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A Study On Adoption Of Farmers On Watershed Technology In Sivagangai District, Tamilnadu

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Abstract

Water is a prime resource for the survival of all living organism. It does not have a substitute in its main use. It is an indispensible, finite, and valuable resource. Its shortage is one of the most pressing issues posting challenges to the world. It is a known fact that it will be difficult to ensure stable supply of water for drinking and food production for an estimated population of about eight billion people in 2018, the watershed technology show that the farmers even after acquiring knowledge and skills through watershed programmes, many of them do not put them into practice. There is always a gap between the knowledge acquired and the practice of it. Some farmers put the knowledge to full use, while some others use it only partially and some of them do not use it at all. An attempt has been made in the present study to analyse the adoption of watershed technology by farmers in the district. Here, adoption refers to continued use of new technique or method. It is operationally defined in the present study as farmers' acceptance leading to continued practices of the watershed technology. The study were used discriminating analysis for adoption of farmers on watershed technology.

Key words : Watershed technology, Skill, Knowledge, New technique

Introduction

Water is a prime resource for the survival of all living organisms. It does not have a substitute in its main use. It is an indispensable, finite, and valuable resource. Its shortage is one of the most pressing issues posing challenges to the world. It is a well-known fact that it will be difficult to ensure stable supply of water for drinking and food production for an estimated world population of about eight billion people in 2025. The only way of overcoming this crisis is

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proper utilisation of water. In other words, water resources management is an essential component of sustainable development of any economy.

Watershed development is a main intervention for natural resource management and rural development. It conserves the environment. It also contributes to livelihood security. As the programme requires large investment of financial resources, its impact needs to be assessed. The empirical studies done in India show that the watershed development programmes have produced desired results. However, there are differences in the impacts of these programmes across the various regions of the country. Thus, the watershed impact assessment is to be carried out in each region. It is a known fact that farmers' participation alone cannot make the programme successful. The adoption of watershed technology by farmers is also essential to ensure significant impacts on their lives. However, experiences indicate that most of the farmers, even after acquiring knowledge and skills through watershed programmes they do not put them into practice. There is always a gap between the knowledge acquired and the practice of it. Some people put the knowledge to full use, while others use it only partially and some of them do not use it at all. This is because there are a lot of social, economic, administrative and input constraints in the adoption of watershed technology in India. In this context, the present study makes an attempt to analyse the farmers' participation in watershed development programmes and adoption of watershed technology in Sivagangai district. It also studies the impact of watershed technology on the crop productivity and the constraints in the adoption of watershed technology in the study area.

The available empirical studies on watershed technology show that the farmers even after acquiring knowledge and skills through watershed programmes, many of them do not put them into practice. There is always a gap between the knowledge acquired and the practice of it. Some farmers put the knowledge to full use, while some others use it only partially and some of them do not use it at all. An attempt has been made in the present study to analyse the adoption of watershed technology by farmers in the district. Here, adoption refers to continued use of new technique or method. It is operationally defined in the present study as farmers' acceptance leading to continued practices of the watershed technology.

These practices include i) soil and water conservation practices and ii) modern cultivation practices and land use pattern. The partial adoption means the application of these practices only in a portion of the cropped area and creation of watershed on their lands to fulfil the partial requirements of crop cultivation. This chapter records the results of the analysis of adoption of

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watershed technology by the farmers in the study area. The first section gives the findings of the analysis of the levels of adoption of these practices by the farmers in the district. The second section provides the results of the characteristics of farmers adopting these practices at higher level in the study area

Methods and Materials

The present research paper is completely based on primary data. The primary data were collected by the researcher himself through personal interview method from July 2018 to January 2019. A well- structured interview schedule was prepared. A pre-test was conducted with 25 farmers in the month of June 2018 to finalise the schedule, which was used to gather information from the sample farmers on the administrative and the inputs constraints faced by them in implementing the watershed development programme in the district. Five watershed development programmes have been implemented under different types of institutional arrangements for the past ten years in the district. These programmes have created 181 watersheds in the study area. Eighteen watershed villages have been chosen random for the present study. There have been 1412 small farmers and 609 large farmers benefitted by these programmes in the selected villages. The researcher has been chosen 10 per cent of the farmers from each category of farmers based on simple random sampling technique. Thus, the sample constitutes 141 small farmers and 61 large farmers. The researcher identified from the literature watershed technology show that the farmers even after acquiring knowledge and skills through watershed programmes, many of them do not put them into practice and were the discriminant analysis for the characteristics of Small and large farmers adopting watershed technology at higher and lower levels in the district.

Result and Discussion

Farmers construct the different types of soil and water conservation structures on their own lands. Soil conservation technology includes construction of contour bunds, field bunds, gully formation, ridges and furrows and side slope plantations. The water conservation technology includes construction of percolation ponds, farm ponds, rain pits, and rejuvenation of wells. The researcher gathered information on these practices adopted by small farmers and particulars are given in Table 1.

TABLE .1

Adoption of Soil and Water Conservation (SWC) Practices by Small Farmers

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Sl. No.	SWC Practices	No.of Small Farmers Adopted		
		Fully	Partially	Not at All
1.	Contour bunds	100 (70.92)	29 (20.57)	12 (8.51)
2.	Field bunds	98 (69.50)	22 (15.60)	21 (14.90)
3.	Gully formation	75 (53.19)	30 (21.28)	36 (25.53)
4.	Ridges and furrows	19 (13.48)	50 (35.46)	72 (51.06)
5.	Side slope plantations	0 (0.00)	48 (34.04)	93 (65.96)
6.	Percolation ponds	102 (72.34)	0 (0.00)	39 (27.66)
7.	Farm ponds	135 (95.75)	0 (0.00)	6 (4.25)
8.	Rejuvenation of wells	60 (45.55)	46 (32.63)	35 (24.82)
9.	Rain pits	0 (0.00)	58 (41.13)	83 (58.87)

Source: Primary Data.

Figures in the brackets are percentages to the respective sample size.

Table 1 shows that 70.92 per cent of small farmers have constructed contour bunds on their lands to the full extent of their requirements. However, 20.57 per cent of them have constructed these bunds partially and 8.51 per cent of them have not at all constructed these bunds. It has also been found that 95.75 per cent of small farmers have constructed farm ponds and 72.34 of them have constructed percolation ponds according to their full requirements. Here, it is to be noted that farmers use water stored in farm ponds directly for cultivation. The water stored in percolation bonds enables the farmers to recharge the ground water. The survey also brings out the point that 45.55 per cent of small farmers rejuvenated their wells. Nearly 53 per cent of small farmers have adopted the method of guilty formation. Only 34.04 per cent of small farmers have followed the method of side slope plantations. It is essential to note that constructions of rain pits and ridges and furrows are not followed by small farmers in the study area. The researcher gathered information on soil and water conservation measures adopted by them on their lands. The details are furnished in Table 2.

TABLE 2
Adoption of Soil and Water Conservation (SWC)
Practices by Large Farmers

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Sl. No.	SWC Practices	No.of Large Farmers Adopted		
		Fully	Partially	Not at All
1.	Contour bunds	52 (85.25)	4 (6.56)	5 (8.19)
2.	Field bunds	54 (88.52)	3 (4.92)	4 (6.56)
3.	Gully formation	49 (80.33)	10 (16.39)	2 (3.28)
4.	Ridges and furrows	47 (77.05)	10 (16.39)	4 (6.56)
5.	Side slope plantations	0 (0.00)	49 (80.33)	12 (19.67)
6.	Percolation ponds	48 (78.69)	0 (0.00)	13 (21.31)
7.	Farm ponds	59 (96.72)	0 (0.00)	2 (3.28)
8.	Rejuvenation of wells	50 (81.97)	9 (14.75)	2 (3.28)
9.	Rain pits	48 (78.69)	8 (13.11)	5 (8.20)

Source: Primary Data.

Figures in the brackets are percentages to the respective sample size.

Table 2 points out that 85.25 per cent of large farmers have constructed contour bunds on their lands to the full extent of their requirements. However, 6.56 per cent of them have constructed these bunds partially and 8.19 per cent of them have not at all constructed these bunds. It was found that 96.72 per cent of large farmers constructed farm ponds and 78.69 per cent of them constructed percolation ponds according to their full requirements. The survey also brings out the point that 81.97 per cent of large farmers rejuvenated their wells and 78.69 per cent of them constructed rain pits on their lands in the district.

Farmers follow the different modern cultivation practices namely seed treatment, weeding, organic manuring, pest-control of rain-fed crops, sowing across the slope and inter-cropping. They also adopt the techniques of land reclamation, smoothing and fall ploughing. The researcher collected information on these practices adopted by small farmers and the particulars are given in Table 3.

TABLE 3
Adoption of Modern Cultivation Practices by Small Farmers and Their Land Use Pattern

		No.of Small Farmers Adopted

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Sl. No	Cultivation Practices	Fully	Partially	Not at All
1.	Land smoothing	40 (28.31)	49 (34.75)	52 (36.88)
2.	Land reclamation	31 (21.99)	41 (29.08)	69 (48.93)
3.	Fall ploughing	60 (42.55)	28 (19.85)	53 (37.60)
4.	Seed treatment	82 (58.15)	47 (33.43)	12 (8.51)
5.	Weeding	141 (100.00)	0 (0.00)	0 (0.00)
6.	Organic manuring	30 (21.28)	92 (65.25)	19 (13.48)
7.	Pest control of rain-fed crops	102 (72.34)	0 (0.00)	39 (27.66)
8.	Sowing across the slope	32 (22.69)	42 (29.79)	67 (47.52)
9.	Inter – cropping	40 (28.31)	21 (14.89)	80 (56.74)

Source: Primary Data.

Figures in the brackets are percentages to the respective sample size.

Table 3 reveals that only 28.31 per cent of small farmers have followed the technique of land smoothing for their entire cultivated land in the watershed regions and 34.75 per cent of them adopted this technique partially. The methods of fall ploughing and land reclamation have been fully followed by 42.55 per cent and 21.99 per cent of small farmers respectively. Inter-cropping has been done in the entire cultivated land by 28.31 per cent of small farmers in the study area. The modern cultivation practices namely seed treatment and sowing across the slope have been followed fully by 58.15 per cent and 22.69 per cent of small farmers respectively in the district. It is important to note that most of the small farmers have used the input organic manure partially. That is, they have not used this input in their entire cultivated land. All the small farmers have followed the practice of weeding in the cultivation of crops.

The researcher collected the data on modern cultivation practices adopted by large farmers in the study area. The details are provided in Table 4.

TABLE 4
Adoption of Modern Cultivation Practices by Large Farmers and Their Land Use Pattern

Sl.		No.of Large Farmers Adopted

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No	Cultivation Practices	Fully	Partially	Not at All
1.	Land smoothing	58 (95.08)	2 (3.28)	1 (1.64)
2.	Land reclamation	56 (91.80)	1 (1.64)	4 (6.56)
3.	Fall ploughing	51 (83.61)	8 (13.11)	2 (3.28)
4.	Seed treatment	56 (91.80)	4 (6.56)	1 (1.64)
5.	Weeding	61 (100.00)	0 (0.00)	0 (0.00)
6.	Organic manuring	54 (88.52)	4 (6.56)	3 (4.92)
7.	Pest control of rain-fed crops	54 (88.52)	0 (0.00)	7 (11.48)
8.	Sowing across the slope	49 (80.33)	4 (6.56)	8 (13.11)
9.	Inter – cropping	51 (83.61)	8 (13.11)	2 (3.28)

Source: Primary Data.

Figures in the brackets are percentages to the respective sample size.

Table 4 indicates that 95.08 per cent of large farmers have followed the technique of land smoothing for their entire cultivated land in the watershed regions and 3.28 per cent of them adopted this technique partially. The methods of fall ploughing and land reclamation have been fully followed by 83.61 per cent and 91.8 per cent of large farmers respectively. Inter-cropping has been done fully by 83.61 per cent of large farmers in the study area. The modern cultivation practices namely seed treatment and sowing across the slope have been followed fully by 91.8 per cent and 80.33 per cent of large farmers respectively in the district. All the large farmers have followed the cultivation practice of weeding in the district.

The researcher studied the levels of adoption of watershed technology by small and large farmers in the study area. Two levels of adoption were generated from the scores secured by the farmers for the statements relating to the adoption of watershed practices in the district. First, the response scores were aggregated across all the respondents in the sample and then median score was determined. The farmers scoring more than the median value were classified as farmers adopting these practices at higher level whereas the ones scoring less than the median score were grouped as farmers adopting these practices at lower level. The results are given in Table 6.1.5.

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TABLE 5

Distribution of Farmers Based on their Levels of Adoption of Watershed Technology

Sl. No.	Particulars	No.of Farmers Adopted		
		Small	Large	Total
1.	Lower Level	87 (61.70)	22 (36.07)	109 (53.96)
2.	Higher Level	54 (38.30)	39 (63.93)	93 (46.04)
	Total	**141 (100.00)**	**61 (100.00)**	**202 (100.00)**

Source: Primary Data.

Figures in the brackets are percentages to the respective sample size.

The researcher estimated the Canonical discriminant function to test the hypothesis that there are no significant differences in the characteristics of small farmers adopting watershed technology at higher and lower levels in the study area. Both social and economic conditions have been taken for the analysis. The variables used in the function were standardized using within pooled variance method to make the coefficients directly comparable for their magnitudes and signs. The non-metric variables were transformed into metric dummy variables by assigning scores to make the data fit for the Discriminant analysis for small farmers. The results of Discriminant analysis for small farmers adopting watershed technology at higher and lower levels are shown in Table 6.

TABLE 6

Result of Discriminant Analysis for the Characteristics of Small Farmers Adopting Watershed Technology at Higher and Lower Levels in Sivagangai District

Sl. No	Variables	Standardized Canonical Coefficients	Other Statistics
1.	Farmer's age	0.041	Wilks' Lambda = 0.923
2.	Farmer's education	0.465	
3.	Farmer's social class	0.529	
4.	Family size	-0.067	
5.	Family type	-0.154	Canonical
6.	Farmer’s experience	0.361	

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7.	Extension contact	-0.196	Correlation = 0.278
8.	Farm size	0.602	
9.	Farm income	0.662	
10.	Non-farm income	1.273	Chi-Square = 10.725
11.	Off-farm income	-2.290	Eigen Value = 0.084

Source: Primary Data

The value of Wilks' Lambda is very high (0.923) indicating that the groups do not differ significantly. Further, this transforms to a Chi-square value of 10.725, which is statistically insignificant. The inference is that the discriminant function is unfit to explain differences in the characteristics of the two groups of small farmers classified based on the levels of adoption of watershed technology by them in the study area. Thus, the hypothesis that there are no significant differences in the characteristics of small farmers adopting watershed practices at higher and lower levels in the district is accepted. The classification matrix also illustrates that the function is unfit for explaining the differences in the characteristics. The results of classification matrix are detailed in Table 6 (a)

TABLE 6 (a)

Classification Matrix for Small Farmers Adopting Watershed Technology at Higher and Lower Levels

Sl. No	Category	Predicted Membership		Total
		Group-I	Group-II	
1.	Higher level of adoption	20 (37.0)	34 (63.0)	54 (100)
2.	Lower level of adoption	57 (65.5)	30 (34.5)	87 (100)

Source: Primary Data.

Overall Efficiency = 35.46 per cent

The fitted Discriminant function correctly classifies only 20 small farmers adopting technology at higher level under group I and 30 out of 87 small farmers adopting watershed technology at lower level under group II. Only 50 out of 141 small farmers are correctly grouped by the function showing that the overall efficiency is 35.46 per cent only,

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Thus, the function is unfit to explain the characteristics of small farmers adopting watershed technology at higher level in the district.

The researcher estimated the Canonical discriminant function to test the hypothesis that there are no significant differences in the characteristics of large farmers adopting watershed technology at higher and lower levels in Sivagangai district. The results are shown in Table 7

TABLE 7

Result of Discriminant Analysis for the Characteristics of Large Farmers Adopting Watershed Technology at Higher and Lower levels in Sivagangai District

Sl. No	Variables	Standardized Canonical Coefficients	Other Statistics
1.	Farmer's age	1.514	
2.	Farmer's education	1.201	Wilks' Lambda = 0.407
3.	Farmer's social class	-0.021	
4.	Family size	-0.395	
5.	Family type	-0.016	
6.	Farmer’s experience	0.819	Canonical Correlation = 0.770
7.	Extension contact	-0.066	
8.	Farm size	0.320	
9.	Farm income	0.290	Chi-Square = 48.09*
10.	Non-farm income	0.493	
11.	Off-farm income	0.629	Eigen Value = 1.457

Source: Primary Data.

* indicates one per cent level of significance

The value of Wilks’ Lambda is low (0.407) indicating that the groups differ significantly. Further, this transforms to a Chi-square value of 48.09, which is statistically significant. The inference is that the Discriminant function is fit to explain the differences in the characteristics of the two groups of large farmers namely farmers adopting watershed technology at higher and lower levels. Thus, the hypothesis that there are no significant differences in the characteristics of these two groups of large farmers classified based on the levels of adoption of watershed technology by them is rejected. The Discriminant analysis brings out the following

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characteristics of large farmers adopting the watershed technology at higher level in the study area.

i) Relatively educated and aged large farmers have adopted the watershed technology at higher level in the district

ii) Large farmers who have engaged themselves in farming activities for quite a long period have adopted this technology at higher level

iii) Large farmers who have earned relatively more income through non-farm activities have adopted watershed practices at higher level

iv) Large farmers whose off-farm income has been relatively more have adopted this technology at higher level in the district.

The classification matrix for testing the overall efficiency of the fitted Discriminant function for the adoption of watershed technology by large farmers in the district is furnished in Table 7 (a).

TABLE 7 (a)

Classification Matrix for Large Farmers Adopting Watershed Technology at Higher and Lower Levels

Sl. No	Category	Predicted Membership		Total
		Group-I	Group-II	
1.	Higher level of adoption	35 (89.70)	4 (10.30)	39 (100.0)
2.	Lower level of adoption	1 (4.50)	21 (95.50)	22 (100)

Source: Primary Data.

Overall Efficiency = 91.8 per cent

The fitted Discriminant function correctly classifies 35 large farmers adopting the technology at higher level under group I and 21 out of 22 large farmers adopting the technology at lower level under group II. That is, 56 out of 61 large farmers are correctly grouped by the function showing that the overall efficiency is 91.8 per cent.

Conclusion

The present study brings out the fact that the farmers of Sivagangai district have evinced interest on both participation in the watershed development programmes and the adoption of watershed technology. Most of the farmers have constructed farm ponds, percolation ponds, contour bunds and field bunds to conserve soil and water resources in the district. They have

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also followed modern cultivation practices. As a result, they could increase the productivities of paddy and sugarcane in the study area. This is evidenced in the production analysis carried out in the present study. This is an indication that the success of rain-fed agriculture has been made possible by the farmers of the study area by harnessing rain water through the adoption of soil and water conservation measures.

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