



Irrigation Problems and their solutions in Agriculture Development

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1. Introduction

Water is an important natural resource effecting economic and social development of human life. It is basic and primary need of human beings. From this point of view water, along with other resources is an important factor for the economical development of Gujarat and India. The availability and quality of water affects the rate of economic development. A water reservoir of any place affects the economic development referring to its domestic use, irrigation, industrial use and transportation, etc. Because of the increasing demand of water and its future availability, it has raised many questions at global level. There is a possibility of water crisis. Developed and developing countries agreed that water should be considered as economic goods rather than free goods available to all because it is related to cost management and expenditure.

As Agriculture sector provides food, the primary need of human beings, its related topic irrigation requires special attention. Availability of water for irrigation and situation of irrigation is directly related to the sustainable development of our country. In this context current position of irrigation and types of irrigation in Gujarat, India and in the world have become the main topics of this study. Water availability per head is decreasing day by day in the world. In fact, water availability per head in developing countries is decreasing rapidly in comparison to developed countries. It can become a great hurdle for the economic development of the country in future. Like other developing countries, in India also water availability per head is decreasing. Because of unequal distribution of water resources in our country, there is scarcity of water at many places. Irrigation is an important factor for agriculture development in India. Water resources, its quality and its uses play important role in agricultural development. There are two main sources of irrigation-surface water and underground water. Underground water is mostly used for irrigation. As the level of underground water is decreasing day by day, problems related to water arises.

2. Economic Problem

Irrigation is an important factor in agricultural development of any country. Irrigation makes agriculture based economy of a country independent. Though underground water is mainly used for irrigation, surface water is also used by some farmers. Today, the demand of water for irrigation is increasing in Gujarat, India and at the world level. But the water resources are very less. Many factors are responsible for this but one thing is clear that use of water for irrigation is continuously increasing so there is a possibility of water crisis in future.

Economic development is primarily based on farm products but they cannot be sustained because of lack of irrigation facility. Rain water is also uncertain and unequal in Gujarat. Average rainfall in different parts of Gujarat is around 340mm to 1000mm. Out of total agriculture land receives good rain, 23.36% land receives medium rain, and 68.65% land receives very less rain. So, it is clear that most of the parts of Gujarat have inadequate amount of rainfall. Due to insufficient rain, plants do not get enough water for their growth and ultimately production of crop is reduced. Water management should be analysed timer to time referring to irrigation condition in Agriculture, technics of irrigation and renovations, water resources, etc. Considering all this, an attempt is made to understand irrigation problems in S.K., availability of water and other related problems in this study.

3. Earlier Study

1. **Dr. G. R. Nambiyar - (1975)** a report on the study of water resources in Gujarat says that if a balance between resources and demand is not maintained, the underground water will be exhausted. It will create severe water scarcity and will affect the economic development badly. But the Govt. has not taken any action and the result is that reuse water scarcity is there are many parts of the state.
2. **Shri Arun Patel & Hariprasad Patel (1980)** - A research on Datiwada canal irrigation project says that more land can be benefitted by canal system. It will also provide 61 % employment to the people. Canal based farming will give more employment compared to rainfall based farming. This study reveals that net income per hectare of canal irrigated area was more than rain irrigated area.
3. **Dr. Haribhai Patel (1987)** – He has studied the development of irrigation and its effect of agriculture. He concluded that by conserving irrigation water for irrigation and case of less rainfall can save the crop. It is possible to take two crops at one time in the same piece of land with the help of irrigation. Green revolution can be seen at only those places with irrigation facility. Again, there is improvement in methods of crop production. The production of irrigated crop increases compared to unirrigated crop. The density of crop in Gujarat In 1960-63 was 1.049. It has incased in 1980-83 to 1.129. The crop density of India in 1960-63 was 1.150 and incused to 1237 in 180-83.
4. **Prof. B. S. Patel (1988)** - His study was on development of Tube-well for irrigation in which he reveals that the use of tube-well for irrigation is increasing continuously. There is little development in the canal system. Farmers use underground water for irrigation using tube-wells. Individual tub-wells can be used for irrigation in net irrigation area which was around 2.79 lacks hectare. The effected of tube-well can be seen.
5. **Dr. B. M. Jani (1992)** - According to Dr. B. M. Jani short and long term efficient water management and organization can play important role to cop up draught in future. It is the duty of Gujarat water and land management institute to prepare water and land management institute to prepare water management plans considering the future of the state.
6. **Tushar Shah (1993)** – Acc. To Tushar Shah the market of Underground water is in the hands of two limited contractors. The cast of drawing water from the wells depends on them. The competition should be increased in this area by forming the horsepower based power supply policy instead of unit based system and excess use of UG Water can be checked by managing power supply. One objection to this study is that more water will be used because of HP based fixed rates, so important resource will be misused and wasted.
7. **Dr. H. P. Trivedi & Smt. Nandaben Patel (1995)** - They have studied the sustention and saltyness of irrigation system in India. The salts present in the (irrigation) water directly or indirectly effect badly the crop production. Water with 0.05% or 750 micromere electricity is suitable for any crop and land. If it is fray 750-2250 micromeres it can be used for some lands and crops having capacity to hold more salts with some care. But if electricity of water is more than 2250 (about 0.15 % salt), than it is not at all suitable for agriculture.
8. **Dr. Y. K. Alag (1997)** – According to Dr. Y. K. Alag. Sometimes it happens that the priority in national water policy is ignored. Especially in case of underground water, those who have money start using UG water but others do not even try to get it. This problem can be solved only by making policies for using U.G. recourses.
9. **Rohit Shukla (2000)** - According to Rohit Shukla, water and land pollution is the serious problem which we have to face in future. Good irrigation helps in fast progress in the field of Agriculture. If a farmer gets the facility of irrigation than there can be fundamental change in a village life. He has put farwad the problem of water in Gujarat in his book.

4. Points of Research according to above study

According to the study of available literature the researcher has to face some questions for example:

- Scientific study of different methods of irrigation is SK and its effect.

- Scientific study of how canal based irrigation system is more effective on crop production and is compared to rain based irrigation system.
- An analysis / study of subsidy given to the farmers by GEB.
- Scientific study of Sardar Sarover Yojana for irrigation in Gujarat. Its advantages and disadvantages are necessary.
- A study is necessary for capital investment in development of irrigation system.
- Electric charges plays important role in Agriculture, so a scientific study of elec. And irrigation is necessary.
- Population increase, Human resource development and use of water are mutually related, so a study of different. Plans and policies about people and their development in agriculture are necessary.
- Scientific study of fixed rate of electric. In HP for irrigation and use of water is necessary.
- Crop density and production are mutually related for irrigated land can pared to non-irrigated land its scientific study is necessary.

5. Aims of Research

1. To study the pattern of irrigation in India.
2. To collect information about different patterns of irrigation.
3. To find out the effect of irrigation on production.
4. To find cut effect of irrigation on different crops.
5. To study different. Problems of irrigation and to give effective solution of irrigation for Agriculture deployment.

6. Hypotheses

1. Inadequate irrigation facility do not interfere Agriculture development.
2. No positive relationship between irrigation and production.
3. Irrigation is not import. Faction for Agriculture. Development.
4. Educated farmer do not accept new methods of irrigation.
5. Instead of traditional crop modern crop are not taken in irrigated land.

It is necessary to know the problem of research present, at global level, many problems are there in irrigation development, and it's different. Methods, proportion of irrigation along with other factors in developing and developed countries. To solve. These problems in Agriculture many scientists and social reformers have drown their attention to it. There is cant. Decrease Agriculture part in total income of nation. It was 57 % in year 1950-51 and in 2009-2010 the contribution of Agriculture decreased to 14.6 % (Econ..... 2011) it shows the fundamental changes in Indian economic pattern.

7. Sample Design

To find out the irrigation pattern four Talukas with 2 Villages are taken.

4 Taluka × 2 Village. = Total 8 Village.

8 Village × 50 Farmers = Total 400 Farmers.

Data will be collected by. A questionnaire of 400 farmers and it will be analysed by SPSS.

8. Research Method

Keeping in mind research problem, its aims and hypotheses, data's of information are collected for irrigation management in Gujarat, India and at the world level, ratio of water for irrigation, water pollution, level of underground water, condition of water in future, etc. Primary information is collected by questionnaire and by making an analysis of it, what steps should be taken for the development of agriculture will be suggested in this study.

(A) Published Information

In this study information like per head availability of water in country and world level, present condition of water resources and demand of water for irrigation in future, figures of investment and expense made after it, useful land for agriculture in Gujarat, India and world, technology, role of cooperative institutions, future plan for irrigation, Asian Development report, Indian Development Report, Five Year Plans of Government collected. A well-known book **Water and Related Statistics** published by Water Ministry, Indian Government is also referred.

In this study for the management of irrigation at Gujarat level, data's of information are collected from Krishi Bhavan, Gandhinagar, from Social and Economic Reviews (2012-13) , different branches of irrigation dept., Narmada and Water Conservation Dept., etc.

Besides it, Irrigation laws of state and centre government, new rules , new policies declared by government from time to time, policy matter of government etc. are referred in this study. Moreover article related to the topic in the magazines like Yojna, Economic Policy Weekly, Bhujal News, Niyati, Arthasankalan and articles from daily newspapers like Times of India, Financial Express, Economic Times, Gujarat Samachar, Sandesh, etc. are referred in this study. Articles like Swaraj, Sahakar and Agro Sandesh are also used as reference in this study.

(b) Primary information

Keeping in mind the aims of research, hypotheses, area of research and by preparing questionnaire important information is collected from concerned persons. It is information about the source of irrigation water, technology, its organizations, income-expenditure etc. It reflects the role of irrigation in the development of agriculture.

9. Explanation of analysis in terms of economic policy

Published and primary information is classified and analysed by percentage method, average method and proportion method. It is through this method that condition of irrigation water and amount of rainfall in future is studied. It also shows an estimate of agriculture production in future and at the same time some suggestions are made to take more production. Study on various water conservation projects in terms of their policies is conducted to increase the level of underground water. Keeping in mind the future demand of irrigation water different new methods of water conservation must be adopted by the people. They should follow such irrigation methods that use minimum water and maximum production is taken.

10. Analysis Method

Here, an analysis of information is done through SPSS method. In the development of agriculture the role of irrigation and its demand in future, quality of irrigation water, stock of underground water and an approximate expense to get the water for irrigation and some other related economic issues are assessed in this study. Some suggestions and solutions to the above mentioned problems are also mentioned in it. Here, in general and unit –wise the structure of irrigation is assessed and the future plan of its stock is shown. To increase the production of crops which irrigation method is beneficial or suitable is also shown. For hypothesis examination test X^2 is conducted.

11. Findings of the Research

1. Approximately only 7.99% land of total agricultural land has the benefit of good rain, 23.36% of land has the benefit of medium rain and 68.65% of land has less than 750mm rain. Because of this situation even Gujarat is not able to develop fully.
2. The ratio of drinking water in the different parts of the world is – in Asia 32.2, Europe 15.2 and in America 38.8 whereas total population of the world is -61.2%, 12.3% and 12.9% respectively.
3. In comparison to other fields, the maximum consumption of water is in agriculture field. For example of the total water available in the world, 8% is consumed in domestic use in the world,

- in Asia it is 6%, in India it is 3%, for industrial purpose it is respectively 23%, 9% and 4%. However, in agricultural field the ratio of water consumption is respectively 69%, 85% and 39%.
4. In India 85% of underground water is used as drinking water. Underground water is an important aspect affecting the economy and life standard of our country.
 5. In the beginning of the planning years contribution of agriculture was 57% in the total national income. In 2010-11 it was decreased to 14.2%. However, income from industrial and service sector is increased in these days. It indicates economic development of our country.
 6. Irrigation facility was available to only 22.56% land of total agricultural land in 1950-51 in India. In 2009-10 it was increased to 38.90%. It means during 60 years only 16.34% of irrigation area was developed.
 7. During planning year's lot of money invested in the field of irrigation but the development of irrigation was not seen in that ratio. In fact, irrigation must be developed in ratio of investment and such type of policy should be implemented by the government.
 8. In only 19.5% area of total irrigated area in Gujarat, irrigation is done through canals whereas the ratio of irrigation done through ponds, lakes and wells is 80.5%. In the states like Punjab, Haryana, Tripura, West Bengal and Andhra Pradesh the ratio of irrigation done through canals is much more than Gujarat. Canals are not much developed in Gujarat and most of the irrigation depends on the underground water.
 9. If we study about the agriculture production in India, we shall find that from 1951 to 2011 production of crops like wheat, rice, oil-seeds and sugarcane is increased per hector while the production of pulses is decreased in 2011 in comparison to 1990.
 10. Table no.-2.16 shows that in 2009 the production of wheat, rice and sugar cane is reduced to 40 to 60%.
 11. Out of total 185 rivers of Gujarat, constant flowing rivers are very less. Rivers are located only in 20% of area that supply water to the remaining 80% area. It means most of the irrigation in the state depends on underground water.
 12. Agriculture sector provides employment to the 2/3 labourers of the total labourers in Gujarat. The role of agricultural income in the total income of the state is more than 1/3 part.
 13. North Gujarat, Saurashtra and Kutch are the areas where there is a scarcity of rain. Middle Gujarat and South Gujarat have more rain in comparison to other parts of the state. So there is an acute scarcity of drinking water and irrigation water in North Gujarat.
 14. 63.77 % land of total geographical area of the state is suitable for agriculture. 60% of that area depends on rain while 40% of land requires irrigation facility.
 15. The ratio of underground water is high in Middle Gujarat and South Gujarat. In North Gujarat this ratio is 25% and in Kutch it is only 4%.
 16. With reference to the problem of water in the state, different projects of water conservation are implemented. State has planned for some big dams to conserve water in different districts.
 17. 74.97 percentage area was covered for agriculture in Sabarkantha district in 2010-11. Forest area in this district is 17.49% and the net area of agriculture is 60.88%. So, the possibilities of development are more in this district.
 18. Average rain in this district is 549mm in 2011. In 2012 it was increased to 772mm. So the level of underground water can be increased in future.
 19. The farmers under study in this research are aware about the benefits of drip irrigation which save time, water and money and increase the production of the crops.
 20. To increase the irrigation facility the problems they have to face are electricity, scarcity of water and land distribution.
 21. To remove the problem of irrigated water, most of the farmers have suggested modern irrigation methods and well-organized method of water conservation.
 22. The farmers under study who use underground water for irrigation get water from the depth of 100 feet to 250 feet. 47% of farmers use canal water but only 17.5% of them can get enough water. 66% farmers say that the water of canal is wasted.

23. For canal water irrigation, most of the farmers use slopes in land whereas very few farmers use electric motor.

12. Suggestions

1. Only 8% land of the total land of India has the benefit of good rain which includes a small part of Gujarat. If some artificial sources of water are developed in Gujarat, dependability on rain water can be decreased.
2. India has 11.3% agricultural land of total agricultural land of the world. 25.3% population of the world is employed in agriculture. In short, opportunities of employment in other sectors should be increased so that burden on agriculture can be reduced.
3. During the planning years government invested huge amount in big, medium and small irrigation projects but the result is not up to the mark. In short, government should invest in such a way that the aims of agriculture irrigation can be fulfilled.
4. Since the age of planning the investment of government is not directly proportional to the development of irrigation facility in the country. Investment in irrigation should be in right direction and proportional to the development of irrigation facility in the country.
5. The main source of water in Gujarat is wells and tube wells. The portion of land irrigated by canals is one –fifth portion of total agriculture land. So administration should try to give more benefits of irrigation to farmers by developing canals.
6. In 2009 the production of crops like wheat, rice, sugar cane etc is very low in India in comparison to other countries of the world.
7. There are total 185 rivers in Gujarat but they affect only 20% agriculture area. So, most of the irrigation depends on underground water. If all these rivers are made alive i.e. constantly flowing, the problem of water will be solved easily.
8. Agriculture sector provides employment to 1/3 of total population in the state. The contribution of agricultural income is more than 1/3 of the total income. If both the irrigation facility and production of crops are improved, the employment will automatically be increased.
9. Due to insufficient rain in North Gujarat, Saurashtra and Kutch, there is a scarcity of drinking and irrigation water. In short, government should develop the canals of Narmada and solve the problem of these areas as early as possible.
10. The main crops produced in India are Bajra, groundnut , oilseeds and cotton. If government efforts to increase the production of such crops and to give them affordable rates of such crops , their income will be increased.
11. 89% of total water is consumed in agriculture. So such modern methods should be used that can save water and farmer can take crops in two or three stages.
12. In Sabarkantha district 75% of land is covered under agriculture. But its forest area is constantly decreasing which is not good for environment.
13. Majority of the people of this district live in villages. They are farmers, farm-labourers and workers. If any parallel or optional employment to agriculture is developed, their dependence on agriculture can be reduced. In short, if other agriculture related employments are developed, their economic status will be changed.
14. In S. K. district the portion of indirect irrigation is much in Megharaj Taluka while in Idar Taluka it is very less. If these inequalities are removed and every Taluka has been given equal benefit of canal and the rivers are made alive, the problems of irrigation can easily be solved.
15. In Sabarkantha district the portion of irrigation made by tube well is 25% and portion of irrigation done by canals is 3.34%. Thus, because of insufficient canals, irrigation facility cannot be fulfilled in the district.
16. With reference to the main crops in district, it is found that that in some crops irrigation area is larger while for other crops irrigation area is smaller. It affects the agriculture production. So, necessary steps should be taken to remove such inequalities.
17. 90% farmers of the district under this study are engaged in animal husbandry and milk business. Most of the farmers of the district have accepted it as their ancestral business but it is not

- developed up to the mark. To expand and develop this business, they have to keep much milk yielding high breed cows and provide them good food and facility. Government and cooperative sector should help them in this regard.
18. Farmers (of the district) under study have only two sources for irrigation-canal and wells. So administration should try to provide them irrigation water from big canals of Narmada.
 19. This study shows that 53.5% of farmers have not adopted modern methods of irrigation. Government should try to know the reasons why they have not adopted modern methods and try to solve their problems. Most probably the poor economic condition of these farmers is responsible for that so government should provide them this facility at a much subsidised rate.
 20. Most of the farmers of the district use chasm (kyara) method for irrigation in which water is wasted much. They should be motivated to use sprinkle and drip method of irrigation.
 21. Farmers under study in this research reflected that they have no information regarding new irrigation methods and lack of information about the need of irrigation for different crops. So if they are educated about such things, more agriculture production can be taken by them.
 22. The study shows that if irrigation facilities are increased, the agriculture production will also be increased. If farmer grows cash crops and modern crops in place of traditional crops, they can increase production as well as their capacity for it. Because of the alteration in the crops, the fertility of the soil will also be increased.
 23. Very few farmers under study of this research are found to test or examine their soil. They should be made aware about it.
 24. Though technological facilities are available, farmers of this area are found to get the information from Gramsevak. These farmers should be motivated that they can get the information of agriculture from experts, news-papers, television programmes and literature of agriculture.
 25. The problems they are facing to increase irrigation facility are- electricity, lack of water and distribution of land. To remove these problems a kind of understanding, spirit of adventure and feeling of co-operation among them should be developed.
 26. The farmers who irrigate their farms through canals use bullocks for that. This method wastes a lot of water. To stop this wastage of water, local administration should guide them how to save the water and make a maximum use of it.

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