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Implementation and Coordination of Agricultural Research and Training in the SADC Region (ICART)

# SADC Universities Networking Meeting in Soil and Water Management



21-24 June, 2009

Kunduchi Beach Hotel, Dar es Salaam

**MEETING REPORT**

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## ABBREVIATIONS AND ACRONYMS

BCA	Bunda College of Agriculture, University of Malawi
CAADP	Comprehensive African Agricultural Development Programme
DPs	Development Partners
ECSA	East Central and Southern Africa
EU	European Union
FARA	Forum for Agricultural Research in Africa
FANR	Food and Agriculture and Natural Resources Directorate of SADC
GTZ	German Technical Aid Agency
ICART	Implementation and Coordination of Agricultural Research and Training Programme of SADC
MDG	Millennium Development Goals
NEPAD	New Partnership for Africa's Development of the African Union
NORAD	Norwegian Agency for Development Cooperation
RUFORUM	Regional Universities Forum for Capacity Building in Agriculture
SACCAR	Southern Africa Centre for Cooperation in Agricultural Research
SADC	South African Development Community
SUA	Sokoine University of Agriculture
UNZA	University of Zambia
UZ	University of Zimbabwe

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# 1. BACKGROUND

## 1.1 INTRODUCTION

Land and Soil degradation is a key constraint to enhancing productivity in the Southern Africa region of Africa. This has been highlighted at various levels, including at continental level. The Forum on Agricultural Research for Africa (FARA, 2006) notes that unless current trends in land degradation are reversed, Africa will not be able to achieve targets agreed to under the Millennium Development Goals (MDGs). However, this requires generation and utilization of farmer friendly, practical technologies for soil and water management by researchers, both university and research on the African Continent.

There has been criticism leveled at institutions of higher education suggesting that they have remained 'ivory towers' unable to adequately respond to the needs of their clientele. A number of universities in Southern Africa (ECSA) have been conducting research and training for capacity building at postgraduate level in various agricultural disciplines including soil and water management for more than two decades. Research has been supported by various development partners (DPs) including through the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), the Rockefeller Foundation, SACCAR, GTZ and NORAD among others. Through these arrangements a critical cadre of problem solvers, more than 1000, has been trained at postgraduate level, and an equal number of theses and dissertations generated and several papers published in refereed journals and proceedings. These outputs involve technologies that have the potential to enable response to SADC priority constraints in the areas of soil and water management, in most cases developed in a participatory manner with stakeholder involvement by universities. A strong point for the universities research has always been their ability to tackle priority constraints not well addressed by national agricultural research institutes (NARIs). This flexibility inbuilt into university research has been an important character of university scientists and contributes towards national development.

Nonetheless, utilisation of the technologies produced by universities across the SADC sub-region remains limited with technologies being largely used at national level despite their potential for wide application across the region if made available. As a result, university contribution to national development remains invisible, underscoring the limited and inadequate funding available for university research. Reasons for the inadequate regional use of technologies developed are probably related to poor dissemination of outputs ('on-shelf technologies), poor linkages and networks across the sub-region and lack of mechanisms for ensuring articulation of demand and prioritization, and sharing of university outputs. Related to the research and development relevance are the training programmes being offered in the universities. Information on the programmes are often not widely disseminated/ advertised within the region due to inadequate dissemination pathways. As a result, resources within the region are not rationalized. Human resource capacity is spatially distributed in the region in such a way that some universities have expertise in particular areas, i.e. soil and water management, agronomy, plant pathology, breeding, socio-economics etc, while others are comparatively weak as a result of attrition from brain drain, retiring staff and other causes coupled with relatively low capacity building drives at postgraduate level in recent years. To eliminate the possibility of duplicating efforts within the SADC sub-region there is need to improve sharing of information amongst stakeholders. Such

information would enable rationalization of human resources within the region such that if deficiencies were identified at a specific institution, available resources in partner institutions could be mobilised.

In light of the above, six participating Universities from Southern Africa, namely; Africa University, Zimbabwe; Eduardo Mondlane University, Mozambique; Sokoine University of Agriculture, Tanzania; University of Malawi, Malawi; University of Zambia, Zambia; and University of Zimbabwe, Zimbabwe agreed on the need to organize a regional meeting in the area of soil and water to strengthen networking amongst themselves.

## 1.2 MEETING OBJECTIVES

The premise of the meeting was that networking and collaboration between the universities and other scientists, and stakeholders is likely to generate broader agenda for capacity building which can accelerate the formation of the needed critical mass for agriculture development of the SADC region, leading to high quality research outputs being utilized by stakeholders. Thus, the overall objective of the SADC networking meeting on soil and water management was to enhance networking amongst SADC universities in the area of soil and water management.

Specific objectives of the meeting were to:

- Share a regional database of existing university generated soil and water management technologies;
- Improve awareness of the existing soil and water management training programmes in SADC region;
- Provide opportunity for networking amongst universities in the SADC region;
- Identify gaps and future training needs/ and other opportunities for the SADC universities in the area of soil and water management.

## 1.3 APPROACH

In line with a proposal submitted to the SADC-FANR ICART programme entitled 'Increasing Access to University R&D: Strengthening university networking in soil-water management in the SADC region', a meeting was organised and held in the Kunduchi Beach Hotel 22-24 June, 2009. The meeting brought together .... university researchers from the eight countries involved in this initiative. The countries were Tanzania, Malawi, Zambia, Zimbabwe, Mozambique, Botswana, Lesotho and Swaziland. The representative from the Democratic Republic of Congo was not able to attend the meeting due to responsibilities at his duty station. The meeting programme involved both presentations and discussions, as well as group work to come up with



Figure 1: Nyambilila Amuri (Tanzania), Oagile Dikinya, Kulthoum Omari (Botswana) and Justice Nyamangara (Zimbabwe) outside Kunduchi Beach Hotel

meeting outputs. Prior to the meeting Universities compiled abstracts of MSc and PhD research in their respective countries for discussion in the meeting. The meeting was opened by the Project Coordinator, Prof. John Msaky, Head of Soil Science Department at Sokoine University of Agriculture. Opening remarks were also provided by Dr. Moses Osiru, on behalf of the Regional Coordinator of the RUFORUM Secretariat. Dr. Jane Alumira, delivered a speech on behalf of SADC-FANR ICART project. Subsequent to self introduction, country synthesis presentations on postgraduate research and training programmes being undertaken in each of the participating countries were received. Discussions were also held to identify gaps and future training needs/ and other opportunities for the SADC universities in the area of soil and water management.

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## 2. OPENING SESSIONS

### 2.1 WELCOME REMARKS BY THE PROJECT COORDINATOR, PROF. J. MSAKY, SOKOINE UNIVERSITY OF AGRICULTURE

The Project Coordinator and Head of Department of the Soil Science Department, Sokoine University of Agriculture, Dr. J. Msaky welcomed participants to the meeting. He thanked them for their time and commitment in attending the meeting. He requested participants to be very involved in meeting deliberations to ensure that outcomes of the meeting are useful for improving soil science research research and training outputs from the region.

### 2.2 ADDRESS BY THE RUFORUM REPRESENTATIVE, DR. MOSES OSIRU, RUFORUM

The Programme Manager for Networking, Advocacy and Grants, Dr. Moses Osiru, welcomed participants to the meeting and noted the value of having such an experienced group at the meeting. Moses Osiru thanked SADC for enabling universities to improve networking in soil and water management through this project and hoped that participants would make use of the opportunity accorded by SADC. He informed participants that the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) is a consortium of 25 universities in Eastern, Central and Southern Africa with mission to strengthen the capacities of universities to foster innovations responsive to demands of small-holder farmers through the training of high quality researchers, the output of impact-oriented research, and the maintenance of collaborative working relations among researchers, farmers, national agricultural research institutions, and governments. Dr. Osiru informed participants that RUFORUM achieves its mission by (1) focusing on capacity building for the agricultural sector through graduate training at M.Sc. and PhD levels; (2) focusing on promoting innovation and integration within universities to support training and research that is aligned with the emergent rural development strategy of 'Integrated

Agricultural Research for Development' (IAR4D) and (3) focusing on adding value to regional agricultural training and research through building, rationalizing and sharing capacities and resources. Its principle mechanisms are a Competitive Grants System with various funding windows, regional Ph.D programmes in the region and improving capacity for making better use of M&E, ICTs for improving quality of training. He requested participants to make best use of the GenStat Discovery Edition 3 distributed by RUFORUM to improve data management.

### 2.3 ADDRESS BY THE SADC REPRESENTATIVE, DR. JANE ALUMIRA, SADC-FANR

Dr. Alumira informed participants that the overall objective of the Implementation and coordination of agricultural research and training (ICART) project is to contribute to regional economic growth and poverty alleviation in the SADC region through innovative research and training activities for the improvement of smallholder livelihoods. ICART has a number of funding windows including the support to research networks. The focus of this window is to enable dissemination of available information previously generated and currently lying on shelf. The fund has been made available to overcome constraints to better information sharing such as inadequate incentives to publish/share, or lack of finances. She informed participants that to-date 11 projects have been funded including this one on soils and water networking amongst universities. However, she noted that funds are still available and participants were urged to submit further proposals that respond to the call areas which would be screened in October this year. She reminded participants that the projects must be regional in nature- that is involve at least three SADC countries.

### 2.4 PROJECT OBJECTIVES BY THE PROJECT COORDINATOR, PROF. J. MSAKY, SOKOINE UNIVERSITY OF AGRICULTURE

The meeting was reminded on the objectives of the Project and its rationale. The overall objective of the project is to enhance networking capacity of SADC universities in the area of soil and water management with specific objectives to review, compile and share a regional database of existing university generated soil and water management technologies; improve awareness of the existing soil and water management training programmes in SADC region; create/ strengthen platforms for networking amongst universities in the SADC region; and identify gaps and future training needs for the SADC universities in the area of soil and water management. He also reminded participants that the Project has promised to deliver the following outputs:

1. Regional database of existing university generated soil and water management technologies shared
2. Awareness of existing soil and water management training programmes
3. A platform for soil and water networking created
4. Gaps and future training needs for SADC universities in the area of soil and water management identified

As a result of the above outputs, the Project will result in strengthened research and training networks responding to SADC priorities; increased adoption of soil and water conservation best practices in the SADC regions; enhanced agricultural production in the SADC region; improved number of regional collaborative research and soil and water conservation projects and, increased visibility of Training institutions (universities) in the SADC region.

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## 3. MEETING OUTCOMES

### 3.1. IMPROVE AWARENESS OF THE EXISTING SOIL AND WATER MANAGEMENT TRAINING PROGRAMMES IN SADC REGION

The meeting discussions focused on postgraduate programmes in soil and water management. However, Participants appreciated the importance of undergraduate programs as the major input to the postgraduate studies, particularly with regards to strengthening postgraduate training inputs. An overview of the postgraduate training programs in various countries were presented by the representatives from six universities in SADC region (University of Botswana, University of Zimbabwe, University of Malawi Bunda Collage, University of Zambia, University of Swaziland, University of Zambia, and Sokoine University of Agriculture, Tanzania).



Figure 2: Meeting participants from Lesotho, Tanzania, and Swaziland listen attentively during the Meeting.

The presentations were informative and provided a good picture of status training in soil and water areas in the universities with varied duration from initiation ranging from 1978 to 2005. Participants agreed that the presentations helped to raise awareness on the existing and future training programs. However, it was apparent that the networking and sharing of information among Universities was lacking. In

view of that, participants realized that the SADC University networking project is an essential opportunity to facilitate networking in training in the area of soil and water.

#### 3.1.1 UNIVERSITY OF BOTSWANA:

The University of Botswana is currently running seven postgraduate courses from two institutions/ Departments of Environmental Science (DES) under Faculty of Science (MSc launched in 1995 and an Mphil/ Phd launched in 1998 and an MSc lauched in 2005 in the Botswana College of Agriculture by Department of Agricultural Engineering & Land Planning (AEL) under Faculty of Agriculture. The seven postgraduate courses are Soil Science and Land Evaluation (Under Review -Des); Hydrology and Water Resources (Under Review-Des); Soil Tillage and Traction; Soil and Water Conservation; Irrigation Systems Design; Land Drainage and Reclamation; and, Agricultural Water Management . The University offers short courses and regional short course supported by SADC/ EU.

In terms of teaching staff with various expertise:

1. Soil scientist specialised in use of GIS for soil and land evaluation.
2. Soil science with bias in soil physics/agrohydrology,
3. Hydrologist with focus on hydrologic and water resources systems modeling and planning
4. Specialists in conservation tillage and land degradation
5. Irrigation engineering expertise to solve problems on water management, irrigation and drainage

The MSc Programme consists of coursework and a dissertation on full-time basis over a period (2 years) of study and on a part-time basis normally 3 years of study. The MPhil/Ph.D programmes are offered primarily through supervised research over a period of 3 (Mphil) and 5 years (PhD) for full time students and a period not exceeding 8 years for part time students. Based on student's research proposal and recommendation of supervisor, the student may transfer from MPhil to Ph.D.

### 3.1.2 UNIVERSITY OF ZAMBIA

The University of Zambia, established in 1965, is the oldest of the three public universities in the country. The School of Agricultural Sciences was established in 1971 with five Departments including the Soil Science Department. There are Five Master of Science Programmes in the school. These are the Master of Science in Agronomy (Crop Science); Master of Sciences in Agronomy (Soil Science); Master of Science in Animal Science; Master of Science in Agricultural Economics (approved in 2007) and the Master of Science in Plant Breeding and Seed Systems. All are two year taught and Research Programmes. Students take five Courses per semester, therefore 10 courses in the first year also called Part I. Once they complete part I, Students proceed to Part II which is Research and Dissertation writing. Courses are arranged in such away that there are core courses which the student must take and elective courses from which they must choose to have the approved course load. All the Departments with Master of Science Programmes also have PhD Programmes, which are delivered by research only.

With regards to facilities, the School of Agricultural Sciences has;

1. Fully equipped Laboratories for research
2. A 10 hectare Field laboratory right in the school premises
3. The school has a 700 hectare University farm which apart from its commercial undertaking also accommodates student training and Research and Development (R&D)

The Soil Science Department fully equipped laboratories for staff and graduate students research with two green houses and one screen house. The Department provides Soil and Plant Analysis and Advisory Services for the farming community and is currently the AU-NEPAD Centre of Excellences for Sustainable Land and Water Management. It is also the Coordinating unit for SADC Land and Water Management

Programme. (For this an MOU was signed between The university of Zambia and SADC Secretariat). The Soil Science Department has conducted several Regional Training courses in Land and water management and has also;

1. Produced simple lime recommendations for small scale Producers
2. Established Land Use Suitability Maps for several locations in the country

### 3.1.3 EDUARDO MONDLANE UNIVERSITY

The Faculty of Agronomy & Forest Engineering at Eduardo Mondlane University runs soil science related courses out of three Departments of Plant Production; Forestry Engineering and Rural Engineering. Rural Development. Masters courses are offered in plant and animal production, forestry and the economy. The Grupo de Gestão de Recursos Naturais e Biodiversidade was created in 1966 to undertake Applied Research & Development; Training & Extension/Education and Consultancy services.

Human resource skills are available in the areas of Natural resources assessments & inventory (Soil, Water & Forest), Remote-sensing & GIS; Agro-economy; Agro-meteorology; Soil Conservation & Degradation; Hydrology; Irrigation & Drainage; Ecology; Post-harvesting Techniques; Gender; Participatory Methodology; and, Plant production; Plant Protection; Integrated Pest Management; Production Systems.

The University has the following facilities for undertaking soils research and has developed various land use and suitability maps for the country:

1. Soil Lab; Wood Technology Lab; Physiology Lab
2. GIS Lab; Computer Labs;
3. Experimental Station in Machipanda

### 3.1.4 UNIVERSITY OF SWAZILAND

The University of Swaziland has three campuses: the Kwaluseni Main campus houses Vice Chancellor and other senior managers of the Institution and 5 Faculties, Institute of Post-Graduate Studies and Institute of Distance Education. The Luyengo campus is where the Faculty of Agriculture is located. The third campus is Mbabane campus (Faculty of Health Sciences). The Mission of the Faculty of Agriculture is to pursue excellence in teaching, research, outreach and enterprise development in the discipline of agriculture and home economics in order to serve the needs of the Kingdom and beyond. There are seven Departments and soil Science is housed within the Crop science Department. A total of nine staff (2 Professors, 2 Senior Lecturers and 5 Lecturers) are in the Crop Science Department. The University boasts of the following facilities: teaching theatres, research laboratories, greenhouse and sheds, computer laboratory, library, departmental teaching and research farms, commercial farm, audio visual aids unit and the Malkerns research station, 4km from the faculty.

With effect from 2009/2010 academic year, credit hour system will be introduced into all Masters Degree Programmes and each student will be required to take and pass a minimum of 42-48 credit hours (of both core courses, electives and thesis work) in order to graduate. So Crop Science Degree programme is being revamped in line with the new recommendations. For the PhD, each student will be required to take and pass a minimum of 65 credit hours (of both core courses, electives and dissertation) thesis work). Core courses and electives constitute 35 credit hours. Crop Production

Department is now working on PhD degree curriculum in Agronomy for first intake in 2010/2011 academic year.

### 3.1.5 UNIVERSITY OF ZIMBABWE

The University of Zimbabwe has five on-going programmes as below:

1. Postgraduate Training in Soil and Water Management in Zimbabwe
2. MSc Soil and Environmental Management - University of Zimbabwe
3. MSc Water Resources Management – University of Zimbabwe (Waternet)
4. MPhil (research degree at masters level)
5. DPhil (research degree at PhD level)

Other postgraduate programs include:

1. MSc Tropical Resource Ecology – University of Zimbabwe
2. MSc Crop Production – Africa University
3. MSc Agronomy – University of Zimbabwe

### 3.1.6 SOKOINE UNIVERSITY OF AGRICULTURE

Since the initiation of postgraduate training in 1978 to date SUA produced 99 dissertation from the department of Soil Science, and 12 dissertation in the area of soil and water management from Faculty of Forestry and Nature Conservation. The trend of research area was similar to that of Zimbabwe, where most of the dissertations are in soil fertility, where approximately than 58% of Msc dissertations from DSS and FoFNC are in soil fertility.

Gender imbalanced was noted with fewer women (19) than men (80) at Msc level and the number of women decreased further in PhD (3 women versus 9 men). In the DSS most women dissertations were in soil fertility. However, a higher proportion of women with Msc came back for PhD studies at in DSS SUA (3 out of 12).

AT SUA each department have its own research priorities, yet sponsored played a big role in selection of students' choices of research topics.

### 3.1.7 PARTICIPANTS DISCUSSIONS ON AND ISSUES RELATED TO TRAINING PROGRAMMES

Participants noted the following issues are being pertinent to training programmes in the region;

- Courses offered in various universities in the area of soil and water are too traditional, and lack aspects of cross-cutting and contemporary issues such as marketing, entrepreneurship, communications, and climate change that would improve the overall quality of the graduates.
- The number of students enrolled and graduated in various soil and water training programs since programmes in the region were initiative, the capable capacity of institution to enroll students, and the gender distribution were also considered. It was noted that the catchment area for postgraduate programmes, which are the undergraduate degree programs are well in place in most of the universities in the region. The major problem is low number of students choosing in soil and water at various levels of BSc MSc and PhD. The problem is exacerbated by the unavailability of funding to support postgraduate training, as most governments provide limited allocation of their

budget support towards postgraduate training. Also mentioned was the issue of duration of the PhD programmes as related to employment. The issue highlighted was the difficulty of potential students to leave their jobs to undertake further training, in fear of losing their jobs.

- Gender issues were discussed in detail. All training programmes, with exception of the University of Botswana, in the region lacked gender balance, with fewer women than men in soil and water management programmes and strategies are required to promote the participation of women in soil and water management programmes. In most of the programs, women comprised less than 30%. Participants identified one way of increasing number of students, and especially women as to introduce more cross cutting courses, change course naming, and to undertake more outreach activities to potential students. Features of the courses to attract more students could include designing courses that addresses contemporary issues such as ecosystem approach, climate change, interface of science and humans as well as including soft skills eg communication. Members noted that the low preference for soil science courses could be due to the general low regards of agriculture courses, and soil science being probably the more 'agriculture' part of agriculture due to perceived regular contact with soils. Some solutions could be in the form of targeting students at lower levels below A level to ensure that they are more amenable to some of the programmes that are not patronized by more students; including second year students and increased outreach by the university in general. More women mentors and role models are essential.



**Figure 3:** Work in small groups required concentration and full participation

- Student exchanges were identified as important in strengthening research and training across the region. Participants identified lack of a mechanism to facilitate staff, student and other exchanges across universities. They however noted the need to harmonise various training components before this could be done. The credit transfer was identified as an important component. Thus, there was a need to understand and harmonise and document university curriculum in terms of courses weights (i.e. Credit hrs and units). A few examples of the definitions used were shared as summarized in Table 1. Participants noted that the universities differed on definitions of a credit hour. It was however proposed that the universities could benefit from other university programmes linked to regional initiatives such as Waternet.

**Table 1: Definitions of credit hours for selected SADC universities**

University	Lecture	Practical	Seminar
Sokoine University of Agriculture	30	60	60
University of Lesotho**	45	135	
University of Botswana	14	42	

\*A semester is approximately 16 weeks (examination weeks inclusive); \*\*Lecture is 3hr/wk and Practicals are 9 hrs/wk

- Members noted the language problems affecting particular universities- particularly the Portuguese and French Speaking Countries within SADC. This will affect exchange programmes and consideration must be put in place such as bridging courses amongst other mechanism to support them.
- It was suggested that universities inventorize equipment available in each institution, as well as human resource at technician level to operate the equipment. The inventory should also consider the condition of equipment, training needs, and cost of analyzing parameters. Due to the expensive nature of most of the equipment used, it will be important to use such a list to rationalize use of the more expensive equipment and take advantage of centers of leaderships.
- Soil Science Programmes must remain relevant to development processes through employment. In the past criticism has been leveled at Soil Science Programmes for being unpopular with both employers and students.
- Funding for soil science programmes remains a limitation. This issues is not limited to Soil Science Research and Training in Universities. The meeting noted that Universities should improve efficiency of programmes to ensure that a lower proportion is spent in administration. Regional bodies such as RUFORUM could play an important role in supporting universities to improve proportion of funds trickling down to programme implementation vis a vis administration.

### 3.2 SHARE A REGIONAL DATABASE OF EXISTING UNIVERSITY GENERATED SOIL AND WATER MANAGEMENT TECHNOLOGIES;

Participating countries presented compiled abstracts of findings in soil and water management generated from each represented university. The book of abstracts has been left separate from this document due to its size. However, summary issues are highlighted in this section:

In the University of Botswana, a total of 8 MSc and Phd degrees have been undertaken. The work is largely in the areas of environmental quality and soil fertility management and majority are supporting the training of women scientists (See Table). An interesting note is that the 2 male candidates are donor sponsored, while the female candidates are self sponsored. Among the three females, 3 are working as teaching assistants to fund their tuition, while two are full time staff at the University.

**Table 2. Dissertations by Area of Specialization and Gender**

Research area/interest	MSc	Mphil	PhD	Total
Environmental quality/soil pollution	F=1, M=1		F=1	3
Hydrology & Water resources		M=1		1
Soil fertility management	F=2		F=1	3
Land degradation/reclamation	F=1			1
<b>Total projects (8)</b>	5	1	2	8
Gender disaggregation F= 6 M=2				

From the University of Zimbabwe, the abstracts were grouped into broad subject areas. Majority of the training (18) candidates pursued MPhil degrees, while 2 pursued MSc degrees. 9 candidates pursued PhD degrees. Studies under soil degradation Studies focused on studying SOC under different land use and management (cropping, natural landscapes, and tillage) through simulation modeling – Century model, rainfall simulation and chronosequences. However, Critical levels of clay content determining these responses were not established. Soil water management/irrigation studies focused on tillage practices effects on water balance, use of wastewater and water management. Findings showed that crop water requirements for maize were highest during flowering; that mulch ripping (MR) and no-till tied ridging gave high soil water recharge (SWR) than CT of up to 24% and that MR had higher water use efficiency. However, possible nutrient leaching losses accompanying higher SWR not measured. In Soil Fertility Management, studies encompassed composting of waste, combined organic and inorganic fertilizers, screening of varieties for acid tolerance, nutrient losses. Findings showed that chicken blood mixed with maize stover at 10 and 30% maize stover increased N uptake to maize; household waste from peri-urban households increased N release but limitation was little waste produced, and mineralization was determined by C/N ratio; crop response to fertilizer application (organic and inorganic) was determined by farmer resource endowment, farmer management inducing soil variability and inherent soil variability; Response of maize and soyabean varieties to N and P fertilizers influenced by soil pH in varieties not acid tolerant and that N mineralization patterns of leaf pruning (biomass transfer) can be managed through their mixtures to enhance synchronization of N availability.

In Biological Nitrogen Fixation, studies involved characterisation of indigenous rhizobia and its survival after inoculation, while soil management focused on Post emergence tied ridging and multiple N fertilizer application according to season rainfall and yield potential was superior to conventional practice. Studies indicated that farmers did not like labour involved in using this technology and that seed priming was effective in mitigating crop establishment in deteriorating seedbeds (soil water and tilth). Other findings in other areas showed that;

1. Atrazine decomposition in soils decreased with increase in clay content (>10%) and OM low at low pH (4.0)
2. Optimum levels of atrazine application as determined by these parameters not determined

3. Pesticidal toxins from *Bacillus thuringiensis* decomposition in soils depends on clay contents, mineralogy, organic matter and sesquioxides
4. Could lead to accumulation and select for resistance

The impact of toxins under field conditions and on microbial diversity requires further study.

At the University of Swaziland, six abstracts were presented. The studies were in the areas of and were undertaken between 2003 and 2009. The University noted that few students are interested in doing research in soils and water at Msc levels, many students concentrate on crop science/agronomic research. Further, gender balance remains a problem with few women students pursuing soil science degrees beyond BSc level. In some cases, ladies preferred to study in South Africa, rather than in Swaziland.

1. Bambara groundnut on fallow and non-fallow land
2. Intercropping sugarcane with cereals and legumes
3. Intercropping of maize with bambara groundnut or groundnut
4. Evaluation of sweet sorghum as a source of biofuel for ethanol production
5. Controlling witchweed in maize field
6. Maize yield following sunnhemp as a green manure crop

**Table 3: Summary of Number of Abstracts for each broad subject area in each postgraduate degree**

Broad subject Area	Msc	MPhil	PhD
Soil degradation/deterioration	1	4	1
Soil water management/irrigation	0	1	3
Soil fertility Management	1	6	3
Biological Nitrogen Fixation	0	5	0
Soil management/conservation	0	2	0
Fate of agrochemicals in soils	0	0	2
	<b>2</b>	<b>18</b>	<b>9</b>

At Sokoine University of Agriculture in Tanzania, the presentations showed that a total of 99 MScs have been undertaken in Soil Science and Land Management. Majority (31.6%) were in the area of soil fertility, following by soil biology/ biochemistry, Soil Chemistry and environmental pollution (21.1, 15.8 and 15.8%, respectively).

**Table 4. MSc Dissertation and thesis by area of specialization and Gender since 1978 to 2008 at SUA**

S/N	Area of Specialization	Total no of Dissertations	Total no of Dissertations By Women	% Total Dissertation By Women	% Of Total
1	Soil Fertility	29	6	29.3	31.6
2	Soil Chemistry	24	3	24.2	15.8
3	Soil Biology/Biochemistry	8	4	8.1	21.1
4	Soil/Environmental Pollution	10	3	10.1	15.8
5	Soil Conservation/soil water	20	2	20.2	10.5
6	Pedology Soil Resource Inventory/Land Evaluation	8	1	8.1	5.2
	<b>TOTAL</b>	<b>99</b>	<b>19</b>	<b>100</b>	<b>100</b>

At Ph.D level, 12 degrees have been awarded between 1978 and 2008. The degrees are in similar areas as for the M.Sc. degrees including Soil Fertility, Soil Chemistry, Soil Erosion/ Conservation and Pedology.

**Table 5. Theses by Area of Specialization and Gender from 1978 to 2008**

S/n	Area of specialization	Total no of Theses	% of total	% of total dissertation by women	% of Total
1	Soil Fertility	7	58.4	3	100
2	Soil Chemistry	3	25.0	0	0
3	Soil Physics/Soil water	0	0.0	0	0
4	Environmental Pollution	0	0.0	0	0
5	Soil Biology	0	0.0	0	0
6	Soil Erosion/Conservation	1	8.3	0	0
7	Pedology/ Soil Resource Inventory/Land Evaluation	1	8.3	3	100
	<b>TOTAL</b>	<b>12</b>	<b>100</b>	<b>3</b>	<b>100</b>

In the Faculty of Forestry and Nature Conservation, 12 MSc's have graduated up until 2008, compared with 4 PhDs.

**Table 6. Theses by area of specialization since to 2008**

S/n	Area of specialization	Total no of Theses	Total no of Dissertations by women
1	Soil Fertility Management	2	0
2	Land Use	0	0
3	Agro-forestry	2	0
4	Soil Water Management	0	0
<b>TOTAL</b>		<b>4</b>	<b>0</b>

**During the ensuing discussions the following was highlighted:**

- Participants noted that Chicken manure uses in vegetable production need careful attention considering heavy metal (Cd, Fe, Cu) accumulation in the manure from chicken feeds. In most cases chicken feed have high concentration of heavy metals and increase the risk of heavy metal contamination in soils and food chain.
- Cautioned that when wastewater is used for vegetable production there is risk of contamination with cadmium which is a risk to human health. Such water should be used for cereal production rather than vegetable production.
- Recommended that soil scientist need to look at heavy metal contents in vegetables, rather than just yield to ensure food quality and improve human health
- Informed that there are other studies at the University of Botswana looking in heavy metals concentrations in both manure and vegetables.
- Noted that there is balance of dissertation/theses areas of soil and water science
- Soil fertility is an area where most students choose to do their research. The reason for this

### 3.3 PROVIDE OPPORTUNITY FOR NETWORKING AMONGST UNIVERSITIES IN THE SADC REGION;

The Networking meeting in soil and water management provided opportunity for stakeholders to network and share information beyond the training programmes. Partners shared other initiatives through various opportunities provided by the meeting organizers including within plenary, at side events and during health breaks. The meeting noted that in general, networking and knowledge sharing across programs and institutions in the area of soil and water management was limited. This constraint, like others, is characteristic of university programmes in general and not limited to soil and water management programmes. However, participants noted the benefits of participating in the networking project as an opportunity to increase knowledge sharing among universities in the SADC region. Some of the issues discussed are summarized below:

1. The meeting agreed on the need to have a more formalized platform, such as a professional societies for Southern Africa to enable increased and sustained networking to share research findings and research agendas in the areas of soil and water management.

2. Participants were informed that small societies are often difficult to run. Most societies in the region have failed due to poor payment of annual subscription and registration fees which in themselves are also not enough to run the societies/ associations. There is need to critically look at a strategy to put in place a platform for soil science networking in Southern Africa. It was suggested that if possible, there might be need to build on the existing national societies in the SADC member countries.

3. The meeting recognized the need to continue sharing research outputs from the region through international societies such as the European Society for Soil Science. This could be undertaken through presentations at annual events of the various societies.



**Figure 4:** Participants take a well earned break

4. Another option suggested was to hold discussion with the Soil Science Society for East Africa to explore avenues for a inclusion of members from Southern Africa. SSSEA is currently making attempts to involve members from Rwanda, Burundi, the Democratic Republic of Congo etc.

5. Participant requested RUFORUM to continue supporting members of soil science to regional and international events to increase visibility of the work being undertaken; In line with this, participants noted the need for improve writing skills to ensure more quality proposals are written.

6. Need to ensure that soil science research and training remains relevant. It was recommended that a mechanism be identified for ensuring relevance of universities to development processes. For this purpose two proposals on networking were identified and groups selected to champion the proposals.

7. General need to improve information dissemination and circulation. Many staff are unable to access available information in the current paradigm and miss opportunities because of this.

a. Increase circulation of calls to Staff;

b. Link various regional initiatives to ensure that information remains available to soil science scientists. It was agreed that RUFORUM should link with SADC and other initiatives to improve information availability. The universities themselves agreed to be more proactive at sharing information. All staff were requested to circulate contact lists;

- c. Universities were urged to improve their websites and make them more up to date and interactive;
- d. Cognizance should be taken of the various language barriers for some countries and steps should be taken to support those countries;
- e. Advertisement of programmes should be given a critical re-think. At the moment, circulation remains limited and information dissemination remains with a limited number of stakeholders.

### 3.4 GAPS AND FUTURE TRAINING NEEDS FOR SADC UNIVERSITIES IN THE AREA OF SOIL AND WATER MANAGEMENT IDENTIFIED

At the meeting, a round table discussion was held to identify some of the critical strength and weakness areas of the soil and water training programmes. Areas included capacity gaps and training needs of university researchers in the area of soil and water management. The session focused on the requirements of 21<sup>st</sup> Century soil science graduates. It was agreed that outputs of this activity should be submitted to RUFORUM and SADC and other platforms by way of this report to enable them mobilize support to enhance capacity for soils research in the region.

#### 3.4.1 STRENGTHS

The following strengths were identified:

1. University training and research often responds national and regional priorities as set by SADC eg Regional Indicative Strategic Program (RISP);
2. The research and training undertaken by universities over the last two to three decades indicate a preponderance towards soil fertility. This is in line with Government and regional priorities and based on stakeholder consultations;
3. There is available human resource capacity for undertaking soil fertility research;
4. There are a number of soil science programs are in place;
5. Regional initiatives and platforms exist that are willing to fund well-organised regionally based programs to increase number of experts within the field eg. Waternet. Further, there are efforts to strengthen such regional initiatives such as waternet, African Conservation Tillage Network, SWMnet;
6. Networking opportunities exist, e.g. through funded programs/ forums such as RUFORUM, SADC, ICART, FARA;
7. There are students interested in and willing to pursue postgraduate training within SADC region;

8. Political will exists;
9. Promoting networking in soil and water issues, a discipline specific versus integrated approach e.g. from production field to the market.

#### 3.4.2 WEAKNESSES

10. Basic research ( and 'blue skies research') is often neglected at the expense of applied research. Applied research offers quick rewards, but often does not allow for pursuit of strategic /long term goals. One of the reasons for this is the alignment of programmes to donor initiatives;
11. Limited awareness and sometimes a complete lack of awareness and knowledge sharing of research in progress/completed within and across regional institutions of higher education;
12. Despite agreement by African governments to allocate 10% of annual budgets to agriculture, few have reached this target. Even in cases where this is met, a very low proportion is allocated for university based research;
13. Institutions within the region have varied training curriculums and arrangements for undertaking training;
14. A high proportion of staff in many of the universities is ageing and there is need for a multi-pronged strategy aimed at both 1) retooling the senior staff to enable them facilitate change processes in institutions of higher education and 2) enhancing capacity building activities to make available a pool of young researchers to support future capacity building;
15. The following areas have poorly targeted across all regional programmes in the region:
  - Pedology
  - Soil biology
  - Soil Resource inventory
  - Soil classification
  - Land evaluation

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## 4. RECOMMENDATIONS AND WAYFORWARD

### 4.1 MEETING RECOMMENDATIONS

The meeting agreed on the following recommendations to strengthen soil and water management research in the SADC region;

1. There is need to promote or increase visibility of African scientists through promotion of research publications and other communication products to ensure dissemination of research and training outputs both within and outside the region;
2. An accessible database on on-going research and completed research within the regional institutions should be developed to increase awareness and knowledge sharing;
3. There is a need to consider networking in a more holistic approach encompassing the entire production to consumption chain from soils, crop improvements, markets and policies;
4. Deliberate efforts are required from each University to improve their visibility. Initially, university website should be made more accessible and other media forms should also be used for communication such as leaflets, magazines;
5. Deliberate university policies are required to ensure that research findings are made available to farmer in user friendly forms;
6. University staff, including administrative staff, require re-tooling. There is need to seek for funds from various sources, including SADC to support the capacity building of senior staff to improve the quality of graduate produced by SADC universities;
7. Considering changes in technology there is a need for acquisition of up-to-date equipments and rationalization of their use. This should be coupled with training of technicians to support their use. Sustainable sharing of equipment should be promoted such as through student and staff exchange and service provision;
8. Women should be promoted to participate in soil science research and training activities at all levels. Efforts should be made to empower women in undergraduate and postgraduate training through mentoring and recognition of gender roles in soil and water management training and research. Opportunities such as scholarships should be provided; and,
9. Universities should lobby governments to increase resource allocation to agricultural research, training, and development and specifically to support university research.

### 4.2 WAYFORWARD

The following actions were agreed to with regards to moving forward from the Soil and Water Management Meeting for Universities:

1. All draft proposal in response to the key areas identified in the meeting should be drafted and finalise. These should be immediately submitted to the Coordinator for submission to the SADC.
2. Participants should take note of the deadline dates for the African Crop Science Society Conference to be held in Cape Town, South Africa. Participants are encourage to busmite their abstracts directly to the Secretariat within these deadlines.
3. The meeting proceedings to be finalized and submitted to SADC by the Coordinator by 30<sup>th</sup> June, 2009;
4. The meeting proceedings should be sent out to all participants 28<sup>th</sup> June, 2009. Any comments from Participants should be registered to enable sending final report to SADC on 1<sup>st</sup> July, 2009, or earlier.
5. A Request be made to SADC to sponsor more individuals from this meeting to the ACSS meeting side event from funds saved from this activity;

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## 5. ANNEXES

### 5.1 ANNEX 1: LIST OF PARTICIPANTS

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## 5.2 ANNEX 2: MEETING PROGRAMME

Time	Activity	Remarks
<b>DAY 1: 22 JUNE, 2009</b>		
<b>CHAIRPERSON: PROF. NYAMANGARA</b>		
<b>08:30-09:00</b>	Registration	Secretariat
<b>09:00-09:15</b>	Welcome Address and Introductions	Coordinator
<b>09:15-09:45</b>	Meeting Objectives	
<b>09:45-09:55</b>	Address by RUFORUM Representative	
<b>10:00-10:10</b>	Address by SADC Representative	
<b>10:10-10:30</b>	Opening remarks by Project Coordinator	Coordinator
<b>10:30-11:00</b>	Health Break	
<b>11:00-13:00</b>	Presentation and discussions on Postgraduate training programmes in various countries <ol style="list-style-type: none"> <li>1. Botswana</li> <li>2. Malawi</li> <li>3. Zimbabwe</li> <li>4. Swaziland</li> <li>5. Zambia</li> <li>6. Uganda</li> <li>7. Kenya</li> <li>8. Tanzania</li> <li>9. Mozambique</li> <li>10. Lesotho</li> </ol>	Country representatives
<b>13:00-14:00</b>	Lunch	
<b>CHAIRPERSON: DR. MOTLATSI NICK MOKHUTHU</b>		
<b>14:00-14:30</b>	Discussion on training programmes	Facilitator
<b>14:30-15:30</b>	Research Agenda in the various countries to include funding, outputs and dissemination	Country representative, Facilitator
<b>15:30-16:00</b>	Health Break	
<b>16:00-17:00</b>	Discussion on the Research Agenda	Facilitator
<b>17:00-17:30</b>	Summary of the Day	

<b>DAY 2: 23 JUNE, 2009</b>		
<b>CHAIRPERSON: DR. GIDEON N. SHONGWE</b>		
<b>08:30-13:00</b>	Presentation on MSc and PhD abstracts from various countries  1. Botswana 2. Malawi 3. Zimbabwe 4. Swaziland 5. Zambia 6. Uganda 7. Kenya 8. Tanzania 9. Mozambique 10. Lesotho	Country Representatives and Facilitator
<b>13:00-14:00</b>	Lunch Break	
<b>CHAIRPERSON: DR. ISAIAH NYANGUMBO</b>		
<b>14:00-15:30</b>	Discussions	Facilitator
<b>15:30-16:00</b>	Health Break	
<b>16:00-17:30</b>	Group work: Way forward: Gaps, issues and possible entry points [Eol in writers workshops and facilitation of dissemination of research work]	Facilitator
<b>DAY 3: 24 JUNE, 2009</b>		
<b>CHAIRPERSON: PROF. GEORGE KANYAMA PHIRI</b>		
<b>08:30-09:00</b>	Review of papers to be presented at the South African Conference	Facilitator
<b>09:00-10:30</b>	Group Presentations	
<b>10:30-11:00</b>	Health Break	
<b>11:00-13:00</b>	Constructive criticism and tips and capacity building on proposal writing	Facilitator
<b>13:00-14:00</b>	Lunch	
<b>CHAIRPERSON: DR. MOSES OSIRU</b>		
<b>14:00-14:30</b>	Dissemination of information and research and development from universities: Improving networking	

	amongst Universities – practical issues	Facilitator
<b>14:30-15:30</b>	Networking in soil and water management: planning and sustainability issues- Biennial meeting - The way forward: Deadlines and responsibilities	RUFORUM
<b>15:30-16:00</b>	Health Break	
<b>16:00</b>	Closing remarks and Departures	JANE ALUMIRA

### 5.3 ANNEX 3: ABSTRACTS FROM THE SELECTED UNIVERSITIES (SEE SEPARATE ATTACHEMENT)