

NATURAL RESOURCES SYSTEMS PROGRAMME FINAL TECHNICAL REPORT¹

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Improving management of common pool resources in rainwater harvesting systems

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Organisation

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Semi-Arid

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ABBREVIATIONS AND ACRONYMS

ASDP	Agriculture Sector Development Programme
ASDS	Agricultural Sector Development Strategy
ASPS	Agricultural Sector Program Support
BBC	British Broadcasting Corporation
CARE	Cooperative for Assistance and Relief Everywhere
CBO	Community Based Organization
CPR	Common Pool Resources
DADP	District Agricultural Development Programme
DALDO	District Agriculture and Livestock Development Officer
FGD	Focus Group Discussion
GIS	Geographic Information System
GWP	Global Water Partnership
MAFS	Ministry of Agriculture and Food Security
NGO	Non Governmental Organization
NRSP	Natural Resources Systems Programme
RBM-SIIP	River Basin Management- Smallholder Irrigation Improvement Project
PIDP	Participatory Irrigation Development Project
PRSP	Poverty Reduction Strategy Paper
RELMA	Regional Land Management
RWH	Rainwater Harvesting
SEARNET	Southern and Eastern Africa RWH Network
SUA	Sokoine University of Agriculture
SWMRG	Soil-Water Management Research Group
TM	Thematic Mapper
URT	United Republic of Tanzania
WPLL	Western Pare Lowlands
WDC	Ward Development Council
UK	United Kingdom

1. Executive Summary

Wide adoption of RWH in Tanzania is leading to changes in tenure, access and management of runoff and related CPR. Often these changes have led to decreased access to CPR by groups of the poor. Poor governance has been identified as the core problem. The overall goal of the research was to develop and promote strategies that can improve the livelihoods of the poor living in semi-arid areas through improved integrated management of natural resources under varying tenure systems.

The outputs from this project were to recommend aspects of institutional and regulatory system requiring improvement to facilitate equitable access to runoff and related CPR, to identify, verify and promote tenure and management approaches that enhance equitable access to CPR, to develop and promote guidelines for use in making CPR management plans and to enhance capacity of stakeholders to plan, negotiate and implement institutional, regulatory and management systems for CPR.

Through implementation of the project activities, it was found that current institutional and regulatory mechanisms limited access to CPR by the poor. The areas that required new or improved by-laws or regulations were therefore identified. The identified areas include coordination between primary court and village government and harmonization of contradictory by-laws, regulations, traditions and customs. Analysis of transaction costs and benefits in CPR management indicated that individuals and communities incur transaction costs in both fiscal and time dimension. However, the poor and politically weak incurred more transaction costs than the rich. Based on the identified institutional weaknesses,, tenure and management approaches that enhance equitable access to CPR were recommended. They include; formation of an autonomous committee for land management in villages with sub committees for residential land, agriculture land and grazing land, preparation of land use plans to demarcate grazing and agricultural land and water allocation should consider spatial and seasonal aspects. Training and information needs for comprehensive planning for CPR management were identified. Results indicated that planners and policy makers at District level need training in approaches for linking their plans and programmes with the requirements of national policies, strategies and legislations. At community level, issues identified for training included: equitable access to runoff; conflicts prevention and mitigation. In order to meet some of the training needs, several training workshops were implemented in the study sites and came up with recommendations. Communication products were produced and disseminated in the study sites. They include planning guide and maps depicting information on agricultural land suitability, tenure systems and land use conversion. The media for communication included posters, leaflets, radio programme, cassettes, and seminars.

Most of the OVI's at output level were attained and the project was able to influence policy and planning at district level. The implementation of project activities enabled the inclusion of CPR management issues into the District Agricultural Development Programmes (DADP).

2. Background

Poverty in Tanzania is caused by many factors, but the most important are inadequate access and poor utilisation of resources to acquire basic human needs for decent life and development. The youth and female-headed households are often in the poor categories with respect to all types of assets. They form an important part of the agricultural households in the study areas. For example, in Western Pare Lowlands (WPLL) 20% of agricultural households are female-headed. Similarly, 20% of heads of agricultural households are less than 35 years old (NBS, 2001). Livelihoods of such population depend on common pool resources (CPR).

Rainwater harvesting is an important entry point in most of the semi-arid areas. Findings from R7888 showed that there is already a high level of adoption of in-situ methods of capturing rainwater and retaining it where it falls to improve crop growth. Recently the technology of RWH has received high attention from policy makers and planners in Tanzania. Rainwater harvesting is now part of key elements of the Agricultural Sector Development Strategy (ASDS) (URT, 2001). Unfortunately, there has not been an equal effort in the development of governance of the runoff and associated CPR in the target areas (Lovett et al., 2001). Adoption of RWH leads to changes or need for change in the access to CPR such as runoff, rangelands, rivers and streams. Given its scarcity, access to rainwater is key to control and utilisation of land in the semi-arid areas. Well-designed and robust institutions are required for the management of such a complex CPR (Huggins, 2000). Several institutions (formal and informal) and regulations for managing CPR exist in Tanzania at all levels. The outstanding research issue is the conflicting roles and approaches of the institutions especially in relation to the interests of the poor (Lovett et al., 2001). It was also observed by Hatibu et al. (1999) that a gap exists between the emphasis given in national policies, strategies, and programmes and what is actually practised by farmers in semi-arid areas. There is, therefore, a real problem in Tanzania, whereby national level strategies and policies are not taken into account at local level.

The work done under project R7857 showed that water is the most critical CPR in semi-arid Tanzania. Integrated management of CPR in the target districts is apparently missing. The project found that governance was the core issue and most important researchable constraint in relation to integrated management of CPR. The findings of R7857 also identified decision making (i.e. planning) and institutional arrangements to be key issues contributing to governance.

Tenure control and access to the runoff and related CPR is important. Of particular interest is also to find out their interactions to see if control of resources by one part (e.g. upstream) or group (e.g. rice cultivators) does not disadvantage sustainable use of resources by another part (e.g. downstream) or group (e.g. pastoralists). This is a critical issue, since often the resource could be commonly available but only those with means to access it become its de facto owners or controllers.

Sustainable and integrated management of CPR, requires the participation of all stakeholders. This requires major changes in the tenure, management, institutional and regulatory arrangements, and planning processes. A major challenge is to ensure that the poor participate and their interests are taken into account during planning. However, participatory planning and management is often associated with high transaction costs which may be a potential constraint on collective action and more importantly limit participation of the poor (Falconer, 2000 and Adhikari, 2001).

In order to contribute knowledge for solving these problems, the project covered by this report was designed to contribute to the NRSP purpose stated as **to deliver new knowledge that enables poor people who are largely dependent on the NR base to improve their livelihoods**, with the aim to suggest tenure, institutional, regulatory and planning framework that improves access and beneficial use by the poor groups, of the runoff and related CPR in rainwater harvesting systems.

3. Project Purpose

The purpose of this research has been stated as strategies to improve livelihoods of specific groups of the poor through improved integrated management of CPR Developed and Promoted. The project intended to assist in transforming local authorities and communities so that they can prioritise needs of poor, such as youth and women, in the allocation of CPR. It is expected that by promoting equitable access by groups of the poor, to runoff and associated CPR in semi-arid areas, the project might contribute to poverty reduction.

4. Outputs

4.1 Results and Findings

The main outputs from this project were stated as: (1) to recommend aspects of institutional and regulatory system requiring improvement to facilitate equitable access to runoff and related CPR in rainwater harvesting systems, (2) to identify, verify and promote tenure and management approaches that enhance equitable access to CPR affected by rainwater harvesting, by different stakeholders and the environment, (3) to develop and promote guidelines for use by District Councils, Wards, Villages and Communities in making CPR management plans that protect the interest of the poor while ensuring optimum and sustainable benefits to the communities using rainwater harvesting systems and (4) to enhance capacity of stakeholders to plan, negotiate and implement/enforce institutional, regulatory and management systems for CPR, in a way that protect the interests of the poor

4.1.1 Institutional and regulatory system for CPR management

Features of existing institutional and regulatory mechanisms for CPR management were studied. However, in order to get basic understanding of institutional and regulatory mechanisms it was necessary to undertake an analysis of the socio-economic groups including a study on how transaction costs affect the implementation and performance of mechanisms for CPR management. The findings are discussed in the following sub-sections while the details are presented in Annexes B2, B5 and B12.

Local criteria for identifying socio-economic groups

It was noted that perceptions on who is rich or poor varied with ethnicity, sex, enterprises and age groups (annex B2). Ethnic groups whose main economic activities are farming put more value on land and access to runoff, while ethnic groups with pastoralism background put much value on livestock. Elders and youth classified community with different levels of resource endowment. To be rich among youth could entail owning assets or having access to factors of production, which on comparisons were less than the amount of similar resource that qualified elders to be categorized as rich. In WPLL, for example adult agro-pastoralists would need to own at least 10 heads of cattle while youth regarded individuals with 2 heads of dairy cattle as rich person. Similarly, amount of resources that would make men to be classified as rich are more than those needed for women to be in the same group. In pastoralists community, men would regard some one with more than ten heads of cattle as rich person while for women 10 heads of cattle was sufficient to classify them as rich.

Findings indicated that local criteria for poverty assessment included material and non-material parameters (annex B2). Comparisons of typical poor and rich individuals based on material and non-material parameters are shown in Table 1 and 2, respectively. Material resources included durable assets like houses and machines and short-term consumables like clothes. Poor people were found to own less and poor quality houses as compared to the rich. Their houses are mainly traditional one

made of poles, mud walls and thatched with grasses. On contrary, rich peoples' houses had brick or block wall and roofed with corrugated iron sheets. However, for communities which kept livestock as primary occupation, quality of houses was not a distinguishing factor between rich and poor. Rich person could possess and live in inferior temporary house. Such phenomenon is more common in Maswa District compared to WPLL.

Table 1: Characteristics of typical poor and rich in WPLL based on material parameters.

Local criteria	Poor	Rich
Housing	Traditional and inferior, made of poles, mud and grass.	Modern, built of bricks or blocks, corrugated iron sheet and furnished
Livestock	Own none or few (15 heads of local cattle) and keep other peoples for milk	Own large heads and flocks
Land	Own small and marginal plots	Own larger land holdings with access to run off and hire plots with access to water
Food security	Food insecure for 9 to 12 months a year	Food secure for 9 to 12 months a year and sometimes have surpluses
Business enterprises	Own none	Own business enterprises such as shops, kiosks and guests houses and hotels
Clothes	Have poor (second hand) clothing	Have expensive clothes
Remittances	Get none from his or her sons/daughters. Can get some (in form of food from government and neighbour)	Get some from sons and daughters working in towns
Farm implements	Do not have access to	Own or hire

Table 2: Characteristics of typical poor and rich in WPLL based on local criteria non-material parameters.

Local criteria	Poor	Rich
Access to social services	Poor access to health services and education for their children	Access to good health and education services
Marital Status ²	Single elders women	Married to a rich man
Self-confidence	Not confident	Confident
Begging	Beg for food and clothes (in case of women) and for cash and local brews (in case of men)	Do not beg
Membership to local networks	Not members to local social networks	Members to local networks such as financial institutions
Wage labour	Sell casual labour	Do not sell casual labour
Ability to pay bride price	Do not have. Their sons get married late and delay paying the bride price	Have the ability and their sons get married in time

Poverty assessment in both sites indicated that majority of population was locally classified as medium wealth group while the rich constituted smallest proportion in the population. For example

² Normally apply to women

12%, 58% and 30% of the community in Mwembe village (WPLL) were classified as rich, middle and poor whereas in Bukangilija (Maswa) 15%, 47% and 38% were rich middle and poor, respectively.

Key Features of the Existing Institutional and Regulatory Mechanisms for CPR

Analysis of key features of institutional and regulatory mechanisms is presented in (Annex B5). Summary of these features are itemised hereunder.

- i) Institutions for managing CPR at local level comprised of village government committees and resource user groups. In some villages, there were specific committees for management of the CPR like land and water resources, whereas for other villages CPRs are managed by social welfare committees,
- ii) Inequality in memberships in CPR management committees between different social groups. For example, Bukangilija (Maswa) village women in CPR management committees constituted only 15%,
- iii) No clear operational plans and transparency in the Ward Development Council (WDC). For example, villagers do not participate in formulating the agenda for WDC meetings,
- iv) Lack of overall organ responsible for supervising the use and management of CPRs that are shared by more than one village,
- v) Bad relationships between community level committee and village leaders and between village governments and primary courts. This frustrates institutions for CPR management. For example, in Makanya (WPLL) village leaders have, in some instances, reversed the rulings made by RWH committee to punish those who broke the established by-laws,
- vi) Poor linkage and/or contradiction of by-laws at different levels of administrative hierarchy, and
- vii) Poor linkage between local level plans, institutional and regulatory mechanisms with national policies and strategies. For example, national level requires DADPs preparation to be open and base on community participation. But in real situation, community participation is minimum because of financial constraints and general lack of commitment to accepting participatory planning approaches.

Effects of current institutional and regulatory mechanisms on access to runoff and related CPR by different target groups

Current institutional and regulatory mechanisms limit access to CPR. For example, in Maswa the rich have more access to runoff compared to the poor, and in WPLL marginal (youth, women and poor) have less access to runoff compared to powerful groups (elders, men and rich). Baseline levels of 2002 showed a high level of gender inequality in the composition of different CPR institutions. For example, in Tae (WPLL) and Bukangilija (Maswa) villages, women in CPR management committees constituted 23%, and 15% respectively (Annex B5).

Generally there is differential access to runoff between different farmer categories in RWH systems. The access levels were rated as adequate (adequate access above 67%), medium (Adequate access between 33 and 67%) and inadequate (adequate access below 33%). It was indicated that about 47% of elder farmers had access to adequate runoff compared to 42% of youth. This might be related to land tenure arrangement where by elder farmers have plots located close to the canals and youth more to the marginal land that have difficult in accessing runoff. It was further noted that about 46% of men had access to adequate runoff compared to 41% of women. Although the difference is not big this might be related to land tenure system where the tradition system gives men more access to land than women. The rich group had good access to runoff followed by medium and lastly the poor. However,

it was learnt that farm sizes had negative effect on access to runoff while number of plots, total fiscal transaction costs and non-compliances costs increased farmers access to runoff. Such results are indicating a general trend that weaker groups get little benefits from RWH systems although the differences were not significant (figure 4-9).

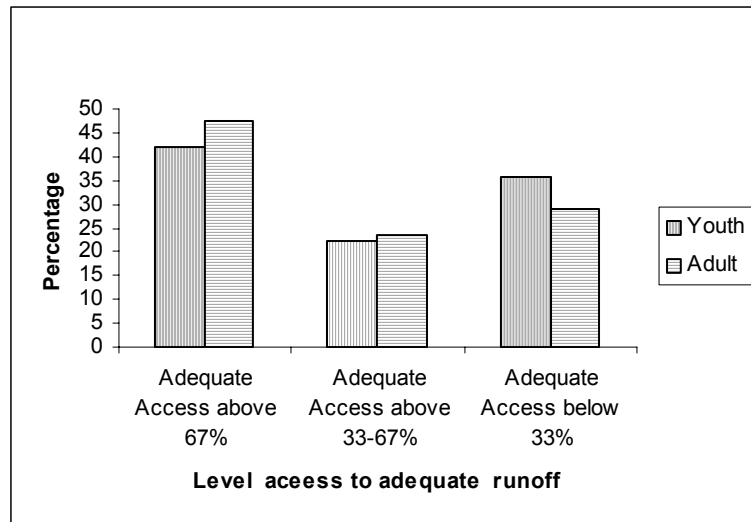


Figure 1: Access to runoff in RWH systems by age in WPLL

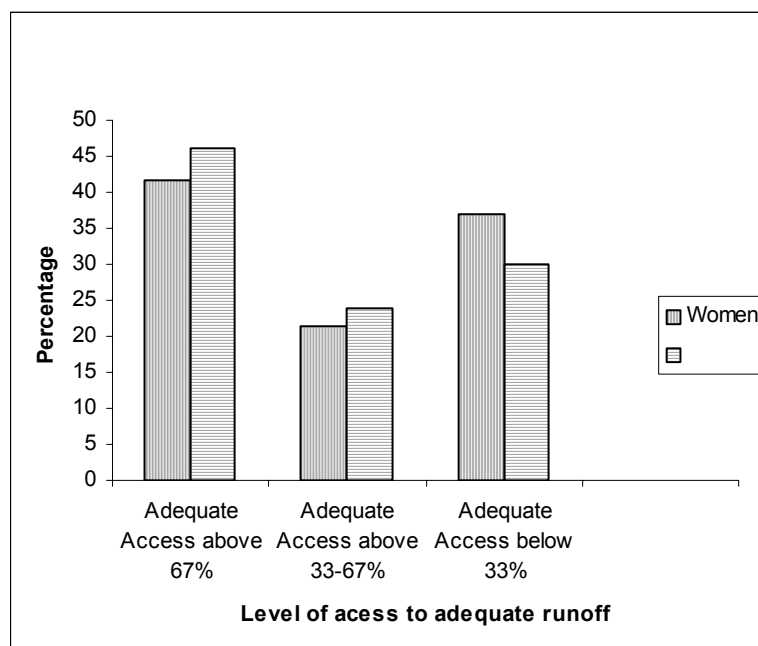


Figure 2: Access to runoff in RWH systems by sex in WPLL

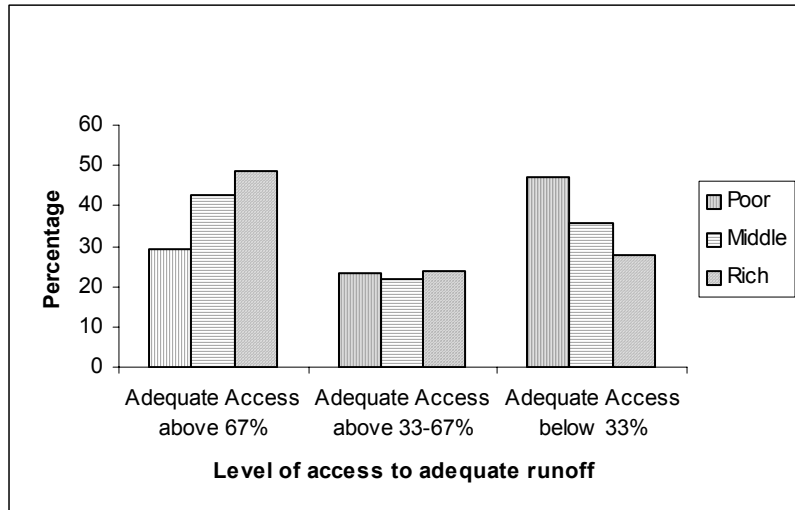


Figure 3: Access to runoff in RWH systems by wealth in WPLL

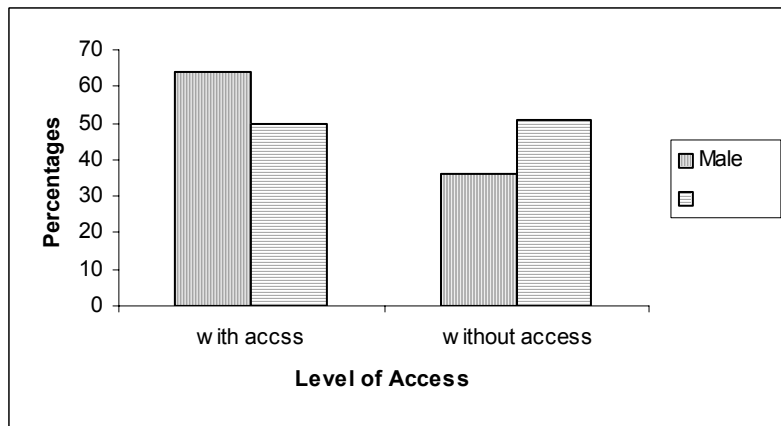


Figure 4: Access to runoff in RWH systems by sex in Maswa District

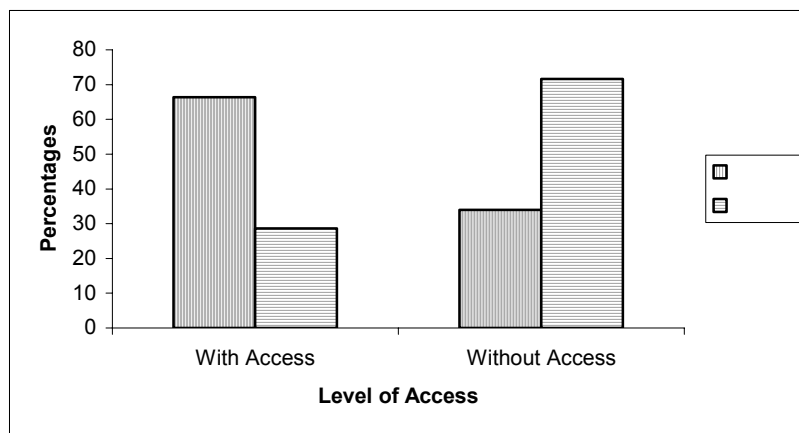


Figure 5: Access to runoff in RWH systems by age in Maswa District

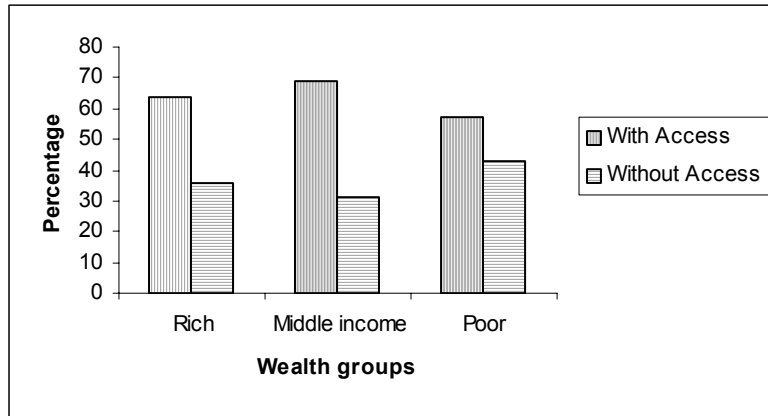


Figure 6: Access to runoff in RWH systems by wealth in Maswa District

Transaction Costs and Benefits in CPR Management

It was revealed that transaction costs for managing RWH systems are in both fiscal and time dimension. Individuals and communities incur transaction costs in planning for resource use, resource allocation, RWH system maintenance, policing/enforcement of regulations and conflicts management (Annex B14).

Comparison of amount incurred by different groups indicated that poor and politically weak incurred more transaction costs than the rich. Figures 7, 8 and 9 show such trend in WPLL.

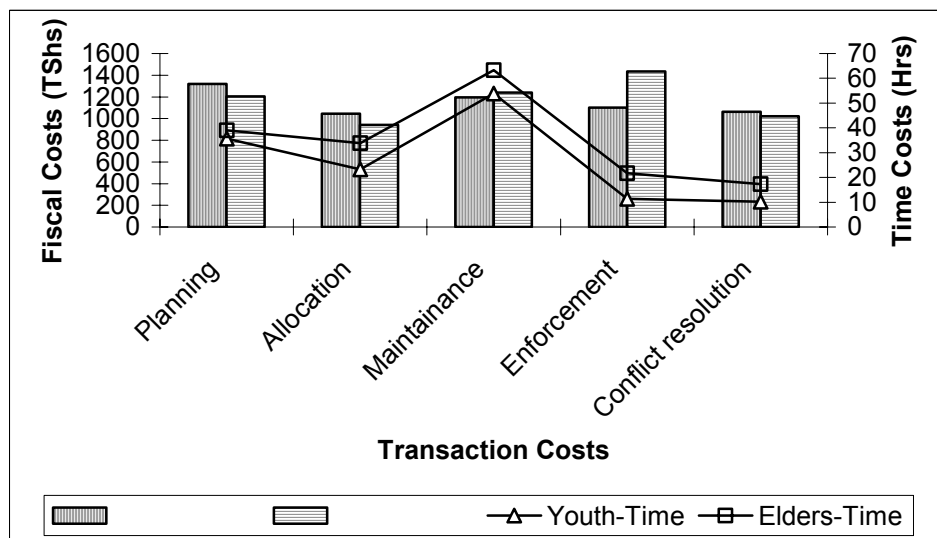


Figure 7: Transaction costs by age in WPLL

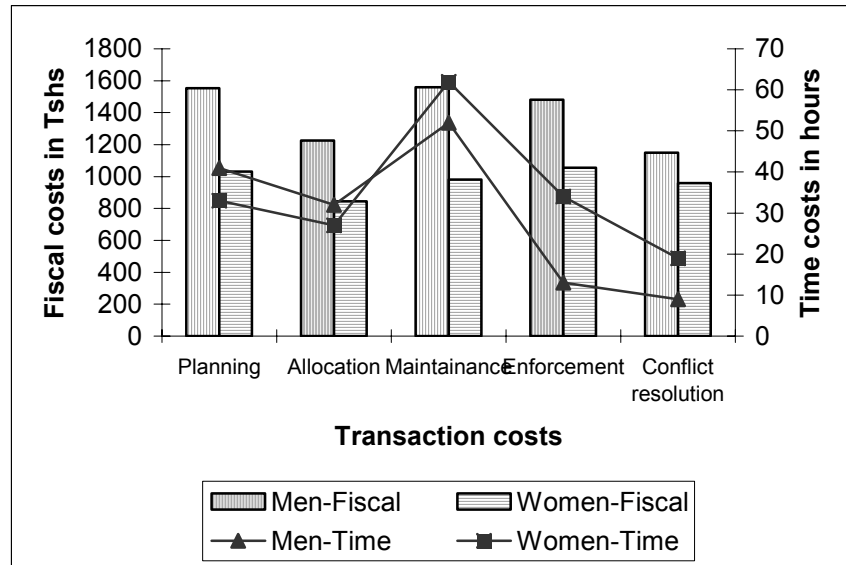


Figure 8: Transaction costs by sex in WPLL

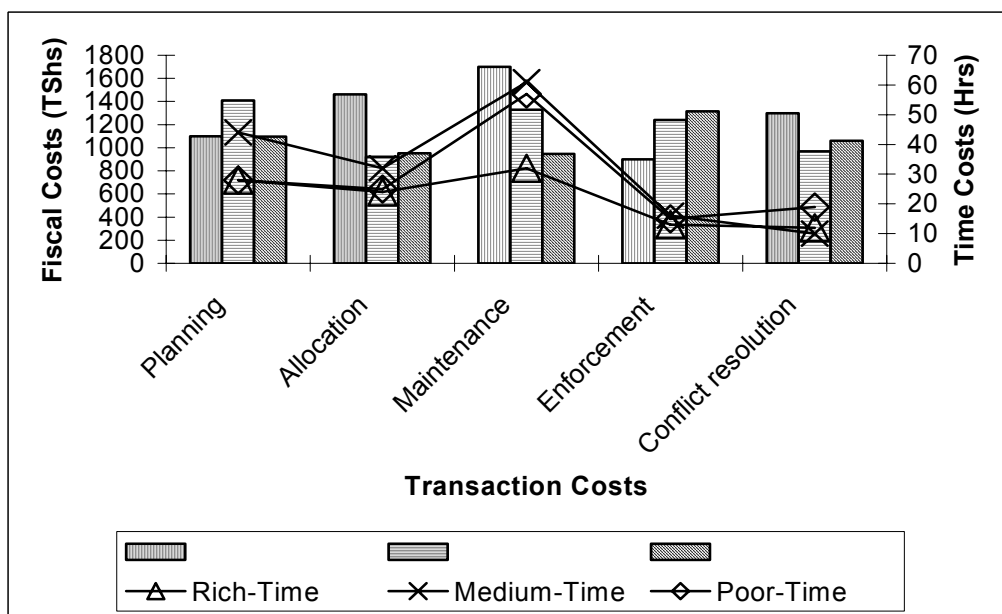


Figure 9: Transaction costs by wealth in WPLL

Comparison of transaction costs in monetary value by age (Table 2, Annex B14) showed that transaction costs related to law and regulation enforcement was higher ($p=0.01$) for elders than youths and total transaction per annum was statistically different ($p=0.1$) between youths and elders. This confirms that elderly farmer incurred higher transaction cost than youths.

Comparison of monetary value of transaction costs by wealth (table 6, Annex B14) showed that medium rich farmers incurred significantly more transaction costs for planning for runoff use than the poor ($p=0.05$). Again it was noted that transaction cost associated to RWH system maintenance was significantly higher to poor than the medium rich groups.

Proposed new or improved institutional and regulatory systems

Following institutional weaknesses identified in preceding sections, new or improved institutional and regulatory systems were proposed (Annex B10). In general, the proposal touched five areas:

- i) Formation of autonomous committees for land management in villages with sub committees for residential land development, agriculture land management and grazing land management,
- ii) Coordination between primary court and village government be improved,
- iii) Land use plans to demarcate grazing and agricultural land be prepared to reduce farmer vs pastoralists conflicts,
- iv) Contradictory by-laws, regulations, traditions and customs should be harmonised, and
- v) More representation of youth and women in leadership at all levels of administration.

It has, however, been observed that most of the decision makers do not respect rules agreed by local institutions. This includes court not respecting village by-laws, village leaders not respecting agreements by local institutions, e.g. committee for distributing runoff and individuals not abiding to village by-laws. To make sure that the proposed improvements are respected by the decision makers the following is proposed:

- Since court is the highly respected institution in the communities, all by-law should be recognised by the judicial system to make them effective
- Establishment of liaison judicially post at community level to create awareness and to advise the community during establishment of by-laws so as to remove possible contradiction with national laws

4.1.2 Approaches to tenure and management of CPR

Approaches to tenure and management of CPR entailed understanding of the spatial and temporal needs and access. Furthermore, it was necessary to get an understanding of the extent of land use conversion. The findings are presented in annex B6 and a summary provided in the following sub-sections.

Spatial and temporal needs, access, tenure and management of CPR

The spatial and temporal needs, access, tenure and management of CPR were assessed and the results showed that;

- i) Biophysical characteristics, production enterprise and group differentiation had influence on access to CPR.
- ii) Land ownership has tended to be a male and elder domain.
- iii) In WPLL agricultural land could be acquired mainly through inheritance and village government. On contrary, in Maswa District no agricultural land could be acquired through village government.
- iv) As opposed to WPLL, in Maswa District all grazing land is privately occupied. There is no common grazing land.

Extent of Land Use Conversion

The extent of conversion of land use was assessed and the findings are presented in Annex B6. In summary, the findings showed that, agricultural land has expanded over the 1980s – 2000s period in both study sites at the expense of other land uses/covers, including grazing land and woodlands.

The results also showed a relationship between land use conversion and toposequence of the Makanya River catchment. Agricultural land has expanded on the highlands. As a result, more runoff has been abstracted at the expense of lowland agriculture. In addition, more grazing land has been encroached through lateral expansion of agricultural land forcing livestock keepers to move further down.

In WPLL, the change detection analysis revealed that, between 1980s and 2000s, in Tae village (highland) 332 Ha of grazing land have been converted into agricultural land. Although the converted land is only 20% of the total agricultural land, it is 62% of the 1980s grazing land. In Mwembe village (middle land) 106 Ha has been converted from sisal estate and 171 Ha from conserved area to maize cultivation. On the contrary to Tae and Mwembe village, Makanya village (lowland) the area under cultivation has decreased. Land use change analysis indicated that 340 Ha (58%) of agricultural land has been converted to either fallow or grazing land as a result of decreased amount and frequency of runoff.

In Maswa District, results from analysis of temporal images (1985 and 2002), indicated that agricultural land has expanded in all the three study villages. Overall, 371 Ha (3%) of woodlands and 3560 Ha (28%) of fallow has been converted to agriculture. Focus group discussion revealed a conversion from cultivating drought resistant crops, e.g. sorghum, to paddy production as a result of wider adoption of RWH.

A number of factors were identified to be drivers for the observed land use conversions. The main factors included: population growth, lack of village land use plan, lack of institutions to manage resources at catchment level, non-compliance to existing by-laws supposed to restrict encroachment of the conserved areas including water sources and weak village leadership.

Current tenure and management approaches of CPR

Analysis of tenure and management approaches to CPR showed that in WPLL agricultural land could be acquired mainly through inheritance, purchasing, and renting and allocation by village government. For Maswa District, no agricultural land could be acquired through village government (Annex B6).

Spatial distribution of land tenure systems revealed that most of the suitable agricultural land (located close to water sources) could be acquired mainly through inheritance. This has resulted into only few people to access suitable land while the majority occupy marginal land. The current tenure and management for land does not provide equal opportunity among members of community to access land.

Some of the identified weaknesses in the current tenure and management approaches included:

- i) Acquisition of land through inheritance has restricted access to suitable agricultural land to few people. In Tae village, for example, arable land could be left fallow for a long period simply because it belongs to someone by inheritance who cannot put it into production for some reasons including old age,
- ii) The existing tradition and customs do not give room for the women to own land. This is because in most cases, inheritance is mainly patrilineal in character,
- iii) The findings also revealed that some people in the villages hoard a lot of land for grazing livestock while others have no access to land, and
- iv) There are no village land use plans.

Proposed approaches to tenure and management of CPR

The proposals for improvement of current tenure and management of CPR varied among the study villages. Most farmers in Maswa District had the opinion that the existing land tenure system has no problems since it has been practiced comfortably over the years, while in (WPLL), the system is perceived to be deficient. To rectify the situation, changes for improving tenure and management of CPR were recommended. After a debate the following approaches to tenure and management were agreed.

- i) Simplified procedure for acquiring land leases to farmers,
- ii) Water allocation should consider spatial and seasonal aspects, and
- iii) Capacity building on land policy and laws to local leadership and communities.

Other proposals are covered in the section on institutional and regulatory mechanism.

4.1.3 Guidelines for making CPR management plans

The process of developing guideline for CPR management involved collecting information and data for planning, an understanding of features of existing plans and communication and negotiation mechanism. Initial draft guideline was produced, piloted and refined.

Information and data for CPR management planning

Through discussion with farmers, the following minimum requirements of information and data for planning in relation to CPR management at community level were established and the extent and constraints of meeting these requirements assessed:

Information and data:

- i) Runoff generated from the catchment,
- ii) Amount of lands that can be supported by available water,
- iii) Alternative enterprises that the available water can be used for,
- iv) Water needs of up stream and down stream stakeholders,
- v) Infield water management techniques,
- vi) Existing CPR management institutions and their capacity,
- vii) Technical knowledge on designing of RWH infrastructures, and
- viii) Where to locate reserve pasture land ("*Mlimbiko*").

Constraints:

- i) Lack of committee responsible for water allocation at catchment level,
- ii) Lack of clear boundaries between agricultural land and pasture land,
- iii) Difficulties in enforcing agreed by-laws/penalties, and
- iv) Deficiency in know how.

Key features of plans at community to district level

Key features of plans at community to district level and how they are linked and influenced by national level policies and strategies were assessed. The findings are as summarised below:

- i) Except for Makanya and Mwembe villages, in all surveyed villages, no specific organs that are responsible for activities related to the use and management of village land were found. In both study sites there were also no committees responsible for preparation and implementation of catchment plans, and resolution of conflicts within the catchment.
- ii) In all the surveyed villages, the composition of committees for CPR management is skewed towards men. Women were less represented probably because of cultural barriers.
- iii) There was little integration between sectoral plans in different administrative levels. Although the link between the DADPs and ASDS is obvious, the DADP did not show strong linkage with other sector development plans. For example, the link with departments of land, water and forestry was not well articulated in the plans. It was obvious that the department of agriculture was not directly involved in the management of land and water resources in the districts. Nowhere has a link been made between these sectors in the preparation of the plans. It looks like every department sits and prepares its plans and submit them to the planning offices for compilation into district development plans. Failure to establish such links can make the implementation of DADP difficult and thus its goal cannot easily be achieved.
- iv) Generally, both WPLL and Maswa local level plans, institutional and regulatory mechanisms had poor linkage with the national policies, strategies and legislation.

Communication and negotiation mechanisms

Through a case study in WPLL involving the siting of a water reservoir for crop production, domestic and livestock water supply, the following was observed:

- i) Communication between different stakeholders is difficult. Makanya and Mgwasi representatives failed to reach a compromise on where to locate a water reservoir. Mgwasi village leadership rejected the location proposed by Makanya leadership because they would lose much of their land for agriculture and settlement.
- ii) Use of non-biased external party, as dialogue mediator, can be essential for ensuring common understanding among the stakeholders. After failure of having fruitful communication with Mgwasi leaderships, Makanya consulted SWMRG to become a mediator to rescue the dialogue from collapsing.
- iii) Negotiation mechanism is a forward and backward process. For example, it was previously agreed in joint village government meeting on June 2004 that suitable sites for reservoir projects were Kavengere and Sisamo because both Makanya and Mgwasi villages would benefit from the project. Later, sub village meetings and village assembly in Makanya refused the proposal.
- iv) There is a limit to both participatory and technical approaches. Whereas technical approach will be biased towards top-down approach, participatory methods assist in exposing the conflicts of interest without necessarily providing concrete answers to the problems. Combination of the two methods would be more useful.

Development, Piloting and Refining Planning Guidelines

The development and refining the planning guidelines was a continuous process which entailed several steps. It started with deskwork from which an initial draft guideline, referred to as a planning matrix, was produced (Appendix 1).

The key feature of the matrix is community participation. Testing of the planning matrix showed that modification were required in the following areas:

- i) Community participation: It was previously thought that feedback be sought from village assembly meetings. After piloting the guidelines it was noted that active community participation would be improved by soliciting feedback from sub village level.
- ii) Inclusion of scientific information is necessary for negotiating parties to have basis for making sound decisions.

During the development of guidelines, some key issues were observed:

- Participatory planning should start at low level of administrative units for wide and active participation,
- Negotiation between stakeholders needs a third party for mediation,
- Technical input is important in participatory planning,
- Participatory planning is time consuming and entails transaction costs, and
- Financial constraint (to do technical studies) can hinder or delay completion of the process of participatory planning.

4.1.4 Capacity of stakeholders in CPR management

Enhancing the capacity of stakeholders in CPR management entailed the following: i) identification of training needs, ii) development of communication products and iii) facilitation of training and awareness raising. The results are presented in the following sub-sections.

Training Needs

Training and information needs for comprehensive planning for CPR management were identified and are presented in Annex B7. Results indicated that planners and policy makers at District level need training in approaches for linking their plans and programmes with the requirements of national policies, strategies and legislations. Such policies and strategies include:

- i) National Agriculture and Livestock Policy (1997),
- ii) National Land Policy (1995)
- iii) Cooperatives Development Policy (1998),
- iv) Village Land Act No. 5 (1999)
- v) Agriculture Sector Development Strategy (ASDS 2003), and
- vi) Agriculture Sector Development Programme (ASDP 2004).

Furthermore, the stakeholders identified training needs in the participatory analysis and formulation of legal and regulatory mechanisms for managing runoff and related CPRs. At community level the most burning issues were:

- i) Equitable access to runoff and related CPR,
- ii) Prevention of conflicts, and
- iii) Approaches for reducing and mitigating the effects of conflicts arising from the use of runoff and other related CPR.

Communication Products

To meet some of the identified training needs, the following communication products were developed and produced.

Planning Guide

A leaflet on planning guide for development of small scale RWH project at catchment level was developed. The leaflet (Annex B15) introduces six steps (project identification, participatory project planning, initial feasibility study of the project, preparation of comprehensive plan, implementation and project monitoring and evaluation) to participatory planning. The leaflet is based on an experience from the process of developing a runoff reservoir project in Makanya River catchment (Annex B8). The process of developing the training materials is described fully in Annexes B9. The process was participatory and the most important outcomes have been the views of target users, on what aspects they would like to see contained in the guideline. A total of 16 feedback meetings were held and 663 people were consulted.

Maps in a form of posters

Two posters were produced and disseminated to all study villages and Districts. The posters depict information on agricultural land suitability and land use conversion (Annex B16)

RWH technologies in a form of cassettes, CDs and Radio Programmes (Gathering in the rain: communicating RWH in Tanzania and beyond)

The series "Gathering in the Rain" contains 4 programmes: Living in a dry place, harvesting the rain, communicating and succeeding and spreading the message. This was made by the BBC in collaboration with Sokoine University of Agriculture (SUA), the Natural Resources Systems Programme (NRSP) and the Natural Resources Institute of the University of Greenwich.

Training and awareness raising

A total of three trainings covering topics on assessment of spatial and temporal distribution of CPR: use of remote sensing and GIS and farm budget were implemented concurrently with participatory workshops.

The first training was conducted between 3rd and 5th June 2003 in Maswa District and involved 63 participants. The participants included District Extension Officers, local councillors, District Agricultural and Livestock Development Officer (DALDO) from Maswa, Subject Matter Specialist (irrigation, livestock, crops, natural resources and land use) and staff from Participatory Irrigation Development Project (PIDP). The workshop made several recommendations some of which include the following:

- Training should be given to people and to the various organizations through seminars, brochures, and workshops,
- Districts should work out and put in place participatory investment in RWH projects,
- There should be plans and policies that assure the availability of market and better price for agricultural crops and other agricultural/Livestock goods,
- There should be officially recognized institution(s)/organization to manage CPR at catchment level,

- There should be enforcement of by-laws and regulations that govern the management of CPR,
- There should be strategies for mitigating conflicts at all levels,
- The districts should launch an agricultural development trust fund,
- Information on water availability and the fertility status of soils should be made available and if possible geo-referenced.

The second training was conducted between 22nd and 25th September 2003 in Same District and involved 40 participants. The participants included District and village extension officers, local councillors, Ward Executive Officers, District Agricultural and Livestock Development Officer (DALDO) from Maswa, Subject Matter Specialist (irrigation, livestock, crops, natural resources and land use) and farmers. The workshop made several recommendations some of which include the following:

- Crop growers, livestock keepers and extension agents should be trained on simple and appropriate RWH technology,
- District councils should budget for RWH activities, ensure availability of inputs and consider subsidies in order to improve agriculture and livestock.,
- There should be in place a strategy that will enable agricultural extension agents to reach farmers,
- Wards and villages development plans should include strategies for conservation of environment,
- There should be strategies for sustainable protection and conservation of water sources, environment and rainwater/irrigation structures,
- Laws meant for management of common pool resources (water, land etc.) have to be amended to suit current situation,
- Build capacities of farmers on seeking markets for different crops
- Information has to be made available to farmers via radio, newspapers, leaflets, public meetings, seminars, workshops, and study tours for farmers, leaders and experts
- Groups of farmers, community development department and non-governmental organizations be trained on participatory approach in planning

The third training was conducted between 23rd to 24th October 2004 in Same District and involved 42 participants. The participants included District and village extension officers, local councillors, Ward Executive Officers, District Agricultural and Livestock Development Officer (DALDO) from Maswa, Subject Matter Specialist (irrigation, livestock, crops, natural resources and land use) and farmers. The most important issues discussed in the workshop include the following:

- i) Tenure and management approaches to CPR management: the participants proposed the following approaches to tenure and management:
 - Simplified procedure for acquiring land leases to farmers,
 - Water allocation should consider spatial and seasonal aspects, and
 - Capacity building to local leadership and communities on land policy and laws.

- ii) Institutional and regulatory mechanism: the participants proposed the following institutional and regulatory systems:
- Formation of autonomous committees for land management in villages with sub committees for residential land development, agriculture land management and grazing land management,
 - Coordination between primary court and village government be improved,
 - Land use plans to demarcate grazing and agricultural land be prepared to reduce farmer vs pastoralists conflicts,
 - Contradictory by-laws, regulations, traditions and customs should be harmonised, and
 - More representation of youth and women in leadership at all levels of administration.

4.2 Achievements

The project targeted four outputs, which are adequately achieved:

Output 1

- Areas needing new or improved by-laws were identified validated and recommended (Annex B12). For example, in WPLL, it was recommended that those by-laws, traditions and customs that have negative impacts on CPR management should be abolished.
- Representation of women and youth in CPR management committee at village level has improved.
- Formation of catchment level committee was recommended and implementation in some catchments started, e.g. Makanya
- Formation of autonomous committees for village land management was recommended and implementation started in some village, e.g. Mwembe.

Output 2

- Acceptable tenure and management approaches were recommended and implementation started. For example, agreement on equitable sharing of land and water resources were made in Tae village.

Output 3:

- Catchment-wide participatory planning process was initiated by the community in Makanya catchment. Based on this progress communities in the catchment area met, discussed and agreed that technical evaluation should be used as a basis for selecting a suitable site for constructing a storage reservoir. Although the site would have deprived some villages of their cropland, a win-win situation was reached whereby those who will be negatively affected (losing cropland) would be compensated by getting fields in the lowlands.
- Planning guidelines have been documented
- KSPs produced and distributed to Village, Ward and District in WPLL and Maswa Districts.

- However, testing and piloting the guideline was not accomplished. This is because subsequent stages had financial implications.

Output 4

- Awareness on the need for integration in CPR management has been raised
- Awareness on the need for increased participation of local communities and different social groups in CPR management raised
- Negotiation forum has been created in the catchments
- Negotiation skills has been improved

4.3 Things to be done to take the research findings forward

Facilitate development of land use plan to mitigate conflicts between farmers and livestock keepers

Experience has shown that where CPR management has been improved, land that was previously used for pasture is often converted into farmland and hence, cause unnecessary conflicts. The presence of a proper land use plan would recognize the requirements of the two sectors and equitably allocate land.

Facilitate harmonisation of resource user groups by-laws and those of village, and districts

Preparation of by-laws at different levels is done without adequate consultation among the relevant stakeholders. This creates a room for producing conflicting by-laws. To address the noted constraint, there is, therefore a need to engage key stakeholders in a participatory law-making process.

Capacity building on land policy and laws to local community

Most of the gaps identified in the area of land tenure at local level emanates from lack of knowledge on existing policies and legal frameworks on land by local peoples. The 1999 Land Act, for instance, addresses almost all the gender and related gaps noted at the village level in both study areas. There is a need therefore to create space for the villagers to be acquainted with the contents of the current policies and laws on land and empower them for implementation of such laws.

Tracking the use of developed KSPs on making plans for managing CPR

Having developed and distributed necessary KSPs is one thing but villagers can not benefit much from such initiatives without adopting the knowledge accrued from them and using it in the planning process. Monitoring the impact of KSPs on the livelihoods of the target groups is therefore a necessary follow up on improvement of management of CPR.

Piloting planning guideline

Piloting planning guideline should be continued through encouraging district councils to solicit funds for completion of the remaining stages of negotiating and concluding on the location of reservoir and formation of the catchment committee. The process of piloting planning guidelines is costly as it entails both technical and financial resources. The researchers have provided much of the required technical input but are constrained by lack of resources to do some required technical studies for which no budget was allocated. Since the task requires active involvement of the district council, there is need for continued cooperation with the council both in terms of soliciting funds and engaging in the remaining stages of piloting without which its promotion cannot be realized.

Promoting and tracking the guidelines in other catchments. The planning guidelines can function perfectly in the pilot area but to ascertain its efficiency and efficacy requires up-scaling to monitor its applicability in various socio-economic settings, in areas where communal land is limited. Makanya area where the piloting is done cannot be claimed to be a representative sample. The experience gained need to be shared in other districts to spread the accrued benefits and justify the costs incurred.

Facilitate resources-user groups (e.g. water-user groups) to register as Community Based Organization (CBO) or association. Most village-based resource-user groups are very informal and are not recognised by legal entities. Their present status is a constraint in that the groups are not recognized as authentic partners in managing CPR nor are they accessing available support from the government. Registration status will give them legal status and associated benefits such as technical support.

Facilitate development of low cost, effective and efficient technologies to minimize transaction costs of managing RWH systems. RWH system currently existing need technological improvements for runoff easy management and runoff distribution.

4.4 Research products

The research products were mostly communicational, and included: Planning Guide, maps and technological packages (BBC radio program and cassette: "gathering in the rain"), which have already been reported under section 4.1.4. Others include scientific papers which are listed hereunder:

Mutabazi, K., E. Senkondo, B. Mbilinyi, S. Tumbo, H. Mahoo and N. Hatibu. (2005) *Economics of RWH for crop enterprises in semi-arid areas. The case of Makanya watershed in Pangani basin, Tanzania.* Proceedings of East Africa River Basin Management Conference, 7-9 March 2005, Morogoro.

Mutabazi, K., E. Senkondo, B. Koda, N. Hatibu, B. Mbilinyi, F. Rwehumbiza, and H. Mahoo (2005). *Land productivity in Semiarid Areas by Reducing Water Supply Risk and Linking Farmers to Profitable Markets.* Proceedings of Soil Science Society of East Africa, 29th November to 3rd of December 2004, Arusha Tanzania.

Senkondo E., K. Mutabazi, N. Hatibu and A. Msangi (2004). *Micro-level determinants of poverty in semi-arid areas. Is RWH a critical factor?* SEARNET Conference, 29 Nov to 3rd of December 2004, Gaborone, Botswana.

N. Hatibu ; K. Mutabazi; E. M. Senkondo and A.S.K. Msangi (2004), *Economics of Rainwater Harvesting for Crop Enterprises in Semi-Arid Areas of East Africa.* Proceedings of the 4th International Crop Science Congress, 26 Sep – 1 Oct 2004, Brisbane, Australia.

Msangi, ASK, EM Senkondo, E. Lazaro, KM Mutabazi and N Hatibu (2005) *Transaction Costs of Rainwater Harvesting System Management and their Effects on Access to Runoff Resource.* Proceedings of East Africa River Basin Management, 7 - 9 March 2005, Morogoro, Tanzania.

4.5 Promotion of products

Most of the research products were directed to users or associations of target beneficiaries which included: District and village extension officers, local councillors, Ward Executive Officers, District Agricultural and Livestock Development Officers, Subject Matter Specialist (irrigation, livestock, crops, natural resources and land use), NGOs and farmers. Dissemination and promotion of the products was achieved through workshops, focus group discussions, training and awareness raising sessions and physical distribution of the maps, cassettes, CDs and leaflets. Furthermore, target groups were involved in the research process including the development and pre-testing of the communication products.

5. Research Activities

The activities undertaken in this project were aimed at achieving the four outputs: (1) to recommend aspects of institutional and regulatory system requiring improvement to facilitate equitable access to runoff and related CPR in rainwater harvesting systems, (2) to identify, verify and promote tenure and management approaches that enhance equitable access to CPR affected by rainwater harvesting, by different stakeholders and the environment, (3) to develop and promote guidelines for use by District Councils, Wards, Villages and Communities in making CPR management plans that protect the interest of the poor while ensuring optimum and sustainable benefits to the communities using rainwater harvesting systems and (4) to enhance capacity of stakeholders to plan, negotiate and implement/enforce institutional, regulatory and management systems for CPR, in a way that protect the interests of the poor .

5.1 Activities 1.1 to 1.5 for Output 1

Five activities were implemented in order to achieve this output. These included: refining local criteria for identifying groups of the poor, identifying key features of the existing institutional and regulatory mechanisms for CPR, assessing how the current institutional and regulatory mechanisms facilitate or limit access by different target groups, assessing transaction costs and benefits to different groups in CPR management and proposing new or improved institutional and regulatory systems.

Refining local criteria for identifying groups of the poor

The process of identifying groups of the poor involved three steps, which were identification of broad socio economic groups, developing criteria for each group and ranking individuals into different wealth groups. These are described in details in the following sub-sections:

Identification of broad social economic groups involved participatory workshops with key informants including divisional and ward leaders, community development officers, village leaders, opinion leaders and representative of NGOs. During these workshop(s), the research team provided briefing on the findings of previous research in the area and introduced the project current (R8116). During the workshop informants listed different CPR associated to runoff and different groups whose livelihoods depend on such CPR.

Developing ranking criteria was accomplished through participatory approaches that brought together researchers and stakeholders. It involved conducting separate focused group discussions with key informants from each of the identified groups of the poor. Participant from each group proposed, discussed and agreed on criteria for differentiating individuals into distinct poverty groups.

Ranking individuals was done for each village. Hamlet registers were prepared which included all households in the hamlet. People who believed to have a wide knowledge about the livelihoods of the hamlet residents were identified and asked to group all households into the broad social groups based on livelihood options and CPR they depend on and then ranked the whole population into poverty group using developed local criteria. The output was lists of individuals in different wealth groups in study village.

Identifying key features of the existing institutional and regulatory mechanisms for CPR

Key features of institutions studied were membership composition of organs responsible for CPR management and integration in CPR management plans. The process involved: identification of CPR management committees, obtaining lists of members to each committee in the study villages and assessing the composition by sex, age (youth vs elders) and wealth categories (rich vs, poor).

The research team collected and analysed secondary data particularly grey literature (reports, minutes of different meetings and plans) from village, ward and Districts. From the collected documents the team assessed integration in sectoral plans and their compatibility with national strategies, policy and legal procedures.

Two participatory workshops were organized, one in Maswa District and another in WPLL, to capture undocumented rules and procedures and identify weaknesses in the existing organs and propose new or improved institutional and regulatory mechanism. The participants included ward Councillors, District Executive Director, District Agricultural and Livestock Officers (DALDO), local NGOs, and farmers from the study villages.

Assessment of transaction costs and benefits in CPR management

Transaction costs of managing RWH were studied using participatory approaches (focus group discussions (FGD) and key informant meetings) and questionnaire survey. FGD and key informant meetings were conducted to identify major transaction costs of managing RWH systems. The process involved

- Listing transaction costs,
- Grouping transaction costs and
- Ranking transaction costs.

Questionnaire survey was conducted in two rounds. First round involved administering questionnaire on CPR management (Annex B3) to 1196 households (596 in WPLL and 600 in Maswa), while second round involved administering questionnaire on transaction costs to 378 households in WPLL (Annex B4).

Measuring transaction costs

Transaction costs were in fiscal and time dimensions. Direct fiscal costs and time spent in attending different transaction activities. Transaction costs were split into planning for resource use, resources allocation, RWH system maintenance, policing and enforcing resources agreement, rule and by laws and conflict management were calculated by summing up all costs per activity. The approach was adapted from that of Rutherford, (2000).

5.2 Activities 2.1 to 2.4 for Output 2

Three activities were implemented in order to achieve output 2. These included: the spatial and temporal needs, access, tenure and management of CPR, assessing the extent of conversion of land use and identifying acceptable approaches to tenure and management of CPR related to RWH.

Assessment of land use conversions

In order to locate and quantify land use changes (e.g. from grazing to cultivation or vice versa) that had occurred between 1980s and 2000s in both runoff producing and runoff receiving areas, a combination of participatory and non-participatory approaches was used. Participatory techniques included key informant interviews and field visits, while non-participatory approaches included analysis of temporal remotely sensed data and GIS techniques.

Key informants, with knowledge in the community's history, were identified and asked to locate (on a timeline as well as on the ground) land use changes, particularly expansion/reduction of agricultural and grazing land, in their villages. Each informant was then asked to draw sketch maps depicting the changes. The informants were also asked to map changes in runoff amount and frequency.

After the discussions the team, i.e. researchers and key informants, visited the area to observe, confirm and map the location and distribution of the identified land use changes. GPS, transect walks, and topographic maps (1:50,000 scale) were used to facilitate mapping. The information was later used to refine the interpretation of remotely sensed data.

Using Erdas Imagine software, temporal remotely sensed data i.e. aerial photographs (1:50,000 scale of 1990 for Maswa District and 1:30,000 scale of 1988 for WPLL) and Landsat TM images (Landsat TM_167-063 of 1984 and 1997 for WPLL and Landsat TM_170-062 of 1985 and 2002 for Maswa District), were enhanced and then visually interpreted to extract past and present land covers/uses in the study area(s). Participatory maps produced during key informant interviews were used to guide the interpretation. A change detection analysis was then performed to locate and quantify land cover/use changes both on runoff producing and runoff receiving areas.

Identification of acceptable approaches to tenure and management of CPR

In order to get ideas and opinions on acceptable approaches to tenure and management of CPR, two participatory workshops were conducted one in Maswa and another in Same District (Annex B9 and Annex B10). These were followed by in-depth group discussion complemented by key informant interviews in the target villages (Annex B13). The following were explored:

- Existing approaches to tenure,
- Current approaches to the management of CPR,
- What should be done to improve the use and management of CPR related to RWH?, and
- How do people respond to the activities concerning the management of CPR related to RWH in this area?

The discussion was facilitated in such a way that the ideas of each person in the group were considered, synthesized and recorded. Systematically, after one question being fully answered by the participants, another question was introduced. At the end of the discussion, each member was requested by the facilitator to give his/her comments.

5.3 Activities 3.1 to 3.4 for Output 3

Four activities were implemented in order to achieve this output. These include: establishing minimum requirements of information and data for planning CPR management, assessing key features of plans at community to district level, evaluating the communication and negotiation mechanisms and propose aspects for improvement and develop, pilot and refine planning guidelines.

Establishing information and data requirements for planning CPR management

Information and data were obtained from discussions with farmers, extension staff, policy makers and implementers and researchers in workshops, seminars and training sessions conducted in Maswa district and WPLL. Thereafter, focus group discussions (FGD) were conducted in both catchments. The FGDs were conducted in all the target villages namely Isulilo, Njiapanda and Bukangilija (Maswa district) and Tae, Mwembe and Makanya (WPLL). The FGD participants were selected through village leadership. Groups of six to eight participants discussed various topics related to CPR management for about two to three hours under the facilitation of a researcher. During the discussions the researcher introduced the topics and guided the discussions and each participant was given an opportunity to contribute in the discussions equally.

Assessing key features of plans at community to district level

Gray literature on plans for CPR management at local and district level were collected and analysed to compare their compatibility and legality with national policies and strategies. The information was collected to answer the following basic questions:

- i) What are the existing local level institutions, regulatory mechanisms and plans for CPR management?
- ii) To what extent did district plans contain comprehensive components for integrated management of CPR?
- iii) To what extent did the existing local level institutional, regulatory mechanisms and plans were linked to national policies, strategies and legislation?

Evaluating the communication and negotiation mechanisms and propose aspects for improvement and develop

This activity was implemented through a case study in WPLL (Makanya and Mgwasi villages) involving the siting of a water reservoir for crop production, domestic and livestock water supply. This was done through individual joint village governments meeting, sub village meetings, village assemblies, consultation with Mohamed Enterprise Sisal Estate and Tanzania Railway Cooperation in Makanya village and feed back meeting at Ward level.

Piloting and refining planning guidelines.

The development and refining the planning guidelines was a continuous process. A draft planning matrix was prepared using data and information from literature. The draft was used in the case study described above (Makanya-Mgwasi reservoir siting). Through this process it was piloted/tested and later refined/improved accordingly.

5.4 Activities 4.1 to 4.4 for Output 4

Three activities were implemented in order to achieve this output. These include: identifying needs for training and awareness raising, developing communication products and training and awareness raising.

Identifying needs for training and awareness raising

The activity was carried out using consultative meetings at different levels as summarised below and detailed in Annex B7.

- A meeting with District Executive Directors, Agricultural and Livestock Development Officers, Extension Officers from Same, Mwanza and Maswa District,
- Consultative meetings with leaders and farmers at ward levels. This was done specifically in Same District,
- A meeting with representatives of river basin management stakeholders. Information was also gathered from other basin-wide dialogue workshops organized by other organizations for the Pangani Basin, and
- A consultative meeting with policy makers and planners from Mwanza and Same Districts was held in Moshi, as part of wider consultation on up-take products for NRSP supported projects under SWMRG.

Developing communication products

The development of the communication products was done with full participation of stakeholders. This was done through workshops whereby stakeholders identified the products. For example, stakeholders in Same workshop (22nd – 25th September 2003) identified information pertaining to rainwater harvesting, fertilizer use, rainwater loss and ownership of common pool resource to be produced as communication products (Annex B10). This was followed by designing and producing the products by the research team. The products were later distributed to stakeholders for feedback.

Training and awareness raising

This activity was implemented through workshops. A total of three workshops were held in Same and Maswa Districts. In Maswa, the training was conducted between 3rd and 5th June 2003 and was attended by 63 participants. The participants included District extension officers, local councillors, District Agricultural and Livestock Development Officer (DALDO) from Maswa, Subject Matter Specialist (irrigation, livestock, crops, natural resources and land use) and staff from Participatory Irrigation Development Project (PIDP). In Same, two trainings were held and were attended by 40 and 42 participants, respectively. In both trainings participants included District and village extension officers, local councillors, Ward Executive Officers, District Agricultural and Livestock Development Officer (DALDO) from Maswa, Subject Matter Specialist (irrigation, livestock, crops, natural resources and land use) and farmers.

6. Environmental Assessment

6.1 Environmental Impacts from the Research Activities

Uncontrolled runoff is known to cause erosion in the upper catchment and flooding in the lowlands. Through implementation of the project activities therefore, positive environmental impacts are expected through better management of runoff and land resources. Furthermore, the increase in the number of farmers practicing RWH is expected to reduce 'fugitive' runoff and hence reduce soil erosion and sedimentation in water bodies. However, when infield methods for control of runoff are not well planned it may cause over harvesting that may result in sand deposition in farm fields.

6.2 Potential Environmental Impacts of Dissemination and Application of Research Findings

Widespread use of integrated management of CPR may result into mitigating flooding in the lowlands.

6.3 Evidence of what is Described in 6.2

None

6.4 Recommended Follow up Actions

None

7. Contribution of Outputs

7.1 Contribution of Project Outputs Towards NRSP's Purpose

The NRSP purpose aimed at delivering new knowledge that enables poor people who are largely dependent on the NR base to improve their livelihoods. The project contributed towards this purpose through (i) recommending aspects of institutional and regulatory system requiring improvement to facilitate equitable access to runoff and related CPR in rainwater harvesting systems, (ii) identifying, verifying and promoting tenure and management approaches that enhance equitable access to CPR affected by rainwater harvesting, by different stakeholders and the environment, (iii) developing and promoting guidelines for use by District Councils, Wards, Villages and Communities in making CPR management plans that protect the interest of the poor while ensuring optimum and sustainable benefits to the communities using rainwater harvesting systems and (iv) enhancing capacity of stakeholders to plan, negotiate and implement institutional, regulatory and management systems for CPR, in a way that protect the interests of the poor

Most of the targets set for the project were adequately achieved. Implementation of project activities enabled communities to identify necessary improvements in institutional and regulatory systems. These included formation of independent committees for land management that would have sub committees for residential, agricultural and grazing land; improved coordination between primary court and village government, village land use plans to demarcate grazing and agricultural land; abolish contradictory by-laws, regulations, traditions and customs on that affect CPR management and lastly improve representation of youth and women in leadership at all levels of administration. Some of the above proposals have been implemented. For example, independent committees for village land management have been formed in Mwembe village and land survey for preparation of village land use plan is complete. Key stakeholders (especially the relatively poor and politically weak) are now adequately represented in planning committees compared to baseline levels of 2002. The results from M&E study indicate, for example, that there is 11% increase in the number of women and 102% in the number of young people represented on institutions responsible for CPR management.

In West Pare Low Lands (WPLL), stakeholders in the project villages have realized the need to review and change their tenure and management approaches. Proposed acceptable approaches included: simplifying procedure for acquiring land leases by farmers; water allocation should consider spatial and seasonal aspect; and capacity building of local leadership and communities on land policy and laws. In Tae, agreement for equitable sharing of land and runoff resources among villagers has been reached and approved by village general assembly. Villagers have agreed to cultivate close to each other during the dry season in order to reduce water losses, and to amend the by-laws governing access to runoff water. The agreement also requires landlords with idle pieces of land to rent it out to the land less.

The planning guide for developing small scale RWH projects at catchment level designed and developed with stakeholders input has six steps: project identification, participatory project planning, initial feasibility study of the project, preparation of comprehensive plan, implementation and project monitoring and evaluation. Piloting the guideline has enabled formation of gender balanced runoff management committees at watershed level in WPLL. It was noted that during developing and piloting the guidelines technical inputs and financial support are important and critical for successful implementation. District Agricultural Development Programs (DADPs) in Maswa now contain ex-ante analysis and economic benefits to justify programme activities in RWH. Integrated watershed management planning guidelines have been prepared and are now available at different levels, from community to District. These have been piloted in both WPLL and Maswa District.

Through implementation of the project, Maswa, Same and Mwanga District Councils have managed to attract RWH developmental projects. This includes construction of Chaco dams (Same and Mwanga), diversion wears (Maswa) and sub-surface tanks (Same) for both livestock and crop production. Furthermore, RELMA (Regional Land Management), SEARNET (Southern and Eastern Africa RWH Network), and SWMRG in collaboration with Global Water Partnership (GWP) are planning major developmental intervention in WPLL on improvement and up scaling of RWH activities.

7.2 Attainment of OVIs at Purpose Level

OVI 1: *By May 2004, district programmes such as District Agricultural Development Programmes (DADP) for implementing national level policies in target districts contain a comprehensive component for integrated management of CPR.*

District Agricultural Development Programmes are the major plans for implementing strategies on CPR management. Implementation of project activities enabled the inclusion of CPR management issues into the DADPs. For example, the key features in the current DADPs for Same and Mwanga include improved land and environmental conservation, identifying potential areas for expansion of irrigated agriculture, establishment of links between District councils, NGOs, government and institutions that provide services to farmers, adoption of RWH technologies, solving conflicts between farmers and livestock keepers through dialogue and encouraging village to prepare land use plans that show agricultural and pasture land.

OVI 2: *By December 2004, Integrated Watershed Management Plans for improving equitable access to runoff water and associated land initiated and developed at grass roots level in at least two watersheds, in at least two districts.*

Integrated Watershed Management aims at promoting a co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

Through a case study in WPLL, involving the siting of a water reservoir for crop production, domestic and livestock water supply, an integrated plan was developed for the Makanya River catchment. In the process of developing the plan various stakeholders were involved. They include: (i) communities from Makanya (lowlands), Mgwasi (middle) and Vudee (upper catchment) villages, (ii). sectors including crop growers, livestock keepers, researchers from SWMRG, extension officers, Zonal Irrigation Office (Moshi), Mohamed Enterprise Sisal Estate and Tanzania Railway Cooperation. (iii) policy makers including the Minister for Agriculture and Food Security, Member of Parliament for Same West Constituency, District Commissioner for Moshi and local councillors.

OVI 3: *By 2005, areas or aspects that require new or improved by-laws or regulations have been identified and approved by the District Council in at least one target district.*

Areas that required new or improved by-laws or regulations were identified in Same District, WPLL. The identified areas include coordination between primary court and village government and harmonisation of contradictory by-laws, regulations, traditions and customs. It was further recommended that an autonomous committee for land management in villages with sub committees for residential land, agriculture land and grazing land should be formed, water allocation should consider spatial and seasonal aspects, land use plans to demarcate grazing and agricultural land be prepared and representation of youth, and women in leadership at all levels of administration increased.

Experience showed that to effect changes to existing by-laws/regulation or to draft new ones takes time. The process requires the new by-laws to be discussed and agreed by the village government from where it is forwarded for approval or otherwise by the Ward Development Council (WDC). If approved, it is forwarded to District Council for approval or otherwise. If approved, it is forwarded to the Ministry of Regional Administration and Local Government for approval.

8. Publication and other communications materials

8.1 Books and book chapters

None

8.2 Journal articles

8.2.1 *Peer reviewed and published*

None

8.2.2 *Pending publication (in press)*

None

8.2.3 *Drafted*

None

8.3 Institutional Report Series

None

8.4 Symposium, conference, workshop papers and posters

Mutabazi, K., E. Senkondo, B. Mbilinyi, S. Tumbo, H. Mahoo and N. Hatibu. (2005) *Economics of RWH for crop enterprises in semi-arid areas. The case of Makanya watershed in Pangani basin, Tanzania.* Proceedings of East Africa River Basin Management Conference, 7-9 March 2005, Morogoro.

Mutabazi, K., E. Senkondo, B. Koda, N. Hatibu, B. Mbilinyi, F. Rwehumbiza, and H. Mahoo (2005). *Land productivity in Semiarid Areas by Reducing Water Supply Risk and Linking Farmers to Profitable Markets.* Proceedings of Soil Science Society of East Africa, 29th November to 3rd of December 2004, Arusha Tanzania.

Senkondo E., K. Mutabazi, N. Hatibu and A. Msangi (2004). *Micro-level determinants of poverty in semi-arid areas. Is RWH a critical factor?* SEARNET Conference, 29 Nov to 3rd of December 2004, Gaborone, Botswana.

N. Hatibu ; K. Mutabazi; E. M. Senkondo and A.S.K. Msangi (2004), *Economics of Rainwater Harvesting for Crop Enterprises in Semi-Arid Areas of East Africa.* Proceedings of the 4th International Crop Science Congress, 26 Sep – 1 Oct 2004, Brisbane, Australia.

Msangi, ASK, EM Senkondo, E. Lazaro, KM Mutabazi and N Hatibu (2005) *Transaction Costs of Rainwater Harvesting System Management and their Effects on Access to Runoff Resource.* Proceedings of East Africa River Basin Management, 7 - 9 March 2005, Morogoro, Tanzania.

8.5 Newsletter articles

None

8.6 Academic theses

None

8.7 Extension-oriented leaflets, brochures and posters

- Soil Water Management Group (SWMRG) (2004). Map on “Mabadiliko ya Matumizi ya Ardhi Wilayani Maswa na Ubora wa Ardhi ya Kilimo Kijiji cha Makanya, Same”.

8.8 Manuals and guidelines

- SWMRG (2005) *Planning Guide for Development of Small Scale RWH Project at Catchment Level*.

8.9 Media presentations

- BBC (2003). *Gathering in the Rain: communicating RWH in Tanzania and beyond*. BBC Radio programme. (Cassettes and CDs).

8.10 Reports and data records

8.10.1 Project technical reports

- SWMRG (2003). *Methodology Manual*. 22pp
- SWMRG (2003). *Local Criteria for Identifying Groups of the Poor in Western Pare Lowlands and Maswa District, Tanzania*. 33pp
- SWMRG (2003). *Main Questionnaire*. 15pp
- SWMRG (2004). *Questionnaire on Transaction Costs in Common Pool Resources Management*: 14pp
- SWMRG (2003). *Key Features of the Existing Institutions for Managing CPR in Western Pare Lowlands and Maswa Districts, Tanzania*. 10pp
- SWMRG (2004). *Mapping Suitability of Common Pool Resources, Land Tenure Systems and Land Use Conversion: A Combination of GIS and Participatory Approaches*. 35pp
- SWMRG (2004). *Catchment Level Participatory Planning: A Case Study of Runoff Reservoir Project in Makanya Catchment, Western Pare Lowlands, Tanzania*. 25pp
- SWMRG (2004). WARSHA JUU YA KUBORESHA MIPANGO, USIMAMIZI, KANUNI NA MIKAKATI YA UVUNAJI MAJI YA MVUA. Maswa, 3rd – 5th June, 2003.
- SWMRG (2004). WARSHA JUU YA KUBORESHA MIPANGO, USIMAMIZI, KANUNI NA MIKAKATI YA UVUNAJI MAJI YA MVUA. Same, 22nd – 25th June 2003.
- SWMRG (2004). *Stakeholders’ Workshop on Improving Management of Common Pool Resources in Rainwater Harvesting*. 19pp
- SWMRG (2004). *Institutions, regulatory mechanisms and Plans, for CPR Management at local level and their compatibility with legality under national policies and legislation*. 43 pp.
- SWMRG (2004). *Acceptable Approaches to Tenure and Management of Common Pool Resources in WPLL and Maswa District*. 25pp
- SWMRG (2004). *transaction Costs in Management of Common Pool Resources in RWH Systems in WPLL and Maswa District*.
- SWMRG (2004). *Mwongozo wa Kupanga Mipango ya Matumizi ya Rasilimali Changia*. 2pp
- SWMRG (2004). *Mabadiliko ya Matumizi ya Ardhi Wilayani Maswa na Ubora wa Ardhi ya Kilimo Kijiji cha Makanya, Same*. 2pp

8.10.2 Literature reviews

None

8.10.3 Scoping studies

None

8.10.4 Datasets

None

8.10.5 Project web site, and/or other project related web addresses

<http://eng.suanet.ac.tz/swmrg/>

9. References cited in the report, sections 1-7

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- Falconer(2000). Farm-Level Constraints on Agri-Environmental Scheme Participation: A Transactional Perspective. Journal of Rural Studies, Pg. 379-394
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- Lovett J., H. Kiwasila, S Stevenson, N. Pallangyo, C. Muganga, and C. Quinn (2001). Review of Common Pool Resources in Tanzania. Draft Final Technical Report Prepared for NRSP Project R7857. Centre for Ecology, Law and Policy, University of York.
- National Bureau of Statistics (NBS) (2001) District Integrated Agricultural Survey: Kilimanjaro Report, Dar es Salaam, Tanzania
- United Republic of Tanzania (URT) (2001). Agricultural Sector Development Strategy. Ministry of Agriculture, Dar-es-Salaam.

10. Project Logframe

Narrative summary	Objectively verifiable indicators	Means of verification	Important assumptions
Goal			
SA Output 1 Strategies that can improve the livelihoods of the poor living in semi-arid areas through improved integrated management of natural resources under varying tenure systems developed and promoted	By 2002, livelihood strategies of poor individuals, households and communities and the nature of their dependence on the NR base, including the relative importance of access to common pool resources, in target areas in at least 2 target countries, understood By 2005, strategies for improving the livelihoods of poor people, by increasing the productivity of water in rainfed agriculture, through the use of appropriate rainwater harvesting and/or soil nutrient management practices, developed and promoted in target areas in at least two target countries	Reviews by programme manager Reports of research team and collaborating /target institutions	

	By 2005, strategies that improve access to common pool resources by the poor under the most appropriate tenure and management regime identified, tested and promoted in at least one target area in each of 2 target countries		
Purpose			
Strategies to improve livelihoods of specific groups of the poor through improved integrated management of CPR Developed and Promoted	By May 2004, district programmes such as District Agricultural Development Programmes (DADP) for implementing national level policies (e.g. PRSP ³ , RDS ⁴ , ASDS ⁵ , Land Act and Water Policy) in target districts contain a comprehensive component for integrated management of CPR. By December 2004, Integrated Watershed Management Plans for improving equitable access to runoff water and associated land initiated and developed at grass roots level in at least two watersheds, in at least two districts. By 2005, areas or aspects that require new or improved by-laws or regulations have been identified and approved by the District Council in at least one target district.	Approved DADP Documents Community or watershed plans as submitted to Ward office Minutes of resolutions of District Councils	The RDS are implemented as planned to create an enabling environment for target beneficiaries to adopt and use strategies and/or approaches Districts are made accountable to meeting their targets for poverty reduction as specified in the PRSP
Outputs			
i) Aspects of institutional and regulatory system requiring improvement to facilitate equitable access to runoff and related CPR in rainwater harvesting systems, Recommended	1. By March 2004, agreements have been reached at all levels regarding the need for new or revision of by-laws governing access to RWH related CPR	Records of meetings at grassroots, Village, Ward and District levels.	Local institutions are well facilitated to play their roles
ii) Tenure and management approaches that enhance equitable access to CPR affected by rainwater harvesting, by different stakeholders and the environment, Identified, Verified and Promoted.	2.1 By March 2004, resource users have agreed on areas for improving tenure and management of CPR affecting or affected by rainwater harvesting, in at least two watersheds in at least two districts 2.2 By September 2004, draft documents of the agreed arrangements for tenure and management of CPR, produced in at least two watersheds in at least two districts	Records kept at Village and Ward Offices Project reports	
iii) Guidelines for use by District Councils, Wards, Villages and Communities in making CPR management plans that protect the interest of the poor while ensuring optimum and sustainable benefits to the communities using rainwater harvesting systems, Developed and Promoted	3.1 By September 2003, stakeholders at different levels, from community to district level have participated in the preparation of planning guidelines 3.2 By December 2003, planning guidelines have been documented and are available at different levels from community to district 3.3 By June 2004, the planning guidelines have been piloted in at least 3 watersheds/communities and revised/refined accordingly	Planning guidelines, December 2003 version and further iteration (post-pilot phase) Minutes of relevant committees adopting the guidelines	
iv) Capacity of stakeholders to plan, negotiate and implement/enforce institutional, regulatory and management systems for CPR, in a way that protect the interests of the poor, Enhanced.	a. By June 2004, all groups of key stakeholders (especially the relatively poor and politically weak) are adequately represented in planning committees compared to baseline levels of 2002	Ward and district records on composition of different committees Records of plans at the ward and district levels	

³ Poverty Reduction Strategy Paper

⁴ Rural Development Strategy

⁵ Agricultural Sector Development Strategy

Activities	Milestones & Budget	Assumptions
<p>1.1 Refine local criteria for identifying groups of the poor and describe target groups for the project.</p> <p>1.2 Identify key features of the existing institutional and regulatory mechanisms for CPR, at local level, and assess compatibility with and legality under national policies and legislation.</p> <p>1.3 Assess how the current institutional and regulatory mechanisms facilitate or limit access by different target groups (e.g. the poor, youth, women, and pastoralists), to runoff and related CPR.</p> <p>1.4 Assess how transaction costs and benefits to different groups affect the nature, implementation and performance of mechanisms for CPR management.</p> <p>1.5 Through participatory approaches involving all stakeholders within a district, propose new or improved institutional and regulatory systems.</p> <p>2.1 Study the spatial and temporal needs, access, tenure and management of CPR in terms of bio-physical, gender, production enterprises, and group differentiation.</p> <p>2.2 Assess the extent of conversion of land use (e.g. from grazing to cultivation) in both runoff producing and runoff receiving areas, as a result of RWH.</p> <p>2.3 Develop a Decision Aide and use it to evaluate suitability, effectiveness, impact and risks of different tenure and management approaches.</p> <p>2.4 Using participatory workshops, identify acceptable approaches to tenure and management of CPR related to RWH.</p> <p>3.1 Establish minimum requirements of information and data for planning in relation to CPR management at community and district levels and assess the extent and constraints of meeting these requirements.</p> <p>3.2 Assess key features of plans at community to district level and how they are linked and influenced by national level policies and strategies.</p> <p>3.3 Evaluate the communication and negotiation mechanisms and propose aspects for improvement in order to ensure interests of the poor are taken into consideration in the planning process.</p> <p>3.4 Through participatory approaches (e.g. workshops, focus groups, and advisory panel) involving all stakeholders within a district, develop, pilot and refine planning guidelines.</p> <p>4.1 Identify needs for training and awareness raising and associated communication products necessary to transform the institutions, district plans and policies in relation to tenure, access and management of CPR related to RWH.</p> <p>4.2 Develop communication products to meet the identified needs.</p> <p>4.3 Facilitate the training and awareness raising process, by local institutions such as NGOs and local governments.</p> <p>4.4 Facilitate and provide support in the reformation of committees where necessary</p>	<p>2002 June: Description of groups of the poor to be targeted completed.</p> <p>2003 March: Activities 1.2, 1.3 and 1.4 completed and report produced.</p> <p>2003 June: GIS database of tenure and management of CPR in RWH systems in place.</p> <p>2003 Sep: Decision Aide for evaluating alternative approaches produced.</p> <p>2003 Sep: Training needs for transformation identified and initial drafts of Communication Products produced.</p> <p>2003 Dec: Report on acceptable approaches to tenure produced.</p> <p>2003 Dec: Activities 1.5 completed in at least two watersheds in at least two districts.</p> <p>2004 Mar: At least one training per district implemented.</p> <p>2004 Sep: Improved institutional and regulatory systems developed and planning guidelines produced and promoted.</p> <p>2004 Dec: Communication Products have been published</p> <p>Staff cost UK = £ 22,870 Staff cost TZ = £ 61,872 Overheads = £ 34,759 Equipment = £ 4,460 International travel = £ 8,400 Communication = £ 29,375 Miscellaneous = £ 48,270</p>	<p>Stakeholders, especially local authorities, NGOs, and those benefiting most from the current set-up are willing and allocate time to participate in the project</p>
	Pre-condition	None

11. Keywords

Semi-arid. Rainwater harvesting, Tanzania, CPR, integrated management, livelihoods, land and water tenure, participatory catchment planning, access to CPR.

12. Annex

Annex	Description
Annex A	Main Report
Annex B1	Methodology Manual
Annex B2	Local Criteria for Poverty Assessment
Annex B3	Main Questionnaire
Annex B4	Questionnaire for Assessing Transaction Costs
Annex B5	Key Features of the Existing Institutions for Managing CPR
Annex B6	Mapping Suitability of Common Pool Resources, Land Tenure Systems and Land Use Conversion: A Combination of GIS and Participatory Approaches
Annex B7	Needs for Training, Awareness and Information
Annex B8	Catchment Level Participatory Planning: A Case Study of Runoff Reservoir Project in Makanya Catchment, Western Pare Lowlands, Tanzania
Annex B9	WARSHA JUU YA KUBORESHA MIPANGO, USIMAMIZI, KANUNI NA MIKAKATI YA UVUNAJI MAJI YA MVUA. Maswa, 3rd – 5th June 2003.
Annex B10	WARSHA JUU YA KUBORESHA MIPANGO, USIMAMIZI, KANUNI NA MIKAKATI YA UVUNAJI MAJI YA MVUA. Same, 22nd – 25th September 2003
Annex B11	Stakeholders' Workshop on Improving Management of Common Pool Resources in Rainwater Harvesting. Held at Same District Council from 26th – 28th October 2004.
Annex B12	Institutions, regulatory mechanisms and Plans, for CPR Management at local level and their compatibility with legality under national policies and legislation.
Annex B13	Acceptable Approaches to Tenure and Management of Common Pool Resources in WPLL and Maswa District.
Annex B14	Transaction Costs in Management of Common Pool Resources in RWH Systems in WPLL and Maswa Distric
Annex B15	Mwongozo wa Kupanga Mipango ya Matumizi ya Rasilimali Changia
Annex B16	Mabadiliko ya Matumizi ya Ardhi Wilayani Maswa na Ubora wa Ardhi ya Kilimo Kijiji cha Makanya, Same
Annex B17	Electronic copy (CD) of datasets from the questionnaire surveys

Appendix 1: Planning Matrix

Planning Guide for Development of Small Scale RWH Project at Catchment Level				
Steps	Why	How	Responsible	
1. Project identification	<ul style="list-style-type: none"> To solve problem To satisfy a need To use available resource 	<ul style="list-style-type: none"> Undertake need or problem assessment Assess alternative solutions Identify appropriate solutions 	<ul style="list-style-type: none"> Pioneers of the project 	<ul style="list-style-type: none"> Description of the project
2. Participatory project planning	<ul style="list-style-type: none"> To assure those who may be affected by the project and agree with them on how the risks may be reduced or kept minimum. To make sure that important institutions support the project To reduce chances of resistance to the project To make sure that all stakeholders (men, women, youths) understand and own the project and appreciate its benefits 	<ul style="list-style-type: none"> Identify stakeholders through stakeholder analysis Involve key stakeholders in initial stages of project planning through meetings (sub-village, village assembly, WDC, etc) Endorse letter of understanding among key stakeholders 	<ul style="list-style-type: none"> Pioneers of the project Stakeholders Representatives of stakeholders Community leaders (sub-village, village, ward) Governmental and non governmental organizations, Community based organisations, Facilitators 	<ul style="list-style-type: none"> Description of the project Committee of project List of all stakeholders pioneers to facilitate project
3. Initial feasibility study	<ul style="list-style-type: none"> To be sure that the project is demand driven and that it will be beneficial. To assist stakeholders to determine the most appropriate location of the project To assist stakeholders, particularly the beneficiaries, to answer basic questions related to the project. These include: how will the project help especially in improving income?, what problems will the project solve?, Is there no other means/alternative of solving the 	<ul style="list-style-type: none"> Identify resources (bio-physical, human, etc) available Identify existing opportunities and constraints Identify potential threats related to the project Assess strength and weaknesses of existing institutions for project management Make agreement on cost sharing among stakeholders and sources of funds for the project 	<ul style="list-style-type: none"> Key Informants Experts in zones and districts Researchers Non governmental organization Stakeholder Facilitators 	<ul style="list-style-type: none"> Project proposal for discussion with government, investors and sponsors. Initial budget estimate for the project. Decision on acquisition of funds for project development

Planning Guide for Development of Small Scale RWH Project at Catchment Level				
Steps	Why	How	Responsible	Output
4. Preparation of a comprehensive plan	<p>existing problems?, whose needs/interests/views should be prioritised in the plan?, who are the primary and secondary beneficiaries, how will gender concerns be addressed</p> <ul style="list-style-type: none"> ▪ To guide the implementation process in order to be sure of: <ul style="list-style-type: none"> i) Benefits expected from the project and who will benefit (men, women and youth) ii) Actual project costs iii) Environmental effect of the project and the way to address them ▪ To make sure that financial and other resources (like land, labour) for project implementation are available 	<ul style="list-style-type: none"> ▪ Conduct technical studies on bio-physical and socio-economic aspects ▪ Develop monitoring and evaluation indicators ▪ Assess institutional requirements for project management ▪ Assess sustainability of the project ▪ Make agreement on cost sharing among stakeholders ▪ Ensure clearly defined time frame for project completion 	<ul style="list-style-type: none"> ▪ Project beneficiaries ▪ Planning committee ▪ Reputable experts ▪ Government and council experts ▪ investors/sponsors ▪ Facilitators ▪ District council ▪ Central government ▪ Sponsors ▪ Other stakeholders 	<ul style="list-style-type: none"> ▪ Feasibility studies reports accepted by all stake holders ▪ Confirmation of environmental effects of the project. ▪ Implementation, management and follow up plan ▪ Contracts of sharing project or investment costs showing who will contribute what. ▪ Steps for preparing project plan
5. Implementation of the project		<ul style="list-style-type: none"> ▪ Ensure active participation of each stakeholder ▪ Efficiency 	<ul style="list-style-type: none"> ▪ Sponsors ▪ Inst Researchers ▪ Project beneficiaries ▪ Other stakeholders institutions 	
6. Project monitoring and evaluation	<ul style="list-style-type: none"> ▪ To gauge success or failure of the project ▪ To check whether the project is going as planned ▪ To make necessary adjustments 	<ul style="list-style-type: none"> ▪ Collect and analyse data and information related to the developed indicators ▪ Make relevant adjustments to the project management 	<ul style="list-style-type: none"> ▪ Researchers ▪ Project beneficiaries ▪ Other stakeholders 	M&E report