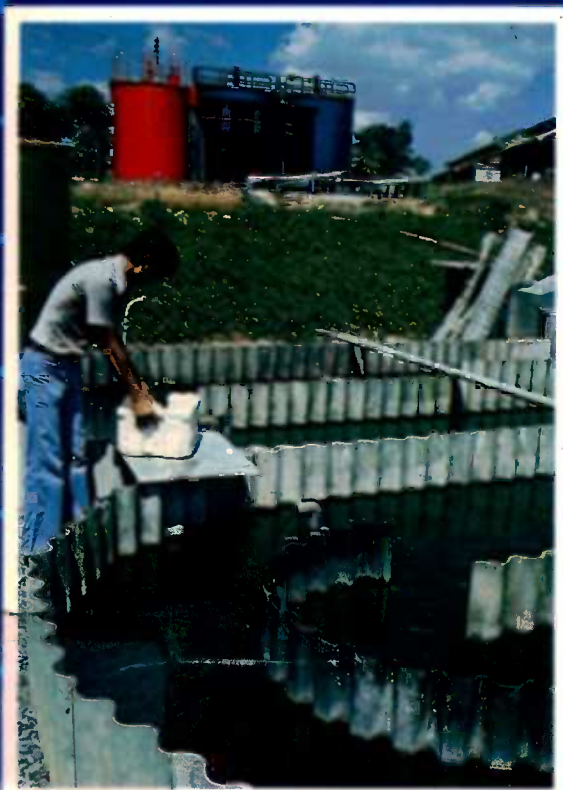


Wastewater Treatment and Resource Recovery

Report of a workshop on high-rate algae ponds,
Singapore, 27-29 February 1980



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Head Office: 60 Queen Street, Ottawa, Canada

IDRC, Ottawa CA
Singapore. Ministry of National Development, Primary Production Dept. SG
IDRC-154e

Wastewater treatment and resource recovery : report of a workshop on high-rate algae ponds, Singapore, 27-29 February 1980. Ottawa, Ont., IDRC, 1980. 47 p. : ill.

/IDRC publication/, /waste waters/, /water treatment/, /waste recycling/, /renewable resources/, /algae/— /biomass/, /cultivation techniques/, /feed production/, /harvesting/, /processing/, /Singapore/, /Israel/, /list of participants/, bibliography.

UDC: 628.357.2

ISBN: 0-88936-260-2

Microfiche edition available

39729

IDRC-154e

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*Sponsored by the International Development Research Centre in
collaboration with the Primary Production Department, Ministry of
National Development, Republic of Singapore*

ARCHIV
62P.357
W 6
1980

Contents

Foreword 3

Overview of Wastewater Treatment and Resource Recovery

Lee Boon Yang, Lee Kam Wing, Michael G. McGarry, and
Michael Graham 5

Introduction 6

High-Rate Algae Pond 10

Harvesting 13

Utilization 21

Economic Analysis 25

Singapore: A Case Study 30

References 38

Abstracts of Presented Papers and List of Participants 41

A study of a sewage-fed, high-rate stabilization pond
in Thailand Peter Edwards, Onanong Sinchumpasak, and
Ely A.O. Ouano 42

High-rate algal growth pond study under tropical conditions
B. Adan and E.W. Lee 42

Recycling of palm-oil mill sludge discharge nutrients through SCP
(*Chlorella vulgaris*) culturing P.M. Sivalingam 42

Microbial treatment and utilization of night soil M.C. Lo
(presented by H.W. Huang) 43

Freshwater cultivation of algae with possibilities of utilizing rural wastes in
India L.V. Venkataraman, K. Madhavi Devi, and
M. Mahadevaswamy 43

Culture of algae in Bangladesh F.Z. Majid, Momena Khatun, and
Rahima Khatun 43

Waste treatment and nutrient removal by high-rate ponds
G. Shelef, Y. Azov, R. Moraine, E. Sandbank, and G. Oron 44

Critical factors in the large-scale production of microalgae
E.P. Lincoln and T.W. Hall 44

Production of algae from pig wastewater in high-rate ponds
Lee B.Y. and Joseph C. Dodd 44

Harvesting algae grown on pig wastes in Singapore
Joseph C. Dodd 45

A nutritional evaluation of pig wastewater-grown algae
M.F. Ngian and S. Thiruchelvam 45

Participants 46

The complete texts of the papers presented at the workshop are included in an unedited form on the microfiche pocketed on the inside back cover of this book.

Abstracts of Presented Papers¹

A study of a sewage-fed, high-rate stabilization pond in Thailand

Peter Edwards, Onanong Sinchumpasak, and Ely A.O. Ouano

A high-rate stabilization pond is described that is part of a sewage driven, combined waste treatment recycling system consisting of three stages: a 200 m² high-rate stabilization pond, a series of 4 m³ concrete fish ponds, and a maize plot. Because the sewage was very weak, the pond was nutrient-limited and not light-limited. At a detention time of 3 days, the mean phytoplankton concentration was 94 mg/l, and the mean phytoplankton yield 15.7 g/m²-day or an extrapolated yield of 57.3 tonnes/ha-year. A yield at least double this should be attainable in Thailand without nutrient limitation in a high-rate stabilization pond. The phytoplankton community in the high-rate pond was generally stable but collapsed on two occasions. No seasonal variations in composition of the phytoplankton community were discernible. The land required to treat domestic sewage from a hypothetical city of 100 000 people was estimated to be 8.93 ha, and the phytoplankton concentration and the algal yield were calculated to be 420 mg/l and 32.8 g/m²-day (120 t/ha-year) respectively, using Thai solar irradiance data.

High-rate algal growth pond study under tropical conditions

B. Adan and E.W. Lee

High-rate algal growth pond systems for waste treatment are usually less expensive to construct and operate than conventional waste treatment systems, are reliable for BOD and nitrogen removal, and provide for nutrient reclamation. For these reasons, a study in the Philippines was made of a high-rate algal pond to determine the feasibility of the system to treat sewage, remove nutrients, and possibly reclaim water and nutrients. The background and theory of the system are provided, and the experiments and their results are explained. The probable significance of these findings to the overall water-management program in Laguna de Bay is also discussed.

Recycling of palm-oil mill sludge discharge nutrients through SCP (*Chlorella vulgaris*) culturing

P.M. Sivalingam

A strain of *Chlorella vulgaris* that thrives well in the adverse conditions of palm-oil mill sludge effluent was isolated. The characteristics for its optimum prop-

¹The complete texts of the papers presented at the workshop are included in an unedited form on the microfiche pocketed on the inside back cover of this book.

agation in fermented palm-oil mill sludge effluent are as follows: pH, 7; temperature, 35 °C; and fermented sludge dilution, 3–4 times. NO_3^- and PO_4^{3-} additions in the form of NaNO_3 and Na_2HPO_4 , respectively, at 10 ppm facilitate its multiplication. Growth enhancement effects were also observed for amendments to the salinity and bicarbonate concentrations. It was found through algal culture experiments that *C. vulgaris* could lower the BOD load of fermented sludge from 1080 ppm to 40 ppm, which meets the limits set by the Government of Malaysia. Biochemical analytical evaluation of harvested *Chlorella vulgaris* also demonstrated the possibility of utilizing this species for human consumption, animal husbandry, and fish feeding.

Microbial treatment and utilization of night soil

M.C. Lo (presented by H.W. Huang)

This study is divided into two parts. The first part deals with the efficiency of night soil treatment with photosynthetic bacteria (PSB) and *Chlorella*. The duration of night soil treatment with PSB and *Chlorella* proved to be 20 days faster than the traditional activated sludge or trickling-filter method and 10 days faster than the aerobic digestion method. Furthermore, much less sludge was produced. The second part compares the growth of chickens fed *Chlorella* with the growth results obtained with commercial feeds. With broilers, feed costs were reduced 14–20%, and with laying hens, feed costs were reduced by 18% while 16% more eggs were produced and, on average, the eggs were 5% heavier.

Freshwater cultivation of algae with possibilities of utilizing rural wastes in India

L.V. Venkataraman, K. Madhavi Devi, and M. Mahadevaswamy

Concentrated efforts to utilize algae grown and harvested from fresh water, sewage, and seawater are progressing in India. Indian farmers are increasing the use of blue-green algae as a biofertilizer, and this awareness is helping in efforts to convince and motivate farmers toward profitable uses of algae grown on both fresh water and wastes. Emphasis is being placed on rural applications so that the algal biomass will reach the rural poor either directly as a supplementary food protein or indirectly through animal feeds. Acceptability is a major factor in promoting the use of algae in food; therefore, feed utilization is an immediate objective.

Culture of algae in Bangladesh

F.Z. Majid, Momena Khatun, and Rahima Khatun

Continual use of chemical fertilizers without sufficient organic manure is gradually deteriorating soil quality in Bangladesh. Therefore efforts are being made to use aquatic weeds as a source of organic manure for fertilizer. Also, attempts will be made to supplement livestock feeds with algal protein. Studies to determine the feasibility of this program have been set up. The efforts are designed to develop simple culture methods that will use inexpensive media and indigenous culture vessels such as clay pots.