

FARMER PARTICIPATION IN THE REHABILITATION OF MINOR IRRIGATION RESERVOIRS - A CASE STUDY FROM THE DRY ZONE OF SRI LANKA

by

N.T.S. Wijesekera, G.K. de S Ginige, W.A.C.K Weerasekara, A.K Manori,

Abstract

The small tank cascade systems in the Dry Zone of Sri Lanka could be traced back to many hundreds of years. Due to lack of maintenance, a majority of these tanks are not in full functional capacity and require rehabilitation. Recently it has been identified that it is essential to have adequate stakeholder participation to ensure sustenance of projects. However efforts to identify stakeholder participation in engineering projects are lacking and therefore it is necessary that such assessments are done while attempting quantification. The United Nations World Food Program that targets farmer participation in rehabilitation work where remuneration for the effort is by means of food rations supports one minor tank rehabilitation program in the Anuradhapura district. Three minor tank systems from this district were selected to look at the stakeholder participation in a quantitative manner. The study using daily work records, a questionnaire survey, and interviews of farmer organisation and state officials identified that more than 1.5 workers from a farmer family had participated in the rehabilitation. The overall farmer participation was between 27% and 41%. Active participation at the planning stage was around 45% and the female participation in the project was very much higher than the male. The study also investigated the status of farmer organisations and the level of stakeholder knowledge required for the sustenance of these minor reservoir systems. It was identified that there are needs to improve the training programs, increase male participation, support farmer organisations and attempt to achieve consistency in stakeholder participation.

1. Introduction

Sri Lanka being an agricultural country, agriculture plays a major and influential part in the life style of Sri Lankans. Agriculture in Sri Lanka has a long history. Practice of irrigation by the diversion of small streams and from small tanks is recorded to have been developed by the first century B.C. (Arumugam 1969). In Sri Lanka, out of all agricultural crops, paddy is the most grown and most consumed. The extent of land under paddy cultivation is estimated as 574,000 ha. Most of paddy cultivation is done in the Dry Zone of Sri Lanka and the irrigation water requirement for cultivation is met by a large number of small reservoir cascades that drain one to another when plenty of rainfall is received. The history of reservoir construction in Sri Lanka could be traced back to about 2000 years and the history of the well developed small tank cascade systems in the Dry Zone dates back to about one thousand years (Brohier 1934). Most of the tanks in the cascades, which are known as minor tanks because of their small command area of less than 80 ha under each system, have played a vital role in the Dry Zone agriculture. The total area catered by minor tanks is said to be around 240,000 ha which is approximately 50% of the area under paddy cultivation. However

Eng. (Dr.) N.T.S. Wijesekera, BSc Eng (Hons), M.Eng., D.Eng (Tokyo), C.Eng, MICE(London), MIE(Sri Lanka), Graduated from the University of Sri Lanka, Peradeniya in 1979. Worked at the Mahaweli Engineering and Construction Agency between 1979 and 1993. Presently, Senior Lecturer, Dept. of Civil Engineering, University of Moratuwa and Chairman, International Centre for Geoinformatics Applications & Training (ICGAT)

Eng. G.K. de S Ginige, BSc Eng., AMIE (SL) Graduated from the Department of Civil Engineering of the University of Moratuwa in 1999.

W.A.C.K Weerasekara, BSc Eng., Graduated from the Department of Civil Engineering of the University of Moratuwa in 1999. Presently Manager, Water Resources and Land, Ridi Bendi Ela Farmer Company, Millagoda, Nikawarntiya.

Ms. A.K Manori, BSc Eng., Graduated from the Department of Civil Engineering of the University of Moratuwa in 1999. Presently working as an engineer, National Water Supply and Drainage Board, Ratmalana.

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due to lack of maintenance of reservoir head works and distribution systems, a majority of these tanks are not in full functional capacity and require significant improvements or rehabilitation. Though the need for improvement had been identified, the poor financial status of farmers or landowners under these minor irrigation systems prevents them from engaging in the rehabilitation of such tanks on their own.

In the recent past many projects the world over have revealed that the sustenance of such works require beneficiary participation. In Sri Lanka the experiences of the National Irrigation Rehabilitation Project (NIRP) also indicate that close involvement of beneficiaries in the planning and implementation of rehabilitation and improvement, is an important requirement for success. (World Bank 1991). As such, most of the rehabilitation works now incorporate beneficiary or primary stakeholder participation as an integral component in the project proposal.

This has a very significant impact on engineering a project starting from planning, design, implementation and maintenance. Though the incorporation of stakeholder participation has been done for numerous engineering activities for quite some time, not much work has been reported about understanding the concepts and definitions of participation and attempting quantification. Unless such quantification is done it is an uphill task to achieve success in engineering projects in terms of both completing in time and achieving the requisite quality. Previous work done by Wijesekera, Chandrasena and Waniganayaka (2000) is also an effort to contribute to the pressing need of identifying the effect of much desired participation in engineering projects.

The United Nations World Food Program (UNWFP) that targets farmer participation in rehabilitation work where remuneration for the effort is by means of food rations, supports one such minor tank rehabilitation program in the Dry Zone. This project also targets ensuring high stakeholder participation so that the development activities in the rehabilitation of minor tanks reach a high level of sustainability through proper planning, quality outputs, social strengthening, etc.. The present work is an attempt to look at beneficiary participation in some of the rehabilitation work in the UNWFP program.

2. Ancient System

It is written in Brohier (1934), that the tank irrigation systems in ancient Sri Lanka had been a self-sufficient entity. They had practised farming systems capable of adjusting to extreme weather conditions so that such systems protected and sustained them against adverse

conditions. The mechanisms of clearly identifying the village leadership, collective decision making, strong linkages established between traditions, customs, and the farming practices have immensely contributed to agricultural development.

The indigenous cultivation systems that had been practised under tank cascades provide many aspects desired in modern agriculture by irrigation practitioners, planners and managers. The water management systems that had been practised in the Dry Zone is considered as wise by many. Some practices under ancient irrigation systems which reflected a high degree of stakeholder participation are (1) The *Attam* system which is for the reciprocal exchange of labour, (2) *Betam* cultivation for the sharing of land for cultivation with an assured supply of water during periods of drought, (3) the *Rajakariya* system which required farmer responsibility in the maintenance of reservoir bund, channel and fences giving weight to the land ownership in the paddy field, (4) *Ande* cultivation or share cropping in which the landowner provided certain inputs such as seed material and tenant farmer provided his labour. Another indicator of stakeholder cooperation is the practice of seed exchange that had functioned smoothly among the stakeholders.

Rajakariya, a system practised under the kings who had ruled Sri Lanka, envisaged that all farmers and landowners under a tank would perform the various tasks of maintenance of tank bund, desilting of the tank bed, field fencing, etc.. This system had ceased to function after British rule abolished the *Rajakariya* system. Most minor irrigation reservoirs which had been on the decline with the collapse of the ancient setup need revival and this would not be a difficult task with the participation of the primary stakeholders.

3. Rehabilitation under WFP

World Food Program (WFP) is considered as the food arm of the United Nations System. The policies governing the use of WFP food aid are oriented towards the noble objective of eradicating hunger and poverty. Since the minor tank rehabilitation in the Dry Zone of Sri Lanka is for a economic and social development which in turn is consistent with its goals, WFP supports the project with food assistance for the labour inputs. This project targets tank rehabilitation and improvement in subsequent operation and maintenance through farmer participation. A study of four minor reservoirs has looked at farmer participation under the UNWFP funded rehabilitation programme and has identified that the project is very well accepted by the beneficiaries and has achieved

around 36% beneficiary participation (Wijesekera, Chandrasena, Waniganayaka 2000). The catalytic role played by the institutional organisers and the strengthening of farmer organisations through training and participation have captured the confidence and commitment of the beneficiaries to have better aftercare scheme and other assets created under this project (WFP 1996). Farmer participation in this rehabilitation project is for (i) achieving reconstruction with cost effectiveness and better quality, and (ii) Strengthening farmers in areas of technical know-how and sense of ownership to manage the operation and maintenance of rehabilitated tanks. The Project targets the strengthening farmer organizations through group-work experiences, allocation of support funds, training programmes in the maintenance and creation of a sense of ownership among farmers. Since many projects target the participation of stakeholders, it is important to make efforts to identify stakeholder participation in reality. In the literature, there is a clear inadequacy in the attempts to quantify stakeholder participation and therefore this effort is also to look at the scenario in a detailed manner.

4. Study Area

A substantial number of the minor tank rehabilitation works under WFP assistance are in the Anuradhapura district and hence three minor tank systems from this district were selected for the study. The Anuradhapura district in the Dry Zone of Sri Lanka receives an annual rainfall of about 1200 mm. Over 70% of annual rainfall is mostly during the North-East monsoon from October to March and the other months are basically rainless. This rainfall is characterized by highly uneven spatial distribution, long dry spells, and intense short duration rains and short rainy seasons. The annual rainfall in Anuradhapura that could be expected at a 75% probability is approximately 900 mm.

Kudawewa, Marakulama and Solayankulama reservoirs in the Thirappane Agrarian Service Centre at Anuradhapura that comes under the rehabilitation program of WFP were selected for the study (Figure 1, Table 1). These reservoirs are located at close proximity to each other. Site visits indicated that the social and environmental conditions are similar at and around these reservoir systems. The reservoirs are quite small in size receiving water from small watersheds but catering to a significant number of farmer families. This indicates the small size of land holdings under each tank.

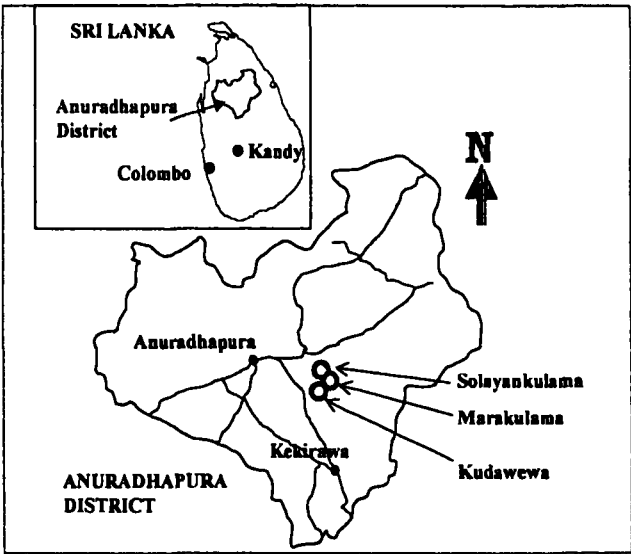


Figure 1: Study Area and Location of the Selected Minor Reservoirs

Reservoir	Kudawewa	Marakulama	Solayankulama
Catchment (Sq. km)	1.67	1.23	1.23
Command Area (ha)	18.2	24.3	24.3
Farmer Families (Nos.)	21	40	35
Total utilised work days for Rehabilitation	6447	6211	9031

Table 1 Details of the Selected Reservoirs for the Study

5. Methodology

Data for the study was collected using different methods. Daily work records maintained by the Agrarian Services Centres were used to identify the number of personnel participated in various activities pertaining to the reservoir rehabilitation. The daily work records indicated the persons participated along with the type of work executed in the minor reservoir rehabilitation project. Tank rehabilitation construction activities included earth excavation, transport, placing, compaction, turfing, etc.. A number of officials from the Department of Agrarian Services (DAS) and farmer organizations were met and discussions were held. A questionnaire survey was conducted to collect data from the farmers and farmer organizations involved in the rehabilitation activities. Interviews were held among selected farmer families from each reservoir. At least 12 farmer families from each reservoir system selected at random were interviewed to collect information. This number is either close to or more than 30% of the total farmer families under each reservoir. One responsible person from each family was interviewed for information. The survey questionnaire targeted the identification of the degree of participation in the planning stage and also the technical knowledge of farmers (Table 2). The work sheets did not give a clear indication of the way of

participation in the planning stage and hence the information was collected to identify the type of participation-whether by means of listening only, supplying of data, contributing with ideas or with a mixture of these. Questions about the knowledge of farmers were categorized into two areas as, (1) general technical knowledge such as the type of soil that should be used for the reservoir bund, the slopes of the reservoir and its maintenance, and the needs of compaction; and (2) water control and canal maintenance such as operation of the sluice, assessing the quantity of water in a reservoir at any given time

and the methods of canal maintenance. Site visit details such as dates and names, questions asked from farmers with respect to this effort and the participatory approach adopted in the identification of questions and achieving survey targets are reported in Weerasekera, Ginige, and Manori (2000). It was necessary that the selection of questions to identify the technical knowledge has to be limited to the most appropriate ones to ensure farmer enthusiasm and understanding. Therefore as discussions were held and questions were selected accordingly.

Name of Reservoir	Kudawewa	Solayankulama	Marakulama
No of families Interviewed	12	13	14
No of Persons above 18 years in Sample (Work Force)	37	31	48
Number of Persons from Sample Families who had Participated in Rehabilitation	21	19	23
Number with Satisfactory knowledge on Soils	11	8	4
Number with Satisfactory knowledge on Slopes	4	2	4
Number with Satisfactory knowledge on Compaction	11	12	11
Number with Satisfactory knowledge on Water Control, Canal Construction and Maintenance	9	9	10
Number of persons participated in Planning by Listening	11	13	14
Number of persons participated in Planning by Providing Data	6	5	8
Number of persons participated in Planning by Providing Suggestions/Ideas	7	5	4

Table 2: Survey of Farmer Families in Each Reservoir System

Farmer Organisation (FO) of Reservoir	Kudawewa	Solayankulama	Marakulama
FO Members Before Rehabilitation (persons)	40	45	30
FO Members After Rehabilitation (persons)	71	72	70
FO Funds Before Rehabilitation (Rupees)	5000	5000	6000
FO Funds After Rehabilitation (Rupees)	25000	31000	35000

Table 3: Status of Farmer Organizations Before and After Rehabilitation

Name of Tank	Kudawewa	Solayankulama	Marakulama
Name of Farmer Organization	Sembukulama	Nandhimitra	Eksath
Status of Meetings	Satisfactory	Unsatisfactory	Satisfactory
Status of Social and Cultural Events	Satisfactory	Unsatisfactory	Satisfactory

Table 4: Status of Activities in Each Farmer Organization

Details of participation at each reservoir including male and female contributions were extracted from available daily work sheets. For each tank, the details for participation during the entire process of rehabilitation exercise were extracted. Officials of farmer organizations responsible for rehabilitation were met and information about the member strengths and the financial status before and after rehabilitation were obtained (Table 3). DAS officials, officials of farmer organizations and farmers were met and discussions were held to obtain the status of activities of each farmer organization (Table 4).

6. Results and Discussion

6.1. Participation in the Project

The sample survey identified that participation as a percentage of the work force was between 48% and 61% (Table 5). The farmer families on average had approximately 1.6 persons participating in rehabilitation. This is a significantly high degree of stakeholder participation since the maximum contribution to the workforce per family was identified as approximately 3.0 from the sample survey. The survey data of the present study indicated that the level of participation identified was satisfying the UNWFP targeted participation of 1.5 workers (WFP 1994) from each farm family.

Name of Reservoir	Kudawewa	Solayankulama	Marakulama	Average
Maximum Possible Person Participation per Family	3.08	2.38	3.43	2.96
Average Number of Persons Participated per Family	1.75	1.46	1.64	1.62
Participation as a percentage of Work Force	56.7	61.2	47.9	55.27
% with Satisfactory knowledge on Soils	92	62	29	61
% with Satisfactory knowledge on Slopes	33	15	29	26
% with Satisfactory knowledge on Compaction	92	92	79	88
% with Satisfactory knowledge on Water Control, Canal Construction and Maintenance	75	69	71	72
% participated in Planning by Listening	92	100	100	97
% participated in Planning by Providing Data	50	38	57	48
% participated in Planning by Providing Suggestions/Ideas	58	38	29	42

Table 5: Statistics Computed from Sample Survey of Farmer Families

6.2. Gender Distribution

Male/Female (MF) ratio of stakeholder participation was quite consistent in case of all three reservoirs (Figure 2, Table 6). The maximum ratio of 1.01 was indicated at the Marakulama reservoir in November and the minimum value of 0.37 was shown at the Solayankulama reservoir in the month of December.

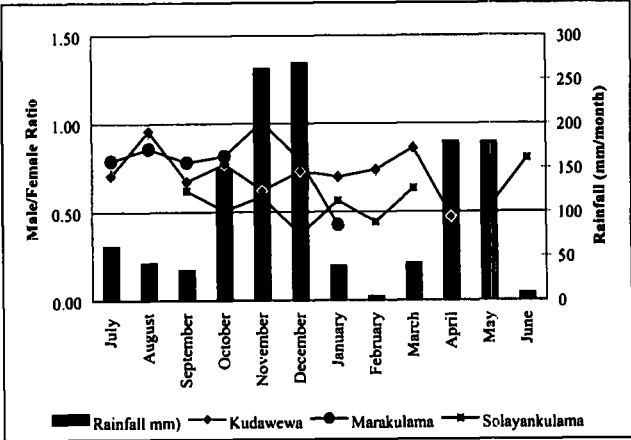


Figure 2: Comparison of the Variation of Male/Female Ratio and Rainfall

Month	Monthly Rainfall (mm)	Male/Female Ratio			Daily Average Participation (Persons)		
		Kudawewa	Marakulama	Solayankulama	Kudawewa	Marakulama	Solayankulama
July	61	0.71	0.79		33	35	
August	42	0.96	0.86		21	35	
September	34	0.67	0.78	0.62	19	39	41
October	149	0.77	0.82	0.51	39	27	34
November	262	0.62	1.01	0.59	28	54	24
December	269	0.73	0.79	0.37	23	22	54
January	39	0.70	0.42	0.56	41	50	55
February	5	0.74		0.44	18		35
March	42	0.86		0.63	17		40
April	179	0.47			24		
May	179			0.52			6
June	9			0.81			23
Average		0.72	0.78	0.56	26	41	35
Number of Families					21	40	35
Possible Max Participation (Persons)					65	148	90
% Participation (Average)					41	27	38

Table 6: Variation of Rainfall, Male/Female Ratio and Daily Average Participation

The average MF ratios for Kudawewa and Marukulama were 0.72 and 0.78 respectively. This means that out of seven stakeholder participants four were females. At Solayankulama there was much less male participation having only one male stakeholder in a group of three. The average MF ratio at this tank was only 0.56.

MF Ratio did not indicate a direct relationship with the probable rainfall. Discussions revealed that the rehabilitation works were planned to suit the rains because the earthworks, turfing etc., could be done effectively when planned accordingly. It is felt that the respective actual rainfall should be considered along with the type of work to identify any existence of a relationship between MF Ratio and the probable rainfall.

The MF ratio throughout participation was around 0.69 for all three reservoirs indicating a significantly high female participation in the rehabilitation activities. The lower male participation indicates that the project could not attract the males to contribute to the rehabilitation activities. Since the females are considered as having a very high influence in the farmer community, this very high degree of female

participation may lead to strengthening the concepts of sustenance of minor reservoir systems after rehabilitation.

6.3. Consistency of Participation

The total number of participating stakeholders was extracted from the worksheets and used to identify the daily average participation in each month of rehabilitation. These values showed a wide variation ranging from 6 to 59 persons on average working in each day during the work period (Table 6). However the percentage participation computed using the maximum possible participation extrapolated from the survey results indicated average values of 41, 27, and 38 for Kudawewa, Marakulama and Solayankulama respectively. Many reasons were identified for the fluctuation of participation over the months. They are, the type of rehabilitation work, amount of work, rainfall, status of other activities of engagement such as in agriculture or other type of employment. It is noteworthy that when participation drops, the MF ratio increases in most occasions. This on the one hand could be due to the reasons above but on the other hand indicates a consistent female participation with a fluctuation of male participation. These combined results of MF ratio and percentage participation shows that the male stakeholders were not quite consistently attending to the rehabilitation activities. One reason could be that the UNWFP rehabilitation project remunerates the stakeholders with food. Since food alone is not adequate for the day to day living of the farmers, they tend to look for occupations that remunerate their efforts with hard currency for the short-term survival.

Though the overall average participation in the three reservoirs computed using monthly averages was between 27% and 41% (Table 6), the sample survey indicated much higher values varying between 48% and 61% (Table 5). The sample survey results indicate the numbers that had subscribed to the rehabilitation, whereas the monthly averaged values show the inconsistency of participation deviating from the average value of 1.62 persons per family. Therefore a critical evaluation of the project needs to consider that the participation at Kudawewa, Marakulama and Solayankulama are as 41%, 27%, and 38% respectively. An improvement in the participation with less inconsistency, would lead to better outputs. Therefore high consistencies should be targeted while ensuring sufficient incentives to satisfy other needs of the farmer families that cannot be met with food remuneration alone.

6.4. Planning Stage Participation

According to the results an encouraging indication is that almost all those who participated in the rehabilitation had participated from the planning stage (Table 5). This is reflected in the high percentage of participation in planning by listening, which amounts to almost the entire sample. The percentage who participated in the rehabilitation was 97% on average, and the percentage who contributed to the rehabilitation activities was at a very encouraging value of 42%. Kudawewa stakeholders with a value of around 54% indicated the best level of active participation by providing data and also making suggestions. In general the Solayankulama stakeholders appeared to have moderately participated in the activities having only about 38% participation. Since active participation in the planning stage is a very important aspect in the planning of engineering activities such as bund repair, location of spill and sluices, a high participation leads to increased stakeholder awareness and also a growth of confidence in the planning and construction activities. Stakeholders who contributed to the planning of Marakulama minor tank rehabilitation activities have shown a poor level of participation in providing suggestions and ideas.

6.5. Participation at Training

There had been three to four training programmes conducted by the DAS under the WFP. to enhance the knowledge of farmers. An increased level of knowledge was targeted by these programs to ensure the sustenance of the system once it is handed over to farmers after rehabilitation. According to the DAS, the training programs had covered the topics such as the selection of soils for construction, suitable slopes for tank embankment, needs and methods of compaction, water control, canal construction and maintenance. In the present study, the surveyed sample of farmers were asked a few predetermined questions from each section to identify whether the farmer knowledge is satisfactory. The interviewers were final year undergraduates from the university (Weerasekera, Ginige, Manori 2000) and the correct answers to the questions were categorised as satisfactory. Results of the survey (Table 5) indicated that in general the knowledge about slopes was poor with percentages of 33, 15, and 29 participant farmers achieving satisfactory knowledge levels for the Kudawewa, Solayankulama and Marakulama respectively. In the Marakulam reservoir knowledge about the soils was also indicated as poor with only 29% of the stakeholders indicating satisfactory level. Knowledge on the needs of compaction, canal construction and maintenance indicated a very satisfactory level of approximately 80%. The survey on knowledge in

general indicated a satisfactory knowledge of farmers on related technical issues reflecting that most of the farmers had actively participated in the training activities. These training efforts are important contributions not only towards achieving high quality construction outputs but also ensuring sustenance of the efforts by donors, government and the farmers. These training programs may need to identify methods to ensure more stakeholder participation to fully achieve the objectives.

6.6. Status of Farmer Organizations

Farmer organizations (FO) at each reservoir are considered as an entity that facilitates the farmers to get together and work as a team. The farmer organizations are legal entities that link the farmer community with government and other non-governmental entities. The UNWFP and the DAS initially support the establishment of the FO by promoting activities and also extending financial help. When the rehabilitation activities are in progress the FOs are permitted contractual engagements to carry out concrete constructions in the rehabilitation programme. The profits from these are used to strengthen the FO activities and the DAS targets the future maintenance activities to be supported by the returns from the investment of such funds. The survey of farmer organization activities was looked at under two broad themes. One is the frequency of meetings of the membership and the other is the organizing of cultural and social events among the farmer community. In this context, the survey conducted for the present work indicated that the Solayankulama FO showed as inactive (Table 4) despite a 1.6 and 6.2 fold increases in membership and funds respectively (Table 3). The Solayankulama FO had only about 50% of the stakeholders as members whereas both other FOs had near 100% of the primary stakeholders as their membership.

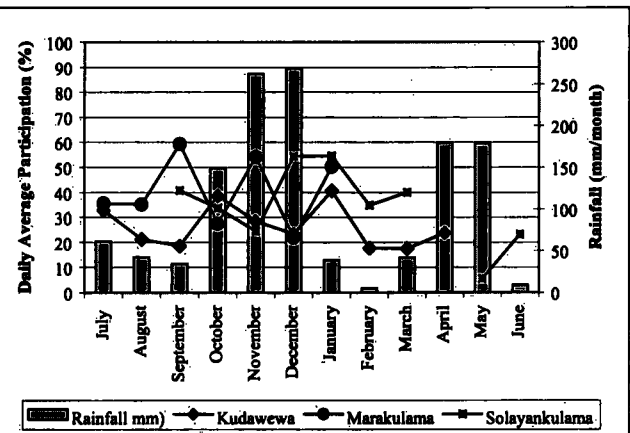


Figure 3: Comparison of the Daily Average Participation and Rainfall

The impressive status of the increased number of members along with a growth in the financial status of farmer organizations indicated that this status would lead to strengthened group activities leading to high quality construction and maintenance. However by looking at the present status, it is felt that the support of the government should only be gradually withdrawn after the handing over the reservoir irrigation systems to the farmer organisations. Such a gradual withdrawal would ensure the sustenance of the farmer organizations as well as the reservoir irrigation systems.

7. Conclusions

1. In the selected minor reservoirs the average participation in the project was at 1.62 persons per family, which was approximately 54% on average. This significant involvement of primary stakeholders is a major achievement towards the sustenance of project activities.
2. The temporal variation of participation indicated that the average percentage values of overall participation had been between, 27 and 41. These values could be improved to suit the targets by including sufficient incentives to attract primary stakeholders.
3. Nearly seven out of ten participants in the minor tank rehabilitation had been females. The high female participation indicates the effective utilization of domestic labour. Female participation would also foster the social clustering which would lead to strengthening the concepts of sustenance of minor reservoir systems after rehabilitation.
4. Male participation in the project was inconsistent and was much less than the female participation. This needs to be given sufficient attention to ensuring that such activities as could be effectively handled by males, are well executed. It could be that the remunerating the efforts through food rations alone is not sufficient for the short-term survival of the poor farmers in the Dry Zone.
5. Participation of stakeholder community during the planning stage was very high in all three reservoirs reaching 97% on average. Active participation by providing data and suggestions, etc., was also at a reasonable value of 45%. Achieving high level of active participation is important for effective engineering of minor tank rehabilitation activities.
6. The level of technical competence of farmers who participated in these rehabilitation works could be identified as very good and it is felt that this may be attributed to the training programmes. These

training efforts are important contributions not only towards achieving high quality construction outputs but also ensuring sustenance of the efforts by donors, government and the farmers.

7. Farmer organizations pertaining to the studied minor reservoirs had achieved an improved status having a substantial number of members and indicating a growth in the organisation's financial status. This indicates strengthened group activities and superior quality in construction and maintenance.
8. The study identified that engineering activities such as rehabilitation of minor reservoirs could achieve very high primary stakeholder participation that would lead to coherent, knowledgeable farming communities who would eventually contribute to the sustainable operation and maintenance of such systems. This may finally lead to relieving the state of responsibility in already completed systems thus enabling the state to support other unattended systems.
9. The present study identified and quantified many concerned aspects of farmer participation in three reservoir rehabilitation projects. These results on the status of activities shed light on many other issues in this study area that require in-depth investigation. Therefore these results and conclusions on the status of activities, need to be further studied to identify patterns of behaviour for successful engineering projects so that they could contribute to the efforts in achieving the much-needed sustenance.

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