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Participatory Approach Potentials in Adoption of Agronomic, Land and Water Management Technologies in Semi Arid Areas of Tanzania

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Abstract
The study was conducted to asses the potentials of Participatory Approach (PA) in enhancing adoption of improved technologies. Literature consists plenty of general information on Participatory Approach (PA) in Tanzania. However, it has inadequate scholarly information on the contribution of PA in adoption of improved technologies. Specifically, the study determined rates of technologies adoption. A cross sectional research design was adopted for the study. Methodologies used for data collection include Focus Group Discussions (FGD), questionnaires survey, Key Informant Interviews (KII) and participant observation. Questionnaire data were collected from 240 households selected randomly. Data from questionnaires were analysed using Statistical Package for Social Sciences. Content analysis was used to analyse information from FGD, KII, participant observations and document reviews. The results show that PA improved knowledge and skills of beneficiaries as most of respondents from Participatory Irrigation Development Programme (PIDP) schemes (61.3%) adopted improved technologies than respondents in Non-PIDP schemes (25%). The results further revealed that farmers using PA adopted more improved agronomic technologies as 63.7 % of respondents in PIDP adopted improved maize varieties while in non-PIDP were 22.5 %. Further more, 61.2 % of respondents in PIDP schemes planted trees while in Non-PIDP schemes were 24.4%. It was concluded that PA encourage large proportion of farmers to adopt improved technologies as farmer's ideas have been incorporated. The study recommends institutionalisation of the PA in tertiary agricultural and forestry institutions curricula and provision of PA training to farmers using PIDP training methods and approaches.
Keywords: participatory-management, technology-adoption, food-security, and PIDP

1. INTRODUCTION

Participation of beneficiaries has gained popularity today because of past failure of top down approach in development projects in the third world countries. Development projects failed to achieve their objectives due to lack or minimum involvement of the beneficiaries in project problem identification, design and implementation which made beneficiaries consider projects as not theirs (White, 1994). Therefore, this calls for the need to involve beneficiaries in development projects including technology dissemination. The PIDP was the programme that declared involvement of farmers in all stages of irrigation scheme development projects. Despite a good number of studies conducted on PA, little is known about the impact of PA on use of improved technologies. Additionally, although there is an increased emphasis placed on the role of participation in development programmes, there is insufficient empirical evidence to support the claim that participation leads to positive project outcomes and impact (Cleaver, 2001). The PIDP was introduced in 2001 as a follow-up to Small Holder Project for Marginal Areas (SDPMA), which performed poorly due to inadequate beneficiaries' participation in project activities. Thus, PIDP upgraded SDPMA irrigation schemes and introduced new schemes with emphasis on PA. In this study, new schemes were called PIDP while schemes that were introduced during SDPMA and up-graded latter under PIDP were called SDPMA schemes. The Non-PIDP schemes were neither under PIDP nor under SDPMA selected as control group. In implementation of the PIDP activities the programme was emphasising PA in all stages of project cycle including technology dissemination activity. This paper, focus on potentials of PA in facilitating adoption of improved technologies in semi-arid areas of Tanzania. Specifically the study determines extent of use of improved agronomic, land and water management

technologies disseminated to beneficiaries.

2.0 Materials and methods

2.1 Study area

The study was carried out in three districts, Babati, Nzega, and Igunga, Tanzania. Babati District council is among six Councils of Manyara Region. The district lies between latitudes 3^0 and 5^0 South of the Equator and longitudes 35^0 and 37^0 East of the Greenwich. Nzega District is one of six districts making up Tabora Region, and covers an area of 9226 Square kilometres. The district is located between 32^o 30' to 33^o 30' longitudes East of Greenwich and latitude 3^o 45' to 5^o 00' South of the Equator. Igunga District is one of the six districts of Tabora Region. It is located between latitudes 3°51 and 4°48 South of Equator and longitudes 33°22 and 34°8 East of the Greenwich. These districts were purposively selected since they were among the 12 districts of semiarid areas where the PIDP operated and consist of other types on schemes. These sites were also selected based on their long experience in implementing PA and few studies have been done in these areas (PIDP, 2000: SUA, 2000). The PIDP was selected as a case study because the programme emphasised on participation of various stakeholders in management of irrigation schemes while non-PIDP and SDPMA schemes were selected for comparison purposes.

2.2 Research design and data collection procedures

The study employed a cross-sectional research design which allows collection of data at one point at a time (Kumar, 2005). Purposive sampling was used to obtain districts and schemes. These are areas where PIDP, SDPM and non-PIDP schemes have been operating for a period of three years. Two schemes were selected from each district. List of WUA members from each scheme constituted the sampling frame from which 40 households were selected from each scheme using a simple random sampling method. A total sample of 240 respondents were selected from WUA, eighty respondents (80) were selected from different types (PIDP, SDPM and non-PIDP) of schemes. According to Bailey (1994) 30 respondents are enough to get information from the selected sample for statistical analysis. Two FGDs were conducted in each scheme with an average of 10 to 15 respondents in each group involved in the discussion. In each scheme 10 key informants were involved in the discussion including Councillors, Village Government Leaders, WUA leaders and Village Environmental Committee leaders. Participant observation, FGD and secondary data were used to supplement information from questionnaire. Secondary data were obtained by reviewing different literature from Journal papers, technical reports, books, the internet and websites. Other sources of secondary data were baseline studies and other documents from the PIDP Coordination office, district agricultural offices and the Ministry of Agriculture and Food Security Headquarters. The purpose was to have background information regarding the study area and the study topic

2.3 Data analysis

Quantitative data from structured questionnaire were coded and analysed using the Statistical Package for Social Science (SPSS) version 12. Content analysis was used to analyse qualitative information collected from FGDs, KII, participant observations and document reviews. Analysis of Variance (ANOVA) was used to check the statistical significance of mean difference between and within types of schemes in selected variables.

3.0 Results and Discussion

The study found that more than (70%) of respondents from the study received training and are aware on agronomic, land and water management technologies (Table 1). The training received under agronomic practices include improved seeds, use of fertilizers, line and space planting while technologies under land and water management practices were bund construction, tree planting, crop rotation and maintenance of irrigation infrastructures. In this paper the discussion concentrate in adoption of unproved seed varieties and tree planting technologies.

3.1 Agronomic practices

Training skills provided under agronomic practices components were line and space transplanting, fertilizer application and the use of improved seed varieties. Among the agronomic technologies, the most adopted ones were: line planting technique, space planting and improved seed paddy varieties. Positive impact on the use of these technologies encouraged farmers to grow paddy and maize using improved agronomic practices. This is due to the fact that the PIDP's concentration was on paddy and maize production in consideration of PA. Contrary to the practice used for crops such as sweet potatoes and sorghum where most of the respondents reported of not even knowing whether the improved varieties existed.

The respondents in the PIDP and SDPMA schemes preferred more improved varieties, than local varieties. Different varieties were planted in farmers' fields as on-farm trails and during farmers' field day the farmers were able to select the variety with good performance. This participatory evaluation process increased the adoption rate in the SDPMA and PIDP schemes on the utilization of improved varieties. As Abrol and Chopra (2007) report, in order to enhance agriculture, practitioners need to view farmers as partners rather than mere

recipients of technology. When there is active community participation in research activities, it is likely that those involved would want to see more immediate benefits directed from within their own community and hence leading to high adoption rate (IDRC, 1991). The results in Table 1 further show that most of respondents (61.7%) used local varieties while few (38.3%) used improved varieties. Among the respondents who used improved maize seed varieties, majority (63.8%) where from PIDP schemes; few (28.8%) in the SDPMA and the rest (22.5%) from non-PIDP schemes. This could be due to the reason that the respondents in the PIDP involved in selection of best performing seeds

The results in Table 1 indicate further that there were higher proportions of the respondents using improved varieties in the SDPMA (41.3%) than in the PIDP (18.8%) and non-PIDP (3.8%). During FGDs the respondents in the non PIDP reported on not using the improved seed varieties introduced by the Japanese because they did not know the performance of those varieties and the taste was bad. Japanese, under JICA project, provided 170 improved paddy seeds varieties to farmers at one of the non-PIDP schemes, but the seeds provided were not accepted by the community due to lack of PA during the introduction of those varieties. Olaka *et al.* (2006) found similar results, reported that the researchers forget about the involvement of farmers in the research process and at the end of the day they came up with technologies which farmers may not have been interested in. According to Berhanu (1999) the most important reasons that contribute to the low level of use of technologies is lack or minimal involvement of farmers in the planning process and inappropriateness of the technologies

The respondents were asked to explain whether they are using improved or local paddy seed varieties. Most of respondents (75.4%) from all schemes reported using more local varieties, despite that more than half of respondents had received agronomic practices training including the use of improved seed varieties. Few respondents (21.3%) used improved seed varieties and only 3.3% used both improved and local paddy seed varieties (Table 1). The reasons provided for few farmers using improved seed varieties were seeds unavailability and high price of the improved seed varieties. However, as Senkondo *et al.*, (1998) argues farmers preferred more local varieties because a farmer is likely to adopt new technology if the utility of that technology is higher than the utility derived from traditional technology.

Table 1: Technology received and adopted under agronomic practice

Item	PIDP (n=80)	SDPMA (n=80)	NONPIDPn=80	TOTAL N=240
Respondents received training				
Yes	97.5	83.5	41.0	74.3
No	2.5	16.5	59.0	25.7
Types of paddy seed varieties used				
Local	77.5	53.7	95.0	75.4
Improved	18.7	41.3	3.7	21.3
Both	3.8	5.0	1.3	3.3
Types of maize seed varieties used				
Local	36.3	71.3	77.5	61.7
Improved	63.7	28.7	22.5	38.3
Overall high adoption rate	61.	78.8	25	52.5
Overall low adoption rate	38.7	21.3	75	47.5

3.2 Land and water management technologies adopted by respondents

Respondents in all schemes received training on tree planting technologies. The number of trees planted was an important element in understanding whether the programme was successful in sensitising the beneficiaries in adopting water and land management.

The results in Figure 1 indicate that more than half of all respondents planted different types of trees in different areas. It was further found that relatively higher proportions of respondents in PIDP (61.2%) and SDPMA (68.4%) schemes planted trees than respondents from Non PIDP schemes. However, through probing it was revealed that generally few respondents reported to have planted more than 10 trees. The evaluation study conducted by SDPMA project team found that, despite the fact that more than 80% of the farmers depend on wood for fuel and nutrient cycling, the average number of trees planted were still very low (SDPMA, 1993).

Through probing it was found that trees were planted around their homesteads, farms and along the rivers, roads and canals. Most of the fruit trees were planted around the homesteads and very few were planted in the farms. Trees which were mentioned to be planted in the farms and along the canal were: *Leucaena leucocephala*, Acacia species and *Grivellea robusta*. Trees like Eucalypts species were planted along the road, due to fear that they would destroy crops when planted in the farms. Wild fig trees (Mikuyu) and Acacia trees were planted along the canals and rivers. The reasons provided for most of farmers not planting trees in field were: lack of tree

seedlings, lack of agroforestry tree planting skills, animal destruction, pests, diseases, drought, fear of reducing their farm size due to trees and the fear of inviting birds in the maize and paddy fields. The same was reported by Grandstaff *et al*. (1985) in a study conducted at northern Thailand. The authors reported that among the values of trees planted in the paddy fields, provide rats and birds habitat and food. Other reasons provided by respondents were: fear for the theft of planted seedlings; poor survival of the trees planted in the paddy fields due to too much water; fear for creating shades which would affect their crops and that the roots of the trees can block canals. It was further revealed that, few farmers had woodlots due to the shortage of land and drought effects. According to Vityakon (2001) farmers make conscious to retain or planted trees when the net benefits are perceived as exceeding
the costs

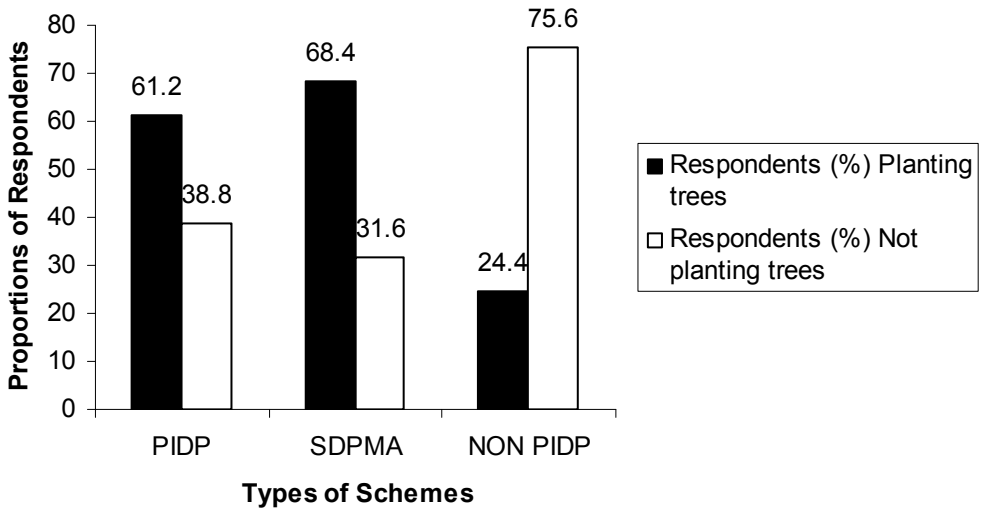

Figure1: Adoption of tree planting technology
Source: Survey data (2008/2009)

The results in Figure 1 further indicate that respondents implementing PA approach (SDPMA and PIDP) had relatively higher proportion of respondents planted trees as opposed to the respondents in non-PIDP schemes. This is probably due to the participatory training provided by the programme to the WUAs members. These results are in line with the argument made by Pretty and Scoone (2006), who noted that people who are directly involved in the project activities are best placed to manage their environments and resources. Farming activities are known to have severe consequences such as land degradation, especially during land preparation. As land preparation activity is associated with tree cutting. Tree planting in the fields was emphasised by the PIDP programme using agroforest trees but, it was unfortunate that most of trees were planted around homesteads and not in their farms and woodlots. Some of the respondents reported that they do not practice agroforestry due to lack of agroforestry knowledge and fear of tree shed crops.. Generally, people in the study areas do not have the culture of planting trees but did a lot of tree cutting. This is partly attributed to the need for some livestock keepers to eradicate tsetse flies by using bush clearing method. The same finding were reported by Jordan (1986) that clearing of vegetations method is practised by livestock keepers to control tsetsefy despite that the method is not allowed by conservationist.

Table 2: Multiple comparisons in mean differences in overall technology adopted by respondents in schemes

(I) Selected scheme	(J) Selected scheme	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
SDPMA	NONPIDP	2.45000(*)	0.32750	0.000	1.8048	3.0952
SDPMA	PIDP	0.90000(*)	0.32750	0.006	0.2548	1.5452
PIDP	NONPIDP	1.55000(*)	0.32750	0.000	0.9048	2.1952

***The mean difference is significant at the 1% level**
Source: Survey data (2008/2009)

The results in Table 2 indicate further that, there was a significant difference in the overall technology adopted by the respondents between and within the schemes. The difference identified was due to programme

intervention emphasizing on the PA. Lutkamu, *at el*., (2006) reported that PA helps in utilization of improved technologies. Since both PIDP and SDPMA received PA training, the difference between them was due to the time of the project intervention In the SDPMA scheme the respondents received support for relatively a longer time than the respondents in the PIDP scheme. Thus, there was evidence that programme interventions had improved the knowledge and skills of beneficiaries. Higher adoption rate of technologies disseminated to farmers was evident to the PIDP (61.3%) and SDPMA (75 %) compared to farmers in non-PIDP (21.3%) schemes (Table 1 and 2.). The study also found that PA training received by beneficiaries added confidence among community members as WUAs members participated in training were capable to contest for ward and village leadership positions. Through observation it was found that, irrigation scheme infrastructures of PIDP schemes were in good condition than in SDPMA and non PIDP schemes due to PA training received during programme intervention. Thus, the programme emphasising participatory approach had significant contribution on utilization of improved technologies.

4. Conclusion

Programme interventions through PIDP and SDPMA had improved the knowledge and skills of the beneficiaries. Higher adoption rate of technologies disseminated to farmers was evident to the PIDP and SDPMA schemes compared to farmers in non-PIDP schemes. Thus, the programme emphasising PA had significant contribution on utilization of improved technologies. The study also reveals that PA contributed to building confidence among community members because some WUAs members who participated in training were able to contest for leadership positions at ward and village levels. Likewise, irrigation scheme infrastructures were in good condition in PIDP schemes than in SDPMA and non PIDP schemes due to PA training received during programme intervention. However policy makers and other development programmes staff tend to impose issues to farmers thinking that is important to farmers but in the ground is not working.

5. Recommendations

The study recommends institutionalisation of the PA approach in agricultural and forestry tertiary curricula. It is also recommended that training on PA should be provided to farmers using good PIDP training methods and approaches.

REFERENCES

Abrol, I.P and Chopra V.L 2007. India's agricultural research and education System-the time for change. Edited by Balaram P.*Current Science Association in collaboration with the Indian Academy of Science Journal*. 93(6):758-761.

Bailey, K.D. 1994. *Methods of Social Research*. The Free press. New York. 345pp.

Berhanu, A. 1999. Soil degradation and economic evaluation of smallholder farm Investment in soil conservation in Hararghe Highlands of Ethiopia: The role of local Conservation measures. PhD thesis. University of Hanover, Germany

Cleaver, F. 2001. Institutions, agency and the limitations of participatory Approaches to development. In B., Cook & U., Kothari (Eds.), *Participation: the new tyranny?* (pp.36-55). London: Zed Books Ltd.

Fujisaka, S. 1992. Were Farmers Wrong in Rejecting a Recommendation: The Case of Nitrogen at Transplanting for irrigated Rice. *Agricultural System* 436 (1993):271-286.

Grandstaff, Terry, B. and Sonluckrnt, W. (1185). Report on Rapid Rural Appraisal Activities. February 5. Khon Kaen University, Thailand.

Lutkamu, M, Shetto, M.C, Mahoo, H.F and Hatibu N. 2006. Scaling-up and uptake Promotion of research findings on NRM in Tanzania. Pages 348-363 *in* Proceedings of the East Africa Integrated River Basin Management Conference (Lankford BA and Mahoo HF, Eds.). Sokoine University of Agriculture, Tanzania

IDRC 1991 *International Development Research Centre. Community Participation* In Research. In: *Proceeding of a colloquium* held in Nairobi, Kenya, 23-27 September 1991.

Jordan, A.M. (1986) *Trypanosomiasis Control and African Rural Development.* Longman Inc., New York.

Kumar, R. 2005. Research Methodology. Stape by stape guideline for beginners. Second Edition. SAGE. [http://www.amazon.com/Research-Methodology-Step-Step-Beginners/dp/141291194X#reader_141291194X] site visited on 4/6/2008.

Olaka, L., Chikuta, J. and Bolo, M. 2006. Emerging issues in science and technology for food and nutritional security and sustainable development in Africa. *Enhancing Women's Role and Participation in science for Food and Nutritional Security in Africa*. Selected essays from a CTA-FARA-RUFORUM Conference from 2-7 July 2006, Entebbe, Uganda. RUFORUM Working Document No. 1 Ruforum capacity Building in Agriculture.

PIDP 2000. Participatory Irrigation Development Programme. Programme Implementation Manual. IFAD and

URT Dar-es-salaam 134pp.

Pretty, J.N. and. Scoones, I. 2005. Participation in language and practice of Governmental and non-governmental organizations. (Ed)N. Nelson and S. Wright. 1995. International Technology Publication Ltd. Pp157-169.

SDPMA 1993. Smallholder Development Project for Marginal areas Baseline Survey report. IFAD, pp200.

Senkondo, E.M.M, Mdoe, N.S.Y., Hatibu, H. Mahoo, H. and Gowing, J. 1998. Factors affecting the adoption of rain Water Harvesting Technologies in Western Pare Low Lands of Tanzania. *Tanzania Journal of Agricultural Sciences* 1(1): 81-89.

SUA 2000. Sokoine University of Agriculture. *Research Achievements of SUA in Agriculture, Forestry and Animal Health.* Proceedings of the first University-wide scientific conference held on 5th - 7th April 2000. 120 pp.

Vityakon, P. (2001). The role of trees in countering land degradation in cultivated Fields in Northeast Thailand. *Southeast Asian Studies*, Vol. 39, No. 3.

White, S.A. 1994. *The concept of participation: transforming rhetoric to reality*. In White, S.A. et al Participatory communication: working for change and development. New Delhi, India: Sage Publications.

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