Original Research Article

Impact assessment of water users' co-operatives initiative on farms returns in Bhadra command area of Shivamogga district, Karnataka

ABSTRACT

The present study was undertaken in Southern Transition Zone of Karnataka to estimate the impact of water users' cooperatives (WUCs) initiative on returns realized by farmers in study area. Four villages of Bhadravathitaluk were selected, two having active WUCs *i.e*Kagekodamagge and Dananayakapura and remaining two having flaccid WUCs *i.e*Sriramanagara and Tiplapura. The required data was collected from 30 farmers from each WUCs. The net returns per ha for Arecanut (A), Arecanut+Coconut (A+C), Arecanut+Coconut+Banana (A+C+B), paddy and sugarcane was higher in farms under active water users' co-operatives (Rs.6,45,094, Rs.7,07,192, Rs.8,08,093, Rs.8,166 and Rs.54,931) than flaccid water users'co-operatives (Rs.4,26,072, Rs.4,50,459, Rs.5,28,057, Rs.7,284 and Rs.39,740). This can be mainly attributed to equitable distribution of water from head reach to tail reach along the canal in active water users' cooperatives. For A, A+C and A+C+B cropping systems there was not much difference in net returns per ha between head reach (Rs. 4,76,100, Rs. 5,16,378 and Rs. 5,82,923 respectively) and tail reach (Rs. 4,31,215, Rs. 4,70,616 and Rs. 5,33,816 respectively) farmers of active water users' co-operatives. Whereas in areas under flaccid water users' co-operatives, the net returns per ha for head reach farmers was higher by Rs. 52,553, Rs. 64,142 and Rs. 1,45,721 over the tail reach farmers. The study emphasizes the need for activating flaccid WUCs to achieve higher net returns by all farmers along the canal.

Comment [i1]: Abstract should include title of the research, objectives, methodology, sampling techniques, results and discussion and results including conclusion

Keywords: *Active WUCs, Flaccid WUCs, Returns per rupee of expenditure on irrigation water, net returns*

1. INTRODUCTION

Irrigation water is outmost constraint faced by many farmers in India.Water is the crucial input to the agricultural production on which the sustenance of the farmers is completely dependent. It is considered as a public good in the living world, where all free-rides on it leading to its extinction. A proper water management mechanism has to be developed for its sustainable useChandrakanth et al. [1]. Water users' association is one such water management technique which will create sense of ownership on irrigation water resource among the farmers.In recent years many irrigation canals in Karnataka are mostly managed bytheWater Users Co-operatives (WUCs). Each WUCs has its own rules and regulations in managing, operating and distribution of water. Lack of collective action and the problem of free riding have led to inadequate water availability to tail reach farmers resulting lower net returns in areas under flaccidWUCs. Hence, it is necessary to form or to rejuvenate the existing WUCs which ensures the equity in distribution of canal water for irrigationto achieve higher net returns. Kagekodamagge and Dananayakapura are two active WUCs managed by farmers through collective action (Active WUCs) which ensures the equity in distribution of canal water. Water is first released to the tail end farmers then to head reach farmers and each farmer is provided with irrigation for five hours. Farmers are being charged Rs.100 per acre per year to meet out the operation and maintenance expenditure. Whereas, in Tiplapura andSriramanagara which are flaccid WUCs, irrigation water is released normally from head reach to tail reach farmers. Farmers in the tail end do not get the water indicating non-equity in distribution of irrigation water leading to conflicts among farmers [11] and no water charges are collected from the farmers. The present study throws a spot light on estimating the returns realized by farms under active and flaccidWUCs in Southern Transition Zone of Karnataka. In this context, objective of research was to know the contribution of Water Users' Co-operatives in enhancing returns through their interventions.

Comment [i2]: Abstract is the general background and justification. there should be clear statement of problem

2. METHODOLOGY

2.1 Study area and sampling

The study was carried out in the Southern Transition Zone of Karnataka during agriculture year 2018-19. Four water users' co-operatives of Bhadravathitaluk of southern transition zone *viz.,*Kagekodamagge,Dananayakapura which are having active WUCs and Tiplapura,Sriramanagarawhich are having flaccid WUCs [passive or defunct WUCs] were chosen purposively for the comparative analysis of the active and flaccid WUCs governing the management and use of canal water for irrigation purpose.

Thirty sample farmers were selected randomly in each WUCs. Totally data was collected from 120 sample farmers for the research problem identified. Distance of the channel was divided into half and was demarcated as head and tail reach.

2.2 Returns/Income

a) **Gross returns:** Obtained by multiplying the total produce with its unit price.

Gross returns = Total output × Price of output

b) **Net returns:** Obtained by subtracting total cost from gross returns.

Net returns = Gross returns – Total Cost

2.3 Returns per rupee of expenditure on irrigation water

$$\textbf{Returns per rupee of irrigation cost} = \frac{Net\ returns\ \ per\ \ ha}{irrigation\ \ cost\ per\ \ ha\ cm\ of\ \ water\ \ used}$$

2.4 Partial budgetingtechnique

Partial budgeting technique was used to estimate the relative profitability of active WUCs in water management and farming. Partial budgeting considers only the changes in income and expenses that would result from an active WUCs. Consequently, all other components which do not change by the decision can be ignored.

The format of partial budgeting is as follows,

Debit	Credit
Increase in the cost due to active WUCs	Savings or reduction in cost due to active WUCs
Decrease in returns due to active WUCs	Increase in gross return due to active WUCs
Total Debit = A+B	Total Credit = C+D
Credit minus debit = Net gain / loss	

In the current study, profitability of active WUCs over flaccid WUCs was evaluated using the partial budgeting approach. The technique considers the additional costs, reduced costs, incremental returns and reduced returns realized byfarmers.

3. RESULTS AND DISCUSSION

3.1 Socio-economic characteristics of the respondent farmers

The farmer respondents were classified based on their socio-economic characteristics and are presented in Table I. Majority of farmers in both type of water users' co-operatives belonged to the age group of 40-60 years *i.e.* 63 and 48 per cent in active water users' co-operatives and flaccid water users' co-operatives respectively. The percentage of farmers in the old age (>60 years) group was the second highest (38 %) in flaccid water users' co-operatives. Whereas, percentage of farmers belonging to below age of 40 years group was the second highest in active water users' co-operatives (22 %).

It was found that about 48 and 40 per cent of the farmers possessed high school level of education in active and flaccid WUCs, respectively.About 20 per cent of the farmers possessed primary education in both type of water users' co-operatives. The average years of schooling was 9 and 8 years in active water users' co-operatives and flaccid water users' co-operatives respectively.

Table 1: Socio-economic characteristics of farmer respondents in the study area

(in numbers)

Particulars	**Active water users' co-operative(n=60)**	**Flaccid water users' co-operative(n=60)**	**Test value**
I. Age Group			
a. Below 40 years	13 [22]	8 [13]	χ^2=8.52*
b. 40-60 years	38 [63]	29 [48]	
c. Above 60 years	9 [15]	23 [38]	
Average age (Years)	**50**	**50**	
II. Education			
a. Illiterate	2 [3]	8 [13]	χ^2=2.83^{NS}
b. Primary	20 [33]	20 [33]	
c. High School	29 [48]	24 [40]	
d. College	9 [15]	8 [13]	
Average Years of Schooling	**9**	**8**	
III. Family Size			
a. Small (<4)	12	14	

	[20]	[23]	$\chi^2=0.28^{NS}$
b. Medium (4-6)	40 [67]	39 [65]	
c. Large (>6)	8 [13]	7 [12]	
Average family size	**5**	**4**	
IV. Land Holding			
a. Small farmers (< 2 ha)	34 [57]	48 [80]	$\chi^2=7.55^{*}$
b. Medium and large farmers(>2.01ha)	26 [43]	12 [20]	
Average land holding (ha)	**2.25**	**1.03**	

Note: figures in brackets represent percentage to the respective totals

It was noticed that majority of farmer respondents fall into the medium sized family category (4 to 6 no.). This was followed by small family category (< 4 no.) in both types of WUCs. In active water users' co-operatives, 20 per cent, 67 per cent and 13 per cent of farmers fall into small, medium and large sized family categories, respectively. While it was 23 per cent, 65 per cent and 12 per cent of the famers in small, medium and large sized family groups, respectively in flaccid water users' co-operatives.

More than 50 per cent of the farmers were small farmers in both types of WUCs. The average size of land holdings was high in active water users' co-operatives (2.25 ha) than that of flaccid water users' co-operatives (1.03 ha). And the difference was statistically significant. This was mainly because of adequate availability of irrigation water to tail reach farmers in active water users' cooperative.There was no significant divergence between the groups with respect to the socio- economic characteristics indicating that the samples were homogeneous and hence they can be meaningfully compared.

3.2 Difference in net returns realized by the farmers under areas of active and flaccid water users' co-operatives

From the Table 2 it is clear that the net returns per ha in arecanut, arecanut+coconut, arecanut+coconut+banana, paddy and sugarcane cultivation was higher in areas under active water users' co-operatives (Rs.6,45,094, Rs.7,07,192, Rs.8,08,093, Rs.8,166 and Rs.54,931 respectively) than in flaccid water users' co-operatives (Rs.4,26,072, Rs.4,50,459, Rs.5,28,057, Rs.7,284 and Rs.39,740 respectively).This was because, the farmers in the tail reach region were deprived of the use of sufficient canal water in case of flaccid water users' co-operatives (farms in tail reach received less water from canal than the head reach farms), which resulted in lower returns. Whereas, in case of active water users' co-operatives, the water was equitably distributed between the head and tail reach farms resulting in higher

returns for farmers in both head reach and tail reach regions.

Table 2: Comparison of net returns per ha in farms under Active water users' co-operatives and Flaccid water users' co-operatives

Sl. No.	Crop	Net returns per ha in Active water users' co-operatives (Rs.)	Net returns per ha in Flaccid water users' co-operatives (Rs.)	Percent difference in net returns
1	Arecanut	6,45,094	4,26,072	51.40
2	Arecanut+coconut	7,07,192	4,50,459	56.99
3	Arecanut+coconut+banana	8,08,093	5,28,057	53.03
4	Paddy	8,166	7,284	12.11
5	Sugarcane	54,931	39,740	38.23

Thus, water users' co-operatives ensuring equity in distribution of water among all the users are the need of the hour. Thus, the hypothesis that, the Water Users' Co-operatives have contributed significantly to enhance returns through their interventions was accepted. The results are in line with results of the studies conducted by Dharam and Arun, 2014 [2].

3.3 Comparison of net returns realized by head and tail reach farmers in areas under active and flaccid water users' co-operatives

Per ha net returns realized by the farmers in tail reach under areas of flaccid water users' co-operatives was lower than the net returns realized by the farmers in head reach. While, there was no much difference in net returns realized by head and tail reach farmers in active water users' co-operatives because of equitable and timely supply of water to every farmer along the canal (Table 3). The results are in line with the study conducted by RaviSC [8].

Table 3: Net returns per ha realized by head and tail reach farmers in areas under active and flaccid water users' co-operatives

Particulars	Active water users' cooperatives			Flaccid water users' cooperatives		
	Head reach (Rs.)	Tail reach (Rs.)	Percent change in net returns	Head reach (Rs.)	Tail reach (Rs.)	Percent change in net returns
A	4,76,100	4,31,215	10.41	3,27,160	2,74,607	19.14
A+C	5,16,378	4,70,616	9.72	3,48,669	2,84,527	22.54
A+C+B	5,82,923	5,33,816	9.20	4,37,775	2,92,054	49.90

Note: A- Arecanut; A+C- Arecanut + coconut; A+C+B- Arecanut + coconut + banana

3.4 Returns per rupee of expenditure on irrigation water

Returns per rupee of expenditure on irrigation water (Table 4) was more in areas under active water users' co-operatives (Rs.39, Rs.43, Rs.38 and Rs.1 for arecanut, arecanut+coconut and arecanut+coconut+banana and sugarcane, respectively) than areas under flaccid water users' co-operatives (Rs.27, Rs.28, Rs.27 and Rs.1 for arecanut, arecanut+coconut and arecanut+coconut+banana and sugarcane, respectively) which was mainly because of higher returns realized by farmers under areas of active water users' co-operatives compared to flaccid water users' co-operatives.

Table 4: Return per rupee of expenditure on irrigation in the study area

Sl. No.	Crop	Net returns per ha (Rs.)	Irrigation cost per ha (Rs.)	Returns per rupee of irrigation cost (Rs.)
Active water users' co-operatives (n=60)				
1	Areca	6,45,094	16,410	39
2	Areca+coconut	7,07,192	16,410	43
3	Areca+coconut + banana	8,08,093	21,456	38
4	Paddy	8,166	3,405	2
5	Sugarcane	54,931	30,867	2
Flaccid water users' co-operatives (n=60)				

1	Areca	4,26,072	15,920	27
2	Areca+coconut	4,50,459	15,920	28
3	Areca+coconut + banana	5,28,057	19,915	27
4	Paddy	7,284	3,293	2
5	Sugarcane	39,740	28,718	1

In case of paddy returns per rupee of expenditure was same for both active and flaccid water users' co-operatives.The results are in line with the study conducted by Ravi., S.C. (2018) [8].

3.5 Estimation of advantage of farms under active water users' co-operatives over flaccid water users' co-operatives in arecanut cropping system using partial budgeting

Since, more than 30 per cent of the farmers were growing arecanut sole crop in both active and flaccid water users' co-operatives, only this cropping system was considered for analyzing the role of water users' co-operatives. To estimate the profitability of farmers under areas of active WUCs over flaccid WUCs, increase and decrease in costs and returns under various items were taken into account. The results revealed that, there was an increased cost of Rs.1,19,702 per ha (Rs.8,502, Rs.27,386, Rs.99, Rs.28,863, Rs.42,530 and Rs.12,323 on irrigation, labour, plant protection chemicals, fertilizers, silt and FYM respectively) incurred to farms under active water users' co-operatives mainly because of increased crop response for inputs like fertilizer, PPC, labour under increased irrigation intensity.

Table 5: Estimation of advantage of farms under active water users' co-operatives overflaccid water users' co-operatives in arecanut cropping system using partial budgeting technique (Rs. per ha)

Debit/Expenses		Credit/Savings	
Added Cost	**Amount (Rs.)**	**Reduced cost**	**Amount (Rs.)**
a. Irrigation cost	8,502	-	
b. Labour cost	27,386	-	
c.Plant protection chemicals	99		
d. Fertilizers	28,863		
e. Silt	42,530		
d. FYM	12,323		

Total added cost (A)	1,19,702	**Total reduced cost (B)**	**0**
Reduced returns		**Added returns**	
-	-	a. Returns	2,04,405
Total reduced return (C)	0	**Total added return (D)**	2,04,405
Total Debit (A+C)	1,19,702	Total credit (B+D)	**2,04,405**
Net gain (Rs. per ha)	**84,703**		

Due to higher input use efficiency of farms under active WUCs and increased yield, the increase in returns per ha was Rs. 2,04,405. Thus, total savings by active water users' co-operatives amounted to Rs. 2,04,405 per ha. The estimated net gain from active water users' co-operatives over flaccid water users' co-operatives Rs.84,703 per ha (Table 5).

4. CONCLUSION

The net returns per ha for arecanut, arecanut+coconut, arecanut+coconut+banana, paddy and sugarcane was higher in farms under active water users' co-operatives (Rs.6,45,094, Rs.7,07,192, Rs.8,08,093, Rs.8,166 and Rs.54,931, respectively) than flaccid water users' co-operatives (Rs.4,26,072, Rs.4,50,459, Rs.5,28,057, Rs.7,284 and Rs.39,740, respectively) this can be mainly attributed to equitable distribution of water from head reach to tail reach along the canal in active water users' cooperatives.There was not much difference in net returns per ha between head reach (Rs. 4,76,100, Rs. 5,16,378 and Rs. 5,82,923 respectively) and tail reach (Rs. 4,31,215, Rs. 4,70,616 and Rs. 5,33,816 respectively) farmers of active water users' co-operatives. In areas under flaccid water users' co-operatives, the net returns per ha for head reach farmers was higher by Rs. 52,553, Rs. 64142 and Rs. 1,45,721 over the tail reach farmers for arecanut, arecanut+coconut and arecanut+coconut+banana cropping systems. Due to higher input use efficiency of farms under active water users' co-operatives and increased yield, the increase in returns per ha was Rs. 2,04,405. Thus, total savings by active water users' co-operatives amounted to Rs. 2,04,405 per ha. The estimated net gain from active water users' co-operatives over flaccid water users' co-operatives was Rs.84,703 per ha.Returns per rupee of expenditure on irrigation water for arecanut, arecanut+coconut, arecanut+coconut+banana and Sugarcane cropping systems was higher in farms under active water users' co-operatives (Rs.39, Rs.43, Rs.38 and Rs.2) than flaccid water users' co-operatives (Rs.27, Rs.28, Rs.27 and Rs.1) which was mainly because of higher returns realized by farmers under areas of active water users' co-operatives compared to flaccid water users' co-operatives. In case of paddy returns per rupee of expenditure was same for both active and flaccid water users' co-operatives (Rs.2). Hence the study emphasizes the need for activating flaccid WUCs to achieve higher net returns by all farmers along the canal.

Comment [i3]: conclusion must not be as such a copy of your result but the summary and generalization of your finding.

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