Declined Tank Irrigated Area Due To Inactive Water User's Association

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Abstract
The rainfed tank sector has traditionally been an important mainstay of Tamilnadu rural economy. In the years following independence, the performance of the sector declined for a number of economic and institutional reasons one among the predominant is inactive Water user's Association (WUA) in villages. WUA is a group of water users, such as irrigation, who pool their financial, technical, material and human resources for the operation and maintenance of a water system. Due to absence of WUA agricultural productivity is drastically reduced in terms of decreased cropping season and change in cropping pattern. Water scarcity from the sources (tank) due to irregular usage is the main reason for less crop production. Hence two tanks namely, Kolathur and Vellarai of Kancheepuram district, Sriperambathur taluk in Tamilnadu were selected for this study to probe the impact of inactive WUA on total land holding and cultivated land in command area by the respondents. Primary data were collected through interview schedule and was analysed using Statistical Package for Social Science. Expected result will give the regression equation for farm size, income and expenditure.

Keywords : Irrigation, tank, water user's association, agriculture, crop production, SPSS

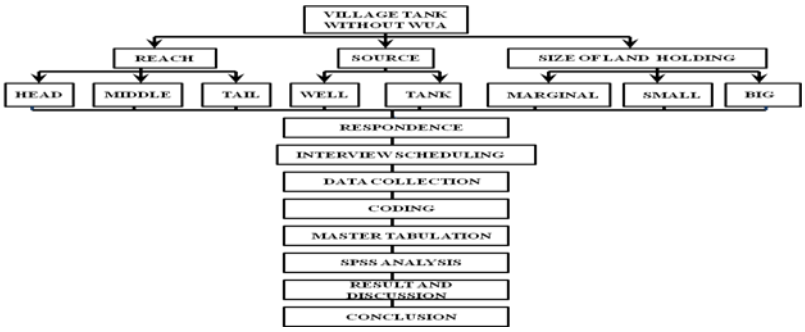
Introduction
There was a large variety of community managed irrigation system in ancient India. Tank irrigations one of the oldest sources of irrigation and is particularly important in South India, where it accounts for about one-third of the rice irrigated area. Now it is necessary to take up a programme of revising local water management groups and water rights, the law should recognize those existing water user group as in effects having control and consider irrigation management as a socio-technical system. (Murthy 1997). Tank systems, developed ingeniously and maintained over the centuries, have provided insulation from recurring droughts, floods due to vagaries of the monsoon and offered the much-needed livelihood security to the poor living in fragile semi-arid regions (Sakthivadivel and Gomathinayagam 2004b). Almost all monsoon countries in the semi-arid tropics have small water bodies like tanks (Vaidyanathan 2001; Sengupta 1985). Problems involved in the formation of WUA are lack of cooperation among the farmers, crop diversification in the field and identifying and promoting leadership can prove to be a major crisis in the formation of WUA's. But if devoted leaders are identified properly with the help of some socio-metric analysis, further work goes ahead smoothly. Reorientation training will be necessary for active participation of WUA in water management. Improving the tank management will enhance tank supplies which in turn will reduce the demand for more number of wells in the tank command area and hence efforts should be made to improve the system efficiencies through tank modernisation strategies involving the water users organisations / associations (Palanisami et al 2008). Multiple uses of tanks make village community including landless to become members of the water users group (Sakthivadivel 2000). According to Makombe et al (2007) high, average and marginal productivities of land under irrigation suggest that expanding irrigation development with WUA, as articulated by Government ambitious plans, may be a viable development strategy.

Sakthivadivel (2005) studied the estimation of water and land productivities in tank commands and its temporal and spatial values. His study has indicated that water productivity was low when tank water alone is used for irrigating crops in the command area especially in the absence of WUA parcitipation. Sustainable institution for management of the tank and ground water systems are the prerequisites to enhance tank water productivity. Palanisami and Flinn (1989) estimated the direct and indirect impacts of varying irrigation water supplies on rice yields for a set of tank irrigation systems in south India through a simultaneous equation model. The model captured the direct effect of varying water supplies on rice yield through the influence of moisture stress on crop growth and indirect effects through its influence on farmer's use of complementary input such as fertiliser and crop management.

Methodology
From the fig 1 it is clear that two villages which do not possess Water user's Association were selected as study areas. They are stratified in to three categories such as reach, source and size of land holding by the farmers. In case of reach, lands located closer to the tank is considered as head reach and farther away is taken as tail reach and the remaining portion is middle reach. Also famers using only well and only tank water for irrigating their fields are classified under source. With respect to size of land holding, farmers owning land less than 1 ha are marginal farmers, from 1 to 2 ha are small farmers and

above 2 ha are big farmers. With the matrix of above stratification, thirty respondents of each village were selected and interview schedule was used to collect primary data.

Fig 1 Frame work for methodology adopted



The gathered information was coded, master tabulated and analysed using Statistical Package for Social Science. The results are given in the form of regression equation interms of farm size, income and expenditure.

STUDY AREA

Kolathur village is located at latitude of 12^{o} 9' N and at longitude of 79^{o} 9' E. The total village area is 422.66hectares and consists of 451 households. The total irrigated land is 376.27hectares and rain fed land is 68.41hectares. The only source of irrigation for this village is tank (Kolathur big tank). The irrigation schemes are not available in this village, i.e., no Water users association (WUA) exists. There are four sluices present in the tank. Depth of water stored in the tank is about 3.55 meters.

Vellarai village

is located at latitude of 12^{o} 9' N and at longitude of 80^{o} 0'E with a total area of 191.16hectares. This village has only tank irrigation system (Vellarai tank) and the length of the tank is 1760 meters. Water users association was formed earlier and was not successfully functioned later due to various conflicts raised among the members. Total irrigated area is 94.42hectares and rain fed land is 14.27hectares. The soil type found here is clay. There are only three sluices present in the village tank.

A total income and expenditure detail for one acre of paddy cultivation is clearly shown in Table1. From nursery to harvest, crop grown period is 120 days. Different varieties of paddy cultivated in Tamilnadu are Ponni, Super ponni, ADT-43, ADT-45, Bapatlal etc. In study villages, Ponni is cultivated widely. The final produce is 25 bags/acre at the cost of Rs.850/bag (each bag weighs 75kg). Hence the total gross income from one acre of paddy cultivation is Rs.21,250. On the other hand the expenses constitutes various activities like nursery, ploughing, sapling, fertilizer and pesticide application, weeding, harvesting, transportation, marketing etc. Approximately 20 kg of seeds are required for one acre of paddy cultivation at the cost of Rs.25/kg. Two persons are in need of nursery work at Rs 300/person.

For transplantation 10 labours are necessary at Rs 200/person as wage rate. DAP, urea, potash and gypsum are applied as fertilizer and Prudon is sprayed three times as insecticide. Removal of weed needs 9 workers at Rs 100/person. Machine harvest is carried out at the cost of Rs 1500/acre for 2.30 hours. While marketing, 25 bags of paddy will be transported from field to market at the cost of Rs 300/acre. Mediator cost is approximately 2% of gross income. Hence the total expenditure is Rs 13,440/-. Net profit is arrived by deducting total expenses from gross income.

Table 1 Total income and Expenditure details for one acre of paddy cultivation in study villages

S.No	Descriptions	Particulars
1	Total Cultivated land in acre	1
2	Crop	Paddy
3	Variety	Ponni
4	Period in days	120
5	No. of bags/acre	25
6	Rate per bag (Rs.)	850
9	Cost of total bags (Rs.)	21250
11	**Gross Amount (Rs.)**	**21,250**
12	Required seed quantity in kg for 1 acre	20
13	Rate of Seed(Rs./Kg.)	25
14	Cost of Seed (Rs.) for 1 acre	500
15	Amount spent on nursery (Rs.) for 1 acre	600
16	Ploughing charges/acre in Rs	2,500

Analysis and Interpretation

In statistics, regression analysis includes any techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps to understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed. In all cases, the estimation target is a function of the independent variables called the regression function.

Regression Analysis for Total Land Holding by the Respondents

1. Dependent Variable : Farming Expenditure (Y)
2. Independent Variable : Income in Rs (X1) and Size of land in acres (X2)
3. Multiple R Value : 0.841
4. R Square Value : 0.707
5. Adjusted R Square Value : 0.695
6. F Value : 61.517
7. P Value : 0.000**

*Note: ** refers it is more significant at 1 % level***.**

Here the dependent variable is farming expenditure and independent variables are income in rupees and size of land in acres. Multiple R values show the correlation coefficient between actual value of Y and the predicted value of Y. Since R^2=0.841 which is greater than 0.5, it is highly correlated. R^2 value is the coefficient of determination. Here 70.7% information about farming expenditure is extracted from income and size of land holding. Adjusted R^2 value is 0.695 and R^2 value is 0.707, which means sample number is higher than Y. Since P-value is less than 0.01, R^2 is highly correlated at 1% level in case of total land holding by the respondents.

Table 2 Regression Analysis for Total Land Holding by the Respondents

Model	Unstandardised Coefficients		Standardised Coefficients	t- Value	p-Value
	B	Std.Error	Beta		
Constant	2.971	0.410	-	7.246	0.000
Net income (X1)	0.400	0.185	0.318	2.164	0.035
Total land holding (X2)	0.292	0.078	0.552	3.752	0.000

Regression Equation for Total Land Holding by the Respondents

Y = 2.971 + 0.400 X1 + 0.292 X2

It is proved from the Table 2, if income is increased by Rs.1000, then the expenditure is increased by Rs.318 and if 1 acre of land is cultivated by the respondents, then expected increase in expenditure is Rs.552.

Regression Analysis for Total Cultivated Land by the Respondents:

1. Dependent Variable : Farming Expenditure (Y)
2. Independent Variable : Income (X1) in Rs and Size of Land in acres (X2)
3. Multiple R Value : 0.860
4. R Square Value : 0.739
5. Adjusted R Square Value : 0.729
6. F-Value : 72.350
7. P-Value : 0.000**

*Note: ** refers it is more significant at 1 % level***.**

Here the dependent variable is farming expenditure and independent variables are income in rupees and size of land in acres. Multiple R values shows the correlation coefficient between actual value of Y and the predicted value of Y. Since R^2=0.860 which is greater than 0.5, it is highly correlated. R^2 value is the coefficient of determination. Here 73.9% information about farming expenditure is extracted from income and size of land holding. Adjusted R^2 value is 0.729 and R^2 value is 0.739, which means sample number is higher than Y. Since P-value is less than 0.01, R^2 is highly correlated at 1% level in case of total cultivated land by the respondents.

Table 3 Regression Analysis for Total Cultivated Land by the Respondents

Model	Un-standardized Coefficients		Standardized Coefficients	t- Value	p -Value
	B	Std.Error	Beta		
Constant	3.354	0.412	-	8.314	0.000
Net income (X1)	0.011	0.227	0.900	0.500	0.096
Total cultivable land (X2)	0.358	0.076	0.851	4.709	0.000

Regression Equation (For Total Cultivated Land):

$Y = 3.354 + 0.011 X1 + 0.358 X2$

It is proved from the Table 3, if income is increased by Rs.1000, then the expenditure is increased by Rs.900 and if 1 acre of land is cultivated by the respondents, then expected increase in expenditure is Rs.851.

Discussion And Conclusion

The functioning of Water User's Association is never an easy job since those are formed by the farmers and are expected to run practically on their own contributions both in terms of finance and manpower. If it is not performing properly, the available water in the storage structure will not be efficiently utilized by the farmers for irrigating their land. Unplanned distribution of water leads to wastage of water and the end result will be the declining tank irrigated area. For example if the farmer owns 5ha of land, he could not cultivate the whole area, rather he will cultivate only 2ha by leaving the remaining land fallow. Most of the time he will go in for only one paddy cultivation season among three seasons. Expenditure interms of agriculture labour, machine harvesting, fertilizer and pesticide cost, transportation of manure to the field and produce to the market, mediator charge will be less when large area is cultivated by a single owner. Incase of agricultural labour, wage rate is less for larger area compared to less cultivated area. Because if land extent is high, labours will adjust their job timing and complete the work with nominal rate since they can get more number of days with a single owner. Otherwise their demand will be high inorder to compensate the income until they get next opportunity. Carrying fertilizer to land, final produce to market, collection of straw from field after harvest etc is done with the help of bullock cart or small truck. For large area, transportation is easy which leads to nominal charge/acre. But for smaller area it is very difficult to reach the field. Drivers are demanding huge amount from the land owners which will reduce their net income. Mediator for marketing the produce is felt necessary by farmers for getting good rate/bag. Mediators charge is high incase of less produce. If they get produce in mass, their work will become effortless to earn more money in a short period. Therefore it is very clear that cultivating larger extent of land by farmers will reduce the expenditure and increase the net income. Efficient use of available water in storage structure by Water User's Association helps farmers to plan for cultivating the entire area they possess. So it is necessary to form a new WUA in the villages where it does'nt exist so far. Also WUA should be revived in a place where it is not functioning well.

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