

Sustainable Development of Drylands
in Asia and the Middle East:
Jordan Component

Jordan Visit Report

November 6, 2005 to November 15, 2005

Report Number
2005-004

Prepared

By

Akrum H. Tamimi, Ph.D.
Assoc. Professor and Project Coordinator
IALC, Office of Arid Lands Studies
The University of Arizona
1955 E. Sixth St. (Bldg. 184)
Tucson, AZ 85719-5224

December 9, 2005

Table of Contents

Table of Contents.....	2
I. Introduction.....	3
II. Objectives of the Visit	3
III. Badia Research and Development Center.....	3
1) Wadi Mousa Awareness Center.....	3
IV. United States Agency for International Development, USAID.....	4
V. Wadi Mousa Landscape Master Plan and Interpretive Materials	5
VI. Biosolids Activities.....	5
1) Characterization of Biosolids Technical Report.....	5
2) Biosolids Reuse Application Study Phase II	5
3) Biosolids Reuse Application Study Phase III.....	6
4) The Study of Management Practices of Sludge and Biosolids in Jordan	6
5) Biosolids Risk Assessment and Standards Development Methods: A Workshop and Seminar	7
6) Modeling Biosolids Treatment in Jordan.....	9
VII. Conclusion and Recommendations.....	9
Appendix A	
Appendix B	

I. Introduction

United States Agency for International Development (USAID) witnessed a change in personnel. Mr. Ross Hagan was assigned to handle all activities of the International Arid Lands Consortium, IALC. Since Mr. Hagan was not aware of the Sustainable Development of Dry Lands Project activities, Dr. Tamimi suggested that he visit him with BRDC at his office and make presentations to him to bring him up to speed on the projects activities in Jordan.

Dr. Tamimi visited Jordan between November 6 and November 15, 2005 and accomplished that objective. He and Dr. Saad Al-Ayyash from BRDC spent more than 4.5 hours with Mr. Hagan and answered all questions and concerns brought up by Mr. Hagan.

In addition to that task, Dr. Tamimi visited with the Jordanian partners and discussed on-going activities and suggested approaches to arrive at starting new activities proposed to USAID. At this point of time, the Scope of Work and the funding for fiscal year 2005-2006 was approved but the actual transfer of funds for the mission's buy-in was not achieved. Some of the activities were started were being affected and Dr. Tamimi worked closely with Mr. Hagan to accomplish the MAARD transfer of the fund to the cooperative agreement.

II. Objectives of the Visit

Dr. Akrum Tamimi traveled to Jordan on November 6, 2005 to work on the Sustainable Development of Dry Lands Project activities to accomplish the following objectives:

- Meet with BRDC staff members to discuss Wadi Mousa activities and project activities in general.
- Meet with Mr. Ross Hagan from USAID to brief him on the activities of the Sustainable Development of Dry Lands Project and to present to him the 2005-2006 Scope of Work.
- Meet with Dr. Erin Addison for Wadi Mousa Landscape master plan and interpretive materials
- Visit with RSS/ERC staff members to discuss biosolids activities

III. Badia Research and Development Center

On Sunday November 6, 2005 a meeting was held at 3:30pm at BRDC. Dr. Saad Al-Ayyash and Engr. Mohammed Shahbaz were present in the meeting as was requested by Dr. Tamimi.

During the meeting the following topics were discussed:

1) Wadi Mousa Awareness Center

Dr. Saad and Engr. Mohammed indicated that they would like to complete the architectural design, develop the structural design and the tender documents, and send them to USAID for review and feed back. BRDC wanted to use this strategy because if all the parties involved in Wadi Mousa such as the UNISCO, PRA, etc...are requested to send feedback then too many

changes would be requested and the design would be turned upside down due to the different interested parties and the different views they have. If this were to happen the designer would never be able to complete the full design in due time. The architectural and the structural designs and the tender documents will be developed together as one package and then they will be submitted to USAID. Feed back will be requested. This will show USAID that the activity has been completed and if long delays occur due to the different Jordanian organizations disagreements then it will be clear that BRDC and IALC are not the cause.

BRDC is expecting delays in reaching agreement among the different interested parties. The contract with the engineering firm, who will develop the architectural and the structural designs and the tender documents, will indicate that revisions will be performed for at least 3 months after the first submittal. The 2 lots principle is being used with the same engineering firm completing the architectural design, the structural design and the development of the tender documents. Engr. Shahbaz and Dr. Al-Ayyash are convinced that this is the best route to finishing this activity. Dr. Tamimi accepted the reasoning and the approach and believes that this strategy might serve the project and the activity better and hence agreed with BRDC to follow this approach. The designs and the documents will be ready by December 15 but it was indicated to USAID that they will be ready by December 31, 2005. If the designs and the documents will be ready ahead of time then that will be an advantage.

An important piece of information was brought up by Engr. Shahbaz in relation to the exact site where the Awareness Center is going to be constructed. Until today an official site location has not been identified. There has been talks by CDM about constructing the center in the place where the caravans are located now, but Engr. Shahbaz indicated that that will be the worst location since there is about 3 to 4 meters of fill materials leftover from the construction of the WWTP that consist of large pieces of concrete of construction debris.

IV. United States Agency for International Development, USAID

Dr. Tamimi and Dr. Al-Ayyash met with Mr. Ross Hagan, the new deputy replacing Mr. Jim Franckiewicz, who was responsible for all IALC activities in Jordan. Dr. Tamimi presented all previous history and activities of the Sustainable Development of Dry Lands Project and the 2005-2006 Scope of Work. The meeting took about four and a half hours on November 7, 2005 and was worth the time. Mr. Hagan indicated that the presentations and the time spent were worthwhile since he received a full update and a complete picture about the Sustainable Development of Dry Lands Project activities.

Mr. Hagan requested that Dr. Tamimi send a copy of the letter sent to USAID by ASEZA requesting the involvement of The University of Arizona in the design of the Town Park. Also, Mr. Hagan requested that the Sustainable Development of Dry Lands Project stress the design of filters and local filter media during the design of the efficient irrigation system course to be offered in the summer of 2006 in Jordan.

While discussing the biosolids risk assessment and standards development workshop, Mr. Hagan gave Dr. Tamimi the SANDEC web site that has a lot of information for biosolids and other waste management issues: <http://www.sandec.ch/FaecalSludge/index.htm>.

V. Wadi Mousa Landscape Master Plan and Interpretive Materials

On November 8, 2005 Dr. Tamimi met with Dr. Erin Addison at BRDC headquarters. She requested a survey of the Wadi Mousa site where the Awareness Center will be constructed. The survey and the foot print of the Awareness Center are needed so Dr. Addison can develop the landscape design around the building itself. Dr. Tamimi indicated that there is no set time to receive such information. He also indicated that it might be a month and it might be 6 months before this information is available. Dr. Tamimi requested Dr. Addison to continue working on finalizing the designs she is working on for Wadi Mousa and expect to be called upon when the foot print of the Awareness Center is ready. Dr. Addison indicated that she will need at the most a 2-week period to finalize all her work once the survey and the foot print of the Awareness Center are available. Dr. Tamimi asked if Dr. Addison can be available in 2006 for a month to finish the Wadi Mousa work once the information is ready. Dr. Addison indicated that she will be available to finish the work and she is committed to completing the work as soon as the information is ready. Therefore, Dr. Tamimi is suggesting that Dr. Erin Addison be rehired as a subcontractor through BRDC to complete unfinished work that is dependent on finalizing the design of the Wadi Mousa Awareness Center.

VI. Biosolids Activities

A meeting at RSS/ERC was held on November 9, 2005 between Engr. Wael Suleiman and Dr. Tamimi. Dr. Bassam Hayek was available but very busy working on other business for the Center. He indicated that whatever Dr. Tamimi and Engr. Wael agreed upon will be fine with him. He was promised a copy of the minutes represented by this report.

1) Characterization of Biosolids Technical Report

Dr. Tamimi requested that an updated version of the Characterization of biosolids technical report be submitted by RSS/ERC to BRDC and to Dr. Tamimi so it can be passed along to USAID since they have requested it many times. Please see Tamimi's report number 2005-003 dated June 28, 2005 for information on the submitted project report related to the characterization of Biosolids, specifically item # III-2. Engineer Wael indicated that the new version will be submitted to the BRDC and to Dr. Tamimi no later than December 31, 2005.

2) Biosolids Reuse Application Study Phase II

RSS/ERC submitted an electronic copy and a hard copy of the final report to BRDC and to the Sustainable Development of Dry Lands Project. A review panel needs to be established to give recommendations on any modifications for finalization. After the report is accepted a copy will be forwarded to USAID. Royal Scientific Society requested that Dr. Tamimi start working on doing statistical analysis of the collected data and prepare one publication or more from the data. Engr. Wael Suleiman from RSS will provide the set of data to Dr. Tamimi on a CD with all photos collected from the characterization and the application studies.

BRDC-RSS contract states that a 3rd quarter report and a final report are needed and are tied to a payment of \$7,500 for each. However, Dr. Tamimi in consultation with Mr. Robert Freitas, the project director, agreed that a 3rd quarter report will not be necessary as long as the final report is submitted during September, 2005 which actually happened on time. RSS

invoiced BRDC for the 2 payments in one invoice which needs to be honored. Dr. Tamimi requested from BRDC to release the remaining funds for this study if that is acceptable to their regulations. BRDC will release the funds to RSS stressing that the review comments will be answered to by RSS to the report reviewing committee in due time.

3) Biosolids Reuse Application Study Phase III

The proposal submitted by RSS for Biosolids Reuse Application Study Phase II included a 2nd application study to monitor residual affects of factors being studied and monitored. The same study carried out in Phase II will be replicated on the same plots with the same experimental design. A plan of action has been submitted by RSS to the Sustainable Development of Dry Lands Project and that in combination with the original proposal submitted in 2004 should be part of the contract.

Dr. Tamimi will review and update the subcontract to be signed between RSS and BRDC. The subcontract will be sent to BRDC for review. After approval of the contract BRDC will send the subcontract to RSS for signature then BRDC will sign the subcontract. The steps that need to be carried out to have the funds transferred to BRDC from The University of Arizona are:

- (1) Sign subcontract between RSS and BRDC and fax a copy to The University of Arizona and send the original by FedEx to The University of Arizona.
- (2) The University of Arizona will prepare a modification to the original contract recognizing and acknowledging the new subcontract between BRDC and RSS and will send it to BRDC by fax and send the original by FedEx.
- (3) BRDC will sign the new modified contract and send a copy by fax to the contracting office at The University of Arizona and send the original by FedEx.
- (4) BRDC will invoice The University of Arizona for \$75,000 of which \$70,000 will be used by RSS to fund Phase III study and \$5,000 will be used by BRDC as supervision and monitoring cost of the work conducted by BRDC.

It should be mentioned here that RSS has started the experiment in the field and has applied the biosolids to the land. The rain storms that Jordan received after the application of the biosolids in late October and early November were on time.

In appendix A the subcontract is attached as modified by Dr. Tamimi based on the Phase II subcontract. Dr. Tamimi has sent this subcontract to BRDC for review and implementation.

4) The Study of Management Practices of Sludge and Biosolids in Jordan

The proposal to conduct the survey of the management practices of sludge and biosolids in Jordan is shown in Appendix B of this report. A subcommittee from the ad hoc committee has been designated to visit the 19 or so wastewater treatment plants that handle biosolids. The survey has been completed and a presentation is going to be presented at the biosolids risk assessment and standards development methods workshop. A report will be submitted by RSS then a manual of the proper handling of biosolids will be developed for operators use during the second phase of this study.

5) Biosolids Risk Assessment and Standards Development Methods: A Workshop and Seminar

The workshop will be for 3 days: December 13, 14 and 15, 2005. The Seminar will be for 2 days: December 18 and 19, 2005. Both the workshop and the seminar will be held at RSS. A contract between RSS and BRDC has been signed. RSS's responsibilities will include hosting the workshop and the seminar, providing refreshments during the coffee breaks, providing lunches for the seminar and the workshop, inviting participants, printing materials and making sure that at the end of the seminar a first draft of the JS 1145/1996 biosolids standards is developed.

The workshop and the seminar schedules have been developed and are shown on the following pages.

Workshop Day 1: Tuesday December 13, 2005			
Starting Time	Ending Time	Subject Matter	Person / Organization
8:30	9:00	Registration / Picking up Registration Materials - Coffee	BRDC - RSS
9:00	9:10	Opening Remarks: BRDC	Engr. Mohammed Shahbaz
9:10	9:20	Opening Remarks: USAID	Mr. Ross Hagan
9:20	9:30	Opening Remarks: RSS	Dr. Saad Hijazi
9:30	9:45	Sustainable Development of Dry Lands Project: An Overview	Dr. A. Tamimi
9:45	10:00	Presentation of workshop Agenda	Dr. Chuck Gerba, Dr. Janick Artiola & Dr. Chris Choi
10:00	10:30	Overview of biosolids Utilization in the world	Dr. Chuck Gerba
10:30	11:15	Methods used for treating biosolids	Dr. Chuck Gerba & Dr. Chris Choi
11:15	11:30	Coffee Break	
11:30	12:15	Overview of biosolids Utilization in arid lands	Dr. Chris Choi
12:15	12:45	Characterization of Biosolids in Jordan for Unrestricted Reuse in Agriculture	Dr. A. Tamimi
12:45	1:00	Coffee Break	
1:00	1:30	Application of Biosolids for Agricultural Production Phase I	RSS
1:30	2:00	Management Practices of Sludge and Biosolids in Jordan	RSS and Biosolids <i>ad hoc</i> committee
2:00	3:00	Lunch	
Workshop Day 2: Wednesday December 14, 2005			
Starting Time	Ending Time	Subject Matter	Person / Organization
8:30	9:00	Registration / Picking up Registration Materials - Coffee	BRDC - RSS
9:00	9:30	Biosolids Standards: EU, UK and Japan	Dr. Chuck Gerba
9:30	10:00	Biosolids Standards: US EPA and Jordanian	Dr. Akrum Tamimi & Engr. Wael Suleiman
10:00	11:00	Pollutants (Chemical Characteristics)	Dr. Janick Artiola
11:00	11:15	Coffee Break	
11:15	12:00	Pathogens (Biological Characteristics)	Dr. Chuck Gerba

12:00	1:00	Risk Assessment	Dr. Chuck Gerba
1:00	1:15	Coffee Break	
1:15	2:00	Vector Attraction Reduction	RSS & ad hoc committee
2:00	15:00	Lunch	
Workshop Day 3: Thursday December 15, 2005			
Starting Time	Ending Time	Subject Matter	Person / Organization
8:30	9:00	Registration / Picking up Registration Materials - Coffee	BRDC - RSS
9:00	10:00	Risk Assessment: Group Homework - Dr. Choi	Dr. Chuck Gerba
10:00	11:00	Risk Assessment: Case Study	Dr. Chuck Gerba
11:00	11:15	Coffee Break	
11:15	12:15	Pollutants Concentration: Management, Loading Rates and nutrients	Dr. Janick Artiola
12:15	12:45	Land reclamation, Mine tailings	Dr. Janick Artiola
12:45	1:15	Emerging Issues: Endocrine Disruptors, Pharmaceuticals, Fire Retardants, etc... Completed yesterday	Dr. Janick Artiola
1:15	2:00	Summary and Discussion	Group
2:00	2:30	Workshop Evaluation, Closing Ceremony and Certificates	
2:30	3:30	Lunch	

Seminar Day 1: Sunday December 18, 2005			
Starting Time	Ending Time	Subject Matter	Person / Organization
8:30	9:00	Registration / Picking up Registration Materials – Coffee	BRDC - RSS
9:00	9:10	Opening Remarks: BRDC	Engr. Mohammed Shahbaz
9:10	9:20	Opening Remarks: ad hoc Committee	To Be Determined
9:20	9:30	Opening Remarks: RSS	Dr. Saad Hijazi
9:30	9:40	Sustainable Development of Dry Lands Project: An Overview	Dr. A. Tamimi
9:40	9:50	Presentation of Seminar Objectives	RSS - ad hoc Committee
9:50	10:15	Methods used for treating biosolids	Dr. Chuck Gerba & Dr. Chris Choi
10:15	10:30	Characterization of Biosolids in Jordan for Unrestricted Reuse in Agriculture	Dr. A. Tamimi
10:30	11:00	Biosolids Standards: EU, UK and Japan	Dr. Chuck Gerba
11:00	11:15	coffee Break	
11:15	11:50	Biosolids Standards: US EPA and Jordanian	Dr. Akrum Tamimi & Engr. Wael Suleiman
11:50	12:20	Present Proposed Modifications of Jordanian Biosolids Standards	Selected Modifications Subcommittee from the ad hoc committee
12:20	12:50	Management Practices of Sludge and Biosolids in Jordan	RSS and Biosolids <i>ad hoc</i> committee
12:50	1:05	coffee Break	
1:05	2:00	Deciding on a plan of action for Day 2 of Seminar and Dividing Participants into Different Groups Based on Standard Category. Also assign reading materials necessary for each group.	RSS
2:00	3:00	Lunch	
Seminar Day 2: Monday December 19, 2005			

Starting Time	Ending Time	Subject Matter	Person / Organization
9:00	11:00	Working groups meetings	RSS & ad hoc Committee
11:00	11:15	Coffee Break	
11:15	12:45	Group Reporting and Presentations	Groups
12:45	1:00	Coffee Break	
1:00	2:30	Reaching Conclusions on First Draft of modified standards for further future discussion and approval	Groups
2:30	3:30	Lunch, concluding remarks and closing ceremonies	

The above schedules have been developed by Dr. Tamimi and Engr. Wael Suleiman in consultation with Dr. Bassam Hayek. The workshop schedule and the seminar schedule were discussed further with The University of Arizona technical assistance team members who will be involved in the workshop and seminar: Dr. Chuck Gerba, Dr. Chris Choi and Dr. Janick Artiola. Also a copy was sent to BRDC and to Mr. Bob Freitas, the director of the project.

6) Modeling Biosolids Treatment in Jordan

In regard to this activity, Dr. Tamimi and Engr. Wael agreed that Dr. Tamimi in cooperation with RSS/ERC staff members will prepare a proposal with budget breakdown that will have the following sections:

- a. Background information including literature review.
- b. Previous findings.
- c. Objectives
- d. Methods and materials – Plan of action
- e. Expected publications
- f. Expected development of a computer program.

The proposal will be sent then to IALC through BRDC for review and approval. When the approval happens then a contract between BRDC and RSS will be developed to transfer the funding to RSS.

During November or December, the Weather station will be moved and erected at the Wadi Mousa Wastewater treatment plant. The solar panel should be replaced to provide better charging to the battery during the cloudy days. Meanwhile RSS will work on getting the approval to erect the weather station at Wadi Mousa Wastewater Treatment Plant from WAJ/MIW.

VII. Conclusion and Recommendations

All objectives of the visit were met and many findings were obtained by Dr. Tamimi and activities were pushed forward.

Further work needs to be done to get USAID to move the approved buy-in funds to The University of Arizona via the MAARD. Dr. Tamimi will continue monitoring the status of this activity until it is completed.

Appendix A

Proposed subcontract for Biosolids Reuse Application Study Phase III



I. INTRODUCTION

This CONTRACT (hereinafter called the “Contract”) entered into affect as of the day Tuesday November 1, 2005, between the Badia Research and Development Center, BRDC (hereinafter called the “Client”) on one hand, and the Royal Scientific Society – Environmental Research Center, RSS/ERC (hereinafter called the “Consultant”) on the other hand.

Client and Consultant are hereinafter referred to as the parties and individually as a party.

WHEREAS:

- a) The Consultant had submitted a research proposal and a plan of action to study the feasibility of utilizing bio-solids for improving soil fertility and crop production in Jordan and to monitor the residual effects on soil to the International Arid Lands Consortium, IALC Sustainable Development of Dry Lands Project whom are represented in Jordan by the Client.
- b) The IALC had approved to provide the technical and financial support to the Consultant through the Client, as defined in the research proposal submitted by the Consultant, and upon the terms and conditions set forth in this contract.
- c) NOW THEREFORE the parties hereby agree as follows:
 - 1- The following document attached hereto shall be deemed to form an integral part of this contract:
 - The general conditions of the contract.
 - The specific conditions of the contract.
 - The following appendices:
 - Appendix (A):** Research proposal submitted by RSS/ERC
 - Appendix (B):** The Plan of Action submitted by RSS/ERC
 - 2- The mutual rights and obligations of the Client and the Consultant shall be as set forth in the contract, in particular:
 - The Consultant shall carry out the research study as set in appendix A and appendix B and in accordance with the provisions of the contract.
 - The Client shall make payments to the Consultant in accordance with the provisions of the contract.

IN WITNESS WHEREOF, the parties here to have caused this contract to be signed in their respective names as of the day and year first above written.

For and on behalf of the Client	For and on behalf of the Contractor
Engr. Mohammed Shahbaz, President: Badia Research and Development Center	Prof. Sa’ad Hijazi, President: Royal Scientific Society President
Date:	Date:

II. GENERAL CONDITIONS CONTRACT

1. General Provisions

1.1 Definitions

Unless the context otherwise requires, the following terms whenever used in this contract have the following meanings:

- a) “Applicable Law” means the laws and any other instruments having the force of law in the Hashemite Kingdom of Jordan or as may be specified in the Special Conditions of contract (SC), as they may be issued and in force from time to time;
- b) “Contract” means the contract signed by the Parties, to which these General Conditions of contract (GC) are attached, together with all the documents listed in Clause 1 of such signed contract;
- c) “Contract Price” means the price to be paid for the performance of the services, in accordance with Clause 5;
- d) “GC” means the General Conditions of contract;
- e) “Government” means the Government of Jordan;
- f) “Party” means the Client or the Consultant, as the case may be, and “Parties” means both of them;
- g) “Personnel” means persons hired by the Consultant as employees and assigned to the performance of the services or any part thereof;
- h) “SC” means the Special Conditions of contract by which the GC may be amended or supplemented;
- i) “Services” means the work to be performed by the Consultant pursuant to this contract, as described in appendix (A) and appendix (B).

1.2 Law Governing the Contract

This contract, its meaning and interpretation, and the relation between the parties shall be governed by the Applicable Jordanian Laws.

1.3 Language

This contract has been executed in the language specified in the SC, which shall be the binding and controlling language for all matters relating to the meaning or interpretation of this contract,

1.4 Notices

Any notice, request, or consent made pursuant to this contract shall be in writing and shall be deemed to have been made when delivered in person to an authorized representative of the Party to whom the communication is addressed, or when sent by registered mail, or facsimile to such Party at the address specified in the SC.

1.5 Location

The services shall be performed at such locations as necessary to perform their duties.

1.6 Authorized Representatives

Any action required or permitted to be taken, and any document required or permitted to be executed, under this contract by the Client or the Consultant may be taken or executed by the officials specified in the SC.

1.7 Taxes and Duties

Unless otherwise specified in the SC, the Consultant shall pay such taxes, duties, fees, and other impositions as may be levied under the Applicable Law, the amount of which is deemed to have been included in the contract price.

2. Commencement, Completion, Modification, and Termination of Contract

2.1 Effectiveness of contract

This contract shall come into effect on the date the contract is signed by both parties and/or such other later date as may be stated in the SC.

2.2 Commencement of services

The Consultant shall begin carrying out the services on the contract effectiveness date, or at such other date as may be specified in the SC.

2.3 Expiration of contract

Unless terminated earlier pursuant to Clause 2.6, this contract shall terminate at the end of such time period after the effective date as is specified in the SC.

2.4 Modification

Modification of the terms and conditions of this contract, including any modification of the scope of the services or of the Contract Prices, may only be made by written agreement between the Parties.

2.5 Force Majeure

2.5.1 Definition

For the purposes of this contract, “Force Majeure” means an event which is beyond the reasonable control of the Party and which makes a Party’s performance of its obligations under the contract impossible or so impractical as to be considered impossible under the circumstances.

2.5.2 No breach of contract

The failure of a Party to fulfill any of its obligations under the contract shall not be considered to be a breach of, or default under, this contract insofar as such inability arises from an event of Force Majeure, provided that the Party affected by such an event (a) has taken all reasonable precautions, due care and reasonable alternative measures in order to carry out the terms and conditions of this contract, and (b) has informed the other Party as soon as possible about the occurrence of such an event.

2.5.3 Extension of time

Any period within which a Party shall, pursuant to this contract, complete any action or task, shall be extended for a period equal to the time during which such Party was unable to perform such action as a result of Force Majeure.

2.5.4 Payments

During the period of their inability to perform the services as a result of an event of Force Majeure, the Consultant shall be entitled to continue to be paid under the terms of this contract, as well as to be reimbursed for additional costs reasonably and necessarily incurred by him during such period for the purposes of the services and in reactivating the services after the end of such period.

2.6 Termination

2.6.1 By the client

The Client may terminate this contract, by not less than one month written notice of termination to the Consultant, to be given after the occurrence of any of the events specified in paragraphs (a) and (b) of this Clause 2.6.1.

- a) If the Consultant do not remedy a failure in the performance of his obligations under the contract, within one month after being notified or within any further period as the Client may have subsequently approved in writing.
- b) If, as the result of Force Majeure, the Consultant is unable to perform a material portion of the services for a period of not less than two months.

2.6.2 By the consultant

The Consultant may terminate this contract, by not less than one month written notice to the Client, such notice to be given after the occurrence of any of the events specified in paragraphs (a) and (b) of this Clause 2.6.2.

- a) If the Client fails to pay any monies due to the Consultant pursuant to this contract and not subject to dispute pursuant to Clause 6 within one month after receiving written notice from the Consultant that such payment is overdue; or
- b) If, as the result of Force Majeure, the Consultant is unable to perform a material portion of the services for a period of not less than two months.

2.6.3 Payment upon termination

Upon termination of this contract pursuant to Clauses 2.6.1 or 2.6.2, the Client shall make the following payments to the Consultant:

- a) Remuneration pursuant to Clause 5 for services satisfactorily performed prior to the effective date of termination.

3. Obligations of the Consultant

3.1 General

The Consultant shall perform the services and carry out his obligations with all due diligence, efficiency, and economy, in accordance with generally accepted professional techniques and practices, and shall observe sound management practices, and employ appropriate advanced technology and safe methods. The Consultant shall always act, in respect of any matter relating to this contract or to the services, as faithful adviser to the Client,

and shall at all times support and safeguard the Client's legitimate interests in any dealings with sub-consultants or third parties.

The Consultant shall also coordinate with the already formed biosolids *ad hoc* committee comprised of representatives of different stakeholders including governmental and non-governmental organizations as well as academic institutions. The committee should continue to meet regularly to follow-up and discuss different aspects of the project, and to firm-up suggestions and recommendations.

3.2 Insurance to be taken out by the consultant

The Consultant (a) shall take out and maintain, and shall cause any sub-consultants to take out and maintain, at his (or the sub-consultants, as the case may be) own cost but on terms and conditions approved by the Client, insurance against the risks, and for the coverage, as shall be specified in the SC; and (b) at the Client's request, shall provide evidence to the Client showing that such insurance has been taken out and maintained and that the current premiums have been paid.

3.3 Consultant's actions requiring client's prior approval

The Consultant shall obtain the Client's prior approval in writing before taking any of the following actions:

- a) Entering into a subcontract for the performance of any part of the services.
- b) Any other action that may be specified in the SC.

3.4 Reporting obligations

The Consultant shall submit to the Client the reports and documents specified in appendix (A) and in appendix (B) in the form, in the numbers, and within the periods set forth in the said appendixes.

4. Obligations of the Client

4.1 Assistance

The Client shall use its best efforts to provide any assistance possible to the Consultant.

4.2 Change in the applicable law

If, after the date of this contract, there is any change in the Applicable Law with respect to taxes and duties which increases or decreases the cost of the services rendered by the Consultant, then the remuneration and reimbursable expenses otherwise payable to the Consultant under this contract shall be increased or decreased accordingly by agreement between the Parties, and corresponding adjustments shall be made to the amounts referred to in Clauses 5.2.

5. Payments to the Consultant

5.1 Lump sum remuneration

The Consultant's total remuneration shall not exceed the Contract Price and shall be a fixed lump sum fixed price including all staff costs, printing,

communication, and the like, and all other costs incurred by the Consultant in carrying out the services.

5.2 Contract Price

The price payable in US Dollars is set forth in the SC.

5.3 Terms and conditions of payment

Payment will be made to the account of the Consultant and according to the payment schedule stated in the SC.

6. Settlement of Disputes

6.1 Amicable settlement

The Parties shall use their best efforts to settle amicably all disputes arising out or in connection with this contract or its interpretation.

6.2 Dispute settlement

Any dispute between the Parties as top matters arising pursuant to this contract that cannot be settled amicably within two months after receipt by one Party of the other Party's request for such amicable settlement may be submitted by either Party for settlement in accordance with the provisions specified in the SC.

III. SPECIAL CONDITIONS OF CONTRACT

<u>Number of GC Clause</u>	<u>Amendments of, and Supplements to, Clauses in the GC</u>
----------------------------	---

1.3 The language is English.

1.4 The addresses are:

For the Client

Badia Research and Development Center

Fax: 535-5680

Attention: BRDC President

Email: shahbaz@hcst.gov.jo

For the Consultant

Royal Scientific Society

Attention: President

Fax: 534-4806

1.6 The Authorized Representatives are:

For the Client

Engr. Mohammad Shahbaz

For the Consultant

Prof. Sa'ad Hijazi

2.2 The date for the commencement of services is **November 1, 2005**.

2.3 The period shall be 11 months. Time required for reviewing final report by the client is not included.

5.2 The amount in US Dollars is: \$70,000

5.3 \$40,000 upon signing the contract,
\$10,000 after 1st report, (January 31, 2006)
\$10,000 after 2nd report, (March 31, 2006)
\$5,000 after 3rd report, (June 30, 2006)
\$5,000 after final report, (September 30, 2006)

Payment shall be made within two weeks of receipt of the invoice, and within one month in the case of the final payment.

6.2 Any dispute, controversy, or claim arising out of or relating to this contract, or the breach, termination, or invalidity thereof, shall be settled in accordance with the Jordanian Law.

Appendix B

Management Practices of Sludge and Bio-solids in Jordan

a Proposal

Management Practices of Sludge and Bio-solids in Jordan

The recent changes in regulations concerning municipal wastewater treatment in Jordan have resulted in significant increase in reclaimed water as well as bio-solids quantities. In this regard, the Royal Scientific Society RSS of Jordan has been involved in studies related to bio-solids quality, treatment, and application for agricultural lands since 2003 with the technical of the International Arid Lands Consortium IALC / University of Arizona. RSS is working in cooperation with local institutions and organizations, and *ad hoc* committee was formed to discuss different aspects of various activities. The activities have been financially supported by the US Agency for International Development (USAID) through a contract with IALC and the Badia Research & Development Center in Jordan.

Sludge and bio-solids in Jordan have been dealt with in an improper manner. Sludge treatment units at wastewater treatment plants WWTP are not properly managed or operated. Ponds at WWTP that utilize wastewater stabilization ponds are usually desludged, sludge is being improperly left in near-by areas. Sludge that is being only thickened at other WWTP is usually hauled by private contractors to dumping sites. Naturally dewatered bio-solids is being accumulated within the premises of the treatment plants through many years of operation or transferred to dumping sites. Although a Jordanian standard (JS:1145/1996) was issued in 1996 to regulate the reuse of bio-solids for agricultural purposes, non of the generated bio-solids have been utilized for beneficial uses, and it is believed that the current regulations need to be modified.

This proposal is a continuing activity to the current cooperation between IALC and RSS in fields relevant to bio-solids, and will investigate and assess current management practices of sludge and bio-solids in the country including treatment, handling, testing, disposal and application.

Methodology

- Some members of the *ad hoc* committee will conduct the tasks, the task force includes representatives of the Ministry of Water and Irrigation MWI/ Water Authority of Jordan WAJ and RSS.
- A field survey will be carried out during summer 2005 to collect relevant data and information on sludge / bio-solids management practices that will take into consideration the following:
 1. Treatment processes of sludge (design criteria, resident time and others).
 2. Available data on sludge/bio-solids quality (physical, chemical and microbial aspects).

3. Testing procedures adopted for bio-solids.
 4. Available data on sludge / bio-solids generated quantities (liquid, dewatered and others).
 5. Handling and disposal practices as well as costs entailed.
 6. Fate of generated sludge / bio-solids.
 7. Previous reuse / application (if any).
- The following WWTP that are operated by MWI/WAJ will be covered by the field survey: Abu-Nuseir, Baq'a, Salt, Fuheis, Central Irbid, Jerash, Wadi Arab, Kufranjah, Samra, Mafraq, Karak, Tafilah, Wadi Mousa, Wadi Hassan, Aqaba, Ramth, Wadi Al-seir, Madaba and Ma'an.
 - A technical report with all necessary documents will be prepared, reviewed and approved by the *ad hoc* committee. The report will include all technical and managerial data and information that to be collected throughout the field survey.
 - The report will be presented by the *ad hoc* committee in the bio-solids risk assessment and standards development workshop that will be held at RSS during December, 2005.
 - The report will be available for other stakeholders in order to develop a first draft of the modified Jordanian standards for bio-solids reuse. This draft will be the baseline for working on the final version of the standards in the bio-solids risk assessment and standards development workshop.

Duration

Field survey will be conducted during the period (Aug. – Oct. 2005). The technical report will be prepared, reviewed, and finalized by Nov. 2005.

Budget and Payment method

The total estimated budget of the study is (7,500 USD) as shown below, to be paid as the following:

- 3,750 USD upon signing the contract.
- 3,750 USD upon submitting the technical report.

Category	Allocated Budget (USD)
Personnel	2,500
Study expenses	1,500
Local travel	1,500
Evaluation & reporting	2,000
Total	7,500