

Quarterly Program Performance
Report 1 of 2001

Grant Number: PCE-G-00-98-00011-00

Project Title: Appropriate Technology for Wastewater Treatment and Reuse in Rural Middle East Areas

Organization I.D.: 10287

Organization Name: The Galilee Society

Resource Code: 410463

Account Number: ES97/98DES798

Reporting Period: January 1, 2001 - March 31, 2001

Date Submitted: April 10, 2001

Summary:

- **Progress Achieved at the Sakhnin Pilot:** The Technion team submitted the annual report covering the period of December 1999-March 2001.
- **Technical Meeting (GS-Technion):** On January 4, 2001 Galilee Society (GS) and Technion staff held a technical meeting to discuss the future work plan for the Sakhnin Pilot Site.
- **Progress Achieved at the El-Sadat City Pilot (Egypt):** Construction and structural developments at the site continue including irrigation networks, tree transplants, and preparations for wetland and polishing pond construction.
- **Progress Achieved at Beny-Zaid (West Bank):** Evaluative study for the construction of a full-scale treatment plant completed. It is anticipated that three schools, the municipality building and 17 households will be connected to the treatment plant.

Future Plans:

- **Technical Meetings -** As a result of the current political situation in Israel, the planned technical meeting between all four partners may not be possible. Because travel and accessibility have been severely restricted throughout the region meetings will instead take place between the coordinating partner (the

Galilee Society) and individual partners respectively. The following meetings are anticipated:

1. On April 19th the GS and the Technion will meet at the GS Regional R&D Center to discuss the status and progress of the entire project. The Technion recently submitted a 70-page report detailing developments thus far. The report will also be a subject of the discussions and is available for review upon request.
 2. The GS will meet with ECOA during early May and with the PHG at the end of May to discuss monitoring and evaluation of the progress of each.
- **Pathogen Testing** - GS R&D Center labs are being prepared to integrate routine testing for pathogens in order to determine unit performance in the removal of pathogens. GS staff is currently undergoing training.
 - **Educational Workshop** - On April 27 and 28 the GS will present a workshop for farmers and agricultural technicians in the Galilee region titled *Wastewater Treatment and Reuse for Irrigation*. The workshop will take place at the Sakhnin wastewater treatment pilot site and will include lectures and a panel discussion presented by regional experts in irrigation techniques, wastewater treatment, health and safety, agricultural organization and organic agriculture. Agenda can be found in Attachment 1.
-

Program Performance:

1. Wastewater Treatment Pilot Site, Sakhnin, Israel

1.A. Technical Meeting GS-Technion staff

GS and Technion staff held a technical meeting on January 4, 2001 at the Galilee Society R&D Center in Shefa' Amr. Project team members discussed daily issues and progress pertaining to the system and agreed on the following modifications to the system operation-

UASB:

1. Monitoring of UASB performance will continue while it is fed with raw sewage following two hours of sedimentation. Increase to the organic load will be done after the winter is over.
2. Cleaning of the sedimentation tank will continue.

Wetland:

1. The wetland is now being fed intermittently in order to improve distribution at the inlet points. Wetland performance will continue to be monitored.

1.B. Annual Performance Report

The Technion submitted an updated performance report covering the period from December 1999 through March 2001. The 70-page document will be discussed at the next technical meeting scheduled to be held on April 19th, 2001. The report details outcomes of the research work undertaken at the Sakhnin pilot site over the last year.

Research activity throughout the year 2000 was devoted to an intensive study of each individual unit in use at the Sakhnin site including: UASB, vertical bed, horizontal wetland and reservoir. The UASB and the vertical beds were the main treatment units examined while the wetland served mostly as a downstream treatment to UASB effluent and the reservoir, as a buffer to effluents from all treatment units before final disposal in the main reservoir. During the start-up year, performance of the treatment units during different seasons was monitored and adjustments were made accordingly. Experiments were performed in order to understand and solve problems encountered during operation.

Last Quarter Progress:

UASB

During the winter months (January and February), COD/BOD removal efficiencies dropped to their lowest levels (days 500-575) when average temperature decreased by up to 10°C with a minimum decrease of 5°C. COD and BOD removal efficiencies were almost always within the range of 20% -30% with very few results recorded at 10% or less. With temperatures rising again at the beginning of spring, UASB activity increased and by early March COD and BOD removal efficiencies were in the range of 50% and 65% respectively.

Vertical Beds

During the reported period, the vertical bed was operated at two different modes:

1. *Long Cycles* - During the first seven months of operation, long 'active cycles' (several weeks) were applied until the bed was clogged. Each 'active cycle' was followed by a long 'rest period' (a total of three cycles were performed).
2. *Short Cycles* - During the following six months, daily short 'active cycles' (several hours) followed by short 'rest periods'.

The results obtained from these two modes are summarized in Table 1:

Table 1	'Long cycles'			'Short cycles'		
	Cycle	First	Second cycle	Third	High HL	Low HL
Hydraulic load (m/day)	9	9	9		9	4.5
Influent TSS (mg/L)	243	275	474		78	128
Loading rate (kgCOD/day)	23	14.5	36		20.5	11
CODt removal rate (g/m ² /day)	922	265	444		397	347
CODs removal rate (g/m ² /day)	267	129	141		275	193
Total CODt removed (kg) (%)	315 (54%)	91 (25%)	115 (18%)		163 (26%)	140 (42%)
Free pore space (%)	60%	54%	52%		60%*	55%*
Total for three cycles					Total high + low HL	
Total Influent CODt (kg)				1583	947	
Total influent TSS (kg)				928	184	
Total CODt removed (kg)				521	303	
Days of operation				225	180	

Wetlands

The wetland removal rate during January and February was lower than expected and could be explained by two main reasons.

1. The low temperatures during the months of January and February, when temperature was on average 10°C and dropped to values as low as 5°C. If that is the case, improvement should be expected in the warmer months following April.
2. Problems in the hydraulic behavior of the system. The low flow rate applied to the wetland created difficulties in maintaining an even distribution, which could have resulted in channeling. A tracer experiment is currently performed in order to determine the actual retention time in the system.

In the meantime, the esthetic aspect cannot be ignored. The *phragmitis* that were planted in the wetland are thriving, the lush, dense cover of the tall reed (2m) can be seen below in figure 1.

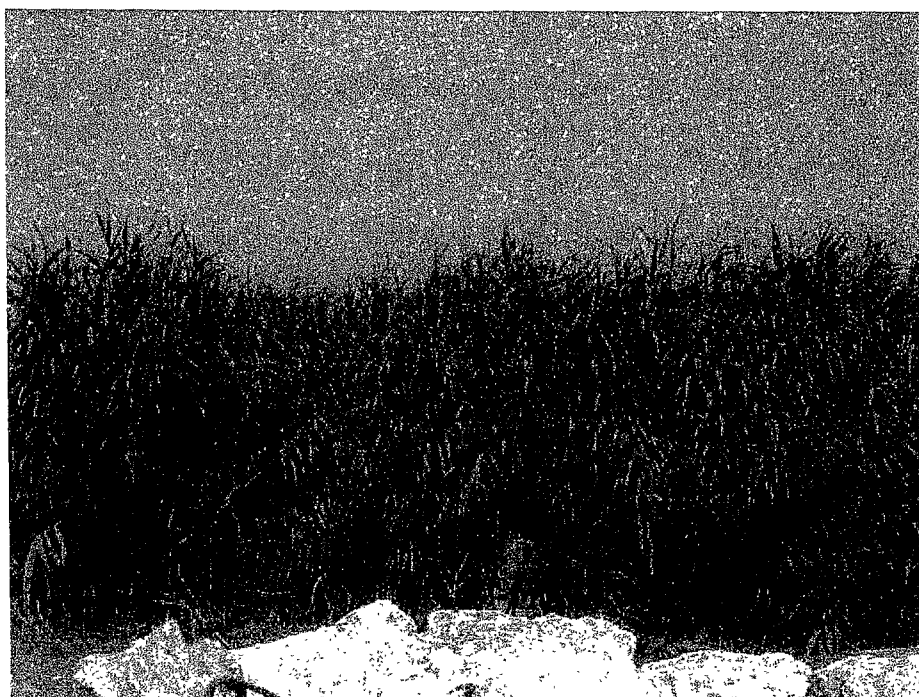


Figure 1: The phragmitis at the end of summer 2000

1. C. Pathogen Tests

The GS and the Technion also resolved (at the above mentioned Technical meeting) to commence testing for pathogens in April 2001. The R&D Center (GS) will be responsible for monitoring unit performance in pathogen removal. Lab technician, Ahlam Haeik, has started a training course with microbiologist, Dr. Abid Nasser from the Israeli Ministry of Health.

2. Wastewater Irrigation Pilot, Sadat City, Egypt

2.A. Progress to Date

ECOA staff continue to make headway with system construction and installation. Bidding for the polishing pond and wetland excavation is underway. Site developments include:

1. Installation of irrigation system networks in the four experimental plots has been completed. Some surface installments in plots of treated water remain.
2. Installation of control head for the fresh water well.
3. Testing of the complete fresh water irrigation network at the fresh water experimental plot. Please see Figure 2 below.
4. Transplanting of wood trees and citrus trees in the fresh water plot.
5. Pump for the second fresh water testing well purchased, installation of the pump is imminent.
6. Polyethylene sheets and other plastic for use in polishing pond and wetland construction purchased.

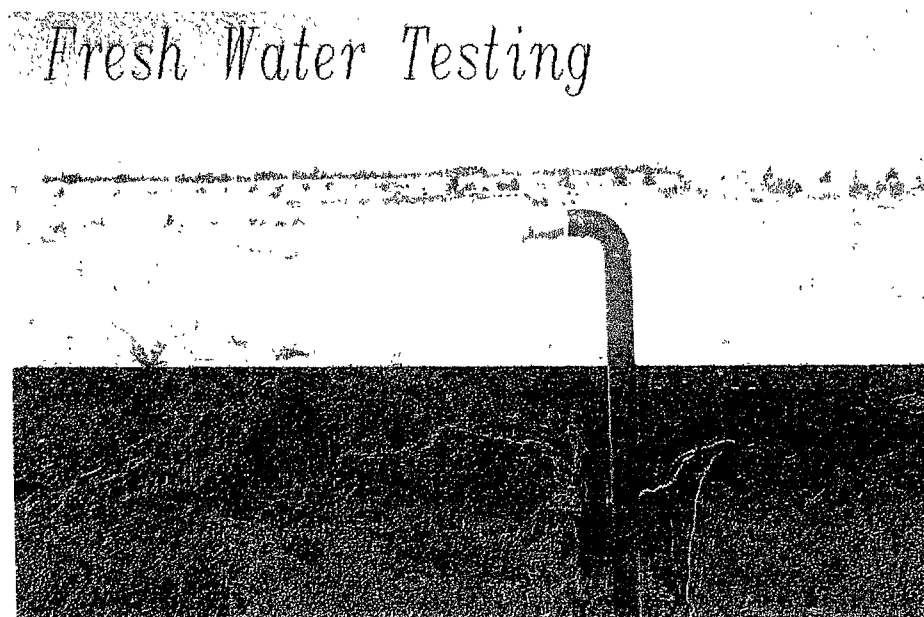


Figure 2: Fresh Water Testing, Sadat City

3. Full-Scale Treatment & Reuse System - Beny Zaid, West Bank

3.A. Evaluative Study for Pilot Treatment Site

A complete study of existing conditions and potential configurations was undertaken in preparation for construction of the pilot treatment facility. The optimal section of the proposed full-scale treatment system, one that will be able to serve the purposes of the pilot and to be integrated into a full-scale system in the future, was considered. The site selected for the pilot treatment plant is adjacent to the proposed site for the full-scale system. It is anticipated that the three schools, the Municipality building and 17 households will be

connected to the pilot treatment plant. Details of the system are in the design layout.

3.B. Pumping Stations

A consultant was hired to support the project team in preparing the design and specifications for the project pumping stations. The consultant prepared the required designs and drawings and provided the technical details of the necessary pumps. The project team then completed the designs of the electrical and civil works as needed.

3.C. Site Design

The designs of the main and sub-main sewer lines were prepared as built in drawings and printed out as hard copies ready for tendering and implementation. The drawings detail the layout lines, the excavation profile and the back filling.