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A report on
**AUTOMATED REAL TIME WATER AND
CANAL MANAGEMENT**

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PREFACE

Water is a resource which is the gift of Nature to the mankind. However this is a scarce resource for which it is the duty of every one of us to conserve this for the next generation. This needs the study of various water saving projects and techniques which facilitate best usage of the available water. One such attempt was 'Automated Real Time Water and Canal Management' in Mudhol Taluk of Bagalkote District of Karnataka'. Karnataka Neeravari Nigam Limited (KNNL) has taken an initiation in improving the irrigation system in Karnataka. We were given an opportunity to prepare a detail report about the farmers' perception towards the Automated Real Time Water and Canal Management and with delight we are presenting this report.

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**FARMERS' PERCEPTION TOWARDS AUTOMATED REAL TIME WATER
AND CANAL MANAGEMENT IN MUDHOL TALUK, BAGALKOTE DISTRICT,
KARNATAKA**

CHAPTER 1

INTRODUCTION

Water is an important component for the growth and survival of human beings and plants. Water constitutes three-fourth of our body weight. It is either supplied by rain or irrigation. An efficient utilization of irrigation is essential to supply water at different critical stages of agriculture to deter the economic loss. Though water is an economic input, it differs from other inputs in many respects. Suppose, water is produced like fertilizers or chemicals, its cost would be enormous. Therefore, maximum yield per unit water applied should be more.

Around the world some 70 % of renewable water resources are used in the agricultural sector, in some developing countries the figure even exceeds 90%. The world's population is increasing and a large part of the required food and agricultural raw products will have to be produced using irrigation. This often results in conflicting goals. Human beings need water for their survival but this demand must be balanced against the rising water consumption in agriculture, industry and tourism, as well as the requirements of local ecosystems. Today, more than 30 countries are already subject to increasing water shortage. The majority of these are the states whose national income is based, to a large extent, on agriculture. In these regions rainfall is often low and climate change is making it increasingly unreliable. Against this backdrop, new impetus and innovative approaches are required if

production is to be stepped up without increasing the level of water consumption and while meeting ecological requirements.

AUTOMATED CONTROL SYSTEM IN WATER CANAL MANAGEMENT

Since agriculture is the largest user of water, any disciplining of water use should be from agriculture since even a small proportion of disciplined use of water results in largest absolute saving of scarce water for other economic uses. Thus, irrigation water literacy should be the prime objectives of development in order to educate the farmers regarding the precious water resources and the need for efficiency in water use which results in overall system efficiency. Improvements in automatic control equipment have greatly expanded the field of canal operation and control. Automation has become a common term while discussing modern canal systems. 'Automation' is defined as "*a procedure or control method used to operate water system by mechanical or electronic equipment that takes the place of human observation, effort and decision; the condition of being automatically controlled or operated.*"

Automating a canal system is, therefore implementing a control system that includes automatic monitoring or the control equipment that upgrades the conventional method of canal system operation. Automation is used to simplify and reduce or replace the decision-making process of the operators and to implement a decision. It is increasingly used to improve the effectiveness and to reduce the cost of water supply system operations.

Automation of distribution canals becomes essential for optimum conditions. The process must not be dismissed out of hand as too expensive. Its economies must be studied; keeping in mind that reduced on-farm costs and water requirements, and increased yields and

management capabilities , provide savings that usually will be more than make up for increased project costs. Reduction of project operation costs and water loss is also a benefit of automation and is usually the only one considered.

Automation of a canal system should not be thought of as an end in itself, but rather as a means to better operate that system. The true goal should be to achieve the most efficient and beneficial operation possible. Expanding control system capabilities is one way of economically reaching this goal.

WORKING OF AUTOMATED CANAL SYSTEM

Automation can be obtained in many ways, some extremely simple, others very complex. A long crested weir (also called duckbill or folded weir) by its very existence maintains a nearly constant water level in a canal under variable flows. A closed pipe line system connected to a variable source such as canal carrying excess water to local needs will automatically convey the exact amount of water that is withdrawn at the turnout valves.

Float-actuated mechanical devices such as the Neyrtec constant level and the improved controlled leak canal gates are self-contained but can obtain a constant canal water level. These systems easily adjust to variable flow rates. If they are desired to control down to the no-flow regime rather than just regulate the flow, they need to be installed in top-level canals. They are sluggish in reaction as they receive input in sequence from each adjacent reach to transmit a change over the whole canal length. The objective of building and operating a canal system is to serve the farmlands, supply to municipal and industrial needs, carry storm runoff to natural drainage channels, collect water from several independent sources into a single supply, convey water

used for the generation of electrical power and supply water to fish and wildlife and for recreation. In order to serve the above purposes as efficiently and economically as practicable, canal operations should be tailored to meet the specific requirements of the systems.

CHAPTER 2

CONCEPT BEHIND THE STUDY

The concept of water management is as old as the water scarcity. This calls for the fullest and judicious use of available water in the limited quantity so that the farmers are assured with the requisite water supply for the hassle free agricultural activity in their farm land.

The field of agricultural water management covers irrigation and drainage as well as water management in rain-fed agriculture. Worldwide irrigated agriculture covers 18 percent of all crop land (about 277 million hectare) and is estimated to produce 40 percent of all crops. Rain-fed agriculture covers 82 percent of the crop land and produces 60 percent of the total crops.

Recent concerns about, on the one hand, rising food prices and food security and, on the other hand, increasing water scarcity, climate change, and the high proportion of water used in agriculture are drawing attention to the urgent need to improve water management in both irrigated and rain fed agriculture.

The Ghataprabha Left Bank Canal irrigation Project is located in the Northwest of Karnataka, bordered by the two rivers Krishna and Ghataprabha. The gross command area is over 1, 61,878 Ha. Major portion of the irrigated land is provided with water supply from the existing canal command serve by Ghataprabha Left Bank Canal and six branch canals. There are 90 distributaries major and minor. The canal system provides irrigation to parts of 4 Taluks in Belgaum and 3 Taluks of Bagalkote Districts. The Right Bank canal irrigates 1, 01,521Ha and CBC 33403 covering parts of 6 taluks in Belgaum & 4 taluks in Bagalkote districts.

As per design the gross command area amounts to 1,61,878 ha while the net irrigatable area is 1,61,000 ha. In reality there is no updated survey on how much area is irrigated and by what source of water. There are many signs of encroachment of agriculture using water pumps on dry lands either outside the command area or inside the GCA. What is the importance of this physical expansion of the irrigated area is difficult to say. The only source of data which is available is the Remote sensing GIS survey made in 2001 in which they say that the command area spans over 2,80,000 ha, that is hundred thousands more than the initial GCA. A more recent analysis made as a follow up of the MASSCOTE workshop report shows that the total irrigated cropped area is about 2,20,000 Ha.

The supply of requisite quantity of water is the biggest problem in these areas. There was need for a program to distribute the water to all the irrigated land and its proper utilization. Since the water was to be released through the canals, it was to be informed to the farmers well in advance to avoid the inconvenience. The Water sources Department commissioned a "Remote Canal Flow a level Monitoring System" on a pilot basis to measure the flow of water in to Ghataprabha Left Bank Canal. Global System for Mobile (GSM) was installed in five locations to monitor the discharge of water from the dam to canals. This system supply the data to central computer server through the GSM network and the data would be made available to the engineers of the department and the office bearers of the Water Users Association. In turn the information is passed on to the farmers who have registered with the association. The time of releasing of water is informed to the farmers of the relevant villages through the messages to their mobile phones. The farmers will then be observant and ready to welcome water flow and use it for agriculture.

WATER USERS ASSOCIATIONS (WUAs)

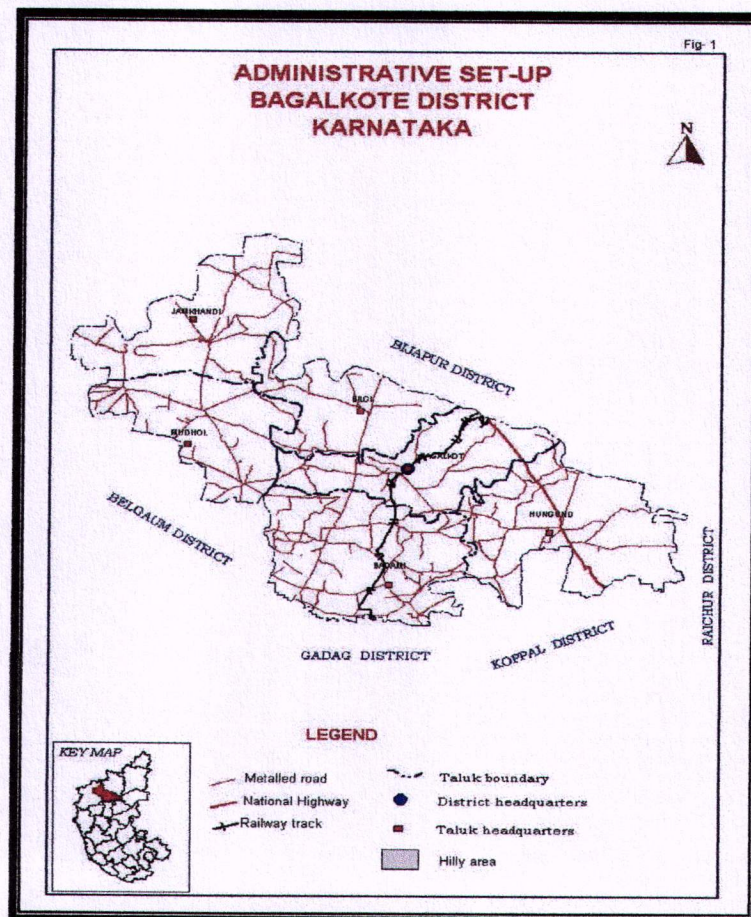
Water Users Cooperative Societies or Water Users Associations have been established to take up the maintenance at lateral levels and also to release water to farmers within their jurisdiction. The average area of these WUAs is around 500 Hectares. The department is supposed to sell water on volumetric basis to WUA and Associations, in turn, sell for supplying water to individual farmers. The Associations are entitled to collect the water charges from the farmers and retain 20% of the collection as administrative charges with Rs.40 per Hectare towards maintenance of the system. The WUAs are unable to function well for the reasons that they do not have any realistic rights in management and most of the WUAs are financially weak. They cannot afford to have technical personnel expertise on their own for proper maintenance and management of the water system.

PREVIOUS PRACTICE

Before the introduction of Automated Water and Canal Management system the information about the quantity, time and date of the release of water was being announced through the news papers and gazettes as per the regulations of Government of Karnataka. On the specified date and time of water release the operator who is in-charge used to make an entry of the same in the register maintained for this purpose and release the water in the presence of authorised officers for this purpose. Through the announcement in the news paper and gazette only the other officers and people were to be aware of the quantity of water released at the particular time and date. This has had created great confusion among the farmers since the majority of the farmers were not much educated.

STRATEGY ADOPTED

The previous practice followed earlier had its own negative brunt on the system release of water. Majority of the farmers are not much educated to follow the documents and newspapers for the information about the release of water at a specified time and date. The Water Users Association then adopted a system where the farmers were allowed to register their names along with mobile numbers with the Association. The detailed information about the release of water passed on to these registered farmers well in advance by the Association. The uncertainty about the release of water was solved to a very great extent. This made the farmers to be very much comfortable and they could schedule their farm activities as per the water release quantity and timings.



RESEARCH DESIGN

STATEMENT OF PROBLEM

Water being the scarcest resource, it has to be used very much judiciously. The conservation of water will increase the potentiality of agriculture and the water saved will be used in future when needed. The water resources have to be saved for our future generation. Otherwise, the future will curse us for our stupidity of exhausting their share of water. Everyone on this globe has got a responsibility to conserve water and save it for the rainy season. This has made us to seriously think over the methods of conserving water. It is very much necessary to know the farmers' perception about the Supply of water to their farming. The study on the farmers' perception about the automated water canal management has been taken to understand the response of the farmers in this regard.

OBJECTIVES:

1. To study the farmers' perception towards the Automated Real Time Water and Canal Management in Mudhol Taluk of Bagalkote District.
2. To study in brief the operation of Automated Real Time Water and Canal Management device in given area.
3. To study the measures to be taken to increase the effectiveness of the automated RTWCM.

SCOPE OF THE STUDY

The study being conducted covers the whole of the Mudhol Taluk of Bagalkote District of the State of Karnataka. This taluk is under the command area of Ghataprabha Left Bank Canal. This study has been devised to cover the individual farmers who are availing the benefit of the Automated Water Management System prevailing in this taluk. The study has also tried to cover the time limit provided for solving the water problem of the agriculturists in that area.

LIMITATION OF THE STUDY

1. The study has been conducted in the Mudhol Taluk of Bagalkote District. Since this study has constrained its scope to this area alone, it cannot be generalized with other parts of the district or State.
2. The study is conducted with the help of the questionnaire administered to a sample of 150 farmers. Since the number of farmers is very large, this small sample may not really be representative of all farmers in the area.
3. The strength of the study depends to a great extent on the reliability and truthfulness of the information given by the farmers in the form of their responses to the questionnaires administered to them. Their bias due to any reason may affect the efficacy of the study.

RESEARCH METHODOLOGY

The study of the farmers' perceptions about the water and canal management has been taken up for finding out what the farmers perceive about the method, working and management of water and canal in the area of Mudhol Taluk and this is possible only with the sufficient information collected from various sources.

DATA COLLECTION:

Primary data:

The main data collected are through the questionnaires which were distributed among 150 sample farmers from different villages of Mudhol Taluk of Bagalkote District. The selection of villages and farmers for this purpose was by *convenience sampling method*.

Secondary Data:

The secondary data are also of very much importance to interpret the information and bring out the findings. The secondary data have been collected from various publications, journals, and research papers, reports given by the governments and authorities and websites. The material collected from various reports and publications of Government of Karnataka and Government of India and other bodies have been immensely helped in making this report meaningful.

The collected data were put into the percentage analysis. The conclusions were drawn from these analysis and interpretations were recorded.

ANALYSIS AND DISCUSSIONS

TABLE 1
SHOWING THE YEARS OF FARMING BY THE FARMERS

1 – 10 years	13	8.7%
11 – 20 years	61	40.7%
21 – 30 years	47	31.3%
30 yrs & above	29	19.3 %
Total	150	100

ANALYSIS: The above table shows 40.7 percent of the farmers are in the profession of agriculture for the last 11 to 20 years. However, the farmers who are farming for the past 21 – 30 years are 31.3per cent, and 19.3 % above 30 years followed by 8.7per cent who are within 10 years.

INTERPRETATION:

The above table infers that agriculture is predominant livelihood in this area. This is being carried out for decades by the farmers who depend on this means of livelihood. This necessitates the provision of the basic essentials of agriculture like sufficient water, quality seeds and manure etc.

CHART. 1
YEARS OF FARMING BY THE FARMERS

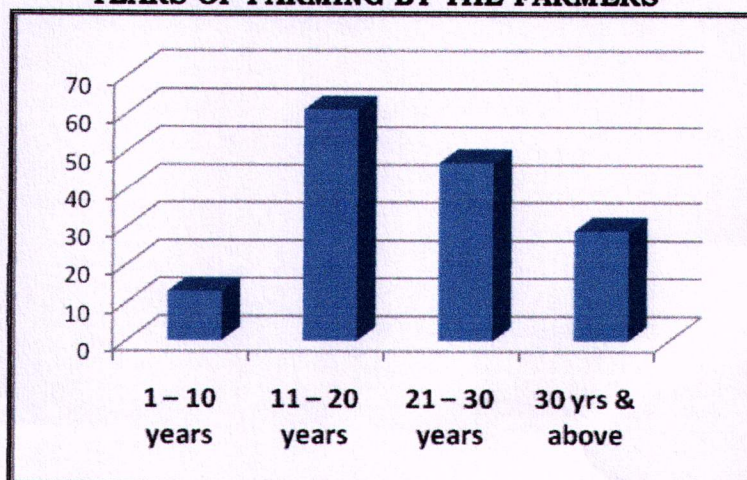


TABLE 2
ROTATIONAL SUPPLY OF WATER THROUGH THE CANAL

	Frequency	Percent
YES	135	90.0
NO	15	10.0
Total	150	100.0

ANALYSIS

The table gives a view that 90 percent of the respondents are used to the rotational system of agriculture and 15% are not.

INTERPRETATION

This means they are well aware of the latest agricultural activities and well acquainted with the benefits of the rotational system of agriculture which is a good sign of progress. The farmers can motivate in general to read the articles on agriculture to understand recent developments in this area.

CHART 2
ROTATIONAL SUPPLY OF WATER THROUGH THE CANAL

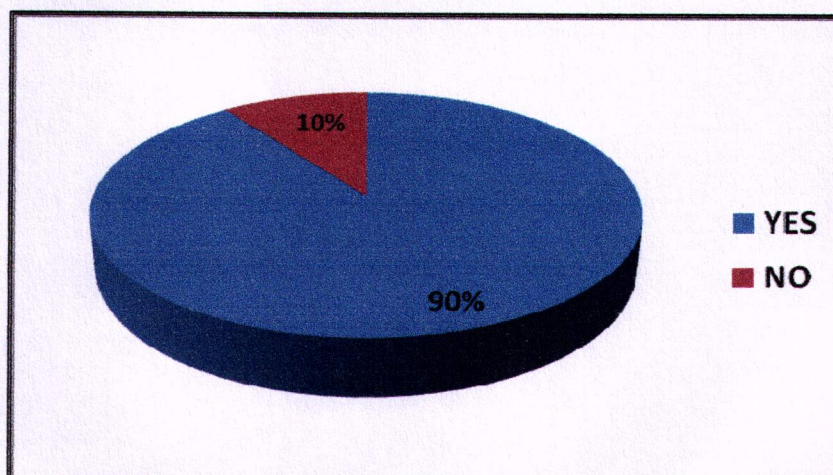


TABLE 3
SATISFACTION WITH PRESENT SYSTEM

	Frequency	Percent
Yes	119	79.3
No	31	20.7
Total	150	100.0

ANALYSIS

The table shows that **79.3% of the respondents have expressed that they are satisfied with the present rotational system of water delivery.** But 20.7 per cent have expressed their negative opinion.

INTERPRETATION

This infers that majority are satisfied with the present system. It is a very good sign that the satisfaction level of the farmers is on the positive side as to the present system is concerned. But since the negative opinion is not in a small percent, concern has to be taken to find the reasons for this dissatisfaction also.

CHART 3
SATISFACTION WITH PRESENT SYSTEM

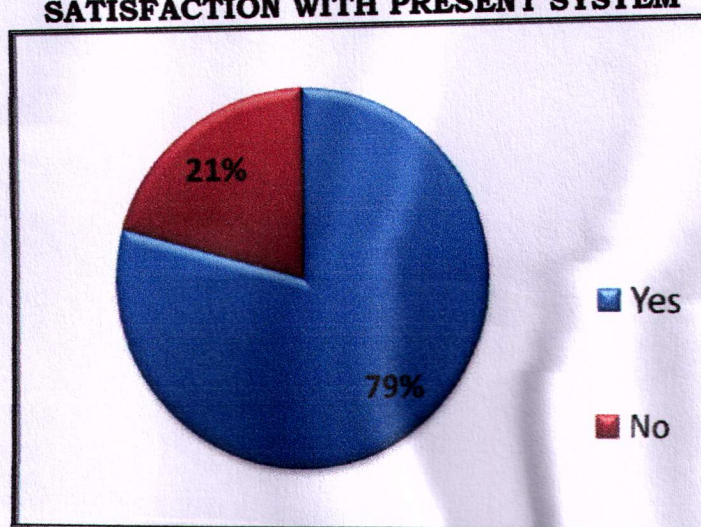


TABLE 4
SUFFICIENCY OF WATER SUPPLY

	Frequency	Percent
Yes	108	72.0
No	42	28.0
Total	150	100.0

ANALYSIS

72 per cent of the respondents opine that the water supplied to them at present is sufficient, only 28 per cent are disagreeing with this.

INTERPRETATION

The above table infers that the water supplied to them is sufficient and agricultural activities are going on smoothly. The negative frequency has been scattered over the entire district. Hence, difficult to identify those who are not satisfied with the present system.

CHART 4
SUFFICIENCY OF WATER SUPPLY

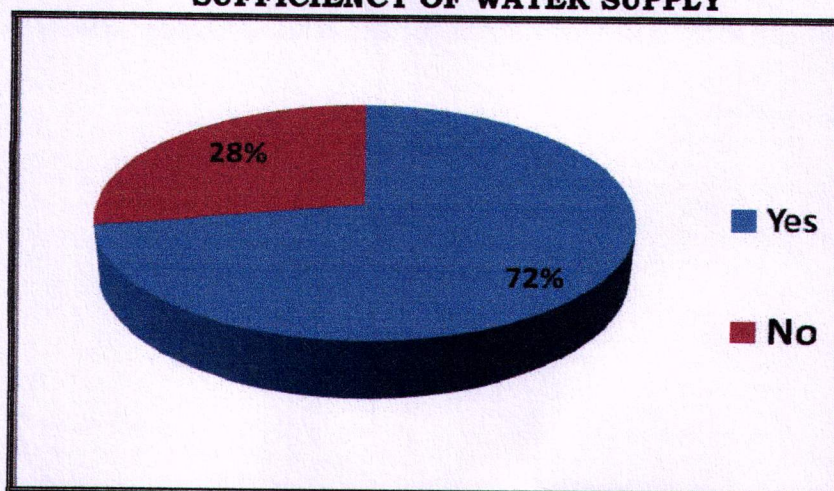


TABLE 5
METHOD OF CULTIVATION

	Frequency	Percent
Traditional	46	30.7
Semi- Automated	80	53.3
Automated	24	16.0
Total	150	100.0

ANALYSIS: The table shows 53.3per cent of the respondents follow semi-automated method of agriculture, 16per cent follow Automated and 30.7 per cent depend on traditional method of cultivation.

INTERPRETATION: It is inferred that majority of the farmers that is $53.3+16=69.3$ percent follows modern method of cultivation. The traditional method of agriculture includes activities which require only the manual labour without the aid of mechanical devices. Semi automated means the agricultural activities conducted with the help of partly mechanical and partly traditional equipments and automated farming including extensive use of the mechanical devices in the agricultural activities like machines used for ploughing with the help of tractors, weeding by machines, blowing, separating the grains from plants, etc. This isreally a very positive sign towards the improvisation of the method of cultivation in the country. Efforts can be made to motivate the balance 30.7 per cent farmers to adopt the modern methods of cultivation so that they can increase the agricultural production for their personal and growth of the country as a whole.

CHART 5
METHOD OF CULTIVATION

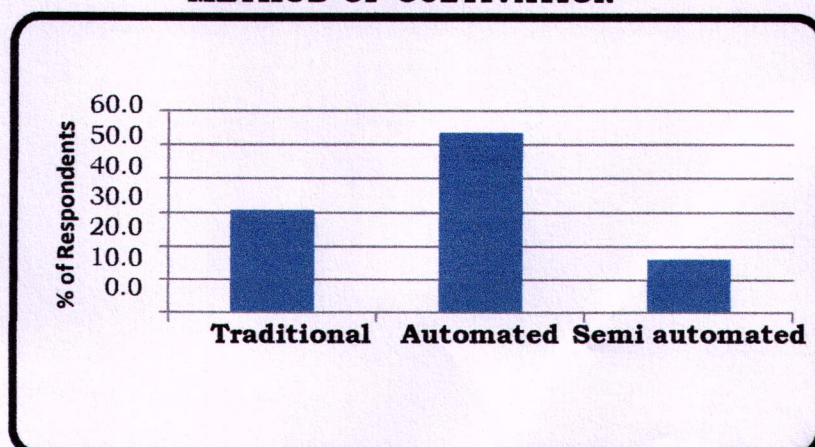


TABLE 6
TYPE OF MANURE USED

	Frequency	Percent
Organic Manure	12	8.0
Chemical Manure	22	14.7
Both	116	77.3
Total	150	100.0

ANALYSIS

The table shows only 8per cent of the farmers are using organic manure, 14.7per cent are using chemical manure and 77.3per cent of the farmers are depending on both chemical and organic manures.

INTERPRETATION

Majority of the farmers are using the chemical manure. This is a double edged weapon. The farmers should be educated to use the chemical manure in a scientific way; otherwise this will have a negative effect over the fertility of the land and the productivity of the agricultural products. The use of organic manure should be propagated more so that the quality of land can be improved having the best healthy produce too.

CHART - 6
TYPE OF MANURE USED

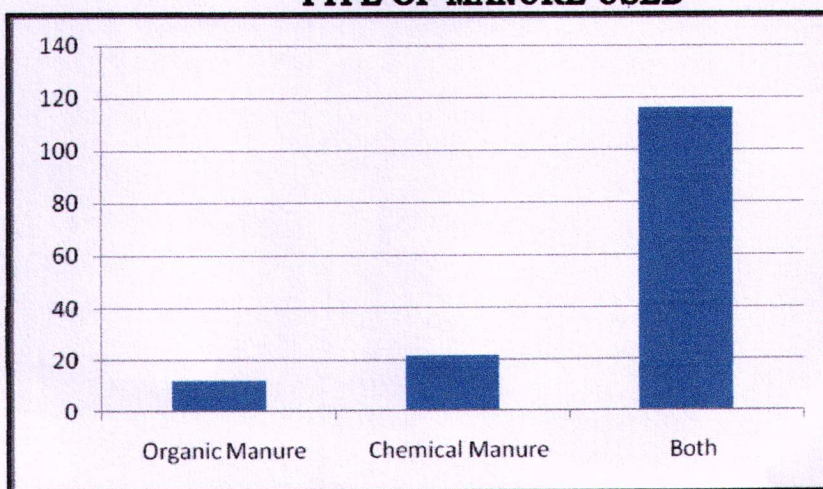


TABLE 7
SOURCE OF SEEDS FOR
SOWING

Source of seeds	Frequency	Percent
Own source	33	22.0
Shops	117	78.0
Total	150	100.0

ANALYSIS:

The table shows that 78per cent of the respondents depend on external shops to get the seeds and 22per cent of the respondents have their own source.

INTERPRETATION

Majority of the farmers are using the seeds available with the shops. Hope these are processed and ready to be used. It increases the productivity of the food grains. It is a positive move with the farmers. However, the farmers should be provided with good quality of seeds for their usage assuring to be cost effective and qualitative. The farmers can also be guided properly as to the method of using the processed seeds available in the shops.

CHART 7
SOURCE OF SEEDS FOR SOWING

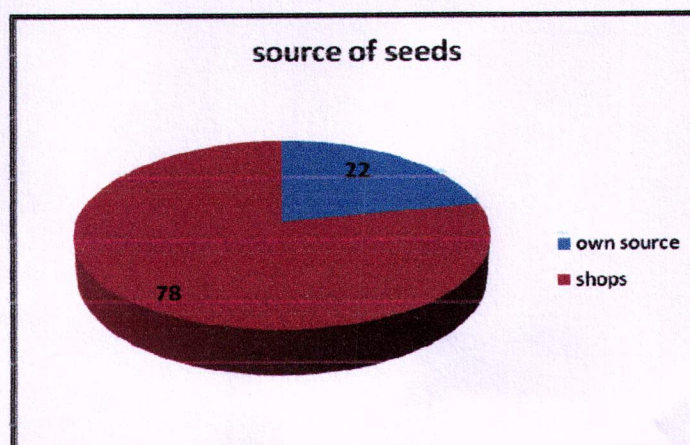


TABLE 8
CROP ROTATION AMONG THE
FARMERS

	Frequency	Percent
Yes	132	88
No	18	12
Total	150	100

This table shows that 88 per cent of the farmers are practicing the pattern of rotational crop whereas 12 percent do not. This method is really scientific since it is very much necessary to follow crop rotation to retain and improve the quality of the land and the productivity of the agricultural products. The other farmers who are not following the crop rotation should be educated to follow the system. This will also stabilize the prices of the agricultural products in the market.

CHART 8

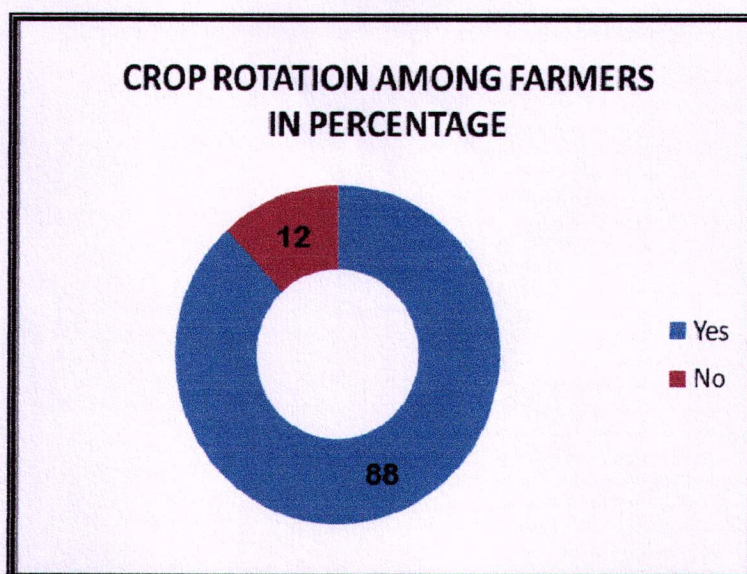


TABLE 9

OWNERSHIP OF LAND CULTIVATED

Type of land	Frequency	Percent
OWN	128	85%
LEASED	22	15 %
Total	150	100.0

ANALYSIS

The above table shows clearly that 85 per cent of the cultivators own the land they are cultivating followed by 14 per cent on the leased land.

INTERPRETATION

This table infers majority of the cultivators are owners of the land and depend on their profession for survival. This is also a signal that they do not have any means of livelihood. The caution is, in case they fail in any respect, their survival will be at stake.

CHART 9

OWNERSHIP OF LAND CULTIVATED

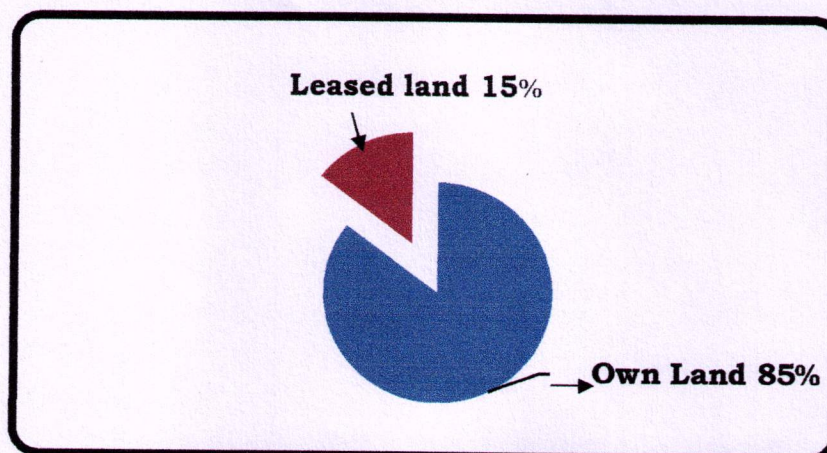


Table 10
CULTIVATED LAND IN ACRES

Cultivated in acres	Frequency	Percent
1 - 10 Acres	108	72.0
11-20 Acres	29	19.4
21-30 Acres	8	5.3
31 & Above	5	3.3
Total	150	100

ANALYSIS

The above table shows that majority of them own land between 1 - 10 acres and only 5 percent own more than 30 acres.

INTERPRETATION

The above table clearly infers that majority of the farmers are small and lower medium farmers and their land holding is low. They mainly depend on small pieces of land for their livelihood. The small and fragmented land holdings are not a sign of prosperity to the farmers. They could be taught about the cooperative farming under a rational and formal manner so that the productivity of land can be increased. This brings economically better days to the farmers.

CHART 10
CULTIVATED LAND IN ACRES

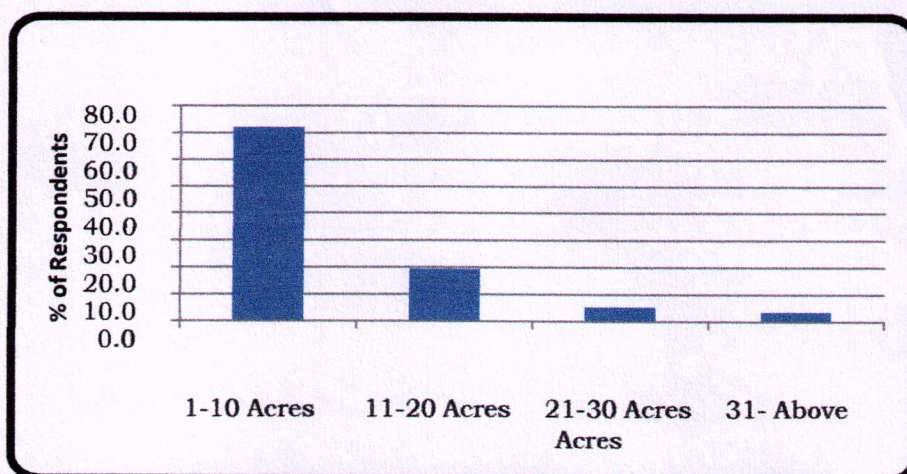


TABLE 11
ASSOCIATION WITH WUA

	Frequency	Percent
YES	141	94.0
NO	9	6.0
Total	150	100

ANALYSIS

The above table shows that 94per cent of the farmers in this area are members of the Water Users Association. Only a meagre number of 6% are the non - members.

INTERPRETATION

The table infers that majority of the farmers are associated with the Water Users Association (WUA). This indicates that the farmers are well organised and are aware of the benefits of forming an association for smooth conduct of agriculture. It is also hoped that the Association can do much for the development of the member farmers in getting sufficient quantity of water for their agriculture. The Association can also think of more than mere supplying water like agriculture demonstrations, agricultural tours, supplying some useful materials, conducting classes, night classes for the members of the family of the members of WUA , etc.

CHART 11
ASSOCIATION WITH WUA

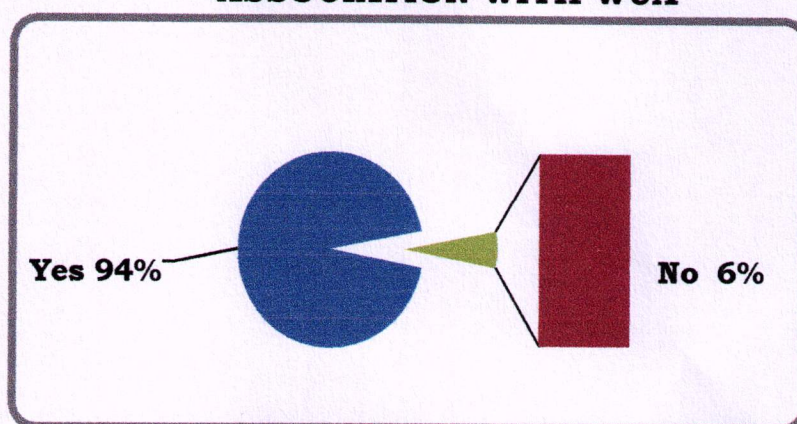


TABLE 12

TOTAL LAND CULTIVATED UNDER WUA

12. A: Present.

Present	Frequency	Percent
1 – 5 Acres	60	40.0
6 – 10 Acres	48	32.0
11 – 15 Acres	13	8.7
16 & Above	29	19.3
Total	150	100.0

ANALYSIS: The table signifies that 40per cent of the land cultivated is with the water supplied by the WUA where the land is below 5 acres. It is followed by 32per cent in case of 6 – 10 acres of land, 8.7per cent in 11 – 15 acres of land and 19.3per cent in 16 and above slot.

INERPRETATION: This table gives the inference that majority of the land covered with water provided by the Association is below 10 acres. That means small farmers are mainly dependent upon the Association for water for their agriculture. This signifies that Association has got a major responsibility and a role to play in agricultural development of the concerned area under observation.

Chart 12 A
TOTAL LAND CULTIVATED UNDER WUA

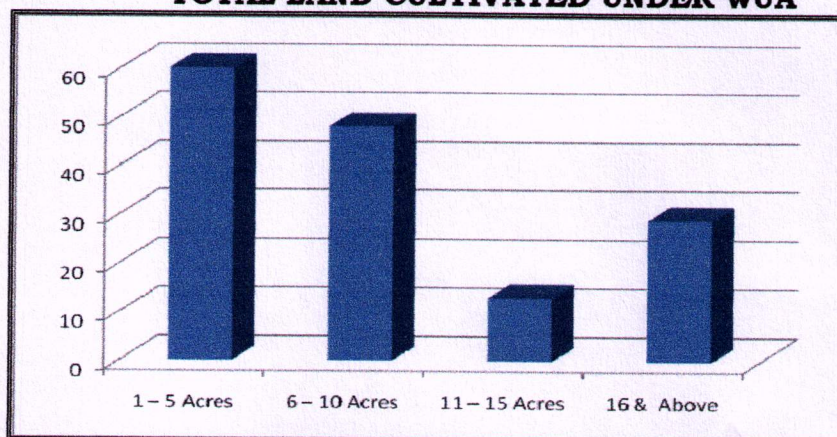


Chart 12 B
TOTAL LAND CULTIVATED UNDER WUA

TABLE 12. B - Decade ago.

Decade ago	Frequency	Percent
No cultivated	7	4.7
1 – 5 Acres	81	54.0
6 – 10 Acres	35	23.3
11 – 15 Acres	13	8.7
16 & Acres	14	9.3
Total	150	100.0

A decade ago 4.7 percent respondents were farmers. But now not cultivating any land. The percentage of cultivators who cultivated 1-5 acres has been decreased from 54% a decade ago to 40% at present. This may be because of some of the farmers giving up the farming and using the land for other purpose of sold the land for a purpose other than agriculture. However there is a steep increase in the cultivators of 6 – 10 acres from 23.3% decade ago to 32% at present. This may due to purchase of land by the farmers or consolidation of agricultural land by the farmers.

CHART. 12-B

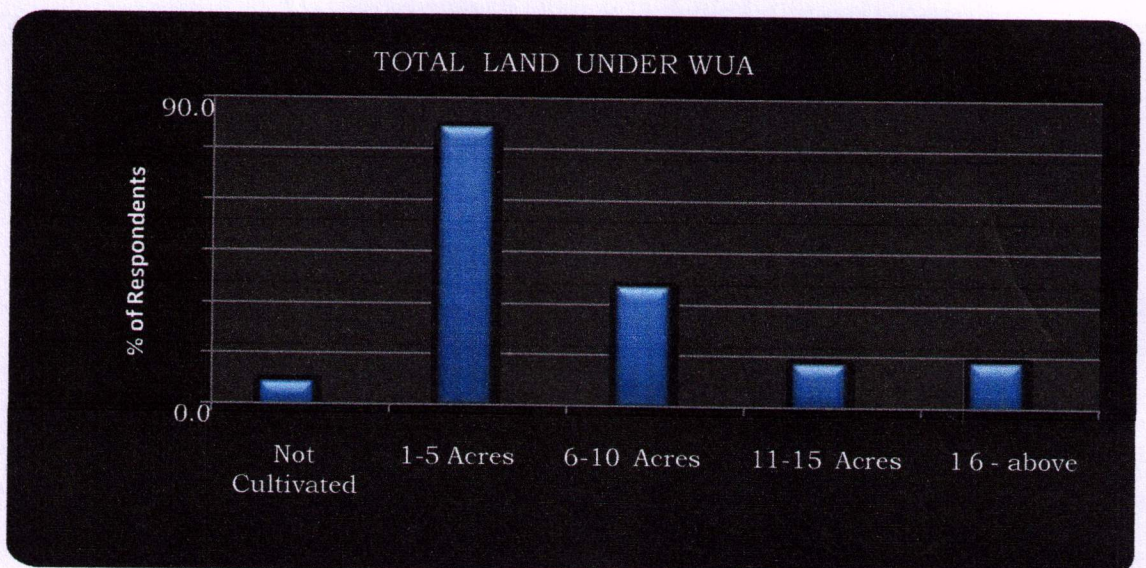


TABLE 13
COMPARATIVE STATEMENT OF LAND CULTIVATED

variables	Present	Decade ago
No cultivation	00	7
1 – 5 acres	60	81
6 – 10 acres	48	35
11– 15 acres	13	13
16 & above	29	14
TOTAL	150	150

ANALYSIS AND INTERPRETATION

The above table infers that there is many a change in the agricultural habit of the respondents. There were 7 respondents who were not cultivating the land and at present it is zero. That shows that new addition to the field of agriculture. This requires the additional water resource for the new agricultural lands being cultivated.

At 1 – 5 acres a decade ago 81 respondents were there but at present there are only 60 respondents. This is an alarming signal. This shows that 21 respondents have either given up agriculture or sold their lands to others. This may be due to non- availability of sufficient water resources for agriculture or usage of agricultural land for non - agricultural purpose. Both turns out to be detrimental to the interests of the agriculture and food production as a whole.

There is no change in 11 – 15 acres slot.

In case of 16 acres and above there is an increase in the agriculturists from 14 to 29. This shows the concentration of agricultural land from different agriculturists to strong land lords.

TABLE 14
RESOURCE OF WATER FOR AGRICULTURE

	Frequency	Percent
Canal	61	41
Canal + tube well	80	53
Tube well	9	6
Total	150	100

ANALYSIS

The above table shows that 41per cent of the respondents have only one source that is canal water but 53per cent depend on canal and tube well both rest 6per cent only on the tube well for the water source for their agricultural activity.

INTERPRETATION

Majority of the farmers depends on the canal and also tube well for their water requirement. This is in one way a positive move since their dependency totally on canal is less. This also infers that water supply for the agriculture may not be sufficient too.

CHART 14

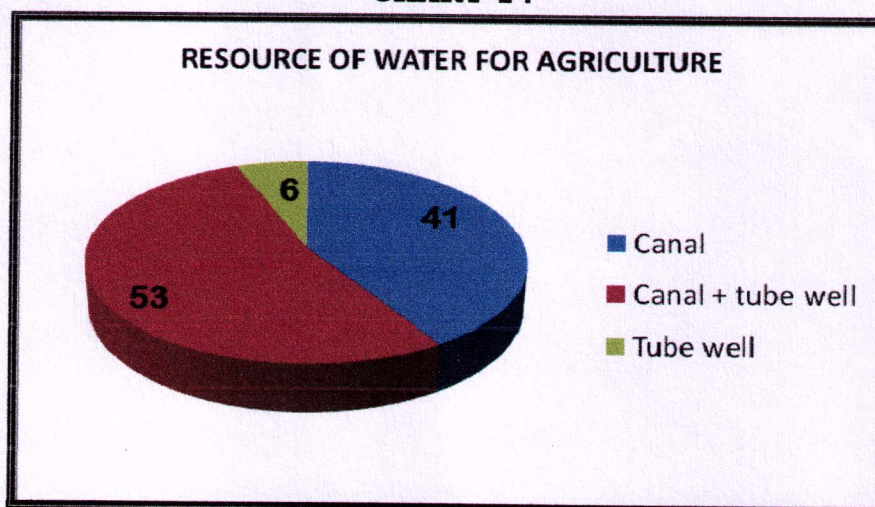


TABLE 15
UNDERSTANDING BETWEEN FARMERS AND THE AUTHORITIES
AS TO THE QUANTITY OF WATER BEING SUPPLIED

VARIABLES	FREQUENCY	PERCENT
Yes	103	69%
No	47	31%
Total	150	100

ANALYSIS

The table shows that 69per cent of the respondents are having a good understanding with the authorities for supply of water to their land whereas 31per cent are at the other pole.

INTERPRETATION

This infers that majority of the farmers are having a good understanding with the authorities for water supply to their land. This shows that a good atmosphere exist ensuring harmonious relationship between the farmers and government authorities. The authorities should also take proper action establishing a good rapport between the two parties in respect of those farmers who are not in good terms with the authorities.

CHART. 15
UNDERSTANDING BETWEEN FARMERS & AUTHORITIES

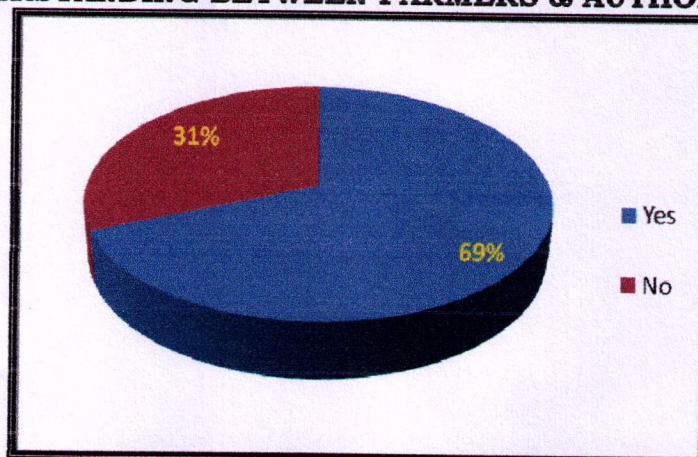


TABLE 16
INFORMATION ON THE WATER SCHEDULE AND ACTUAL FLOW OF
WATER FOR A PARTICULAR TIME

VARIABLES	FREQUENCY	PERCENT
Yes	79	52.7
No	71	47.3
Total	150	100.0

ANALYSIS

52.7 per cent of the respondents have opined that information is available about actual flow of water during a particular fortnight and 47.3per cent have said NO to this statement.

INTERPRETATION

The table infers that majority have the information about the water supply. However, the percentage of respondents who have received and not received is almost equal to the other. This is an *alarming signal* about flow of information. The authorities should take sufficient measures to improve the information flow so that farmers are well informed about the flow of water in the particular fortnight. The authorities should take farmers into confidence. The communication gap may be due to many reasons like non transmission of the message to the mobiles, network problem, not noticing the message given by the sender, etc.,

CHART 16
INFORMATION OF WATER SCHEDULE

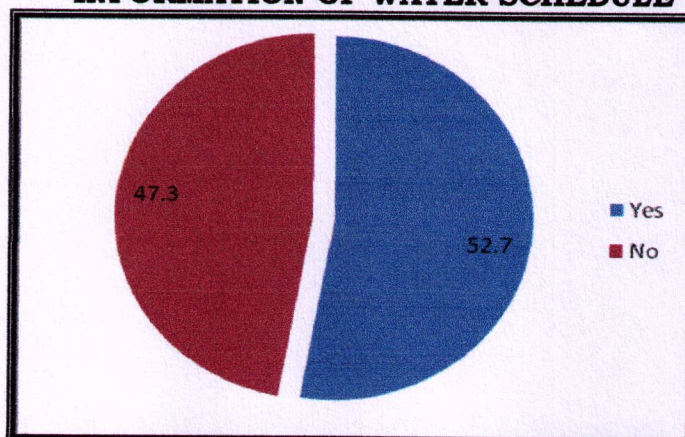


TABLE. 17
INFORMATION ON MOBILE PHONE ON THE WATER FLOW CONDITIONS
AND CHANGES

variables	Frequency	Percent
Yes	47	31.3
No	103	68.7
Total	150	100.0

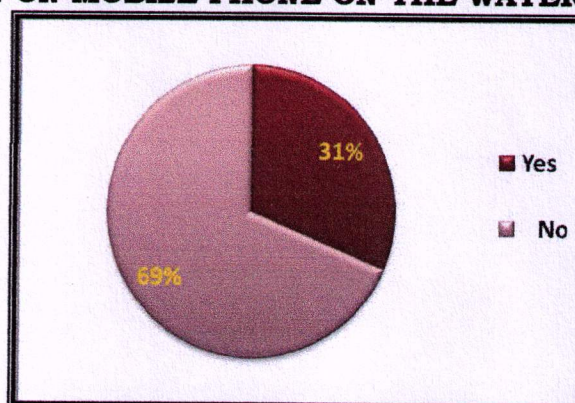
ANALYSIS:

The table shows that 31.3per cent of the respondents receive through SMS the information of water flow through mobile and 68.7per cent do not.

INTERPRETATION

This table infers that communication through mobiles is very limited. The farmers should develop their communication abilities through mobiles so that they can get the information in the right time about the water flow.This will help them to carry out the farming activity easily and productively. This also reminds about the necessity of improving the literacy among the farming community in this area. The farmers can attend the night classes and study in the evenings and during their free time so that they can be aware of the developments of the agricultural field. The authorities should also collect the proper phone numbers of all the farmers and give the information in the right time when it is needed. This will build up the confidence of farmers over the system of water management.

CHART 17
INFORMATION ON MOBILE PHONE ON THE WATER FLOW CONDITIONS



CHAPTER- 5

FINDINGS AND CONCLUSIONS OF THE STUDY

FINDINGS

- 40.7% of the farmers have been in agriculture for the last almost 20 years 31.3% farmers from 21-30years and 19.3% farmers are farming for more than 30 years.
- 90 percent of the farmers are accustomed to rotational system of water supply.
- **79.3% of the farmers have expressed their satisfaction with the present rotational system of water delivery.**
- 72% of the farmers are of the opinion that the present water supply is sufficient.
- 53.3% of the farmers follow mechanized method of agriculture, 16% follow semi-automated and 30.7 % depend on traditional method of cultivation.
- Only 8% of the farmers are using organic manure 14.7% using chemical manure and 77.3%on both chemical and organic manures.
- 78% of the famers depend on external shops for seeds and 22% have their own source.
- 88% of the farmers are practicing crop rotation pattern.
- 85% of the cultivators own the land they are cultivating.
- The farmers owing land between 1 – 10 acres are 72% of the population, 19.4% own 11-20acres and 5.3% and 3.3% own 21-30 acres and above 30 acres respectively.

- At present 40% of the farmers who own their land of 1-5 acres are cultivated under Water Users Association. The farmers who own 6-10 acres comprise 32 % of the population, 8.7% under 11-15 acres and 19.3% are cultivating land above 16 acres under their cultivation activity.
- A decade ago 4.7% of the farmers were not cultivating any land, 54% of them were cultivating 1-5 acres of land, 23.3% were cultivating 6-10 acres and 9.3% were cultivating more than 15 acres.
- 41% of the farmers are depending upon canal for their source of water, 53% on canal and also tube well both and 6% only on the tube well for the water source for their agricultural activity.
- 69% of the farmers are having good understanding with the authorities for supply of water to their land.
- 52.7% of the farmers get information about actual flow of water during particular Timings.
- 31.3% of the farmers are getting the required information of water flow through mobiles.

CONCLUSION

The findings land us at conclusions that agriculture is the most predominant vocation and means of livelihood in Mudhol Talluk of district of Bagalkote where study has been conducted. Majority of farmers have been in farming for more than 20 to 30 years. This shows the dependency of their lives on the agriculture.

The farmers are well aware and accustomed to rotational system of water supply. This indicates that they are aware of the seriousness of the scarcity of the water and its judicious use and their responsibility in saving water. Majority of the farmers are happy with the present system of rotational water supply system. This shows that the water supply mechanism is working to the expectations of the farmers to cater their needs.

The farmers of Mudhol Talluk are not behind in utilising the modern agricultural equipments in their activities. Because majority of the farmers have been following the mechanized method of agriculture. They have shown their concern towards Green activity also. Negligible number of farmers has been using chemical manures and majority are depending on organic and non organic manures. Farmers could be educated further with help of demonstrations and booklets etc to get a insight into the organic farming which increases the productivity of the land and saving the valuable resources.

Majority of the farmers depend on the external shops for the seeds and other requirements. The chances of exploitations cannot be ruled out. The Water Users Associations can think of establishing the farmers help centre which distributes their requirements at subsidized rates. This will increase the confidence of the farmers and reduce their cost of operation also.

The happiest thing is that farmers are aware of the rotational crop system. This assures that our farmers are updated to this extent. They are aware of the benefits of rotational crop system. Majority of cultivators carryout their farming on their own land. That means they do not have any source of income depending entirely on agriculture. Majority of the farmers are the members of Water Users Association and they depend fully on the water supplied by the WUA. This reminds the responsibility of the Association to come to the rescue of the members in case of need as a collective bargaining power.

SUGGESTIONS AND RECOMMENDATIONS

After a thorough study of the project we suggest the following recommendations.

1. The agriculture is the predominant occupation of the people in this area and hence providing aids to them should be geared up to develop the area. The aids may be in the form of subsidized loan, farm equipments, and seeds at a subsidized rate to help farmers.
2. The farmers can be motivated to continue the rotational system of water supply. This will reduce the wastage of water and also allow the water to be used by other farmers. The appropriate time gap between the supplies effect positively on the productivity of the agricultural land and the quantity of water to be used.
3. The farmers have expressed that water supply has been satisfactory in the canal system. But they are not in a position to express it in terms of quantity of water required and supplied. Hence, they need to learn about automated canal and water management system thoroughly. This will increase the effectiveness of the system. Demonstrations may be given to **educate the farmers** in this regard.
4. The Water Users Associations can think of establishing the farmers **help centres** which distribute their requirements at a subsidized rate. This will increase the confidence of the farmers and reduce their cost of operation also.

5. The farmers can be well educated and informed about the use of **organic manure** in agriculture so that dependency on the chemical manure shall be reduced. They can be enlightened about Green Farming, a method to use eco friendly technique for farming.

6. Information about the water flow should be made known to **all farmers** through mobiles well in advance so that economic usage of water is possible. The farmers should be motivated to register their phone numbers with the Water Users Association to provide information. The WUA may also strive to increase the membership to gain the support of the farmers and to become financially stronger. At the same time the WUAs may be given some financial support by the Government to make them financially sustainable so that it can help the farmers in their need.

BIBLIOGRAPHY

1. Ground Water Information Booklet published by Central Groundwater Board, Ministry of Water Resources, Government of India, April 2011.
2. Article by Sri. Anil.B.Mandavia, Chief Engineer, Management Information Systems, Sardar Sarovar Narmada Nigam Limited, Gandhinagar, Gujarat, India.
3. [http://worldbank.org/water/topics/agricultural-water-management/rain fed- agriculture](http://worldbank.org/water/topics/agricultural-water-management/rain-fed-agriculture)
4. "*THE HINDU*", dated February 22, 2009.
5. Chandrakanth M.G. (2009) Karnataka State Water Sector Reform: Current Status, Emerging Issues and Needed Strategies: ITP RESEARCH SERIES 3 by IWMI- Tata Water Policy Program, International Water Management Institute (IWMI)
6. MASSCOTE Case Study in Karnataka – India, Working Document on GHATAPRABHA LEFT BANK CANAL – KNNL, Modernization strategy for Irrigation Management, 14/03/2008.