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Article

Watershed programme: Adoption of knowledge in farming by farmers

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Watershed programme is an integrated one, addressing the problems in rain fed areas. It addresses the environmental and ecological problems like deforestation, over-utilization of water and most importantly it seeks to convert unsustainable agriculture to sustainable agriculture besides tackling unemployment and under-employment faced by the farmers as well as landless people. Of all the beneficiaries, the most benefited under watershed porgramme are the farmers. Watershed brings along many favours like improvement in the ground water levels, restoration of eroded soils, crop rotation, improved agricultural technology, increased and improved animal husbandry, more green fodder to their milch and draught cattle etc. Through watershed programme they gained knowledge about soil and water conservation, crop production practices, land use pattern and alternative practices. The present paper is attempted to study the extent of knowledge gained by farmers through watershed programme and adopted in farming in Prakasam district of Andhra Pradesh, India.

Key words: Watershed, non government organizations (NGOs), watershed programme, farmers, extent of knowledge, social aspects, development.

INTRODUCTION

Watershed programme is conceived as a multi pronged development effort particularly all-round development of rural areas in the third world countries including India. Watershed aims at restoration of environmental degradation, raising ground water level, providing irrigation and drinking water facilities, control of soil erosion, afforestation, improvement in livestock and productivity in agriculture etc. In a sense, watershed is synonymous with upliftment of all sections of people particularly rural people. It has been long realized by the NGOs, planners and administrators that watershed programme cannot be a success unless the people and communities to whom it is intended are involved in all facets of the programme.

Watershed is conceptualized as an area lying above a given drainage point. It may cover less than a hectare or thousands of hectares depending on the point of reference. However in simple terms “a watershed is the land area from which surface water drains to a single outlet.” NGOs (Non government organisation) have played a pioneering role in the field of rural development through watershed programmes. Not withstanding their limitations to undertake rural development programmes nation wide, they may contribute their might by undertaking special projects in selected pockets by implementing them with an element of information and flexibility which is the distinctive feature of their work. Alternatively, they may concentrate on selected rural development activities covering a wide geographical area. They may also stimulate and promote people's participation in watershed programme and thereby play a supportive role in the fields of rural development.

The experience of development researchers has shown that the people even after acquiring knowledge through watershed programme and skills to better their lives need not necessarily put them into practice. There is always a gap between the knowledge acquired and the practice of it. Some people may put the knowledge to full use, while some others may use it only partially and some of them may not use it in their lives at all. Respondents’ (farmers)

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extent of knowledge and practice of the same is examined in the following pages.

However it would be appropriate here to mention that, assuming the farmers are ignorant of knowledge in agricultural practices, it will be wrong and it is also wrong to assume that all the knowledge they have on watersheds and other related aspects was gained only through the extension activities organized by the NGOs. The traditional farmers do have knowledge on many of the aspects discussed here, which was gained through experience and information passed on from generation to generation. It may also be mentioned that agriculture despite the application of science and technology still mainly depend on adequate rain fall.

Adoption or practice refers to a decision to make full use of an innovation and its continued use. However, the adoption or acceptance of practice may be partial which means that the practice was applied only in a portion of the cropped area or it might only be an adoption of a part of the innovation. For this study, adoption is operationally defined as the acceptance leading to continued use of practices. The present paper is attempted to study the extent of knowledge gained by farmers through watershed programme adopted in farming in Prakasam district of Andhra Pradesh, India.

To test the extent of knowledge of farmers on watershed technology, a list of items was prepared under each subject area like agriculture, horticulture, forestry and alternate land use systems by consulting experts in the respective fields and administered to the respondents.

Adoption of watershed technology by the farmers was studied with reference to four components ranging from 3 to 14 under each component. Adoption levels of the respondents are assessed on a three point continuum of, full adoption, partial adoption and non-adoption. Item-wise analysis was carried out to gain insight into the adoption of watershed technology.

The following four components have been examined to find out the extent of knowledge and adoption or practice among the respondents (farmers).

1. Soil and water conservation
2. Crop production practices
3. Land use pattern
4. Alternative practices.

REVIEW OF THE LITERATURE

The main findings of the Kallur (1997) study are that despite the fact that farmers are being cajoled by Sanghas to adopt the improved agricultural practices, they have succeeded in their attempt only partially. It is, therefore, that people's participation in adopting environment friendly techniques in farming with reference to three mini-watersheds is more or less a failure. Rajput and Verma (1997) from their study concluded that the benefit-cost ratio was higher at 1:2.51 in watershed development programme as compared to 1:1.83 in non watershed development programme area. The return on per rupee of investment was also higher in watershed development programme as compared to non watershed development programme area.

Nalatwadmatha et al. (1997) reported that the cropping intensity of the watershed area has increased from 93.5 to 108.4%, while the productivity of different crops increased by 1.36 to 1.70 times. The watershed management programme not only increased the crop yield but also developed fodder resources in the area.

Naidu et al. (1999) in their study observed that rice and groundnut yields have increased by 8.6 q/ha and 8.64 q/ha respectively in 1995 - 1996 indicating the impact of transfer of technology and making available high yielding variety seed. Similarly the yields of remaining major crops viz. sesamum, red gram, black gram, green gram, bajra, and ragi also increased considerably during the period under reference indicating adoption of better management practices.

Ratnakumari and Padmavathi (1999) conducted a study of the impact on watershed management of dry land farming in kommaddi watershed. They concluded that the yield of groundnut as a mono crop has increased by 21.67% while as an intercrop with red gram rose by 17.39%. The yield of red gram as an intercrop with jowar and sunflower increased by 25 and 50%, respectively. The productivity of jowar and sunflower increased by 26.87 and 12.50%, respectively. Though there was an improvement in the crop yields in non watershed area, the incremental yields were relatively more in watershed area than in non watershed area.

In their study, Shiyani et al. (2002) examined the differential impact of watershed development in South Saurastra region of Gujarat. Three watersheds managed by Gujarat State Land Development Corporation (GLDC) and one by NGO were studied. The study revealed that in GLDC watershed, rabi crops accounted for 22.59 and 14.60% of gross cropped area for beneficiaries and non beneficiaries respectively. The corresponding figures for Agakhan Rural Support Programme (AKRSP) watershed were 34.59 and 23.59% for beneficiaries and non beneficiaries respectively. It was also observed that the area occupied by summer crops was 9.01% of the grass cropped area (GCA) in case of beneficiaries of GLDC watersheds while no summer crop could be grown by the beneficiaries of AKRSP watershed as well as by all non beneficiaries. On the whole, it can be concluded that the rabi crops contributed as high as 28.4% of GCA in respect of beneficiaries compared to 19.1% of GCA in the case of non beneficiaries. In addition, the beneficiaries were able to grow groundnut, bajra, jowar, and maize during summer season. The increased irrigation facilities created by the watershed development have been utilized by the beneficiaries for bringing more land under

Table 1. Selected NGOs and villages sample farmers.

Name of the NGOs	Name of the Mandal	Name of the village selected	Total farmer families	Sample families
Ongole Division				
HELP	Korisapadu	Pamedipadu	455	72
RDS	J.Pongalur	Chandalur	466	74
RASO	Ballikurava	Vemavaram	730	116
Markapuram Division				
CALL	Donakonda	Badapuram	139	22
SNIRD	Dornala	Bommalapuram	308	49
ASSIST	Markapur	Bhupatipalli	100	16
Kandukur Division				
SARDS	H.M.Padu	Pedagolla palli	264	42
RRS	Lingasamudram	Muttamvaripalem	376	60
PDES	V.V. palem	Polineni cheruvu	187	29
Total			3025	480

rabi and summer crops.

From the above review of studies, there is hardly any study dealing with NGOs role in rural development through watershed developing programme especially in drought prone areas. The present study is a modest attempt in this direction in examining the role of NGOs in implementing watershed development programmes and to analyze the impact of these programmes on the beneficiaries with reference to their standard of living.

METHODOLOGY

Area of the study

Prakasam district in Andhra Pradesh was purposefully selected for this study. The district was selected for two reasons; firstly, in most of the areas in the district agriculture is rain-fed and the rainfall is scarce and erratic. Secondly it is one of the few districts not only in Andhra Pradesh, India but also in the country where a number of watershed programmes have been launched in the rain-fed areas and a number of NGOs were entrusted with the initiation and management of watershed programmes.

Sample selection

Between 1999 and 2003, 9 NGOs which claimed success in the watershed programme in 9 villages of three divisions of the district covering 500 acres of land in each village and further confirmed by the government agencies which entrusted the programme were selected for the study.

In each of the selected 9 villages, 16% of the farmers were selected to make in depth analysis of watershed impact on them. In the selection of the sample farmers, care was taken to select almost equal percentage of farmers from different social divisions in each of the 9 villages. The sample farmers were classified into four social divisions namely (1) Forward castes (2) Backward castes (3) Scheduled castes and (4) Scheduled tribes. It means all the castes found in each of the 9 villages were classified under four social divisions for the sake of convenience of the analysis. Further care was taken in the selection of sample farmers, to provide proper representation of the large, small and marginal farmers. The data for the study was collected from both primary and secondary sources. The primary data were collected through a structured schedule, informal interviews (using detailed checklists), key informant interviews and observation. Secondary data and information were collected from DPAP, DWMA project directors, Mandal Revenue Officers (MROs), Mandal Development Officers (MDOs), and selected NGOs of the Prakasam district. The data collected from the sample beneficiary farmers had been analyzed and presented in the form of simple and bivariate tables. Table 1 shows the scheme of sample selection.

ANALYSIS AND INTERPRETATION

Farmers' extent of knowledge on soil and water conservation

The information on the extent of knowledge of the farmers on recommended soil and water conservation are furnished in Table 2.

A cursory glance at the Table reveals that more than 90% of the watershed farmers have knowledge of four of the soil and water conservation aspects viz., diversion channels, contour cultivation, over seeding and fodder and field crops, while knowledge of the farmers is between 80 - 90% in the case of formation of gullies, percolation tanks, farm ponds, check dams, earthen bunding, opening dead furrows, vegetative bunds with khus and nalabund. It leads to the conclusion that overwhelming majority of the farmers have knowledge on soil and water conservation.

Table 2. Farmers' knowledge on soil and water conservation.

S/No.	Item	No. of respondents		Total
		Know	Do not know	
1	Formation of gullies	412 (85.8)	68 (14.2)	480 (100.0)
2	Percolation tanks	420 (87.5)	60 (12.5)	480 (100.0)
3	Farm ponds	418 (87.0)	62 (13.0)	480 (100.0)
4	Check dams	426 (88.7)	54 (11.3)	480 (100.0)
5	Diversion channels	460 (95.8)	20 (4.2)	480 (100.0)
6	Earthen bunding	430 (89.5)	50 (10.5)	480 (100.0)
7	Contour cultivation	450 (93.7)	30 (6.3)	480 (100.0)
8	Opening dead furrow	420 (87.5)	60 (12.5)	480 (100.0)
9	Over seeding	436 (90.8)	44 (9.2)	480 (100.0)
10	Fodder and fields crops	438 (91.2)	42 (8.8)	480(100.0)
11	Vegetative bunds with khus	419 (87.3)	61 (12.7)	480 (100.0)
12	Graded bunds	408 (85.0)	72 (15.0)	480(100.0)
13	Ridges and furrows	408 (85.0)	72 (15.0)	480 (100.0)
14	Nalabund	420 (87.5)	60 (60)	480 (100.0)

Figures in the parenthesis represent percentages.

Adoption (practice) of knowledge on soil and water conservation

Adoption of soil and water conservation knowledge by the farmers is given in Table 3.

From Table 3, more than 50% of farmer fully adopted knowledge of formation of gullies, check dams, contour cultivation, opening dead furrow and nalabund. Percolation tanks, diversion channels, earthen bunding, over seeding, fodder and fields crops, vegetative bunds with khus, and graded bunds were partial adopted by more 50% of farmers. It leads to conclusion that more 50% of farmers adopted knowledge gained on soil and water conservation in farming.

Farmers' knowledge on crop production practices

The data pertaining to knowledge of the farmers on crop production practices are furnished in Table 4.

It could be seen from Table 4 that out of the 10 items, in seven practices, seed treatment, seed pest, fertilizer, weeding, inter-cropping and plant protection 90% of the farmers have the knowledge while 80% of the farmers have knowledge in the management of rain fed crops, management of pests of rain-fed crops and the method of sowing across the slopes. It can be concluded that more than 90% of the farmers are aware of crop production practices.

Adoption of knowledge on crop production practices

Adoption of crop production practices by the farmers is given in Table 5. From Table 5, more than 50% of farmers fully adopted knowledge of seed treatment, seed pest, fertilizer (kg/ac), seed of rainfed crops, sowing across the slope, inter - cropping and plant protection. Weeding, pest control of rainfed crops, management of rainfed crops etc., were partial adopted by more 41% of farmers.

Farmers knowledge on land use pattern

The data pertaining to knowledge of the farmers on land use pattern is furnished in Table 6. From the table, it is clear that more than 90% of the farmers have knowledge on land smoothing or leveling, use of improved implements, fall ploughing and maximum land usage. It indicates that more than 90% of the farmers have knowledge of land use pattern.

Adoption of knowledge on land use pattern

Adoption of land use pattern by the farmers is given in Table 7. From Table 7 more than 50% of farmer fully adopted knowledge of land smoothing / leveling, use of improved implements, fall ploughing, maximum land usage and afforestation. It leads to conclusion that more 90% (fully and partially) of farmers adopted knowledge gained on land use pattern.

Farmers' knowledge on alternative practices

The information on knowledge of the watershed farmers on eight alternative practices are presented in Table 8. It is noticed from the table that relatively high awareness

Table 3. Adoption of knowledge on soil and water conservation.

S/No.	Item	No. of respondents			Total
		FA	PA	NA	
1	Formation of gullies	244 (50.8)	158 (32.9)	78 (16.3)	480 (100.0)
2	Percolation tanks	166 (34.6)	252 (52.5)	62 (12.9)	480 (100.0)
3	Farm ponds	124 (25.8)	288 (60)	68 (14.2)	480 (100.0)
4	Check dams	300 (62.5)	120 (25)	60 (12.5)	480 (100.0)
5	Diversion channels	218 (45.5)	238 (49.5)	24 (5)	480 (100.0)
6	Earthen bunding	122 (25.5)	298 (62)	60 (12.5)	480 (100.0)
7	Contour cultivation	286 (59.5)	154 (32)	40 (8.5)	480 (100.0)
8	Opening dead furrow	248 (51.6)	162 (33.8)	70 (14.6)	480 (100.0)
9	Over seeding	125 (26)	301 (62.7)	54 (11.3)	480 (100.0)
10	Fodder and fields crops	125 (26)	312 (65.1)	43 (8.9)	480 (100.0)
11	Vegetative bunds with khus	113 (23.5)	298 (62)	69 (14.5)	480 (100.0)
12	Graded bunds	85 (17.7)	320 (66.7)	75 (15.6)	480 (100.0)
13	Ridges & furrows	194 (40.5)	213 (44.4)	73 (15.1)	480 (100.0)
14	Nalabund	258 (53.7)	159 (33.2)	63 (13.1)	480 (100.0)

Figures in the parenthesis represent percentages.
FA- Full adoption; PA- Partial adoption; NA- Non-adoption.

Table 4. Farmers' knowledge on crop production practices.

S/No.	Status	No. of respondents		Total
		Know	Do not know	
1	Seed treatment	459 (95.6)	21 (4.4)	480 (100.0)
2	Seed pest	460 (95.8)	20 (4.2)	480 (100.0)
3	Fertilizer (kg/ac)	458 (95.4)	22 (4.6)	480 (100.0)
4	Weeding	438 (91.2)	42 (8.8)	480 (100.0)
5	Seed of rainfed crops	408 (85.0)	72 (15)	480 (100.0)
6	Pest of rainfed crops	426 (88.7)	54 (11.3)	480 (100.0)
7	Management of rainfed crops	420 (87.5)	60 (12.5)	480 (100.0)
8	Sowing across the slope	420 (87.5)	60 (12.5)	480 (100.0)
9	Inter – cropping	459 (95.6)	21 (4.4)	480 (100.0)
10	Plant protection	440 (91.6)	40 (8.4)	480 (100.0)

Figures in the parenthesis represents percentages.

(87% and above) is noticed in the case of agro-forestry, social forestry and alley cropping whereas more than 85.0% of the farmers are aware of farm forestry, silvi-horti-system and silvi-pasture system. While in the case of the remaining two practices more than 82% of the farmers are aware of agri-horti-system and timber- fibre system. It can be concluded that more than 85% of the farmers have knowledge of alternative practices.

Adoption of knowledge on alternative practices

The details about adoption of knowledge of the farmers on alternative practices are given in Table 9.

From Table 9, more than 40% of farmers fully adopted knowledge of farm forestry (in fallow lands), agro-forestry, social forestry, alley cropping, silvi-pasture system silvi-horti-system, and agri-horti-system. It leads to the

Table 5. Adoption knowledge on crop production practices.

S/No.	Item	No. of respondents			Total
		FA	PA	NA	
1	Seed treatment	330 (68.8)	127 (26.4)	23 (4.8)	480 (100.0)
2	Seed pest	350 (73)	108 (22.5)	22 (4.5)	480 (100.0)
3	Fertilizer (kg/ac)	240 (50)	216 (45)	24 (5)	480 (100.0)
4	Weeding	236 (49.2)	198 (41.2)	46 (9.6)	480 (100.0)
5	Seed of rainfed crops	242 (50.4)	158 (32.9)	80 (16.7)	480 (100.0)
6	Pest control of rainfed crops	217 (45.2)	203 (42.3)	60 (12.5)	480 (100.0)
7	Management of rainfed crops	214 (44.5)	204 (42.5)	62 (13)	480 (100.0)
8	Sowing across the slope	280 (58.4)	138 (28.8)	62 (12.8)	480 (100.0)
9	Inter – cropping	259 (54)	198 (41.2)	23 (4.8)	480 (100.0)
10	Plant protection	262 (54.5)	176 (36.6)	42 (8.9)	480 (100.0)

Figures in the parenthesis represent percentages.
FA-Full adoption; PA- Partial adoption; NA-Non-adoption.

Table 6. Farmers knowledge on land use pattern.

S/No.	Status	No. of respondents		Total
		Know	Not know	
1	Land smoothing / leveling	440 (91.6)	40 (8.4)	480 (100.0)
2	Use of improved implements	450 (93.7)	30 (6.3)	480 (100.0)
3	Fall ploughing	455 (94.8)	25 (5.2)	480 (100.0)
4	Land reclamation	410 (85.4)	70 (14.6)	480 (100.0)
5	Maximum land Usage	460 (95.8)	20 (4.2)	480 (100.0)
6	Aforestation of land	430 (89.6)	50 (10.4)	480 (100.0)

Figures in the parenthesis represent percentages.

Table 7. Adoption of knowledge on land use pattern.

S/No.	Item	No. of respondents			Total
		FA	PA	NA	
1	Land smoothing / leveling	240 (50)	198 (41.2)	42 (8.8)	480 (100.0)
2	Use of improved implements	290 (60.5)	152 (31.6)	38 (7.9)	480 (100.0)
3	Fall ploughing	240 (50)	212 (44.1)	28 (5.9)	480 (100.0)
4	Land reclamation	140 (29.2)	268 (55.8)	72 (15)	480 (100.0)
5	Maximum land usage	230 (48)	220 (45.8)	30 (6.2)	480 (100.0)
6	Afforestation	184 (38.4)	236 (49.1)	60 (12.5)	480 (100.0)

Figures in the parenthesis represent percentages.
FA-Full adoption; PA- Partial adoption; NA-Non-adoption.

conclusion that more 70% (fully and partially) of farmers adopted knowledge gained on land use pattern.

CONCLUSION

As seen from the analysis of the extent of knowledge acquired, out of the total farmers more than 80% of the farmers have knowledge in 1) Soil and water conservation, 2) Crop production practices, 3) Land use pattern and 4) Alternate practices. All the 9 NGOs must be given credit for their efficient management of training programmes and extension activities. However one question which has to be answered is, did all the farmers

Table 8. Farmers' knowledge on alternative practices.

S/No.	Status	No. of respondents		Total
		Know	Do not know	
1	Farm forestry(in fallow lands)	410 (85.4)	70 (14.6)	480 (100.0)
2	Agro-forestry	420 (87.5)	60 (12.5)	480 (100.0)
3	Social forestry	419 (87.3)	61 (12.7)	480 (100.0)
4	Alley cropping	418 (87.1)	62 (12.9)	480 (100.0)
5	Silvi-pasture system	408 (85.0)	72 (15.0)	480 (100.0)
6	Silvi-horti-system	480 (85.0)	72 (15.0)	480 (100.0)
7	Agri-horti-system	398 (83.0)	82 (17.0)	480 (100.0)
8	Timber-fiber system	396 (82.5)	84 (17.5)	480 (100.0)

Figures in the parenthesis represent percentages.

Table 9. Adoption of knowledge on alternative practices.

S/No.	Status	No. of respondents			Total
		FA	PA	NA	
1	Farm forestry(in fallow lands)	236 (49.2)	162 (33.7)	82 (17.1)	480 (100.0)
2	Agro-forestry	238 (49.5)	180 (37.5)	62 (13)	480 (100.0)
3	Social forestry	265 (55.2)	152 (31.6)	63 (13.2)	480 (100.0)
4	Alley cropping	250 (52.0)	162 (33.8)	68 (14.2)	480 (100.0)
5	Silvi pasture system	223 (46.4)	180 ()37.5	77 (16.1)	480 (100.0)
6	Silvi-horti-system	215 (44.8)	190 (39.5)	75 (15.7)	480 (100.0)
7	Agri-horti-system	195 (40.6)	200 (41.6)	85 (17.8)	480 (100.0)
8	Timber-fibre system	150 (31.2)	240 (50)	90 (18.8)	480 (100.0)

Figures in the parenthesis represent percentages.
FA-Full adoption; PA- Partial adoption; NA-Non-adoption.

who have knowledge on the above mentioned practices acquire their knowledge only through efforts of the 9 NGOs involved in the watershed management? The answer partially is 'no'. Because during the field work in informal discussions and interviews with the farmers, some of the educated farmers in the sample revealed that they did acquire some knowledge on the above mentioned aspects independently of NGOs. These farmers are in the habit of reading agricultural journals both in English and the regional language, Telugu. Further, some of them have been in contact with agri-cultural experts from the state Agricultural Universities, and Government Agriculture Departments. A few of them did say that they acquired their knowledge on some of the above four aspects from other farmers both by asking them and by looking at the way they applied their knowledge in practice. Thus we see that diffusion of knowledge at grass root level need not always be due to training and participation in extension activities. However, all the 9 NGOs should be credited with their efforts.

As mentioned earlier acquiring knowledge does not automatically mean that it will be put into practice. It is clear from the analysis of extent of practice that more than 50% of the sample farmers put their knowledge to practical use. But within this segment there are farmers who utilized their knowledge fully and there are others who used the knowledge partially. In an informal conversation with the farmers, some of the farmers did give reasons why they did not put to practical use all the knowledge they have acquired. The most important constraint they faced was limited land holdings. With their small and marginal land holdings they could use their knowledge only partially. Even those who reported that they used their knowledge fully agreed that though their land holdings are somewhat large, still they could not use all the knowledge they have acquired.

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