



# **Knowledge and Opinion of Farming Community about Irrigation Tanks - A Study from Tiruvannamalai District of Tamil Nadu State, India**

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## **ABSTRACT**

Irrigation tanks which are important for agricultural and other livelihood activities of farming community are facing many threats in India. Since the protection and management of irrigation tanks rest with the command area farmers (ayacutars) of respective irrigation tank, it becomes very essential to study their knowledge and opinion on various aspects of irrigation tanks. The present study was carried out in Tiruvannamalai district, which is endowed with 1900 irrigation tanks with water-spread area ranging from 5 to 767 ha, to determine the prevailing knowledge and opinion of farmers on utility values, management and threats of the irrigation tanks. Tools namely “information schedule”, “questionnaire” and “opinionnaire” were designed and administered on 264 farmers from 88 irrigation tanks with three farmers each. The total water-spread area of all the 88 tanks is 8492 ha. The profile of sampled farmers and irrigation tanks were collected by using information schedule. The mean knowledge score of the farmers for the dimensions namely “Utility values of tanks” and “Threats of tanks” was 55.08% and 56.43%, respectively. Similarly, the mean opinion score of the farmers for dimensions namely “Utility values of tanks”, “Threats of tanks” and “Management of tanks” was 79.17%, 80.46% and 76.07%, respectively.

*Keywords:* Irrigation tanks; farmers; statements; knowledge; opinion

## **1. INTRODUCTION**

Freshwater wetlands are among the highly productive ecosystems of the world (Bassi et al., 2014). The irrigation tanks, one of the categories of freshwater wetlands, offer benefits to humanity in innumerable ways. Constructed some 3000 years ago with a notion of garnering multifarious use, they were managed efficiently till the end of 19<sup>th</sup> century (Dikshit et al., 1993). The irrigation tanks have been, from the period of constructions, used by farming community mainly for irrigational activities in addition to many other purposes.

The farmers though realize the economic values of the irrigation tanks their immense ecological values in the way of harbouring many species of flora and fauna were not largely considered by them. All types of wetlands including irrigation tanks are, from the beginning of 20<sup>th</sup> century getting deteriorated owing to anthropological activities ( Ramachandra, 2005). It is explicitly evident from the shrinking of tank irrigated cultivable land area in Tamil Nadu from 38% in 1950 to 23% in 1980 and declined thereafter by another 10% (CPREEC, 1996). The degradation of irrigation tanks not only poses severe impact

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on the livelihood of farming community and devastation of biodiversity but also seems to be causing a telling effect on the national and international economic scenario (Jana and Lise, 2013). In these days of human population explosion it becomes essential to accelerate agricultural growth to address issues of food insecurity, fall in rural income generation, unemployment and poverty. Addressing these problems warrants empowerment of farmers on several issues such as enhancing their knowledge on various aspects of management of irrigation-tanks. With these in the backdrop and to find ways to ameliorate the prevailing situations this study was carried out in 2005 to evaluate knowledge and opinion of farmers on utility values of irrigation tanks to human beings, flora and fauna, especially bird species and also various threats faced by the irrigation tanks and management aspects of the irrigation tanks.

## 2. MATERIALS AND METHODS

### 2.1 Study area

The present study was carried out in Tiruvan-

namalai district, one among the 32 districts of Tamil Nadu State, which is located on the southern most tip of India (Fig. 1).

#### 2.1.1 Tiruvannamalai district

Tiruvannamalai district ( $11^{\circ} 96'N$  and  $78^{\circ} 69'E$  to  $79^{\circ} 78'E$ ), where this study was carried out, is located at the northern part of Tamil Nadu State with a total geographical area of 6355.61 sq.km and comprising six taluks such as Arani, Chengam, Cheyyar, Polur, Tiruvannamalai and Vandavasi. Tiruvannamalai is the district headquarter (Fig. 1). This district is bordered on the east by Villupuram and part of Kanchipuram districts, west by Vellore and a small stretch of Dharmapuri districts. Moreover, on the north it is encircled by Vellore and part of Kanchipuram districts and south by Villupuram and reminiscent of Dharmapuri districts. Most parts of the district are scattered with hilly terrains with dry deciduous forests. The total human population is nearly 25 lakhs. This district gets maximum rainfall from northeast monsoon (October to December). The annual mean rainfall in this district is 1500 mm.

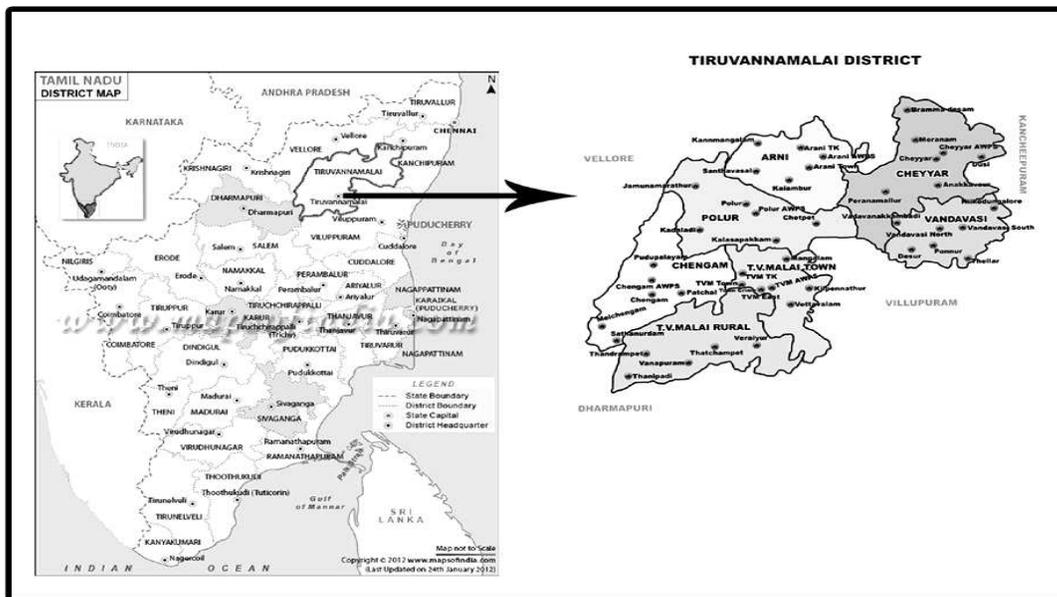


Figure 1 Location of the study area

### 2.1.2 Irrigation tanks

The total water-spread area of all the 1900 irrigation tanks (herein after in this work mostly referred to as tanks) found in this district constitutes 10% of its geographical area. The water-spread area of these tanks differs widely and the largest tank is with 767 ha. Except a small number of tanks, which are rain-fed all other tanks are either fed directly by a few rivers or indirectly through tanks in series on the upstream. The number of tanks surveyed in the six taluks viz., Arani, Chengam, Cheyyar, Polur, Tiruvannamalai and Vandavasi was 13, 8, 26, 15, 16 and 10, respectively. While the total water-spread area of all the 88 tanks is 8492 ha, the water-spread area of 34 tanks is above 100 ha each.

## 2.2 Methodology

The farmers' knowledge and opinion were studied by constructing tools such as "questionnaire" and "opinionnaire" respectively and administered on the farmers.

### 2.2.1 Construction of tools

Though the management of irrigation tanks is a subject of department concerned but literally it lies with local farming communities. Hence, it becomes essential to measure the knowledge and opinion of farmers on different aspects of the tanks. This sort of exercise will enable the authorities concerned and conservationists to devise strategies to improve further the knowledge and skills of farmers and thereby to conserve all resources of the tanks including birds. Evaluation of knowledge and opinion of farmers on irrigation tanks requires well-defined tools. In the present study three types of tools namely, information schedule, questionnaire and opinionnaire were designed and used.

### 2.2.2 Information schedule

The information schedule consisted of two parts viz., profile of farmers and irrigation tanks. The profile of farmers included their name, age, educational qualification, occupation, extent of land owned, annual income, marital status, and number of cattle reared. The profile of tanks comprised name of tank, name of village, name of panchayat, name of taluk, water-spread area of tank, ayacut-area of the tank, water level, borewells found in the ayacut area, implementation of social forestry activity, nature of extent of infestation by weeds, extent of encroachment, magnitude of siltation, water colour, year of modernization, number of sluices, number of villages and human population around tanks and uses of tanks.

### 2.2.3 Questionnaire

The questionnaire which contained constant/alternative type of questions under two dimensions namely "Utility values of tanks" and "Threats of tanks" with 13 and 9 questions, respectively was used to assess the knowledge of farmers related to irrigation tanks.

### 2.2.4 Opinionnaire

The opinionnaire was designed to measure the opinion of farmers on three dimensions viz., "Utility values of tanks", "Threats of tanks" and "Management of tanks". The number of statements in the said three dimensions was 13, 13 and 17, respectively. All the statements were given options "yes" and "no".

### 2.2.5 Sampling and scoring

All the three tools were administered on 264 farmers with 3 farmers randomly selected from each of the 88 tanks chosen for the present study. Before being administered the tools the farmers selected were informed of the purpose of the present study. Among the illiterate

farmers questions and statements were read and their responses recorded. In the process of administration of the tools help of farmers' views on various aspects of the tanks were collected and interpreted.

The data collected through information schedule was collated and the profiles of the sampled farmers and surveyed tanks were prepared. The number of farmers either responded positively or negatively for each of the questions in the questionnaire and the statements in the opinionnaire was presented in terms of percentage.

### 3. RESULTS AND DISCUSSION

#### 3.1 Profile of farmers

Of the 264 sampled farmers, 23 (8.71%) were uneducated. A large number of 157 (59.47%) farmers studied classes varying from 1-8<sup>th</sup> standard. The number of farmers who studied up to secondary stage (9 and 10<sup>th</sup> standard) of education was 67 (25.38%). The remaining 17 (6.44%) farmers qualified higher education of different levels. In the case of possession of lands 15 (5.68%) farmers did not possess land at all. A large number of 215 (81.44%) farmers owned lands in the range of 1 to 5 acres. Another 21 (7.95%) farmers possessed lands to an extent of 6 to 10 acres each. Only 13 (4.92%) farmers acquired lands of above 10 acres. When looking at the age of farmers, 44 (16.66%) farmers aged between 20 and 30 years. The age of another 56 (21.21%) farmers ranged between 31 and 40 years. The age of remaining 164 (62.12%) farmers was above 40 years. In the case of tending of cattle, a considerable number of 117 (44.32%) farmers did not have cattle. A large number of 142 (53.79%) farmers reared cattle and the number ranged from 1-10. Only a meager number of 5 (1.89%) farmers possessed cattle numbering above 10.

#### 3.2 Factors affecting irrigation tanks

The deterioration of tanks started from the beginning of the 20th century (Dikshit et al., 1993). Since then, the irrigation tanks were facing alarming threats from several fronts and many of the irrigation tanks had already disappeared. The irrigation tanks in the State of Tamil Nadu are getting deteriorated by the various factors like siltation, encroachment, infestation by weeds, submerged vegetation, social forestry activity, wrong agricultural practices (Palanisami et al., 2008, 2010), and hunting and trapping of birds (Sampath, 2005). The magnitude of these factors by which the tanks in the districts of Tiruvannamalai, Kanchipuram and Tiruvallur affected was studied extensively (Sampath, 2005, 2011).

#### 3.3 Bird population

Many of the irrigation tanks offer ideal feeding grounds for an appreciable number of birds belonging to many species of residents and local migrants and also considerable number of species of true migrants from Siberian region of Russia, Australia, Europe and many other countries. Of the 1300 species of birds recorded in India 318 species are wetland birds (Vijayan, 1986). The wetland bird species use the irrigation tanks as suitable habitats both for feeding (Sampath, 2005) and breeding (Islam and Rahmani, 2002). Since birds are the conspicuous component of the irrigation tanks their population structure is presented here. The 212,722 birds belonging to 69 species of aquatic birds recorded from the 88 tanks during the said period of the study carried out have been categorized into 12 groups (Sampath, 2005). The number of species in each group with percentage composition are as follows: grebe 1 species (2.14%), cormorant 1 species (3.75%), darter 1 species (0.79%), herons 4 species (1.76%), egrets 4 species (4.01%), stork 1 species (0.30%), ibises 2 species (0.55%), ducks 11 species (68.55%), coot

1 species (3.26%), shorebirds 31 species (14.38%), gulls and terns 7 species (1.07%), and “miscellaneous birds” 5 species (0.17%). The “miscellaneous” group includes Watercock, White-breasted waterhen, Common moorhen, Cinnamon bittern and Black bittern.

### 3.4 Threatened bird species

Among the recorded bird species from India, 130 species (10%) were listed as threatened species with varying levels of threats as critically endangered, endangered, vulnerable, conservation dependent, near threatened and data deficient (Islam and Rahmani, 2002). Among the 130 threatened species 29 species are exclusively wetland birds. Of the 69 species recorded from the 88 tanks where the present study was carried out 3 species namely Darter (*Anhinga melanogaster*), Painted Stork (*Mycteria leucocephala*) and Oriental White Ibis (*Threskiornis melanocephalus*) have been listed as “Near Threatened species” and their population in the present study area was 17,055 and 458, respectively. Further, Spot-billed Pelican (*Pelicanus philippensis*) which has been listed as “Vulnerable Species” was recorded earlier from the present study area Tiruvannamalai district (Sampath, 1993). All types of wetlands, including irrigation tanks, need to be protected in addition to improve the economic status of people, solve water crisis and to conserve the flora and fauna especially bird species by inculcating awareness among the farming community.

### 3.5 Knowledge of farmers

The knowledge of the farmers on various aspects of the tanks is very crucial for the effective management of the tanks (Amin et al., 2005; Aminul Islam, 2005; Zhengrmin and Zhenjie, 2005). In the dimension “Utility values of tanks” 55.08% of farmers were found to have possessed with knowledge. Similarly, in the dimension “Threats of tanks” also

56.43% of farmers were found to be aware of threats related aspects of the tanks. As such, in each of the dimensions nearly 45% of the farmers were not found to have been acquainted with various aspects of the tank management. Thus, for the active participation of all the farmers in the efficient and sustainable management of the tanks, the knowledge of the entire farming community needs to be promoted by conducting awareness programmes.

#### 3.5.1 Utility values of tanks

Item wise analysis of the questions showed that considerable number of farmers possessed knowledge on a relatively large number of questions under the dimension “Utility Values of Tanks”. Of the 13 questions under this dimension the 8 questions for which more than 50% of farmers responded affirmatively were: “usefulness of irrigation tanks” (99.62%), “tank water is better than ground water for irrigation” (95.36%), “tanks are important for replenishment of ground water” (94.32%), “tanks are ideal habitat for birds” (93.18%), “bird droppings are important for crops” (87.12%), “birds control insects pests” (70.07%), “bird population is an indicator of tanks’ health” (65.53%) and “birds control vermin like rat” (50.75%). The remaining five questions for which the lowest number of farmers answered correctly were; “year of construction of tanks” (0.75%), “ayacut area of tank” (3.72%), “water-spread area of tank” (6.82%), “birds from foreign countries use the tanks (7.57%), and “tanks play a crucial role in the socio-economic status of the farmers” (17.23%). Since all farmers are expected to have known answers for these questions also, their knowledge in these areas may be enhanced by organizing awareness programmes through various means. Further, inclusion of concepts on these areas in school curricula starting from primary level would facilitate to empower the future generations.

### 3.5.2 Threats of tanks

Under this dimension, of the 9 questions, the five questions for which more than 50% of farmers answered correctly were: “tanks are getting silted” (97.35%), “awareness on various threats faced by tanks” (95.67%), “weed infestation is a cause for deterioration of tanks” (81.06%), “prevalence of unawareness among farmers is a major cause for deterioration of tanks” (79.54%), and “many species of flora and fauna are getting endangered by the deterioration of tanks” (60.60%). It could be, from the correct responses offered by a large number of farmers to these questions, inferred that farmers were well acquainted with the threats faced by the tanks. However, as these issues were unable to be addressed by the farmers themselves, the authorities concerned should come forward to address the problems in the interest of the farmers. The other four questions for which less than 50% of farmers offered meaningful answer were: “many species of birds are getting endangered by the deterioration of tanks” (7.57%), “implementation of social forestry activity deteriorates the quality of tanks” (24.62%), “use of chemical fertilizers affects the tanks” (26.57%), and “electricity given free of cost for agricultural activities indirectly affects the tanks” (34.89%). Since nearly half of the sampled farmers were not in a position to respond properly it becomes essential to sensitize them on these areas too, to enable them to realize and to take up measures to protect the tanks. The nature of deterioration of irrigation tanks by various threats is highlighted in their work by Palanisami et al. (2008, 2010), Chandrasekaran et al. (2009), and Jana and Lise (2013).

### 3.6 Opinion of farmers

Among the three dimensions the number of farmers who offered positive opinion for the dimension “Threats of Tanks” was relatively high and being 80.46%. Between the other two

dimensions, the mean percentage of farmers who opined positively for the dimension “Utility values of tanks” was 79.17, and that of “Management of tanks” was 76.07. However, since considerable number of 20% of farmers was found to be in the state of not analyzing the various issues in right sense the causes need to be probed and corrective measures taken.

#### 3.6.1 Utility values of tanks

It becomes explicit that farmers demonstrated largely favorable opinion for many of the statements on the utility aspects of the tanks. This could be supported with the expression of positive opinion by all the 264 (100%) sampled farmers for 4 statements namely “tanks offer livelihood for the people of the area”, “proper maintenance of irrigation tanks will facilitate groundwater recharge”, “tank water is used in several ways in addition to agricultural practices” and “tank water is better than bore well water for agricultural activities”. From the expression of positive opinion by all the farmers to these four statements it could be confirmed that the farmers possessed well defined information on the utility values and management of tanks. Deivalatha et al. (2014) in their work stated that proper management of tanks improved socioeconomic condition of the people of the area. Further, a large chunk of 96.96% of farmers exhibited their positive opinion to the statement “implementation of social forestry activity on the tank area will deteriorate the tanks”. It indicates clearly that farmers realized that implementation of social forestry activities on tanks deteriorate the tanks in many ways as reported by Palanisami et al. (2010). As many tanks seemed to be affected by the social forestry programme, an in-depth study on the impact of implementation of social forestry activities on the tanks needs to be undertaken and corrective measures may be taken. Further, for another six statements a little over 70% of farmers had opined positively. The statements were “tanks offer

ideal habitats for many species of plants and animals including birds”, “birds droppings help increasing agricultural yields”, “birds of irrigation tanks control insect pests and vermin which cause damage to agriculture”, “tanks are ideal habitat for a large number of aquatic birds”, “population of birds and animals is an indicator of tanks’ health”, and “farmers have concern on the protection of flora and fauna of irrigation tanks”. The said six statements though considered crucial, nearly 30% of farmers could not realize the issues properly and hence responded negatively. Thus, concerted efforts need to be taken to empower them so as to make them take the responsibility of conserving the tanks. For the statements “tank water is sufficient for agricultural activities all through the year” only 9 (3.40%) farmers gave positive opinion. It showed that the remaining 255 (96.60%) farmers understood well that utility values of tanks for irrigation had suffered a lot in the recent past. As a large number of 78.79% of farmers agreed to the statement “taking up of fish culture in the tanks is hindrance to irrigational activity” using of tanks for this purpose may be avoided. However, fortunately only a few tanks were found to have been used for fish culture.

### 3.6.2 Threats of tanks

In this dimension, of the 13 statements, for 2 statements viz., “irrigation tanks are getting deteriorated in many ways” and “weed infestation deteriorates the tanks” all the 264 (100%) farmers responded positively. It shows that farmers understood the full magnitude of degradation of the tanks by these factors. Besides, 85% of farmers responded positively to five statements such as “deterioration of tanks is a cause for decimation of flora and fauna”, “deterioration of tanks is one of the reasons for the decline in bird population”, “tanks are getting silted by wrong agricultural practices”, “tanks suffer from encroachment”, and “encroachment of tanks is a cause for their

deterioration”. As a large number (85%) of farmers expressed their positive opinion for these statements, it is explicitly known that farmers well acquainted with these issues. The various threats faced by the Indian waterbodies in general were reviewed by Prasad et al. (2002) and the deterioration of irrigation tanks was reported by Palanisami et al. (2008, 2010) and Jana and Lise (2013). Further, since 83.33% of farmers positively opined for the statements “greed rather than unawareness is a cause for farmers encroaching the tanks” it disapproves of the common belief that encroachment is a result of unawareness. This situation was further proved by the negative opinion given by 86.36% of farmers to the statement “prevalence of unawareness is a cause for the deterioration of tanks”. Farmers repose faith on bureaucrats in the management of tanks was evident from the positive response of 79.16% of farmers to the statement “authorities concerned take action if informed on the encroachment of the tank area. The farmers’ ill-will on fellow-farmer-encroachers is reflected from 80% of farmers opined negatively to the statement “encroachers of tanks will desist from such act if convinced”. As many tanks get parched for longer period in a year for many years due to failure of monsoon, the farmers were tempted to encroach up on the tank area. Such a tendency of the farmers needs to be alleviated by conducting sensitization programmes. Farmers did not have adequate knowledge on the impact of using chemical fertilizers was known from the negative opinion given by 69% of farmers to the statement “excessive use of chemical fertilizers for agricultural activities will degrade cropland”. To wean away farmers from this practice they need to be sensitized so as to enable them to take up organic farming. It became obvious that 53.79% of farmers opined positively to the statement “free supply of electricity for agricultural borewell becomes indirectly one of the factors for tank degradation”. It could be

inferred from the responses of farmers that only those farmers who did not have electric borewell were concerned about the health of the tanks. The remaining 46.21% of farmers who enjoyed free electricity were unconcerned about the health of the tanks. The negative impact of modern irrigation system has been highlighted in the work of Nagarajan (2013).

### 3.6.3 Management of tank

The responses of farmers to the 17 statements under the dimension "Management of tanks" clearly stated that farmers got well defined opinion on management aspects. This was evident from the positive opinion made by all the 264 (100%) farmers to the three statements "I am concerned about the welfare of the tanks". As all the farmers individually expressed their own desire in this regard, it could be considered that they are prepared to contribute their mite as when required for the protection of the tanks. Further, the other two statements for which all the farmers opined positively were "tank conservation movement is necessary to inculcate awareness among the masses" and "inclusion of concepts on tank management in the school curricula". With the expression of positive opinion to these two statements it could be inferred that farmers are inclined in taking up constructive measures by the authorities concerned in a sustainable way to protect the tanks. Espousing of positive opinion by 98% of farmers to the statement "a change is required in the existing structure of tank management" implied that farmers are expected to see a change in the existing system of tank management through government department. From the positive opinion of 94.69% of farmers to the statement "mismanagement of tanks is a cause for drastic decline in bird population over the years" proved that farmers possessed basic knowledge on bird population of the tanks. As again, a large number of farmers (92%) agreed to the statement "if all the farmers are made members of

farmers' society it will bring desired benefits". As farmers exhibited their inclination in this regard efforts may be taken to fulfill their aspirations. Furthermore, considerable population of farmers (85%) opined positively to the statement "income from the tanks is spent properly by the local panchayat". Such responses of the farmers indicated that farmers were keen in evaluating the performance of administrative body in the management of the tanks. Expectation of farming community in the efforts to involve all the ayacuttars in the management of tanks was palpable from the positive opinion offered by 80% of farmers to the statement "all the farmers are prepared to get involved in the management of tanks". Furthermore, "Farmers' faith on authorities concerned in curbing hunting of birds and animals" is known from the positive opinion given by 69.32% of farmers to the statement "authorities concerned will take action against the offenders if informed". From the positive responses by 52% of farmers to the statement "irregularities might have occurred in the restoration works of tanks" the veracity needs to be probed and maladies if found addressed in the welfare of farming communities. Unlike that of the above said statements for six statements over 70% of farmers elicited negative opinions also. For the statements viz., "government takes necessary steps for the effective management of the tanks", "tank restoration work taken up by the government is satisfactory", "feeder canals are maintained properly", "supply canals are maintained properly", "functioning of farmers' society is satisfactory", and "right attitude prevailed among the educated youth in conserving the tanks and their biota". The percentage of farmers offered negative opinion to these statements was 75, 84, 90, 89, 82 and 79, respectively. As the negative opinion of farmers to these statements is a testimony to the deteriorative nature of the tanks, necessary steps should be taken to ameliorate the situation.

## CONCLUSIONS

The knowledge of the farmers on various aspects of the tanks is very crucial for the management of the tanks. In the dimension “Utility values of tanks” an average of 55.08% of farmers had possessed knowledge and in the dimension “Threats of tanks” 56.43% of farmers was found to be aware of the threats related aspects of the tanks. As such in both the dimensions nearly 45% of the farmers was not found to have been acquainted with various aspects of the tank management. In the present context it could be possible to infer that prevailing of unawareness among the large population of farmers could be one of the prime reasons for the deterioration of the tanks. Thus, for the active participation of all the farmers in the efficient and sustainable management of the tanks, all the farming community needs to be sensitized. Similarly, among the three dimensions the mean percentage of farmers who offered positive opinion for the dimension “Threats of tanks” was relatively high and being 80.46%. Between the other two dimensions, the mean percentage of farmers who opined positively for the dimension “Utility values of tanks” was 79.17 and that of “Management of tanks” was 76.07. However, since considerable number of farmers was in the state of not analyzing the various issues in right sense the causes need to be probed and corrective measures taken.

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