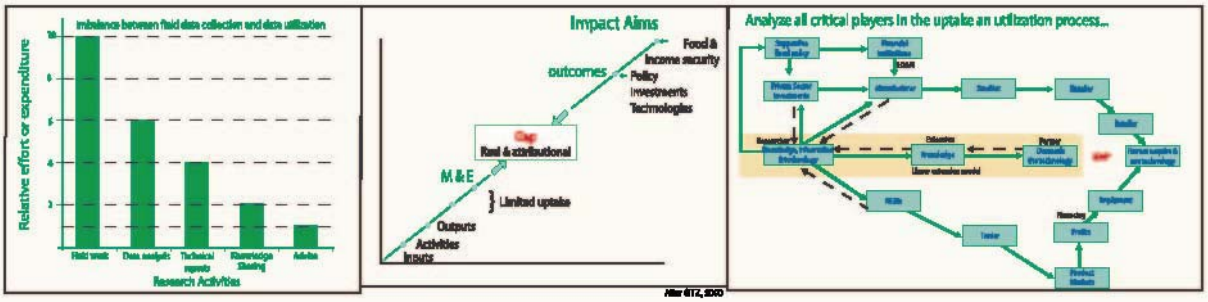
SWMnet Working Paper 4

Institutionalized Scaling-up and Uptake Promotion of Outputs from Soil and Water Management Research in East and Central Africa (SWMnet R8381)

Tanzania Country Report on Constraints & Barriers



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Tanzania Country Report on Constraints & Barriers

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The Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) is a non-political organization of the national agricultural research systems (NARS) of ten countries: Burundi, the Democratic Republic of Congo (DRC), Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania and Uganda. SWMnet aims at supporting the generation of wealth by coordinating the efforts of ASARECA to support effective utilization of land and water resources in profitable crop, livestock and other natural resources-based enterprises.

The SWMnet Working Papers are designed to encourage members of SWMnet to share initial findings from research and other investigations facilitated by SWMnet in order to encourage wide scale peer review during the research process. These are raw documents which have not been reviewed and edited and are released to encourage discussion of work in progress. Readers are therefore welcome to send comments to: lutkamu@yahoo.com or nastemu@hotmail.com

Institutions Participating in the Project

The Department of Research and Development (DRD) of the Ministry of Agriculture, Tanzania

The International Crops Research Institute for the Semi-Arid Tropics - as scientific partner to SWMnet

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ABBREVIATIONS AND ACRONYMS

ARI	Agricultural Research Institute
ASDP	Agricultural Sector Development Program
ASDS	Agricultural Sector Development Strategy
ASLM	Agricultural Sector Lead Ministries
ATTT	Association of Tanzania Tobacco Traders
CIDA	Canadian International Development Agency
DADP	District Agricultural Development Plans
DFID	Department for International Development
DRD	Division of Research and Development
DRLT	Director for Research in Livestock and Training
FFD	Farmers' Field Days
FRG	Farmer Research Groups
FRMP	Forest Resources Management Program
ICE	Institute of Continuing Education, SUA
ICRAF	International Centre for Research in Agro-forestry
ICT	Information and Communication Technology
IRA	Institute of Resource Assessment
LGA	Local Government Authorities
LGA	Local Government Authority
MAFS	Ministry of Agriculture and Food Security
MATI	Ministry of Agriculture Training Institute
MCM	Ministry of Cooperatives and Marketing
MTP	Medium Term Plan
MWLD	Ministry of Water and Livestock Development
NALRP	National Agricultural and Livestock Rehabilitation Project
NARF	National Agricultural Research Fund
NARS	National Agricultural Research Systems
NEMC	National Environment Management Council
NES	National Extension Service
NGO	Non Government Organization
OPRAS	Open Performance Review and Appraisal System
PO-RALG	Presidents Office, Regional Administration and Local Government
PRA	Participatory Rural Appraisal
PSRP	Poverty Reduction Strategy Paper
PTD	Participatory Technology Development
RAPD	Review of animal production
SPSS	Statistical Package for Social Sciences
SUA	Sokoine University of Agriculture
SWMnet	Soil and Water Management Network
TAFORI	Tanzania Forestry Research Institute
TARP II	Tanzania Agricultural Research Project, Phase II
UDSM	University of Dar es Salaam
URT	United Republic of Tanzania
VEO	Village Extension Officer
ZARF	Zonal Agricultural Research Fund
ZILO	Zonal Information Liaison Officer

EXECUTIVE SUMMARY

This report presents results from a rapid appraisal conducted in Tanzania to evaluate to what extent available knowledge and technology for managing soil and water for agriculture, is communicated and promoted to end users. The appraisal was part of a regional project on *Institutionalized Scaling-up and Uptake Promotion of Outputs from Soil and Water Management in Eastern and Central Africa*. This project was coordinated by the Soil and Water Management Research Network (SWMnet) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). For the rapid appraisal, eight hypotheses were developed and tested through:

- a review and synthesis of documents on policy, strategies and programmes related to agriculture, natural resources and research,
- group and individual focus discussions with relevant stakeholders on constraints and barriers limiting a more pro-active involvement of research organizations and researchers in the promotion of uptake of their research findings, and
- a questionnaire survey administered to researchers, senior managers and administrators that included female and male officers from relevant ministries, research organizations and universities.

Findings from the review of documents on policy and strategies of government showed a high level demand for increased usage of knowledge for development. However, strategies are not specific with respect to effective implementation communication, uptake promotion and scaling-up of existing knowledge from within or outside the country. The current focus on technology transfer pays adequate attention to farmers but overlooks other key stakeholders along the uptake pathways. These stakeholders include for example input suppliers, equipment and implement manufacturers and micro-finance institutions. More importantly communication and uptake promotion were not included in the majority of agricultural research projects and programs that were implemented in the country.

Through the focus group discussions and questionnaire survey, the appraisal found out that there are already substantial amount of effort on the ground to deliver research results to farmers. However, the process of dissemination is not given high priority in terms of allocation of time and effort. Although appropriate means and media for uptake promotion are well known, only a limited amount of effort is invested in converting research results into appropriate advice for the research clientele. One major finding of the appraisal is that for every 10 units of efforts or budget invested in data collection, only 2 units are invested in the development of advice and products for communicating this advice to the target stakeholders.

The research managers and researchers have identified a number of barriers limiting their participation and investment in uptake promotion and scaling-up of research results. These include inadequate financing, inadequate skills in communication and promotion, and low capacity in the use of information and communication technology. However, they state that the most important constraint is the current institutional arrangement where research and

extension are considered to be two separate entities placed under different government ministries. The appraisal also found out that even where promotion is effectively implemented, utilization of research results by the end-users is still a major problem. The barriers identified included high cost to benefit ratio in the use of inputs due to low farm gate prices, poor availability of inputs, and poor access to financing by smallholders. These views tie with the other finding of this appraisal that the communication and promotion of uptake of technologies do not target critical players in the agriculture systems.

On the basis of the limited findings of this rapid appraisal, it is being recommended that:

- There is an urgent need for research organizations to review their strategies so as to put more priority and thrust on the promotion of uptake and effective utilization of already existing knowledge, information and technologies as demanded by national development policies;
- Researchers should be required, encouraged and supported to work more on knowledge prospecting and packaging for different clientele rather than the current very high proportion of investment in field and laboratory investigations;
- To achieve the above regulations for project development, approval and M&E should be reviewed to demand the inclusion of communication and uptake promotion as part and parcel of research projects;
- Furthermore, researchers should be re-trained to increase their skills in communication, uptake promotion, and effective channels and media;
- The research system should undertake an analysis of uptake pathways for different knowledge and technologies so as to identify and profile the knowledge needs of all the critical players, leading to better targeting of outputs;
- Thus develop communication and uptake promotions plans to respond to users' knowledge, attitudes and current practices;
- Provide appropriate information and communication technologies (ICTs) to different agricultural research institutes;
- Improve the incentives given to researchers and find ways of linking them to the extent of uptake and utilization of research results, and
- Review the curricula of relevant post-graduate programmes to ensure that new researchers are well trained in communication, uptake promotion, and effective channels and media.

1 INTRODUCTION

This report presents an analysis conducted in Tanzania to evaluate existing barriers to effective promotion of uptake of results from research in soil and water management. The rapid appraisal formed part of a regional project covering four countries: Ethiopia, Kenya, Sudan and Tanzania, under the auspices of the Soil and Water Management Research Network for Eastern and Central Africa (SWMnet). The Tanzania component of the project was coordinated by the Department of Research and Training of the Ministry of Agriculture and Food Security (MAFS). A team of three scientists from MAFS collaborated with researchers from the Sokoine University of Agriculture in Morogoro, especially through a sister project R8088B (*Improved research strategy to assist scaling-up of pro-poor management of natural resources in semi-arid areas*).

The appraisal the study was designed to collect information to test the following eight hypotheses namely:

Hypothesis 1: The role of research systems, institutions and researchers in uptake promotion in rarely recognised or promoted in policies and strategies that guide research in soil and water management.

Hypothesis 2: The mind-set of most research planners, managers and researchers in soil and water management are still fixated in the linear dissemination approach of reaching the ultimate beneficiaries through the extension service.

Hypothesis 3: Research programmes and projects rarely include communication and uptake promotion plans.

Hypothesis 4: Research programmes and projects are rarely evaluated for communication, knowledge sharing, uptake and utilization of knowledge and technologies produced.

Hypothesis 5: A very small proportion of programmes and project budgets and activities are committed or used in the communication and uptake promotion of research results.

Hypothesis 6: Research outputs rarely include specific advice to farmers, input suppliers (e.g. fertilizer suppliers), extension service, policy makers and other clients.

Hypothesis 7: Researchers are not adequately trained for communication and uptake promotion.

Hypothesis 8: The reward and incentive systems like salaries, promotion and prizes to researchers do not demand evidence of utilization and impact of research.

This report is divided into four sections supported by two appendices. The methodology is briefly described in the second section and the results and findings a re presented and discussed in section three. Section 4 presents conclusions and preliminary recommendations.

2 METHODOLOGY

The rapid appraisal was designed to collect data and information for testing in Tanzania of the eight hypotheses agreed at regional level. This was achieved through:

- a review and synthesis of documents on policy, strategies and programmes related to agriculture, natural resources and research,
- group and individual focus discussions with relevant stakeholders on constraints and barriers limiting a more pro-active involvement of research organizations and researchers in the promotion of uptake of their research findings, and
- a questionnaire (Appendix I) survey administered to researchers, senior managers and administrators that included female and male officers from relevant ministries, research organizations and universities.

To ensure in-depth and targeted information gathering the questionnaires was divided into two parts. Part one was administered to researchers, while part two was administered to policy makers and research managers (such as directors of planning, research and extension, and postgraduate studies as well as deans of faculties). The questionnaire was pre-tested with researchers at Mlingano Agricultural Research Institute in Tanga and then reviewed. The interviewees were those involved in soil and water management research from different agricultural, forestry and water research institutes. In total 50 researchers and 21 policy makers/research managers, respectively were interviewed or responded to the questionnaire. Some of the questions by their nature obtained multiple responses from the respondents.

The data from the questionnaires were collated, coded and analysed using "Statistical Package for Social Sciences (SPSS)". Descriptive statistical analysis was done that include frequencies, proportions, means and ranking. In a lot of cases there were multiple responses from the respondents what tends to lead to more or less than 100%. The results are presented in the form of tables and figures.

3 RESULTS AND DISCUSSIONS

The results of the study are presented in this sectionon a hypothesis by hypothesis basis although there are few cases where results overlap between hypotheses.

3.1 Policies and Strategies Guiding Research in S&WM

3.1.1 Recognition in policy and strategy documents of the role of research system in uptake promotion

In the Agricultural Sector Development Strategy (ASDS) (URT, 2001) and Agricultural Sector Development Programme (ASDP) (URT, 2003), it is stated that up-to-date and relevant information is crucial for all stakeholders (e.g. input suppliers, equipment/implement manufacturer) in a market economy. The policy documents also included statements which acknowledge that despite the fact that farmers and extension officers are involved in technology development, the uptake of these technologies by stakeholders is still very low. For example, the ASDS noted with concern that there are many technological innovations that for a variety of reasons have not yet been adopted by the majority of end-users (URT, 2001 pg 6). Furthermore, the Medium Term Plan (MTP) of the National Agricultural Research Systems (NARS), identified poor communication of research results as one of the major problems in the uptake and utilization of research results (URT, 2004). The MTP thus underscores the need for promoting proven knowledge, information and technologies as one of the key strategies for food security and poverty alleviation.

The national water policy states categorically that very little research has been conducted and it goes further to note that even the low cost technologies that have been identified are not sustainable. In addition there is lack of coordination among sectors and institutions that use water (agriculture, livestock, power suppliers, agro-forestry etc). The policy document further states that research findings are not adequately disseminated to end-users (URT, 2002). According to the water policy, in order to attain equitable, efficient and sustainable water resources management and based on experiences gained in the country and internationally, the following must be in place:

- Information, education and communication;
- A sound information and knowledge base including both data in surface and ground water (quality & quantity) as well as socio-economic data for effective action with all related activities; and
- Communication, awareness creation and information exchange.

From this few examples, the findings show that policy framework is not a major limitation to uptake promotion of research results. All the policies demand this to happen and therefore it is surprising the NARS have put only limited efforts to respond to these policy demands. It is therefore necessary to ascertain to what extent the NARS are aware of these policies as discussed in the next sub-section.

3.1.2 Awareness on available policies and strategies

When asked to identify the policies and strategies they are aware of, more than 50% of the researchers were often not aware of the national policy and strategies that guide research in soil and water management (Fig. 1). Respondents from the university were relatively more aware of all policies and strategies, probably due to involvement in consultancies to the government.

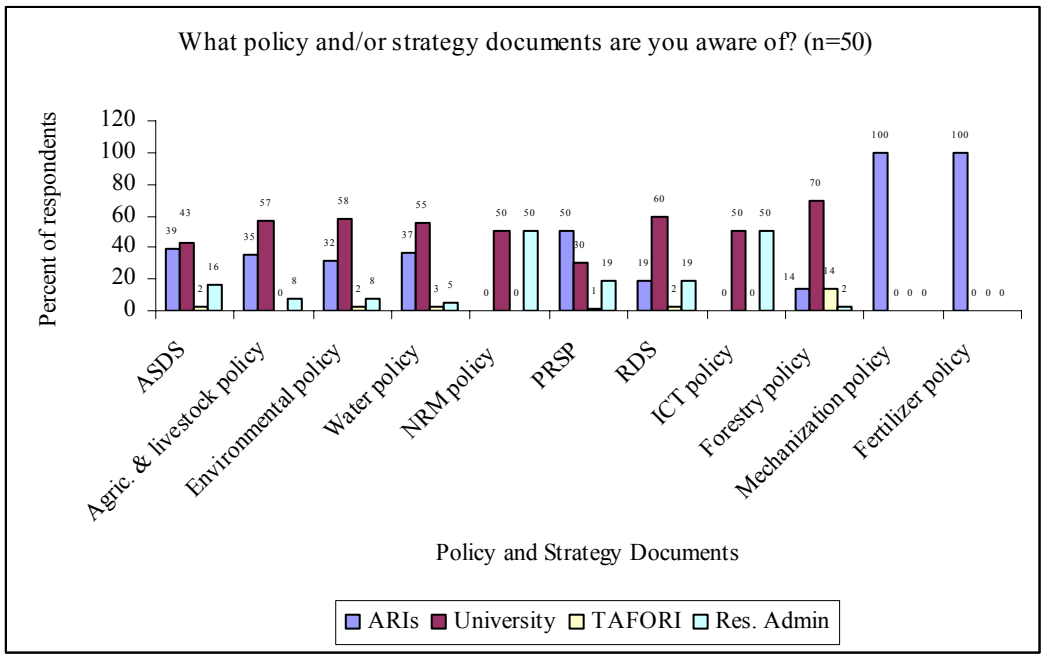

Figure 1: Extent of awareness of existing policy and strategy documents by researchers

N.B: ASDS (Agricultural Sector Development Strategy); NRM (Natural Resources Management); RDS (Rural Development Strategy); PRSP (Poverty Reduction Strategy Paper); ICT (Information and Communication Technology)

Researchers from ARIs were aware of many of the documents produced in the past 5 years, particularly, the soil fertility initiative, agro-forestry, PRSP and agricultural mechanization policies as indicated in Table 1. However, few ARI researchers were aware that of the SWC strategy and the land use policy. The university researchers were mostly aware of agriculture/livestock policy, followed by SWC and land use policy, but least aware of the ASDS. While TAFORI researchers are not aware of most policy documents, 40% are aware of the national forestry policy and few know irrigation and forestry research master plan as well as the land use policy. Scientists at DRD headquarters are also poorly informed of policy/strategy documents as only small proportion indicated awareness to them, including the agriculture and livestock policy which is so central to their work.

Table 1: Awareness of documents produced in the past 5 years (n=50)

Documents	Level of awareness by % of respondents of a given organization			
	ARIs	University	TAFORI	Research Admin.
Soil Fertility Initiative	100	-	-	-
Irrigation Master-plan	41	41	7	10
SW Conservation Strategy	25	50	-	25
Land Use Policy	29	43	14	14
Poverty Reduction Policy	100	-	-	-
Agric. Sector Development Programs	67	17	-	17
Water Policy	44	44	-	11
Agriculture/Livestock Policy	38	63	-	-
Agro-forestry Strategy	100	-	-	-
National Forestry Res. Master-plan	-	-	100	-
National Forestry Policy	-	40	40	20
Agric. Mechanization Strategy	100	-	-	-

Dash means no response

3.1.3 Accessibility policy and strategies documents

The majority of respondents who were aware of policy and strategy documents confirmed that they also had access to such documents. Those having better developed information management systems, had a relatively better access to important documents, compared to those in remotely located agricultural research institutes (ARIs). Both ARIs and University respondents agree by 100% that low accessibility is a result of the documents being available only at head offices. These documents are mostly available from the MAFS headquarters, institute library, government website, and friend/colleague. Out of 50 respondents only two mentioned MAFS headquarter as their source of documents; eight mentioned institute's library; seven, mentioned government website, and two mentioned colleagues. The most reliable sources for these documents therefore are the institute's libraries and the websites.

3.2 Research-Extension-Farmer Model of Dissemination

As mentioned earlier, analysis shows that most of the policies and strategies do cover issues of soil and water management. To some extent dissemination pathways are mentioned in the documents. However, it was noted that end users that are contacted through the pathways vary between and within categories. The communication strategy does not take these variations into account. For example, soil and water management technology pathways do not cover all stakeholders such as input suppliers, equipment/implement manufacturers, etc. the pathway is concentrating on linear dissemination that is Research→Extension→Farmers. One particular strategy statement regarding uptake promotion and scaling up is quoted from the Medium Term Plan of Tanzanian NARS (URT, 2004) that states that "Poor communication of research results is one of the major problems in the uptake and utilization of research results".

The appraisal findings show that communication and uptake promotion were not included in the majority of agricultural research projects and programs that were implemented in the country. Lack of ineffectiveness to communicate the right messages to the right end users has been and is one of the criticisms of agricultural sector in Tanzania that is wrongly directed only to the agricultural extension system. Having been perceived to have failed to influence the farming practices of farmers by transferring modern and appropriate technologies from research to the rural areas, the National Extension Service bridged up the gap by establishing the National Agricultural and Livestock Rehabilitation Project (NALRP) in1989 through1996 (MAFS, 1996). The project had the objective to provide the farming community with adequate extension messages through training and visit (T&V) model. The shortcomings of the project included geographical limitations, unsatisfactory flow of information, insufficient support of the mass media, lack of knowledge in communication skills, shortage of qualified field staff and limited resources for routine training.

Much as the targeted end users of the majority of technologies developed in Tanzania are the smallholders, one would have expected that the research, training and extension departments of the Ministry of Agriculture would put some emphasis in communication and uptake promotions. On the other hand research established a National Agricultural Research Fund - NARF (URT, 2002) to facilitate collaborative and contract research during the implementation of the National Agricultural and Livestock Research Project (NALRP I). The fund had positive impacts on the enabling environment for agricultural research and for the establishment of Zonal Agricultural Research Funds (ZARFs). One of the five possible domains for ZARF support was dissemination of research results. It was said that funds would be available to motivate scientists to publish their research findings in international papers and in local series as well as translate these results into extension messages. Research projects were thus evaluated only up to the level that one managed to publish the results of one's research proposal. Unfortunately, even the year 2003 training manual that was developed by the Ministry's Farming System Research sub-directorate did not include a section dealing with communication and or uptake promotion. For most of the projects and programmes regular studies were only conducted to assess the impact of previous attempts to promote innovations and to provide feedback to the scientists for further technology adoption.

3.3 Inclusion of Promotion and Uptake Plans in Research Programs and Projects

Two case studies were analysed to assess the extent to which aspects of communication and uptake promotion plans have been addressed in the country. The case studies on agro-forestry research programme and client-oriented research and management were done to respond to hypothesis number three.

3.3.1 Agro-forestry research programme

Most of the Agro-forestry research activities in Tanzania are carried out at Tumbi Agricultural Research Institute (ARI- Tumbi) in the Western research zone. They are to some extent undertaken in collaboration with the International Centre of Research in Agro-forestry

(ICRAF) under the SADC/ICRAF Agro-forestry Research Project with funding from CIDA (Otysina *et al.* 1999).

The agro forestry research work at ARI-Tumbi began in 1987 in the "cereal–tobacco-farming system" in the Miombo ecological zone of Western Tanzania. This work was based on problems identified through diagnostic surveys that is: declining crop production, shortage of fuel wood for tobacco curing and other household uses (leading to increasing deforestation of Miombo woodland); declining soil fertility and inadequate fodder supply, especially during the dry season.

The major objective of the programme was to screen, evaluate, develop and disseminate appropriate agro-forestry technologies that lead to alleviation of shortages of fuel wood and fodder and replenishment of soil fertility in cereal-tobacco farming system. The programme focused on developing and disseminating various agro-forestry technologies that enhance agricultural and livestock productivity and increased the supply of fuel wood for tobacco curing and domestic uses. A research on indigenous fruits was later also established.

In the programme the aspect of dissemination was given priority right from the beginning. Most of the research activities were conducted on-farm with active participation of farmers in the technology testing and dissemination process. For technologies that proved appropriate after extensive farmer testing it was realized that scaling up activities must be improved. Therefore, the programme launched dissemination and development component aimed at improving the livelihood of farming families by making agro-forestry technologies accessible to farmers by using various dissemination strategies. It was foreseen that the programme had to collaborate with various stakeholders. The first step was to identify stakeholders to work with the programme and their roles. Therefore, several rural development institutions were identified and have been collaborating with the program. These include:

- Government extension service: Village extension officers (VEO) play a major role in day-to-day supervision and monitoring of agro-forestry on-farm trials and dissemination activities in the pilot villages in Shinyanga and Tabora rural Districts.
- World Vision (an NGO): collaborating with agro-forestry programme in Nzega District, especially in organizing farmer exchange visits.
- Agricultural Programme of Moravian Church: Has been providing diary cattle to farmers while the project has been providing fodder production and utilization technologies.
- Association of Tanzania Tobacco Traders (ATTT): collaboration has been in areas of tree planting and energy use for tobacco curing
- Tanzania Forestry Research Institute (TAFORI): the institute has been collaborating in testing rotational woodlots technology in some villages in Tabora.
- Sokoine University of Agriculture has been involved in training and testing some Agro-forestry technologies.
- Forestry Resource Management Project (FRMP)

There has also been focus on building the capacity of farming communities and other stakeholders. The dissemination activities of the agro forestry programme were:
Establishment and strengthening agro-forestry networking
Sensitization of farmers and policy makers on agro-forestry technologies

Nursery establishment activities at farm-level to sustain availability of seeds and seedlings
Training extension, farmers and other partners: capacity building on agro forestry technologies and on nursery establishment and management
Farmers exchange field visits and on-station visits to learn and exchange ideas on various agro forestry technologies
Production and distribution of extension materials: brochure on specific technologies, extension manuals on nursery establishment and management and, newsletter (forum for exchanging information and sharing experiences).

Technologies and recommendations released in the Western Zone

Over the years the agro forestry research programme in the western zone developed technologies with greater potential for improving soil fertility, enhancing supply of animal feed, identification and processing of indigenous fruit trees of the miombo woodlands and identifying fuel wood for curing tobacco. These technologies included: rotational woodlots, improved fallows, fodder banks, boundary planting, improved furnace for curing tobacco and indigenous tree fruits.

The impact of agro forestry research and development efforts up to 2000

According to SADC/ICRAF Agro forestry Project 2003, about 20,332 farmers had adopted one or more agro forestry technologies in Tabora region by the year 2004. Table 1 below shows the number of farmers who are practising agro-forestry in their farms over a number of years in Tabora region.

Table 2: Extent of uptake of agro-forestry technologies by farmers (nos) in Tabora district 1993-2000

Technology	92/93	93/94	94/95	95/96	96/97	97/98	98/99	99/00
Rotational woodlots	-	5	15	140	222	190	308	81
Fodder banks	-	-	-	9	69	61	25	48
Improved fallow	-	-	4	14	50	82	91	50
Boundary planting	5	1	-	94	160	167	-	13
Total	5	6	19	257	501	500	424	192

The total also include indigenous fruits processing and domestication
Dash means no response

The five technological packages developed and recommended to farmers included rotational woodlots, fodder banks, improved fallows, improved furnace for curing tobacco (malakis barn) and processing of indigenous fruit trees. Various dissemination activities were combined to make sure that appropriate technologies are adapted by the end-users. Although not mentioned in this paper, sufficient resources have to be in place to ensure dissemination strategies are achieved. Partial funding will only result in half-finished work. Most important is that researchers must be fully aware that research results have to be disseminated to make their work complete.

3.3.2 Client-oriented research management approach (CORMA), Tanzania

In the last decade, government expenditure on public agricultural research has weakened, while clients of research and end-users of agricultural technologies ask for appropriate research results and value for their investments. On the other hand donors are shifting attention to the demand side of research. In view of this agricultural research organisations will in the near future be prompted to adapt themselves to rapidly changing economic and political conditions, and involve and satisfy clients of agricultural research services.

As a step towards that, in 1998, the Division of Research and Development (DRD) of the Ministry of Agriculture and Food Security (MAFS) piloted the Client Oriented Research Management Approach (CORMA) programme in the Lake and Northern research zones, funded by the Netherlands Government (DRD, 2001a and b). CORMA focused on research management in five areas: human resource management, financial management, linkages and collaboration research and output production, information management and dissemination.

The CORMA programme encouraged demand-driven research agendas where clients were assigned a pivotal role in deciding priorities and in planning and monitoring agricultural research. This aimed at facilitating organizational change and build in local accountability through a focus on improving and reforming critical areas of research organization and implementation. CORMA successes in piloted zones built on proper client targeting, appropriate and timely research output and dissemination.

Targeting aimed at defining research areas or target groups with similar circumstances; specifying geographical zones or farmer groups that have the same production constraints; identifying possible solutions appropriate for specific farmer groups and testing them in the field with groups concerned; and defining and disseminating flexible recommendations to address needs and circumstances of different farmer groups.

Specific CORMA experiences to improve communication, collaboration and information sharing included:

- ***Liaison Teams:*** 3 scientists were assigned per district so as to link research and extension at district and village levels through FRGs. Besides the zonal research extension liaison Officers, CORMA appointed regional and district extension liaison Officers who facilitated the dissemination process significantly
- ***Memoranda of Understanding:*** In 1999, zonal institutes established MoU with district authorities
- ***Stakeholder Meetings:*** Regular stakeholder meetings and visits tend to narrow the gap between research and clients. In the Lake zone such meetings were organized per region
- ***Rural Seed Fairs:*** Aimed at sharing seeds, planting materials and knowledge between farmers. They have proved to be important tool to enhance the adoption of new seed varieties.
- ***Farmer Extension Groups:*** are farmers working with extension on verification of recommended messages and options, which have been developed in the same or similar farming systems zone

- ***Farmer Field Schools:*** puts emphasis on stakeholder involvement, PRA techniques and tools and underscores the principles of Farming Systems Approach.
- ***Technology Reference Book:*** Has each technology short description, results, applications, advantages and limitations and were prepared as references in both zones
- ***Extension Seminars for Clients:*** These were events purposively organized for extension and covered specific topics, and
- ***Development Forums****:* are meetings that brought stakeholders of a particular area together to discuss development issues.
- ***Training Sessions:*** Lake Zone prepared more than 30 training manuals that cover many different technical subjects in addition to doing adaptive research
- ***Distribution of User-Friendly Materials:*** Once published, extension material is added to the publication list and made known to potential users. An order form is usually attached to the publication list that is sent to the stakeholders
- ***Use of Mass Media:*** such as radio programmes, newspapers, magazines are useful for large-scale dissemination of technologies has proved very effective under CORMA.

3.3.3 Lessons on communication and uptake promotion of research results

General lessons learnt from the appraisal of these two programmes are summarized in Table 3. The CORMA programme was successful in introducing some elements of communication planning and there are indications that good dividends were obtained from this approach.

Table 3: General findings from the studied projects

Item	Agro-forestry project	CORMA project
Inclusion of CP in the project proposal	various dissemination activities were combined to ensure that appropriate technologies are adapted by the end-users	A CP encouraged demand-driven research agendas
Stakeholder analysis and targeting	Identified and well targeted such that they collaborated fully during the entire project span	Stakeholders were analysed and made to meet regularly. With appropriate targeting farming system zones and participatory technology developments were undertaken.

3.4 Evaluation of Communication, Knowledge Sharing, Uptake and Utilization of Research Results

To test hypothesis number four, a number of reports were reviewed and interviews conducted with policy makers and research managers as well as researchers. This section presents the results.

3.4.1 M&E processes

As far as monitoring and evaluation is concerned it is for example stated in the 1996/97 progress report of the root and tuber crops research sub-program that dissemination and exchange of research results was done through:

- Technical papers that were presented during international conferences/symposia–Cassava biotechnology network (3 papers); African potato association (3 papers); International society for tropical root crops (4 papers)
- Field notes
- Extension leaflets (2)
- However, no mention was made on how and when the contents of the field notes and leaflets were communicated to the end users. Similarly no mention was made on whether or not these media were evaluated for their effectiveness.

On the approval of funds for collaborative research it was clearly stated that the proposals should be focus on applied and adaptive on-farm research that is demand driven or client oriented. However, no statements were made on how the demand would be measured or how and at what cost the results would be communicated to the end users.

Projects that secured funds through the NARF and ZARF (MAFS, 1999) were monitored and evaluated to simply review the appropriateness of the research methodology, to identify the status of technology or information for dissemination, to establish the potential impact of the research outputs and to assess the attainment of the project objectives. Only in very few cases did monitoring and evaluation teams include representatives from clients and stakeholders that were knowledgeable in the field of study. Researchers evaluated the works of fellow researchers leaving very little room for external criticism.

In principle the notion of communication is weak not only in the research system but also in the extension system. Consequent to this there is no single guideline for monitoring and evaluating communication and uptake promotion. As for the collected and analysed data all respondents have had experience with soil and water management issues and have been promoting research results. About 63% of the respondents said they have produced research results on soil and water management. Generally, all respondents indicated that they promote research results and they have been applying different dissemination pathways.

3.4.2 Manager's perception on availability and promotion of NRM technologies

Research managers were requested to identify types of NRM technologies they believe are available from their organization. The responses revealed that among the available technologies the soil conservation related outputs were the highest (Table 4). These were followed by tree species for soil and water management and rainwater harvesting. About 26% of the respondents said that research results for soil conservation are available. The same proportion (16%) of respondents had knowledge on the availability of multipurpose trees for soils and water management and rainwater harvesting technologies. Other results include soil fertility and fertilizer recommendations (11%), management of saline and acidic soils (11%), soil characterization (11%), conservation tillage (11%) and use of indigenous methods for soil conservation.

Table 4: Proportion (%) of managers (n= 21) who identified availability of different NRM technologie**s**

Technologies in	% of managers identifying availability of technologies				
	DRD/DLRT	University	TAFORI	Others	Total
Multipurpose trees for Soil and water management		5	11		16
Soil conservation	16	-	11		26
Rain water harvesting	16	-	-		16
Soil fertility and fertilizer recommendation	11				11
Management of saline and acidic soils	11	-	-		11
Soil characterization	11	-	-		11
Conservation tillage	5	5	-		11
Use of indigenous methods for soil conservation	-	5	-		5

Dash means no response

Different mechanisms have been used to promote research outputs and they include publication in local and international journals, stakeholder meetings, farmers training, extension messages, mass media etc. (Table 5). The table shows that there has been limited use of these mechanisms. Whereas within the DRD/DRLT use of farmer training and dissemination of extension messages (26.3%) are commonly mechanisms for technology promotion, at the Universities publication in journals and conducting stakeholder meetings (15.8%) are most common.

The various media that have been used by the respondents in promoting outputs are indicated in Table 6. The kind of media that were considered by the respondents as being most effective in reaching a wide range of target end-users are ranked in figure 1. Use of leaflets/brochures ranked number one followed by radio programmes (21%), posters (15%), newsletters (9%), scientific meetings and conferences (9%) (Fig. 1).

Table 5: How do you promote research outputs? (n=21)

Promotion Approaches	Estimation of extent of use (%)			
	DRD/DLRT	University	Others	Total
Publication to Journals	16	16	11	42
Mass media	5	5	5	16
Agricultural shows	21	11		32
Farmers field days	21			21
Extension messages	26			26
Stakeholder meetings	16	16		32
Reward to scientists	5			5
Document dissemination	5	11	5	21
Farmers training	26			26

Table 6: What media are used to promote research outputs? (n=21)

Media Type	Proportion of responses (%)			
	DRD/DLRT	University	Others	Total
Leaflets/booklets	47	21	11	79
Posters	32	11	5	47
Newsletters	11	16	11	37
Radio programs	42	5		47
Audi visual tools	5	5		11
Television programs	5	16	5	26
Website	0	11	0	11
Scientific papers/journals	11	5	5	21
Scientific meetings/conferences	58	32	11	100

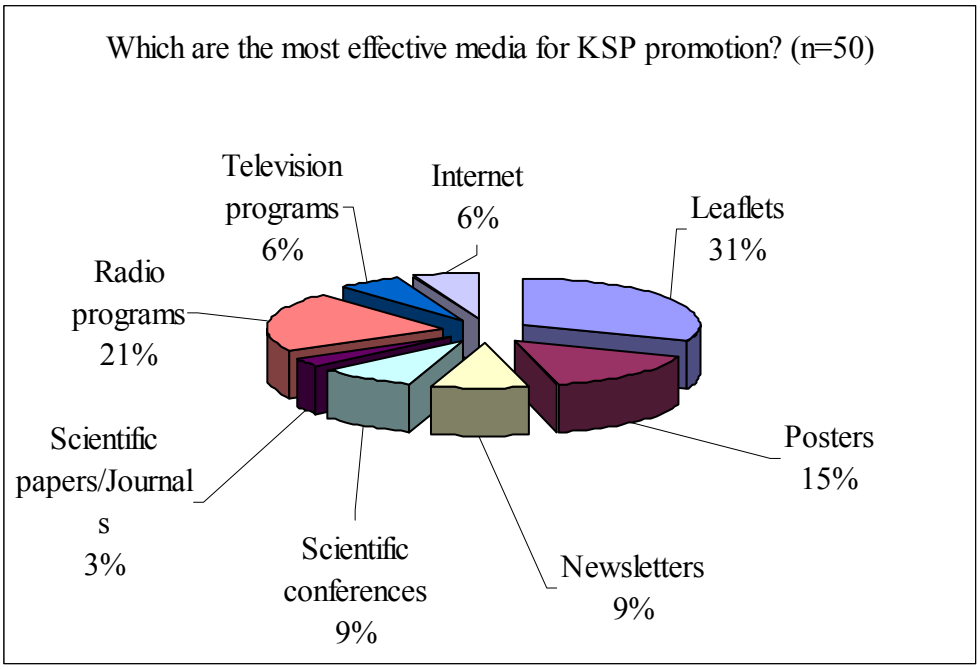

Fig. 1: Most effective media for KSP promotion

The policy makers and research managers have been providing overall guidance and policy directions to ensure that the new improved technologies developed from soil and water management follow appropriate dissemination media and that their uptake are promoted and widely utilized by the end users. However, the survey results show that only 33% of the total respondents said that they encourage and facilitate activities aimed at promoting research results. Only about 17% of the total respondents indicated that priorities are given to promotional activities in terms of financial allocation. Other approaches that were emphasized include use of participatory methodologies (56%), use of simple and adaptable technologies (28%), make follow up on the adopted technologies (22%), and ensure that there is application of agreed communication methods (33%).

Several constraints were mentioned that have been hindering promotion of the research results. The main constraints as presented in Table 7 include inadequate finance which was mentioned by 63% of the total respondents. This was followed by lack of transfer kit (32%) and inadequate promotional skills (26%) among intermediate stakeholders (researchers, extension, input suppliers etc.). The problem of finance and inadequate promotional skills were found to be a problem in all institutions. Only the public research policy makers and managers considered that inappropriate and inefficient institutional arrangement affects promotion activities (11%).

Table 7: What constraints are encountered in promoting research results? (n=21)

Constraints	Proportion of responses (%)			
	DRD/DLRT	University	Others	Total
Inadequate finance	37	21	5	63
Inappropriate Institutional arrangements	11	-	-	11
Lack of transfer kit	21	11	-	32
Inadequate promotional skills	16	11	-	26
Lack of researcher motivation	11	5	-	16
Results not user friendly			5	5
Low use if IT	11	11	-	21

Dash means no response

3.4.3 Managers' perception on effective of different approaches and media

While the role of NARS for effective KSP uptake has mainly been by a way of financial support, to ensure that research is demand-led, user-friendly technologies and use of participatory methodologies at all stages of technology development have been emphasised by the sector policy and strategies. However, their use has not effectively been transformed into practice. This has been due to the number of institutional factors that support learning and innovation that include inadequate co-ordination among sector ministries; lack of clear responsibility for providing information to mass media; budgetary constraints for agricultural information broadcasting and low priority for agricultural broadcasting.

It has also been noted that different dissemination media have been employed. But the choice of which dissemination media to use has not been tailored depending on the nature of the output, the characteristics of the potential users and the capacities of the local collaborators and institutions. The results show the dissemination media that are mostly used in technology development, transfer and uptake promotion. However, not all end-users have been effectively involved in the process such as input suppliers, marketers, stockists, companies, associations, NGO's, church organizations, etc. About 68% of the respondents said that they use different kind of dissemination media. The media that are used include publications, television, radio, training and research collaboration, leaflets and on-farm trials (Table 8). The policy makers ranked training and research collaboration as the most effective media. This is followed by leaflets/brochures and on-farm trials as the second most effective while television and demonstration plots were rated third. The use of radio was ranked as the least effective.

Table 8: Ranking of the perceived effectiveness of different media (n=21)

Dissemination Media	Proportion ranking first				Ranking
	DRD/DLRT	University	Others	Total	
Publication	16	-	11	26	4
Television	11	5	11	26	3*
Radio	11	-	5	16	5
Demonstration plots	11	-	5	16	3*
Training and research collaboration	32	-	-	32	1
Leaflets/brochures	26	5	5	37	2*
On-farm trials	32	5	5	42	2*

* ranked at the same level

Constraints to the use of dissemination media are presented in Table 9. Several problems were mentioned with respect to specific media. For instance, the use of television and radio was hampered by their limited access to a wide range of end users. Inadequate financial support, inadequate communication skills and inappropriate institutional set constrain training and research collaboration up. Inadequate funds to produce enough leaflets and brochures were also mentioned by about 37% of the total respondents.

Table 9: What problems have been encountered in the use of the media? (n=21)

Communication Media	Problem Encountered	% of respondents
Television/Radio	Limited access to wide end users	16
Training and research collaboration	Inappropriate institutional set up and inadequate communication skills Inadequate financial support	21
Leaflets/brochures	Inadequate funds to produce enough	37
On-farm trials	Inadequate skills in participatory methodologies	5

The development of new technology involves a continuum of activities, from basic scientific research, through technology generation, testing, adaptation and integration into existing systems and practices. Research that is done with the participation of end users is more likely to produce outputs that are quickly disseminated and taken up. The information was solicited from policy makers and research managers concerning the reactions they receive/perceive from the end users. Different constraints that were mentioned as important include inadequate follow up by researchers and extension (ranked number 1) and lack of coverage by information and extension services (ranked number 2). Non-availability of material inputs in the order of importance was third ranked, followed by lack of farmer empowerment. High cost and labour demand and inadequate on-farm trials were ranked number five and six respectively.

3.4.4 Assessment of extent of utilization

As regards the utilization of research results by the end users, the policy makers had mixed feelings. About 42% of them indicated that technologies from soil and water management have not been widely utilised while 11% felt that the results have been confined only to research areas. About 26% said that they are only for research and academic interest or use. Those who said the results have been widely utilised constituted about 16% of the total respondents. Different methods have been used to ensure effective technology utilization. About 26% of the respondents reported to have put emphasis on training of end users and use of combined media. Less than 10% of the total respondents have tried to strengthen and form farmer groups, use mass media and provide convincing benefit/cost data.

The results show that it has been difficult to ascertain that the technologies communicated to the end users have been effectively utilised or adopted and that they have had an impact. This is evidenced from very few impact studies, monitoring and evaluation and adoption studies that have been targeted to soil and water conservation technologies. For instance, only about 16% and 15.8% of the respondents said that impact and adoption studies respectively were conducted. About 53% and 21% of the total policy makers interviewed indicated that several follow up visits to sites and monitoring and evaluation respectively were undertaken for soils and water conservation. About 53% of the respondents showed that they had revisited the technologies for service improvement while 32% of the respondents had modified the on-going projects from evaluation as a learning tool.

Several constraints were mentioned that have been facing policy makers and research managers in their efforts to ensure that the end users effectively utilise soil and water conservation technologies. These include lack of credit facilities or support to access inputs (16%), communication barriers between sector ministries and departments, and also the remoteness of the end users in rural areas (16%). About 32% of the respondents complained of inadequate or lack of funds for technology follow-up. Also, 5.3% said that the end users are not motivated to use improved technologies because even if the farm yield was increased there were no ready or reliable markets for their farm produce.

3.4.5 Implication of findings

From the foregoing it can be concluded that to some extent efforts have been made to produce research outputs to the end users. Different mechanisms have been employed to ensure that research results are communicated and their uptake promoted for wider utilization by the end users. The policy makers and research managers have emphasised appropriate dissemination media and media. However, the low level of responses (as percentage of total respondents) as revealed from the survey implies that their effectiveness and proper use is still limited. Identified barriers to promotion activities include:

- Inadequate finance,
- Inadequate promotional and communication skills,
- Low use of IT,
- Inappropriate institutional arrangement, and
- Low use of mass media by end users such as radio and television due to their high costs.

Identified barriers to utilization of research results include:

- High cost and labour demanding technologies,
- Inadequate coverage by extension and information services,
- Non-availability of material inputs (e.g. small seeds, equipment, fertilizer),
- Research results not user friendly,
- Lack of farmer empowerment (e.g. access to credit facilities or support to input access), and
- Non-targeting of research results. Results are not tailored depending on the nature of outputs, socio-economic characteristics of potential users and the capacities of the local collaborators and institutions.

3.5 Budgetary Commitments to Communication and Uptake of Research Results

In response to hypothesis 5, the appraisal shows that on average more time is spent on conducting demonstrations, farmer exchange visits and reports writing than on the preparation of audio-visual aids. The little time spent on the preparation of audio-visual aids can be explained by the fact that a small percentage of respondents use audio-visuals. As far as finances are concerned the greatest part of it is spent on field work, data analysis and report writing (Fig. 2) with very little of it being spent on preparation of audio-visual aids. When one compares the amounts of time that a researcher spends on any given field work and the amount of money that he/she spends on giving advice on the final research outputs, one realises that the differences are statistically highly significant (Table 10 a & b).

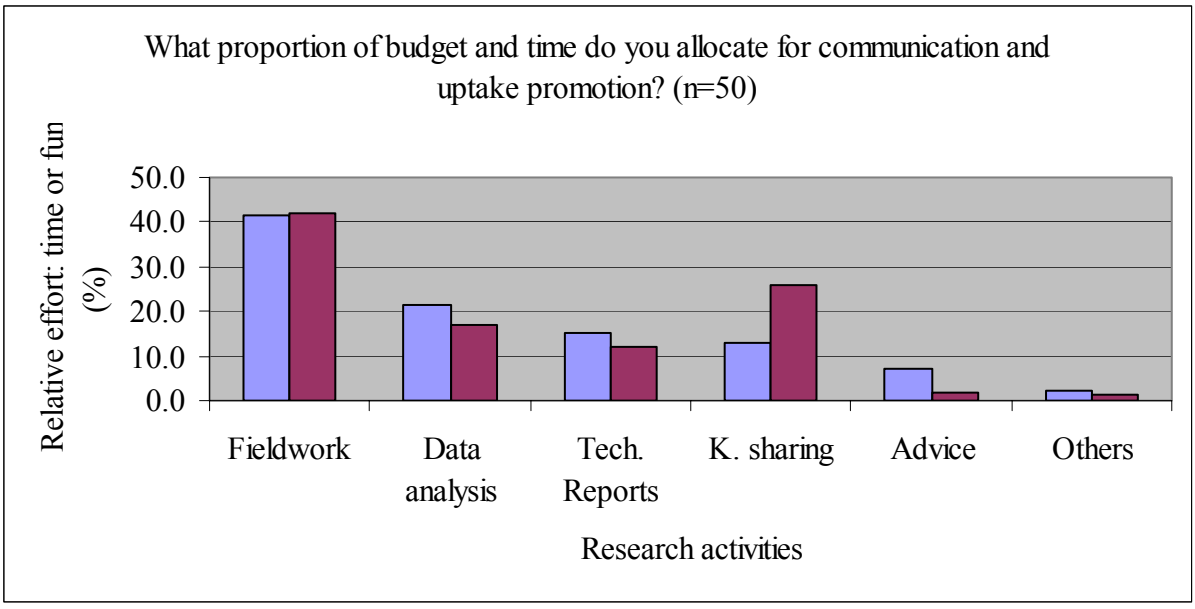

Figure 2: Relative allocation of time and budget to communication and uptake promotion

Table 10: T-test results

a) Time

	Fieldwork	Data analysis	Tech. Reports	K. sharing	Advice
Fieldwork		3.774***	5.318****	5.418****	5.783****
Data analysis			2.108*	2.653*	4.487****
Tech. Reports				0.996	2.772**
K. sharing					1.993
Advice					

b) Funds

	Fieldwork	Data analysis	Tech. Reports	K. sharing	Advice
Fieldwork		2.764**	2.686*	1.222	5.083****
Data analysis			0.819	1.012	4.539****
Tech. Reports				1.528	2.018
K. sharing					3.287**
Advice					

Significance level: * P < 5%, **P < 1%, ***P < 0.1%, ****P < 0.01%

3.6 Advice to Farmers and Other Stakeholders

In dealing with hypothesis 6 the appraisal covered a number of public institutions including the Agriculture Sector Lead Ministries (ASLMs) namely Ministry of Agriculture and Food Security (MAFS), Ministry of Water and Livestock Development (MWLD), Ministry of Co-operatives and Marketing, and the President's Office –Regional Administration and Local Government (PO-RALG). Others were the Sokoine University of Agriculture (SUA); Tanzania Forestry Research Institute (TAFORI) and the Department of Research and Development (DRD) of MAFS covering head office and upcountry Agricultural Research Institutes (ARIs).All these are public, but because of the nature of their functions and responsibilities they were grouped as follows: University, Research Administration (meaning those researchers from the head office), TAFORI, and ARIs – representing the remaining agricultural research institutes. Fifty researchers were sampled. Out of these, 9 were females constituting 18% of the total respondents.

3.6.1 Technical reports/journal articles

As seen in Fig. 3 below, the ARIs produced the highest percentage (34%) of technical reports and TAFORI produced the highest (45%) in journal articles. The DRD headquarter (research administration) published the least (14%) technical reports and not a single journal article in the five years (figure 5). This is because researchers at the head office are mostly engaged on matters pertaining to research co-ordination, guidance and policy formulation/updating and seldom do they publish research works.

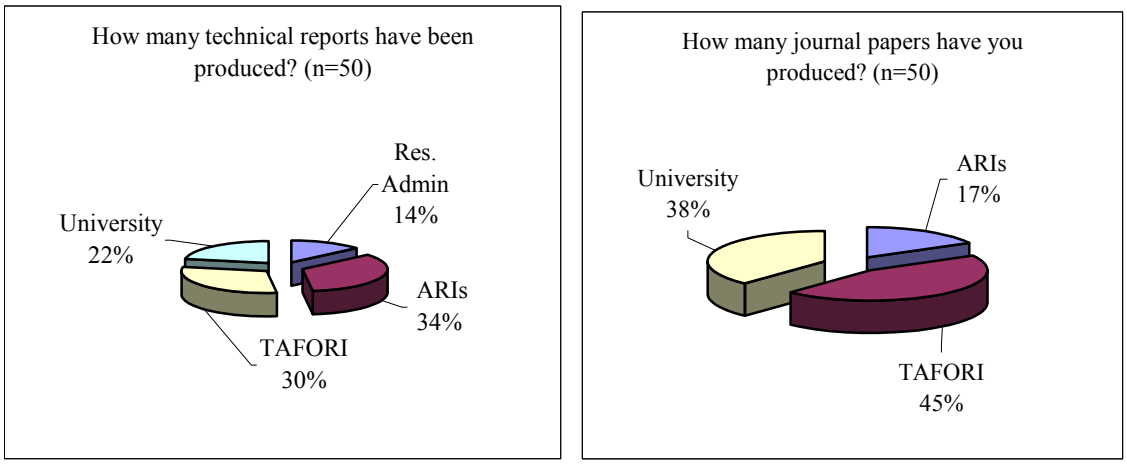

Fig 3: Extent of publication of technical reports and journal articles

3.6.2 Advises given to target groups

Specific advises that were given to the target end-users (policy makers, managers, farmers, etc.) included use of draught animals, rain-water harvesting and irrigation system designs, soil conservation, land evaluation, integrated natural resource management, technical uptake and markets linkages, inorganic fertilizer, multi-purpose trees, farming systems zones etc.(Table 11).

Table 11: Percentages of researchers giving advice to target end-users

Advice	Proportions (%) by organization			
	ARIs	University	TAFORI	Research Admin
Oxen weeding – labor saving	6.7	-	-	-
Benefits of animal drawn power	13.3	-	-	-
Water harvesting in-situ through tie-ridges and ripping	6.7	14.3	-	-
Techniques in design of irrigation system	6.7	26.7	-	-
Land evaluation	22.2	-	50.0	
Soil conservation and improvement of plant nutrition	46.7	21.4	-	50.0
Nutrition mining threaten land productivity	6.7	14.3	-	50.0
Integrated natural resource mgt.	26.7	35.7	50.0	50.0
Linkage of technical uptake and markets	13.3	-	-	-
Cover crops as alternative to inorganic fertilizers	26.7	-	-	-
Potential of MTPs	6.7	-	50.0	-
Participatory techniques in SW management	13.3	21.4	-	-
Local resources as alternative for SW improvement	20.0	28.6	-	-
GIS-based farming systems zones	-	-	-	50.0

Dash means no response

Form Table 11 it is seen that about half of the researchers from ARIs advised end-users on soil conservation and improvement of plant nutrition; and about quarter (24.8%) of them advised on integrated natural resource management and cover crops as alternatives to

inorganic fertilizers. They however, did the least (3.1%) on advising end-users on oxen weeding, in-situ water harvesting, design of irrigation schemes and the potential of MTPs.

Researchers from university (22%), TAFORI (33.3%) and DRD headquarter (25%) highly emphasised the use of integrated natural resource management, while only a proportion of University researchers (8.8%) advised on in-situ water harvesting and nutrition mining threat to land productivity. Half of TAFORI researchers advised on land evaluation and potential of MTPs, while half of research administration scientists advised on SW conservation and nutrition mining, together with GIS-based farming systems zones, an area untouched by other institutions. Generally, TAFORI and Research Administrators gave little advice to the target end-users. It is evident then that, researchers do not go far below into advising users of their innovated technologies.

3.6.3 Extent of advice usability

The extent by which the advice was being used by target end users was rated medium by ARIs, university, DRD headquarter (61%, 63%, and 50% responses respectively). Low use of research results is attributed by the fact that it might be too technical for farmers, no linkage to follow adaptation, poor linkages between farmers-researchers-extension officers, and could be because of poor technology dissemination mechanisms.

3.6.4 Knowledge sharing products (KSP)

Various knowledge-sharing products (KSPs) were produced by the surveyed organizations in (Table 12). These include substitution of fertilizers by legumes, cover crops, proper crop debris management; integrated fertilizer management; indigenous soil fertilizer practices; water harvesting technologies; reduced tillage, etc. Use of integrated fertilizer management was noted as a KSP by most institutions though at different levels. Water harvesting, introduction of indigenous soil fertility practices, and use of cover crops were prevalent KSPs among University respondents, confirming their interest to SW management research work; whereas, ARIs had legumes as fertilizers, reduced tillage by using ripper, and use of locally available resource as KSPs.

Table 13: Proportion of researchers who have produced KSPs in the last 5 years

	Proportion (%) of respondents			
KSPs Produced	ARIs	University	TAFORI	Research Admin.
Legume as source of fertilizer	75.0	25.0	-	-
Use of cover crops	50.0	50.0	-	-
Use of integrated fertilizer management	20.0	40.0	20.0	20.0
Introduction of indigenous soil fertility practices	14.3	57.1	14.3	14.3
Participatory crop residue management	25.0	50.0	-	25.0
Use local resources as alternative to SW improvement	100.0	-	-	-
Water harvesting technologies	33.3	66.7	-	-
Reduced tillage using ripper	100.0	-	-	-

The overall level of participation by stakeholders in the production of KSPs was generally at medium level as perceived by the researchers (Table 15).

Table 15: Extending of involving stakeholders in the production of KSPs (n=50)

Institution/Level of participation	Extent (%) as judged by researchers				
	ARIs	University	TAFORI	DRD/DLRT	Overall
No participation	-	39.4	-	-	4.9
Low	26.5	24.2	-	53.5	31.7
Medium	34.4	18.4	42.4	46.5	36.6
High	39.1	17.9	57.6	-	26.8
Total	100.0	100.0	100.0	100.0	100.0

Dash means no response

3.6.5 Communication media used in disseminating research results

The commonly used communication media in dissemination research results are leaflets and pamphlets, posters, agricultural shows, farmer exchange visits, field days, video shows, demonstrations, technical reports, newsletters, publications, and radio and Internet. The study revealed that overall leaflets/pamphlets is the mostly commonly used dissemination media for many respondents (18.3%), followed by farmer field days (17.8%). Posters and newsletters are widely used in ARIs, but are quite uncommon in the University (Figure 4). This can be explained by the nature of their targeted groups.

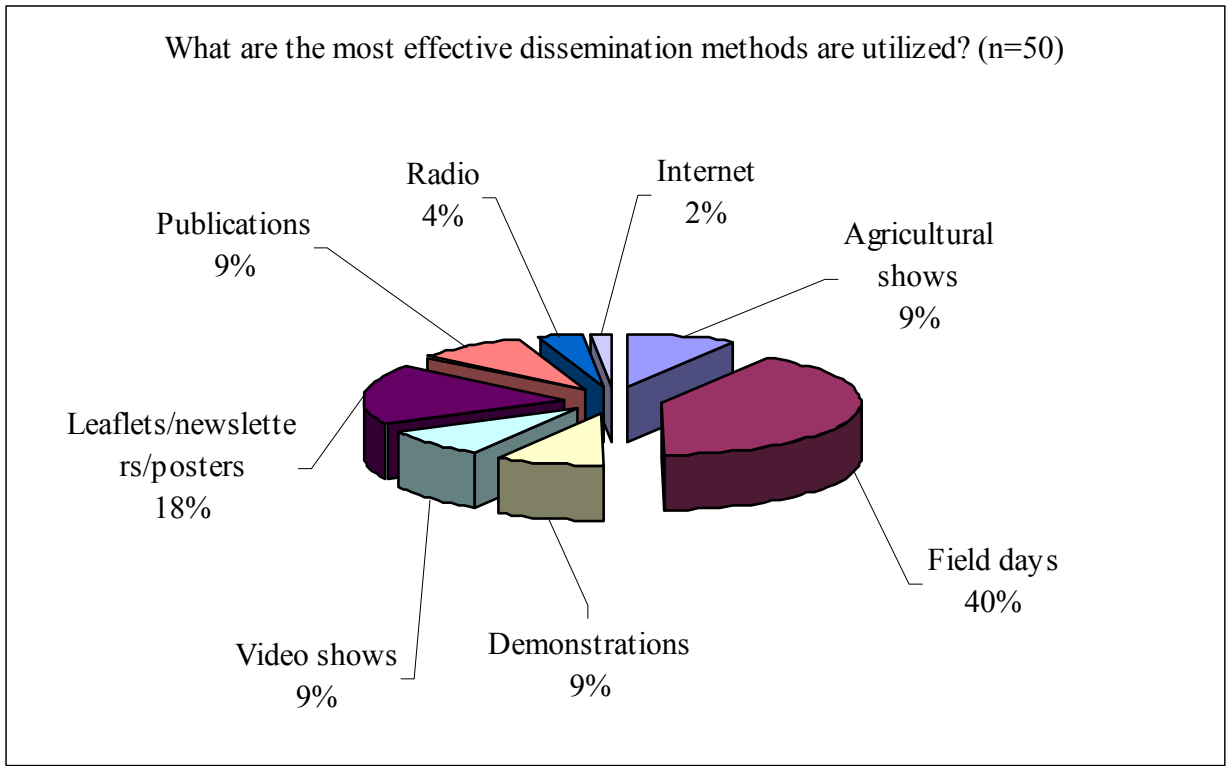

Fig 4: Communication and knowledge sharing methods utilised by the respondents

As far as the effectiveness of the media is concerned, use of posters does not seem to be popular among many researcher respondents. This is supported by an overall small percentage of 1.8% of respondents who used posters as a dissemination media. Farmer field days and study tours (25%) was the most effective media for disseminating research results, followed by field exchange visits (16%) and leaflets/pamphlets (14.3%). The popularity of farmer field days and farmer field and tours over pamphlets and leaflets can be attributed to their high cost of organizing and funding and the benefits that the organizers receive. Table 16 shows percentage distribution of the different dissemination media used by the institutions.

Table 16: How effective are the dissemination media? (n=50)

Institution/KSP needed	% of respondents				
	ARIs	University	TAFORI	DRD/DLRT	Overall
Agricultural shows	-	75.0	-	25.0	9.8
Farmers exchange visits	45.5	54.5	-	-	26.2
Demonstrations	30.0	70.0	-	-	23.3
Video shows	14.3	85.7	-	-	16.7
Leaflets or pamphlets	47.1	47.1	-	5.9	40.5
Farmer field days (FFD)/tours	52.9	47.1	-	-	39.5
Posters	100.0	-	-	-	2.4
Technical reports	60.0	-	20.0	20.0	11.9
Newsletters	100.0	-	-	-	4.8
Publications	7.1	71.4	14.3	7.1	32.6
Radios	33.3	66.7	-	-	7.1
Internet	33.3	33.3	-	33.3	7.1

Dash means no response

3.6.6 Evaluation of impacts of knowledge sharing products

Overall, the results indicate that only 27% of the total respondents do evaluate for the impact of research results. With exception of researchers from University who to some extent evaluate their KSPs, most of the researchers do not have the habit of evaluating impacts of their Knowledge Sharing Products (KSP). The main reason given was that evaluation for impact is not budgeted and planed in the project proposal. Other respondents said it was too early to evaluate the results. Regarding those who had evaluated the impact of their KSPs, they perceived that adoption was as high as 54% in their project area.

3.7 Communication Skills and Effective Utilization of KSPs

A rapid survey was undertaken to evaluate if researchers are adequately trained for communication and uptake promotion on aspects related to soil water management. The study was done by collecting and reviewing of the training curricula from Sokoine University of Agriculture with respect to research planning and management courses given to postgraduate students in programmes related to soil and water management. A total of 7

programmes were assessed. Furthermore an assessment was made based on the courses given to researchers for in service training for professional development.

3.7.1 The aspect of communication in relation to soil and water management

The review aimed at looking on the presence of communication study in courses related to soil and water management from different departments and institutes curricula (Table 17). Of the 7 departments and institutes, only one institute (≈14%) The Institute of Continuing Education (ICE) is offering a course in aspects of communication in relation to soil and water management as component in the Management of Natural Resource and Sustainable Agriculture (MNRSA). This course of Principle of communication in natural resource Management covers the following topics: Definition of communication, Elements of Communication process, Communication/Educational methods and media, How to learn effectively, Message development, Practices to improve communication, Effective listening, Barriers to effective communication and methods or approach used to overcome them. It was also observed that in the department where soil and water management courses were offered either as being elective or core course, students were not being trained on communication. This implied that although the postgraduate students are acquainted with the soil water management knowledge they might fail to deliver the knowledge to targeted stakeholders. Furthermore insufficient training in communication may hinder the process of scaling-up of the information to targeted end users.

Table17: Department and Institutes where the study was conducted

Department	Long or short course offered
Soil Science	MSc. Soil science and Land Management
Agriculture Education and Extension	MSc. Agricultural Education and Extension
Agricultural Engineering and Land Planning	MSc. Agricultural Engineering
Animal Science and Production	MSc. Agricultural Tropical Animal Production and short course in dairy goat husbandry and milk processing
Crop Science and Production	MSc. Agriculture
Development studies Institute	MA in Rural Development
Continuing Education Institute	Short course in management of natural resource and sustainable agriculture

3.7.2 Aspect of uptake promotion of research outputs

A thorough review of curricula for various MSc and MA revealed that the aspect of uptake promotion is completely absent. For example research planning and management courses lack the aspect of uptake promotion of research outputs. Much emphasis has been put on the formulation of research proposal, management of data, interpretation of research and organization and writing of research reports. However, it was under this section where this aspect of uptake promotion could be fully covered. Thus researchers are being trained on how to produce the knowledge sharing products mainly (thesis) which are not easily accessed by

all stakeholders. This implies that many research output regardless of their importance to the targeted end users and supporting actors are not implemented to give desirable impact.

3.7.3 Discussion

Based on the above discussion, it is only (ICE) that offers a short course on Management of Natural Resource and Sustainable Agriculture that covers aspect of communication in relation to soil and water management. However, 86% of all the MSc and MA programme courses at SUA offer training on S&WM and do not cover communication and uptake promotion, thus research results are mainly utilized by few stakeholders. There is a dire need to communicate research findings to farmers and other stakeholders; therefore it is recommended that:

- For the in service short courses, emphasis should be given in improving participants' capacity in communication and uptake promotion of research output. This information will enable the targeted groups involved in generation of technology and researchers to evaluate the outcome of their works. It will also enable adoption of generated technology for efficient production. Therefore, research activities should go hand in hand with identification of strategies to convey information to the targeted groups.
- For effective communication and uptake promotion short courses and MSc/MA course curricula should be reviewed so as to incorporate the aspect of communication and uptake promotion that will enhance dissemination of information. This will enable all stakeholders to have access and effectively utilize locally and globally generated knowledge, information and technologies on soil and water management, through effective networking and collaboration.

3.8 Researchers Motivation and Reward System

Ideally, effectiveness of agricultural research is supposed to be assessed using criteria such as creation of wealth/income among the target beneficiaries. These criteria are often not used. Instead, criteria like publications in internationally referred journals have been used as an effective yardstick for assessing effectiveness and performance of researchers particularly at the universities (SUA and UDSM).

At SUA, publications are major criteria of promoting scientists and this has encouraged them to publish in internationally recognized journals. This had not been the case in public research system such as DRD and DLRT where even the publications award has not yet been implemented. It appears that there has been little or no support for DRD scientists to publish good research work as a way of encouraging good research work. Developing competencies in scientific knowledge should result in staffs that are highly qualified, responsible, and able to operate in teams and conducting focused/targeted research that is essential for sustainability and impact of research at farm level. Drawing up an attractive scheme of service and salary policies that reward improved performance could only support this. The SWOT analysis of the 2003, 5-year NARS Medium Term Plan in Tanzania (URT June 2004) indicated that delayed promotions, salary adjustment led to low staff morale and therefore reduced research output and thus limited transfer of proven technologies to farmers.

During phase II of the Tanzania Agricultural Research Project, it was planned that a start will be made of taking deliberate move to motivate staff by providing research awards to scientists who would excel in showing outstanding research performance (URT, 1998). In the FY 2001/2002 a total of 56 research scientists and 51 technicians were awarded cash prizes totalling US $ 17,894.8 for performing exceptionally well in their research work. The award per person ranged from Tsh. 75,000 to 700,000. Although a total of US $ 20,000 was set aside for the following years, it was not released to that effect. It is difficult to attribute the increased number of released technologies in the following years to prizes given in the previous year (2001), but there has been significant increase particularly in number of seed varieties released in the following years. For instance, the number of improved varieties that were released in year 2000 was only 5; year 2001 was only 11; year 2002 was only 9 and year 2003 the seed varieties were increased to 17.

At the University scientists are generally very highly motivated. However, it is difficult to attribute their efforts to technology utilization and impact at farm level. The university incentives are geared toward promoting in academic interests (basic research), research publications and individual recognition.

Box 1: The Case Study of Staff Motivation - Lack of income security

The mid-term review of TARP II remarked that the enabling environment for agricultural research in terms of scientists' salaries and incentives leaves much to be desired. The salaries of DRD staff have deteriorated in real terms during the past two decades. Salaries are not competitive and too low to sustain a family. This lack of income security affects research work. The different phases of the research process are in varying degrees subject to financial incentives. Data collection in the field, for example, presents an opportunity to save some money from DSA payments received, while financial incentives in the phases of data analysis and report writing are absent. This has resulted into a backlog of data yet to be analyses and in partial and sometimes delayed report writing.

In the Lake and Northern zones 'leaflet production weeks' have been organized during the past two years in which the output produced was rewarded (Tsh. 100,000 per leaflet). This encouraged staff to produce user-friendly outputs. Both zones have now produced more than 50 leaflets and posters. In this way 'shelves' technologies have been made available to extension and farmers. The fees paid to researchers can be part of the research budget, which would imply that clients contribute to staff motivation. The experience in the two zones indicates that clients do not object to this when the price they pay is proportionate to the results they get. Such output-related incentives enhance staff performance.

The review of Animal Production and Diseases Research (RAPD) in 2001 and the Review of Crops, Factor and Socio-economic Research (RCFSE) in 2002 raised concern over the quality of research on some sites on-farm in the zones. They also recommended some of the

performance evaluation criteria that need to be followed by research institutions in order to retain the image of DRD of being an attractive place to work with (see Box1).

3.8.1 Merit-based public service reward system

Staff motivation can be enhanced through zonal empowerment, independent ZARF's research award, publication awards, study tour and sponsorship to scientific conferences. All these mechanisms are to some extent used in DRD. It is all useful but probably insufficient mechanisms to achieve the ultimate goal of client-oriented research. A truly merit-based public service reward system is needed with remuneration level adequate to sustain a family and make some savings possible. The MAFS is one of the five ministries in the pilot phase of the public service reform programme scheduled to start in July 2002. Under this new programme contracts will be signed between superiors and their direct subordinates (for example, between the director of DRD and the zonal DRD's). Performance appraisals will take place twice a year with both parties grading themselves and grading by the superior, and only promotions on merit will be possible. Such a results-based management approach, when sternly implemented, certainly has the potential to change things. National and zonal research management need to assume a pro-active role in the implementation of this approach.

3.8.2 Criteria for performance evaluation

Substantial improvements in salaries, linked to performance evaluation, are necessary. The "hard criteria used in performance evaluation of agricultural researchers should at the end of the day reflect the main objective of client-and development-oriented research, i.e. adoption and adaptation by farmers. However, evaluation of researchers on the basis of actual adoption/adaptation by farmers might be difficult to implement, since a multitude of 'external' factors (outside the control of individual researchers) affect adoption rates. Various criteria can however, be used to evaluate client-and development orientation. These include:

- Justification of research site selection and representation of participating farmers.
- Justification of level of experimental and non-experimental factors.
- Quality and timeliness of seasonal research reports, including reporting on issues emerging from earlier reports.
- Financial/economic analysis of research results.
- Gender-sensitiveness of research work.
- Number of farmer-managed/farmer-implemented trials.
- Adequate statistical analysis of no-farm experiments, including analyses across locations and seasons when appropriate.
- Development of conditional recommendations.
- Development of user-friendly extension material.
- Level of pro-active engagement in development-related activities (for example, training of other stakeholders in rural development).

These criteria can be used in the evaluation of on-station and on-farm research work on annual as well as perennial crops, and also for long-term research topics in the special programmes (for example, integrated soil fertility management). When most of the above mentioned criteria are adhered to, adoption/adaptation by the majority group of resource-poor farmers becomes more likely. An enabling environment, however, remains crucial for large-scale adoption, but at least individual researchers have done what is within their control.

The Tanzanian personnel policy states that ‘providing a kind of motivation and encouragement through attitudes and actions helps to attract advance and retain qualified staff that contribute to the development of innovations and become responsible for the outcomes’. This could be accomplished partly by creating an environment that fosters ever-increasing creativity, quality and productivity as well as scientific and social well being. The newly introduced ‘Open Performance Review and Appraisal System (OPRAS)’ that is under the civil service reform programme aims at accomplishing this endeavour.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

There is a strong policy demand for increased utilization of effective existing knowledge, with the national water policy being very strong on this subject. Therefore, it is not true that there is no policy support for increased uptake promotion and scaling-up of research results in soil and water management. However, the appraisal found that these policies are not adequately accessed and interpreted by leaders and managers of research organizations. As a result, it is true that the role of research systems, institutions and researchers in uptake promotion is not apparent in research strategies and programmes. Therefore, the main obstacle is not policy but rather the mind-set and institutional set-up that separates research and extension and emphasize the linear dissemination approach of research-extension-farmer linkage. Consequently, robust communication and uptake promotion planning is missing from most of the research projects as researchers concentrate on communicating only either among themselves or to the extension service. The need to do a thorough assessment of all the target stakeholders and then to appropriately packed the results and advice to target these stakeholders is neglected in the planning, implementation and evaluation of research projects. For this reason, research outputs rarely include specific advice to farmers, input suppliers (e.g. fertilizer suppliers), extension service, policy makers and other clients. Most of the researchers tend to blame the extension system when their results and outputs are not taken up. As a result, research programmes and projects are rarely evaluated for communication, knowledge sharing, uptake and utilization of knowledge and technologies produced.

This appraisal show that it is true that a very small proportion of programmes and project budgets and activities are committed or used in the communication and uptake promotion of research results. Results from the questionnaire survey indicate a high imbalance of the amount of time and funds allocated to different stages of the research to utilization chain. The time allocated to fieldwork was significantly higher and more than double what was allocated for data analysis and report writing respectively. The researchers' time allocation to knowledge sharing was about 30% of what is allocated to field data collection. The final stage of giving targeted advice to clients is allocated only a minuscule 4% of the funds allocated to field work.

The research managers and researchers have identified a number of barriers limiting their participation and investment in uptake promotion and scaling-up of research results. These include inadequate skills in communication and promotion, low capacity in the use of information and communication technology, and the current incentive mechanism that does not recognize scaling-up efforts.

4.2 Recommendations

On the basis of the limited findings of this rapid appraisal, it is being recommended that:

i) There is an urgent need for research organizations to review their strategies so as to put more priority and thrust on the promotion of uptake and effective utilization of already

existing knowledge, information and technologies as demanded by national development policies;

ii) Researchers should be required, encouraged and supported to work more on knowledge prospecting and packaging for different clientele rather than the current very high proportion of investment in field and laboratory investigations;

iii) To achieve the above regulations for project development, approval and M&E should be reviewed to demand the inclusion of communication and uptake promotion as part and parcel of research projects;

iv) Furthermore, researchers should be re-trained to increase their skills in communication, uptake promotion, and effective channels and media;

v) The research system should undertake an analysis of uptake pathways for different knowledge and technologies so as to identify and profile the knowledge needs of all the critical players, leading to better targeting of outputs;

vi) Thus develop communication and uptake promotions plans to respond to users' knowledge, attitudes and current practices;

vii) Provide appropriate information and communication technologies (ICTs) to different agricultural research institutes;

viii) Improve the incentives given to researchers and find ways of linking them to the extent of uptake and utilization of research results, and

ix) Review the curricula of relevant post-graduate programmes to ensure that new researchers are well trained in communication, uptake promotion, and effective channels and media.

BIBLIOGRAPHY

MAFS (1996): Program Implementation Plan. National Agricultural Extension Program – NAEP II. Final draft. MAFS, Dar es salaam

MAFS (June 2004): Medium Term Strategic Plan for NARS, 2004/5-2008/9. MAFS, Dar es salaam

URT (March 1998): National Beekeeping Policy, Ministry of Natural Resources and Tourism. Government printer, Dar es salaam

URT (1997): Agricultural and Livestock Policy. Ministry of Agriculture and Co-operatives – Dar es Salaam.

URT (2000): The Tanzania Development Vision 2025. Government Printer, Dar es salaam

URT (August 1992): Forest Research Master Plan 1993 –2002. Ministry of Tourism, Natural Resources and Environment. Tanzania Forestry Research Institute

URT (August 1998). Project Implementation Plan – Tanzania Agricultural Research Project (TARP II). Department of Research & Training, Dar es salaam

URT (August 2003): Tanzania Soil Fertility Initiative Proceedings of stakeholders Feedback Workshop held at Oasis Hotel, Morogoro 19th – 20th June 2003. Ministry of Agriculture and Food Security, Dar es salaam

URT (July 2002): National Water Policy. Ministry of Water and Livestock Development. . Government Printer, Dar es salaam

URT (June 1999). 3rd Revision Guidelines for Zonal Agricultural Research Funds – Tanzania Agricultural Research Project Phase two (TARP II) Department of Research & Development, Ministry of Agriculture and Co-operatives – Dar es salaam

URT (March 1998): National Forest Policy, Ministry of Natural Resources and Tourism. Government Printer, Dar es salaam

URT (March 2003). Agricultural Sector Development Program Framework and Process Document. Final Draft. Ministry of Agriculture, Dar es salaam.

URT (October 1999): National Forestry Research Master Plan (NAFORM) (2000 – 2009). Ministry of Natural Resources and Tourism, Forestry and Beekeeping Division. Government Printer Dar es salaam

URT (October 2001): Agricultural Sector Development Strategy. The Government printer, Dar es salaam

URT (October 2002): National Agricultural Research Fund (NARF) Constitution. Division of Research and Development

URT (October 2002): Poverty Reduction Strategy Paper (PRSP). Government Printer, Dar Es Salaam,

ARI Tumbi (2001). Research Project Proposal Summaries for "Western Zone TARP II Funding for November 1998 – November, 2001". Western Zone Head Office

ARI Tumbi (1998). Research project proposal summaries for Western Zone. Tumbi Agricultural Research and Development Institute, Tabora

DRD (1997). Progress reports for root and tuber programme. Tanzania root and tuber co-ordinating committee meeting. Tengeru, Arusha

Lema, N. et al. (2003). Managing Research for Agricultural Development. Proceedings of the National Workshop on Client Oriented Research. MAFS, Dar es Salaam

MAFS (1999). Guidelines for Zonal Agricultural Research Funds. Tanzania Agricultural Research Project – Phase Two (TARP II). MAFS, Dar es salaam

MAFS (1999). National Agricultural Research Fund (NARF) Constitution. Division of Research and Development. Dar es salaam

URT (1998): Program Implementation Plan. Tanzania Agricultural Research Project – Phase Two (TARP II). MAFS, Dar es salaam

URT (1995). Planning, Monitoring and Evaluation of Agricultural Research; Proceedings of a workshop, Morogoro Hotel, Tanzania. February 13 –17, 1995.Ministry of Agriculture, Dar es salaam

URT (1996): Program Implementation Plan. National Agricultural Extension Program (NAEP II). Final Draft. Ministry of Agriculture, Dar es salaam

URT (1997): Agricultural and Livestock Policy. Ministry of Agriculture and Co-operative Development. Government Printer, Dar es salaam

URT (2003). Managing Research for Agricultural Development-Proceedings of the National Workshop on Client Oriented Research 27 – 28 May 2003, Moshi, and Tanzania

DRD (2001a). Client-oriented research management and organizational sustainability. Background, framework and implementation of the COR Management Approach. MAFS/DRD, Dar es Salaam

DRD (2001b). Proceedings of the First National Workshop on the Client-Oriented Research Management Approach. Held at Mbagala Spiritual Centre, Dar es Salaam, 26-7 June 2001. MAFS/DRD, Dar es Salaam

DRD/KIT (2000). Introduction to Client Oriented Research in Tanzania. Division of Research and Development, MAFS, Tanzania and Royal Tropical Institute, The Netherlands. Dar es Salaam, Tanzania

DRT (1994). Synthesis of the strengthening of client-oriented researches (COR) meeting. Morogoro 20 July, 1994. Department of Research and Training. Ministry of Agriculture, Dar es Salaam, Tanzania

Kileo, R. and T. Schrader (2001). Client-Oriented Research Management in the Lake Zone: Experiences and Challenges. Prepared for National COR workshop, Dar es Salaam, June 2001. LZARDI, Mwanza, Tanzania

Lema, N.M; Chira Schouten and Ted Schrader (2003): Managing Research for Agricultural Development Proceedings of the National Workshop on Client Oriented Research 27-28 May 2003, Moshi, Tanzania. DRD and KIT MAFS, Dar es Salaam

Massawe, F., L.C. Mushi and J. Mziray (1999). Stakeholders in the agricultural sector of the Northern Zone. Northern Zone Publication Series, Field Note no.3. NZARDI, Arusha

Otysina, R. et al (1999). Annual Report. SADC/ICRAF Agroforestry Research Project. Tumbi, Tabora.

SADC/ICRAF Agroforestry Research Project (2000): Research Overview Report Tumbi, Tabora

SADC/ICRAF Agroforestry Project (1998): Annual Report, No. 126. - Tumbi, Tabora, Tanzania

SADC/ICRAF Agroforestry Project (2003): Annual Progress Report. - Tumbi Tabora, Tanzania. 56pp

APPENDIX I: QUESTIONNAIRE

Ministry/Institution: Location:
Name of respondent:
Position of respondent:
Sex:
Name of interviewer: Date

General questions:
How long have you been in this post? Months _____/Years _____

Promotion of research results with specific focus on soil and water management
1. What research results have you produced in this Ministry/Institute with regard to S&WM?
i) ---------
ii) ---------
iii) --------
iv) --------
2. Do you promote research results in this Ministry/Institution? YES/NO

3. How do you promote research results in this Ministry/Institution?
_____
_____
_____

4. What media do you use in promoting these research results?
(Posters, leaflets, booklets, radio etc)
i) ii) iii)
iv) v)

5. Which of the listed media are most effective in reaching the targeted end users?
I) ii) iii)

6. What is the role of the research system in ensuring that there is effective promotion of research results?
_____
_____
_____
7. What constraints do you encounter in promoting the research results?
_____
_____
_____

Uptake of research results with specific focus on soil and water management.
1. What is the role of the research system in ensuring an effective uptake of research results?

2. Do you have any media through which your research results in soil and water management are delivered to end-users? YES/NO

3. Which media do you use in ensuring that research results in S&WM reach end users?

i) ii) iii)

4. Which of the media mentioned are most effective in ensuring that the research results reach the end users?
i) ii) iii)

5. What reactions if any have you received from the end users?

_____
_____

6. What constraints are you encountering/do you encounter in using any of the media you have mentioned?

_____
_____

Utilization of research results with specific focus on soil and water management
1. What is the role of the research system to ensure effective utilization of research results with specific focus on S&WM?

_____
_____

2. How wide are your research results utilized?

_____
_____

3. What methods do you use to ensure that research results in S&WM are effectively utilized?

4. What approaches do you use to ensure that the results have effectively been utilized? (M&E, Impact studies etc)

_____
_____

5. What do you do with the feedback that you receive from end users?

_____
_____

6. What constraints are you facing/have you faced in ensuring that the end products are utilized?

_____
_____

Extra Questions for DIRECTORS OF POST GRADUATE STUDIES & DEANS OF FACULTIES

1. Does your Institution have any policy on communication and uptake of research results? YES/NO. If YES, give details.

_____

_____

2. Does the policy contain issues on soil and water management? YES/NO.
If YES, give details.

_____

_____

3. Does your Institution have strategies on communication uptake of research results? YES/NO. If YES, give details.

_____

_____

4. Do the strategies contain issues on soil and water management? YES/NO.
If YES, give details.

_____

_____

5. Which departments/Institutes have a curriculum addressing issues on soil and water management?

_____

_____

_____

6. Does the curriculum contain communication plans for disseminating soil and water management results to end-users? YES/NO
If YES, which knowledge sharing products are you promoting to end-users?

_____

_____

_____

7. What uptake media are you using to promote these products?
i) ii) iii)

8. How do you ensure that the end users sustain the promoted products?

_____

_____

9. What constraints do you encounter in promoting the products?

_____

_____

10. Do you conduct any short courses on communication skills? YES/NO

If YES, does the content of the course include issues on communication in soil and water management research/ YES/NO

If YES, give details of the contents.

_____

_____

11. How often do you conduct the short courses? □ Once □ twice per year □ Others

12. What is the average number of participants per intake? _____

THANK YOU FOR YOUR COOPERATION

Part 2: Questionnaire for Researchers

Ministry/Institution: Location:
Name of respondent:
Position of respondent:
Sex:
Name of interviewer: Date

1. What policy and/or strategy documents are you aware of?
i)----------
ii) ----------
iii) ----------
iv) ----------
v) ----------
2. Do you have access to the policy and strategy documents you have listed? YES/ NO

If YES, to what extent do you have access to the documents you mentioned?

High	Medium	Low

If low, give reasons.

If NO what are the reasons for not accessing these documents?
---

3. In the past five years (1998-2003) how many policy and strategy documents were produced and have bearing on soil and water management?
i)----------
ii) ----------
iii) ----------

4. What technical information do these documents contain?
i)----------
ii) ----------
iii) ----------

5. What was the source of this information? (List)
i)----------
ii) ----------
iii) ----------

6. How many technical reports or journal papers have you produced in the past five years?
i)----------
ii) ----------
iii) ----------

7. What were the specific advises given to the target end users (policy, makers/managers/farmers, etc)?

i)----------

ii) ----------

iii) ----------

8. To what extent have these advises been used by the target end users?

High	Medium	Low

9. For each target group give reasons if the extent of use is ranked low.

---

10. What knowledge sharing products (KSP) have you produced in the past five years?

i)----------

ii) ----------

iii) ----------

11. To what extent did the stakeholders participate in each of the KSP?

---

12. For each of the KSP what were the stakeholders' needs? List

i)----------

ii) ----------

iii) ----------

13. Which communication media did you use to disseminate your research results?

i) ii) iii)

14. Which of the listed media were most effective or preferred by the end users?

i) ii) iii)

14.5 Have you evaluated any or all of the KSP? YES/NO

If YES what is the proportion of adoption by the target group?

_____

_____

If NO, give reason(s)

---

16. For each of your three major research projects list the relative time and budgeted expenditure for the following activities:

Activity	Time allocated	Budget (Tsh)
Field work		
Demonstration		
Seminars/workshops		
Farmer assessments		
Preparation of audio-visual aids		
Farmer exchange visits		
Data analysis		
Technical report writing		
KSP		
Advise to end users		
Others		
Total		

17. Have you been trained in communication skills? YES/NO
If YES, How do you assess yourself in terms of communication?

---

18. Give own assessment on capacity to communicate and promote KSP?

---

19. What barriers are there in communicating and promoting KSP?

---
20. What are the barriers in the effective utilization of KSP?

---
21. Suggest priority interventions to overcome the identified barriers?
i)---
ii) ---
iii) ---

APPENDIX II: LIST OF STAKEHOLDERS IN SOIL AND WATER MANAGEMENT

1	Tanzania Meteorological Agency (NMA)	Ministry of Communication and Transport
2.	Tanzania Commission for science and Technology – COSTECH	Ministry of Science Technology and Higher Education
3.	Rwegarulila Water Institute – Ubungo	Ministry of Water and Livestock Development
4.	Water Laboratory – Ubungo	
5.	A.R.I. Mlingano	Ministry of Agriculture and food security
6.	MATI Mlingano	
7.	Department of Research & Development	
9.	Land Use Planning and Mechanization sections	
10	TARP II Project Manager	
11	NAEP – Project Manager	
12.	Department of Training Institutes	
13.	National Land Use Planning Commission	Ministry of Lands and Human Settlement
14.	Department of Lands	
15	Tanzania Forestry Research Institute (TAFORI)	Ministry of Natural Resources and Tourism
16	Department of Forestry and Beekeeping	
17.	Rufiji Basin Development Authority (RUBADA)	Dar es salaam
18.	Rufiji Basin Management and Small-holder Irrigation Improvement Project	Dar es salaam
19.	Department of Agricultural Engineering	Sokoine University of Agriculture
20.	Department of Soil Science	
21.	Department of Extension	
22.	TARP II–SUA Co-ordinator	
23.	Directorate of Environment	Vice Presidents Office, DSM
24	National Environmental Management Council (NEMC)	
25.	National Ranching Company (NARCO)	Dar es salaam
26.	Private Shallow well drillers	Dar es salaam
27.	Mohamed Enterprise (stockist for fertilizers & other farm inputs)	Dar es salaam
28.	Department of Geography	University of Dar es salaam
29.	University College of Lands and Architectural studies	
30.	Institute of Resource Assessment	
31.	Department of Civil Engineering	