



Decomposition Effect of Water Users' Association in Thamirabharani river basin of Southern Tamil Nadu

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ABSTRACT

Agricultural sector in India consumes about 75 per cent of the available water resources and still it faces constraints in enhancing productivity due to water scarcity. River irrigation systems irrigates one third of the irrigated area in Tamil Nadu. Thamirabharani river basin is one of the oldest and most important command areas in southern Tamil Nadu. With this end in view, the present study is undertaken to analyze the decomposition effect of Water Users' Associations (WUAs) on productivity and farm income in Thamirabharani river basins of Tamil Nadu. The method used for collecting the primary data was multi-stage random sampling technique. In the first stage of sampling, all the districts in Tamil Nadu, which had largest number of WUAs were listed. The result of structural difference using the Chow's test was employed. In Thamirabharani river basin, calculated F value (7.0) was higher than the table value (2.47). The most important constraint under WUAs' was no remunerative price for their produces in the selected river basins. Strengthening of the association and increasing the number of meetings was suggested among member and non-member, respectively for improvement of WUAs' in Thamirabharani river basin.

Key words: Water users Association, Decomposition, Thamirabharani river basin

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INTRODUCTION

Agricultural production is greatly influenced by irrigation water and increasing water productivity in agriculture is particularly appropriate where water is scarce and one needs to realize the full benefits of other production inputs, viz., high-quality seeds, fertilizer, plant protection chemicals, labor, energy and machinery [4]. Further, efforts to increase water productivity in agricultural sector become all the more important in the view of (i) meeting the rising demands for food and changing dietary patterns of a growing, wealthier and increasingly urbanized population; and (ii) responding to pressures to reallocate water from agriculture to domestic and industrial sectors. Productive use of water not only ensures adequate and better food and nutrition for families but also more income through productive employment. Water Users' Associations (WUA) are voluntary, non-governmental, non-profitable entity established and managed by a group of farmers located along one or several water source canals. Water users include farmers, peasants and other owners who pool together their financial, material and technical resources to improve the productivity of irrigated farming through equitable distribution of water and efficient use of irrigation and drainage systems. Hence, a study on Water Users' Association and problems relating to allocation, distribution and efficient use of water and also to assess the impact and participation of farmers in WUAs of the selected areas in terms of farm productivity becomes very important. The studies on performance of WUAs in Tamil Nadu especially in Tirunelveli district were very much limited [1-3]. With this background the objective was set to decompose the productivity differences of the selected crops between the members and non-members of water users' associations in the selected river basins; and to identify the constraints involved in the water use efficiency in the farms covered by the selected Water Users' Associations.

MATERIAL AND METHODS

The method used for collecting the primary data was simple random sampling technique. A list of all WUAs was obtained from the selected district. Based on the location of distributary channel, the taluks

were selected. From the list of WUAs, In order to compare the benefits obtained by members of WUAs over non-members of WUAs, a sample of 40 non-members of WUAs at the rate of 10 farmers in each of the selected villages were randomly selected. Thus 60 members and 40 Non-members of Thamirabharani (Ambasamudram Taluk of Tirunelveli district) river basin

RESULT AND DISCUSSION

Decomposition Analysis of Water Users' Associations in the Selected River Basins

The production functions for members and non-members of paddy cultivation in the selected WUAs of the study area was tested for structural difference using the Chow's test. The test revealed that the calculated F value (7.0) was higher than the table value (2.47) and hence, it could be concluded that there was a structural differences between the parameters, and the preceding decomposition analysis was done.

Table 1. Chow Test for Measuring the Structural Difference in the Production Function for Thamirabharani River Basin

S.No	Particulars	Value	Observation
1	RSS_P	0.0295	N=100
2	RSS_nm	0.00146	N_m=60
3	RSS_m	0.0155	N_nm=40
4	F value	7.0	

Estimated Per Hectare Production Function of Member and Non-member of Water Users' Associations in Thamirabharani River Basins

For decomposing the productivity difference in paddy cultivation between members and non-members, the parameters of the per hectare production functions and mean levels of input were essential. Hence, the production functions for paddy cultivation for members and non-member were also estimated separately.

Table 2 Per-hectare Cobb-Douglas Production function Estimates for the Members and Non-Members in Water Users' Associations for Paddy Cultivation

Sl. No.	Particulars	Production Elasticity		
		Pooled	Members	Non -members
1	Intercept	9.465***	7.837***	7.323***
2	Seed(kgs/ha)	-0.128***	0.059***	0.034
3	Manure (t/ha)	0.013**	0.014***	0.012***
4	N (kg/ha)	-0.091**	-0.014	0.074***
5	P (kg/ha)	-0.013	0.016**	0.019
6	K(kg/ha)	0.060	0.068***	0.002
7	Machine power (hp hr/ha)	0.021	0.035*	-0.007
8	Human labour (man days)	0.116***	-0.012	0.085***
9	Plant Protection Chemicals (Rs/ha)	-0.115***	0.013	-0.004**
10	Irrigation (ha.cm)	0.023**	0.012***	0.025***
	R ²	0.66	0.89	0.91
	F-Value	19.81***	55.17***	42.30***

The regression results for the sample farmers in the Water Users' Association of rice cultivation showed that the co-efficient of multiple determinations (R²) was 0.66 for the pooled data. This would reveal that about 66 per cent of the variation in the dependent variable was accounted by the selected independent variables. Human labour was found to be positive at 1 per cent level of significance. This would imply that an increase in human labour by 1 per cent from their respective mean levels, *ceteris paribus*, would increase the yield by 0.116 per cent. It was also found that the output elasticities for manure and irrigation were significant at 5 per cent level, i.e., by increasing the level of manure and irrigation by one per cent, the yield will increase by 0.013 per cent and 0.023 per cent respectively.

Seed and plant protection chemicals were found to be negative at 1 per cent level of significance. This would imply that an increase in seed and plant protection chemicals by 1 per cent from their respective mean levels, *ceteris paribus*, would decrease the yield by 0.128 per cent and 0.115 per cent respectively. It

was also found that the output elasticities for nitrogen was negative and significant at 5 per cent level, i.e., by increasing the level of nitrogen by one per cent, the yield will decrease by 0.091 per cent.

Source of Productivity Differences between Member and Non-Members in Water Users' Associations for Paddy Cultivation

In case of Thamirabharani river basin the sources of productivity difference between members and non members for paddy were discussed below.

Table 3. Decomposition of Productivity Differences between Member and Non-Members in Water Users' Associations for Paddy Cultivation

S. No	Particulars	Percent contribution
1	Observed differences in output Sources of contribution	100.53
	A. Due to differences in technology	
i	Neutral technical change	107.01
ii	Non-neutral technical change	-0.35
iii	Total due to technology	106.66
2	B. Due to difference in input use	
i	Seed	0.06
ii	Farm Yard Manures	0.03
	Nitrogen	-0.01
	Phosphorus	0.02
	Potash	0.07
iii	Machine power	0.03
iv	Human labour	-0.01
v	Plant protection chemicals	0.01
vi	Irrigation	0.01
3	Estimated difference in output (A + B)	106.87

From the Table it could be seen that the effect of non-neutral effect was 35 per cent more for members of water users' association in paddy cultivation when compared to that of the non members. The estimated difference in output for paddy cultivation was found to be 106.87 per cent. The effects of seeds, farm yard manure, phosphorus, potash, machine power plant protection chemicals and irrigation have shown a positive effect on paddy yield. The effects of nitrogen and human labour have shown a negative effect on paddy yield.

Constraints faced and Suggestion Improvement by the Selected Water Users' Associations in the Thamirabharani River Basin

Constraints faced by the Water Users' Association in Thamirabharani River Basin

Garrett's ranking technique was employed to find out the constraints faced by Water Users' Association in Thamirabharani river basin and the results are presented.

Table 4. Constraint faced by Water Users' Association of Thamirabharani River Basin Using Garrett's Ranking Technique

Sl. No	Constraints	Thamirabharani	
		Score	Rank
1	Fund Constraints	14	V
2	Poor attendance of members	18	III
3	Inadequate Water availability	10	VI
4	Conflicts among members	20	II
5	Political interference	17	IV
6	Unremunerative price for the produces	21	I

Source: Primary data collection

The most important constraint under Water Users' Association was unremunerative price for the produces followed by conflicts among members, poor attendance of members, political interference, fund constraints and inadequate water availability. Most of the association meetings were intervened by the politically influenced persons, which reflected in the poor attendance of the meetings conducted and this further led to conflicts. In order to mobilize any developmental activities, funds play the key role and hence, it was one of the constraints faced by the sample famers in the selected area.

CONCLUSION

The production functions of members and non-members of paddy cultivation in Thamirabharani river basin was tested for structural difference using the Chow's test. In Thamirabharani river basin, calculated F value (7.0) was higher than the table value (2.47). For decomposing the productivity difference in paddy cultivation between members and non-members, the parameters of the per hectare production functions and mean levels of input were essential. The regression results for the sample farmers in the Water Users' Association of rice cultivation showed that the co-efficient of multiple determinations (R^2) was 0.66 for pooled data. This would reveal that about 66 per cent of the variation in the dependent variable was accounted by the selected independent variables. Human labour was found to be positive at 1 per cent level of significance. This would imply that an increase in human labour by 1 per cent from their respective mean levels, *ceteris paribus*, would increase the yield by 0.116 per cent. It was also found that the output elasticities for manure and irrigation were significant at 5 per cent level, i.e., by increasing the level of manure and irrigation by one per cent, the yield would increase by 0.013 per cent and 0.023 per cent respectively.

Seed and plant protection chemicals were found to be negative at 1 per cent level of significance. This would imply that an increase in seed and plant protection chemicals by 1 per cent from their respective mean levels, *ceteris paribus*, would decrease the yield by 0.128 per cent and 0.115 respectively. It was also found that the output elasticity for nitrogen was negative and significant at 5 per cent level, i.e., by increasing the level of nitrogen by one per cent, the yield will decrease by 0.091 per cent.

Non-neutral effect was 35 per cent more for members of water users' association in paddy cultivation when compared to the non members in Thamirabharani river basin. The estimated difference in output for paddy cultivation was found 106.87 per cent. The effects of seeds, farm yard manure, phosphorus, potash, machine power plant protection chemicals and irrigation had shown a positive effect on paddy yield. The effects of nitrogen and human labour have shown a negative effect on paddy yield in Thamirabharani river basin.

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