agriculture technology may affect their adoption. In order to know the attitude of farmers towards modern Agriculture the scale which consisted with eight statements

was adopted and the response of farmers was collected on five points scale ranging from strongly agree to strongly disagree (Sheriff and Candrill 1945). The scoring procedure is as follows:
The total scores of all the statement were worked out. The respondents were categorized into following manner.

Particulars	Response				
	SA	A	UD	DA	SDA
• Score for favorable statements	5	4	3	2	1
• Score for unfavorable statements	1	2	3	4	5

SA = Strongly Agree, A = Agree, UD = Undecided,
DA = Disagree, SDA = Strongly Disagree

The total scores of all the statement were worked out. The respondents were categorized into following manner.

Category	Score
• Low (Upto 33.33%))	1
• Medium (33.34- 66.6 %)	2
• High (more than 66.6 %)	3

Technological traits

Land holding

Land holding is an important factor to determine the economic status and potentiality of farmers. The respondents were asked about the total cultivated land owned by them at the time of enquiry. The respondents were grouped in to five categories using the criterion method adopted by Indian Agricultural Statistics Research Institute, New Delhi (Anonymous, 2016). The categorization and score of respondents are as follows:

Category	Score
• Marginal (up to 1 ha)	1
• Small (1.1 to 2 ha)	2
• Semi Medium (2.1 to 4.0 ha)	3
• Medium (4.1 to 10.0 ha)	4
• Big (above 10 ha)	5

Land fragmentation

Land fragmentation is the varied location of plots in a farm family**.** The categorization and score of respondents are as follows:

Category	Score
• In single Location	1
• In two Locations	2
• In three Locations	3
• More than three Locations	4

Soil type

Different variety of soil is present in the area, selected for investigation. Characteristics of these soils were taken into consideration and accordingly, soil is characterized as Bhata (*Entisols*), Matasi (*Inceptisols*), Dorsa (*Alfisols*), Kanhar (*Vertisols*) and Bharri (*Lateritesols*) on the basis of its texture, moisture content and colour etc.

Category	Score
• Entisol (Bhata)	1
• Inceptisols(Matasi)	2
• Alfisols (Dorsa)	3
• Vertisols (Kanhar)	4
• Lateritesols (Bharri)	5

Number of irrigation provided to rice

Number of irrigation refer to the amount of water supplied to the rice crop during entire crop cycle. It depends on the availability of water. The number of irrigation provided was classified as follows.

Category

Category	Score
• Upto 2	1
• 2 to 4	2
• More than 4	3

Method of irrigation

It refers to the situation of the respondents with regard to availability of water sources. Irrigation method may be known as the type of irrigation. For irrigation methods, one score is assigned to flood

irrigation and two score is allotted to ridge and furrow.

Category	Score
• Flood	1
• Ridge and furrow	2

Time of irrigation to rice crop

Crop water requirements is the water required by the plants time to time for its survival, growth, development and other physiological processes. The stage at which the water stress causes severe yield reduction is also known as critical stage of water requirement. 1 score was provided for the non-availability of water during critical stage, whereas 2 score was provided for availability of water during critical stage. Further, they were categorized according to time of irrigation to rice crop, by assigning scores as follows:

Category	Score
• Not during critical stage	1
• During critical stage	2

Indirect benefits from irrigation

Many indirect benefits can be avail from irrigation and it can be defined as the collateral benefits which one get from applying irrigation to crops. There are many benefits found from irrigation. The score is given according to number of indirect benefits from irrigation reported by the respondents and response were obtained as increase in water table, increase in cash crop, rise/increase in ground water table, crop diversity and domestic and industrial water supply.

Availability of irrigation

Availability of irrigation operationally considered as the seasonal availability of irrigation. Farmers were asked about their sources of irrigation with percent irrigated area by various sources for different crops grown by them in kharif, kharif and rabi and perennial season. Further, they were categorized according to availability of irrigation by assigning scores as follows:

Category	Score
• Kharif	1
• Kharif and rabi	2
• Perennial	3

Sources of irrigation

Information regarding the type of the source used by the respondents for providing irrigation to the rice crop was collected. Different sources of irrigation such as canal, tank, and tube well were identified.

Category	Score
• Canal	1
• Tank	2
• Tube well	3

Farming situation

Farming situation can be defined as the agro-climatic situation prevalent in the area, which is based on factors like rainfall, source of irrigation, soil type etc. Rice farming is practiced in several agro ecological zone. In Chhattisgarh rice cultivation is done in various farming situation. The respondents were characterized in the following manners and score is given according to number of farmers cultivating rice crop in different farming situation, reported by respondents.

Category	Score
• Rainfed upland	1
• Rainfed mildland	2
• Rainfed lowland	3
• Irrigated Upland	4
• Irrigated midland	5
• Irrigated lowland	6

Summary:

Water is the most essential component of the environment and holds a unique status in it. One-third of our country's total geographical area is drought - prone because we are dependent upon the monsoons which can be wavering.

Water should be provided in drought-prone areas not only for human and cattle consumption but also for irrigation. Water has inimitable characteristics that determine that it can be allocated and use as a resource in agriculture. For irrigation, agricultural use of water is itself contingent on land resources. Water is the most exquisite and essential source of ecosystems and agricultural production.

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