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Post-adoption Behaviour of Farmers Towards Horticultural Soil and Water Conservation Technologies for Watershed Management in India

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ABSTRACT

Indian Institute of Soil and Water Conservation (IISWC) and its Research Centres have developed many model watershed projects in India in the past and implemented many horticultural Soil and Water Conservation (SWC) technologies for sustainable watersheds management. Though many evaluation studies were conducted on these watershed projects in the past but assessment of the post-adoption status of different horticultural SWC technologies over a longer period has not been done yet. It was imperative to appraise the behaviour of the farmers with regard to continuance & discontinuance of the horticultural technologies adopted, diffusion & infusion that took place and technological gaps that occurred in due course of time on post watershed management. The research study was carried out during 2012-15 as core project at Vasad as lead Centre along with IISWC headquarter Dehradun, and Centres Bellary, Chandigarh, Kota & Ooty, with the specific objectives of the study to measure the extent of post-adoption behaviour (continue-adoption, discontinuance, technological gap and diffusion) of farmers towards adopted horticultural SWC technologies of watershed management. In the present study various indices regarding continue adoption, discontinuance, technological gap and diffusion towards horticultural soil and water conservation technologies for watershed management were developed for measurement of post-adoption behaviour of farmers. It was revealed that seventy percent(71.08%) of horticultural SWC technologies were continued adopted and about thirty percent(28.91%) were discontinued by farmers. Out of the total continued adopted horticultural SWC technologies by farmers, one-third(33.84%) of technologies were continued adopted with technological gap. About one-fifth (22.02%) of horticultural SWC technologies were also diffused to other farmers' fields in nearby villages from the watersheds developed by the IISWC and its Centres.

Key words: Horticultural soil and water conservation technologies, post-adoption, watershed management.

INTRODUCTION

Post-adoption behaviour is a decision of farmer regarding whether to continue with an adopted technology with or without technological gap or discontinue for adoption of another better technology or his unwillingness to continue with adopted technology (Bagdi *et al.,* 2015). When the farmers are satisfied with whatever new technology they have adopted, they are likely to hold on to it, but if they feel that it does not meet their needs they will discard it (Rogers, 1995). But, in the present times, there are so many other factors, apart from meeting of needs that push a farmer to discard a technology. Adoption of improved technologies will not improve food security and reduce poverty if barriers to their continued use are not overcome (Oladele, 2005). Van Tongeren (2003) investigated the discontinuance of farming innovations and found that the end of subsidies and educational programming explained the majority of discontinuance. It is believed that an effective way to increase productivity is broad-based adoption of new farming technologies (Minten and Barrett, 2008). Discontinuance is a decision to reject an innovation after it has previously been adopted (Rogers, 2003), he also

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reported three types of technology discontinuance are: (1) replacement, (2) disenchantment and (3) forced discontinuance. Replacement discontinuance is a decision to reject an idea in order to adopt a better idea that supersedes it. Constant waves of innovations may occur in which each new idea replaces an existing practice that was an innovation in its day. For example, the adoption of tetracycline led to the discontinuance of two other antibiotic drugs (Coleman *et al.,* 1966). E-mail has replaced much postal mail. Disenchantment discontinuance is a decision to reject an idea as a result of dissatisfaction with its performance. Leuthold (1967) concluded from his study of a statewide sample of Wisconsin farmers that the rate of discontinuance was just as important as the rate of adoption in determining the level of adoption an innovation at any particular time. In any given year, there were about as many discontinuers of an innovation as there were first-time adopters. Third type of discontinuance is also reported as forced discontinuance, it happens when individuals are compelled to change, farmers are forced to discontinue the existing practices because of government policies. For example, the Kerala state government in India has banned the sale and distribution of the weed-killer Glyphosate and all products containing it citing its harmful effects on human health and the environment (The Hindu, 2019). Inability discontinuance could also be the fourth type of technology discontinuance, when farmers discontinued an adopted technology because of his inability to maintain due to high cost or complexity of technology(Bagdi *et al.,* 2018). For example, a poor farmer can't maintain bunding technology properly on his sloppy land and abreached concrete check dam can't be repaired by poor farmers.

The continued use of Soil and Water Conservation (SWC) technologies seemed mainly determined by the actual profitability and, related to that, the labour requirements for recurrent maintenance and use. Moreover, in villages with better future prospects (where SWC was promoted within an integrated development strategy) farmers also performed better maintenance of their measures and replication rates were higher (De Graaff *et al.,* 2008). If many farmers in a specific project area or village adopt a certain measure, farmers in neighbouring villages may also adopt the measures without project assistance (spontaneous diffusion), as was experienced in Mali (Bodnar *et al.,* 2006).

Indian Institute of Soil and Water Conservation (IISWC) and its Centres has developed many watershed projects in India in the past and implemented many horticultural soil and water conservation technologies for watershed management and increase of farmers' income. Continued adoption or discontinuance of horticultural SWC technologies *viz.*, fruit tree plantation in fields, agri-horticulture system, horti-silviculture system, and horti-pasture cultivation system depend on availability of resources with adopter farmers and also suitability to their field conditions. Therefore, it was realized that the post-adoption behaviour of beneficiary farmers who have adopted different horticultural soil and water conservation technologies for watershed management should be studied in detail regarding their present status of continue-adoption, discontinuance, technological gap and diffusion also, as this is a pioneering institute involved in this kind of conservation oriented watershed projects since last six decades. Keeping these points in mind this research study was framed with the main objective to measure the extent of post-adoption behaviour (*i.e.* continue-adoption, discontinuance, technological gap and diffusion) of farmers regarding adopted horticultural SWC technologies for watershed management.

METHODOLOGY

Study area: The research study was carried out during 2012 to 2015 in eight states of India as core project at Indian Institute of Soil and Water Conservation (IISWC), Research Centre, Vasad, (Gujarat) as lead Centre along with IISWC headquarter Dehradun, Uttrakhand state, and its Centres *viz.,* Bellary (Karnataka), Chandigarh (Haryana), Kota (Rajasthan) &Ooty (Tamil Nadu). The already developed watersheds by IISWC and its Centres in the past minimum three years old were selected for the study and 4 or 5 watersheds were selected at each Centre. Thus, in total 29 watersheds were selected from six research Centres of IISWC in the country as given in Table 1 below.

Selection of respondents: The beneficiary farmers of selected watersheds who have adopted agronomic soil and water conservation technologies were selected as respondents in the study. At least 50 respondents were selected from each watershed comprising from all the existing categories of farmers in the watershed. A list of agronomic SWC technologies was prepared which were implemented during the each watershed development programme. Agronomic SWC technology-wise inventory of respondent farmers was prepared, who have adopted them, with the help of Detail Project Report (DPR) or by organizing meetings with farmers. In the inventory listed out the names of farmers along with size of land holding, who have adopted a particular technology in the watershed and likewise to prepared lists or inventories of farmers for all technologies adopted by them during watershed development programme. Stratified proportionate random sampling plan was adopted to select respondents from different inventories

or lists of farmers. At least 50 respondents were selected from each watershed comprising from all the existing categories of farmers in the watershed. Thus, total 1452 respondent farmers were selected in the study as sample size (Table 1). A detail structural interview schedule was developed by the investigators and data regarding personal, psychological and post-adoption behaviour variables were recorded on developed structured schedule by interviewing the respondents personally.

Measurement of post-adoption behaviour of farmers

To measure the extent of post-adoption behaviour variables *viz.,* continue adoption, discontinuance, technological gap and diffusion, a detail methodology was developed such as data collection schedules, scoring procedure and data analysis with the following developed indices by the first author:

Technologies Continue Adoption Index (TCAI):

Number of horticultural SWC technologies continued adopted out of total initially adopted technologies by a farmer in his field under watershed area and it could be worked out as given below

$$TCAI = \frac{Number\ of\ Horticultural\ SWC\ TechnoLogies\ Continue\ Adopted\ by\ a\ Farmer}{Number\ of\ Horticultural\ SWC\ TechnoLogies\ Initially\ Adopted\ by\ a\ Farmer} X 100 \quad ---(1)$$

Overall Technologies Continue Adoption Index (OTCAI):

It could be worked for horticultural SWC technologies continued adopted on large area or region basis for all watersheds as given below:

$$OTCAI = \frac{\sum_{i=1}^{N} TCAI_i}{N} \quad \text{..... (2)}$$

where,

$\sum_{i=1}^{N} TCAI_i$ = Sum Total of Technologies Continue Adoption Indices of i^{th} farmers

N = Total number of farmers

Discontinuance of Technologies Index (DTI)

Number of horticultural SWC technologies discontinued out of total initially adopted technologies by a farmer in his field under watershed area and it could be worked out as given below:

$$DTI = \frac{Number\ of\ Horticultural\ SWC\ TechnoLogies\ Discontinued\ by\ a\ Farmer}{Number\ of\ Horticultural\ SWC\ TechnoLogies\ Initially\ Adopted\ by\ a\ Farmer} X 100 \quad ---(3)$$

Overall Discontinuance of Technologies Index (ODTI)

$$ODTI = \frac{\sum_{i=1}^{N} DTI_i}{N} \quad \text{..... (4)}$$

Where,

$\sum_{i=1}^{N} DTI_i$ = Sum Total of Discontinuance of Technology Indices of i^{th} farmers

N = Total number of farmers

Technological Gap Index (TGI)

$$TGI = \frac{\sum_{i=1}^{N} \left[\frac{R-A}{R}\right]}{N} X 100 \quad \text{..... (5)}$$

Where

R = Maximum possible score on complete adoption of a technology as per the design suitable in the watershed (*i.e.*10).

A = Score obtained by a beneficiary farmers on his incomplete adoption of a technology

N = Total number of technologies adopted

Overall Technological Gap Index (OTGI)

$$OTGI = \frac{\sum_{i=1}^{K} TGI_i}{K} \quad \text{..... (6)}$$

Where, $\sum_{i=1}^{K} TGI_i$ = Sum total of Technological Gap Indices of k^{th} farmers

K = Total number of farmers .

Technologies Diffusion Index (TDI)

Number of horticultural SWC technologies diffused out of total initially adopted technologies by a farmer from his field in watershed area and it could be worked out as given below

$$TDI = \frac{Number\ of\ Horticultural\ SWC\ TechnoLogies\ Diffused\ by\ a\ Farmer}{Numbers\ of\ Horticultural\ SWC\ TechnoLogies\ Initially\ Adopted\ by\ a\ Farmers} X 100 \quad ---(7)$$

Overall Technologies Diffusion Index (OTDI)

$$OTDI = \frac{\sum_{i=1}^{N} TDI_i}{N} \quad \text{.....(8)}$$

Where, $\sum_{i=1}^{N} TDI_i$ = Sum Total of Technology Diffusion Indices of i^{th} farmers

N = Total Number of farmers

Table 1: Centre-wise selected watersheds and number of respondents

Name of Centre	Name of selected watersheds with number of respondents in brackets	Total respondents
Vasad	Navamota (50), Rebari (50), Sarnal (50), Antisar (50), Vejalpur-Rampura (50)	250
Bellary	Joladarasi (50), Chinnatekur (50), PC Pyapli (54), Mallapuram (54),Chilakanahatti (58)	266
Chandigarh	Aganpur-Bhagwasi (50), Mandhala (49), Johranpur (26), Sabeelpur (50), Kajiana (50)	225
IISWC, Dehradun	Fakot (50), Raipur (50), Sabhawala (51), Langha (60)	211
Kota	Chhajawa (50), Badakhera (50), Haripura (50), Hanotiya (50), SemliGokul (50)	250
Ooty	Salaiyur (50), Chikkahalli (50), Eramanaikkanpatti (50), Putthuvampalli (50), Thulukkamuthur (50)	250

RESULTS AND DISCUSSION

Continue adoption of horticulturalSWC technologies by farmers

Table 2 showed data regarding continued adoption of horticultural SWC technologies in various watershed programme simplemented by IISWC and its Centres in the country. It was revealed that maximum 49.10 per cent of farmers were continued adopted agri-horticulture cultivation system in their fields and who all were also adopted it initially in the watersheds developed by IISWC, Dehradun. Horti-pasture cultivation system was continued adopted by 44 per cent of farmers, whereas 62 per cent of farmers were initially adopted it for agricultural production with soil and water conservation in the watersheds developed by Ooty Centre of IISWC. Fruit tree plantation technology was also continuedadopted by 41 per cent of farmers, whereas 56 per cent of farmers initially adopted it during implementation of watershed programmes by Ooty Cenre of IISWC. The pool data in table 2 further reveals that average maximum 44 per cent of farmers were continued adopted horti-pasture cultivation technology in their fields for sustainable management of watersheds, whereas 62 per cent of farmers were initially adopted itduring implementation of watershed programmes. Agri-horticulture technology was continued adopted by20.92 per cent of farmers for soil conservation in their fields but during implementation of watershed programmes butit was initially adopted by 29.99 per cent of farmers. Fruit plantation technology was continued adopted by 19.91 per cent of farmers, whereas 29.61 per cent farmers initially adopted it during implementation of various watershed programmes by IISWC and its Centres in the country. Horti-silvi cultivation technology was continued adopted by 5.55 per cent of farmers for soil and water conservation in their fields, whereas 5.55 per cent of farmers also initially adopted it during their watershed implementation programmes. Bagdi, G.L. and Joshi, U. (2018) also reported that three-fourth (76.02%) of farmers showed moderate level of participationin implementation of the SWCtechnologies for watershed management. Kandwal, P. and Rampal V.K. (2019) reported that the level of adoption of forestry practices was found medium.

Table 2: Continue adoption of horticultural SWC technologies by farmers in various watersheds implemented by IISWC and its Research Centres in India

Name of technologies continued adopted in watersheds	Technologies Continue Adoption Index (TCAI)						Pool
	Vasad Navamota, Rebari, Sarnal, Antisar& Vejalpur Rampura (N=250) %	Dehradun Fakot, Raipur, Sabhawala & Langha (N=211) %	Chandigarh Aganpur Bhagwasi, Mandhala, Johranpur, Sabeelpur & Kajiyana (N=225) %	Bellary Joladarasi, Chinnatekur, PC Pyapli, Mallapuram&Chilakanah-atti (N=266) %	Kota Chhajawa, Badakheda, Haripura, Hanotiya &SemliGokul (N=250) %	Ooty Salaiyur, Chikkahali, Ermanaikk-anpatti, Patthuvampa-lli&Thulukkamu-thur (N=250) %	
Fruit tree plantation	8 (16)	32.8 (40.8)	18.66 (44.66)	11.81 (13)	7.2 (7.2)	41 (56)	19.91 (29.61)
Agri-horticultural system	7 (32)	49.10 (49.10)	6.67 (8.89)	-	-	-	20.92 (29.99)
Horti-silvi cultivation	-	-	-	5.55 (5.55)	-	-	5.55 (5.55)
Horti-pasture cultivation	-	-	-	-	-	44 (62)	44 (62)

Note: Figures presented in parentheses are also percentage of farmers adopted the technologies initially at the time of implementation of watershed programme.

Discontinuance of horticultural SWC technologies by farmers

Table 3 revealed about the discontinuance of horticultural SWC technologies in various watershed programme simplemented by IISWC and its Centres in the country. It was found out that maximum 26 per cent of farmers were discontinued fruit tree plantation from their fields, whereas 44.66 per cent of farmers were adopted it initially in the watersheds developed by Chandigarh Centre. Agri-horticultural cultivation system was discontinued by maximum 25 per cent of farmers, whereas 32 per cent of farmers were initially adopted it for agricultural production with soil and water conservation in the watersheds developed by Vasad Centre of IISWC. Horti-pasture cultivation technology was discontinued by maximum 18 per cent of farmers, whereas 62 per cent of farmers initially adopted it during

development of various watershed programmes by Ooty Cenre of IISWC. Table 3 further reveals that average maximum 18 per cent of farmers were discontinued horti-pasture cultivation technology from their fields, whereas 62 per cent of farmers were initially adopted it during implementation of watershed programmes for sustainable management of watersheds. Fruit tree plantation technology was discontinued by average 9.69 per cent of farmers, whereas 29.61 per cent farmers initially adopted it during implementation of various watershed programmes by IISWC and its Centres in the country. Agri-horticulture technology was discontinued by average 9.07 per cent of farmers from their fields but during implementation of watershed programmes butit was initially adopted by 29.99 per cent of farmers for soil conservation. Horti-silvi cultivation technology was not discontinued by any farmers from their fields and allthe 5.55 per cent of farmers continued adopted it whowereinitially adopted during their watershed implementation programmes for sustainable agricultural production with soil and water conservation. Woldeamlak Bewket (1998) also reported that the major factors that were discouraging the farmers from adopting the introduced SWC technologies on their farms were found to be labour shortage, land tenure insecurity and problem of fitness of the technologies to the farmers' requirements and to the farming system circumstances. Rameshwar Das *et al.,* (1998) has reported that education, farm power, material possession, social participation, socio-economic status, extension contact, and mass media exposure has significant and negative association with the technological gap.

Table 3: Discontinuance of horticultural SWC technologies by farmers in different watershed programmes implemented by IISWC and its Research Centres in India

Name of technologies discontinued in watersheds	Discontinuance of Technologies Index (DTI)						Pool
	Vasad Navamota, Rebari,Sarnal, Antisar&Vejalpur Rampura (N=250) %	Dehradun Fakot, Raipur, Sabhawala& Langha (N=211) %	Chandigarh Aganpur Bhagwasi, Mandhala,Johranpur, Sabeelpur& Kajiyana (N=225) %	Bellary Joladarasi, Chinnatekur, PC Pyapli, Mallapuram & Chilakanahatti (N=266) %	Kota Chhajawa, Badakheda Haripura, Hanotiya&SemliGokul (N=250) %	Ooty Salaiyur, Chikkahali Ermanaik kanpatti, Patthuvampalli &Thulukkamuthur (N=250) %	
Fruit tree plantation	8 (16)	8 (40.8)	26 (44.66)	1.19 (13)	0.00 (7.2)	15 (56)	9.69 (29.61)
Agri-Horticultural system	25 (32)	0.00 (49.10)	2.23 (8.89)	-	-	-	9.07 (29.99)
Horti-silvi cultivation	-	-	-	0.00 (5.55)	-	-	0.00 (5.55)
Horti-pasture cultivation	-	-	-	-	-	18 (62)	18 (62)

Note: Figures presented in parentheses are also percentage of farmers adopted the technologies earlier at the time of watershed development programme.

Extent of technological gapinhorticultural SWC technologies by farmers

Technological gapinhorticultural SWC technologies adopted in various watershed programme simplemented by IISWC and its Centres in the country are presented in Table 4. It was revealed that maximum 30.8 per cent of farmers were continued adopted fruit tree plantation technology with technological gap in their fields, whereas 40.8 per cent of farmers were adopted it initially in the watersheds developed by IISWC, Dehradun. Agri-horticultural cultivation system was continued adopted with technological gap by maximum 20.27 per cent of farmers, whereas 49.10 per cent of farmers were also initially adopted it for agricultural production along with soil and water conservation in the watersheds developed by IISWC, Dehradun.

Horti-pasture cultivation technology was continued adopted with technological gap by maximum 18 per cent of farmers, whereas 62 per cent of farmers initially adopted it during development of various watershed programmes by Ooty Cenre of IISWC. Horti-pasture cultivation technology was continued adopted with technological gap by 2.30 per cent of farmers, whereas 5.55 per cent farmers initially adopted it in watershed programmes by Bellary Cenre of IISWC. Table 4 further reveals that average18 per cent of farmers were continued adopted horti-pasture cultivation technology with technological gapin their fields, whereas 62 per cent of farmers were initially adopted it during implementation of watershed programmes for sustainable management of watersheds. Fruit tree plantation technology was continued adopted with technological by average 11.42 per cent of farmers, whereas 29.61 per cent farmers initially adopted it during implementation of various watershed programmes by IISWC and its Centres in the country.

Agri-horticulture technology was adopted with technological gap by average11.31 per cent of farmers in their fields but 29.99 per cent of farmers were initially adopted it during implementation of watershed programmes by IISWC and its Centres for sustainable agricultural production along with soil and water conservation. Horti-silvi cultivation technology was adopted with technological only by 2.30 per cent of farmers intheir fields, whereas 5.55 per cent of farmers initially adopted it during their watershed programmes implemented by Bellary Centre of IISWC for soil and water conservation.Ashok K. Gupta *et al.,* (1993),B.N Kalasariya *et al.,* (1998), and Bhagwan Singh (2007) were reported that overall majority of the farmers belonged to medium technological gap category in agricultural production technologies.

Table 4: Technological gap in horticultural SWC technologies by farmers in different watershed programmes implemented by IISWC and its Research Centres in India

Name of technologi-esadopted with technologi-cal gap in watersheds	Technological Gap Index (TGI)						Pool
	Vasad Navamota, Rebari Sarnal Antisar&Vejalpur Rampura (N=250) %	Dehradun Fakot, Raipur Sabhawala & Langha (N=211) %	Chandigarh Aganpur Bhagwasi, Mandhala Johranpur Sabeelpur& Kajiyana (N=225) %	Bellary Joladarasi, Chinnatekur PC Pyapli Mallapuram& Chilakanahatti (N=266) %	Kota Chhajawa, Badakheda Haripura, Hanotiya& SemliGokul (N=250) %	Ooty Salaiyur, Chikkahali Ermanaikkan patti Patthuvampa lli&Thulukka mu-thur (N=250) %	
Fruit Plantation	8 (16)	30.8 (40.8)	17.34 (44.66)	4.61 (13)	0.8 (7.2)	7 (56)	11.42 (29.61)
Agri-horticultural system	7 (32)	20.27 (49.10)	6.67 (8.89)	-	-	-	11.31 (29.99)
Horti-silvi cultivation	-	-	-	2.30 (5.55)	-	-	2.30 (5.55)
Horti-pasture cultivation	-	-	-	-	-	18 (62)	18 (62)

Note: Figures presented in parentheses are also percentage of farmers adopted the technologies earlier at the time of watershed development programme.

Extent of diffusion of horticultural SWC technologies from farmers' fields

The pool data in Table5 showed diffusion of horticultural SWC technologies from various watersheds developed by IISWC and its Centres in the country and it was revealed that average maximum 12.35 per cent of farmers were diffused Agri-horticultural cultivation technology from their fields to other farmers' fields within the watershed or nearby villages for sustainable agricultural production along with soil and water conservation, whereas 29.99 per cent of farmers were initially adopted it in their fields.

Fruit tree plantation technology was diffused by 7.8 per cent of farmers from their fields'in watershed developed by IISWC and its Centres in the country to other farmers' fields, whereas 29.61 per cent farmers were initially adopted it.

Horti-pasture cultivation technology was diffused by 6 per cent of farmers from their fields' in watersheds developed by Ooty Centre of IISWC to other farmers' fields within watershed or nearby villages, whereas 62 per cent of farmers were initially adopted it.

Horti-silvi cultivation technology was also diffused by 1.85 per cent of farmers from their fields' in watersheds developed by Bellary Centre of IISWC to other farmers' fields, whereas only5.55 per cent of farmers initially adopted it.

Table 5: Diffusion of horticultural SWC technologies by farmers in different watershed programmes implemented by IISWC and its research Centres in India

Name of Technologies diffusedfrom watersheds	Technologies Diffusion Index (TDI)					Pool
	Vasad Navamota, Rebari, Sarnal, Antisar&Vejalpur (N=250) %	Dehradun Fakot, Raipur Sabhawala& Langha (N=211) %	Bellary Joladarasi, Chinnatekur, PC Pyapli, Mallapuram& Chilakanahatti (N=266) %	Kota Chhajwa, Badakheda, Haripura, Hanotiya&SemliGokul (N=250) %	Ooty Salaiyur, Chikkahali, Ermanaikkan patti Patthuvampa-lli&Thulukka mu-thur (N=250) %	
Fruit tree plantation	5 (16)	5.6 (40.8)	11.11 (13)	1.3 (7.2)	16 (56)	7.8 (29.61)
Agri-horticultural system	13 (32)	11.71 (49.10)	-	-	-	12.35 (29.99)
Horti-silvi Cultivation	-	-	1.85 (5.55)	-	-	1.85 (5.55)
Horti-pasture cultivation	-	-	-	-	6 (62)	6 (62)

Note: Figures presented in parentheses are also percentage of farmers adopted the technologies earlier at the time of watershed development programme.

Extent of post-adoption behaviour of farmers towards horticultural SWC technologies

The data in Table 6 represent the overall extent of post-adoption behaviour of farmers towards horticultural SWC technologies adopted during various watershed development programmes implemented by the IISWC and its research Centres in India.

It was revealed that the overall TCAI value shows that 71.08per cent of horticultural SWC technologies were continued adopted by farmers in the watersheds developed by IISWC and its Centres in the country for the cause of sustainable agricultural production along with natural resources conservation. Accordingly, overall DTI value shows that 28.91 per cent of horticultural SWC technologies were discontinued by farmers from their fields in the watersheds.

The overall TGI data revealed that 33.84 per cent of horticultural SWC technologies were continued adopted with technological gap by farmers in their fields in the watersheds developed by IISWC and its Centres in the country.Diffusion of horticultural SWC technologies were also studied with the help of Technology Diffusion Index (TDI) and it was found out that 22.02 per cent of horticultural SWC technologies were diffused to other farmers' fields within watersheds or nearby villages from the fields of farmers' who were adopted these technologies during the watershed development programmes implemented by IISWC and its Centres in the country for sustainable agricultural production along with natural resources conservation.

Table 6: Extent of post-adoption behaviour of farmers towards horticultural SWC technologies in various watersheds implemented by IISWC and its Research Centres in India

Extent of post-adoption behaviour of farmers	Watersheds developed by Research Centres of IISWC in India						Overall
	Vasad Navamota, Rebari, Sarnal, Antisar &Vejalpur Rampura (n=250) (%)	Dehradun Fakot, Raipur, Sabhawala & Langha (n=211) %	Chandigarh Aganpur Bhagwasi, MandhalaJohranpur, Sabeelpur& Kajiyana (n=225) (%)	Bellary Joladarasi, Chinnatekur, PC Pyapli, Mallapuram, &Chilakanahatti (n=266) (%)	Kota Chhajawa, Badakheda Haripura, Hanotiya& SemliGokul (N=250) %	Ooty Salaiyur, ChikkahaliErmanaikkanpatti, Putthuvampalli, &Thulukkam-uthur (n=250) (%)	
TCAI	31.25	91.10	47.30	93.58	100	72.03	71.08
DTI	68.75	8.90	52.72	6.42	0.00	27.97	28.91
TGI	31.25	56.81	44.84	37.25	11.11	21.19	33.84
TDI	37.50	19.25	-	69.87	18.06	18.64	22.02

CONCLUSION

It could be concluded from the study that in the government sponsored watershed development programmes in India, seventy percent (71.08%) of horticultural SWC technologies were continued adopted and about thirty percent (28.91%) of them were also discontinued due to their non-suitability or inability of farmers to continue the technologies. Out of the total adopted technologies, one-third (33.84%) of horticultural SWC technologies were also continued adopted with technological gap. It was also concluded from the study that about one-fifth (22.02%) of horticultural SWC technologies were also diffused to other farmers' fields in nearby areas or villages from the fields of farmers' who were initially adopted these technologies during the watershed development programmes implemented by IISWC and its Centres in the country for the cause of sustainable agricultural production along with conservation of natural resources like soil and water.

It could be inferred from the findings that on completion of government sponsored watershed development programme or on withdrawal of watershed project by Project Implementing Agency (PIA), then after farmers are unable or don't much take care to maintain the horticultural SWC technologies implemented in their fields due to paucity of funds and lack of labourers. Therefore, the provisions of finance or farm equipments on custom hiring basis should be provided to poor farmers at the end of watershed development project from the fund of watershed project itself so that the horticultural SWC practices could be maintained by farmers in case of non-availability of money or labourers for long-term sustainable benefits to farmers.

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