

CRITICAL ANALYSIS OF FACTORS ASSOCIATED WITH ADOPTION OF WATERSHED CROP PRODUCTION TECHNOLOGY IN NORTH GUJARAT

*PRAJAPATI, V. V. AND PATEL, B. K

VANBANDHU POLYTECHNIC IN AGRICULTURE
SARDARKRUSHINAGAR DANTIWADA AGRICULTURAL UNIVERSITY
AMIRGADH-385 130. DIST: BANASKANTHA, GUJARAT, INDIA

**Email: vvprajapati1963@gmail.com*

ABSTRACT

The role of situation or environment is very crucial in understanding human action. Behaviour takes place in situation, which have profound influence on the individuals action. Sometimes situations present the actor with certain goals to pursue. Rogers (1962) therefore, confirmed the decisive role of situation. The social system of which individual is a member, had dominant effect on the behaviour upon many factors. As conceptualized by Parson (1954) the action takes place in a situation consisting of social, physical and cultural factors. To be precise, the action process is dependent upon psychological, biological, cultural and physical factors involved in the situation. On the basis of the studies conducted in past and looking to the watershed development activities in the area, the most important individual characteristics in relation to extent of adoption of watershed crop production technology were socio-personal, economic and psychological characteristics of the beneficiary farmer. Since adoption is a mental process, the role of situation or an environment is very crucial. Behaviour takes place in situation, which has profound influence on the individual's action. It was therefore assumed that the adoption of WCPT is governed by personal, social, economic and psychological characteristics. An attempt was therefore made to ascertain the relationship if any between selected socio-personal, economic, communication and psychological characteristics of the respondents and their extent of adoption of WCPT. This was ascertained by computing coefficient of correlation ('r' value). Table show the results in this regard. The data collected through interview schedule were transferred on the master sheet and were coded, processed, tabulated, classified and analyzed.

KEY WORD: WCPT, Correlation, Relationship

INTRODUCTION

The farmers in rainfed area are mostly following subsistence farming and have low resources and their income is subject to large fluctuation. High risk of crop failure further dissuades the individual farmer from using costly inputs for increasing the production, although, this area has high

potential to increase the production. In view of the above, development of rainfed areas assumes a major thrust in attaining national food security and narrowing down regional socio-economic imbalance. This could be attained by following conservative production oriented programmes

through integrated watershed approach.

Keeping in view the problem and potential of rainfed farming, the National Watershed Development Project in Rainfed Areas (NWDPA) was started during 1987-88 in Gujarat state. The present study was undertaken to examine the the Critical analysis of the beneficiaries and their extent of adoption of Watershed crop production technology (WCPT) following specific objectives

Objectives

- To Know the relationship between the characteristics of the beneficiaries and their extent of adoption of Watershed crop production technology (WCPT)
- To ascertain the combined relationship of independent variables and extent of adoption of WCPT.
- To know the contribution of independent variables on extent of adoption.
- To study the direct and indirect effect of independent variable on dependant variables.

METHODOLOGY

The present study was undertaken in Banaskantha district of Gujarat state. Using purposive random sampling, three talukas viz., Palanpur, Vadgam and Danta were selected, as these talukas are having similar agro-climatic condition, soil type and cropping pattern. A list of villages covered under NWDPA during 9th Five Year Plan in selected three talukas was obtained from the office of Gujarat State Land Development Corporation, Palanpur the implementing agency of the project. There were 21 villages where the project was in operation during 9th Five Year Plan. All these villages were selected purposively to make the

present study reliable. Using proportionate random sampling, 7.00 per cent beneficiaries were selected from each village making a sample of 200 respondents. The interview schedule was developed and the data were collected, tabulated, analysed and interpreted in light of objectives :

RESULTS AND DISCUSSION

(A) Zero order correlation

Since adoption is a mental process, the role of situation or an environment is very crucial. Behaviour takes place in situation, which has profound influence on the individual's action. It was therefore assumed that the adoption of WCPT is governed by personal, social, economic and psychological characteristics.

An attempt was therefore made to ascertain the relationship if any between selected socio-personal, economic, communication and psychological characteristics of the respondents and their extent of adoption of WCPT. This was ascertained by computing coefficient of correlation ('r' value). Table 1 show the results in this regard.

1.0 Relationship between socio-personal characteristics and extent of adoption

1.1 Age and extent of adoption

The results presented in Table 1 reveal that the calculated correlation coefficient ($r = -0.2527$) showing relationship between age of respondents and their extent of adoption of WCPT found negatively significant at 0.01 levels of significance. Hence, the null hypothesis ($H_1 : 1.1$) was rejected. Therefore, it can be concluded that age of the beneficiary farmers was negatively related with their extent of adoption of WCPT.

This finding is in line with the findings reported by Patel (2000) and Dabhi (2002).

1.2 Education and extent of adoption

It can be apparent from the data in Table 1 that education of the respondents had significant relationship with their adoption of WCPT. The 'r' value (0.4620) was found positively significant at 0.01 level of significance, hence, the null hypothesis ($H_1 : 1.2$) was rejected. Therefore, it can be concluded that the educational level of beneficiary farmers was significantly associated with their extent of adoption of WCPT.

This finding is in conformity with the findings of Karkar (1998) and Dabhi (2002).

1.3 Social participation and extent of adoption

It can be observed from the data in Table 23 that the correlation coefficient ($r = 0.6073$) showing relationship between social participation of the respondents and their extent of adoption of WCPT was found to be significant at 0.01 level of significance. The null hypothesis ($H_1 : 1.3$) is therefore rejected. It can be thus inferred that the participation of beneficiary farmers in various social organizations was significantly associated with their extent of adoption of watershed crop production technology. .

This finding is supported by Karkar (1998) and Patel (2000).

2.0 Relationship between economic characteristics and extent of adoption

2.1 Occupation and extent of adoption

The data from Table 1 indicate that occupation was found positively and significantly ($r = 0.2201$) related with adoption level of respondents at 0.01 level of significance, hence null hypothesis ($H_1 : 2.1$) was rejected. Therefore, it can be concluded that occupation of the beneficiary farmers

of watershed programme was significantly associated with their extent of adoption of WCPT.

The result is in conformity with that of reported by Timbadia (2001).

2.2 Land holding and extent of adoption

It is apparent from Table 1 that calculated 'r' value 0.1600 showing relationship between size of land holding of the respondent and their extent of adoption of WCPT was found significant at 0.05 level of significance. The null hypothesis ($H_1 : 2.2$) was therefore rejected. It can be inferred that there was positive and significant correlation between size of land holding of the beneficiary farmers and their extent of adoption of WCPT.

This finding is in conformity with the findings of Patel (1999) and Patel (2000).

2.3 Herd size and extent of adoption

The calculated correlation coefficient value ($r = 0.0927$) in Table 1 indicating relationship between herd size possessed by the respondents and their extent of adoption of WCPT was found non-significant. Hence, the null hypothesis ($H_1 : 2.3$) was accepted. Therefore, it can be concluded that adoption of WCPT by the beneficiary farmers is independent of the herd size with them.

The finding is contradiction with the finding reported by Patel (2000).

2.4 Irrigation potentiality and extent of adoption

The data presented in Table 1 were used to test the null hypothesis ($H_1 : 2.4$) that there is no relationship between irrigation potentiality of the respondents and their extent of adoption of WCPT.

The calculated correlation coefficient value ($r = 0.5306$) was found significant at 0.01 level of significance hence, the null hypothesis

(H_1 : 2.4) was rejected. Therefore, it can be concluded that there was significant association between irrigation potentiality and extent of adoption of WCPT. This finding is in agreement with those of Karkar (1998).

3.0 Relationship between communication characteristics and extent of adoption

3.1 Sources of information and extent of adoption

It is conspicuous from Table 1 that there is positive and significant relationship between sources of information used by the respondents and their extent of adoption.

The calculated correlation coefficient value ($r = 0.5015$) was found positively significant at 0.01 level of significance. The null hypothesis (H_1 : 3.1) is therefore rejected and it was concluded that sources of information utilized by the beneficiary farmers had positive and significant association with their extent of adoption of WCPT.

The finding is in agreement with the findings of Patel (2000).

3.2 Extension participation and extent of adoption

It is apparent from Table 1 that the calculate value ($r = 0.5462$) indicating relationship between extension participation of the respondents and their extent of adoption of WCPT, was found to be significant at 0.01 level of significance. Hence, the null hypothesis (H_1 : 3.2) was rejected. This finding is in conformity with those of Patel (1995) and Karkar (1998).

4.0 Relationship between psychological characteristics and extent of adoption

4.1 Scientific orientation and extent of adoption

The data of Table 1 indicate that calculated r' value 0.7277 showing

relationship between scientific orientation of the respondents and their extent of adoption of WCPT was found significant at 0.01 level of significance. The null hypothesis (H_1 : 4.1) was therefore rejected and it was concluded that scientific orientation of the beneficiary farmers had positive and significant correlation with their extent of adoption of WCPT.

This finding is being supported by the findings of Patel (2000) and Dabhi (2002).

4.2 Economic motivation and extent of adoption

The data presented in Table 1 were used to test the null hypothesis (H_1 : 4.2) that there is no relationship between economic motivation of the respondents and their extent of adoption of WCPT.

The correlation coefficient value ($r = 0.7017$) was found to be significant at 0.01 level of significance. Hence, the null hypothesis (H_1 : 4.2) was rejected. Therefore, it can be inferred that economic motivation of the beneficiary farmers was significantly and positively associated with their extent of adoption of WCPT. This result gets the support from the finding reported by Patel (2000) and Timbadia (2001).

4.3 Risk preference and extent of adoption

It can be observed from Table 1 that risk preference of respondents had positively significant relationship ($r' = 0.6758$) with extent of adoption of WCPT at 0.01 level of significance. Hence, null hypothesis (H_1 : 4.3) was rejected.. This finding is in conformity with the finding of those reported by Timbadia (2001) and Dabhi (2002).

4.4 Knowledge and extent of adoption

It is apparent from Table 1 that calculated ' r ' value (0.5940) showing relationship between respondent's

knowledge about WCPT and their extent of adoption of WCPT was found significant at 0.01 level of significance. The null hypothesis (H_1 : 4.4) was therefore rejected. It can be thus, inferred that there was positive and significant correlation between beneficiaries' knowledge about WCPT and their adoption of WCPT. The probable reason might be that, when farmers understood the main features of the new idea/thing very well, they would most likely adopt such thing/idea since knowledge itself is an important precursor to adoption. This finding is in agreement with the findings of Patel (2000) and Dabhi (2002).

4.5 Attitude and extent of adoption

The data displayed in Table 1 were used to test the null hypothesis (H_1 : 4.5) that there is no relationship between respondent's attitude towards WCPT and their extent of adoption of WCPT.

The calculated correlation coefficient value ($r = 0.8122$) was found significant at 0.01 level of significance. Hence, null hypothesis (H_1 : 4.5) was rejected. Therefore, it can be concluded that attitude of beneficiary farmers towards WCPT had positive and significant association with their extent of adoption of WCPT. This finding is in conformity that of Patel (2000) and Dabhi (2002).

(B) Multiple regression

Pearson's correlation analysis merely portrays coexistence of relation between any two variables. This procedure does not capture the interaction effect among variables. One variable is associated with or simultaneously dependent on several others. Adoption of watershed crop production technology (WCPT) was postulated as a linear function of socio-personal, economic, communication and psychological variables. It is not

influenced solely by any of these factors taken in isolation but as a part of complex and interacting system. Based on this approach, the multiple regression analysis using linear model was carried out to know the combined effect of the independent variables in explaining the total variation in the dependent variable.

In regression analysis, all the 14 independent variables were fitted to explain the extent of adoption of WCPT. The results are presented in Table 2.

All the independent variables mentioned in Table 2 explained as much as 70.83 per cent total variation in the extent of adoption of WCPT. The unexplained variation of 29.17 per cent might be due to the factors not included in the study.

It can also be revealed that the 't' value of attitude was found to be significant at 0.01 level of significance, whereas, 't' value of social participation variable was significant at 0.05 level of significance, indicating significant contribution of these two variables in extent of adoption of WCPT. Remaining variables have failed to contribute significantly in extent of adoption of WCPT.

It can be thus concluded that 70.83 per cent total variation in extent of adoption of WCPT was explained by a set of 14 independent variables together. Further, out of 14 variables, two variables viz., attitude and social participation had significant contribution in extent of adoption of WCPT.

This study provided evidence about the overwhelmingly important role of two significant variables played in extent of adoption of WCPT.

(C) Step-wise regression analysis

Efroymsons (1962) stated that step-wise regression is one method, which has been widely adopted in

multiple regression analysis. It has got the added advantage that at each stage of analysis, every variable is subjected to an examination for its predictive value. Based on this approach, the step-wise multiple regression analysis was carried out to know the important variables with their predictive ability in explaining the variation in the dependent variable.

In step-wise regression analysis, all the 14 independent variables were considered and the results are presented in Table 3.

From the data presented in Table 3, it can be observed that out of fourteen independent variables, three variables viz., attitude, social participation and extension participation were accounting influences on adoption of watershed crop production technology (WCPT).

All the three independent variables together accounted 68.86 per cent of variation as indicated by R^2 value for the extent of adoption of WCPT. It is to be noted that about 66.00 per cent change in extent of adoption had occurred due to attitude. The 'F' value was significant at 0.01 level of significance.

Attitude + social participation accounted for 68.19 per cent and scientific orientation + social participation + extension participation were responsible for 68.86 per cent change in extent of adoption. The partial b value of these three variables were converted into standard partial b' value which were 0.6110 for attitude, 0.5004 for social participation and 0.1733 for extension participation.

The 't' values of attitude were highly significant. According to higher data values, the rank order for attitude was first, second to social participation and third to extension participation. It is therefore, clear that the relative importance of attitude was more than

social participation and extension participation.

(D) Path analysis

The correlation analysis reported earlier indicated relationship between independent and dependent variables in presence of all other variables, which are manually operative in a life situation. The relationship revealed by correlation study may undergo change in different situation where some of the independent variables may not exist or they may be latent. The correlation coefficient of extent of adoption and all the independent variables except herd size were found significant. In case of the stepwise regression, coefficient of three variables viz., attitude, social participation and extension participation, were significantly contributing with extent of adoption of WCPT. The data thus indicated that observed relationship of independent variables with dependent variables was only partially absolute and partially relative and a portion of observed relationship was the contribution made by other independent variables through which the independent variables exercised their influence jointly.

It is therefore of interest to study the effect of independent variables on the dependent variable both directly as well as through other variables present in the study. The path co-efficient permits the separation of correlation coefficients of dependent variables with independent variables into direct and indirect effect in a system of cause and effect relationship. Hence, 13 independent variables (except herd size being non-significant) were subjected to path analysis.

Direct effect

Table 4 reveal that the variable, attitude had exerted the highest direct

positive effect on extent of adoption of WCPT, as the path coefficient being 0.6577 followed by scientific orientation (0.1602), social participation (0.1401), extension participation (0.0879), irrigation potentiality (0.0491) and sources of information (0.0406).

On the other hand, the variable viz., risk preference exerted the highest direct negative effect on extent of adoption of WCPT as path coefficient being -0.1530. This was followed by knowledge (-0.0843), age (-0.0753) and occupation (-0.0684), respectively.

Total indirect effect

The data in Table 4 indicate that risk preference had the highest positive total indirect effect (0.7887) on extent of adoption of WCPT, followed by economic motivation (0.6886), knowledge (0.6742), scientific orientation (0.5675), irrigation potentiality (0.4815), social participation (0.4671), extension participation (0.4582) and education (0.4340), while age had exerted total indirect negative effect (-0.1774). The variables viz., attitude (0.1545) and land holding (0.1245) did not exhibit considerable total indirect effect on extent of adoption of WCPT.

Substantial indirect effect (First)

The data presented in Table 4 also show that the variable scientific orientation was seen to have the highest positive first substantial indirect effect (0.5585) on extent of adoption of WCPT through the variable attitude. The next important variables exerting first substantial positive indirect effect were economic motivation (0.5375), risk preference (0.5164), knowledge (0.5164), social participation (0.3953) and irrigation potentiality (0.3872), all through the variable attitude. Other important variables viz., extension participation (0.3448), sources of information

(0.3459) and education (0.3469) exerted first substantial positive indirect effect through the variable attitude. The variable land holding (0.1064) and attitude (0.1361) exerted first substantial indirect effect through the variable attitude and scientific orientation, respectively. Remaining variable age (0.0306) through the variable risk preference exerted the first substantial indirect effect on adoption of WCPT.

It can be concluded from the above path result that the attitude, scientific orientation, social participation and extension participation were the most important variables affecting positively and directly on adoption of WCPT. While risk preference exerted the highest direct negative effect on adoption of WCPT.

In respect to total indirect effect on adoption of WCPT, the key variables were risk preference, economic motivation, knowledge and scientific orientation having positive effect, while age had negative effect. These all were also important in respect of first substantial indirect effect through the variable attitude, scientific orientation and risk preference.

The path analysis further show that the characteristics studied accounted for 70.92 per cent variation in adoption of WCPT in Banaskantha district in Gujarat State. The residual effect for the path (0.5392) suggesting that the characteristics studied were not sufficient to express their contribution towards adoption of WCPT.

CONCLUSION

Based on the above discussion on critical analysis, it can be concluded that the important characteristics of beneficiary farmers in relation to adoption of WCPT were; attitude, scientific orientation, social

participation, irrigation potentiality, economic motivation, knowledge and risk preference, respectively. Therefore, due weightage should be given to the above characteristics of beneficiary farmers to achieve higher adoption of WCPT and thereby increasing yield, which should sustain the economic and overall development.

REFERENCES

- Agrawal, S.S., Sagne, M.A. and Bhople, R.S. (1994). Training needs of personnel engaged in watershed activities. *Maha. J. Ext. Edn.*, **13** : 291-293.
- Dabhi, R.A. (2002). Impact of Participatory Irrigation Management Society on techno-economic change of farmers of Anand district in Gujarat State. M.Sc. (Agri.) Thesis (Unpublished), Submitted to Gujarat Agricultural University, Anand.
- Efroymsons, M.A. (1962). Multiple regression analysis in mathematical methods for digital computers, Ralston, A. and Wift, R.S. (Edn.), Art., 17.
- Islam, Md. M.H. (1991). Impact of training as perceived by the immediate groups. *Maha. J. Ext. Edn.*, **27** (1 & 2) : 81.
- Karkar, B.R. (1998). Impact of National Watershed Development Project for rainfed areas on farmers knowledge and adoption of rainfed agro technology. Ph.D. Thesis (Unpublished), Submitted to Gujarat Agricultural University, Junagadh.
- Patel, J.B. (1995). Impact of watershed management technology in agriculture development in Panchmahals district of Gujarat state. M.Sc. (Agri.) Thesis (Unpublished), Submitted to Gujarat Agricultural University, Navsari.
- Patel, G.R. (1999). A study on adoption of watershed management technology and its consequences in watershed area of South Gujarat. Ph.D. Thesis (Unpublished), Submitted to Gujarat Agricultural University, Navsari.
- Patel, M.V. (2002). Socio-economic characteristics of watershed for land use planning. Annual Progress Report. : pp. 3-12.
- Patel, P. P. and Sangle, G.K. (1993). Techno-economic developments consequent upon adoption of selected agricultural practices in tribal farming system. *Maha. J. Ext. Edn.*, **12** : 283-287
- Patel, R.C. (2000). A study on the consequences of adoption of watershed management technology by beneficiary farmers in watershed area of Kheda district of Gujarat State. Ph.D. Thesis (Unpublished), Submitted to Gujarat Agricultural University, Anand.
- Patel, R.C. and Popat, M. N. (2003). Constraints in adoption of technology for watershed management. *Guj. J. Ext. Edn.*, **14** : 52-54.
- Timbadia, C.K. (2001). A study on Techno-socio-economic consequences of drip irrigation system among farmers of Gujarat state. Ph.D. Thesis (Unpublished), Submitted to Gujarat Agricultural University, Navsari.

Table 1. Zero order correlation coefficient between characteristics of the beneficiary farmers and their extent of adoption of WCPT

Sr. No.	Characteristics	Correlation coefficient ('r' value)
[I]	Socio-personal	
1.	X ₁ Age	-0.2527**
2.	X ₂ Education	0.4620**
3.	X ₃ Social participation	0.6073**
[II]	Economic	
4.	X ₄ Occupation	0.2201**
5.	X ₅ Land holding	0.1600*
6.	X ₆ Herd size (Animal possession)	0.0923 ^{NS}
7.	X ₇ Irrigation potentiality	0.5306**
[III]	Communication	
8.	X ₈ Sources of information	0.5015**
9.	X ₉ Extension participation	0.5462**
[IV]	Psychological	
10.	X ₁₀ Scientific orientation	0.7277**
11.	X ₁₁ Economic motivation	0.7017**
12.	X ₁₂ Risk preference	0.6358**
13.	X ₁₃ Knowledge	0.5940**
14.	X ₁₄ Attitude	0.8122**

NS = Non significant,

** Significant at 0.05 level of significance,*

*** Significant at 0.01 level of significance*

Table 2. Multiple regression analysis of independent variables with extent of adoption

Sr. No.	Variables	Regression coefficient	Standard error of b_i	't'
[I] Socio personal				
1.	Age	-0.0177	0.0132	1.343
2.	Education	0.1346	0.5470	0.246
3.	Social participation	2.0383	0.8730	2.335*
[II] Economic				
4.	Occupation	-0.9975	0.6277	-1.589
5.	Land holding	0.3588	0.3578	1.003
6.	Herd size	-0.1607	0.2159	-0.744
7.	Irrigation potentiality	0.0339	0.0460	0.737
[III] Communication				
8.	Sources of information	0.1412	0.7130	0.198
9.	Extension participation	0.2698	0.1517	1.778
[IV] Psychological				
10.	Scientific orientation	0.4068	0.3090	1.316
11.	Economic motivation	0.0249	0.2654	0.094
12.	Risk preference	-0.2856	0.1809	-1.579
13.	Knowledge	0.1549	0.1248	1.241
14.	Attitude	0.4546	0.0736	6.175**

Multiple regression (R^2) = 0.7083

* Significant at 0.05 level of significance

** Significant at 0.01 level of significance

Table 3. Step-wise regression analysis indicatin important variables contributing extent of adoption

Independent variables	Multiple correlation coefficient (R)	Coefficient of determinat ion (R^2)	'F' value	Partial regression coefficient (b)	't' value	Standard partial regression coefficient (b')	Rank order
X_3 = Social participation	0.8258	0.6819	5.636*	1.8783	2.3740	0.5004	II
X_9 = Extension participation	0.8298	0.6886	4.217*	0.2773	2.0535	0.1733	III
X_{14} = Attitude	0.8122	0.6597	173.15 2**	0.5527	13.157 5	0.6110	I

Constant = 22.2915 Multiple R = 0.8298 R^2 = 0.6886

* Significant at 0.05 level of significance

** Significant at 0.01 level of significance

Table 4. Path analysis showing direct, total indirect effect and substantial indirect effect of independent variables on extent of adoption of WCPT

Sr. No.	Independent variables	Direct effect	Total indirect effect	Substantial indirect effect (First)
1.	Age	-0.0753	-0.1774	0.0306 (X_{12})
2.	Education	0.0279	0.4340	0.3469 (X_{14})
3.	Social participation	0.1401	0.4671	0.3953 (X_{14})
4.	Occupation	-0.0684	0.2884	0.2002 (X_{14})
5.	Land holding	0.0355	0.1245	0.1064 (X_{14})
6.	Irrigation potentiality	0.0491	0.4815	0.3872 (X_{14})
7.	Sources of information	0.0406	0.4609	0.3459 (X_{14})
8.	Extension participation	0.0879	0.4582	0.3448 (X_{14})
9.	Scientific orientation	0.1602	0.5675	0.5585 (X_{14})
10.	Economic motivation	0.0131	0.6886	0.5375 (X_{14})
11.	Risk preference	-0.1530	0.7887	0.5164 (X_{14})
12.	Knowledge	-0.0843	0.6782	0.5164 (X_{14})
13.	Attitude	0.6577	0.1545	0.1361 (X_{10})

R^2 = 0.7092; Residual = 0.5392

[MS received: June 6, 2014]

[MS accepted: June 15, 2014]