SWMnet Training Manual 2

Managing and Scaling-up of Knowledge in Soil and Water Management (SWMnet RP04-02 & DFID 8381)

Professional Development Course (PDC) & Training of Trainers (TOT)

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Turning Knowledge into Action

ASARECA

TABLE OF CONTENTS

Abbreviations and Acronyms

A-AARNET	ASARECA Animal Agriculture Research Network
AATF	African Agricultural Technology Foundation
AHI	African Highlands Initiative
AKST	Agricultural Knowledge Science and Technology
ASARECA	Association fro strengthening Agricultural Research in Eastern and Central Africa
ASARECA-NRM	ASARECA's Natural Resource Management
CAADP	Comprehensive African Agricultural Development Program
CBOs	Community Based Organizations
CDE	Centre for Development and Environment
CGIAR	Consultative Group for International Agricultural Research
CGS	Competitive Grants System
COMESA	Common Market for Eastern and Southern Africa
DFID	Department for International Development
DLD	Department of Land Development
ECA	East and Central Africa
EAPGREN	East Africa Plant Genetic Resources Network
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural
GEF	Global Environmental Facility
GIS	Geographic Information Systems
GPS	Global Positioning System
IAASTD	International Assessment of Agricultural Science and Technology for Development
IARCs	International Agricultural Research Centers
IAR4D	Integrated Agricultural Research for Development
ICT	Information and Communication Technology
ICT/ICM	Information and Agricultural technology/Information Communication Management
IPR	Intellectual Property Rights
INRM	Integrated Natural Research Management
IPG	International Public Good
ISRIC	International soil reference and information centre
KM	Knowledge Management
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MTP	Medium Term Plan
NARES	National Agricultural Research and Extension system
NARI	National Agricultural Research Institute
NARO	National Agricultural Research Organization
NARS	National Agricultural Research Systems
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
NR	Natural Resources
NRM	National resource management
NRM-NPs	National Resource Management Networks and Programs
NSRA	National Strategy for Revitalizing Agriculture
PDC	Professional Development Course
PDC-ToT	Professionals Development Course-Training of Trainers
PLSs	Pilot Learning Sites

PLTs	Pilot Learning Teams
PMA	Program for the Modernization of Agriculture
PRSPs	Poverty Reduction Strategic Papers
PVP	Plant Variety Protection
RAIN	Regional Agricultural Information Network
RELMA	Regional Land Management Unit
R&D	Research and Development
R4D	Research for Development
SOTER	Soil and terrain database
S&T	Science and Technology
SSA-CP	Sub-Saharan Africa Challenge Program
SWOT	Strengths, Weaknesses, Opportunities and Threats
SWMnet	Soil and Water
THP	Traditional Health Practitioners
TOFNET	Trees-on-Farm Network
TRIPS	Trade Related aspects of Intellectual Property
UN	United Nations
USAID	United States Aid for International Development
USAID-SAKSS	United States Aid for International Development-Strategic Analysis and Knowledge Support System
WCT	WIPO Copyright Treaty
WOCAT	World overview of conservation approaches and techniques
WPPT	WIPO performance and phonograms Treaty
WEHAB	Water, Energy, Health, Agriculture and Biodiversity
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

Introduction

Acceleration of the uptake and utilization of knowledge, innovation and technologies (KIT) generated by the NARS in ECA countries is one of the priorities of ASARECA. The Soil and Water Management Research Network (SWMnet) is one of the ASARECA networks and it is mandated to promoting and strengthening research in NRM. One of the eight priority results that ASARECA plan to produce in NRM, is stated as: *Increased Effectiveness in Knowledge Management, Brokering and Sharing: Leveraging More Benefits from Existing and New Knowledge*. It is a response to the fact serious NRM challenges face the ECA sub-region with its high concentration of the poor and hungry. Quick-win actions are therefore required for sustainable utilization of natural resources. NRM is a knowledge-intensive undertaking and often knowledge rather than inputs, is more critical to NR managers and other stakeholders. Furthermore, NRM research is often a long term venture with long lead times before impact is realized. Moreover, there must be intensive use of the existing knowledge before impact can be achieved. So increased synthesis of existing knowledge to produce and deliver practical solutions and technologies is a quick-win way through which the NARES in ECA can assist poor farmers, NGOs, planners and policy makers to overcome NRM constraints and effectively contribute to poverty reduction.

This training manual is a compilation of materials from many sources and is designed to assist in increasing the understanding by NRM researchers in ECA of the effective knowledge management systems and tools, uptake pathways, and communication and knowledge sharing process for ensuring that research in NRM conducted at global, regional and national scale can be effectively used at local levels in the sub-region to guide decision making, investments, technology options, monitoring and evaluation, and impact-orientation in NRM research and development programmes in the region.

The manual is divided into 5 parts dealing with:

1. **Policy and institutional arrangements for knowledge management - t**he **objective** of is to enable the reader to critically analyze existing policies and institutional frameworks that determine effectiveness in the management and scaling-up of knowledge and technologies, from research and development organisations dealing with soil and water management in eastern and central Africa.
2. **Different aspects of knowledge management and the science of scaling-up -** designed to increase the understanding of participants on aspects related to the science of sharing, scaling-up and general management of knowledge. Various terminologies that one finds in the subject of knowledge management (KM) and in the science of scaling-up will be defined and elaborated with examples where applicable.
3. Knowledge management (km) strategy for organizations and projects working on soil and water management research and development - the objective of this section is to build the capacity of the participant to develop a strategy for managing, sharing and scaling-up knowledge at institutional or project level.
4. Integrating best practices with best available tools for effective scaling-up and scaling-out - the objective is to strengthen the participant's capacity to select the most appropriate tools and activities, within their context that can effectively help meet the objectives of the communication strategy. The module will also provide the participants with vital information regarding the various options and tools for scaling-up and scaling-out with emphasis on the merits and limitations of each tool or activity.
5. Training others to championing knowledge management, sharing and scaling up, to get the reader exposed to:
   - ? principles of adult learning
   - ? process of carrying out training needs assessment
   - ? template and demonstrate an appropriate training design to meet a stated need

MODULE I: Policy and Institutional Arrangements for Knowledge Management

[1 Hour Lecture; 2 Hours Working Groups; 2 hours Seminar] *(**Compiled by Nuhu Hatibu**)*

1.1 Why this Module?

The **objective** of this module is to enable the participant to critically analyze existing policies and institutional frameworks that determine effectiveness in the management and scaling-up of knowledge and technologies, from research and development organisations dealing with soil and water management in eastern and central Africa. The module is designed ***to enable the participant to become a champion and an advocate of change in policies and strategies*** of governments and relevant institutions and organizations towards more effective management and scaling-up of research outputs.

This module is important because many policies already exist and are good at describing convincingly what needs to be done. However, regional organizations as well as national governments fail to turn these “good” intentions into tangible actions and results. Often, countries and organizations are involved in endless review of policies while the situation on the ground, especially for the very poor remains unchanged. We should find ways of overcoming this state of affairs with respect to management and scaling-up of knowledge in soil and water management. This is why this module is necessary.

At the end of this module participants are expected to be aware of existing policies that could be put into use through robust strategies and programmes to accelerate the scaling-up and effective utilization of existing knowledge. This module will also briefly discuss existing knowledge bases that we in Africa have hardly been able to exploit.

The materials required to assist the participant achieve this objective are presented in this chapter in six parts. The second part gives a brief overview of the kind of global policies that influence investments in knowledge management and scaling-up, especially for smallholder agriculture in Africa. The third part of this chapter looks at policies of pan-African and sub-regional organisations, especially with respect to agricultural development and the management of natural resources. Section four looks at the national level policy and institutional frameworks. This section also evaluates the mechanisms for managing knowledge at organization levels, specifically with respect to the national agricultural research and extension systems (NARES). Each section provides a generic assessment of the positive as well as un-supportive aspects of policies and frameworks, providing examples of actual barriers to knowledge management and scaling-up, by research systems in ECA.

In section five the manual presents an example of databases existing at global level that can be put to use immediately to solve the problems we face in our region. The last section describes the terms of reference for working groups to assist the participants learn by doing critical assessment of a sample of current policies and frameworks.

1.2 Policies at International Level

At global level, the most important policies are those formulated by the United Nations System, including the World Bank; international commissions such as the commission for Africa; and (with respect to agricultural research) organizations such as the Consultative Group for International Agricultural Research (CGIAR). In this section we discuss how such policies can affect what a scientist in a small NARI in ECA can do or cannot do with respect to management and scaling-up of knowledge and technologies. The section will also briefly discuss the Intellectual Property Rights (IPR).

We start with the development thrust of most of the current global policies.

1.2.1 Good-will and increased demand for impact from research

Many international organizations are increasingly calling for a serious focus on up-take promotion and scaling-up of what is already known, especially to deal with agricultural and rural stagnation in Sub-Saharan Africa. For example, the UN Secretary General has called for a uniquely Africa's Green Revolution. Among other important actions, he has stated that: ***knowledge is not lacking … what is lacking, as ever, is the will to turn this knowledge into practice*** (MDG Technical Support Centre, 2004 – page 19). We agree with him that many good policies exist; in fact, the world has been locked into endless reformulation of policy without serious efforts to putting each version into extensive implementation.

1.2.1.1 The UN system

The United Nations has been in the forefront in searching for balanced development with respect to economic, social and environmental spheres as first elaborated in the famous but virtually forgotten Agenda 21. The UN system in general including the World Bank, is committed to effective management, sharing and scaling-up of knowledge because of the understanding that*:* ***Access to information and knowledge hold one of the keys for the [African] continent to unlock its potentials to bridge the development gap in relation to the rest of the world****.*

More recently in 2002, the World Summit for Sustainable Development in Johannesburg, South Africa, came up with the strategy known as WEHAB. This is a consolidated proposal for coordinated actions in the areas of water, energy, health, agriculture and bio-diversity. The WEHAB framework for agriculture observes that: ***Dissemination of existing technologies and best practices should receive as much importance as the development of new technologies***. It then goes on to identify the following as critical aspects of intervention with respect to knowledge management and scaling-up:

- *Strengthen national capacities in developing countries to address and to benefit from appropriate technology development related to agricultural services*
- *Promote cross-boundary partnerships and alliances related to the generations, adaptation and dissemination of technologies*
- *Design national policies that facilitate the establishment of functional linkages among research, extension, education and communications*
- *Promote information exchange, networking and technology generation and dissemination related to best practices in agriculture*

These have been up-dated recently by the UN Millennium Project Task Force on Science, Technology and Innovation which has recommended that: *greater emphasis should be put on increasing the capacities of national governments and international*

organizations to utilize advice from the scientific community in a world increasingly marked by rapid technological change. Scanning through the series of reports from the UN Millennium Project, released in 2005 and the report to the UN Secretary General by the Inter-Academy Council, one sees a long list of ideas of how the existing knowledge should be put into use to accelerate development especially in Africa. Examples of such statements include:

- The core challenge of the goals lies in financing and implementing scaling-up interventions in order to reach large proportions of the populations.
- Scaling-up needs to be carefully planned and overseen to ensure successful and sustainable implementation.
- Africa's uptake of high-yielding varieties was the lowest in the developing world and as a result, Sub-Saharan Africa has the lowest cereal yield per hectare of any major region and the slowest gain in yields in the last two decades.
- An essential priority for African economic development is to mobilize science and technology, because at the moment tropical Sub-Saharan Africa produces roughly a twentieth of the average patents per capita compared to the rest of the developing world. It has only 18 scientists and engineers per million population compared with 69 in South Asia, 76 in the Middle East, 273 in Latin America, and 903 in East Asia.
- Because of greater emphasis on impact, the science and technology strategies have shifted to all-inclusive aspects of generation, diffusion and application of knowledge.
- This new perspective places more emphasis on the role of farmers, input suppliers, transporters and processors in the innovation process and rejects the traditional linear model of research-extension-farmer linkages.
- To be effective, the national innovation system paradigm will require major investments in information and communication technologies.
- Therefore, we stress the need for increased investments in science, higher education, and research and development targeted at Africa's specific ecology challenges (food, diseases, nutrition, construction, energy).

The World Bank in its Rural Development Strategy – *reaching the rural poor*, states that: ***scaling-up good practices must become an integral part of development strategies*** (World Bank, 2003 – p xxvi). The strategy calls for the following:

- Identification and scaling-up of good practices within country, between countries, and between regions.
- Increased emphasis on piloting new and innovative approaches that reflect the dynamic economic, social, environmental and institutional contexts.
- Strategic leveraging of projects to a larger scale or broader coverage to increase efficiency and impact.

The World Bank document on scaling-up provides such a thorough analysis to the subject matter of this professional development course that we have provided the full text to the participants for reference. Another initiative of the World Bank and other organizations is the *International Assessment of Agricultural Science and Technology for Development* (IAASTD), which is designed to evaluate at international level the relevance, quality and effectiveness of agricultural knowledge, science, and technology (AKST) to development. The initiative will also evaluate the effectiveness of public and private sector policies as well as institutional arrangements in promoting AKST in support of agricultural development. This evaluation when completed will be very useful to the many aspects advocated in this SWMnet PDC.

1.2.1.2 Current priorities of international development organizations

Among the international development organizations, which support agricultural research for development, it is increasingly being realized that more impact will be realized from the utilization of existing knowledge than from entirely new research. For example, the Department for International Development (*DFID)* is among organizations that are strongly committed to ***focusing a greater proportion of their development funding to promote much greater use and uptake of the research that it and the international community has funded in the recent past***. In this regard *the first priority, especially for Africa, is the capacity to access both existing and new knowledge*. More practically, the United States Agency for International Development (USAID) has initiated a programme known as *Strategic Analysis and Knowledge Support System* (SAKSS). The stated aim of SAKSS is to capture and consolidate scattered data and information on Africa's agriculture from national statistics agencies, bilateral donors, the United Nations system, and other institutions. On top of improving access and utilization of existing data, information, experiences, and knowledge systems, SAKSS will *also invest in gaining new knowledge where gaps currently exist.* It is expected that SAKSS will devote a major part of its effort in developing a robust framework for global compilation, synthesis and access to data, information and knowledge for meeting the Millennium Development Goals. The ultimate goal of SAKSS is stated as: *to institutionalize a SAKSS-like system within national agencies (government ministries and/or research institutions) to enable African policymakers to have access to up-to-date analysis and knowledge necessary for planning, monitoring and evaluating long-term development strategies* (see www.ifpri.org/themes/**sakss**/**sakss**.htm).

1.2.1.3 Increased formation of networks and partnerships

Networking in international organizations has been a major area of investment in an attempt to implement the global policies mentioned in this section. This is especially with respect to improved sharing and scaling-up of knowledge existing world-wide. The Soil and Water Management Research Network for eastern and central Africa (SWMnet) is one such network. However, most of these networks have been short-term affairs running for as long as the interested donor continued to support it. They have tended to be talk shops holding one workshop per year and then nothing else happen in between. The SWMnet Strategy identifies several weaknesses and threats to networking as follows:

Weaknesses

- Institutional frameworks in all NARS do not fully accommodate the participation and contribution of resources to regional programmes and activities.
- Capacity for integrated and scaling-up approaches in soil and water management is limited among member scientists.
- There is inadequate documentation of the available knowledge, information and technologies.
- Most past research has focused on only few aspects of the soil and water management spectrum.
- Impact is not included in the criteria for remuneration of researchers among member NARS, reducing incentive to scale-up research results.

Threats

- Continued under-investment in communication infrastructure keeps the cost of networking prohibitively high.

- Nationalistic tendencies, political instability and competition for water resources may hinder collaboration and sharing of data, knowledge and technologies.
- Poor incentives and reward systems for national scientists may discourage talented scientists and encourage brain drain.
- Excessive demand by organizations for collaboration may burden national institutions.
- Underdeveloped mechanisms for funding regional programmes (as compared to bilateral funding), may restrict resource mobilization.

We shall come back to discuss these weaknesses and threats in more details in section 1.4, but the most important observations are: i) networks require sharply focused and negotiated operational objectives to succeed; ii) this can only happen if the network is formed around a widely shared problem and the activities must provide tangible benefits to each individual member, iii) this will then provide a fair incentive to collaborate. Therefore, there is a need for serious search for ways to consolidate the incentive packages.

1.2.2 Intellectual Property Rights: *Do they facilitate scaling-up?*

(*Compiled by Newton Temu*)

This section starts with a brief overview of the existing IPR systems. It was recently stated in the Human Development Report of the UN, that: ***knowledge is the new asset … and globalization has set off a race to lay claim to knowledge***. The explosion of information and communication technology (ICT) are globalizing the knowledge asset but polarizing the world between those who have access to knowledge and those who do not. It has been observed that the level of education and skills required to access, adapt and utilize knowledge is the same as what is required to generate your own knowledge. The question therefore is: Does IPR hinder access to information and knowledge for development?

1.2.2.1 General definition

Intellectual property (IP) is any useful product of intellectual creation by one or more individuals. Invention is here defined as data, technical information, know-how, methods, techniques, formulas, and processes. In law, particularly in common law jurisdiction, intellectual property right (IPR) is a form of legal entitlement, which allows its holder to control the use of certain intellectual property. The term intellectual property rights reflects the idea that once established, such entitlements are generally treated by courts, especially in common law jurisdictions, as if they were tangible property. IPRs are divided into two basic branches, namely “copyrights” and “industrial property”. A copyright relates to the artistic creation, such as poems, novels, music, cinematographic works, etc. whilst industrial property is related to inventions, utility models, industrial designs, and trade and service marks.

There are five most common forms of protecting innovations namely trade secrets, copyrights, trademarks, new plant varieties protection and patents.

i) **Trade secret** – an innovation can be protected by keeping it secret i.e. by not telling others about it. A typical example is the formula for Coca-Cola that has been commercially available since 1886, but is not known outside the company.
ii) **Copyrighting** is protection that is granted for original authorship works. It includes literacy works; musical works plus accompanying words; pictorial, graphic and sculptural works; motion pictures and audiovisuals. Because of treaties between countries, copyright protection given in one country will be enforced in most other countries.

iii) **Trade and Service mark** - a trademark is any word, phrase, logo (e.g. SWMnet), brand name, symbol or device or any combination of these that is used in commerce to identify and distinguish the goods of one company/institution from that of others. A trademark can also be used to identify and distinguish an innovation that is protected by copyright, plant variety certification or patent.

iv) **Plant variety certification** – It is widely accepted that "Plant Variety Protection" (PVP), which grants "Intellectual Property Rights" (IPR) to eligible plant varieties is essential to increase the availability of good quality seed of improved varieties. Breeding for high yielding varieties with all other desired characteristics requires considerable investments in trained staff and the allocation of funds. If PVP is not granted, the private seed sector will not be willing to invest in plant breeding.

v) **Patenting** - is a process of obtaining an exclusive right of its owner to exclude others from making, using, or selling the owner's invention as defined in the claims of the patent for a period of time. In the United States of America protection through patenting is granted for a limited period of 20 years from the date of filing a patent application. Patents are granted under national patent laws and have territorial application only. The TRIPS Agreement provides minimum standards of protection for intellectual property rights including patents, while WTO Members are free to grant a higher level of protection under their national laws. As far as is possible, Attorneys should be consulted in drafting the patent applications. Particularly import in any patent application is the "claim" of what this new innovation can do better than existing innovations or their alternatives. Patents can be protected locally or internationally as long as the costs of patenting are lower than what the patent holder will earn from sales and/or net **royalties.** "Net royalty" is defined as gross royalty, derived from a particular intellectual property product, less actual costs for legal, patent, copyright, and licensing related fees and expenses, compensation to sponsors and consultants pursuant to prior agreements, reimbursement of state funded incremental costs and other expenses incurred during the intellectual property and commercialization process.

1.2.2.2 Benefits of IPRs

The main advantages of granting IPRs are to:

? Provide an incentive for the innovator by recognizing and protecting his/her efforts in developing the innovation. **Protection** prevents any one from using the innovation without the innovator or owner's permission. The incentive encourages innovators and results in new and better innovations that can be scaled-up in the community.

? Allow commercialization of the *intellectual property* (through patents or copyrights) that has been developed by individual researchers, institutions, faculties, staff or students with resources from the institution/university or as a part of employment responsibilities. This ensures that the person putting work and effort into an IP gets some benefits as a result of his/her work. In other words, this stimulates generation of new ideas. Experiences from R&D and S&T institutions of developed countries have shown that significant income can be generated through commercialization of innovations and research findings.

? The most important advantage is that IPRs if properly implemented they encourage and provide incentives to inventors to disclose new knowledge for wider uses and scaling-up. IPRs should facilitate knowledge sharing within the nation as well as from external sources as it allows the exploitation of existing resources through

licensing and various other means. In order to facilitate this, national laws, policies and institutional frameworks are needed to assist individuals/organizations to recognize, handle, protect and market intellectual properties.

1.2.2.3 The global IPR regime

There is one major international convention upon which several copyrights and IPR rules and regulations are built. This is the Berne Convention originally agreed upon in 1886 but having gone through numerous amendments. The World Intellectual Property Organization (WIPO) that implements the convention through two copyright treaties administers the convention:

- The WIPO copyright treaty (WCT), and
- The WIPO performance and phonograms treaty (WPPT).

The Berne Convention has recently been reinforced by a complementary agreement known as: Trade Related Aspects of Intellectual Property (TRIPS) agreement. This gives means for enforcing the protection of intellectual property rights around the world. The **WCT** was adopted by WIPO in 1996 to provide additional protections for copyrights due to the realities of the modern information era. For example, it provides for the protection of computer programmers and software as if they were literary works (Article 4) and it also makes provisions for the protection of databases (Article 5). It provides authors of works with control over their rental and distribution (Articles 6-8) that they may not have under the Berne Convention alone. And it prohibits circumvention of technological measures for the protection of works (Article 11) and unauthorized modification of rights management information contained in works (Article 12).

TRIPS deals with all types of protection as described in the previous sub-section, and specify procedures for enforcement, remedies, and dispute resolution. The obligations under TRIPS apply equally to all member states; however developing countries are allowed a longer period in which to implement the applicable changes to their national laws. States that do not adopt TRIPS compliant intellectual property rights regimes can be disciplined through the WTO's dispute settlement mechanism, which is capable of authorizing trade sanctions against non-compliant states. Therefore, TRIPS requires member states to provide strong protection for intellectual property rights; for example:

- Copyright terms must extend to 50 years after the death of the author (although films and photographs are only required to have fixed 50 and 25 year terms, respectively).
- Copyright must be granted automatically, and not based upon any "formality", such as registrations or systems of renewal.
- Computer programs will be regarded as "literary works" under copyright law and receive the same terms of protection.
- National exceptions to copyright (such as "fair use" in the United States) must be tightly constrained.
- Patents must be granted in all "fields of technology" (regardless of whether it is in the public interest to do so).
- Exceptions to patent law must be limited almost as strictly as those to copyright law.

1.2.2.4 The IPR and sharing and scaling-up

The current IPR protection systems started out as copyrights mechanism designed to stimulate and reward invention and innovation. The initial idea was to protect the interests of creative individuals. However, the current forms of IPR regimes have to a large extent deviated from this original and noble objective. For example, most of the ideas of research scientists end up being owned by the publishers of the scientific paper in which the idea first appears. This is clearly against the original sprit of

copyrights protection. This is leading to knowledge enclosure and poor or insignificant reward for the research scientists. It is most serious for the developing countries in Africa whose most of the outputs of their scientists are published by publishers based in the developed world. The main consequence of this is that the public in this countries end up paying for the research outputs twice. First the public pays for the research work and then it pays to purchase the published knowledge from the publishers based in the developed world.

1.2.2.5 The IPG concept

The opposite of IPR is the concept of public good knowledge systems ranging from national, regional and international level. At the international level these have been referred to as International Public Good (IPG) knowledge systems. In agriculture the national agricultural research system (NARS), regional organizations such as ASARECA and the international system such as the CGIAR supported network of international agricultural research centres (IARCs). The current IPR regimes as discussed above are based on the system of rights over physical properties such as land, water and manufactured goods. These are finite resources, while information held digitally is not finite, in the sense that one piece of information can be consumed by a million people without being depleted or degraded in any way. In other words, information necessary for knowledge and innovation has the potential to be made available to every one as a public good. But how do you then maintain motivation to individuals and corporations to continue to produce good information? What kind of reward system should the public put in place to facilitate the production of high quality public good information? These are some of the questions that this professional development course is designed to deal with. We will start to deal with these questions in section 1.5.

1.3 Pan-Africa and Sub-regional Levels

1.3.1 NEPAD and CAADP

The Comprehensive African Agricultural Development Program (CAADP) is designed to focus on enhancing the rate of adoption, institutionalizing delivering and promotion of systems that quietly bring innovations to farmers (NEPAD, 2003 - page 3). It will therefore focus on:

- Acceleration of adoption for the most promising available technologies so as to support the immediate improvement of African production through the more efficient linking of research and extension systems to producers.
- Technology delivery systems that quickly bring innovations to farmers and agribusiness, thereby making increased adoption possible, notably through the appropriate use of new information and communication technologies.
- Renewing the ability of agricultural research systems to efficiently and effectively generate and adapt new knowledge and technologies, including biotechnology, to Africa, which are needed to increase output and productivity while conserving the environment.
- Mechanism that reduce the cost and risks of adopting new technologies

1.3.2 African Agricultural Technology Foundation (AATF)

The African Agricultural Technology Foundation (AATF) is designed to facilitate public-private partnerships for the access and delivery of appropriate technologies to the poor smallholder farmers in sub-Saharan Africa. This creates an enabling environment for the royalty-free transfer of proprietary technology for the benefit of the resource-poor farmers in a way that addresses the concerns of technology providers. AATF links the

needs of resources-poor farmers with potential technological solutions. It acquires technologies from technology providers through royalty free licenses or agreements, along with associated materials and know- how for use. It also establishes partnerships with existing institutions to adapt agricultural technology to African circumstances and ensures compliance with all laws associated with use of these technologies. Finally, it promotes the wide distribution of the technologies to Africa's resource-poor farmers.

1.3.3 The SSA-CP and IAR4D

Three issues have been identified as the most significant constraints to reviving agriculture in sub-Saharan Africa:

- Failures of agricultural markets,
- Inappropriate policies, and
- Natural resource degradation.

The Sub-Saharan Africa Challenge Programme (SSA-CP) is based on the "Integrated Agricultural Research for Development" (IAR4D) paradigm, that draws on successful experiences in Africa with Integrated Natural Resources Management (INRM). These take a systems approach to manage the interactions between soils, water, pests and human interventions in agriculture. IAR4D goes beyond INRM, however to encompass issues on policies and markets, and the effects these have on the productivity, profitability and sustainability of agriculture. Taking all these factors into account, the research for development agenda of IAR4D of SSA-CP focuses on four overall objectives:

- To develop technologies for sustainably intensifying subsistence oriented farming systems
- To develop smallholder production systems that are compatible with sound natural resource management
- To improve the accessibility and efficiency of markets for smallholder and pastoral products
- To catalyze the formulation and adoption of policies that will encourage innovation to improve the livelihoods of smallholders and pastoralists.

Four additional mechanism or "support pillars" are required to foster internalization of a new way of doing business and the "out-scaling" and "scaling-up" of programme outcomes. Out-scaling to neighboring villages or similar agro-ecosystems elsewhere on the continent; and, up-scaling to connect with local, national and international governments, institutions and the private sector. The four support pillars of IAR4D are:

- Promotion of organizational and institutional change to enable cross-disciplinary research and development and multi-institutional collaboration
- Capacity building for project teams, farmers, and scientists in African institutions
- Information and knowledge management (including documentation of new methodologies developed) to disseminate widely the findings of IAR4D work
- Ongoing monitoring and evaluation and a systemic approach to impact assessment, to track programme progress towards overall goals, signal the need for mid-course adjustments and document the returns on investment in IAR4D

Because IAR4D represents a significant change from past approaches to agricultural research and development, it will be implemented in a two-step process congruent with the principle of learning from doing. For the first phase of the programme, Pilot Learning Sites (PLSs) will be used. For each site Pilot Learning Team (PLTs) will be formed to address the hypotheses. These will comprise of members from a variety of scientific disciplines (biophysical and social) and from diverse institutions (e.g. national

agriculture research institutes, universities, CGIAR Centres and advanced research institutes, extension agencies, nongovernmental, community based and farmers' organizations, and the private sectors).

1.3.4 ASARECA and its Networks

ASARECA is an umbrella organization comprising the national agricultural research systems (NARS) of 10 countries (Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda). The sub-region has perhaps the highest proportion in the world, of people living with food insecurity and those living below the poverty line. The sub-region also has a very high rate of degradation and underused natural resource base.

ASARECA was formed in 1994 help member countries reverse this situation by increasing economic growth and improving social welfare in the sub-region while enhancing the quality of the environment. Currently ASARECA is pursuing its agenda through 16 networks and programmes. Five of these deal with natural resources management. They include the African Highlands Initiative (AHI), which targets densely populated highlands challenged by limited livelihood options and degradation; the ASARECA Animal Agriculture Research Network (A-AARNET); the Eastern Africa Plant Genetic Resources Network (EAPGREN); the Soil and Water Management Research Network (SWMnet) and the Trees-on-Farm Network (TOFNET).

ASARECA is pursuing four main results:
- Demand driven technologies/innovations utilized
- Enabling regional policy environment for agricultural transformation facilitated;
- Performance driven institutional arrangements promoted
- Enhanced utilization of information for research and development.

Utilization of information is given very high priority such that the Regional Agricultural Information Network (RAIN) is dedicated to this result. The mission of RAIN is to promote the provision and sustainable management of client-oriented agricultural information throughout the ECA sub-region. The work of RAIN is complemented by knowledge management efforts of other networks. For example one of the 8 results to be pursued by the NRM strategy concerns is the increased effectiveness in knowledge management, brokering and sharing: leveraging more benefits from existing and new knowledge. This particular course designed to contribute to the delivery of this result.

1.4 Major Policy Frameworks at National Levels

At national levels, relevant policy is found in the poverty reduction strategy papers (PRSPs) and Agricultural Development Strategies. The research, training and extension policies and strategies are also major frameworks for guiding management and sharing of knowledge. In this document, we briefly review policies in several countries that are members of ASARECA, to see the major policy recommendations with respect to agricultural knowledge management sharing and scaling-up. In the next section we review documents from Uganda and Kenya to see the type of supportive emphasis given to scaling-up of knowledge.

1.4.1 Supportive aspects

1.4.1.1 The case of Uganda

Uganda is known for its recent bold re-organization of its research and extension system. The government of Uganda is implementing a programme for the modernization of agriculture (PMA) with the vision to create, a profitable, competitive, dynamic and sustainable agricultural and agro-industrial sector of transforming subsistence agriculture to commercial agriculture. Both the research and extension systems have been re-engineered to support the national objective. With respect to the scaling-up of knowledge and technologies, NARO has made the commitments in its current MTP, to improve the efficiency of technology development and transfer by:

- Stronger linkages with all sources of knowledge
- Strengthening collaboration with extension NGO's and commercial firms to improve the prospects for successful dissemination of improved technologies and methods,
- Ensuring that research action plans observe a set of guideline for technology transfers that are integral components of the research and dissemination process,
- Maintaining interactions with clients at all stages of research and dissemination as an integral component of all approved research projects
- Building viable partnerships with service providers and other stakeholders, because the growth of NGO's /CBOs, farmers organizations and commercial forms significantly expands the potential capacity in the area of technology transfer
- Developing and testing extensive technology transfer methods and systems aimed at empowering large numbers of clients to better help themselves through accessing information and materials, which they can test and adapt

Basically NARO is committed to moving away from the researcher- extension-farmer paradigm of technology transfer, to a more holistic up-take promotion and scaling-up. This is a very conducive policy framework for improved agricultural knowledge systems in Uganda.

1.4.1.2 The case of Kenya

The National Strategy for Revitalizing Agriculture (NSRA) in Kenya is a commitment to agricultural transformation and modernization as a major condition for general economic recovery and wealth creation. The strategy has identified the transformation of subsistence farming into commercial agricultural system, as the cornerstone for achieving the vision of a *Kenya's agricultural sector that is profitable, commercially oriented and competitive regionally and internationally*. To achieve this vision, the NSRA sets very ambition targets for the agricultural sector with respect to commercialization. In its evaluation of the current state of commercialization of the Kenya's agricultural sector, the NSRA notes that: *with regard to markets, the country has not adequately utilized the large regional markets made possible by regional integration.* It continues to note that: *opportunities to develop service hubs in the areas of processing, quality control and export, for example, to the Far East, have not been exploited effectively*. Therefore, NSRA calls for an increased and more effective utilization of these and other available opportunities through the development of agricultural enterprises and agribusiness. The NSRA clearly calls for the creation of *an agricultural innovation system composed of research institutes, universities, research foundations, private sector research and NGOS,* as a means of putting in place *an efficient agricultural research system that consistently provides appropriate technology, knowledge and information to the agricultural sector*.

The NSRA identifies ***low absorption of modern technologies*** as one of the main

constraints to agriculture growth in Kenya. However, it goes on to repeat the usual suspect for this state of affairs by stating that: ***while lack of affordable credit has partly contributed to this situation, equally important is the inadequate research-extension-farmer linkages and lack of demand-driven research***. While this is part of the reason, there is evidence from other parts of the world to suggest that this is only a small part of the reason. Given that, as discussed in section 2, the source of control of the agricultural product value chains and the resultant benefits, is knowledge (and not physical resources), then the ***well-developed agricultural research infrastructure***, should have created a knowledge base to spur innovations, investments and credit availability. This constitutes a very supportive element of policy with respect to building knowledge and innovation systems in Kenya.

1.4.2 Un-supportive aspects

1.4.2.1 Institutional set-up for management and scaling-up of S&WM knowledge in ECA - *with special reference to NARES*

Perhaps the most serious policy weaknesses are found at institutional levels. Examples are from National Agricultural Research Institutions (NARIs), universities, and data generation organizations. Below are findings from case studies conducted in Ethiopia, Kenya, Sudan and Tanzania (see SWMnet Discussion Paper 4):

i) Policy and strategy documents of government ministries and departments as well as those of organizations recognizes and put a lot of emphasis on ensuring that agricultural research results reach the farmer. However, most lack a comprehensive plan of action for managing knowledge, ensuring communication and uptake promotion, and effective scaling-up. Basically, the good will stated in policy documents has not been exploited and converted into action.

ii) Furthermore, government and intuitional plans for making knowledge and technologies available to uses is very limited as it is confined to the linear dissemination model of uni-directional dissemination of results from research to extension to farmers. In this model, researchers develop the technology, and extension agents disseminate it to farmers, often neglecting other key players in the agricultural sector such as input supply system that is very critical in technological up-take.

iii) Most research projects and programmes do not include promotion and uptake promotion plans because as noted above most research planners, managers and researchers in S&WM still favour the linear dissemination approach of reaching the farmers through extension services. In fact the survey findings show that many researchers believe that their role is to generate technologies and let the extension agents promote their uptake.

iv) Consequently, only a limited amount of time and budget are allocated to project activities concerning communication and uptake promotion of research results. Similarly, there was little emphasis on research outputs that include specific advice to farmers, input suppliers, extension service, policy makers and other clients. For this reason research results are rarely packaged for different clients, and most are normally presented in the form of technical reports and papers for scientific conferences and journals.

v) Moreover, most researchers are not adequately trained for communication and uptake promotion. The survey results show that more than 50% of researchers claim to have not been trained in communication and uptake promotion, and blame

this weakness for the little communication and uptake promotion currently being implemented. This was confirmed by the findings that programmes of universities and other agricultural colleges often do not cover communication and uptake promotion as part of curriculum.

vi) Most critically, project M&E does not include assessment of uptake, utilization and impact of knowledge and the developed technologies. Therefore, reward and incentive systems like salaries, promotion and prizes do not demand evidence of utilization and impact of the research conducted.

1.4.2.2 Existing barriers to effective management and scaling-up of S&WM knowledge in ECA

We again refer to the SWMnet Discussion Paper 4, to assess the main barriers limiting access and scaling-up of knowledge. These barriers are divided into three categories, with respect to those limiting promotion, uptake, and then those limiting utilization.

The main barriers limiting **promotion of uptake** are basically those given in the previous sub-section. These are mainly inappropriate and inefficient institutional arrangement, which limit **resources** in terms of human capacity and financial resources available to the researchers and their partners to seriously engage in uptake promotion.

The little that is promoted is not taken up to the full and the **barriers to uptake are**:

? Inadequate follow-up by researchers and extension officers (ranked number 1)
? Limited coverage by information and extension services (ranked number 2);
? Shortage of material inputs towards communication, demonstrations and pilots (ranked 3)
? Stakeholders, especially farmers not adequately empowerment to demand and ensure that available knowledge and information meet their needs (ranked 4); and
? High cost to benefit ration of the available technologies both in terms of financial and labour demand (ranked 5).

Finally, **barriers to extensive utilization**, according to policy makers and research managers include:

? Inadequate financing such as credit and other investment facilities to support smallholders who have very limited financial capita. This is in turn caused by poor access to profitable markets for excess produce resulting from using improved technologies;
? Poor integration and communication between different sectors at policy and business levels leading to poor synergy of different initiatives; and
? The sheer difficulty of reaching end-users in rural areas due to infrastructural constraints.

More detailed analysis is given in the individual country reports as well as the findings of the study conducted by RAIN with respect to ICT/ICM capacities in the context of agricultural research for development in eastern and central Africa.

1.5 Under-Utilized International Public Good Knowledge Bases

Since the Green Revolution in the early 1950s global, regional and national organizations have embarked on the development of public good knowledge and information systems to support development in general and land and water management in particular. These include methodologies and tools for the assessment of global, regional, national and sub-national land resources potentials and planning appropriate uses. This development has been boosted by the rapid improvement of computer tools for managing spatial data, including geographic information systems (GIS), remote sensing and global positioning systems (GPS). In the last few years, the availability of networked PC workstations, rapid application development and multimedia tools and the Internet have opened an era of new possibilities in the development and application of the knowledge bases for development. In this section we give a few examples of global databases with respect to soils and water management that are hardly put into use. For more discussion of the barriers to effective utilization of these global public good knowledge and information we refer you to SWMnet Discussion Paper No. 2.

1.5.1 WOCAT – (The World Overview of Conservation Techniques and Approaches)

This is a global system designed to facilitate the sharing of valuable knowledge in soil and water management, to assist experts in the search for appropriate knowledge, technologies and approaches. The system is also designed to support decision-making in the field and at the planning level. WOCAT was established as a global network of SWC specialists. It is organized as a consortium of national and international institutions and operates in a decentralized manner. (*Core members are CDE - Centre for Development and Environment, University of Bern; DLD- Department of Land Development, Ministry of Agriculture and Cooperatives, Thailand; FAO; ISRIC- International Soil Reference and Information Centre, The Netherlands; OSS - Observatoire du Sahara et du Sahel, Tunisia; and RELMA - Regional Land Management Unit, Kenya*)

A set of three comprehensive questionnaires and a suite of databases have been developed to document all relevant aspects of SWC technologies and approaches, including area coverage. These tools have been tested in many workshops worldwide, and they have been systematically optimized for five years through application in a context of international expertise. WOCAT results and outputs are accessible via the Internet, in the form of books and maps, or on CD-ROM. The WOCAT knowledge base is in the public domain, i.e. everyone is invited to share it and use it. The WOCAT network is open to all individuals and organizations with a mandate or

At the field level, SWC specialists work under very different biophysical, socio-economic and institutional conditions. They search for SWC technologies successfully practiced elsewhere under a set of similar conditions. Querying, the WOCAT Technology database, will return technologies that are most likely adaptable to their specific situation and needs. The query system provides access to SWC technologies at various points. The 27 search criteria (21 criteria in the www-version) comprise, for example, agro-ecology, climatic and slope conditions, degradation processes to be tackled, farming systems, cost and input levels. Thus, a choice can be made among relevant SWC options. Soil and Water Conservation Technologies data are gathered during WOCAT workshops by means of an approx. 50 pages questionnaire. These

data are then verified and entered into the WOCAT Technologies Database (MS-ACCESS version) and subsequently uploaded into Oracle via an automated procedure, thus becoming available in the www version. For more information visit the following sites:
www.wocat.net
http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGL/agll/wocat.htm

1.5.2 AQUASTAT - Information system on water in agriculture and rural development

In 1993, FAO initiated an activity to meet the considerable demand for data on rural water use from national governments and development agencies. This resulted in the AQUASTAT Programme, the objective of which is to generate data at country and sub-country level in a systematic and standard form. The programme currently contains data on Africa, the Near East, Former Soviet Union, Asia, and Latin America and the Caribbean. The system presents a description of the rural water situation in Africa, Near East, Former Soviet Union, Asia and Latin America and the Caribbean. The information is presented as regional surveys and country profiles in 5 FAO-publications containing charts, tables, graphs and maps. The database provides information on the state of water resources and use at global, regional and country level in relation to agriculture and food security and contains more than 100 variables on water resources, irrigation and drainage. For more details visit the following website:
URL: http://www.fao.org/ag/AGL/aglw/aquastat/aquastat.htm

1.5.3 SOTER – soils and terrain database

Soil information is needed for many purposes: policy, engineering, urban and rural development as well as agricultural science. Existing data are often not used to their full potential because of poor accessibility: traditional soil maps generally do not display the information that is required or it is presented in a format that cannot be used directly for a particular interpretation. This leads to a perceived absence of useful soil and terrain information. The Soil and Terrain database (SOTER) is a program for storing and handling natural resources data. It consists of a spatial and an attribute data component handled, respectively, by Geographic Information System and data management software. SOTER allows for easy retrieval and updating of the information, as well as for generation of different interpretations of the data in combination with other data layers. It is used at national level, with scales ranging from 1:250 00 to 1:1million and globally for the update of the Soil Map of the World at scale 1:5 million.

1.5.4 Discussion and SWMnet strategy

Result 4 of the SWMnet strategy is concerned with enhancing the brokering, sharing and utilization of knowledge, information and technologies across ECA. The guiding hypothesis is that increased synthesis of existing knowledge to produce and deliver practical advice and technologies, is the quickest way the NARES in sub-Saharan Africa can assist poor farmers, NGOs, planners and policy makers to overcome land and water constraints and effectively contribute to poverty reduction. Therefore, SWMnet will direct its efforts towards an intensive, systematic and detailed stock-taking of knowledge and experience at local, national and international levels. This exercise will include information mapping, sharing and exchange systems, encouraging co-operation and partnership at all levels, and building capacity for developing and using information systems (see the strategy document for more details). SWMnet will implement a programme designed to leverage more benefits for ECA from the past and

current investments in research by the CGIAR institutes, UN organizations such as FAO, World Bank and IFAD and other international organisations, increasing the returns on these investments. The programme will develop and implement a demand driven communication and knowledge sharing strategy that will increase the uptake, adaptation and effective utilisation of these, by policy makers, development agencies, extension services, trainers, researchers and ultimately users of land and water resources in ECA. The main outcome will be an accelerated improvement of access, promotion and utilization of existing and new knowledge and innovations by all stakeholders, leading to effective utilization by the poor farmers and relevant institutions. The main outputs will be:

i) A sound understanding by key target institutions in ECA of the overall portfolio of results and products from the work of target organizations (starting with CGIAR and FAO), which are relevant to the ECA sub-region, established.
ii) Knowledge, information and technologies in integrated management of soil, land and water, from the work of target organizations, promoted in the most relevant forms in ECA.
iii) Uptake pathways, and communication and knowledge sharing process for ensuring that research in INRM conducted at global scale can be effectively utilized at local levels in sub-Saharan Africa, elaborated and promoted. The aim is to produce lessons on how research by global institutions can effectively be promoted through regional networks for adoption by national and local institutions and individuals. This will constitute the research aspect of the project.

1.6 ToRs for Working Groups

The purpose of the working group exercise for this module is to enable the participant to**:**

i) Evaluate supportive and unsupportive elements from the global, regional, national and institutional policy documents with respect to knowledge management, sharing and scaling-up; and then
ii) Specify urgent actions to be taken by countries, organizations and individuals to improve the situation.

Each working group will be required to produce a concise report of no more than 5 pages in word and present a seminar to the rest of the PDC/TOT participants.

1.6.1 Lessons from global and regional policy

Review the sample documents on global and regional policies and from the information you learned from the lecture do the following:

i) Identify the most supportive and unsupportive elements with respect to knowledge management and scaling-up;
ii) Categorize the supportive and unsupportive elements into 3 or 4 groups each; and
iii) Compare findings with your own experience and draw lessons.

1.6.2 Lessons from national and institutional policy review

Review the sample documents on national and institutional policies and the two evaluation documents (from SWMnet and RAIN) and then do the following:

iv) Identify the most supportive and unsupportive elements with respect to knowledge management and scaling-up;
v) Categorize the supportive and unsupportive elements into 3 or 4 groups each; and
vi) Compare findings with your own experience and draw lessons.

1.6.3 What will you champion in your country and organization?

Propose an effective way or means of championing / advocating for change in the policies, attitudes and practices of leaders – so as to increase the profile of knowledge management and scaling-up within country and organization. This will be an input to working group's exercise under Module III. Furthermore make specific recommendations to ASARECA and SWMnet

1.6.4 What will you do differently yourself?

Here the group should identify actions that the participants can take themselves to lead by example.

2 MODULE II: DIFFERENT ASPECTS OF KNOWLEDGE MANAGEMENT AND THE SCIENCE OF SCALING-UP

[1 hour – Lecture; 4 hours – Group Work; 2 hours – Seminar] (Compiled by Newton Temu)

2.1 Objective of the Module

As stated in chapter 1, knowledge has become the major asset for development in the world today, and it is important that we in the ECA sub-region manage the available knowledge and ensure its wider utilization to support a vibrant innovation system. The management, sharing and scaling-up of knowledge is a science like any other science that studies the material world using human reason. Therefore, this module is designed to increase the understanding of participants on aspects related to the science of sharing, scaling-up and general management of knowledge. Various terminologies that one finds in the subject of knowledge management (KM) and in the science of scaling-up will be defined and elaborated with examples where applicable. It is expected that the participants will at the end of the course be able to make a clear account of the different stages in KM and define the common concepts in the science of scaling-up. They should also be in position to provide policy recommendations for overcoming existing weaknesses and mitigating effects of threats in the scaling-up of research outputs in soil and water management.

2.2 The Science of Managing and Scaling-up Knowledge

Knowledge management is a conscious strategy of getting the right knowledge to the right people at the right time and helping them to share and put it into action in ways that improve performance towards target objectives. In natural resources management, researchers will use their tacit knowledge to develop appropriate technologies for given communities. As a result of this the ability of an institution to create, store and apply knowledge in keeping up with the rapid science and technology changes in this 21st century is a critical success factor in its survival and growth. In this section we present the major components of knowledge products chain which consists of data/idea, information, knowledge, innovations (in terms of policy, technologies, practices), and finally action on the ground to generate wealth Figure 2.1 shows a schematic estimation of the proportion of data from research in soil and water management that ends up in facilitating actual action on the ground to create wealth.

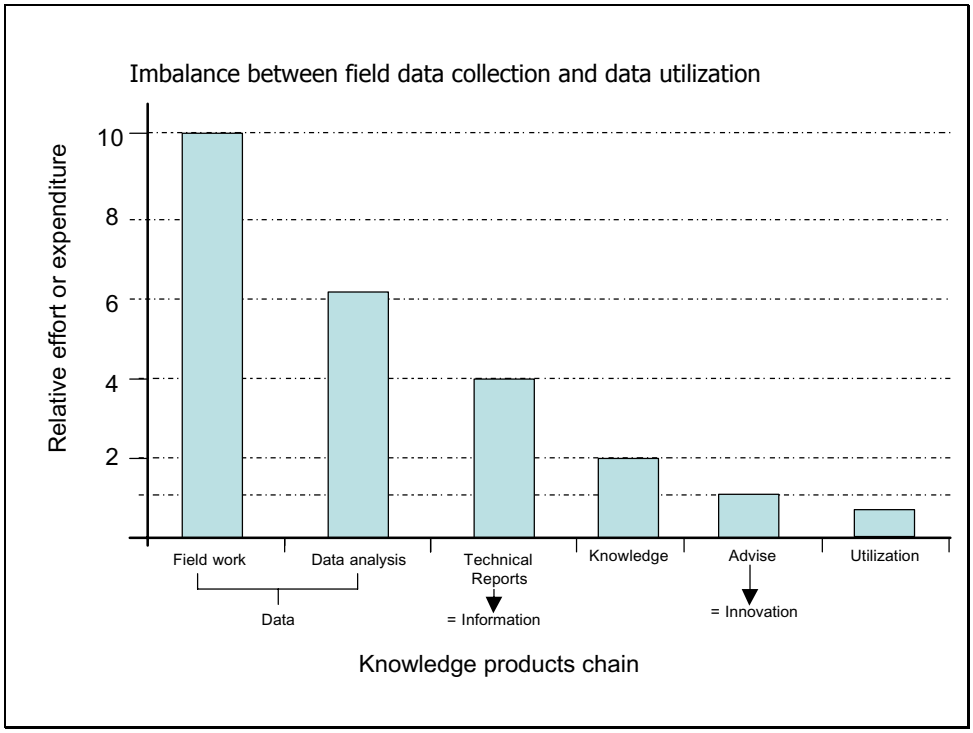

Figure 2.1: Proportion of data that translate into the other components of knowledge product chain

2.2.1 Data and data usage

Data is a collection or a representation of facts or concepts in an organized manner in order that it may be stored, communicated, interpreted, or processed by automated means. It is factual information that is used as a basis for reasoning, discussion, or calculation. All technologies are based on data or ideas. Data can exist in a variety of forms - as numbers or text on pieces of paper, as bits and bytes stored in electronic memory, or as facts stored in a person's mind. Data is the raw material for information and knowledge but on its own is of very little use. Refer to a paper by Peter Muraya in SWMnet Discussion Paper 2 (pages 50 – 50) on the usability of data. However, unless data is processed into information it is hardly of any use to anybody.

2.2.2 Information

Information is a term with many meanings depending on context, but is as a rule closely related to such concepts as meaning and instruction. Data on its own has no meaning, only when interpreted by some kind of data processing system does it take on meaning and become information. Information is data that has been processed in such a way that it can increase the knowledge of the person who receives it. What is one person's information can become another person's data. Information may reside in a variety of sources that include policy documents and strategies, research papers, books, journals, manuals etc. Information, like data can be encoded and therefore stored, processed and communicated to others via a variety of means.

2.3 Knowledge

Knowledge is the driving force of both proactive and reactive change. It is basically a combination of information and processes whereby the processes relate a vast array of information so as to promote a rational behavior and achieve desired goals. In other

words, it is the information that is processed in the minds of individuals through a process of deliberation, learning and thought. A person generates technical knowledge and it is a person who has it; and it will be a person who will try to understand it or decide not to understand it.

Knowledge contributes to the building of the value of the person, the researcher, in whom it is embodied. Without the conveyor belt of communication, information stays in the same place and does not add value. Managing the information is a science that should be seen as key part of the activities of research institutions within ECA as well as a precondition for accomplishing their goals of contributing to food security and poverty eradication in the region. There are basically two types of knowledge that are:

- Tacit knowledge – this is knowledge that is uncodifiable. It is unarticulated, rooted in action and experience and situated in context. Included here is the knowledge of a maize breeder, the training skills of a lecturer in Soil and Water Management and the convincing tactics of an Extension agent.
- Explicit knowledge – this is the knowledge that is codifiable. It is articulated in various forms that include spoken and written words, formulas, charts, drawings etc. However, only a small portion of what we know is explicit.

There are many Traditional Health Practitioners (THP) within the ECA region who are highly knowledgeable in the control of locally occurring diseases. Some of these cannot be cured through modern medicine. Despite their valuable intellectual asset the THP are faced with financial poverty to support sourcing for herbal materials, processing them, and packaging, storing, and patient follow-up. Many believe that their particular formulation, sometimes kept secret, would loose its effectiveness if it were revealed to anybody. Many times knowledge of such formulations dies with the death of such healers. Likewise there are many healers who reveal the knowledge of their particular healing technology only to their closest kith or kin. Despite their problems the THPs are not ready to share their knowledge with modern scientists who could assist in marketing their intellectual property. It is of course risky to reveal such knowledge to the modern health care system if one is not assured as to how his/her intellectual property will be protected. Their fear is valid because modern medical doctors and pharmacists may use their scientific knowledge to extract the “active ingredients” out of the delivered herbs and develop tablets, syrups or such other medicine that can be sold freely, hence forcing the THP out of business. It is only through conceited collaboration that THP will accept adopting scientific procedures for the conduct of modern medicine.

2.4 Innovations

Innovation is the ability and process of coupling knowledge, technical possibilities with opportunities, to create policies, strategies, technologies and practices. It is the fourth step in the knowledge products chain. This section discusses innovations with respect to technology. Technology is a form of application of knowledge or scientific advances to meet the goals, goods, and services desired by people. It is the technical means people use to improve their surroundings. It is also the knowledge of using tools and machines to do tasks efficiently. For the effective development and transfer of a given technology, tacit and explicit knowledge have to co-exist in a research institution. The higher the degree of tacit-ness of knowledge, the more difficult is its transfer to the end-users.

Agriculture is the original technology. It includes pesticides; disease diagnostics, chemical indicators and reagents; devices, farm tools and equipment; support systems;

and organizational and managerial systems to practical tasks. Adoption of agricultural techniques moved humans from societies of nomadic hunter/gatherers to geographically-stable sustainable communities. Civilizations and governments rest on their ability to feed their people. All other technology, culture, and human advance stand on the foundation of agricultural technology. Each new agricultural technology has advanced the ability of fewer farmers to feed more people. In a world where rapidly growing populations are putting greater demands on our available arable lands and our environment, improved agricultural technologies are critical for our future.

Changing technologies are nothing new to agriculture. Animal traction, plows, selective breeding, artificial insemination, vaccines, bio-pesticides, conservation tillage, antibiotics, computers; all of these technologies were once new and now seem "normal." Each new technology was introduced with its champions and its detractors. Sometimes new ideas never take hold and sometimes old technology is replaced. The market generally sorts out which technologies offer a competitive advantage and which do not. Research institutions within ECA have for example developed and released numerous crop varieties and other agro-technologies for yield enhancement and environmental improvement during the last century. For almost every technology the researchers also drew up a lot of recommendations for the end users. Although the end users have plenty of land, water, labour and human capital, the impact of the research recommendations have not been seen because the researchers did not consider the socio-economic and cultural situations of the farmers from the initial stages of conceiving the technology.

Of course no single technology is appropriate for every household. The issue for any single farmer is whether to adopt a new technology on his own farm. Agricultural production and productivity within the ECA is thus still low in spite of the many and commendable research products/technologies.

2.5 Knowledge Management Cycle

In order to get a grip of what knowledge management is all about, a lot of definitions have been proposed. However, the key components of KM are ideas, communication, sharing, collaborating, retrieving and learning. Protecting growing expertise, nurturing it, encouraging it and exposing that expertise to others who will benefit is the ultimate knowledge management activity. The objective of knowledge management is to leverage the transfer of knowledge within the institution and with its external customers and partners who may include farmers, NGO, Meteorological agencies, input suppliers and transporters. Consequently, the more knowledge an institution has in combining available resources to derive M&E services, the more profitable it becomes.

KM deals with the ongoing creation, discovery, learning, piloting, nurturing, sharing, evaluation, diffusion, teaching, implementation, redirecting, etc of knowledge in organisations and businesses in a systematic, purposeful, methodological, thoughtful and scientific way. All these activities revolve in a cycle of events that end up with the application or scaling up of the original idea that was acquired or created by the individual or institution. The six steps of the cycle are as shown in Figure 2.2 below.

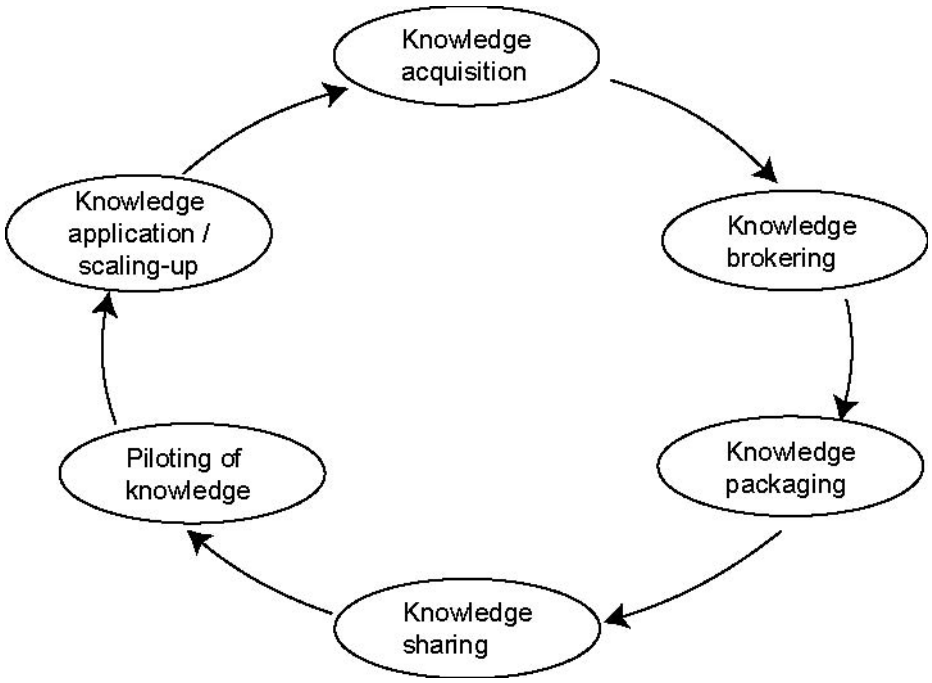

Figure 2.2: A knowledge management cycle

2.5.1 Acquisition

Data and information are generally passed between knowledgeable entities. Knowledge acquisition therefore refers to the elicitation (gathering, extraction, validation) of new information components or replacing existing ones to build qualitative models for decision support. There is usually no training or self-adaptive function here. Common examples are rule-based expert systems for helping with complex scheduling or configuration issues. Researchers within ECA countries acquire their knowledge through a variety of channels that include holding discussions with the potential end users, use of participatory approaches, competitive research grants such as the call for “Concept notes” by ASARECA, newspapers, and the Internet and research networks. The advantages and or disadvantages of each of these sources of depend on the interested researcher. Many researchers in Tanzania for example do not have access to the Internet because their working stations are located in remote areas where communication through Internet is still a dream. Others get hold of newspapers a week after they were published during which some advertisements are obsolete.

Within the scientific paradigm there is a tendency to assume that good science leads to new technologies that will be adopted because their benefits are self-evident. A researcher spends time; money and his/her brain to develop a product/innovation that she/he assumes the target group will adopt. The interest and wish of many researchers is to have their research products compete and win in the market. However, regardless of the approaches used to disseminate the researcher’s product, researches funding organisations, stakeholders, politicians and the community have become increasingly frustrated with the low level of adoption of scientifically proven innovations that “enhance the farmers system”.

Using the consumer behaviour theory[1], the key to understanding the adoption of new research products/technologies is the knowledge of the extent to which the anticipated benefits of a proposed technology are relevant to the needs of individual primary producers, the farmer. This means that the pattern of innovations will vary from innovation to innovation depending on the range of farm contexts within which the innovation can be successfully implemented. The low rate of many natural resource management innovations by farmers and other stakeholders suggests that many of these innovations do not generate benefits that are relevant to the needs of the end-users.

The biggest barrier to the adoption of reform efforts is the lack of obvious evidence that the change works. Broadly speaking, people react to new technology in one of four ways (see adoption circle). As an example, think about the adoption of a widely used technology, the tractor[2].

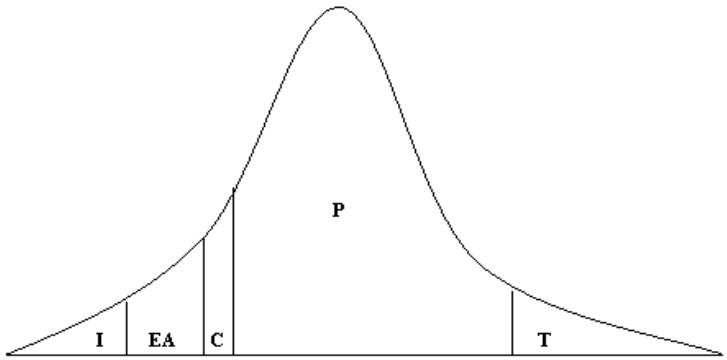

Figure 2.3: Technology adoption cycle

Innovators (I) - These are the people that actually develop the new technologies, or at least who are first to use it under practical conditions. They are the pioneers, and they take their lumps. Not only are they the ones that gain the first benefit of the new technology, but they also pay the price for working out the bugs and for trying things that simply don't work. With tractors, these innovators were the first to be able to plow vast acreages when compared with draft animals, but they were also the ones to deal with breakdowns, fuel costs, accidents, and in some cases imperfect engineering.
Early Adopters (EA) - These are the ones that reap the biggest benefit of the new technology. They watch the innovators until most of the problems are worked out, then take up the innovation and reap the gains in production and efficiency. These people were driving tractors while most were still using draft animals. They planted and harvested more acres more efficiently and reaped the added margins of profit. After all, they were producing their product in the new era, but still selling their product in a market where price was set by those still farming in the old era.
Mass Adopters (P) - Early majority pragmatists are the solid citizens who do not like to take the risks of pioneering, but are ready to see the advantages of tested technologies. They are the beginning of a mass market. It is the nature of competitive

[1] C. J. Linehan and G. Kaine – The key to reducing the gap between research and application
[2] John Fetrow 1995

free enterprise that the consumer benefits (cheaper, better quality food) while the producer must constantly improve to stay even. In most of today's agriculture, tractors are a fact of life. They are now such a widely used technology that they seem a normal cost of doing business.

Late (or Never) Adopters (T)
These either adopt a new technology late, or they never adopt it. Some farmers never adopt a technology because it is inappropriate for their operation. The Amish, for example, still compete within the context of their chosen life style without tractors. Others refuse to make the change or cannot do so. The latter ones compete in a larger market that uses the technology and often do so at a serious disadvantage. Most farms that did not switch from draft animals to tractors passed out of business.
It is good to remember that all households will not adopt every new technology and that there is no single technology that fits every household. Consequent to this farmers consider nine basic things/elements before deciding to adopt a new technology:

- **Efficacy:** Does the technology really work under conditions similar to what is faced on his/her farm? Ideally, this should include both well-controlled research studies and the evaluation of the idea under practical conditions.
- **Management:** Can he/she manage the new technology and the farm so that he/she can reap the benefits?
- **Learning:** What does he/she have to learn to take advantage of the new technology? Every new technique requires new skills, knowledge, and ways of thinking. Is he/she willing to do things and think in a new way?
- **Start up:** What are the start-up costs? What does he/she have to change in his/her current operation to get the benefit of the technology?
- **Phased start-up (Piloting):** Can he/she try the technology on a small scale at first, testing its value on his/her farm, or does he/she need to get in all the way at the beginning?
- **Labor:** What changes in labor will the new technology require, including employee training?
- **Capital:** What capital must one invest to make the changes in say the control of gully erosion?
- **Downside risk:** If it doesn't work, how much sunk cost is one risking? How risky is it for example that by adopting the application of sulphur dust on cashew trees (against powdery mildew) one will increase the acidity of soils in one's farm and hence reduce one's chances of planting a food crop within the rows?
- **Feelings:** What are his/her own psychological/ cultural feelings and beliefs about the technology? It is good to remember that sometimes the roadblocks to adopting a profitable technology are not the practical issues, but the emotional ones.

How potential consumer/farmer gains knowledge of the researcher's product and reacts to it determines whether she/he will move forward and purchase the product or service. There are three phases of how a technology is assimilated:

- Awareness – how a person learns of the existence of a given technology
- Engagement – how the individual initially reacts to the technology
- Activation – the individual's forward move towards the technology

Under normal circumstances an individual will not move through these stages in a linear or in an orderly manner. The adoption or rejection of any given technology is catalysed by two stimuli:

Manufactured catalysts: These include the features of the product/technology being marketed: the price of the product, the channels being used to market it; the promotion and branding.
Environmental catalysts: They include peer group influences; past applications and perceptions of similar technology – gained experiences; social interactions in the community of the end-user; demographic classes. These catalysts also determine the rate at which an individual will adopt the technology.

2.5.2 Brokering

Research is generally understood to be the systematic process for generating new knowledge and can act as a powerful tool for providing information for policy formation, market developments and other opportunities. The extent, to which such research is translated to policy action or market formation, however, is dependent on the success of communicating research outputs between the researcher, policy makers and marketing agents. .

An effective system should make use of “communication mediators” or “ Knowledge brokering thus links decision makers and researchers, facilitating their interaction so that they are able to better understand each other's goals and professional cultures, influence each other's work, forge new partnerships, and promote the use of research-based evidence in decision-making. In Tanzania the research system has in place a Zonal Research-Extension Liaison Officer (ZRELO) who plays the role of a broker by seeing to it that viable innovations from research institutions are taken on board by the farming communities through the government extension service which is currently under the Presidents Office, Regional Administration and Local Government Authority (PO-RALG). A well-trained information broker should assist in scaling up of innovations by providing a degree of assurance to the end users about the quality of the innovation. He/she should also widen the target audiences for research dissemination to consider full range of end-users of the information (i.e. government ministries, service delivery practitioners, law enforcement agents, NGOs academic audiences and the media). Such a broker should also be in position to advise the researcher/institution on appropriate packaging of the research outputs that consider the needs of different audiences (i.e. policy briefs, posters, leaflets, brochures etc).

A good broker is also the main generator of new knowledge for the researcher about the social, economic, cultural and environmental aspects of the technology end users. There is no harm in a researcher acting as broker for his/her own research outputs. By participating in agricultural shows and farmers field days a researcher could sell his/her innovations better than letting the information go via extension system. Knowledge brokering includes four main activities namely:

- Finding the right players to influence research use in decision-making
- Bringing these players together
- Creating and helping to sustain relationships among them
- Helping them to engage in collaborative problem solving

Knowledge brokering in this context is ultimately about increasing evidence-based decision-making in the organisation, management, and delivery of healthy services.

2.5.3 Packaging

Many institutions today have made tremendous investments in knowledge management systems. As they hasten to harness their intellectual capital however, many are acquiring knowledge management tools without giving enough thought to the quality and value of the content those tools are intended to carry. Packaging (filtering, editing and organizing pieces of knowledge) is an essential though frequently overlooked component of successful knowledge management investments. By packaging knowledge, research managers will ensure that it proves useful, provides value and encourages application of that knowledge to address business issues.

Knowledge packaging translates and structures information into usable knowledge. The packaging that most clearly communicates the content's worth might take the form of a memo, a paper, a presentation, hypertext media, a videotape, a course syllabus, a directory or an information map.
There are six steps in packaging knowledge:

- Identify general domains or specific topics and then finding the knowledge that fits those topics.
- Identify the targeted recipients for the knowledge and sort them into groups.
- Select the relevant information from the knowledge base (for example, reports, process diagrams) and tailor it for each segment
- Select one or more formats (paper, electronic, video, multimedia) for delivering the intellectual material. Reports and other paper documents offer portability and are the most familiar format for learning.
- Organise the contents
- Test the contents and make revision based on the reaction of a sample of end users. Multiply the revised version for end-users.

2.5.4 Sharing

Knowledge has value only when the owner can share it with another. Generally knowledge can be shared between individuals, within an institution or between institutions, regions and continents. Deciding to share requires commitment by the individual and the institution in general. A real commitment to sharing usually requires substantial changes in resource allocation and organisational procedures. Incentive structures by the institution can also significantly affect the pace at which knowledge is shared. An open sharing culture will promote the success of knowledge management programmes and incentives can help in turn to make this culture possible. An institution could make knowledge sharing an integral part of their formal personnel evaluation system to apparently good effects. Information can be shared through and with the use of the tools that are discussed in module 4.

2.5.5 Piloting

The long journey to enterprise enlightenment begins with deliberate steps. Modest breakthroughs in targeted pilot projects help to avoid stumbles and build momentum.
The pilot project is a critical step both in implementing a comprehensive KM strategy and in deploying a specific solution—but it is not the first step for either. Rather, it works best when preceded by careful analysis and consideration.
The pilot project should be a reflection of the overall approach in terms of methodologies and motivations. The last thing you want to do is choose technology products before settling on your KM goals.

The success of a pilot project depends on the effective participation of all individuals and organisations/stakeholders required to guarantee success.

2.5.6 Taking to scale

The higher one goes up the institutional level (vertical scaling-up) the greater the chances for horizontal spread; likewise as one spreads farther geographically (horizontal scaling-up), the more the chances of influencing those at the higher levels. For example once a research product has been piloted and found to be successful it can be advocated for a wider application within and even outside a given community, thus bringing more benefits, to more people, more quickly.

2.6 Scaling-up: turning innovations into wealth

2.6.1 The problem

As stated above, the NSRA has made clear that policy makers in Kenya are concerned with the lack of impact from research and other knowledge undertakings. Many proven results and technologies are achieving only a very limited adoption such that only 'islands of success' have been registered. Rogers (1995) observed that the existing de-link between knowledge and action, is a result of researchers limiting the communication of research results to scientific fora such as journal publications and scientific conferences. This approach limits the extent to which most decision makers and key players in the impact pathways are reached by the research knowledge. Furthermore, M&E interventions often fail to link project success to development outcomes and impact. The German Agency for Technical Cooperation (GTZ) among others has developed a conceptual framework for explaining the real and attribution gap that exists between research activities and utilization of research results (Figure 2.4) (Douthwaite *et al.*, 2003 and Kuby, 1999). The challenge to bridging the gap will require a very strong in-built ability of projects to effectively link outputs to purpose and to take actions that improve the linkage of the purpose to the goal.

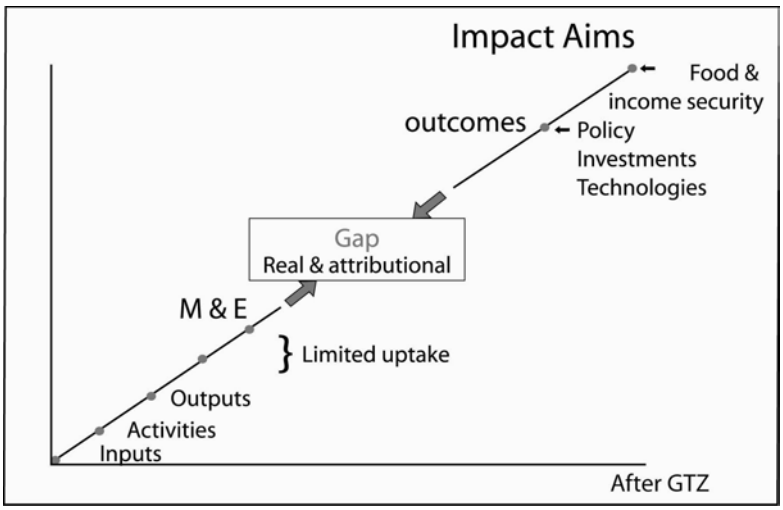

Figure 2.4: The impact gap as modified from a definition by GTZ (Kuby, 1999)

Literature available on linking research to impact suggests about nine aspects that the research systems must pay attention to (Harrington *et al*., 2001). These aspects are:

i) Early identification of the up-take, utilization and impact pathways.
ii) Critical analysis of the decision makers and actors along the pathway to impact.

iii) Elaboration of indicators on the basis of robust base-lines.
iv) Sensible use of participatory approaches to ensure that all stakeholders obtain information about and influence the research process and outcomes to maintain relevance and acceptability.
v) Avoiding the artificial division between research (science) – driven and user driven strategies, by taking a balanced view.
vi) Promotion of networking for knowledge and information sharing, and negotiation among stakeholders,
vii) Responding to existing policy while informing policy change and institutional development,
viii) Remaining problem focused rather than organization focused – to ensure that effective partnerships necessary to deliver the results are formed.
ix) Making sensible use of information management tools, including models and geographic information systems (GIS), to achieve an effective linkage between knowledge and local action.

The above nine “principles” show a clear need for researchers to get out of the narrow boxes defined by their organizational affiliation and adopt a problem focussed approach that brings the necessary stakeholders together to create “boundary organisations” (Clark *et al.*, 2004). These are “virtual” systems with an ability to focus on solving the problem at hand rather than defending or maintaining the status quo of certain institutions such as the artificial “division of labour” between research and extension. The consumer behaviour theory should also be used to build a better understanding of what drives adoption and how should these drive the research and scaling-up strategies (Linehan and Kaine, (n.d)).

2.6.2 Scaling-up and uptake promotion defined

There are many different ways of interpreting the term “scaling up”. Sometimes people talk of scaling when they refer to "Going to scale’ described as the process of setting a universal achievement goal. The term "scaling-up" was originally used to describe economic development in the third world countries that include the ECA region. We currently use the term to describe the adoption of a product or practice by an increased number of units, going from a smaller to a larger number. When applied to soil and water management in the rural areas of ECA scaling up has four major characteristics:

i) It has two elements: scaling up in space, which means increasing coverage; and scaling up in time, or making services more sustainable.

ii) It requires attention not just to the communities, but also to the enabling environment – the laws, policies, institutions and actors that support and build on the communities’ own capacities. Scaling up at the local or district level cannot happen in isolation. Efforts are also required at national level to support positive enabling environments, to influence and modify sector policies, legislation, regulations and to develop planning mechanisms in favour of this approach. Policy and strategy documents available in Institutions and Ministries within ECA address the issue soil and water management, and issues related to communication and uptake promotion of research results in a very scanty manner. The policy documents however, contain necessary good will that can be exploited to have the concerns in this study addressed. Political support to the scaling up process is vital and it is necessary to open a dialogue and identify influential “champions” who can push forwards the scaling up agenda.

iii) It necessitates moving from a *project*-based approach to one based on delivering long-term *services*. Such a move is costly but necessary. Financing is the greatest

challenge to scaling up efforts. Financial resources are needed to address several groups of costs which will require renewed efforts on the part of all actors. National governments must take a leading role in setting out realistic financing strategies for the rural sector that are based on transparent decisions about resource allocation, cost recovery, subsidies and social equity principles.

iv) It is based on a target of achieving 100% coverage with sustainable services in a defined geographic area. Planning for scaling up must start at a level above the community.

One problem with using this term to describe the expansion of agricultural research outputs is that the products and practices of interest are too complex and too inadequately defined to reduce to a single theory. In order to talk about scaling up research outputs, we need a better image of the products and practices we are talking about. One question that must be answered in defining scaling up has to do with focus: Are we attempting to get more farmers/extension workers/researchers/trainers to use existing outputs, or to learn more about how these outputs work? In its 2004/05 annual report the agronomy section of the Cashew Research Programme (CRP) in Tanzania observed that the extension service of the Southern zone has not disseminated the improved agronomic knowledge to villages not included in demonstration plots despite the fact that the CRP has been operating in their districts for the past four years. This calls for strengthening the linkage between research, extension and farmers with the District Authorities playing a leading role.

2.6.2.1 Types

A lot of institutions in East and Central Africa have for years considered scaling-up as an issue at the end of projects. For natural resources management, scaling up has entailed disseminating the findings of given research projects to a wider clientele primarily through documentary-based approaches. In view of this one can find a lot of recommendations that have been put forward by researchers in leaflets, brochures, workshop proceedings, journals and many other information media. Such information was arrived at after a series of well-funded, well managed and time consuming on-farm and on-station trials. Unfortunately only the researcher and possibly a few other people are aware of the value of this information. A lot of times however, the researcher does not put up a value for his/her findings because this is not evaluated by her/his employer. Not only this, but most of the information is neither stored in a manner that one can access it at and when needed, nor is it patented to the researcher's advantage.

In order to make a significant contribution to poverty reduction and the improvement of livelihoods in our communities these valuable technologies must be up-scaled from the libraries, office shelves and computers files to the target end-users for implementation. Up scaling or scaling-up is generally defined as an expansion that has a cumulative impact. With the example of figure 4, scaling-up can either be horizontal or vertical. Horizontal scaling-up is better known as scaling-out and is a geographical-based expansion where knowledge is spread to more people and communities within the same sector or community.

Vertical scaling-up is also referred to as *Scaling-up*. Through vertical scaling partnership linkages are built from the individual's farm and family up through the community and higher levels of the institutional infrastructure, thus permitting the participation of all key stakeholders at all appropriate levels. Vertical scaling is therefore an institutional-based expansion whereby other stakeholders and sectors are involved in the transfer of technologies. Scaling-up has the objective to lead to more

quality benefits to more people over a wider geographical area more quickly, more equitably and more lastingly. In the context of natural resources management, an innovation will be up-scaled from the collaborating farmer's plot to the village farms, community farms, etc.

2.6.2.2 Institutional scaling-up

Institutional scaling-up is perhaps the most important and is a process of influencing higher and higher level institutions as shown schematically in Figure 2.5. Institutional scaling-up is based on the recognition that actions are required from many institutions for effective adoption by target beneficiaries of any particular knowledge or technology. Scaling-up is where efforts are made to communicate and share knowledge with higher up institutions and bringing in other sectors including manufacturers, planners, policy makers and investors at community, local, national and global level. Uptake, acceptance and internalization at higher levels, increase the chance that these institutions will support and invest in horizontal spread (scaling-out). Scaling-up can also happen in a spatial dimension with respect to: (i) the expansion of the area covered by the project by spreading to more of the same categories of people or area (ii) the linkages of impacts to downstream areas especially in connection to watersheds. The second aspect is very important in integrated natural resources management (INRM).

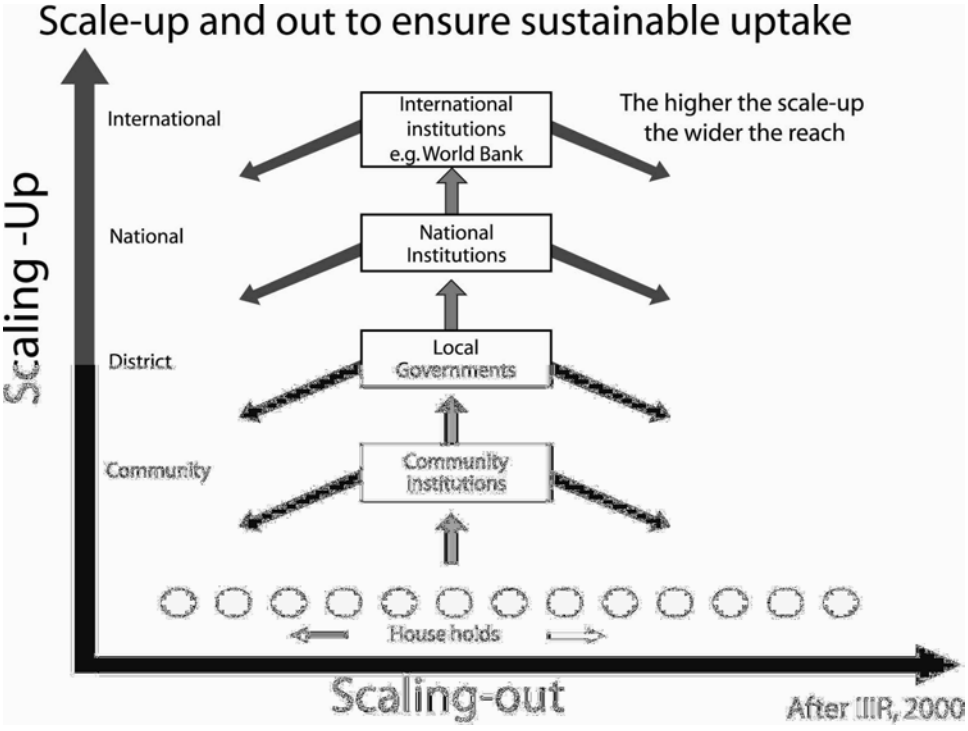

Figure 2.5: Institutional scaling-up as modified from IIRR, 2000

2.6.3 Facilitating and limiting factors for scaling-up

Within ECA, scaling-up of innovations in natural resources management can be facilitated or limited by the factors listed in table 1.

Table 2.1: Facilitating and limiting factors for scaling-up

Facilitating factors	Limiting factors
Peoples enthusiasm for change	Lack of knowledge to provide backstopping to the end users
An encouraging and motivating program	Absence of enabling policies
Correct diagnosis of farmers' problems and needs	Lack or limited access to credit for agricultural enterprises
Starting small and using local knowledge in the design of solutions	Poor and inadequate infrastructure – communication, transportation, logistics
Demonstrating easily recognisable results	Cultural, political and religious conflicts
Testing a wide range of management options with the target group	Lack of vision to move beyond where we currently are
Adequate funding	Limited institutional capacity to sustain scaling up
Clear government mandates that open room for NGOs and other partners to participate	Culture of not accepting change
Strong informal social organisations for local dynamics	Lack of knowledge for value addition on traditional products
Dissemination networks	High cost of resources involved in technical innovations
Good and effective working relations	

2.6.4 Principles and approaches to successful scaling-up

In natural resource management, scaling up of research innovations can successfully be undertaken when the researcher adheres to the following principles and strategies:

- Involve multiple stakeholders, coalitions and alliances. Identify your strategic partners such as the government and the extension service**.**
- Build consensus with the strategic partners
- Invest in networking with NGOs and other partners and maintain supportive role to the network.
- Understand the stakeholders' decision making regarding their adoption of improved technologies and where applicable match their needs with incentive and technology.
- Build capacity and knowledge sharing attitudes at all levels. Encourage farmers to transfer their knowledge to others.
- Influence policy reform by facilitating debate among policy makers and raising awareness about the potentials of the technology
- Facilitate sustainability by using opportunities to build upon the program
- Facilitate the development of accessible and viable markets for the research inputs and products
- Develop indicators and measures for success of up-scaled technology
- Create a sense of ownership of the technology at grassroots level
- Develop effective grassroots organisations
- Develop an element of accountability in every participant/group member
- Maintain good communication and friendly attitudes at all times
- Be dynamic and innovative by bringing new and relevant information
- Be reflective and encourage partners to also reflect on issues, problems and past events

2.6.5 Steps to scaling -up

Building social capital including empowerment of partners provides a foundation for effective scaling-up. Five steps are unique in scaling up of technologies.

- Empower the stakeholders through training and other approaches. Put the local knowledge and priorities of the community at the centre of discussion
- Specify problems and opportunities available in the community by identifying root causes and cause-effect relationship.
- Identify existing constraints – cultural, social, research, extension, training, policy aspects etc
- Analyse need and design action plans
- Evaluate progress and review from different partners' perspectives to redesign action plans

2.6.6 Role of NARS and associated systems in scaling-up

Nowadays, research is mainly supposed to solve the people's real problems. In other words, research is demand driven. The target group has the opportunity to assess its needs and priorities, whereby its local knowledge, practices and values are considered as inputs of the innovation development. The innovation process thus centres on mutual learning and problem solving between the target group and the technology developer/researcher.

As opposed to the demand driven research, supply-driven research assumes that the end-users or beneficiaries of a given technology are unable to generate the required change by themselves and that whatever is imparted on them, as technology will satisfy their needs. These assumptions undermine their ability to prioritise their needs and preferences.

A well-articulated research should therefore be interactive as indicated in the model given by Gundel *at al*.[3] Research institutions and researchers should change their mindset to accept other stakeholders in the initiation, development and management of research outputs.

In order for ECA countries to move with the world, human resource managers in ministries and organizations should ensure that researchers are trained in communication skills and that aspects of communication, knowledge sharing, multidisciplinary teamwork and uptake promotion issues are included in their performance criteria for promotions, prize awards, salary increments and other incentives. The researcher and project leaders on their side should ensure that appropriate plans and budgets are included for scaling up and uptake promotion of the outputs in all new projects and programmes.

Much as it was realised that lack of training is indeed a major barrier to effective communication and promotion of research results in ECA and much as knowledge is not static, curriculum developers at higher institutions of learning should review their curricula to include short-term in-service training courses and long term courses on communication skills and promotion of uptake of developed technologies.

[3] Sabine Gündel et al 2001- Scaling up strategies for research in NRM

2.7 Institutional capacity and partnerships necessary for KM cycle

Developing and nurturing human relationships is one of the key factors in the scaling-up process. The building of personal relationships should not be directed at the farmers alone, but also at the other institutional players. Community-based Organisations (CBOs) and Non-governmental Organisations (NGOs) are grassroots-based and could play important roles in facilitating the stakeholders.

Partnerships are fundamental requirements for effective scaling-up of innovations. They play a key role in KM based on the recognition that achieving sustainable development requires the collaborative efforts of a wide range of stakeholders, working together towards common, clearly defined goals. The CBOs and NGOs could for example encourage the community to form common interest groups on a wide range of topical areas to the advantage of the researcher.

In initiating partnership relations, it is important to reach consensus and gain commitment from the different stakeholders groups. Ways and means of ensuring commitment and accountability by all stakeholders include signing of a memorandum of agreement (MoA); commitment of one's own resources to share the costs involved; and regular communicating.

For the scaling up process to be effective, institutions must build the capacity to innovate so as to facilitate wider and local adaptation to changes. The institution need to develop a training program where learning is effective, efficient and expansive. The village setting is the best place to develop such a program.

2.8 ToR for Working Groups

The purpose of the working group exercise for this module is to enable the participant to **analyze** different stages of knowledge management and sharing and role of the research system:

i) For the various steps of the KM cycle, the group should undertake SWOT analysis of different categories of organisations (NARS, Univ., Extension, data institutions and NGOs) with respect to achieving each step.
ii) Provide policy recommendations for overcoming existing weaknesses and mitigating effects of threats.
iii) Articulate the role of the research system in overcoming the existing constraints and threats.

Each working group will be required to produce a concise report of no more than 5 pages in word and present a seminar to the rest of the PDC/TOT participants.

2.8.1 Lessons from the course materials and handouts

Review the sample documents on KM and scaling-up and from the information you learned from the lecture do the following:

i) Identify the most useful definitions and descriptions with respect to knowledge management and scaling-up;
ii) Describe how to link these definitions with the current knowledge, attitudes and practices of S&WM researchers, research mangers and policy makers; and
iii) Compare findings with your own experience and draw lessons.

2.8.2 What will you champion in your country and organization?

Propose an effective way or means of championing / advocating for change in the policies, attitudes and practices of leaders – so as to increase the profile of knowledge management and scaling-up within country and organization. This will be an input to working group's exercise under Module III. Furthermore make specific recommendations to ASARECA and SWMnet

2.8.3 What will you do differently yourself?

Here the group should identify actions that the participants can take themselves to lead by example.

3 MODULE III: Knowledge Management (KM) Strategy for Organizations and Projects Working on Soil and Water Management Research and Development

***[2 Hours Lecture; 4 Hours Working Groups; 4 Hours Seminar*] (Compiled by Nuhu Hatibu)**

The **objective** of this module is to build the capacity of the participant to develop a strategy for managing, sharing and scaling-up knowledge at institutional or project level. Most of the agricultural research systems in ECA and indeed the whole of sub-Saharan Africa are not putting the knowledge they generate or access, into good uses for the benefit of their stakeholders or even themselves. This is tragic in the current information and globalized age in which the finishing line of the development race keeps on moving further away. Knowledge has become an important asset such that modern empires are made of knowledge multinational companies such as Microsoft. How then can organizations such as the NARS to which knowledge is both the raw materials and products of their core business, continue to pay such a low attention to knowledge as an asset? It is time we woke up to the fact that knowledge is an asset of more importance than financial assets, and that it needs a strategy as well as adequate investment of time and resources to manage. In this chapter we discuss the elements the kind of strategy necessary for this task.

3.1 Institutionalization of the Knowledge Management

The first step towards a strategy is to institutionalize the concept. For this to happen, the institution must grasp the need for effective management of knowledge and hence the need for a strategy. Therefore, in this section we discuss[4] key reasons as to why organisations involved in the generation and promotion of knowledge for S&WM need a strategy to manage the knowledge it generates or acquires from its network of partners.

Access and use of knowledge is a key factor for an efficient innovation system that is currently being advocated under the Integrated Agricultural Research for Development (IAR4D). To implement successful innovation systems requires access to knowledge, information, ideas, technologies and experiences that can be combined into innovative products and processes. This means that more time is used to put knowledge to work to solve problems rather than to generate knowledge for its own sake. There is a strong justification for this in Africa which was by-passed by the “green revolution” and thus still marred with problems whose solutions other parts of the developing world implemented in the 1960s. The NARS should therefore increase their capacity to leverage more benefits for their stakeholders from the wealth of knowledge, information and technologies already available through robust knowledge management strategies.

To put knowledge into use, the NARS need to adopt what has been called “Re-use of knowledge” practice. This requires facilitating spatial and temporal transfer of inventions into new settings as well as rewarding scientists for utilization of knowledge to solve problems, and successive knowledge sharing. The knowledge management strategy of any organization, especially the agricultural research systems should therefore have the following elements:

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[4] *This discussion is based on “Using Knowledge Management to Drive Innovation Best-Practice Report” published by the American Productivity and Quality Center (APQC). (See http://www.apqc.org/portal/apqc/site)*

i) Its stakeholders and clients and potential sources of such knowledge require a good understanding of the knowledge.
ii) Robust plan for putting the necessary knowledge, information and technologies in the hands its clients in the most accessible form – this is what is called "communication and knowledge sharing strategy".
iii) Strong communities of practice (CoPs) to ensure intra-disciplinary knowledge sharing among professionals from within and outside the organization.
iv) Human resource practices, rewards and recognition systems that help knowledge sharing, promotion and utilization.
v) Continuous learning process to build both its own and client capacities to innovate and address problems. This includes building the ability of the organization to tap into its own diverse knowledge.
vi) Up-to-date ICT infrastructure and management structure which support, guides, and links all knowledge sources and centers.

3.2 Main Components of a Knowledge Management Strategy

- What do we want to see happen – Vision
- Understanding the demand and responding to it – defining the mission
- How important is KM for us? – Motivation
- Knowledge products – establishing a niche in responding to the demand
- Ensuring innovation in products and practices (critique of the current status)
- Intellectual property – valuation of the K.I.T produced, leveraged and held by the organization – and then deciding how to convert it into value.

3.3 Knowledge Management Strategy Formulation Process

A strategy is description of the chosen pathway for achieving as specified goal. It provides the vision, mission and objectives of an organization and specifies the key outputs to be delivered and the framework and means necessary to achieve the outputs.

This section describes the approach that can be followed to developing a strategy for managing and scaling-up knowledge and technologies. It focuses strongly on supporting the achievement of the overall goal of the organization, but it is driven by a bottom-up demand for knowledge by the stakeholders, clients and staff of the organization. Therefore, the overall strategy of the organization should be used to identify the focus of the knowledge management and scaling-up initiative, but without losing site of the demands. The formulation of a strategy for managing and scaling-up knowledge can be divided into four major steps:

i) Identify the knowledge needs of stakeholders, clients, staff and management, by:
   - Comprehensive and holistic needs analysis,
   - Reinforce the analysis with input from policy and strategic documents of governments etc.
ii) Based on the findings, evaluate different option for addressing the identified issues and needs.
iii) Identify and specify the strategic actions that fit with the demand and the organization set-up.
iv) Select suitable knowledge management techniques and approaches and then develop plan of action.

3.3.1 Needs assessment

The aim is to achieve interaction with agricultural sector stakeholders in the field, input suppliers and stockists or service providers, often very dispersed geographically, with limited communication channels. Typically, there are also few mechanisms for sharing information between staff working in different locations. The challenge is to ensure consistency, accuracy and repeatability. There is also the need for sound decision making and policy formulation. These decisions are enabled by accurate, complete and relevant information. Knowledge management can play a key role in supporting the information needs of management staff. It can also assist with the mentoring and coaching skills needed by modern managers. Therefore to assess the needs, one needs to:

(a) Raise awareness so as to obtain the commitment from senior leaders of the organisation with respect to the need for such a strategy and establishing a vision;
(b) Identify key players in the organisation and relevant partners and obtaining their commitments; and
(c) Work with the stakeholders of the organization to identify priority needs for knowledge, information and technologies – establishing the mission and purpose of KM.

3.3.2 Evaluate different options

This is achieved through a participatory process:

i) Determine and agree on processes and practices – linked to the mission and services of the organization.
ii) Determine the technology required and feasible to enable the implementation of the processes and practices. Recognizing that Information technology permits better information management and knowledge sharing.
iii) Identify human resources capacity requirement for the implementation of the processes and practices.

3.3.3 Implementation, indicators and impact assessment

Setting the M&E and impact assessment to enable the organisation to judge when it has succeeded (or failed) in effective management of knowledge, increased sharing and promotion of up-take of KIT.

3.4 Building a knowledge management community of practices and networking

Definition: A group of individuals with common understanding and commitment to a set of practices and values.

i) Structure, leadership and roles of different members
ii) Key to efficiency and success.
iii) How to develop a community of practices

3.5 Communication and Knowledge Sharing Planning at Project Level

We reproduce in the next 16 pages the NRSP guidelines on project communication plan guidelines

Insert pages 38 – 53 from here $$$

3.6 ToR for Working Groups

The purpose of the working group exercise for this module is to enable the participant to **develop knowledge management strategies for organizations and projects**:

One group will work on the KM strategy for ASARECA and three groups will works on one actual project each. More detailed ToR are provided separately

Each working group will be required to produce a concise report of no more than 5 pages in word and present a seminar to the rest of the PDC/TOT participants.

3.6.1 Lessons from the course materials and handouts

Each group will be required to draw lessons from the lecture and practical sessions and present these at the seminar.

3.6.2 What will you champion in your country and organization?

Propose an effective way or means of championing/advocating for strategies for KM at different organizations to ensure that all research projects have in-built communication and uptake promotion components.

3.6.3 What will you do differently yourself?

Here the group should identify actions that the participants can take themselves to lead by example.

4 MODULE IV: INTEGRATING BEST PRACTICES WITH BEST AVAILABLE TOOLS FOR EFFECTIVE SCALING-UP AND SCALING-OUT

[2 Hours Lecture; 4 Hours Working Groups; 4 Hours Seminar]

(Compiled by Abdel Hadi Mohamed)

The **objective** of this module is to strengthen the participant's capacity to select the most appropriate tools and activities, within their context that can effectively help meet the objectives of the communication strategy, dealt with in module III. The module will also provide the participants with vital information regarding the various options and tools for scaling-up and scaling-out with emphasis on the merits and limitations of each tool or activity.

4.1 Best Practices

It is important to explain the difference between tools and activities although they are sometimes used interchangeable. For simplicity, this module deals with tools as: those equipments, instruments or any piece of technology that is necessary or used in the performance of specific activity (e.g. Radio, TV, computer, video, etc). On the other hand, activities refer to any functions or actions that are performed by an individual or a group of people to achieve certain objectives (e.g. field day, tour, training or awareness raising etc). There are numerous communication tools and activities that can be used in scaling-up and scaling-out of research results. Generally, the following four main best practices may be followed to facilitate the decision on the selection of the most appropriate communication tool or activity[5].

4.1.1 Matching the communication products with target stakeholders

Knowing the perception and existing knowledge of the stakeholders or audience about the subject in question helps in selecting the appropriate communication products and activities. For example, it is importance to know the level of the stakeholders' knowledge of the topic in question, and their attitude to wards it. If their knowledge is low, and their attitude is also negative or neutral, an awareness raising activity may be the best choice. On the contrary if both the knowledge and the importance of the topic are high, then farmer-to-farmer extension or exchange visits maybe the best communication option, besides networks, workshops, participatory video and newsletters. Figure 4.1 provides a general guide in linking the stakeholders' knowledge and attitude with the relevant communication products.

[5] This discussion is partially based on a document funded by DFID "Improved communication strategies for renewable natural resource research outputs," published by the National Resources Institute.

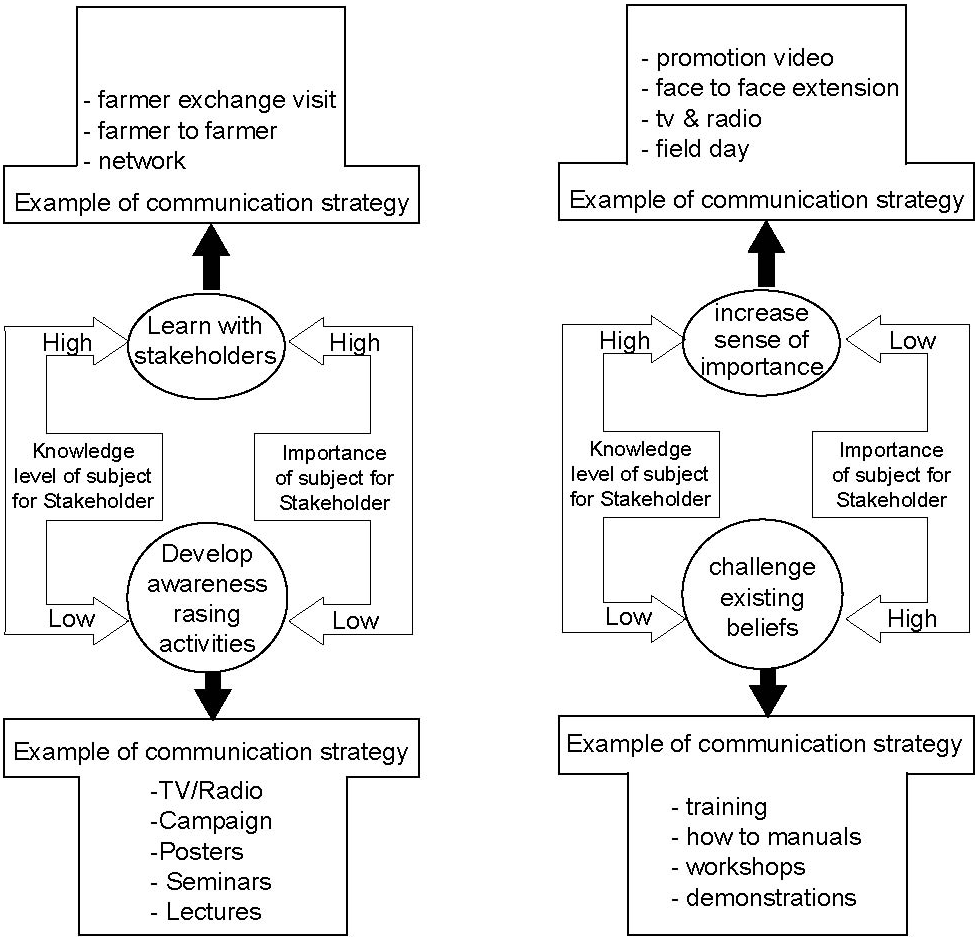


Figure 4.1: Sketch showing possible communication pathways as linked with stockholder's available knowledge and attitudes (Modified from "Improved communication strategies for renewable natural resource research outputs")

4.1.2 Ensuring availability of skilled manpower and adequate budget

Certain skills are needed to ensure that the communication strategy and product delivers the intended message. Training and capacity building aids in providing those skills but the points raised in **module III part 3.4.3** may be used as general guidelines towards developing some of the skills needed. It is also preferred that consultation with relevant media professionals at all stages of the product development should continue, to make sure that the end-product matches the purpose.

Regarding the budget, it is very difficult to set a rigid kind of budget at early stages of a project. However, it is recommended that about 8-15% of the total project budget with another provisional 10% be used for communication activities. It is important to provide room for revisiting and up-dating the budget for the communication plan throughout the project cycle. Although the project carried out in four of the ECA region revealed that most of the projects and program had not included budget allocation for communication activities, successful stories cited mainly belong to those programs and projects with allocated budget for communication.

4.1.3 Planning and pre-testing

It is vital to pre-test the intended product(s) with a representative sample of the target stakeholder. This allows and ensures that the intended product is acceptable, relevant useable and interesting. It also helps in removing some misunderstanding,

misinterpretation and minor production problems that arise during the process of editing and producing the product. For example a poster, a paper, a radio program, a video, etc, can be viewed by representative of the target stakeholder or even checked in a one-to-one interview before going into mass production.

4.1.4 Monitoring and evaluating the effectiveness of the communication strategy and activities

Without a baseline study before the implementation of a program or a project, it is very difficult to attribute the change in knowledge attitude and practices (KAP) to certain communication activity. The baseline may provide qualitative indicator for measuring or evaluating the communication activities. It also helps to numerically quantify the effectiveness of the communication activities when numerical indicators are identified at the start of the project. (Please refer to **module III part 3.4.5**.)

There are different ways of monitoring. Some these are direct consultation with stakeholders, questionnaires, interviews, audience ratings and diaries. The overall strategy of communication can be evaluated in association with intermediate and end users. The focus of the evaluation in this case may include the following:

- ✍ Evaluate the nature of the project that increases its chances of scaling-up e.g. demand-driven project
- ✍ Check whether the prepared communication strategy was implemented as planned and find out the reasons for any failure encountered at any stage during implementation.
- ✍ Check weather the target stakeholder were adequately identified and satisfactorily addressed
- ✍ Match and compare the communication skills available and used with the delivered purpose
- ✍ Check whether the budget was sufficient for the implementation of the communication strategy

4.2 Sharing of Knowledge Based on Tools and Products

The results of the scaling-up and uptake promotion of soil and water management research outputs in ECA have shown that there are certain emphases or preferential attitude of researchers towards certain dissemination tools and activities. Figures 4.2 and 4.3 show the most effective media used by researchers for dissemination of research results by percentage of use. There are numerous means and tools that can be utilized to achieve certain communication objectives of a communication strategy. Each tool and activity has its own advantages and limitations. The following may be taken as guidelines for some of the most known tools and activities with respect to their merits and shortcomings. Box 1 below gives definitions of different communication media.

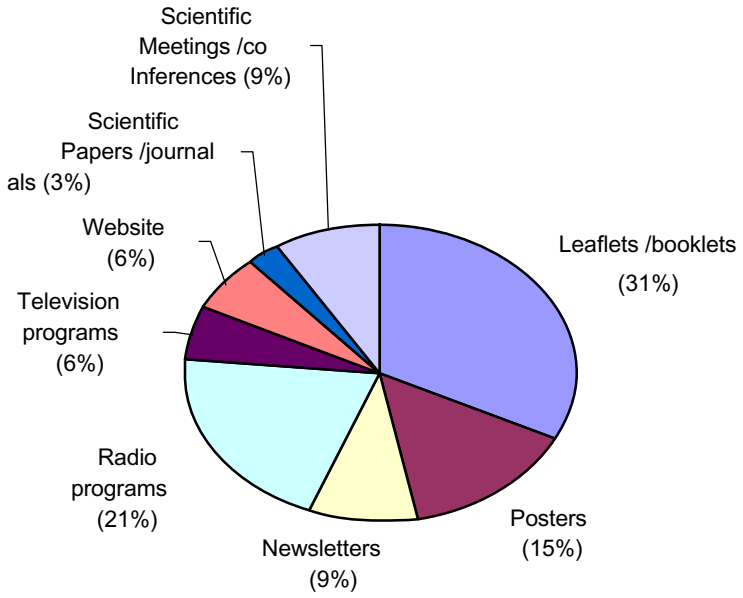


Figure 4.2: Most effective media for KSP promotion, Tanzania

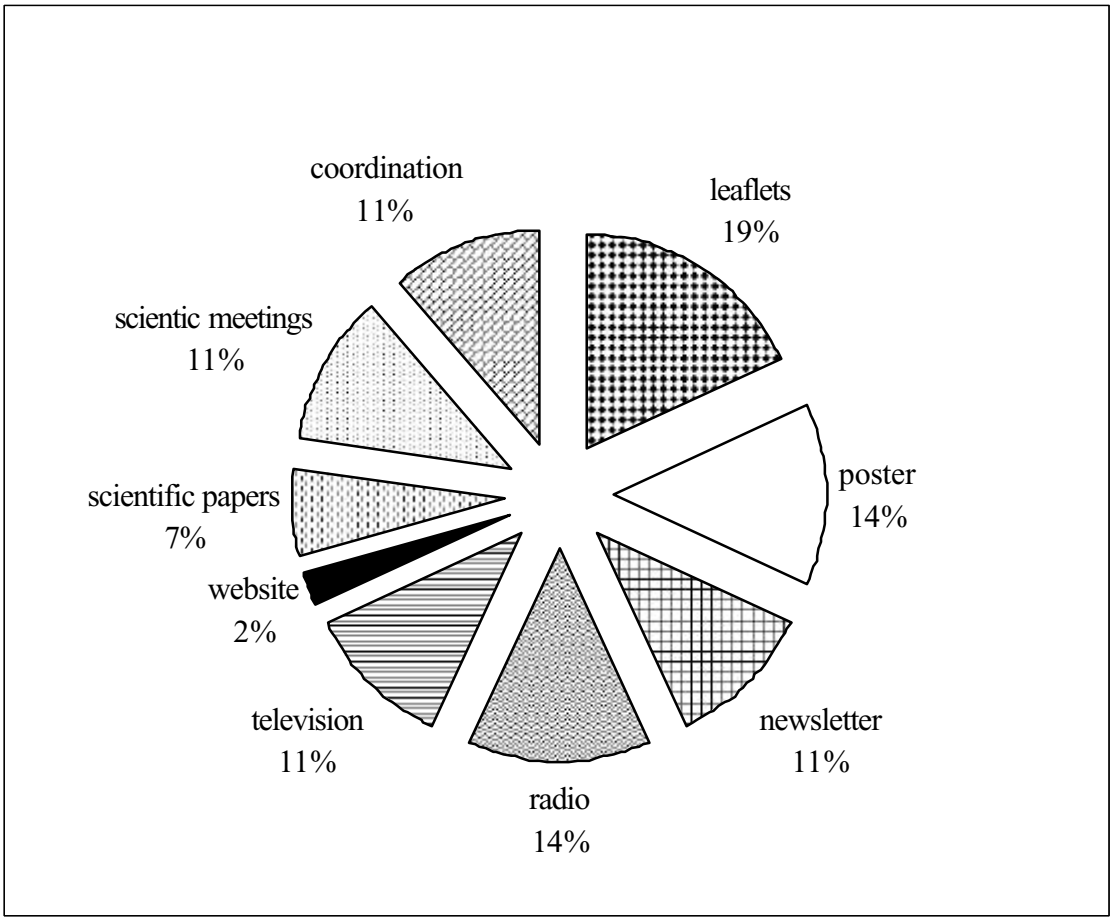


Figure 4.3: Most effective media for KSP promotion in Sudan

Box 4.1 Definitions of Communication Media

Media is classified as:
? Print media
? Electronic media
? Folk Media (Live media, and many other names…)

1. Print media includes:
   i. Newspapers
   ii. Journals
   iii. Magazines
   iv. Books and other publications
   v. Flyers
   vi. Poster
   vii. Brochures

2. Electronic media includes:
   i. Radio
   ii. TV
   iii. Videos Phones
   iv. The Internet (emails, Websites)

3. Folk Media includes:
   i. Drama
   ii. Poetry
   iii. Songs
   iv. All the genre called folklore

4. Other activities:
   i. Chief's barazas
   ii. Meetings
   iii. Community activities and events
   iv. Grapevine

4.2.1 Print media

In this context print media covers many products, e.g. books, booklets, posters, refereed and non-refereed papers, brochures, leaflets and newspapers. There are two main characteristics of print media: One is that it can be short-lived i.e. read and throw away. The other is that it can be used and re-used e.g. records, manuals and references for study or training. The following points should be considered when dealing with print media

i) Style, quality and format i.e. newspaper, comic, glossy, academic etc
ii) Education level of target stakeholders
iii) Costs of editors and graphic designers
iv) Expected extent of usages i.e. read and throw or permanent (use and re-use)
v) Possibility of pre-testing with a sample of stakeholders
vi) Further multiplication possibilities by end users

4.2.1.1 Main advantages of printed media

Advantages vary with the specific type of print media, but some general advantages are listed below:

i) Handy, and can be visited and re-visited by the target
ii) Can be used to address non-literate section if carefully designed
iii) Do not require special arrangements to use
iv) Constitutes wide range of options with respects to their numerous types, styles and formats
v) Can use different background materials such as paper, cloth and plastic
vi) Can attract wide range of readers
vii) Can be used to create awareness, increase value or warn and forbid certain practices e.g. posters and banners.

4.2.1.2 Main disadvantages of printed media

i) Subject to damage by adverse storage or weather conditions
ii) Difficult to store and preserve for long time
iii) Need special arrangements and extra cost for wide distribution
iv) They are impersonal and can be treated carelessly or ignored

4.2.2 Radio, TV and video

4.2.2.1 Radio

Radio has long been used as one of the most effective mass media to warn, encourage, teach, train, inform and entertain. There are certain points to consider before using radio as a communication tool

i) At least 30-40% of target stakeholders must have access and listen to radio
ii) Is it possible to reach target audiences in terms of time language and format?
iii) Willing to pay incurred cost of buying air time
iv) Willing to hire experts to transform the message into interesting program that can attract more audience
v) Can you provide support for enquires raised as a result of the broadcasted program?
vi) Can you afford to pre-test a sample program with small group or sample of target stakeholders?

Advantages

i) Can reach wide range of audience and can be listened to almost anywhere
ii) Can encourage community gathering in rural areas
iii) Can affect decision and policy makers
iv) Relatively cheap to produce and broadcast
v) Effective in rural and non-literate cultures
vi) Portable and can attract loyal audience
vii) It stimulates imagination and can be attractive

Disadvantages

i) Can be used as a background sound and hence ignored or becoming less memorable compared with visual media
ii) Requires batteries or electricity
iii) Requires skilled broadcaster, producer, etc

iv) Can be mistrusted

In spite of the disadvantages, the radio has been successfully utilized by certain projects, such as the radio soap opera developed by KARI, Kenya to keep cows worm-free. The impact was remarkable where about 6.5 million were estimated to regularly listen to this soap opera. Another example is the message that is broadcasted twice a week over 6 months in three languages by the Malawian Radio within the context of a project to control water hyacinth.

4.2.2.2 TV and Video

TV and video are gaining importance as the broadcast range is widening and the cost of equipment is decreasing in most countries. It is no longer strange to see satellite antennas protruding from simple roofs of rural areas.

Advantages

i) Memorable as it combines pictures and audio " seeing is better than hearing, seeing is believing"
ii) Can be used for training despite literacy level
iii) Can bring reality to audience
iv) Can document success stories, monitoring and evaluation of projects and programs
v) Programs can be recorded played back when desired or when the needs arisen
vi) TV programs can be used to promote live discussions if combined with telephone access
vii) Video can easily be used for recording and playback and multiplication of tapes

Some disadvantages of TV

i) TV program slots are expensive
ii) Requires time and preparation with specialized technicians i.e. cameramen, editors, broadcast engineers and directors.
iii) Still does not cover large portion of rural areas, cost of equipments is still high
iv) Competition with other entertainment programs is rising since the availability of free satellite channels is increasing

Some disadvantages of Video:

i) Needs spare parts and skills to maintain
ii) Needs stable electricity supply
iii) Cost of equipment including TV still high
iv) Skilled trainers needed to guide discussion that arise after video show

4.2.3 Other Electronic media

In this context, other electronic media comprises Web sites, e-mail, CD-ROMs, telephones and SMS services. Website can be used for conferencing, newsgroups, e-mails as well as for publicity and promotion. In addition it provides huge amount of information and countless number of online journals. CD-ROMs can provide a variety of information and training materials. Telephones and SMS services can provide short and vital communication of information.

Main advantages of electronic media

i) Can provide cheap conferencing via internet
ii) Provide huge amount of information with simple telephone line connection and a computer
iii) Access to different newsgroup and online communities of practice for knowledge sharing
iv) Provides opportunity for distance education, learning and training
v) Provides interaction with local, regional and global issues and linkages
vi) CD-ROMs provide large storage media for easy distribution and multiplication of electronic media (e.g. training courses, manuals, simulation programs, images, scientific papers, documents, books etc) **see module I part 1.2.2**
vii) Websites can encourage professional networking

Main disadvantages of electronic media

i) Requires costly equipments such as computer, printer, digital cameras, telephone and modem, prescription to service providers, CD-writers etc.
ii) Mostly inaccessible to the end-users of the natural resource research.
iii) Websites require skills and cost to update and maintain.
iv) Some of the services may require the availability of up-to-date software to run or view certain products e.g. online conferencing, PDF readers etc.

4.2.4 Live media

Live media such as drama and folklore songs, provides an option for communication of knowledge. The message can be delivered with participation from local community and children. Although it requires special skills from script writing to dialogue, act and direction, it can be presented in the form of tragedy, comedy or even a group coral. One of the main advantages of live media is that it can reach large numbers of people at community level or may even spread to wider audiences if combined with other media such as radio and TV. One of the main disadvantages is that it is not suitable to convey or transmit technical matters and may cause offence if used irrationally. Furthermore, it is difficult to justify funds for live media utilization and also difficult to monitor impact.

4.2.5 GIS and Models

GIS can be used in what is known as site similarity analysis. Identification and characterization of similar sites provides a good opportunity for scaling-out certain activities. The merits of the tool lie in its ability to cover large areas from local, national, regional to global levels. It can also be used to facilitate and select sites for study tours by linking similar activities with different group across the globe. GIS can also be associated with other process-based simulation models to quickly examine different scenarios. For example, GIS tools can be integrated with crop models e.g. residue retention model to examine the variation over space and time of retained crop residues with respect to conservation tillage practices. GIS-based application can also guide and point out opportunities for scaling-out at national, regional or international level. Its strength is associated with the fact that it can provide outputs that have specific interest to stakeholders. Its main shortcoming is the high basic cost of hard and software. The GIS output depends entirely on the quality of the used associated models and addition it requires specialists to implement. It is main application is directed towards decision support and development projects.

4.3 Sharing Based on Physical Sites and Activities

4.3.1 Demonstration and exchange visits

These cover a wide range of activities such as field days, study tours, demo-plots, exchange visits and piloting. It inspires or motivates stakeholders to take actions that may range from simply copying and applying certain ideas and solutions to introducing improved version of solutions for similar problem. It can also trigger demand for specific solutions. Some of these activities include:

i) Field days (farmer or researcher managed).
ii) Demonstrations (Researcher-to-farmer or farmer-to-farmer extension etc).
iii) Exchange visits and tours.
iv) Piloting

Physical demonstrations are regarded as some of the most common activities for scaling-up. They involve learning by seeing and/or doing and they increase the chances of wide adoption by seeing/doing and interacting directly on the spot. One of the main disadvantages of physical demonstrations is the high cost involved in terms of time and money. It requires good planning and mobilization of certain resources to provide positive participation of stakeholders or target group. The survey carried out in 4 ECA countries revealed that demonstration plots ranked 3rd in a scale of1 to 5 between dissemination pathways. In Sudan demo plots ranked 5th with on-farm trials and publication among 9 dissemination pathway activities and scaling-up. Study tours and field days provide effective means for scaling-up if properly funded and organized because there is a chance to bring all involved stakeholders to share and discuss the matter.

4.3.2 Meetings: from face-to-face meetings to congresses

Awareness raising activities are usually undertaken to:

i) Stop, reduce or limit certain bad practices e.g. stop removing land cover to combat soil erosion, desertification and desert encroachment
ii) Emphasize the need to change certain policies or attitudes e.g. activities carried out by SWMnet to change the mind-set of researchers with respect to linear extension model towards building a culture of scaling-up and scaling out of research results.
iii) Harness the way for policy and institutional changes necessary to activate the role of different stakeholders so as to improve the pro-poor farmer and induce sustainable management of NARS e.g. the activities carried out by SWMnet in training of trainers with respect to knowledge sharing, knowledge management and R4D projects.
iv) Encourage the adoption and utilization of certain successful practices and activities e.g. awareness raising about the merits of participatory water management techniques, adoption of improved varieties, use of organic fertilizers, application of water harvesting techniques etc.

Awareness raising activities can utilise most of the tools discussed above for application e.g. printed media, radio and TV etc. Some of the mentioned activities can be used merely for awareness raising e.g. field days, meetings, face-to-face communication, and round table meetings.

4.3.3 Training

Training is empowering people with suitable practices and knowledge to improve performance and to gain up-to-date experience by doing. Training is an on-going process that continues with daily activities (informal analogous to acquired experience). Formal training is the well defined structured activity with clear objectives to cover certain demand-driven needs.

Training activities are usually designed after a training need assessment is carried out to identify the target group or stakeholders and the gaps that need to be filled (**refer to module V**). Training of trainers or farmers can be used as an important activity in scaling-out process in the sense that trained farmers or researchers can train others and so on, thus adding to the horizontal expansion (scaling-out) of certain innovations. The main advantage of training is that it empowers learning by doing. The main disadvantage is that it requires mobilization of funds and resources hence added costs.

4.3.4 Networking

Networking is becoming an increasing activity for scaling-out knowledge. Networking can be electronic (e.g. via web sites that allows people to work together without being together) or non-electronic when people form a physical network and gather to do certain activities, they may use other tools such as print media (e.g. newsletters etc). The use of the Internet has increased the wider applications linking professionals across the globe. The main disadvantage of electronic networks is that it is still beyond the reach of the pro-poor, and even when it is available the contents in most cases may be regarded as too technical to suit the end-user needs at the farm level.

4.4 ToRs for Working Groups

Development of Communication, Up-take promotion and scaling-up plan for three projects coordinated by SWMnet

Purpose: To develop a workable knowledge sharing, up-take promotion and scaling-up for a typical 3-year research project in S&WM

Select one funded or on-going project involving one or more of the group members and follow the following steps:

See NRSP – 10 questions

5 MODULE V: TRAINING OTHERS TO CHAMPIONING KNOWLEDGE MANAGEMENT, SHARING AND SCALING UP

[2 hour – Lecture; 4 hours – Group Work; 2 hours – Seminar] (Compiled by IIRR)

Objective

By the end of the session, participants will:

- Be exposed to principles of adult learning
- Be able to explain the process of carrying out training needs assessment
- Develop a template and demonstrate an appropriate training design to meet a stated need

5.1 Principles of Adult Learning

Part of being an effective trainer involves understanding how adults learn best. Compared to children and teens, adults have special needs and requirements as learners.

Adult learning is a relatively new area of study. Malcom Knowles pioneered the field of adult learning and identified the following characteristics of adult learners

- Adults are *autonomous* and *self-directed.* They need to be free to direct themselves. Their teachers must actively involve adult participants in the learning process and serve as facilitators for them. Specifically, they must get participants' perspectives about what topics to cover and let them work on projects that reflect their interests. They should allow the participants to assume responsibility for presentations and group leadership. They have to be sure to act as facilitators, guiding participants to their own knowledge rather than supplying them with facts. Finally, they must show participants how the class will help them reach their goals (e.g., via a personal goals sheet).
- Adults have accumulated a foundation of *life experiences* and *knowledge* that may include work-related activities, family responsibilities, and previous education. They need to connect learning to this knowledge/experience base. To help them do so, they should draw out participants' experience and knowledge, which is relevant to the topic. They must relate theories and concepts to the participants and recognize the value of experience in learning.
- Adults are *goal-oriented*. Upon enrolling in a course, they usually know what goal they want to attain. They, therefore, appreciate an educational program that is organized and has clearly defined elements. Trainers must show participants how this class will help them attain their goals. This classification of goals and course objectives must be done early in the course.
- Adults are *relevancy-oriented*. They must see a reason for learning something. Learning has to be applicable to their work or other responsibilities to be of value to them. Therefore, trainers must identify objectives for adult participants before the course begins. This means, also, that theories and concepts must be related to a setting that the participants are familiar with. This need can be fulfilled, by letting participants choose projects that reflect their own interests.

- Adults are *practical*, focusing on the aspects of a lesson most useful to them in their work. They may not be interested in knowledge for its own sake. Trainers must tell participants explicitly how the lesson will be useful to them on the job.

As do all learners, adults need to be shown *respect*. Trainers must acknowledge the wealth of experiences that adult participants bring to the classroom. These adults should be treated as equals in experience and knowledge and allowed to voice their opinions freely in class.

5.1.1 Motivation and the adult learner

What motivates adult learners? Typical motivations include a requirement for competence or licensing, an expected (or realized) promotion, job enrichment, a need to maintain old skills or learn new ones, a need to adapt to job changes, or the need to learn in order to comply with company directives.
At least six factors serve as sources of motivation for adult learning.

- **Social relationships:** To make new friends, to meet a need for associations and friendships.
- **External expectations:** To comply with instructions from someone else; to fulfil the expectations or recommendations of someone with formal authority.
- **Social welfare:** To improve ability to serve mankind, prepare for service to the community, and improve ability to participate in community work.
- **Personal advancement:** To achieve higher status in a job, secure professional advancement, and stay abreast of competitors.
- **Escape/Stimulation:** To relieve boredom, provide a break in the routine of home or work, and provide a contrast to other exacting details of life.
- **Cognitive interest:** To learn for the sake of learning, seek knowledge for its own sake, and to satisfy an inquiring mind.

5.1.2 Barriers in adult learners

Unlike children and teenagers, adults have many responsibilities that they must balance against the demands of learning. These include lack of time, money, confidence, or interest, lack of information about opportunities to learn, scheduling problems, "red tape," and problems with child-care and transportation.

The best way to motivate adult learners is simply to *enhance* their reasons for enrolling and *decrease* the barriers. Trainers must learn why their trainees are enrolled - the motivators.

5.2 Learning Tips for Trainers

People learn at different speeds. Positive reinforcement and proper timing of the instruction by the trainer can enhance learning. Learning results from stimulation of the senses and in some people, one sense is used more than others to learn or recall information. Therefore, trainers should present materials that stimulate as many senses as possible. The most critical elements of learning that must be addressed to ensure that participants learn are: motivation; reinforcement; retention and transference.

5.2.1 Motivation

If the participant does not recognize the need for the information (or has been offended or intimidated), all of the trainer's effort to assist him/her to learn, will be in vain. The trainer must establish rapport with participants and prepare them for learning. This provides motivation. Trainers can motivate students by several ways:

- **Set a feeling or tone for the lesson.** Trainers should try to establish an open atmosphere friendly. Fro the learners.
- **Set an appropriate level of concern.** The level of tension must be adjusted to meet the level of importance of the objective. If the material has a high level of importance, a higher level of tension/stress should be established in the class. However, people learn best under low to moderate stress; if the stress is too high, it becomes a barrier to learning.
- **Set an appropriate level of difficulty.** The degree of difficulty should be set high enough to challenge participants but not so high that they become frustrated by information overload. The instruction should predict and reward participation, culminating in success.
- **Feedback**. Participants need to know hoe they are faring in their learning effort. This feedback must be specific.
- **Reward**. Participants must also see a *reward* for learning. The reward does not necessarily have to be monetary; it can be simply a demonstration of benefits to be realized from learning the material. The participant must also be **interested** in the subject. Interest is directly related to reward.

5.2.2 Reinforcement

Reinforcement is a very necessary part of the learning process. Through it, trainers encourage correct modes of behaviour and performance.

- *Positive reinforcement:* is normally used by trainers who are teaching participants new skills. As the name implies, positive reinforcement is "good" and reinforces "good" (or positive) behaviour.
- *Negative reinforcement:* is normally used by trainers who are facilitating the learning of a new skill or new information. It is useful in trying to change modes of behaviour. The result of negative reinforcement is *extinction,* that is, the trainer uses negative reinforcement until the "bad" behaviour disappears, or it becomes extinct.

Trainers who are trying to change behaviour (old practices) should apply both positive and negative reinforcement.

5.2.3 Retention

Participants must retain information from the session in order to benefit from the learning. The trainers' jobs are not finished until they have assisted the learner in retaining the information. In order for participants to retain the information taught, they must see a meaning or purpose for that information. They must also understand and be able to interpret and apply the information. This understanding includes their ability to assign the correct degree of importance to the material.

The amount of retention will be directly affected by the degree of original learning. Simply stated, if the participants did not learn the material well initially, they will not retain it well either.

Retention by the participants is directly affected by their amount of practice during the learning. Trainers should emphasize retention and application. After the students demonstrate correct (desired) performance, they should be urged to practice to maintain the desired performance. Distributed practice is similar in effect to intermittent reinforcement.

5.2.4 Transference

Transfer of learning is the result of training. It is the ability to use the information taught in the course but in a new setting. As with reinforcement, there are two types of transfer: *positive* and *negative*.

- Positive transference, like positive reinforcement, occurs when the participants use the behaviour taught in the course.
- Negative transference, again like negative reinforcement, occurs when the participants do not do what they are told not to do. This results in a positive (desired) outcome.

Transference is most likely to occur in the following situations:

- *Association*: Participants can associate the new information with something that they already know.
- *Similarity:* The information is similar to material that participants already know, that is, it revisits a logical framework or pattern.
- *Degree of original learning*: Participant's degree of original learning was high.
- Critical attribute element: The information learned contains elements that are extremely beneficial (critical) on the job.

5.3 Critical Steps of Designing and Developing Short Training Activities

5.3.1 The training design

A training design serves as the plan for implementation. It varies depending on the unit of implementation such as a program or project design, a training event or a training session design. The effectiveness of the training program is dependent on a thorough training needs analysis (TNA) and training needs assessment (TNA). The duration covered depends on the objectives, target audience and the budget.

Key components of a training design
A comprehensive training design covers the following areas.

- **Rationale:** This explains the reasoning behind the training design, and states the overall goal to be achieved by the training.

- **Participants**: This is a description of who the participants are and their background and expectations. It assists the trainer or trainer to remain focussed, and to tailor the design to the audience.

- **Objectives:** The objectives show the action that the participants will be able to perform after the training.

- **Topics/content:** This is a list of the topics and a description of the materials to be covered.

- **Methods/tools:** The selected methods, tools and training aids for each topic will be described to help the trainer.

- **Materials:** These are material to be used by the trainer and the participants. They include handouts, presentations, case studies, stories, TOR for group work and reference materials.

- **Operating details:**
    - Program schedule or timetable.
    - Budget/ course fees depending on type of course.
    - Monitoring and evaluation plan: It is recommended that:
        - A **pre-test** is performed at the beginning of the training to assess the confidence level of the participants. This forms the baseline for the training.
        - A **post- test** is performed at the end of the training, to assess the impact of the training. This serves to evaluate the training.

5.3.2 Basis of a training design

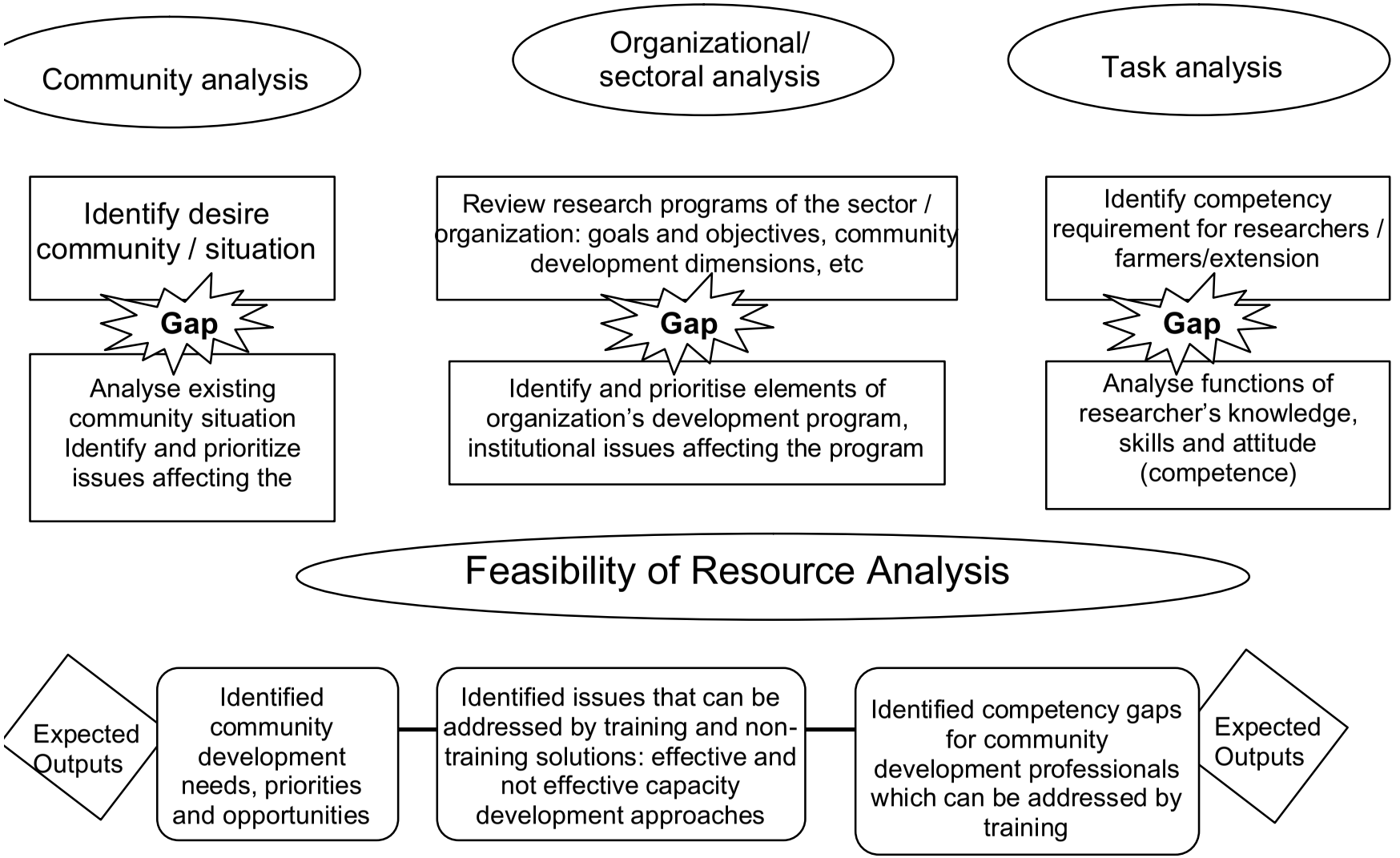
A training design may be initiated based on a survey carried out, known needs or upon request by interested parties. In order for the training needs to be validated, a training needs analysis and assessment have to be carried out. SWMnet has carried out such a survey in four countries, namely Tanzania, Sudan, Kenya and Ethiopia. One of the key findings of the report was that though research was now well ground in the region there was minimal knowledge sharing with the end users and scaling up of new technologies or knowledge.

Training needs analysis
This is the narrowing down process for investigating performance discrepancies. It studies the environment in which the performance is happening and how this environment is affecting the performance. The environment may refer to the community, farm situation, the institution or the sector and the individual. The purpose of this investigation is to isolate the cause of the discrepancies and identify the best means to overcome them

Training needs assessment

This is the process of identifying training intervention(s) that would address a performance problem(s). The framework for assessing training needs for development Is given below:

Framework for assessing training needs for development



From IIRR in-house training documents

Pre-requisites of a good Training needs assessment (TNA)

The following are other areas that should be clear.

- ✍ Know the subject/content area.
- ✍ Understand the role of the workers/ target audience through job analysis.
- ✍ Carry out critical task analysis for good performance.
- ✍ Type of program required (short or long term, new or improved, discussion forum, workshop etc).
- ✍ Clear objectives.
- ✍ Carry out an analysis of the performance or information gaps at community, institutional and sector levels.
- ✍ Identify the priority training areas.

5.3.3 Designing the training course

5.3.3.1 Designing a training course / module

The following steps are effective in developing a training design:

i. Training needs assessment of key stakeholders
ii. Identifying the specific training or capacity building interventions and the elements/components of the training design
iii. Writing or developing of the objectives.
iv. Selecting the most appropriate methods to be used.
v. Putting together a training design
vi. Visual aids preparation, posters and transparencies/flip charts or power point presentation
vii. Preparing for the presentation
    1. Actual presentation
viii. Evaluation of the training activity
ix. Post training support and evaluation of impact

5.3.3.2 Objective writing

The objectives assist the trainer to remain focused on the learning required and state what the participants will be able to do after the learning process. The objectives also inform the participants what to expect from the training. The objectives have to be SMART.

- ? S – Specific
- ? M – Measurable
- ? A – Achievable
- ? R – Realistic
- ? T – Time bound

A good objective should have three components:

- ? **Activity:** This component describes what the learner will do. It must contain an action verb such as explain, describe, demonstrate, list etc.

- **Condition:** This part describes the condition(s) under which the activity will be carried out.

- **Criterion/Performance Standard**: This part describes how well the learner must be able to do the activity.

Exercises

Let the participants analyse a set of objectives to see if they are SMART. This exercise may be done individually or in buzz groups of two people each.

Clear objectives form the basis of the content development and sequencing.

5.3.3.3 Logical sequencing of topics

The following are guidelines to help in planning for the training. They are based on the general principles of adult learning.

- Teach easier concepts first as these will form the foundation of building on new knowledge.
- Begin with what the participants already know.
- Provide easier sub-skills before practicing complex skills.
- Make the logical flow interesting and captivating.

There are different ways of varying the sequencing to create interest, based on the subject matter, level or participants and the duration. The approaches are listed below:

- General to specific or specific to general.
- For procedures, from the 1st step to the last or from the expected result backwards.
- Experiential activity before content presentation or vice versus. An experiential activity can be a very good introduction to a topic as it exploits the curiosity of the participants and gives a good opening point to delivery the information required.
- Beginning with the theory and then proceeding to a practice session. The alternative would be to begin with a practice session and then provide the theoretical information.

5.3.4 Components of a training session

A good training session has three parts:

- Introduction
- Body
- Conclusion/Summary

- **Introduction**

The introduction should create interest in the topic and should state the objectives clearly as this will be the standard against which evaluation will be done

It can be in different forms but should not take a long time. A good introduction is 3 – 10 minutes for a one-hour session

- **Body**

The body contains the bulk of the training and takes up most of the time allotted. The body presents the learner with materials and helps him/her to assimilate the new information, to understand the new technology and to test how it operates. This new knowledge must be supported with evidence.

- **Summary / conclusion**

This section mainly serves the purpose of crystallizing lessons learnt or main parts of the session. It is best achieved through asking questions to evaluate learning level or by application of new skills through an assignment.

5.4 Delivery Methods and Tools

The methods and tools used in training should vary to keep the trainees motivated and to involve them in the learning process. An important consideration is the context in which it is applied (the trainer, trainees, subject/objectives, training climate etc). The combination of various methods can either strengthen or weaken the learning process and need to be carefully thought out and planned. It is important to vary the learning techniques in each training session as this improves the potential impact of each individual technique such as from passive (lecture) to active (group discussion) to practical (presentation) or from lecture to practical session where participants try out new skills/knowledge and attitudes

There are many training methods that have proved to be valuable in training adults. Some of the most commonly used methods are:

- **Lectures:** This is a method whereby the trainer provides the knowledge in a given subject matter. It is appropriate for use in delivering new concepts and information, but it is not very interactive. A good trainer can make a lecture interesting by drawing on the experience of the participants and interjecting with some plenary discussions, case studies, personal experiences and some limited humour.
- **Buzz groups:** In this method, participants are asked to discuss a given topic in groups of two or three in a limited time. This method is good to introduce a new topic or to clarify new terms or definitions.
- **Group discussion**: This method involves more thorough discussions and takes a longer period. Participants are required to present their outputs in form of cards, flip charts, PowerPoint or written papers. A lot of deliberation and thought is required from the participants. It is a good example of a learner based training method.
- **Games:** As many games are available for use as the creativity of the trainer will allow. The games should be used with care to ensure that they are relevant and are not time wasters
- **Role-play.** This method is useful in practising new skills and attitudes as it allows participants to practise as well as observe their colleagues acting out a particular situation, skills and attitudes.
- **Demonstration.** This method is used to pass on new skills. The trainer or trainer performs a given skill(s) while the participants observe. The participants then repeat the performance and the trainer can observe and correct where necessary.

- **Reading assignment.** This method is learner directed and is useful when a lot of new knowledge needs to be passed to the participants.
- **Case study method:** Participants are presented with a documented practice or a situation and they are required to analyse it either individually or in groups
- **Panel discussion/debate:** In a debate, the participants are presented with a situation or some background information that they are required to debate on by taking two opposing sides to the issue. In a panel discussion, the participants discuss a contemporary issue by looking at it from different viewpoints.
- **Field visit:** A field visit is organized for the participants to go to the selected site to observe and interview the project staff/partners or beneficiaries. It is important that the host community is briefed well in advance on the mission of the learners and that the learners are very clear on the objectives of the visit. Clear outputs from the visit must be defined to ensure that it is not just another luxury excursion
- **Field day:** This is an important tool in dissemination of research findings or new knowledge and technology. For it to be successful, people need to be informed in good time and support should be given in the preparation of exhibits or displays

The specific method(s) to be used depend on the following factors or considerations:

- The objective(s) that need to be achieved.
- The training situation i.e. trainers, trainees (number and level) and training environment e.g. lecture hall, open field, radio etc.
- Efficiency – the available time and the cost in relation to the achievement of stated objectives.

5.4.1 Training skills

Training is defined as a process, whereby the trainer motivates and guides the trainee to discover and investigate new knowledge, attitudes and skills. Modern approaches advocate for learners to drive the learning process hence the need to use methods that promote this approach.

Training is different from teaching. In training, most of the learning is learner-centred, while in traditional teaching learning is trainer or teacher-centred.

Training aims to:

- Provide new knowledge.
- Encourage participation and sharing
- Give guidance.
- Create an environment in which participants can learn quickly.
- Helping the group to stay in focus and giving feedback.
- Assisting in solving problem or conflicting situations.

Training is preferred to teaching because it has the following advantages.

- It encourages maximum participation training. Participants are encouraged to share their experience, to react to new knowledge and to practice new skills and attitudes.
- Allows for critical thinking and group decision making
- Provides opportunity for participants to show and develop creativity
- It builds the confidence between the participants. Participants are encouraged to present the outputs of their individual or group effort.

? It emphasizes team effort. Both the trainer and the participants work as a team.

Training Techniques

i) Drawing Out / Evoking strategies

? Ask questions to provoke thoughts or discussion
? Giving meaning to what the participants are required to do
? Maintain the attention of the participants as you progress
? Maintain a good rapport by using humor, re-phrasing or re-wording concepts
? Clarify any conflicting information
? Observe time to ensure that the objectives are achieved in the given time

ii) Classifying Information

? Generate a good listing of the key points
? Ensure that the participants have understood each of the points by clarify and giving illustrations
? Arranging the points according to order

iii) Validating Learning/New Information

? Know the knowledge, Attitudes, and Practices (KAP) of the subject well to ensure that you provide value to the participants. However this should not be a draw back as you can use the participant's information as your resource base and coordinate the knowledge base.
? Ask for clarification from the participants or help modify wrong or inaccurate information

iv) Summarizing Sessions

? A simple summary that can easily be understood is one approach to concluding a session
? An Analogy that will drive the point home may also be used so long as it is relevant to the topic under discussion
? Any relationships that exist between the pieces of information needs to be linked
? Composing a whole picture out of the different parts or pieces of information
? Introducing new topic or giving an assignment is another proven strategy

5.4.2 Qualities of a good trainer

The proficiency of training skills comes with time and practice. The more one practices the more they improve on their effectiveness. A good trainer has the following qualities:

? Trusts other people and their abilities
? Respects others ideas and their experiences
? Has a good listening skill
? Has self-confidence but is humble
? Is interested in people and their personal development
? Friendly and sensitive

- Is flexible, dynamic and creative
- Is open to feedback
- Is alive, active and has a sense of humour
- Gets thing done, is organized and works well with a team
- Speaks clearly and uses simple words

Some useful Tips for trainers

- Grasp content well
- Be in control of the session
- Be open and flexible to adapt as the sessions progress
- Ensure learning. By the end of the session / module, the participants should be able to perform a new thing or do it differently
- Test new ideas/ approaches over time
- Motivate participants for active participation through involving them and complementing them for good work done
- Keep time at the beginning and the end and within the session. For example a good trainer should realize when the discussion has strayed, end it graciously and refocus on the topic of discussion or move on to a new area.
- Have artistic touch especially in the design of the module and in its presentation. Creativity is also required in the design of the material to be used.
- Be a good coach by assisting the participants to learn and practice new skills. A good trainer aims to make the participants even better than himself
- Learn how to complement participants for a good job done

5.4.3 Training tools

There is a wide array of equipment that can be used in training and facilitation. The specific tools used will depend on the topic of discussion, the method being used and the size of the group. The experience of the trainer will also count and time available for planning and deliver of the training.

- Overhead projector
- LCD projector and computer
- Case studies/photographs/posters
- Cards/balls/string/building blocks
- Video/DVD tapes and TV/Video
- Reference books/handouts
- Training manual for participants and for trainers
- Farmer learning sites

5.5 Organization and Logistics

The trainer or convener of the training needs to pay special attention to the logistical issues of the training as these make or break the training mood, environment and have an impact on the motivation of the participants. These include a range of issues such as:

- Booking a suitable training room/ area
- Identifying good facilitators/trainers

- ? Providing the training material/equipment and tools
- ? Housekeeping issues such as accommodation and meals, internet and telephone access
- ? Transport to and from venue/ to field or learning visit
- ? Preparation for the training / facilitation

5.6 Monitoring and Evaluation

The learning progress needs to be monitored as an ongoing process. This will allow for modification of the methods being used or the pace of the learning. A trainer should be willing to change as he moves along.

At the end of the session a more comprehensive evaluation will be done to summarize the feedback from the participants. Although it is not possible to modify the training at this point, the trainer may do some remote monitoring or support after the training. Alternatively the trainer will use the feedback to improve future modules.

Post training support and follow-up needs to continue to ensure that as much as possible the new knowledge, skills and practices are being utilized.

5.7 TOR for Group Work

The purpose of this group work session is to:

i) Build the capacity of the participants to develop training designs that will help to include knowledge management, sharing and scaling up as integral parts of research study and work.

ii) Select and use the most appropriate training methods, tools and materials given different target audience, time constraints and other variables.

Instructions

In groups 4-6 persons, design a template that will include knowledge management, sharing and scaling up components for the following target audience.
The following assignments can be given to different groups

1. Develop a two-day professional development course for practicing
2. Researchers
3. Develop an appropriate module(s) for a university course
4. Develop an appropriate module for a two-hour session with policy makers and decision makers in research institutes such as KARI, ILRI, ARTC, and NARS etc.
5. Develop an appropriate module for extension workers

Presentation format

- ✍ Explain how you will investigate the training needs. Highlight any assumptions made.
- ✍ State the objectives of the training clearly
- ✍ Identify the key topics to include

- ✍ Select the most appropriate methods, tools and materials to use
- ✍ Each group will have 15 – minutes to present their outputs.

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