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# International Computer-Based Conference on Biotechnology

## A Case Study

Editor: D.A. Balson

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## Abstract

An international computer conference on the bioconversion of lignocellulosics for fuel, fodder, and food took place from May to December 1983. It was initiated to evaluate the appropriateness of using computer conferencing to facilitate scientific discussions and to explore the application of the subject matter to development purposes. Individuals intimately involved in the organization and evaluation of this activity contributed chapters documenting the background, organization, operation, evaluation, and results. These chapters reflect the personal views of the authors, allowing the reader to view the activity from a number of different perspectives.

Generally, the technique of computer conferencing was accepted by this user group as a viable medium for facilitating scientific research. Although the industrialized-country researchers did not find the content of the discussions very valuable, the developing-country researchers found it extremely pertinent and appropriate. The most important outcome of this activity, however, was its contribution to the body of knowledge concerning the use of this technique in the facilitation of cooperative research activities.

## Résumé

De mai à décembre 1983 s'est tenue une téléconférence informatisée internationale sur la bioconversion de matières lignocellulolytiques en combustible, fourrage et nourriture. Elle avait pour objet de déterminer le bien-fondé de l'utilisation de la téléconférence pour faciliter les discussions entre scientifiques et d'étudier l'utilisation de ce mécanisme à des fins de développement. Les personnes chargées de l'organisation et de l'évaluation de cette activité ont rédigé des documents sur l'origine, l'organisation, le fonctionnement, l'évaluation et les résultats de la téléconférence. Chaque document reflète les idées et opinions de son auteur, ce qui permet au lecteur de regarder cette activité à partir de différents points de vue.

Les participants ont reconnu, de façon générale, l'utilité de la téléconférence informatisée pour la recherche scientifique. Bien que les chercheurs des pays industrialisés aient jugé peu intéressants les sujets traités, les chercheurs des pays en développement, pour leur part, les ont trouvés très pertinents. Cette activité aura eu pour principal mérite de contribuer à l'approfondissement des connaissances sur l'utilité des téléconférences dans la promotion des activités de recherche en collaboration.

## Resumen

De mayo a diciembre de 1983 se celebró una conferencia internacional computarizada destinada a analizar temas relativos a la bioconversión de lignocelulosa en combustible, pienso y alimentos para el ser humano. La conferencia evaluó la conveniencia de la utilización de las conferencias computarizadas para facilitar las discusiones científicas y para explorar la aplicación de los temas discutidos a los esfuerzos de desarrollo. Los expertos que participaron en la organización y evaluación de esta actividad contribuyeron capítulos sobre antecedentes, organización, operación, evaluación y resultados. Los mismos reflejan las opiniones personales de los autores y ofrecen diferentes puntos de vista sobre estas actividades.

En términos generales, este grupo de usuarios opinó que la técnica de conferencias computarizadas resulta un medio viable para facilitar la investigación científica. Los investigadores de los países industrializados no consideraron muy valioso el contenido de estas discusiones; sin embargo, los investigadores de los países en vías de desarrollo estimaron que los temas tratados fueron pertinentes y apropiados. Esta actividad contribuyó sobre todo a aumentar el caudal de conocimientos relativos al empleo de esta técnica para facilitar la colaboración en las actividades de investigación.

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## Organization and Implementation

D.A. Balson<sup>1</sup>

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The International Development Research Centre (IDRC) became involved in sponsoring this computer conference as a result of a workshop on Computer-Based Conferencing Systems for Developing Countries, which was held in Ottawa in October 1981. One of the recommendations of this workshop was that IDRC support a pilot computer conference, involving both developing and industrialized countries, on a topic such as lignocellulose research. Possible implementation strategies were examined in informal meetings by Carl-Goran Hedén, myself, and other interested IDRC staff through the first half of 1982. The identification of a moderator represented the first concrete step in the implementation process.

Professor Murray Moo Young of the Department of Chemical Engineering of the University of Waterloo accepted our invitation to be moderator for this proposed conference. To enhance the planning process the following individuals were also invited to join the Canadian Organizing Committee: Dr Stan Martin of the National Research Council of Canada, Dr Jack Saddler of Forintek Canada Corporation, Dr Dennis Howell of the Centre for International Programs of the University of Guelph, and Dr John Black of McLaughlin Library of the University of Guelph. Formal meetings of this group began in late 1982 and took place periodically throughout the course of the conference in 1983 and the evaluation and reporting phase in 1984. At times, this group of seven met and at other times it was augmented by interested individuals who became involved at later stages. Carl-Goran Hedén was the common thread between the Canadian Organizing Committee and a Scandinavian Organizing Committee that was struck early in 1983. This committee, which was chaired by professor Karl-Erik Eriksson of the Swedish Forest Products Research Laboratory, concentrated its activities on the concluding 5-day "dispersed workshop" phase of the pilot conference (12-16 December 1983).

### Planning Phase

At our first formal meeting, the general topic of "Bioconversion of Lignocellulosics," with the subtitle "for Fuel, Fodder, and Food Needed for Rural Development in Poor Countries," was established. This was further broken down into five subtopics: Upstream Process Considerations, with Jack Saddler as a co-moderator; Processes for Food/Fodder, with Doug Cunningham of the University of Guelph as a co-moderator; Processes for Liquid Fuels, with G. Stewart of the

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Labatt Brewing Company Limited and D.G. MacDonald of the University of Saskatchewan as co-moderators; Processes for Gaseous Fuels, with J.M. Scharer of the University of Waterloo as a co-moderator; and General Considerations with Stan Martin as a co-moderator. Each of these subtopics was further divided into five areas, respectively, to assist in focusing the discussions.

The general objectives of this exercise were established as follows: on the scientific side, to explore the possible uses of the bioconversion of lignocellulosics for development purposes; on the technical side, to explore the viability of using computer conferencing to facilitate scientific research by a specific user group; and on a secondary level, to lay the groundwork for future application of this technique, on a global basis, to more specific aspects of the subject. From my own standpoint of being responsible for a program involving the support and facilitation of the use of data communication techniques in support of research in developing countries, I had two additional objectives: to increase awareness in general and to gain experience in the organization and operation of a computer conference on an international scale. Following an examination of a number of commercially available host systems, we selected the Electronic Information Exchange System (EIES) and COM to be the host conferencing systems for this event.

EIES is managed by the Computerized Conferencing and Communications Center under the direction of Murray Turoff, based at the New Jersey Institute of Technology in Newark, New Jersey. This system was chosen basically because of its reliability, its relative user-friendliness, its established nature, and its extensive network of existing users.

The Scandinavian Organizing Committee selected the COM conferencing system designed and developed by Jacob Palme and his colleagues first at the Swedish National Defense Research Institute and then at the Stockholm University Computer Centre (QZ). This system was chosen for use mainly for participants in Scandinavian and European countries but also for any other countries that could more easily or economically access the Swedish national data network than the EIES system. The COM system has enjoyed a very good reputation throughout Europe and Scandinavia and countries further afield.

At an early stage, funding for specific aspects of this conference was put in place by IDRC. This funding would cover the costs of participation of the principal participants from the Canadian Organizing Committee and of the co-moderators, the costs of participation of selected participants in developing countries both on-line and off-line (explanation of this aspect appears later in this chapter), the costs of transferring entries from EIES to COM and vice versa, and the costs of holding three meetings of the Canadian Organizing Committee (meetings of some members of this group were possible without funding).

As it turned out, this budget was not spent as planned. As the computer conference began to take shape, other organizations became interested and actively involved. The Energy Division of the National Research Council of Canada (NRC), which was interested in both the subject and the process, offered to support the costs of some of the key Canadian participants. The Board on Science and Technology for International Development of the U.S. National Academy of Science funded a project whereby three research teams in the United States and three teams in developing countries would participate in the confer-

ence and report on the results. Finally, the United Nations University, which was interested in exploring how this communication process could enhance its decentralized project-oriented operations, offered to fund an extensive evaluation of this activity. These additional sources of financing allowed the IDRC budget to cover such unbudgeted expenses as an evaluation design study and an expensive but useful experiment of access to EIES from Bangkok, Thailand.

The activities of the Scandinavian committee were managed by the United Nations Environment Programme (UNEP)/United Nations Educational, Scientific and Cultural Organization (Unesco)/International Cell Research Organization (ICRO) sponsored Microbiological Resource Center (MIRCEN) at Karolinska Institutet in Stockholm under a grant from the Sven and Dagmar Salén Foundation.

From the outset, we realized that the majority of the participants would be located in North America and Europe, because most of the research was taking place in these regions and access to equipment and data networks was both easier and more economical. At the same time, we wanted to encourage as much participation as possible by developing-country researchers to promote interactions between regions in this research area, to expose this technique to as wide a community as possible, and to learn more about the access difficulties that would be experienced by participants located in developing countries.

Realizing that many developing-country researchers would not be able to participate on-line because of problems such as lack of access to a terminal, the existence of legal or regulatory constraints on international data communications, excessive costs in accessing the nearest data transmission network, or all of the above, we established a procedure for off-line participation. Individuals in this category were mailed copies of the transcript of the computer conference on a monthly basis. They could then submit comments, questions, or messages via IDRC by mail or telex. Responses to their submissions were then received by the individual upon receipt of the next mailing of the transcript.

A set of potential participants was derived from the individual directories of contacts of the members of the Canadian and Scandinavian Organizing Committees, the participant lists of several recently held face-to-face conferences on related subjects, and the mailing lists of several organizations with mandates covering the biotechnology field. More than 500 individuals received an initial invitation package that included an invitation letter documenting the specifics of the computer conference, a description of computer conferencing, a mailing list of those individuals who were receiving the invitation, and a questionnaire inquiring whether the recipient was interested in participating and receiving more information and in naming any other individuals who might be interested.

To those persons who replied in the affirmative, a follow-up information package was sent. This information package included the following: the program format; the logistics of participating in the computer conference; the scope and aims of the conference; the topics and subtopics to be discussed; an overview of the general subject; short descriptions of the subtopics; the identification of EIES as the host system; a description of the account structure of EIES and respective costs; a User Guide, which was a condensed, easier to use version of the EIES Users' Manual that is sent to new users following account activation; advice on data communication protocol including lists of the public access telephone numbers for Datapac in Canada and Telenet in the United States; procedures for



activating one's account (I acted as an intermediary to facilitate the account activation process by requesting activation upon receipt of a telex or telephone request and then relaying the account number and password to the new user); and an explanation of the procedures for participating off-line for researchers in developing countries. Potential COM users received corresponding information and support packages from the Scandinavian committee.

Although we expected to initiate the computer conference in March of 1983, it did not actually commence until May. From our experience, one should expect at least a 6-month lead time from sending out invitations to active participation. Even though we initiated the conference 4 months after the invitation process began, significant participation did not occur until 2 months later.

Time delays occurred during the invitation and account activation stages with the use of postal systems. Delayed decisions to participate and minimal participation in the early stages (at least in this instance) because of a "wait and see" attitude being felt by many of the participants and hesitation by others while they became accustomed to a new technique of communicating, resulted in a later effective start-up date.

The following table provides a breakdown on the responses to the invitations (for participation on the EIES system only).

	Individuals in industrialized countries		Individuals in developing countries		Total	
	No.	% of all invitations	No.	% of all invitations	No.	% of all invitations
Invitations sent	461	100	80	100	541	100
Replies received	140	30.4	25	31.3	165	30.5
Affirmative replies	104	22.5	25	31.3	129	23.8
Response rate	30.5% (165 of 541 invited)					
Affirmative response rate	23.8% (129 of 541 invited)					

## Asynchronous Computer Conference Phase

Not all of those individuals who expressed an interest in participating followed through with the necessary arrangements. The actual number of on-line accounts on EIES was 33. This represented about 107 researchers because some accounts were shared by groups of researchers. In addition, there were 23 off-line participants. The number of COM participants was also 23.

On both EIES and COM, one can establish conferences as either "public" (open to any individual who has access to the system) or "private" (open to only those users who have been given access by the moderator of that conference). The computer conference on bioconversion of lignocellulosics officially began on 2 May 1983 on the EIES system as public conference C604 — Bioconversion of Lignocellulosics. As each account was established a welcome message was sent informing the new user on how to access the specific conference. It was announced to the general EIES public through the EIES on-line newsletter, CHIMO, and in the conference listing of public conferences (C1008). Corresponding announcements were also made over the COM system.

A complementary private conference, Bioconversion CC Organization (C268), was established for communications among the two Organizing Committees and to facilitate the transfer of entries between EIES and COM. C268 was used minimally. A group was set up on EIES, BIOCON — G50, consisting of all participants in the public conference, with the purpose of sending administrative or nonsubject-oriented messages to all participants. Here again, this facility was used minimally until after the conference was concluded. At that time the membership of the group was reduced to consist of only those individuals in the expanded Canadian Organizing Committee (including the evaluators and representatives of funding agencies) and the group messaging technique was used effectively for facilitating the evaluation construction, meeting preparation, and follow-up report distribution and feedback. On COM, the conference was also split into a technical and an administrative component (Bioconversion Technical and Bioconversion Planning, respectively).

Instead of opening the conference with a discussion paper, we began with a welcome message to the participants from the President of IDRC, Ivan Head, and 11 comments introducing the aims and scope, program, and topics and subtopics including background and descriptions of the subtopics. We originally planned to run the conference for a 6-month period until the end of October, but due to the slow start, as previously explained, we extended the conference until the end of December 1983.

Running the conference on two host systems was a complicating factor. Initially, John Black, University of Guelph, handled the transfer of conference comments manually in both directions. This was a time-consuming and expensive task. Furthermore, decisions on what to transfer and what to leave behind can be difficult. In the latter stage of the conference, Jacob Palme, Stockholm University, handled the intersystem transfers using, in part, automated methods. Although publicity for this computer conference was not handled in a coordinated fashion, a number of subject-related journals and institutional newsletters ran periodic announcements about its progress.

During the course of the conference, the role of the overall organizer or coordinator consisted of multitudinous tasks. These included responding to requests from outsiders for information about the conference; inviting participation of newly identified potential participants; account activation and cancellation upon request; clarifying account problems especially related to billing; distributing extra user guides and manuals; disseminating monthly transcripts and updates and facilitating off-line participation; troubleshooting via telex, mail, and phone about log-on procedures; troubleshooting on-line about the use of the system and its special facilities; editing entries upon request (double entries, private messages entered as conference comments, mistakes within comments); entering 500-word summaries received by mail; consulting with moderators concerning overall plans and the timing of moderators' inputs; monitoring the discussion and the flow of communications; and organizing of face-to-face meetings.

Not all of these tasks need have been centralized. Individual participants could have been requested to handle their own arrangements. A number of participants involved in the organization could have had certain tasks designated to them. But, because this particular computer conference was the first of its kind in many ways with a relatively inexperienced user group, it was deemed appropri-

ate, to ensure better coordination, to have most of these duties looked after by a central body. The COM management was of a similar nature with the task of handling the day-to-day activities assigned to Mrs Francis Van Sant of the Karolinska Institutet, with Jacob Palme as the technical back-up expert.

## **The “Dispersed Workshop” Phase**

It is well-known that psychological factors such as the feeling that “there is someone out there listening” are important for the success of a computer conference. In the course of asynchronous communication, extending over many months and involving a fairly small number of active participants, this puts a very severe load on convenors, moderators, and co-moderators who may even have to do literature searching to respond to questions that are outside their narrow fields of specialization.

An alternative approach, to create a sense of participation in a dynamic activity, is to concentrate the exchange of messages and comments to a limited period of time. Such an effort was made in December when the Scandinavian committee organized a concluding 5-day “dispersed workshop” on the computer-conferencing theme. This exercise involved participation from Manchester, Frankfurt, Stockholm, Moscow, Bangkok, Manila, Tokyo, Washington, and Ottawa. Those cities either acted as nodes for local networks or as locations for small 4-hour, face-to-face daily meetings. Moscow, for instance, served as a node for a network stretching from Leningrad to Kiev and from Tallin to Tashkent, and Frankfurt used telephone-conferencing to involve a number of bioengineers, dispersed by a beet-campaign, in the information exchange. The timing of the different inputs was chosen in such a way that a natural round-the-globe flow of information was achieved. Ottawa and Washington started their meetings at 0900 hours and Manchester, Frankfurt, and Stockholm followed at 1300 hours on Monday. Moscow, on the other hand, did not join the system until 0900 hours on Tuesday, followed by Bangkok, Manila, and Tokyo at 1300 hours. On Tuesday at 0900 and 1300 hours, the Ottawa/Washington and Manchester/Frankfurt/Stockholm groups entered their second round, and so on.

As illustrated by the participation in this phase, which in fact became so intense that a planned Delphi-study had to be cancelled, there is much to be said for the “dispersed workshop” as a supporting activity in the course of an extended asynchronous computer conference.

## **Evaluation and Report Phase**

The initial plan for the evaluation of the computer conference involved three steps: obtain baseline data through a short questionnaire at the start of the exercise, obtain data for comparison purposes and analysis at the conclusion of the conference through a more extensive questionnaire (on-line), and evaluate the resulting transcript with respect to its scientific content. It became apparent, with the gradual increase in the number of participants and the small amount of participation through the early stages of the conference, that a new plan was required.

A three-pronged evaluation was planned with the collaboration and funding of the United Nations University (UNU). Jo Tombaugh, of the Department of Psychology of Carleton University, was identified to do an analysis on the social-psychological aspects of participation and to comment on possible technical improvements for facilitating networking with scientists in developing countries. Bjorn Olof Fabricius, of the Department of Microbiology of the University of Helsinki, was selected to evaluate the scientific content of the conference and to comment on the communication dynamics within the discussions. John Black was named to assess the technical aspects of access to the conference with special emphasis on the problems encountered by developing-country participants or potential participants.

A questionnaire to gather information useful to all the evaluators was constructed with inputs from the Organizing Committees, sample questionnaires from EIES, and a draft questionnaire produced by the UNU. Statistics on usage and costs were procured from EIES and COM. Other data were obtained from personal interviews and the transcript itself. This evaluation took place during the first half of 1984 and later chapters document the results.

Albeit that this exercise was undertaken on basically virgin ground, the implications for human resource requirements for organization and coordination should not be underestimated. Significant inputs are required. It is hoped that lessons learned from this experience, and documented in this report, will help to alleviate the organizational burden of any future undertaking of this nature.