International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 04 Issue: 09 | Sep -2017 www.irjet.net p-ISSN: 2395-0072

Sustainable water management by conjunctive use of ground and surface water of the left bank canal of Ghataprabha Command

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Abstract - *The world's freshwater resources are unevenly distributed both in time and space. Until today the management of water resource is focused on reallocating water to when and where it was required with a fragmented approach. These days, there are signs that the water resource availability is decreasing due to both population growth and increased per capita water use and thereby eco systems are being damaged. This is especially more serious in irrigation sector as demand for production per hectare is increasing, whereas water resources getting depleted. To face this challenge a new holistic approach is necessary*. The conjunctive use of surface and ground water envisages an integrated use of water available from all sources in particular area. There is a less availability of surface water throughout the year in the present study area of Left bank canal of Ghataprabha command. Here authors have reported on the water requirement of the crops, quantity of available water through surface and ground water with regard to commad area of Ghataprabha considered. Depending on which, a cropping pattern for the study area is proposed along with the cost -benefit analysis to meet the water requirement.

Key Words: Conjunctive use, Crop water requirement.

1. INTRODUCTION

Conjunctive use of water relates to the combined use of surface and ground water. The answer to the scarce surface water source can be achieved through improved water availability through integrated use of surface and ground water. During the period of water stress, integrated use functions as a buffer. The thought of this administration approach is to utilize surface water when the water table is high and move to groundwater is embraced amid the time of less water availability through surface source. The natural hydrologic link between ground water and surface water can be utilised in order to develop reliability. Water asset administration ought to save or upgrade the earth's buffering ability to withstand sudden stress or negative long term impact. As the earth's conveying limit is put under expanding weight, because of the developing requirements of the population and despicable usage of its sources, ecological powerlessness has increased. All in all terms, conjunctive utilize suggests the arranged and composed administration of surface and groundwater, to boost the effective utilization of aggregate water assets. In view of the interrelationship existing amongst surface and subsurface water, it is conceivable to store amid basic periods the excess of one to hold over the deficiency of the other. Subsequently groundwater might be utilized to supplement surface water supplies, to adapt to peak requests for city and water system purposes, or to meet shortages in years of low precipitation.

Patamanska, G. (2016) has worked on water requirements of crops in irrigated area on allocation of available water resource using an algorithm involving water balance, and also the current technological constraints was developed and implemented in excel environment. The main objective in the study was daily allocation of the available water at the main canal to the distributaries in accordance with water requirement and technological constraints. The proposition given by Saravanamuttu Subramaniam Sivakumar (2013) explains exchange arrangement choices in light of specialized techniques to work minor and medium water system plans with coordinated conjunctive utilization of surface and groundwater to enhance groundwater frameworks in a confined zone for the financial pumping for agrarian and local water use, by upgrading the utilization of groundwater and surface water. A basic issue that humankind needed to face and adapt to is the means by which deal with the increasing demand for water among the growing urban focuses, rural segments, in-stream water uses (H. Ramesha and A. Mahesha, 2005).

1.1 The concept of conjunctive use

A basic issue that humankind needs to face and adapt to is the way to deal with the increasing rivalry for water among the extending urban focuses, the agrarian part and in stream water utilizes directed by natural concerns. Stood up to with the possibility of uplifted rivalry for accessible water and the expanded troubles in building new extensive scale water plants, water organizers must depend increasingly on better administration of existing activities through basin wide procedures that incorporate coordinated usage of surface and groundwater. Conjunctive utilize suggests the arranged and composed administration of surface and groundwater, to boost the effective utilization of aggregate water asset.

2. Methodology

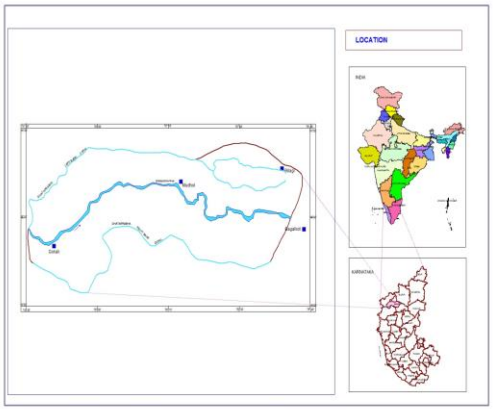

Figure1: Map of study area, Ghataprabha command area

Ghataprabha command area is located in taluks of Bilgi, Jamkhandi, Hungund, Mudhol, Badami, Bagalkote district of Bagalkote in Karnataka state(fig.1). The area lies between Lattitude 16.17 N and longitude 75.65 E. Annual yield of the Ghataprabha command area is estimated to be 121 TMC at 75% dependability. Mean annual rainfall is 533.25mm. Depth to water level in the area is 5-10m below ground level. The total length of left bank canal network is 202 km.

The data of rainfall, land use and copping pattern, canal data, aquifer parameters, water table data have been used in the present study. The data required for the present study is collected from NIH, Belagavi and also from CADA, Belagavi.

2.1Crop water requirement:

The crop water requirement is estimated using ground water budgeting tool. The crop water requirement is estimated based on the cropping pattern of the study area and the area under each crops of the study area.

Here five major crops are considered for the estimation of crop water requirements such as maize, paddy, wheat, sugarcane and other general crops like groundnut, castor, sunflower, black gram, green gram, chilly, vegetables and other general crops.

Table -1: Crop water requirement of the selected crops

Crop Water Requirement of different Talukas considered (MCM)			
Crops	**Mudhol**	**Jamakhandi**	**Bilgi**
Maize	14.28	14.39	11.6
Wheat	9.09	9.09	4.68
Sugercane	120.24	120.24	15.1
Paddy	20.08	60.24	8.1
Others	7.1	1.9	7.945
Total	170.79	205.86	47.425

Table -2: Availability of water .

Source of water	Quantity of water
Surface water	72.20 MCM
Ground water	107.52 MCM
Water that can be collected in area with 30% of runoff during monsoon	107.88 MCM
Total water available	290.60 MCM
Total crop water required for existing cropping water	424.07 MCM

2.2 Proposed cropping pattern for the study area

For the existing cropping pattern in the study area, it is estimated that the crop water requirement is more than the available water. In order to use the available water efficiently, it becomes imperative to encourage those crops which require less water for their growth. In this direction it is proposed reduce the area covered under sugarcane and paddy to help to reduce pressure on supply of water for irrigation. However only less water required crops, such as general crops and maize, are only proposed in the present study.

Table -3: Total crop water requirement for the proposed cropping pattern

Crops	Crop water requirement(MCM)
Maize	73.04 MCM
Wheat	40.86 MCM
Sugercane	111.58 MCM
Paddy	49.14 MCM
Others	19.345 MCM
Total water requirements of the crop	290.975 MCM

Table 3 Shows the total water requirement of the selected crops under proposed cropping pattern for the three talukas together and is estimated to be 290.975MCM of water. It can be stated that with the proposed cropping pattern the crop water requirement of the crops it is possible to meet the requirement by the use of conjunctive approach. Hence we can able to address the problem of water scarcity through conjunctive use plan of surface and ground water to meet the requirement of crops in the command area.

3. Cost benefit analysis

Cost benefit analysis is based on the data available on the preliminary survey of the farmers. Cost benefit analysis is carried out for the proposed conjunctive use plan.

The cost benefit analysis is also done for the present and proposed cropping pattern. It is seen that with the change in

the cropping pattern and by the practice of conjunctive use the yield is increased and also the value of produce is increased and efficient management of water can be achieved by the proposed cropping pattern. Accordingly cost benefit analysis for the crops selected, out of the several existing crops in the command area, is carried out and the results are obtained before and after the practise of conjunctive use and compared the results with the cost benefit analysis for the proposed cropping pattern. Study reveals that in the absence of sufficient water, the yield is reduced by 2.5 times and if adequate water is supplied by choosing less water demanding crops, the crop production increases and the net profit of the farmers also increase.

4. CONCLUSIONS

Total water available in the study area is estimated to be 290.6 MCM from both surface and ground water together. The water needed for existing crops for their growth is less when compared with the demand for the crop water requirement. Therefore a cropping pattern is proposed for the study area to match with the available resources. The water demand for the proposed cropping pattern is efficiently met by the available water in the study area using conjunctive use of surface and ground water practice. The cost benefit analysis which is carried out states that the increase in the availability of water increases the economy of farmer by increasing the yield .Hence the cost benefit analysis for the proposed cropping pattern shows that there is a increase in the yield by the practise of conjunctive use, thereby increase in the value of produce. Therefore the water demand of the study area for proposed cropping pattern can be efficiently met with the practice of Conjunctive use of surface and ground water resources. Hence the conjunctive use of both surface and ground water source helps to manage the available water resources to satisfy the demand for the suggested cropping pattern efficiently.

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