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Dimensions and Determinants of Peoples' Participation in Watershed Development Programmes in Rajasthan

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Abstract

Peoples' participation has been at the centre-stage of the resource conservation and rural development efforts in the developing countries. The study on peoples' participation in watershed development programmes in Rajasthan has revealed that a very low proportion of beneficiaries is contributing at different stages of the programme in terms of either labour or finances or both. The determinants of participation have been identified using Tobit regression. The institutional effectiveness has been found as the key factor towards guaranteeing involvement of people in the watershed programmes. The other factors positively related with peoples' participation are training of farmers, age, and frequency of the visit of extension workers. A negative relationship has been found between participation and off-farm income. Therefore, efforts should be made for developing effective local institutions, capacity building through training of farmers and providing off-farm employment opportunities in the countryside itself for safeguarding the livelihoods of people in the rainfed areas.

Introduction

The watershed development programmes have been conceived as a strategy for protecting the livelihoods of people inhabiting the fragile ecosystems experiencing soil erosion and water scarcity. The objectives of

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these programmes have been focused on ensuring the availability of drinking water, fuel wood and fodder, and raising the income and employment of farmers and landless labourers through improvement in agricultural production and productivity. Learning from the experiences of the successful watersheds in the past, a Technical Committee constituted by the Ministry of Rural Areas and Employment (MoRAE), Govt. of India, recommended planning on the watershed basis through participation of the people at all stages of the programme (GOI, 1994; Hanumantha Rao, 2000).

Peoples' participation is a dynamic group process in which all members of a group contribute towards the attainment of group objectives, share the benefits from group activities, exchange information and experiences of common interests, and follow the rules, regulations and other decisions made by the group. Need for peoples' participation in these development programmes is articulated in terms of efficiency and/or cost effectiveness, equity in distribution of benefits, sustainability and empowerment of people (Kishor, 2000). The "1994 Guidelines" envisage a high degree of participation and local autonomy in the designing and implementation of micro-watersheds. These cover in detail the technical and social criteria by which projects can be assessed. But in reality, monitoring by DRDA or Programme Implementing Agencies (PIAs) is limited to the recording of inputs (primarily financial flows) and physical outputs. No information is being collected on qualitative processes such as participation and social inclusion. It appears that the very same factor, viz. peoples' participation and decentralization, which accounts for the successes made so far, is highly inadequate for sustaining this development, especially in the areas where programme has proceeded fast by fulfilling the targets for completion of works without waiting for the required institution building and leadership formation at the grassroots level (Turton and Farrington, 1998; Yugandhar *et al.*, 1999). Though most of the past studies have made a cursory statement that peoples' participation is a must for the sustainable watershed development, a few have attempted to analyse and understand the process of collective action, either theoretically or empirically. As a result, peoples' participation in watershed management has remained cursory even in policy formulations and consequent low adoptions (Ratna Reddy, 2000).

Rajasthan is one of the most water-scarce regions of the country. It receives only 1 per cent of the available water, which supports 5 per cent of population and 10 per cent of the geographical area (Singh, 2004). A major part of the state is arid and semi-arid. A number of watershed projects have been implemented in the state by the government agencies (GAs) and non-governmental organisations (NGOs) to address the soil erosion and water-scarcity problems. Therefore, a study examining the dimensions and

determinants of peoples' participation in these programmes will provide valuable insights for devising suitable strategies for sustainable watershed development.

Data Sources and Methodology

The Jaipur Division of Rajasthan was purposively selected for the present study as it comes under semi-arid zone of the state with average rainfall of 550 mm and various agencies have been working for the watershed development in this region. A total of 300 farmers were selected from six micro-watersheds spread across three districts, namely Jaipur, Dausa and Alwar, using multi-stage random sampling technique. A sample of 50 farmers was randomly selected from each village/watershed for collecting information on socio-economic characteristics, nature and level of participation in different watershed activities and their perception about benefits of the programme. Surveys were conducted during the agricultural years 2002-2003 and 2003-04 and information was collected using pre-structured schedules.

Participation Index

Individual watershed activities were considered to assess the extent of participation in the programme. Participation Index of each farmer was calculated using formula (1):

$$PI_i = \frac{\sum_{j=1}^{N} Y_{ij}}{N} 100 \qquad \ldots(1)$$

where,

PI_i = Participation Index for the ith farmer

Y_j = 1, if the farmer has participated in the jth activity;

= 0, if the farmer has not participated in the jth activity

N = Total number of activities taken up in the watershed.

Factors Affecting Farmers' Participation

The decision of a farmer to participate in the watershed development programmes may be affected by different socio-economic, psychological and institutional variables. Tobit analysis was used to identify the factors that influence a farmer's participation. The details of explanatory variables

used in the analysis are given in Table 1. The *a-priori* hypotheses about the expected signs are as follows:

Age (AGE) of the household head is expected to be inversely related to the level of participation. Younger farmers are usually more educated and hence have higher level of awareness about the problems of soil erosion and depleting water resources. In addition, they are more concerned about the future productivity of land as they have a higher life expectancy and a longer planning horizon (Araya and Asafu-Adjaye, 2001). Education (EDU) is expected to influence positively as it leads to greater awareness about the benefits of these programmes. Similarly, training (TRAINING) in *in situ* water conservation and/or modern agricultural practices is expected to motivate the farmers for greater participation and the expected sign is positive. The size of operational holding (OHOLDING) is also expected to influence the participation positively, as those operating on larger farms tend to have greater expected benefits from the programme. The off-farm income (OFFINCOM) is expected to have a negative sign as more the time farmers spend on off-farm jobs, lesser the time they get for watershed activities.

The number of livestock owned (LIVESTOC) is expected to be positively related to participation, as the development of watershed leads to greater availability of fodder and water. The family size (FAMILYSI) is expected to be positively related to participation, as larger families might not face the constraint of labour supply. VEXT is frequency of visit of extension workers/ personnel of the PIA to the watershed area. It is expected to influence participation positively as it helps create awareness and build rapport. The existence of formal rules (RULE) for benefit sharing and effectiveness of local institutions (EFFECTIN) are expected to be positively influencing participation as they work towards fair distribution of benefits and increasing trust among the villagers. The farmers' perception about the benefits of watershed, i.e. reduction in run-off (PRUNOFF), increase in employment opportunities (PEMPLOY), irrigated area (PIRRIGA), yield (PYIELD) and water table (PWTABL) are expected to have positive influence on participation behaviour.

Tobit Model

The Participation Index has censored distribution since it is zero for those not participating in any of the watershed activities. This suggests that ordinary least squares (OLS) regression is not appropriate and Tobit estimation should be used (Tobin, 1958).

A model for participation may be specified as per Equation (2):

$$PI^{*} = \beta X + e^{*} \qquad \ldots(2)$$

Table 1. Description of factors affecting farmers' decision to participate in watershed development programmes

Variable	Description	Unit	Mean	Standard deviation	Expected sign
AGE	Age of the household head	Years	43.31	13.84	(-)
EDU	Education of the head of the household	Years	4.87	4.28	(+)
TRAINING	Number of trainings imparted to members of the household	Number	1.30	1.01	(+)
OHOLDING	Operational holding	Hectare (ha)	3.27	2.90	(+)
OFFINCOM	Off-farm income	Yes=1; No = 0	0.24	0.43	(-)
LIVESTOC	Livestock	Number	4.18	4.33	(+)
FAMILYSI	Family size	Number	8.96	5.96	(-)
VEXT	Frequency of visit of extension workers/or personnel of PIA	At least once a month = 1; Otherwise =0	0.79	0.54	(+)
RULE	Fixed rule for sharing of benefits from common resources	Yes = 1; Otherwise =0	0.11	0.32	(+)
EFFECTIN	Local institution(s)* is functional	Yes =1; Otherwise =0	0.65	0.48	(+)
PRUNOFF	The programme leads to decrease in runoff	Yes = 1; No = 0	0.89	0.31	(+)
PEMLOY	The programme leads to more employment	Yes = 1; No = 0	0.75	0.43	(+)
PIRRIGA	The programme leads to increase in irrigated area	Yes = 1; No = 0	0.91	0.28	(+)
PYIELD	The programme leads to increase in yield	Yes = 1; No = 0	0.90	0.30	(+)
PWTABL	The programme leads to increase in water table	Yes = 1; No = 0	0.78	0.42	(+)

*Local institutions include Users' Association/Watershed Committee/or Self-Help Groups

where, PI is the Participation Index, β is a vector of parameter values; X is a vector of regressors comprising personal, socio-economic and institutional characteristics (Table 2) and ε is an error-term. PI^* is the solution to utility maximization problem of the level of participation subject to a set of constraints per household and conditional on being above a certain limit PI_0, which is the minimum level of participation of a household. Here, $PI_0 = 0$ for those not participating in any watershed activity. Therefore,

$$PI = PI^* \text{ if } PI^* > PI_0 \quad \ldots(3)$$
$$= 0 \text{ if } PI^* = PI_0$$

Equation 3 represents a censored distribution of the level of participation since the value of PI for all non-participants equals zero. Following Tobin (1958), the expected level of participation in watershed programme E(PI) is:

$$E(PI) = X\beta F(z) + \sigma f(z) \quad \ldots(4)$$

where, X is a vector of explanatory variables, F (z) is the cumulative normal distribution of z, f(z) is the value of the derivative of the normal curve at a given point (i.e. unit normal density), z is Z-score for the area under normal curve, β is a vector of Tobit maximum likelihood estimates, and σ is the standard error of the error-term.

McDonald and Moffitt (1980) have shown that the marginal effect of an explanatory variable on the expected value of the dependent variable can be given by Equation (5):

$$\delta E(PI)/ \delta X_i = F(z)\beta_i \quad \ldots(5)$$

The Tobit coefficients do not directly give the marginal effects of the associated independent variables on the dependent variable. But their signs show the direction of change in probability of participation and the marginal intensity of participation as the respective explanatory variables change (Amemiya, 1984; Maddala, 1986).

Results and Discussion

Nature and Extent of Participation

All the activities of the watershed development were classified on the basis of their stages, i.e. planning stage, implementation stage, and the post-withdrawal stage. The nature and extent of participation of sample farmers in these activities were studied. A farmer was classified as a participant if he/she had contributed in any of the watershed activities in terms of labour or finances or both.

Planning Stage

A perusal of Table 2 reveals that on an average 44 per cent of the farmers participated at the planning stage. A very high proportion of farmers contributed in the form of labour, followed by participation in the form of both labour and money. The highest proportion of farmers participated in the participatory rural appraisal (PRA) which involved making of village resource map, seasonal analysis, transect walk, ranking of felt needs and problem identification. It was followed by capacity building (i.e. training in *in situ* water conservation, modern agricultural practices and/or dairying) and institution building (watershed association, users' association and self-help groups). Participation was high for activities involving less of financial contribution. Thus, a greater proportion of farmers participated by way of labour contribution. However, it can be argued that financial contribution is essential for ensuring long-run interests of the stakeholders and consequently, the sustainability of the programme. Contribution made by the poor and landless families enables them to lay a claim to the sharing of benefits emanating from the common pool resources and creates a sense of equity and trust among the villagers (Palanisami *et al.*, 2002).

Implementation Stage

A perusal of Table 3 reveals the nature and level of participation at the implementation stage of the programme. The implementation stage activities were grouped into two categories: (a) development of common land, and (b) development of private land. It can be observed that the participation was much higher (36%) in the development of common land than private land (19%). This is due to the fact that activities such as digging of farm pond, development of forest and grazing land and of fuel woodlot undertaken on the common lands affected a large number of the farmers. The perceived benefits of the activities such as digging of pond and gully plugging also

Table 2. Participation of farmers in different watershed institutions at the planning stage of watershed programmes

(per cent of farmers)

Activity	Nature and level of participation			
	Financial only	Labour only	Financial and labour, both	Overall participation
Participatory rural appraisal (PRA)	2.0	38.7	9.3	50.0
Capacity building	2.0	20.7	20.0	42.7
Institution building	0.7	17.3	21.3	39.3
Average	1.57	25.57	16.87	44.0

Table 3. Participation of farmers at the implementation stage of watershed programmes

(per cent of farmers)

Watershed development activities	Nature and level of participation			
	Financial only	Labour only	Financial and labour, both	Overall participation
A. Development of common land				
Development of forest and grazing land	0.7	30.7	12.0	43.3
Development of fuel woodlot	0.7	13.3	21.3	35.3
Digging of farm pond	3.3	15.3	36.7	55.3
Grassed waterways	0.7	16.7	8.7	28.0
Gully plugging	0.7	8.0	24.7	34.0
Side slope plantations	0.0	13.3	8.7	22.0
Mean of A	*1.02*	*16.22*	*18.68*	*36.32*
B. Development of private land				
Agro-forestry	0.7	6.7	8.0	14.7
Live fencing	0.0	9.3	7.3	16.6
Vegetative barriers	0.7	12.7	9.3	22.7
Vermi-compost and mulching	0.0	4.7	3.3	8.0
Expansion in vegetable area	0.7	9.3	4.0	14.0
Demonstration of modern cultivation practices	0.0	11.3	2.7	14.0
Field-bund strengthening	3.3	36.0	13.3	52.7
Contour bunding	0.7	6.0	4.0	10.7
Mean of B	*0.76*	*12.0*	*6.48*	*19.2*
Average	0.87	13.81	11.71	26.53

motivated the farmers to contribute financially. Since the development of common land led to the benefits that were more egalitarian with respect to social class, gender and age, it could attract greater participation. In the case of development of private lands, activities such as checking of soil erosion through vegetative barriers and fieldbund strengthening attracted high participation. The participation of farmers was found high in some selected activities of the watershed development. There was a need to create awareness about other components/activities also to ensure farmers' participation in a larger number of activities.

Post-withdrawal Phase

The indicators of programme sustainability after withdrawal of the PIA have been shown in Table 4, along with the extent of participatory monitoring and its evaluation. It can be seen that a large proportion of the farmers

Table 4. Functioning of watershed development programmes after PIA's withdrawal
(per cent of farmers)

Activity	Implementing agency						Total		
	Government agency			NGO					
	Yes	No	Can't say	Yes	No	Can't say	Yes	No	Can't say
Local body is still functioning	60	9	31	88	0	12	74.0	4.5	21.5
There is equitable sharing of benefits	79	7	14	92	4	4	85.5	5.5	9.0
Conflict resolution takes place at local level	58	12	30	90	2	8	74.0	7.0	19.0
Assets created are being maintained	65	1	34	88	0	12	76.5	0.5	23.0
Users' association is functional	57	8	35	90	2	8	73.5	5.0	21.5
The implementing agency still takes interest in the watershed	60	3	37	92	0	8	76.0	1.5	22.5
Satisfied with the functioning of watershed programme	85	3	12	92	0	8	88.5	1.5	10.0
Average	66	6	28	90	1	9	78.3	3.6	18.1

(78%) felt that the watershed was working well even after PIA's withdrawal. Surprisingly, 18 per cent of the respondents were found to be indecisive, it indicates a scope of their inclusion in the decision-making process.

It is often stated that NGOs are stronger in the participatory approaches, social mobilization and adaption to local situations. A comparison of the post-withdrawal assessment of programmes implemented by the government agencies (GAs) and NGOs has confirmed this notion. Almost 90 per cent of the beneficiaries under the NGO-implemented programmes felt that it was functioning well, whereas the same was found to be only 66 per cent under watersheds implemented by the GAs. However, it would be appropriate to mention that the GAs were much stronger in the technical know how, were accountable and had official standing with the public. There is, however, a need to make GAs see beyond meeting the physical and financial targets and evolve a mechanism to assess the bio-physical and socio-economic impacts of programmes they implement. This will make them sensitive to inclusion of beneficiaries at all the stages of decision-making (Turton and Farrington, 1998).

Table 5. Level of participation of farmers in watershed development programmes

Level of participation (Participation Index)	Extent of participation (% of farmers)	Cumulative percentage
0-20	45.0	45.0
21-40	16.0	61.0
41-60	27.0	88.0
61-80	11.0	99.0
81-100	1.0	100.0

Determinants of Participation

Participation Index was used as a measure of farmers' participation level in the watershed programmes and was calculated using Eq. (1). It can be seen that 88 per cent of the farmers obtained a score of 60 or less (Table 5). Any effort to increase this score must recognise the relative strength of variables that influence the farmers' decision to participate in such development programmes.

The Tobit estimates and marginal effects (derivatives) of the level (intensity) of participation have been presented in Table 6. The model was run taking all the variables as given in Table 2 and finally only those variables were retained which led to the best fit, i.e. minimum value of log-likelihood function. A perusal of Table 6 reveals that the age (AGE) of the head of household, numbers of trainings imparted to each household (TRAINING), operational holding (OPHOLD), frequency of visit of extension workers (VEXT), effectiveness of local institutions (EFFECTIN) and off-farm income (OFFINCOM) had significant influence on the participation behaviour of the farmers.

The *a-priori* expectation that younger farmers participate more was rejected and it was found that the participation was positively related with age. It may be so because the older farmers, being more experienced in cultivation, could better assess the utility of the technological intervention than the younger farmers. There is no agreement in literature about the direction of the effect of age on adoption, as it is generally location- or technology-specific (Adesina and Baidu-Forson, 1995).

The frequency of visit of extension workers and institutional effectiveness showed a positive relationship with participation. Unlike the case of individual-based technology like HYVs, the watershed technology is based on collective action approaches. Visits made by the extension workers create mass awareness about the common good of the technology. Similarly, institutional effectiveness ensures the sustainable management of common pool resources. Both of these factors lead to greater participation. It was found

Table 6. Tobit regression coefficients for determinants of participation in watershed development programmes

Variable	Coefficients	Standard error	P value	Change in probability $dF(z)/dX_i$
CONSTANT	–0.0617	0.0819	0.452	
AGE	0.0009	0.0004	0.021	0.0008
EDU	0.0040	0.0047	0.397	0.0035
TRAINING	0.0412	0.0194	0.034	0.0368
OHOLDING	0.0178	0.0067	0.008	0.0159
OFFINCOM	–0.0232	0.0110	0.048	–0.0207
LIVESTOC	–0.0043	0.0047	0.362	–0.0038
FAMILYSI	–0.0024	0.0035	0.493	–0.0021
VEXT	0.0754	0.0361	0.036	0.0674
EFFECTIN	0.2409	0.0404	0.000	0.2153
log likelihood function = –10.1657(P < .0001)				
Z = 1.2477	F(Z) = 0.8939			
f(z) = 0.1849	s = 0.2241			

that training rather than education had significant influence in motivating the farmers in taking action and contributing in the form of labour and/or money.

A negative relationship was found between participation and off-farm income. This may be due to the fact that the number of days farmers work on an off-farm job leaves them with little time for being associated with the watershed activities. Moreover, their dependence on watershed resources becomes less, leading to their disinterest in the programme.

The results presented in Table 6 also show the marginal effects of different explanatory variables on the level of participation. The effectiveness of local institutions had the maximum marginal effect on participation, followed by the visit of extension workers and training. It can be seen that the assured effectiveness of the local institutions increased the probability of participation by 21.5 per cent. Similarly, with each additional training, the probability of participation increased by 3.7 per cent. The frequency of visit of extension personnel was another significant variable where policy interventions can increase the participation in such programmes. However, it was noted that creation of sources of off-farm income cerated disincentive to participation. It may be due to the fact that farmers had to move out of village in search of service/business. Therefore, efforts should be made to create off-farm employment opportunities within the village.

Summary and Policy Implications

The study has revealed that institutional effectiveness is the key factor towards guaranteeing involvement of the people in watershed programmes. Though all of these programmes have an essential component of institution building, a number of them end up creating institutions either only on paper usually under the compulsions of achieving financial and administrative targets or are weak in nature that disappear with the official withdrawal of the PIA. Often, the in-house skills for development of local institutions are not adequate. At times government organizations subcontract social organization to NGOs. But this should only be an interim arrangement, while government organizations develop these skills. Otherwise, they will continue to consider peoples' participation a discrete activity, such as establishing a committee or informing villagers about project plans, rather than a process that should underline every activity (Kerr *et al*., 2002). Frequent visits of the extension staff are essential for motivating and mobilizing local support, formation of groups, facilitating planning, efficient implementation and evaluation. The regular interaction between PIA personnel and beneficiaries helps in identifying the problems and constraints and evolving solutions in a participatory way. Capacity building through training of beneficiaries is essential for creating awareness and involvement. Depending upon the resource-base, farmers should be imparted training not only in soil and water conservation practices but also in suitable enterprises for higher income generation. This will also provide incentive to stay in the countryside productively and contribute to the resource conservation process.

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