

An Analysis on Attitude of Farmers Towards Conservation of Groundwater in Agriculture at Tumkur District of Karnataka

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ABSTRACT

Groundwater water and its availability in India has become one of the serious problems in recent years. In the last five decades, the intensive groundwater extraction through shallow tube wells is reflected in tube well numbers, which have increased tremendously since the previous 35 years. In Indian villages, there is an increasing number of bore wells or tube wells installed on farms or near their houses. More than 80.00 per cent of farmers are dependent on Groundwater for drinking, domestic use, and agriculture. There has been a recent focus on understanding the attitudes and practices of rural farmers in enhancing their groundwater conservation practices. Farmer's positive or negative attitudes towards groundwater conservation practices can affect their behaviors on adopting those conservation practices. This study aims to provide much-needed empirical data about rural farmers' attitudes towards groundwater conservation. Results from a survey of 32 farmers of the eastern dry zone of Karnataka indicated that most of the farmers have a more favourable (34.37 %) to favorable Attitude (31.25%) towards groundwater conservation and water-saving practice. The mean attitude score of different factors influencing the Attitude of farmers towards groundwater conservation is also mentioned in the present paper. These findings highlight that there is still substantial potential to be harvested from the central institutes to the local government in India through groundwater conservation measures.

Keywords: Groundwater conservation, Attitude of farmers, Environment, Groundwater quality

INDIA is the largest user of Groundwater in the world, with an estimated usage of 230 km³ per year (Namratha Chandrashekar, 2019). Globally, areas under groundwater irrigation are the highest in India (39 million ha), followed by China (19 million ha) and the USA (17 million ha). In Karnataka, the total replenishable groundwater potential for the State is estimated at 17.03 Billion Cubic Meters (BCM) received from both monsoon and non-monsoon seasons rainfall constitutes 9.48 BCM and recharge of 7.55 BCM from other sources (Krishna Raj, 2015). The intensive groundwater extraction in the last five decades through shallow tube wells is reflected in tube well numbers, which have increased tremendously from the last 35 years. In Indian villages, there is an increasing number of bore wells or tube wells installed on farms or near their houses. More than 80.00 per cent of farmers are dependent on Groundwater for drinking, domestic use and agriculture most of the time (Varua *et al.*, 2018). Farmers in semi-arid parts of

India use groundwater to save rain fed crops from failure and to increase yields. As it is a relatively cheap and easily accessible water resource for individual farmers, groundwater is often extracted beyond its natural recharging capacity irrespective of their farm size. The exploitation of groundwater in the dry taluks of North and South interior Karnataka is higher than Coastal, Malnad and irrigation command areas. Sixtysix per cent of the drinking water bore wells recharged successfully are yielding water in Eastern dry agro-climatic zone of Karnataka (Anitha, 2017). As mentioned Groundwater has been out of sight and thus under appreciated. Moreover, the time for groundwater system degradation to reach thresholds of concern, even if recognized, is typically longer than many time frames used in societal decision-making. As a result, despite its importance, Groundwater remains a minor player in water resources management. (Anthony J. Jakeman *et al.*, 2016). However, many aspects are interrelated to manage Groundwater effectively; it

requires a sound science including biophysical and social sciences that actively engages the vast community and stakeholders. Conserving, preserving, and protecting Groundwater provides for the natural environment and human health and well-being services. (James Charles, 2018). Thus this hidden resource is complex in characterizing, and once the groundwater system is degraded, it is not so quick, cheap, or easy to bring it back to normal. Hence, precautionary principles need to be focused on by the groundwater users; like we say, an ounce of prevention indeed may be worth a pound of cure. Farmer's income doesn't show significance on Managed aquifer recharge (MAR), efficient water use, and mulching but shows a significant positive relationship with the practice of farm water harvesting (Maria *et al.*, 2016). Farmers are always ready to adopt the on-farm conservation and are smart enough to practice with much expenditure if they are earning well through farming. But some farmer's behavioral changes towards water conservation and public acceptance of conservation initiatives still remain critical along with other conservation measures. Thus, such knowledge of ground water user farmers has to be concentrated, and a necessary counseling program, is expected through increased knowledge gained from the extension, that would improve the Attitude of farmers on groundwater conservation urgency (Darwis *et al.*, 2015). The analysis of attitude of farmers / beneficiaries towards programme will help us to trace and upgrade the manipulable variables such as personal, socio-economic and communication characteristics (Jagdeesh, 2019). Thus, keeping in view the importance of attitude on groundwater conservation affecting their livelihood, the present study was undertaken to know the Attitude of farmers towards groundwater conservation and future use.

METHODOLOGY

The study was taken to analyze the attitude of farmers in groundwater conservation practices in the eastern dry zone districts of Karnataka state. One taluk of Tumkur district was selected purposively based on the highest groundwater usage (%) for conducting pretest. 32 farmers were randomly selected and interviewed

using structured schedule, which consists of attitude scale statements. Ex-post-facto research design was adopted for the study. The responses were scored, classified, analyzed and calculated the mean attitude score for each attitude statements under different factors influencing the attitude of the farmers in Microsoft Excel-2019.

RESULTS AND DISCUSSION

Fig. 1 reveals the overall Attitude of farmers towards groundwater conservation that as high as 37.50 per cent of them had a favorable attitude towards

TABLE 1
Overall attitude of farmers towards groundwater conservation n=32

Category	Criteria
Less favourable	< 156.70
Favourable	156.70 to 172.49
More favourable	> 172.49

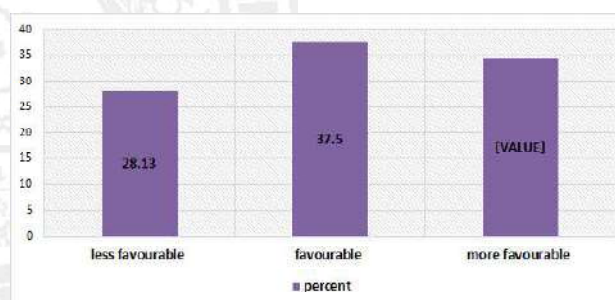


Fig.1 : Overall Attitude of farmers towards groundwater conservation

groundwater conservation. In comparison, 34.37 per cent of the farmers had a more favorable attitude and the remaining 28.13 per cent had a less favourable attitude towards groundwater conservation. It can be concluded that a majority (71.87 %) of the farmers had favourable to more favourable attitude towards groundwater conservation. Since, the survey area belongs to the eastern dry zone of Karnataka where groundwater exploitation is going high year by year, and some of the initiatives taken up at central and panchayat levels in order to make farmers realize the importance of groundwater and its conservation.

Hence, majority of famers have realized that groundwater is the only major available water resource for farming and drinking and so expressed more favourable to favourable attitude towards groundwater conservation.

In Table 2 explanation on the attitudinal mean score on Socio-Economic and Environmental factors influencing groundwater conservation is indicated. We can observe the highest attitudinal mean score of 4.13 on the statement 'If we undermine the ecosystem, it would directly shorten the water availability.' farmers are very much aware that they should not harm their

TABLE 2

Socio-economic and environmental factors influencing attitude of the farmers towards for groundwater conservation n=32

Attitude statements	Farmers
	Mean attitude score
<i>Socio-Economic and Environmental factors</i>	
Increased population is creating water scarcity for rural people.	3.88
It is rather preventing investing on bore wells with a fear of risk of well failure.	3.38
We can pump out GW as much as possible, or else it gets used by neighbor farmers	3.47
We find difficult in practicing GW conservation practices due to small and fragmented lands.	3.34
Investing on GW structure is like creating a free ride, benefits garnered by all other users	3.56
We need to assess social cost and benefit of GW management in a participatory approach	4.03
We are the most affected generation by climate change	3.66
Excessive precipitation may damage the soil and affects taking up conservation practices	3.88
If we undermine the ecosystem, it would directly shorten the water availability.	4.13
I do not believe that trees can hold more water, so I instead utilize trees for commercial purposes	3.88
One should always prioritize growing native species and phase out the monoculture plantations of exotic species (Ex. Eucalyptus)	3.53

ecosystem, on which the major source of Groundwater, rainwater comes. We can observe the attitudinal mean score on a statement. 'We find difficult in practicing GW conservation practices due to small and fragmented lands,' *i.e.*, 3.34 was the least score. A very few farmers who belong to small and marginal categories of landholdings have expressed their difficulties in practicing groundwater conservation on their limited land holdings. Thus, the findings also depict that overall attitude on socio economic and environmental factors shows favorable, they are not optimistic about groundwater availability and are aware that repercussion of over-exploitation of Groundwater may affect their livelihood. Hence, more concern should be given to increasing population, preventing bore well digging, and the environment and its safety.

Table 3 throws a light on the Attitude of farmers on Agronomic factors for groundwater conservation, farmers have a favorable attitude towards changing

TABLE 3

Agronomic factors influencing Attitude of the farmers towards groundwater conservation n=32

Attitude statements	Farmers
	Mean attitude score
Agronomic factors	
Soil erosion need to be controlled well before occurrence	3.94
I would prefer improved/protected irrigation, it is more accessible and suitable for rainfed situation	3.75
It is always a better solution to restrict water intense crops and switch to drought-resistant crops	4.13
mulching to doubles the overall yield, do not prevent water loss from soil	3.75
Empty and unfertile part of farms can be utilized for Constructing farm ponds and percolation ponds	3.38
Constructing bunds is simple and economically viable.	3.75
Taking up of integrated farming system will helps to diversify the farm	3.66

the cropping system as per the availability of water source and according to the season, thus the mean attitude score for the statement ‘It is always a better solution to restrict water intense crops and switch to drought-resistant crops’ is the highest score. On the contrary, it is seen low mean score for the statement ‘Empty and unfertile part of farms can be utilized for Constructing farm ponds and percolation ponds’ as mentioned earlier, farmers with small and marginal landholdings choose to utilize their limited land holdings for farming purpose only.

It was witnessed in Table 4, that the attitude expressed by the farmers on the management of Groundwater, the highest mean attitude score of 3.97 for the statement ‘I can irrigate my farm by recycling of greywater it is easy and time-saving practice.’ says that farmers are ready to recycling of wastewater and convert into a useful resource for domestic purpose.

TABLE 4

Management factors influencing the attitude of the farmers towards Groundwater conservation n=32

Attitude statements	Farmers Mean attitude score
Management factors	
One should always have the urge of planning and managing GW efficiently	3.47
Formation of GW users group simply creates differences of opinion and will not serve the purpose	3.56
Being a Groundwater user, all I need to be aware of the principles of Integrated water resource management	3.63
Recharge pits will just store the water; it doesn't do its job effectively in farm reality	3.44
Establishing the centralized infrastructure for conserving GW at my own risk and expenditure is not my cup of tea.	3.28
I can irrigate my farm by recycling of greywater it is easy and time saving practice	3.97
Community Watershed developments are lifesaving initiatives for us	3.78
Roof top rain water harvesting better suits to urban dwellers than us	3.22

Likewise, least mean attitude score of 3.22 is seen for the statement ‘Roof top rain water harvesting better suits to urban dwellers than us’, where most of the farmer’s opinion that rainwater harvesting can be done more efficiently by urban dwellers because of pacca houses and cemented rooftop, where different kinds of storage structures can be installed which is not possible in rural houses.

Table 5 shows the attitude of farmers towards institutional factors for Groundwater conservation. Farmers’ expression on the attitude statement ‘The economic and environmental implications of a large-scale project of Govt. institutes threatens the farmer’s livelihood’ has got highest mean attitude score of 5.50. they feel that policymakers and concerned institutes

TABLE 5

Institutional factors influencing the attitude of the farmers towards groundwater conservation n=32

Attitude statements	Farmers Mean attitude score
Institutional factors	
I feel that GW conservation measures carried out by Govt. institutes will just influence drilling additional wells in villages	3.22
Good geo- hydrological surveys are missing in regions which is seriously in need of GW management	3.69
Govt. should prioritize the GW conserving measures first, people follow automatically	4.13
Govt. focus on more training and skill on GW conservation practices are need of the hour	3.56
Govt. says river diversion as one of the strategies for GW management, it is simply a high-cost project	3.78
Govt. should stop subsidizing the Electricity supply	3.63
People always wait for some push factor; organizations can provide incentives on the construction of farm ponds	3.44
The economic and environmental implications of a large-scale project of Govt. institutes threatens the farmer's livelihood	5.50
We are likely to involve more with the institute which takes fair and unbiased initiatives	4.22

could form better reforms for regulating groundwater usage, instead of investing on large-scale projects like river diversion and tank filling which are not influencing the people to manage Groundwater. The attitude statement 'I feel that GW conservation measures carried out by Govt. institutes will just influence drilling additional wells in villages', has got a lowest mean score of 3.22, which shows that the eastern dry zone farmers are carrying out bore well drilling at the highest intensity, indirectly influenced by the Govt. providing subsidies for borewell drilling and free electricity for

agricultural purposes causing more threat, hence the suggestion.

Table 6 shows that farmer's attitude towards quality factors and future availability for groundwater conservation. The highest mean attitude score is 4.00 for the statement 'When the extension of cities is limited, that would be a boon for sustainable supply of GW'. Rural farmers have a negative opinion of urban dwellers and their resource management practice. They believe that if urban boundaries are extended, invariably, they depend on and depletes the rural resources that would imbalance the rural ecosystem. In same way, some farmers who are practicing farming organically and in traditional methods avoid using pesticides and herbicides because they are aware that pesticides, fertilizers, and petroleum products contribute to water pollution and affect the groundwater quality.

Location of Groundwater is less certain; even with this fact, farmers of eastern dry zone districts are more towards drilling bore wells and extracting water at any extent of depth. They have a more favorable attitude toward conserving this hidden resource because they feel their future is at risk. Farmers also expressed that, especially in Groundwater conservation districts, the prime means is to implement proper policies and reforms right from the local level to ensure the groundwater availability. Providing subsidies and free electricity for farming will not serve the purpose of conservation. More concentration on awareness, encouragement, and incentives on conservation practices and mold the mindset of farmers towards groundwater management and conservation is the need of the hour.

TABLE 6
Quality and future factors influencing the attitude of the farmers towards Groundwater conservation n=32

Attitude statements	Farmers
	Mean attitude score
<i>Quality factors and future of Groundwater</i>	
Maintaining GW quality should be the priority and all other issues take next (+)	3.66
It is groundwater users' duty to maintain and manage Septic tanks and farm waste in their respective farms (+)	3.63
There are many precautions to maintain the quality of GW, so more concern should be on the quantity of water (-)	3.59
I prefer to go for Traditional method of Pest and disease control which are zero chemicals (+)	3.06
Weeds in my field are plentiful, and I don't take any measures to avoid weeds (+)	3.88
One should have a concern on long-term planning rather than short-term plans (+)	3.28
When the extension of cities is limited, that would be a boon for sustainable supply of GW (+)	4.00
Resource poor farmers can rely on Groundwater markets to augment current GW supplies (+)	3.44
There is no shortage of GW really; there is only how and what methods we take up to conserve and use (+)	3.81
Saving GW for current needs is easier than recharging (-)	3.69

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