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Scaling-up and Uptake Promotion of Research Findings on Natural Resources Management in Tanzania

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Abstract

Improved technologies and innovations are essential to support increased productivity of natural resources in watershed management. Many research and development programmes and projects on natural resources management (NRM) have been conducted in Tanzania to address problems of declining natural resource productivity. Due to the nature of interventions in NRM, it often takes a long time for significant and appreciable change and impact on livelihoods to happen. This is because few of the recommendations from NRM research have been put into use by the target end users. Lack of an enabling policy environment is one of the major causes for non-adoption. This is attributed to inadequacy in communicating research findings by researchers to stakeholders other than farmers. A study was conducted to better understand the research and communication processes, barriers and efficacy of various communication methods and media used for various stakeholders across a range of levels and research for development sectors. Results showed that most research projects do not have communication plans for ensuring uptake of findings by other stakeholders such as policy makers, input suppliers, traders and manufacturers. Much of the resources for research are allocated to conducting field-work rather than production and dissemination of knowledge-sharing products. The study proposes that research projects should include communication strategies to ensure that research findings are well communicated to the targeted stakeholders in order to influence decision-making and resource allocation, to enhance utilisation of improved technologies. Improvement in research design is envisaged to improve the impact of research on the livelihoods of the poor and increase environmental benefits in the watershed.

Key words: Communication strategies, Knowledge sharing products, Scaling-up and Uptake promotion.

Introduction

Tanzania is endowed with abundant natural resources. The country has a long history of natural resources management (NRM) interventions and there is a large reserve of technologies to address declining natural resource productivity (Hatibu et al., 2002; Onduru et al., 2001). Although many NRM technologies have been introduced to restore soil and water in degraded lands, most of these have been shown to be effective in pilot studies (Senkondo et al., 1999; Lazaro et al., 1999). Adoption of these technologies on a wider scale is a concern of many practitioners in rural development (Ashby, 2003; Onduru et al., 2001). Limited participation of local communities in the management of local resources; lack of involvement of social scientists and economists in the research teams; and the absence of an enabling policy environment are among the reasons for low adoption (Hatibu et al., 2000; Craswell, 2001; Barrett et al., 2002). Farming systems approaches in the early 1990s and later participatory approaches envisaged increased involvement of farming communities in technology development and hence improved adoption of technical innovations (Kalineza et al.; 1999; Ashby, 2003). For example, participatory approaches were used in the implementation of projects such as the Soil Conservation and Agro-forestry Project Arusha (SCAPA); Soil Erosion Control and Agro-forestry Project (SECAP) in Lushoto; Hifadhi ya Mazingira (HIMA) in Iringa; and Rainwater Harvesting (RWH) by the Soil Water Management Research Group at the Sokoine University of Agriculture (SUA). This enabled spreading

innovations to communities within the project areas; however, the expansion has been within the same stakeholder groups, which are referred to as horizontal scaling-up (Gundel et al., 2001; Middleton and Ellis-Jones; 2003). The expansion of these technologies to other sectors and stakeholder groups like policy makers, donors and development institutions nationally and internationally, referred to as vertical scaling-up, has been lacking (Gundel et al., 2001; DFID/NRSP, 2002).

One of the problems facing past and current research and development (R&D) in NRM is failure to effectively communicate findings to stakeholders other than farmers (Garforth, 1998; Ashby, 2003). The traditional dissemination strategy of research findings has continued to use the same research-extension-farmers pathways (Garforth, 1998; Norrish, 2001). Most of the information generated from NRM research could not inform policy formulation and decision-making to support farmers' efforts (Mosse, 1998; Hatibu et al., 2002). Hatibu et al. (2002) argues that policy and institutional issues beyond the control of households influence wider adoption. In many cases, farmers could not utilize information provided by researchers due to the lack of a conducive policy environment that is a necessary ingredient for adoption of new technologies (Turton et al., 1998; Hatibu et al., 2002).

The problem is partly caused by the way research projects are designed. Most guidelines for research projects do not demand a plan of how the research project and its outputs will contribute to the livelihoods of the poor, nor ways in which research findings would be communicated to ensure that this happens (MAFS, 2003; Lutkamu et al., 2004). The other stakeholders are necessary for creating enabling environments to allow the uptake of research products, such as in manufacturing and distribution, policies, institutions and processes that would promote use of the products (Ashby, 2003). The uptake of research products needs more players than researchers, extensionists and farmers, as suggested in the Agricultural and Knowledge Information Systems (AKIS) knowledge triangle (FAO/World Bank, 2000). Furthermore, R&D has failed to address institutional and policy issues in order to support a broader integrated strategy that addresses NRM and poverty. Ashby (2003) argues that researchers should recognize that the outcomes and impact of NRM research depends on relationships between researchers and other stakeholders, who may have more power to visualize and to realize the desired outcomes of interventions than the researchers do.

This is a challenge for researchers in NRM, especially in integrated watershed management. Integrated Watershed Management (IWM) is a complex process that involves multiple stakeholders who have different interests, perspectives, entitlements, knowledge, capabilities and power (CGIAR, 2003). Although management of water systems is part of the broader natural environment and of their socio-economic environment, it goes beyond land and water management to include significant parts of land-use planning, agricultural policy and erosion control, environmental management and other policy areas (Shah et al., 2000). The multiple stakeholders involved include individual farmers, farmers' groups, communities, downstream and upstream users of water, village leaders, district authorities, traders, input suppliers, financial institutions and national level institutions (Grewal et al., 1995; Turton et al., 1998; Samra et al., 2002). All these influence the utilisation of NR available in watersheds or basins in one way or another.

The role of research in watershed management is to provide technologies that are broadly applicable to make it more meaningful and cost effective (Turton et al., 1998). However, in order for technologies to benefit the end users the government has to put in place a structure or systems to monitor and regulate use of resources, a task that goes beyond the research and extension mandate (Shah et al., 2000). Improving the benefits of watershed management also requires reorientation of sectoral policies on markets and prices, legislations on land, water resources and water rights, harmonization of research and

extension services in agriculture, livestock, forestry, and wildlife sectors (Turton et al., 1998). Experience from India shows that the success they have recorded in IWM is due to direct government interventions in terms of providing guidelines, resources and monitoring and evaluation systems to assess impact (Samra et al., 2002). This happened because of the continued efforts by research to generate valuable technologies in NRM using participatory approaches and engaging government officials and private service providers in the whole processes right from the beginning (Grewal et al., 1995).

Experience in Tanzania, for example in the Rufiji river basin, shows that apart from technical and institutional challenges, scientists are faced with difficulties in ensuring that well-informed solutions are taken up by policy makers in planning and decision making (Sokile et al., 2004; Lankford et al., 2004). Lankford et al., (2004) challenges researchers to manage “the complex science-policy interface as an important feature of integrated water resources management”. This challenge calls for a change in the way research projects are designed and communicated to end-users at all stages of research project implementation. Improving communication of the research findings across a range of stakeholders in the R&D sectors would create an enabling environment to support use of information from research findings on a wider scale. This is envisaged to increase the impact of research on farming households’ livelihoods and watershed development. This paper highlights the research findings on a study conducted to understand communication constraints and barriers limiting uptake and promotion of research findings from a few selected research institutions in Tanzania.

The main objective of this study was to institutionalize and promote uptake, scaling-up and effective use of research findings from soil and water management. The specific objectives were:

- i. To understand the policy, institutions and processes guiding research designing and implementation of NRM
- ii. To understand and elaborate the constraints and barriers limiting uptake and promotion of research findings by research institutions and other related partners.
- iii. To increase understanding of the efficacy of communication methods used to disseminate research findings to various stakeholders.

Research questions used to guide information-gathering included the following:

- a) To what extent does a researcher have access to and use of higher-level policy and strategy documents and guidelines in designing research projects?
- b) How much of the information and data contained in his/her technical report or journal paper has been used to produce specific advice to farmers and other clients such as policy makers, input suppliers and manufacturers?
- c) What communication methods and media do researchers use to disseminate research findings, and how effective are they?
- d) What communication methods and media do farmers and other clients receive or prefer in receiving information on improved technologies?
- e) How are researchers capable of communicating and promoting uptake of their research results?

Methodology

Literature review

Several policy strategies and research guideline documents, including grey literature, were reviewed for insight into policy concerns on issues of NRM and the pathways through which policies are received and implemented. Information was collected from institutions including the Directorate of Research and Development (DRD) in the Ministry of Agriculture and Food Security (MAFS), Sokoine National Agricultural Library (SNAL), and projects such as the

Tanzania Agricultural Research Project II and Agricultural Sector Development Programme, Tanzania Forestry Research Institute (TAFORI) and the Environmental Department of the Vice-President's Office (VPO).

Primary data collection

Interviews using two types of semi-structured questionnaires were conducted. The first semi-structured questionnaire was administered to 21 policy makers, research managers in the DRD and Extension Services in the Ministry of Agriculture and Food Security, the director of the Forestry Research Institute, Director of Postgraduate Studies and Deans of the Sokoine University Faculties. The second semi-structured questionnaire was used to collect information from 50 NRM researchers at national and zonal level. Nine out of fifty researchers interviewed were women scientists, forming 19 percent of the total respondents. Information collected included issues related to policy, strategies and guidelines used to guide research designs and how communication activities to disseminate NRM research findings are planned, funded and implemented.

Information at village level was also gathered to evaluate the current sources of information to farmers regarding NRM technologies with reference to rainwater harvesting (RWH) in Maswa and Western Pare lowlands (WPLL), where research on RWH has been conducted over the past ten years. Focus group discussions with farmers were conducted in twelve villages in the target areas to establish the efficacy of various communication methods and media used by researchers in communicating information on improved technologies to end-users.

Data collected from a checklist and the semi-structured questionnaire were summarized, coded and analyzed using the SPSS package. Descriptive statistical analysis was done which included frequencies, percentages and means, and the results are presented in tables, charts and histograms.

Results and Discussion

Policy and Institutions Guiding Research and Communication Processes in NRM

Institutions involved in NRM research in Tanzania

Several institutions are conducting research related to soil and water management. These include the Ministry of Agriculture and Food Security (MAFS); Ministry of Water and Livestock Development (MWLD); the Vice-President's Office (VPO); National Land Use Planning Commission (NLUPC); the Town Planning division of the Ministry of Lands, Housing and Urban Development; National Environmental Management Council (NEMC); Ministry of Higher Education, Science and Technology; University of Dar-es-Salaam under the Institute of Resource Assessment; the University College of Lands and Architectural Studies (UCLAS); and Sokoine University of Agriculture (SUA). One of the major shortcomings is that there is no coordination between institutions involved in water resources management. This poses a big challenge that needs to be addressed if the country is to achieve integrated water resources management. One area of intervention is to address the harmonisation of policies and regulations at policy level and work towards one common guideline in addressing river basin issues.

Policies guiding research and communication processes in NRM

The study showed that there are policies that guide NRM in all relevant sectors such as agriculture and livestock, forestry, land and water. Policy and strategy documents reviewed included the National Science and Technology Policy of 1995; Agriculture and Livestock Policy, 1997; National Forestry Policy, 1998; National Water Policy, 2002; Poverty Reduction Strategy Paper, 2002; Agricultural Sector Development Strategy (ASDS) (URT, 2001);

Agricultural Sector Development Programme (ASDP) (URT, 2003); National Forestry Research Master Plan 2000-2009 of 1999; National Agricultural Research Fund, 2002; and Tanzania Soil Fertility Initiative – Concept paper, Guidelines for Zonal Agricultural Research Funds of 1999 and Medium Term Plan (MTP) (MAFS, 2003). Some of the policy and strategy documents mention contain some aspects of soil and water management (or NRM). However, MTP acknowledged lack of communication of research to end-users.

The Water Policy (URT, 2002), for example, states categorically that there is very limited research into water resource management and that the research findings are not adequately disseminated to end-users. It is, however, acknowledged in the Water Policy that in order to attain equitable, efficient and sustainable water resource management and based on experience gained in the country and internationally, understanding water resource management will be based, among other things, on improved communication. Improvement in the dissemination and utilization of research findings in the sector will be achieved through the strengthening of the information, education and communications system, and monitoring and evaluation involving many stakeholders.

The Agricultural Sector Development Strategy (URT, 2001) and the Agricultural Sector Development Programme (URT, 2003) and the recent Medium Term Plan (MTP) for R&D programme of MAFS identified poor communication of research results as one of the major problems in the uptake and utilization of research results (MAFS, 2003). These documents recognize the importance of informing and updating relevant information for all stakeholders such as input suppliers and equipment/implement manufacturers in a market economy. The ASDP emphasizes that the current focus in research processes will be on data collection, analysis and dissemination for planning purposes at national level by sector ministries. It is at this interface that research should play a role in informing stakeholders on the scientific evidence of the performance of various technologies so as to influence planning and resources allocation for uptake of improved technologies on a wider scale. However, traditional research is still using conventional communication methods for dissemination of research findings, as discussed later in this paper.

The review also showed that during the implementation of the National Agricultural and Livestock Research Project Phase I (NALRP I), the National Agricultural Research Fund (NARF) and later, Zonal Agricultural Research Funds (ZARFs) were established to facilitate collaborative and contract research. One of the areas supported by ZARF was dissemination of research findings. It was envisaged that the funds would be available to motivate scientists to publish their research findings in international papers and in local series as well as to translate these results into extension messages. Although this was a good intention, it is unfortunate that end of project evaluations of performance were based on the articles published in international journals only. Furthermore, in the Tanzania Agricultural Research Project Phase II (TARP II), the Farming System Research sub-directorate developed a training manual in order to strengthen researchers' skills in technology transfer. Unfortunately the manual did not include a section dealing with communication and/or uptake promotion. For most projects and programmes, regular studies were conducted to assess the impact of previous attempts to promote innovations and to provide feedback to scientists for further technology development. However, there was no emphasis on ensuring that research findings reached various categories of stakeholders.

Scientists' Awareness of Policies and Strategies in NRM

Results showed that only a small proportion of scientists are aware of the existence of national policies and strategies on NRM. Table 1 summarizes the response on scientists' awareness on policy and strategies that guide development of NRM in the country. In the ARIs, on average only 37% were aware of these documents. In the Universities about 50% of respondents were aware of the policy documents guiding soil and water conservation. Scientists from other research institutions such as TAFORI are slightly aware of these

documents. One of the reasons for low awareness is limited accessibility to these documents, particularly in the ARIs. The sources of information on policies and strategies to researchers mentioned were MAFS headquarters (2%), Institute libraries (8%), government website (7%) and friends/colleagues (2%).

Table 1: Scientists' awareness of policies and strategy documents (% of respondents: n=50)

Documents	Institutions/Organisations			
	ARIs	University	TAFORI	DRD/DLRT
Soil Fertility Initiatives	100	-	-	-
Irrigation Master Plan	41	41	7	10
Soil Water Conservation Strategy	25	50	-	25
Land Use Policy	29	43	14	14
Poverty Reduction Policy	100	-	-	-
Agricultural Sector Development Programme	67	17	-	17
Water Policy	44	44	-	11
Agriculture and Livestock Policy	38	63	-	-
Agro-forestry Strategy	100	-	-	-
National Forestry Research Master Plan	-	-	100	-
National Forestry Policy	-	40	40	20
Agricultural Mechanisation Strategy	100	-	-	-

The results indicate that most researchers have not been adequately informed of the policies and strategies and consequently they do not consider that they have a role in providing scientific evidences in NRM situations to policy makers. By nature of their mandate, research institutions require clarity on this aspect and the need for compliance with policies and strategies in implementation of their projects, so that research findings contribute to policy objectives and reviews thereafter.

Scientists' understanding of research up-take pathways

Results on research uptake pathways by National Agricultural Research Systems in the sector ministries such as the Ministry of Agriculture and Food Security (MAFS), Ministry of Water and Livestock Development (MWLD) and Ministry of Natural Resources, Tourism and Environment (MNTE) are shown in Figure 1.

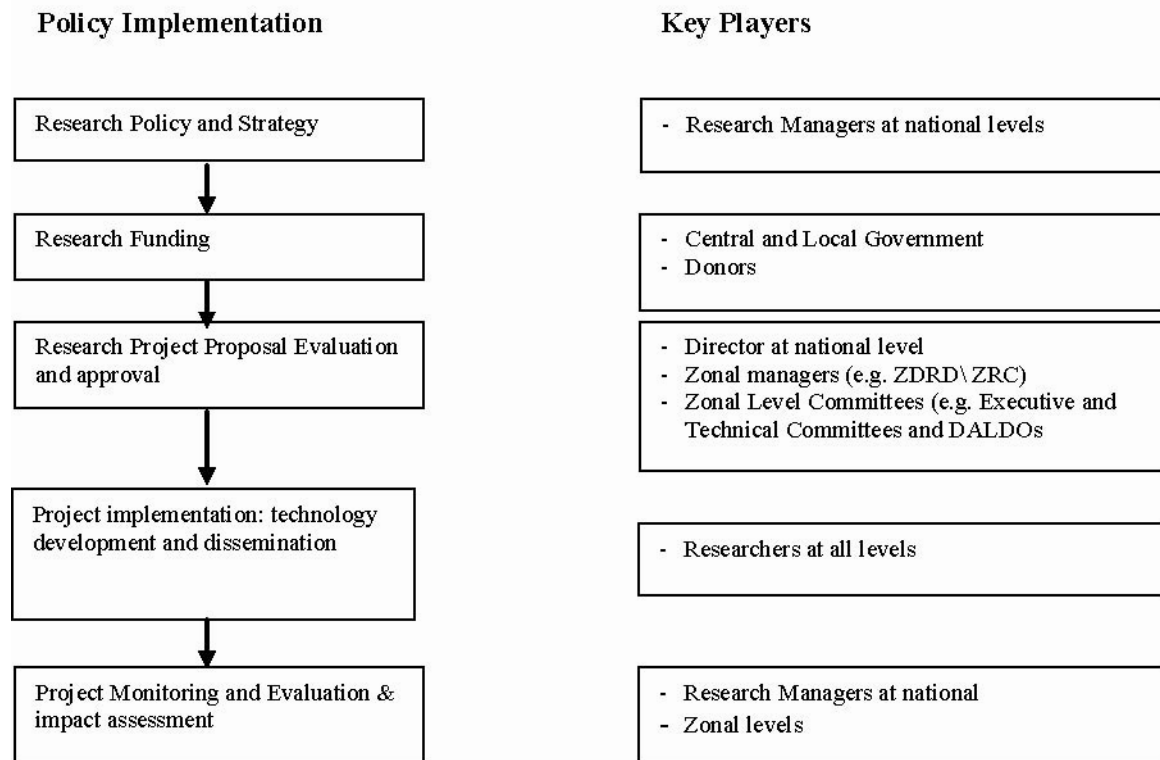


Figure 1. Sector ministries research processes pathway

Policy makers and research managers at national level argued that they have been providing overall guidance and policy direction to ensure that new improved technologies are developed and disseminated following appropriate dissemination pathways. On approval of funds, research guidelines require that proposals should be adaptive and demand-driven. However, only a few research managers indicated that they facilitate and encourage scientists to promote research results.

Another pathway is that of research carried out in academic institutions, such as research conducted as part of the fulfillment of postgraduate studies. Similarly, research proposals are developed and approved using provided guidelines following a pathway shown in Figure 2, but the major emphasis is on fulfilling academic requirements. The policy documents and guidelines for research project preparation and funding do not demand a communication plan to ensure that research results are communicated to end-users.

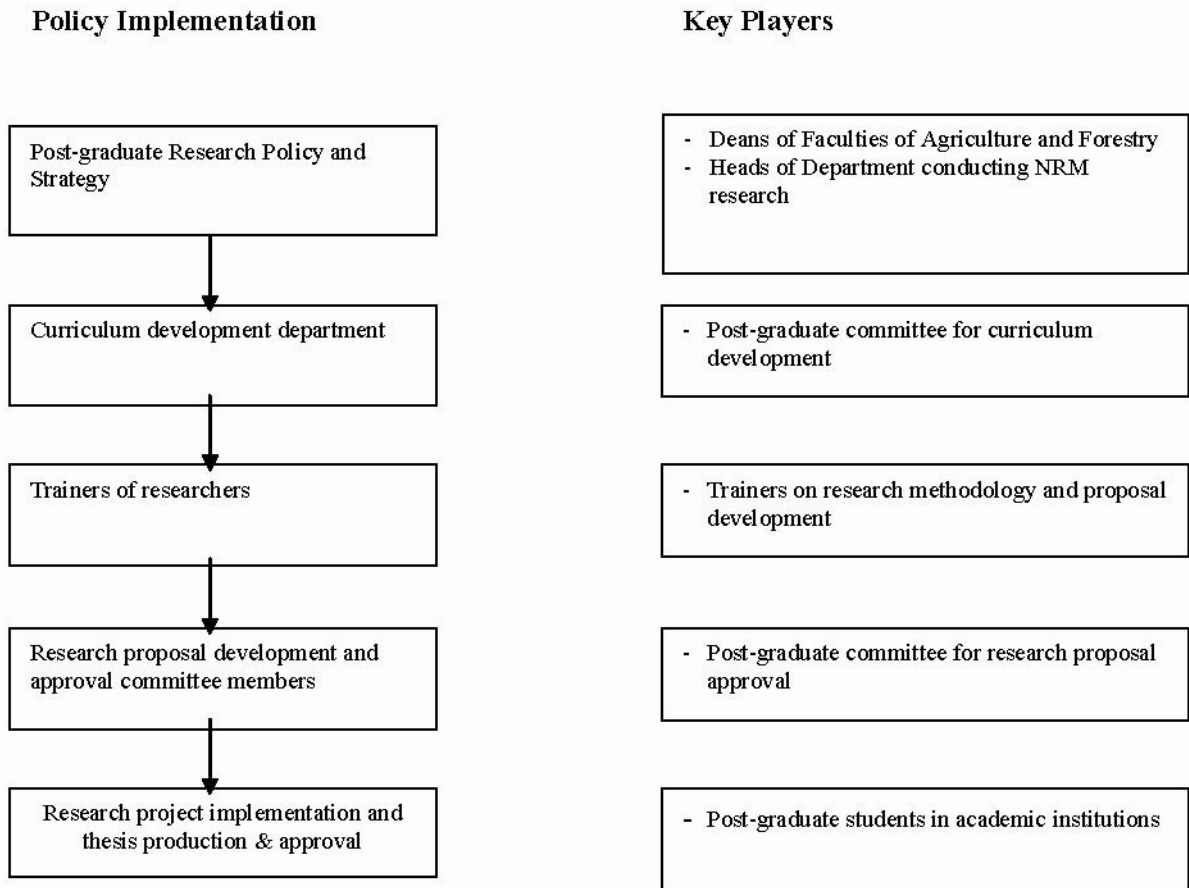


Figure 2: University research processes pathway

In disseminating research findings, analysis of stakeholders is rarely carried out in the communication processes. Most researchers still use the linear model for dissemination, that is, Research to Extension to Farmers (Fig. 3). As a result, the typology of end-users is not taken into account in the packaging of research findings. This limits the choice of communication methods and media to the traditional ones, which have been found to be ineffective (SWMRG, 2004).

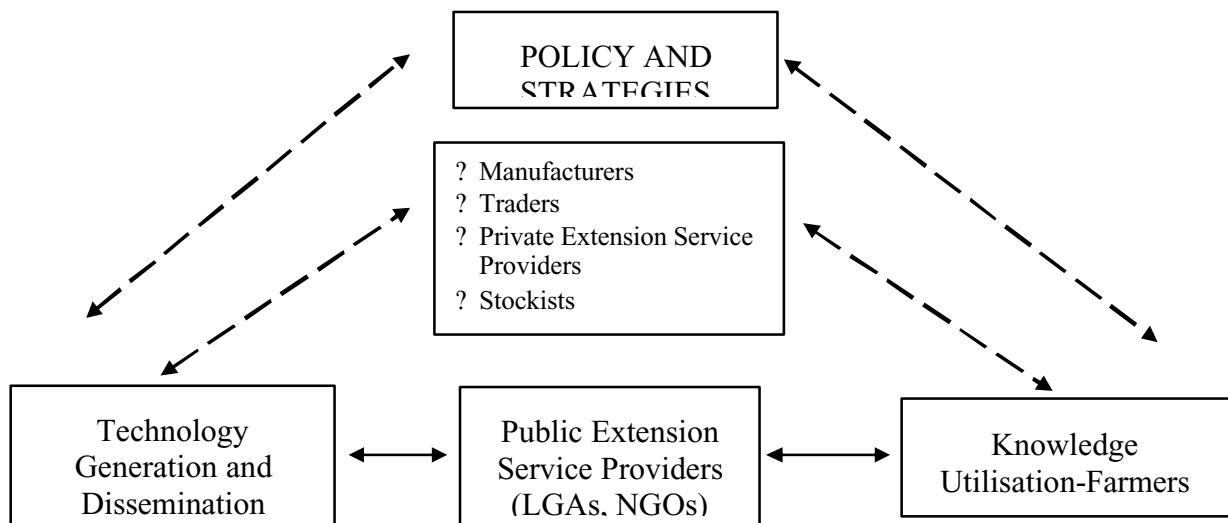


Fig. 3. Dissemination and up-take pathways

Communication of Research Findings to Stakeholders

Production of knowledge-sharing products and dissemination

The knowledge-sharing products (KSPs) produced by scientists in the past five years in the institutions visited include: substitution of fertilisers by legumes; cover crops; proper crop residues management; integrated fertiliser management; indigenous soil fertilizer practices; rainwater harvesting technologies and reduced tillage. Results showed that water harvesting, indigenous soil fertility practices and use of cover crops were most prevalent among university scientists. On the other hand, the ARIs had produced KSPs on use of legumes to enhance soil fertility and minimum tillage using rippers.

Traditionally, once technologies were generated by researchers, scientific reports and papers were prepared for sharing with fellow scientists in organs such as coordinating committees at national and currently at Zonal level. The District Agricultural and Livestock Development Officers (DALDOs) and a few farmers attended these meetings, which had limited influence on the outcomes of the communication process. After receiving research reports, extension services at district level are expected to repackage information into user-friendly messages and pass them on to village extension officers for further dissemination. Apparently, extension services lack the financial ability and skills for such repackaging of technologies as expected. As a result, research findings remain in the hands of researchers and to a lesser extent, in DALDO's offices.

Other stakeholders that include input suppliers, traders and manufacturers were not invited because of the narrow definition of end-users of the research findings. Researchers have been defining end users as farmers who utilize information by practicing improved technologies on the farm. However, in order for farmers to effectively utilize information from research, they need enabling environments. For example, farmers from Lembeni in Western Pare lowlands visited Babati in Arusha and learned from their fellow farmers that ripping is one of the technologies that could increase water infiltration. Immediately after returning from the visit, these farmers started asking how to get the rippers. Unfortunately, farmers could not get rippers in the nearby input supply shops, hence limiting adoption of rippers in the area. Currently, there is no linkage with manufacturers to enable them know that there is such demand for rippers. This gap needs to be addressed.

Communication media used to promote NRM technologies

The mechanisms and media used to disseminate or promote research findings included publication in local and international journals, stakeholder meetings, farmers training, extension messages and mass media (Table 2). The commonly-used communication media in the dissemination of research results included leaflets and pamphlets, posters, agricultural shows, farmer exchange visits, field days, video shows, demonstrations, technical reports, newsletters, publications, radio and the Internet. However, the study indicated that leaflets/pamphlets are the most common dissemination media used (41%), followed by farmers' field days (40%).

Table 2: Dissemination media used by scientists (% of respondents)

Knowledge Sharing Media	Institutions/Organisations				Overall
	ARIs	University	TAFORI	DRD/DLRT	
Agricultural shows	-	75	-	25	10
Farmers' exchange visits	46	55	-	-	26
Demonstrations	30	70	-	-	23
Video shows	14	86	-	-	17
Leaflets/pamphlets	47	47	-	6	41
Farmers' field days	53	47	-	-	40
Posters	100	-	-	-	2
Technical reports	60	-	20	20	12
Newsletters	100	-	-	-	5
Publications	7	71	14	7	33
Radios	33	67	-	-	7
Internet	33	33	-	34	7

Effectiveness of the methods and media for dissemination of research findings

Findings on the effectiveness of different dissemination media used as perceived by researchers are summarized in Table 3. Researchers from the ARIs indicated use of posters as one medium for communication of research findings, but posters did not seem to be popular among researchers in other institutions as only 3% of total respondents used posters as a dissemination medium.

Table 3: Effectiveness of different dissemination media (% respondents)

Media	Institutions/Organisations				Overall
	ARIs	University	TAFORI	DRD/DLRT	
Agricultural shows	20	60	-	20	14
Farmers' exchange visits	44	56	-	-	26
Demonstrations	20	80	-	-	14
Video shows	20	80	-	-	14
Leaflets/pamphlets	38	50	-	12	23
Farmers' field days/tours	57	43	-	-	40
Posters	100	-	-	-	3
Technical reports	100	-	-	-	3
Newsletters	100	-	-	-	3
Publications	-	75	25	-	11
Radios	50	50	-	-	6
Internet	-	100	-	-	3

Forty per cent of researchers indicated farmers' field days as the most effective media for disseminating research results, followed by leaflets/pamphlets (23%). The popularity of leaflets/pamphlets over farmers' field days and tours can be attributed to the high cost involved in organizing and funding farmers' field days and tours.

Effectiveness of communication media as perceived by farmers

Farmers listed most common sources of information and assessed them in terms of their availability, accessibility and usefulness. In each focus group, farmers identified about ten different sources of information. Figure 4 shows the score given to different sources of information.

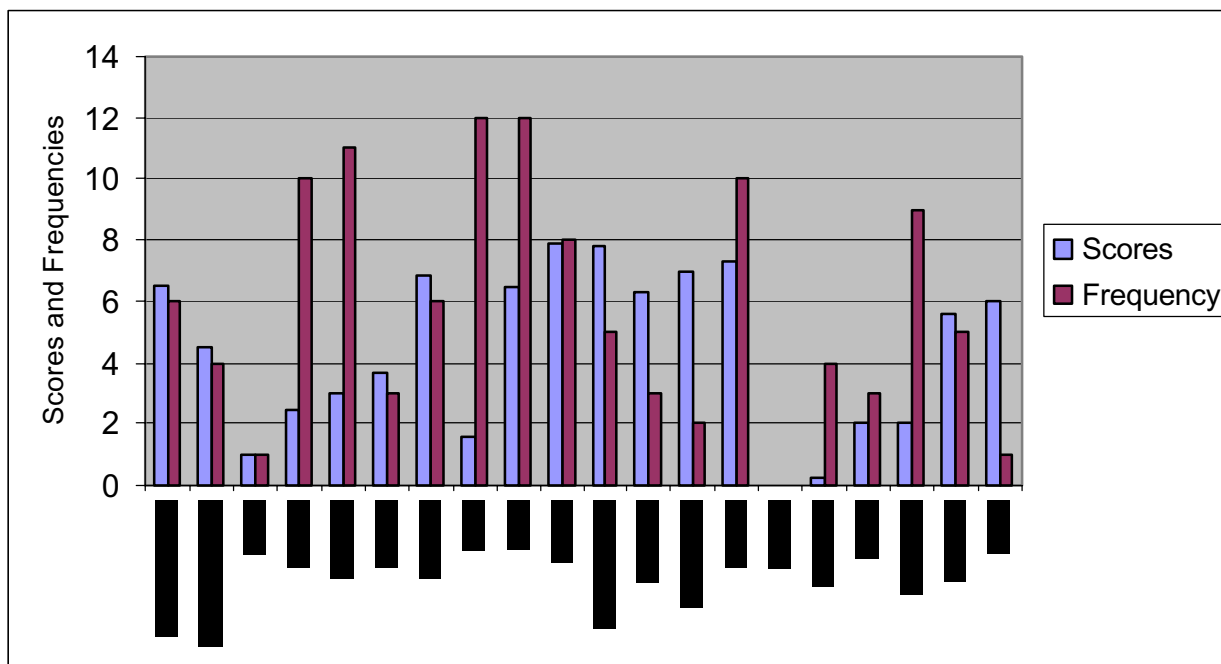


Fig. 4. Source of agricultural information by farmers in Maswa and WPLLs

Although leaflets/pamphlets, booklets and magazines were mentioned in almost all the focus group discussions as sources of information (i.e. high frequency) their availability at village level was limited and thus scored low in terms of effectiveness. Low level of literacy, especially among elderly farmers, was also a limitation to their use. In the case of radio, most farmers own radios (72% of respondents); however, the majority do not listen to Radio Tanzania, which broadcasts educational programmes particularly on agriculture and natural resource management. Among other reasons, Radio Tanzania was perceived to broadcast programmes that are not attractive to farmers, especially the youths. Posters were mentioned as a source of agricultural information but they were not available in any of the villages visited.

Effectiveness of communication media as perceived by extension workers and district level policy makers

Village extension officers preferred to use interactive methods like individual contact (82%), farm visits (47%) and demonstration plots (71%), where farmers could learn by seeing and doing (Fig. 5). Although written extension materials such as booklets, leaflets and magazines were also preferred (35%, 47% and 41% respectively), they were not easily available; and when available, they do not contain messages needed by farmers.

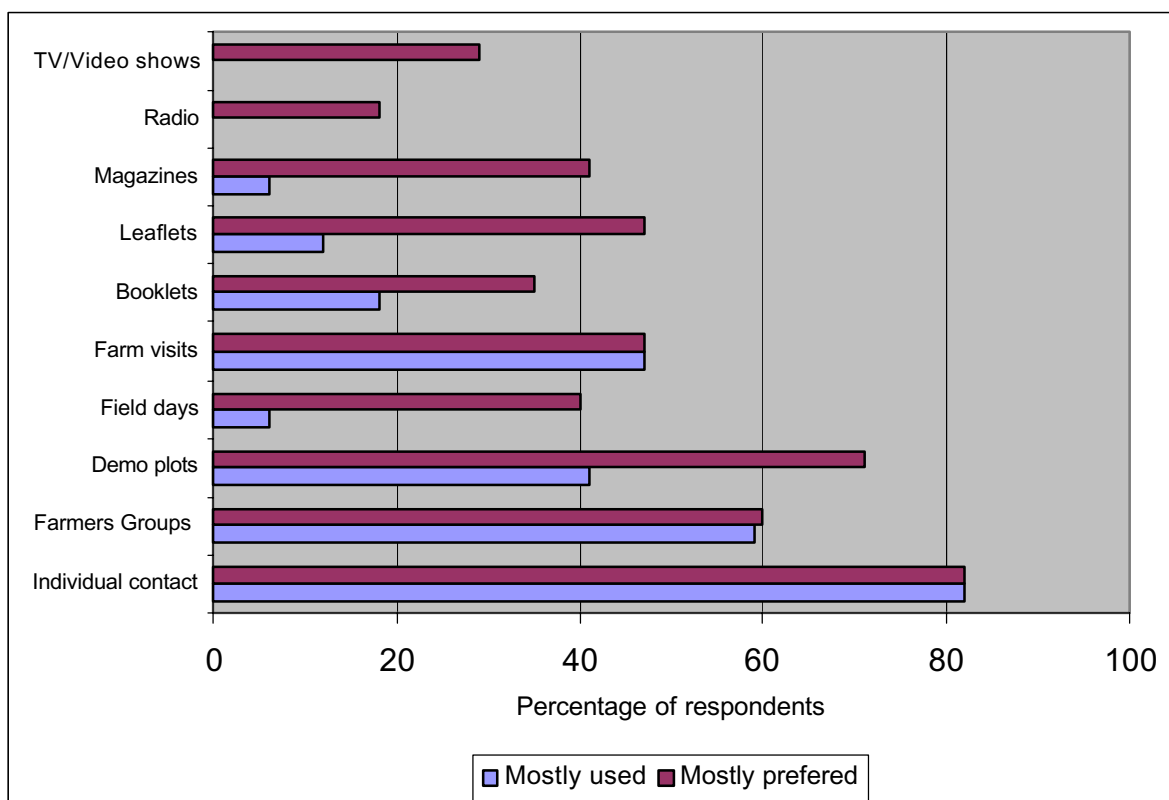


Fig. 5. Communication methods/media used/preferred by Village Extension Officers in target area.

At district level, District Executive Directors, Planners and Councillors revealed that they would prefer brief messages from research that are user-friendly and interactive sessions such as workshops. For example, awareness created to Councillors through seminars, reading of booklets provided by the Soil Water Management Research Group (SWMRG) and brief reports influenced District Councils' decision to allocate resources for RWH interventions in their District Agricultural Development Plans (DADPs) in 2003/04 in all the three districts visited. Another effective way was to invite them during field days, where they would observe the results in practice in the farmers' fields. In addition, close collaboration with NGOs like the Mixed Farming Improvement Project (MIFIPRO), has also influenced their approaches to the improvement of traditional irrigation systems.

Researchers' allocation of time and funds for research and communication activities

The study showed that on average, researchers spent more time on fieldwork, demonstrations, data analysis and report writing than on the preparation of knowledge-sharing products (Fig. 6). The little time spent on KSP preparation, dissemination and advising end users shows lack of emphasis on communicating research findings to end users. Regarding finances, the greatest part is spent on fieldwork, data analysis and report writing.

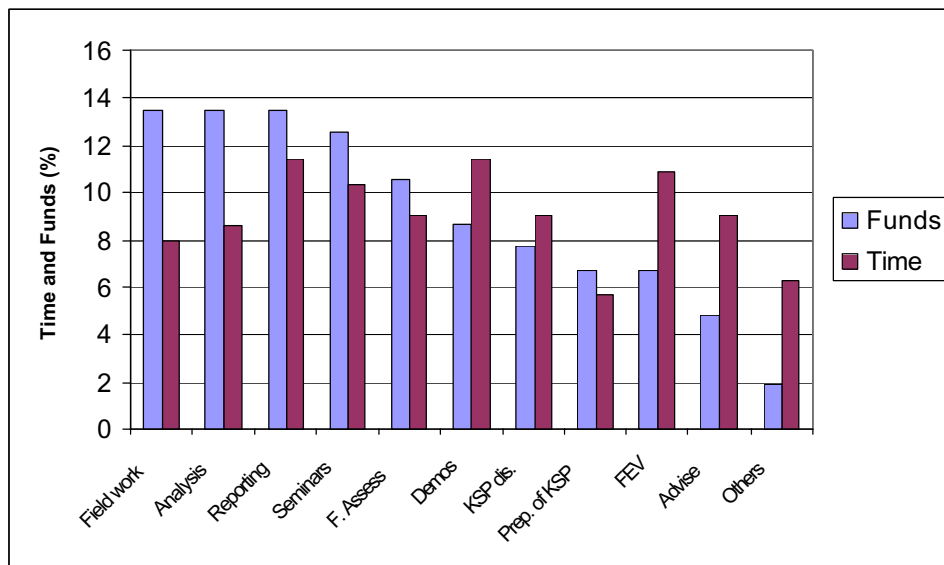


Fig. 6: Researchers' allocation of time and finances for research activities

Evaluation of the impacts of knowledge sharing products was also limited. Overall, the results indicated that only 24% of total respondents evaluated the projects for the impact of research results. With the exception of researchers from universities, who to some extent evaluated their KSPs, most of the researchers from ARIs did not evaluate the impacts of the KSPs disseminated to end-users. The main reasons given were that evaluation for impact is not budgeted or planned for in the project design, and that some thought it was too early to evaluate for impact. Regarding those who had evaluated the impact of their KSPs, they estimated adoption to be about 54% in the project area.

Communication skills of researchers

The results revealed that about 43% of the total respondents were trained in communication skills. Out of these about 60% were from universities, 35% from ARIs and 5% from other institutions (Fig 7a). Regarding the assessment of their capability to communicate, 57% of respondents rated themselves as good, 24% as moderate and 16% as excellent (Fig 7b). It would imply that researchers are not inadequately equipped with communication skills to promote KSPs.

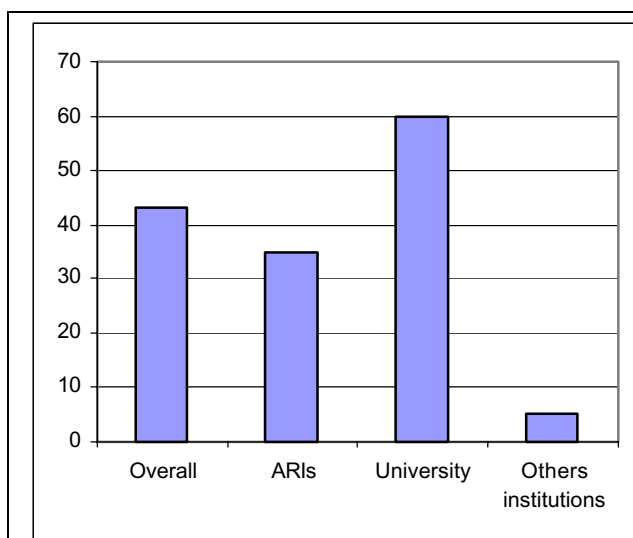


Figure 7a: Percentage of researchers received training on communication skills



Figure 7b: Researchers' response on their ability to communicate

Barriers to communicating and promoting KSPs

The various barriers faced by researchers in communicating and promoting KSPs are shown in Table 4. Although different institutions prioritized different barriers, on average, a bigger percentage of the respondents (23%) considered low income of farmers to be the most critical. On the other hand 71% of respondents from ARIs stated that dissemination is not considered a mandate for researchers and therefore is not budgeted for. However, University researchers (75%) considered inadequate communication skills the major barrier.

Table 4: Barriers to communicating and promoting KSPs (% respondents)

Institution/barrier	Institution/Organization				Overall
	ARIs	University	TAFORI	DRD/DLRT	
Level of education of the farmers (end users)	40	60	-	-	13
Culture	50	50	-	-	10
Low income of farmers	11	67	11	11	23
Inadequate communication media	43	57	-	-	18
Inadequate communication skills of researchers	25	75	-	-	10
Dissemination not considered mandate for researchers	71	14	-	14	18

Other barriers that impair effective utilization of KSPs included ineffective policies which were supported by about 14% of the total respondents; inadequate technology follow-up (14%); inadequate land for farming (5%); low level of education of target groups (29%); and inadequate researchers' promotion which led to low morale (27%). As shown in Table 5, most respondents (46%) think that participatory approaches would eliminate most of the barriers which hinder utilization of KSPs. On average only 7% of respondents had a view that improvement of communication skills of researchers through training would improve promotion of KSPs. However, respondents from ARIs were positive that provision of training on communication skills would help to overcome barriers to effective promotion of uptake. Furthermore, 77% of university respondents believed that development of favourable policies would improve effective communication and promotion of KSPs.

Table 5: Priority interventions to overcome barriers to effective promotion of uptake

Proposed interventions	Institution/Organization				Overall
	ARIs	University	TAFORI	DRD/DLRT	
Adequate use of participatory approaches	52	48	-	-	46
Communication and dissemination be included in research proposal budgets	73	19	-	9	24
Training of researchers and extension staff in communication skills	100	-	-	-	7
Development of favourable policies	12	77	6	6	37

On the other hand, farmers revealed that adoption of improved soil and water technologies require community mobilization and infrastructure development. For example in Bukangilija, despite participatory approaches involving farmers to construct diversion channels after receiving training from SWMRG, their own efforts to block and divert water using gunny bags proved futile. The involvement of district officials at a later stage enabled the village to receive assistance through district development plans to construct a weir.

Review of University Training Curriculum for Communication and Uptake Promotion

A rapid survey undertaken to evaluate if researchers were adequately trained on communication and uptake promotion aspects related to soil water management revealed that little emphasis is given to imparting communication skills. Training curricula from seven programmes at the Sokoine University of Agriculture were assessed with respect to research planning and management courses given to postgraduate students in programmes related to soil and water management. Furthermore, an assessment was made based on the courses given to researchers through in-service training for professional development. The results are presented in the following sections.

The aspect of communication in relation to soil and water management

Out of seven departments in the Faculty of Agriculture and the two institutes at SUA, only the Institute of Continuing Education (ICE) offers a course on aspects of communication under the Management of Natural Resource and Sustainable Agriculture programme (Table 6). The course on Principles of Communication in NRM covers topics such as: 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 approaches used to overcome them.

Table 6: Departments and Institutes at SUA where the study was conducted

Department	Long or short course offered
Soil Science	MSc. Soil Science and Land Management
Agricultural 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
Institute of Development Studies	MA in Rural Development
Institute of Continuing Education	Short course in Management of Natural Resource and Sustainable Agriculture (MNRSA)

It was also observed that in other departments where soil and water management courses were offered either as elective or core courses students were not trained in communication skills. This implied that although students are acquainted with 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 information to targeted end users.

Aspect of uptake promotion of research outputs

A thorough review of curricula for various MSc and MA programmes at SUA revealed that the aspect of uptake promotion is completely lacking. For example, research planning and management courses lack the aspect of uptake promotion of research outputs. Much emphasis is put on the formulation of research proposals, management of data, interpretation of research and organization and writing of research reports. Thus, researchers are being trained on how to produce knowledge-sharing products, mainly theses, which are not easily accessed by all stakeholders. This implies that many research outputs, regardless of their importance to the targeted end users and supporting actors, are not communicated or used to give the desired impact. This is a gap that needs to be addressed to include the aspect of uptake promotion at the design stage to add value to research findings.

Conclusions

From this study, the following conclusions can be made:

- ? The available policy and strategy documents have not been widely communicated to researchers. This could be due to lack of communication strategies within sector ministries responsible for NRM that would ensure wide distribution of the policy documents to implementing agencies.
- ? Researchers have ignored their mandate to participate in the dissemination of research findings to the wider audience because they feel it is not their mandate. It should be noted that technology generators ought to be good communicators in order to share their innovations with target end-users.
- ? Most researchers are not well-equipped with communication skills and the training they received did not cover communication and uptake promotion aspects, thus research results are mainly utilized by few stakeholders.

Recommendations

In order for research to contribute towards meaningful and sustainable integrated watershed management, the study recommends the following:

- ? Policies and strategies guiding NRM should be availed to all stakeholders and users should be informed of their role in the implementation of policies and strategies. These documents should not be archived at national level; instead, users should access them in relevant places like institutes' libraries and government websites.
- ? For effective institutionalization of scaling up and uptake promotion, research guidelines need to be reviewed with emphasis on the need for research projects to include communication strategies at the design stage. A change in mind-set on the way research is designed and implemented and findings disseminated to end-users through a mixture of communication methods and media is required. Stakeholders involved in providing a necessary environment for uptake of research findings should be better defined, so that packaging of messages is well targeted.
- ? Use of participatory approaches should ensure that stakeholders' involvement includes other service providers who are key in providing an enabling environment for farmers to adopt technologies.
- ? Capacity development for researchers in communication skills is required. It is recommended that training in communication skills is intensified, raising levels of end-user literacy as well as repackaging technologies to suit user needs.
- ? For in-service short courses, emphasis should be put on improving participants' capacity in communication and uptake promotion of research output. This information will enable the targeted groups that were involved in generation of technology and the 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 at the design stage.
- ? For effective communication and uptake promotion, short courses and MSc/MA course curricula should be reviewed so as to incorporate the aspects 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.
- ? Infrastructure support to ARIs in terms of resource allocation and infrastructure development should be given so that they are able to access important documents guiding research design and implementation. Facilitation for the production and dissemination of knowledge sharing products is also necessary.

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