# Strategies for Scaling-up Research Findings on Natural Resources Management

Authors
Lutkam, M.; Shetto, M.; N. Hatibu and H. Mahoo

## *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. Very few of the recommendations from research have been put to use by the target end users. Lack of an enabling policy environment that was necessary ingredients for adoption of new technologies is one the major causes for non-adoption. Failure of research project to communicate research findings to stakeholders other than farmers, who may have more power to visualise and to realize the desired outcomes of interventions, is identified as one of the contributing factor. The study was conducted to better understand the research and communication processes, barriers, efficacy of the various communication methods and media used for various stakeholders across a range of levels and research for development sectors. It was found out that most research projects do not have communication plans for ensuring uptake of research findings. It is proposed that research project should include communication strategies in research designs that will well inform beneficiaries and influence decision-making and resource allocation to enhance utilisation of improved technologies. Improvement in research designed is envisaged to improve the impact of research on livelihoods of the poor and increase environmental benefits in the watershed.*

## Introduction

East Africa is endowed with abundant natural resources. The region has a long history of natural resources interventions and there is a large reserve of technologies to address issues of natural resource management (Boyd *et al.*, 2000). Many restorative technologies have shown to be effective in pilot studies, but adoption of these technologies on a wider scale has always been a concern. Limited participation of local communities in the management of local resources was one area that was earmarked as a major hindrance in adoption of improved technologies due to among other things low understanding of the socio-economic factors of the target population (Semgalawe, 1998; Senkondo, *et al.*,1999; Barrett, *et al.*, 2002). Farming systems approaches in early 1990s and later participatory technology development was envisaged to improve the situation (Hagmann, 1999; Kalineza, et al; 1999; Ashby, 2003). Adoption of holistic approaches was evidenced during the implementation of projects on Soil and Water Conservation projects such as SCAPA in Arusha, SECAP in Lushoto and Hifadhi ya Mazingira (HIMA) in Iringa, to mention a few. These approaches have been successful in spreading innovations to communities within the project areas and expansion has been within same stakeholder group, and increased participation and ownership, which is referred to as horizontal scaling-up or scaling out (Gundel *et al.*, 2001; Middleton and Ellis-Jones; 2003).

Despite the potential for improving productivity, uptake of soil and water conservation technologies to wider areas has remained low and thus limited impact on farmer livelihoods (Stroud, 2003). One of the shortfall facing past and current R&D in NRM is failure to effectively and efficiently communicate findings it generated to stakeholders other than farmers (Garforth, 1998; Ashby, 2003). Traditional dissemination strategy of research findings has continued to use the same research-extension-farmers pathways (Garforth,

1

1998). Most of the information generated from NR research could not inform policy formulation and decision making to support farmers' efforts (Mosse, 1998; Hatibu et al., 2002). Hatibu et al.; (2002) argued that wider policy and institutional issues beyond the control of household influences adoption. In many cases farmers could not utilise information provided by researchers due to lack of an enabling policy environment that was necessary ingredients for adoption of new technologies (Turton, et al; 1998; Hatibu et al., 2002; Crewe and Young, 2002). Vertical scaling-up that involves expansion of these technologies to other sectors and stakeholder groups from grass roots organisations to policy makers, donors and development institutions nationally and internationally has been lacking and hence spread to wider geographical areas, more quickly, more equitably and more lastingly has been a concern (IIRR, 2000).

This paper presents preliminary results of an on-going study conducted in Tanzania on "Improving Pro-poor research strategies to assist scaling-up of the management of natural resources in semi arid areas" by the Soil Water Management Research Group of SUA and a study on "Institutionalising Scaling-up and Uptake Promotion of Outputs from Soil and Water Management Research in East and Central Africa" under SWMnet. A number of communication barriers in dissemination of research findings have been identified and strategy to overcome are proposed.

## Research and Development in Natural Resource Management

River Basin Management (RBM) is a complex processes that involves multiple stakeholders who have different interest, perspectives, entitlements, knowledge, capabilities and power (CGIAR, 2003). Management of water systems is part of the broader natural environment and their socio-economic environment, that goes beyond land and water management to include significant parts of land-use planning, agricultural policy and erosion control, environment management and other policy areas (Shah, et al; 2000). RBM covers all human activities that use or affect fresh water systems, it involves multiple stakeholders including individual farmers, farmers groups managing a water resource structure like *ndiva*, community, downstream users and upstream users of water resource, 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 in one-way or another in the utilisation of NR available in the basin. The role of research is to provide technologies that are applicable broadly to make it more meaningful and cost effective (Turton, et al; 1998).

In order for technologies to benefit the end user the government has to put a structure or systems to monitor and regulate use of resources the task that goes beyond research and extension mandate (Shah, et al; 2000). Improving benefits of a watershed management also require reorientation of sectoral policies on markets and prices, legislations on land, water resources and water rights, harmonisation 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 due to direct Government interventions in terms of providing guidelines, resources and monitoring and evaluation systems to assess impact (Samra et al., 2002). This would happened because of the continued efforts by research to generate valuable technologies on NRM using participatory approaches, technical and processes documentation and engage government officials in the whole processes right from the beginning (Grewal, et al., 1995).

This has been a challenge for researchers in Tanzania as it is evidenced in Rufiji river basin. Studies show that apart from technical and institutional challenges, scientists are faced by difficulties in ensuring that well informed solutions are taken up by policy makers in planning and decision making (Sokile, et al.; 2004; Lankford, et a.l; 2004). Past and current Research and Development (R&D) in Natural Resource Management (NRM) has not always been

the creation of a policy framework incorporating natural resource management into the broader national framework of sustainable social and economic development and insisting on the collective ownership of natural resources. In the early 1980's, the government through the then Ministry of Water started the management of water under a river basin approach.

Recently Tanzania has formulated a new water policy but its implementation is limited, as the Water Regulation Act has not yet been amended. The water management initiatives in Tanzania are characterized by an institutional gap and the institutions involved are loosely connected and lack basic coordination. Over a period of time, these initiatives lead to a divorce between customary arrangements for land and more formal water management [9]. Institutions involved in water management are listed as follow:

- Ministry of Water and Livestock Development is in charge of water supply through the Regional water engineers;
- Ministry of Agriculture and Food Security is responsible for irrigation;
- Hydropower is under the Tanzania Electric Supply Company (TANESCO) in the Ministry of Energy and Minerals;
- Ministry of Natural Resources and Tourism is responsible for conservation of biodiversity in water bodies;
- Planning Authorities oversee construction of resort facilities and hotels along the shorelines of lakes; rivers, islands and oceans; and
- The Ministry of Industry and Commerce is responsible for industrial discharge to water.

The National Water Policy emphasizes maximizing economic and social well being generated by the development and use of water resources and ecosystems in such a way as to ensure that the present and future generations enjoy the benefits of this vital resource. Yet, the present institutional framework ignores informal institutions, especially traditional by-laws, norms and restrictions [9]. The predominance of isolated institutions locked into narrowly defined activities with no interactive learning is likely to continue to hamper national aspirations to manage water [2]. The expectations are diverse and relate to, besides water, other natural and human systems. The goal of the National Water Policy [6, p. 27-28] is to incorporate the following objectives into water resources development and management:

- A minimum water requirement is guaranteed to all humans to maintain human health, and sufficient water is guaranteed to restore and maintain the health, services and functions of ecosystems.
- Water for food security, energy production and other economic activities is readily available.
- Water quality is maintained to meet agreed objectives and standards and that human actions do not impair the long term availability of freshwater stocks; ensure that water resources management is financed and raw water priced to promote efficiency, sustainability and equity.
- Integrated water resources management is instituted.
- Effective and sustainable strategies are in place to address natural and man-made water resources problems.
- Water resources planning and decision-making are participatory involving all users and stakeholders.
- Water resources data are available and easily accessible to all and an effective infrastructure and information system is in place and operational.
- Institutional mechanisms exist to resolve conflicts over water resources.
- Adequate number of motivated and highly skilled professionals is available.

Procedurally, emphasis is on delegating responsibilities to stakeholders (through water users entities), local governments and Basin Water Offices in order to have the river basin or sub-basin as the planning unit.

## Water management in the Great Ruaha Basin

The main water management institutions in the basin are the River Basin Management and Smallholder Irrigation Improvement Project (RBMSIIP); the Zonal Irrigation Unit – Mbeya; the Rufiji Basin Development Agency (RUBADA); the River Basin Water Office of the Rufiji Basin (RBWO); the Ministry of Agriculture and Food Security through its extension agents and other activities; and NGOs, community-based organizations, and grassroots organizations. Water management institutions in the basin reflect the wider framework of the national level explained above. Several government organizations and formal institutions are dominant, although in the actual sense such institutions do not guide day-to-day human interactions with water. Most of these institutions, especially the governmental ones, are normally backed by formal rules and constraints. The village-based, local informal institutions are inconspicuous and are often ignored. NGOs, although they are very influential in water management and service delivery [9], they are not fully involved in national or regional strategic management.

Several initiatives have been introduced, often in an uncoordinated fashion, some of which are described here. The Water Utilization Act No.42 of 1974 (Control and Regulation) created Water Users' Associations (WUAs), which are now viewed as important conflict resolution tools and seek to reduce the number of water right holders for effective purpose of coordination of water use. Currently, unregistered users abstracting water in accordance with customary law are being encouraged to regularise their water abstraction by forming WUAs. Previously, the conventional more individual way of allocating water resources via rights has proved to be inefficient. In addition, in the last 10 years, several initiatives were taken in the basin, such the gazettement of the *Ihefu* wetland as a Game Reserve in 1998 by the Ministry of Natural Resources. People that were depending on the wetlands through livestock keeping, agriculture, fishing and bee keeping are no longer allowed to utilize the resources in the reserve. The gazettement, which has left a large population without real alternatives, is one of the initiatives taken by decision-makers without reference to other Ministries or initiatives. This gazettement lacked initial coordination between managing organisations and appears to be having little success on restoring downstream flows. It is possible, that such ill-attuned interventions partly arise from a lack of adaptive tools able to provide a comprehensive view of the basin and the linkages between different water users. The reminder of this paper presents the rationale for having a DA to assist decision-making concerning water resource management in the basin, its objectives and structure.

## Rationale and objectives of RUBDA

The development of a DA was initiated under the former technical co-operation project SMUWC (Sustainable Management of the Usangu Wetland and its Catchment). It was first developed as a hydrological model [8] but for different reasons the software was only partly finished. One reason was its interface, programmed in Fortran 77, which had a "poor" interface in terms of ease of use. Following the SMUWC project, a new version of the model was developed by University of Dar es Salaam using visual basic interfaces but this version was not completed too and never delivered to decision-makers. One achievement of SMUWC and of other projects and initiatives has been to show that Integrated Water Resource Management (IWRM) helps avoid water conflicts between different uses and users. The Ministry of Water and Livestock Development and most of the institutions in Tanzania now hold this view, implying that a multi-disciplinary understanding and approach is required. The National Water Act [6, p. 15] describes "water resources models and decision support systems" as an instrument for the implementation of water policy and a means of getting an integrated multi-sectoral approach. The Basin Office has also raised the need for such a DA for the management of natural resources, in general, and water resources, in particular.

Where research on NRM has succeeded to reach various stakeholders, including policy makers, it took a long time and the processes that led to these successes are not well documented. For example: for the past 12 years RWH research has been carried out by Sokoine University of Agriculture in Tanzania, but it is only recently it has received policy attention. RWH aspects have been incorporated in the Water Policy revised in 2004, Medium Term Plan of the National Agricultural Research System (MAFS, 2003); and RWH interventions are funded under the District Agricultural Development Plans (DADPs) in Same, Mwanga and Maswa Districts (SWMRG, 2002). However, the difficulty is to link these outcomes to the RWH research project objectives. Understanding of the processes that led to these outcomes and impact of such research will assist in scaling-up current and future research programmes in NRM. This indicates that most researchers have not been adequately informed of the policies and consequently they are do not consider that they have a role to provide scientific evidences of NRM situation to policy makers. By nature of their mandate research institutions require clarity on this aspect and the need for compliance to policies and strategies in implementation of their projects so that research findings contribute to policy objectives and reviews thereafter.

The Water Policy (2002) recognised limited research done in the water resource management. The few technologies that have been identified their sustainability is questionable and are not adequately disseminated to end-users. The policy also identified lack of sectoral coordination among institutions involved in water use such as agriculture, livestock, energy, and forestry). Water policy highlights that in order to attain equitable, efficient and sustainable water resource management and based on the experience gained in the country and internationally, understanding the water resource management will be based among other things improved communication. This will be achieved through strengthening of the information, education and communications system; and monitoring and evaluation involving many stakeholders.

In the Agricultural Sector Development Strategy (ASDS, 2001) and Agricultural Sector Development Programme (ASDP, 2003) also recognised the importance of up-to-dating relevant information for all stakeholders such as input suppliers, equipment/implement manufacturers in a market economy. Currently the focus is on data collection, analysis and dissemination for planning purposes at the national level by sector ministries. It is at this interface that research should play important role in informing the systems on the scientific evidence of performance of various technologies so as to influence planning and resource allocation for uptake of improved technologies on a wider scale.

**Understanding the up-take pathways**
For output to reach these end users, it is important to understand the critical uptake pathways of policy messages at national in the processes of designing and execution of knowledge generation and dissemination. Analysis of uptake pathways from policy to implementers and how it influenced allocation of resources was also studied. The first pathway involves research conducted by National Agricultural Research Systems in the sector ministries such as Ministry of Agriculture and Food Security (MAFS), Ministry of Water and Livestock Development (MWLD) and Ministry of Natural resources, Tourism and Environment (MNTE) as shown in Appendix 1 a&b. The second pathway is that of research carried out in the academic institutions such as research conducted as part of the fulfillment of the pursued postgraduate level. On approval of funds research guidelines required that proposals should be adaptive and demand driven. However, in most of the policy documents for research project preparation and funding guidelines there was no demand on how results should be communicated to end users. Analysis of stakeholders is rarely carried out in the communication processes; as a result variation of end users is not taken into account in packaging of research findings. For example soil and water management technology pathways do not cover stakeholders like input suppliers, manufacturers of implements and traders.

**Production of Knowledge sharing products and dissemination**
Various knowledge sharing products (KSPs) are produced by the scientists in visited institutions in the past five years. These include substitutions of fertilisers by legumes, cover crops, proper crop debris management, integrated fertiliser management, indigenous soil fertilizer practices, rainwater harvesting technologies, reduced tillage. Results shows that water harvesting, introduction of indigenous soil fertility practices and use of cover crops were most prevalent among University scientists, confirming their interest to soil water management, where as ARIs had produced KSPs on legumes as fertilisers, reduced tillage by using rippers and use of locally available resources.

Traditionally after the generation of technologies by research scientific reports and papers are prepared for sharing with fellow scientists in the coordinating committees at national and currently at Zonal level. DALDOS and few farmers represented others, but with limited influence on the outcomes of this process. Extension services at district level after receiving research reports are expected to repackage information into user-friendly messages and pass-on to village extension officers for further dissemination. Apparently extension services lack financial ability and skills for such repackaging of technologies as expected. As a result research findings remained in the hands of researchers and to a less extent into DALDOs offices. Other stakeholders that include input suppliers, traders, and manufacturers are not invited because of the narrow definition of end users of the research findings. Researchers have been defining end users as farmers who utilise information by practicing improved technologies on the farm. However, in order for farmers to effectively utilise information from research they need enabling environment. For example, when farmers from Lembeni in Pare lowlands visited Babati and learned from their fellow farmers that ripping is one of the technologies that could help to increase water infiltration. The next question was how to get rippers, but to their disappointment they could not get rippers in the nearby input supply shops. This was identified as one of the barriers to adoption of rippers in this area.

**Communication media used to promote NRM technologies**
Assessment of the mechanisms and media used to disseminate or promote use of research findings was also carried out. Different mechanisms have been used to promote research outputs. These include publication in local and international journals, stakeholders meetings, farmers training, extension messages and mass media. 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, radio and internet. The study indicates that leaflets/pamphlets are the commonly used dissemination media (41%). Table 2 below summarise the results.

**Table 2: Use of different dissemination media by scientists (% of respondents)**

| Knowledge Sharing Media | Institutions/Organisations | | | | |
|---|---|---|---|---|---|
| | 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/pamphlets | 47.1 | 47.1 | - | 5.9 | 40.5 |
| Farmers field days | 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 |

**Effectiveness of the media used for dissemination of research findings**

The use of posters does not seem to be popular among researchers as only 2% of respondents produced posters as a dissemination media. Forty percent of researchers indicated that farmer field day is the most effective media for disseminating research results, followed by leaflets/pamphlets (23%). The popularity of leaflets/pamphlets over farmer's field days and tours can be attributed by high cost involved on organising and funding farmers field days and tours. Table 3 below summarises findings on effectiveness of different dissemination media used.

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

| Media | Institutions/Organisations | | | | |
|---|---|---|---|---|---|
| | ARIs | University | TAFORI | DRD/DLRT | Overall |
| Agricultural shows | 20.0 | 60.0 | - | 20.0 | 14.3 |
| Farmers exchange visits | 44.4 | 55.6 | - | - | 25.7 |
| Demonstrations | 20.0 | 80.0 | - | - | 14.3 |
| Video shows | 20.0 | 80.0 | - | - | 14.3 |
| Leaflets/pamphlets | 37.5 | 50.0 | - | 12.5 | 22.9 |
| Farmers field days/tours | 57.1 | 42.9 | - | - | 40.0 |
| Posters | 100.0 | - | - | - | 2.9 |
| Technical reports | 100.0 | - | - | - | 2.9 |
| Newsletters | 100.0 | - | - | - | 2.9 |
| Publications | - | 75.0 | 25.0 | - | 11.4 |
| Radios | 50.0 | 50.0 | - | - | 5.7 |
| Internet | - | 100.0 | - | - | 2.9 |

**Effectiveness of communication media as perceived by farmers**

On the other hands farmers were also requested to identify sources of information of different technologies in their areas. Farmers listed most common sources of information and ranked in order of availability, accessibility and usefulness of these media. In each focus group farmers identified about ten different sources of information. Figure 2 below show the score given to different sources of information mentioned.
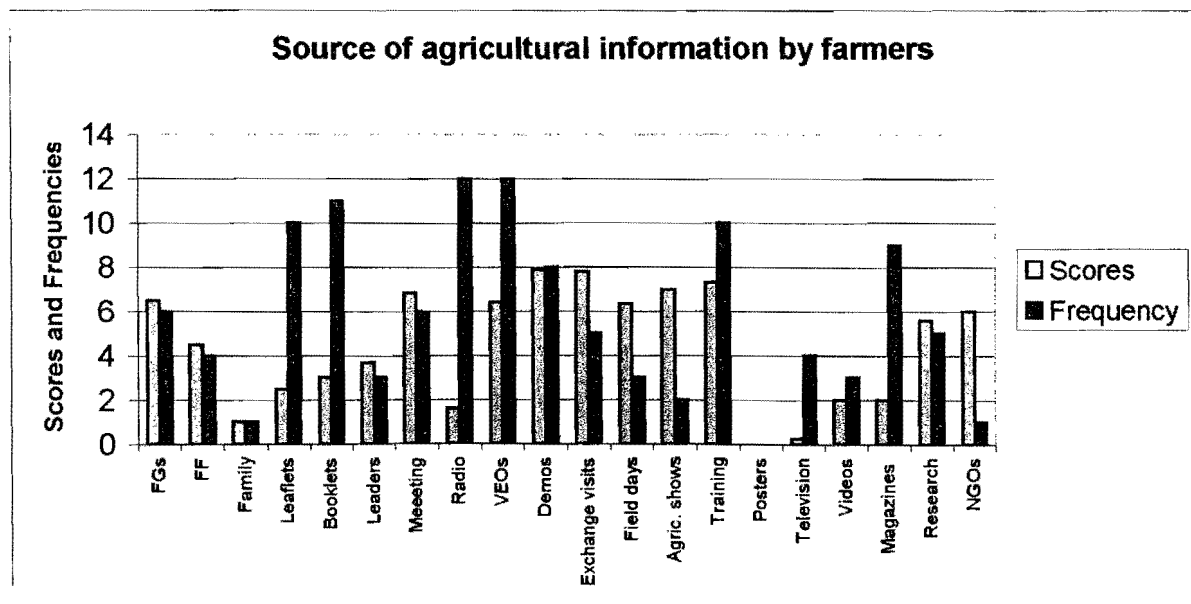


Fig. 2: Source of agricultural information by farmers in Maswa and WPLLs

Although leaflets/pamphlets, booklets and magazines were mentioned in almost all the focus group discussions as sources of information their availability at village level and level of literacy especially among elderly farmers was a major limitation to their use. In case of radio most farmers own radio (72% of respondents), many listeners do not prefer Radio Tanzania that broadcast educational programme particularly on agriculture and natural resource management. Moreover, most farmers doubted its efficiency because radio is not interactive. Posters were mentioned as a source of agricultural information in all villages visited but they are not available so they could not score in any village.

**Effectiveness of communication media as perceived by Extension workers and district level policy makers**
Village extension officers were also requested to list communication media they use most and which ones are most effective. Seventy percent (70.6%) preferred to used interactive methods like field visits and demonstration plots where farmers could learn by seeing and doing because most farmers they are dealing with are old and their literacy level is low. Although written extension materials such as booklets, leaflets and magazines were preferred (35%, 47%, 41% respectively) they are not easily available and when available do not contain messages needed by farmers. At district level, discussion with District Executive Directors, District Planners revealed that they would prefer brief messages from research that is user friendly. The most effective way to inform them about research findings is to invite them during field days where they would learn from farmers after observing the results physically from the field performance. Councillors consulted appreciated their involvement in research and communication activities particularly workshops where they were briefed about RWH systems that made them understand the potentials existing in their localities. For example, awareness created to councillors through seminars, reading of booklets provided by SWMRG and brief reports influenced District Councils decision to allocate resources for RWH interventions in their DADPs in 2003/04 plans in all three districts visited. Close collaboration with NGOs like MIFIPRO have also influenced their approaches improvement of traditional irrigation systems, which was costly towards better management of RWH systems (MIFIRPO, 2003/04).

**Allocation of time and funds for research activities**
The study shows that on average more time is spent on field work, demonstrations, farmers exchange visits and report writing than on the preparation of knowledge sharing products.
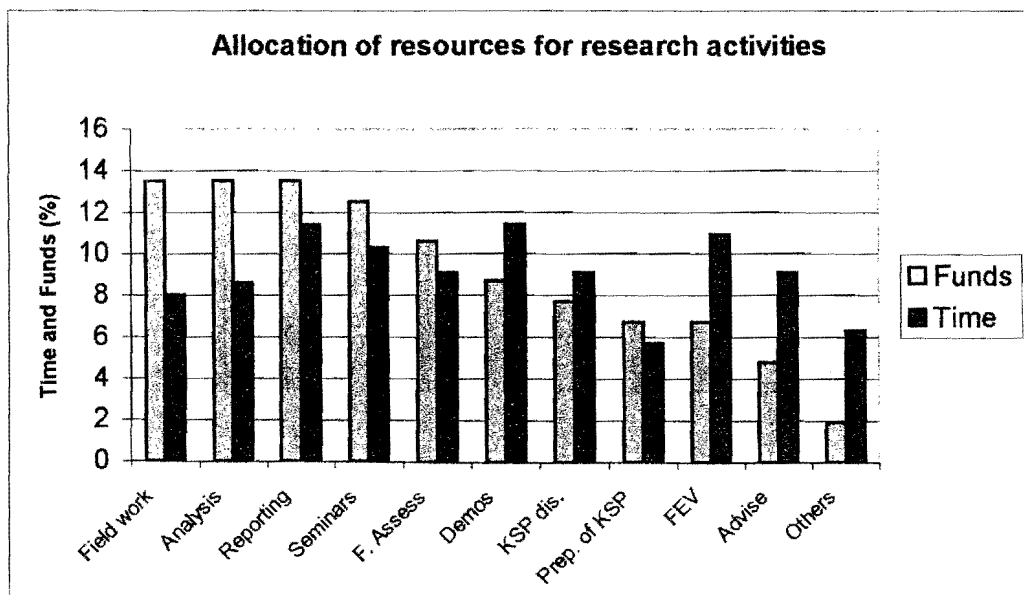


Fig. 3: Allocation of time and finances for research activities

The little time spent on KSP preparation and dissemination and advising end users show lack of emphasis on communicating research findings to end users. Regarding finances the greatest part is spent on field-work, data analysis and report writing.

### Evaluation of impacts of knowledge sharing products
Overall, the results indicate that only 24% 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 or planned for in the project proposal. While others said it was too early to evaluate the results. Regarding those who had evaluated the impact of their KSPs, they perceived the adoption as about 54% in the project area.

### Communication skills of researchers
The results reveal that about 43% of the total respondents were trained in communication skills. Out of these about 60% were from University, 35% from ARIs and 5% from other institutions. As regards to the assessment of their capability to communicate, 57% of respondents rated themselves as good, 24% as moderate and 16% as excellent. It would imply that a big number of the researchers are not well equipped with communication skills to promote KSPs.

### Barriers to Communicate and Promote KSPs
Various barriers faced by researchers in communicating and promoting KSP were identified. Although different institutions prioritised different barriers, on average, a bigger percentage of the respondents (23%) considered low income of farmers. While on average 18% of respondents stated that dissemination is not considered as mandate for researchers and therefore not budgeted for, 71% of respondents from ARIs is high to give evidence of he problems of communication of research findings. However, University researchers considered inadequate communication skills as the major barrier. Other barriers that impair effective utilization of KSP include 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 for target group (29%) and inadequate researchers' promotion which lead to low morale (27%).

### Table 4: Barriers to communicate and promote KSPs

| Institution/barrier | Institution/Organization | | | | |
|---|---|---|---|---|---|
| | ARIs | University | TAFORI | DRD/DLRT | Overall |
| Level of education of the farmers (end users) | 40.0 | 60.0 | - | - | 12.5 |
| Culture | 50.0 | 50.0 | - | - | 10.0 |
| Low income of farmers | 11.1 | 66.7 | 11.1 | 11.1 | 22.5 |
| Inadequate communication media | 42.9 | 57.1 | - | - | 17.5 |
| Inadequate communication skills of researchers | 25.0 | 75.0 | - | - | 10.0 |
| Dissemination not considered mandate for researchers | 71.4 | 14.3 | - | 14.3 | 17.5 |

### Proposed interventions by researchers to overcome barriers to effective utilization of KSPs
Based on the above barriers, different suggestions were put forward by the interviewed researchers with respect to intervention approaches. These include:

- Incorporation of KSP promotion component during the research project proposal;
- Training of researchers and extension officers in communication skills;
- Developing favourable land use policies; and
- Strengthening technology development and transfer mechanisms

As shown in Table 5, most respondents (45.7%) think that participatory approach will put off most of the barriers, which hinder utilization of KSPs. Only 6.7% of the respondents had a view that improvement of communication skills of researchers through training will improve utilization of KSPs. Furthermore 76.5% of the University respondents believe that development of favourable policies will improve effective utilization of KSPs.

**Table 5: Priority interventions to overcome barriers to effective utilization of KSPs**

| Institution/barrier | Institution/Organization | | | | |
| --- | --- | --- | --- | --- | --- |
| | ARIs | University | TAFORI | DRD/DLRT | Overall |
| Adequate use of participatory approaches | 52.4 | 47.6 | - | - | 45.7 |
| Communication and dissemination be included in research proposal budgets | 72.7 | 18.7 | - | 9.1 | 24.4 |
| Training of researchers and extension staff in communication skills | 100.0 | - | - | - | 6.7 |
| Development of favourable policies | 11.8 | 76.5 | 5.9 | 5.9 | 37.0 |

This indicates that mostly scaling up is viewed on promoting horizontal dissemination, which has not been very successful. Discussions with farmers revealed that even those who received information about improved soil and water technologies fail to implement due to the fact that adoption of some of these technologies require community mobilisation and sometimes infrastructure development. For example in Bukangilija farmers' efforts to harvest rainwater was constrained by the fact that the ephemeral river passing their village is very deep. Despite participatory approaches of involving farmers to construct diversion channels after receiving training from SWMRG, their own efforts to block water using gunny bags and divert water proved futile and destroyed their structure. Involvement of district officials at a later stage enabled the village to receive assistance through district development plans to construct strong weir. Farmers need strong support from the government.

**Review of University Training Curriculum for Communication and Uptake Promotion**
A rapid survey was undertaken to evaluate if researchers are adequately trained for communication and uptake promotion on aspects related to soil water management. 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 were collecting and reviewing. A total of 7 programmes were assessed. Furthermore an assessment was made based on the courses given to researchers through in service training for professional development.

**The aspect of communication in relation to soil and water management**
Of the 7 departments and institutes, only the Institute of Continuing Education (ICE) is offering a course in aspects of communication in relation to soil and water management as part of the Management of Natural Resource and Sustainable Agriculture (MNRSA). This course on Principle of communication in NRM 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.

**Table 6: 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 |

It was also observed that in the department where soil and water management courses were offered either as being elective or core course, students are not trained on communication skills. 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.

## 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.

## Communications barriers
From the general observations made during interviews, barriers and constraints limiting promotion, uptake and utilization of outputs from NRM research in the Tanzania include:
- Poor infrastructures and unavailability of communication equipment. This could be further compounded by the remoteness of the majority of ARIs.
- The available policy and strategy documents have not been widely communicated to researchers, which could have been as a result of low publicity and awareness campaigns. Policies and guidance documents should be availed at all levels and users should be informed to that effect. These should not be archived at national levels or given for reference only as is the case now, instead, be stocked where most users can access them like institute libraries and government website.
- Researchers have ignored their mandate to participate in 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. Intensification of training in communication skills, raising levels of end-user literacy, as well as repackaging of technologies to suit user needs are areas that need to be revamped.

- Ensuring that participatory approaches are undertaken right from developing to implementation stage of research projects. Although this is considerably happening, its up-scaling is recommended.
- Most researchers are not well equipped with communication skills and training they received did not cover communication and uptake promotion aspects, thus research results are mainly utilized by few stakeholders.

## Strategies for scaling-up and up-take promotion
With these observations for research to contribute towards meaningful and sustainable integrated watershed management the study recommend the following strategies that would enhance scaling-up and uptake promotion:

**Institutionalising scaling up and uptake promotion:** The research guidelines need to be reviewed to emphasize on the need for research projects to include communication strategy incorporating a better definition of stakeholders all those involved in providing necessary environment for uptake of research findings. This requires 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.

**Capacity development:** There is a need to develop capacity of researchers in communication skills.
- 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 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.
- 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. (

**Infrastructure support:** Facilitate researchers in terms of resource allocation and infrastructure development so that they are able to produce and disseminate knowledge sharing products.

## References

Ashby, J. (2003). Uniting Science and Participation in the Process of Innovation – Research for Development. In Managing Natural Resources for Sustainable Livelihoods: Uniting Science and Participation (edited by Pound, B; Snapp, S; McDougall, C. and A. Braun). Earthscan Publications Ltd., London and IDRC, Canada), pp 1-25.

Barrett, C.B.; F. Place; A. Aboud and D. R. Brown (2002). The Challenge of Stimulating Adoption of Improved Natural Resource Management Practices in African Agriculture. In Natural Resources Management in African Agriculture: Understanding and Improving Current Practices (edited by C.B. Barrett, F. Place and A.A, Aboud). ICRAF. CABI publishing, pp 1-21.

Bopp, M. (2002). Interventions and Impacts: An evaluation of Interventions and Impacts of three Eco-health Projects in Central and East Africa. Report prepared for IDRC Project on Ecosystems Approaches to Human Health Programme Initiative

Boyd and Turton with N. Hatibu, H.F. Mahoo, E. Lazaro, F.B. Rwehumbiza, O. Okubal and M. Makumbi (2000). The Contribution of Soil and Water Conservation to Sustainable Livelihoods in Semi arid areas of Sub-Saharan Africa. ODI/AgREN paper NO. 102.

Consultative Group on International Agricultural Research (2000). Integrated Natural Resource Management Research in the CGIAR, A brief report on the INRM Workshop held in Penang, Malaysia, 21-25 August 2000

Garforth, C. (1998). Dissemination pathways for renewable natural resources (RNR) research. Socio-economic Methodologies for Natural Resources Research: Best Practices Guidelines. Natural Resources Institute (NRI), Chantam, UK.

Grewal, S.S.; J.S. Samra; S.P. Mittal and Y. Agnihotri (1995). Sukhomajro Concept of Integrated Watershed Management. Centre for Soil and Water Conservation Research and Training Institute, Research Centre, Sector 27-A, Madhya Marg. Chandigarh, 160 019 (India). ICAR Bulletin No. T-26/C-5.

Gundel, S.; Hancock, J. and Anderson, S. (2001). Scaling-up Strategies for Research in Natural Resources management: a comparative review. Natural Resources Institute (NRI), Chatham, UK.

Hatibu, N.; E.A. Lazaro; H.F. Mahoo; F.B. Rwehumbiza and A.M. Bakari (2002). Soil and Water Conservation in Semi-Arid Areas of Tanzania: Government policies and farmers' practices. In Natural Resources Management in African Agriculture: Understanding and Improving Current Practices (edited by C.B. Barrett, F. Place and A.A, Aboud). ICRAF. CABI publishing, pp 205-218.

Hazzell, P. and L. Haddad (2001). 'Agricultural Research and Poverty Reduction'. 2020 Vision Discussion paper Vol. 34. Published by IFPRI Washington D.C.

Kalineza, H.M.M.; Mdoe, N.S.Y. and M.R.S. Mlozi (1999). Factors influencing Adoption of Soil Conservation Technologies in Tanzania: A case study of Gairo. Paper presented at the Fourth Annual Scientific Conference of the Faculty of Agriculture 17-19 November 1999.

Lankford, B. (2004). Irrigation improvement project in Tanzania: scale, impacts and policy implications. Water Policy, 6 (2): 99-102.

Lankford, B.; van Koppen, B., Franks, T. and H. Mahoo (2004). Entrenched views or insufficient science?: contested causes and solutions of water allocations; insights from the Great Ruaha River Basin, Tanzania. Agricultural Water management 69 (2004): 135-153.

Lutkam. M.; T. Newton; Lema, N. and H. Mahoo (2004). Institutionalised Scaling-up and Uptake Promotion of Outputs from Soil and Water Management Research in East and Central Africa: the case of Tanzania. Draft report prepared for SWMnet NRSP Project, October 2004.

Mahoo, H.F.; M.D.B. Young and O.B. Mziray (1999). Rainfall variability and its implications for Transferability of Experimental Results in Semi Arid areas of Tanzania. Tanzania Journal of Agricultural Sciences 2 (2):127-140.

Ministry of Agriculture and Food Security (2003). Medium Term Plan for Agricultural Research in Tanzania.

Samra, J.S.; Y. Agnihotri; S.P. Mittal; R.C. Bansal; R.K. Aggrwal and R.P. Yadav (2002). Environmental Impact Assessment of Participatory Watershed Management in Shivaliks-Rel Majra. Centre for Soil and Water Conservation Research and Training Institute, Research Centre, Sector 27-A, Madhya Marg. Chandigarh, 160 019 (India). ICAR Bulletin No. T-46/C-10.

Semgalawe, Z.M. (1998). Household Adoption Behaviour and Agricultural Sustainability in the Northern Mountains of Tanzania: the case of Soil Conservation in the North Pare and West Usambara Mountains. PhD thesis.

Senkondo, E.M.M.; E.A. Lazaro and G.J. Kajiru (1999). Adoption of Rainwater Harvesting Technologies by Farmers in Tanzania with Particular Reference to the Western Pare Lowlands. Tanzania Journal of Agricultural Sciences 2 (2): 205-218.

Shah, T.; I. Makin and R. Sakthivadivel (2000). Limits to Leap Frogging: issues in Transposing Successful River Basin Management Institutions in the Developing
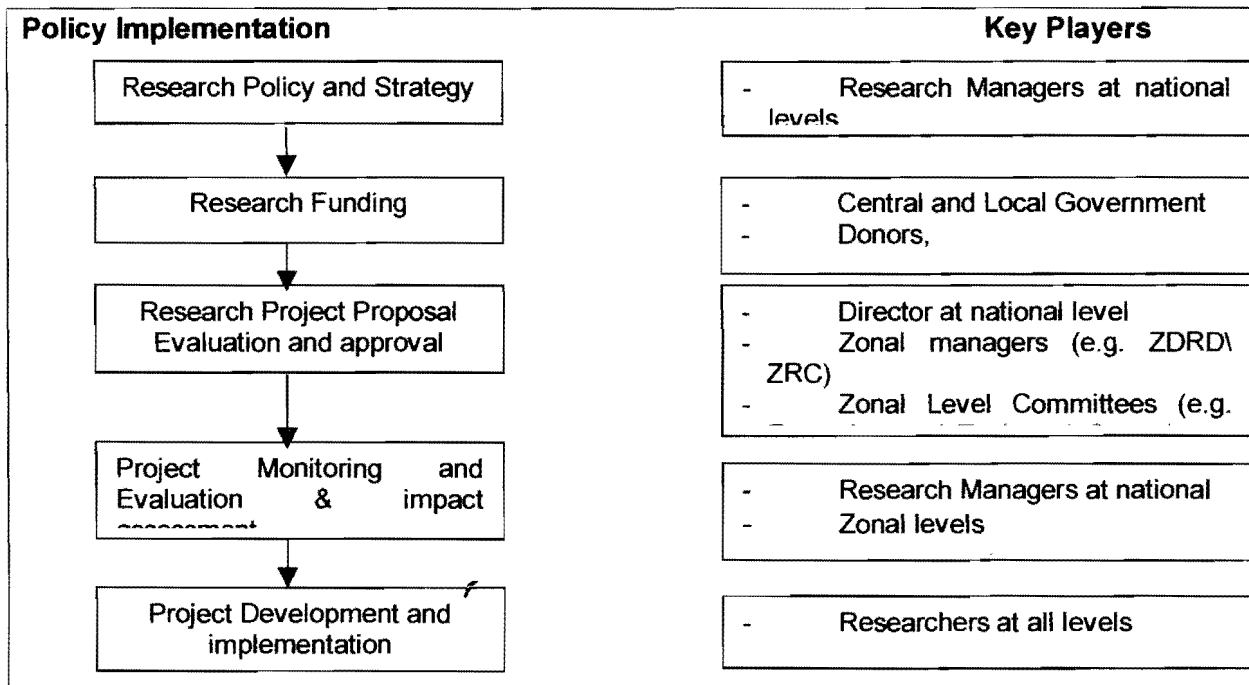
World in Intersectoral Management of River Basin. In: Proceedings of an International Workshop on Integrated Water Management in Water Stressed River Basins in Developing Countries: Strategies for Poverty Alleviation and Agricultural Growth (edited by Abertnethy, C.L.), 16-21 October 2000, Loskop Dam, South Africa, pp 89-114.

Sokile, C.S., L.M. Hermans, G.E. van Halsema and H.F. Mahoo (2004). Tackling Dilemmas for the shared use of water resources: moving towards IWRM in the Mkoji Sub-catchment, Tanzania (in press)
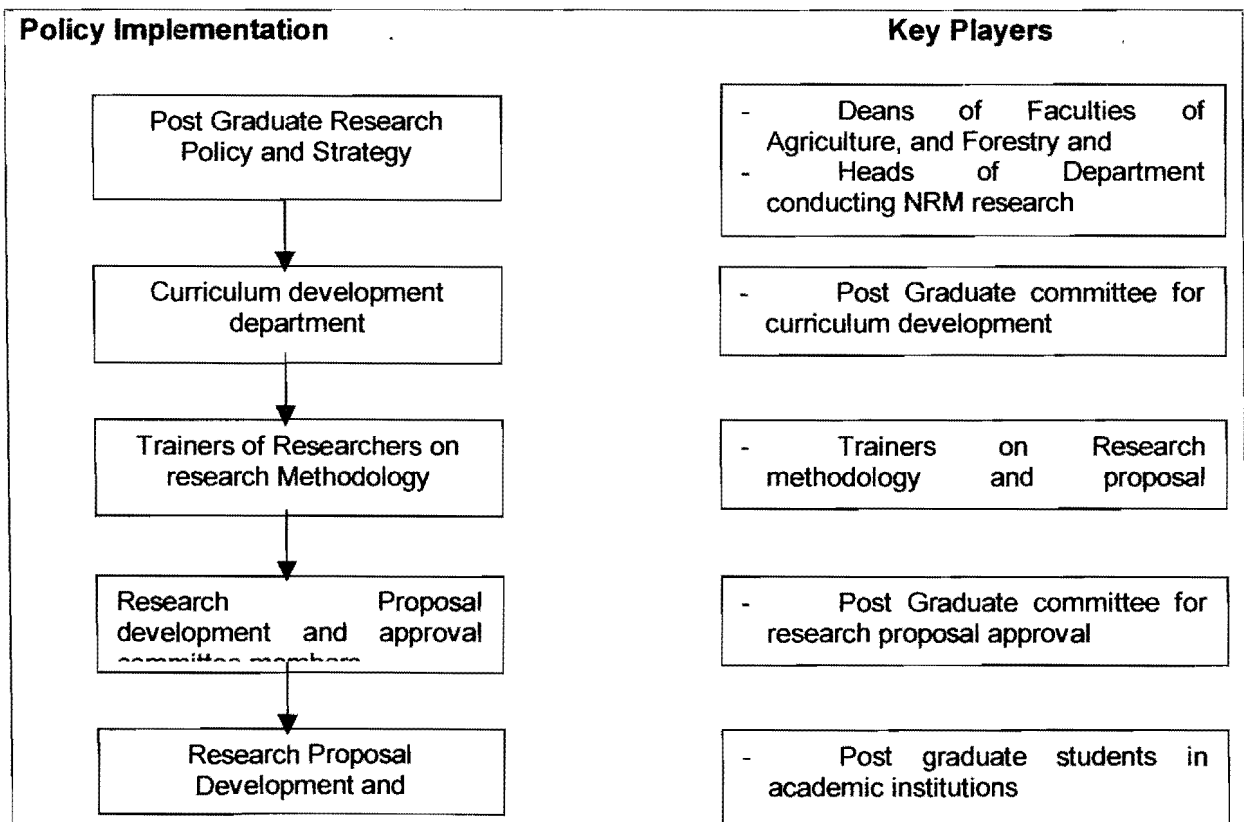
Turton, C., M. Warren and B. Groom (1998). Scaling-up Participatory Watershed Development in India: A review of the literature. ODI AgREN Network paper No. 86.

United Republic of Tanzania (2003). Agricultural Sector Development Programme (ASDP).

## Pathway 1: Ministerial Level Research processes

| Policy Implementation | Key Players |
|---|---|
| Research Policy and Strategy | - Research Managers at national levels |
| Research Funding | - Central and Local Government<br>- Donors, |
| Research Project Proposal Evaluation and approval | - Director at national level<br>- Zonal managers (e.g. ZDRD\ZRC)<br>- Zonal Level Committees (e.g. |
| Project Monitoring and Evaluation & impact | - Research Managers at national<br>- Zonal levels |
| Project Development and implementation | - Researchers at all levels |

## Pathway 2: University Level Research processes

| Policy Implementation | Key Players |
|---|---|
| Post Graduate Research Policy and Strategy | - Deans of Faculties of Agriculture, and Forestry and<br>- Heads of Department conducting NRM research |
| Curriculum development department | - Post Graduate committee for curriculum development |
| Trainers of Researchers on research Methodology | - Trainers on Research methodology and proposal |
| Research Proposal development and approval | - Post Graduate committee for research proposal approval |
| Research Proposal Development and | - Post graduate students in academic institutions |

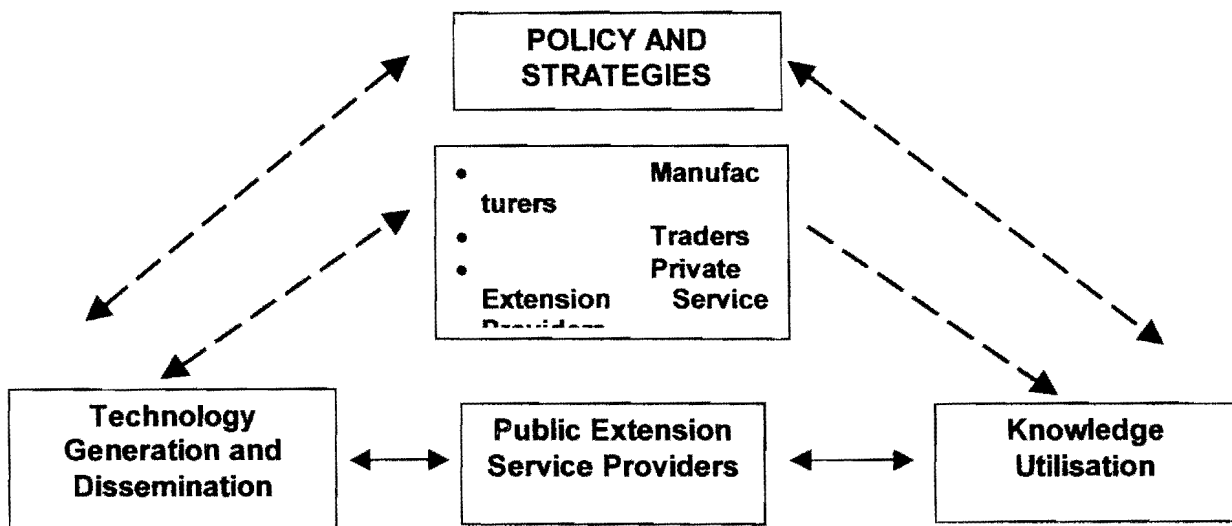**Fig. 1: Up-take pathways for research and communication processes**

Box 1: Definitions of Terminologies
Different terms used in this document and the most important terms are defined hereunder in order to create a common understanding.
i.      **Communication** is defined as a process of sharing or conveying information, while **dissemination** is an act of distributing information to various audiences in forms appropriate to their needs. Communication and dissemination of research findings aims at increasing wider awareness of research products and, in turn, enhances the speed of use of the research products.
ii.     **Communication strategy** is a process of preparing ground, through communication and dialogue that will enable effective scaling-up of the research products after a project is over.
iii.    **Research products** (or knowledge sharing products) are the findings and results of research such as methodologies, conceptual models, decision-making tools, process recommendations, scientific understandings, technical information, transferable technologies, sets of alternatives from which end-users choose.
iv.     **Scaling-up** is a way that aims to provide more quality benefits to more people over a wider geographical area more quickly, more equitably and more lastingly. The end users of knowledge and information generated may be farmers who would adopt and adapt the technologies.
v.      **An impact** is a change in the socio-economic and ecological context and conditions that has occurred as a result of research activities. Some impact are significant relative to the research problem, but some are not and some have delayed or indirect significance that can only be detected under certain conditions such as community or institutional learning which only show itself if the learning is applied.