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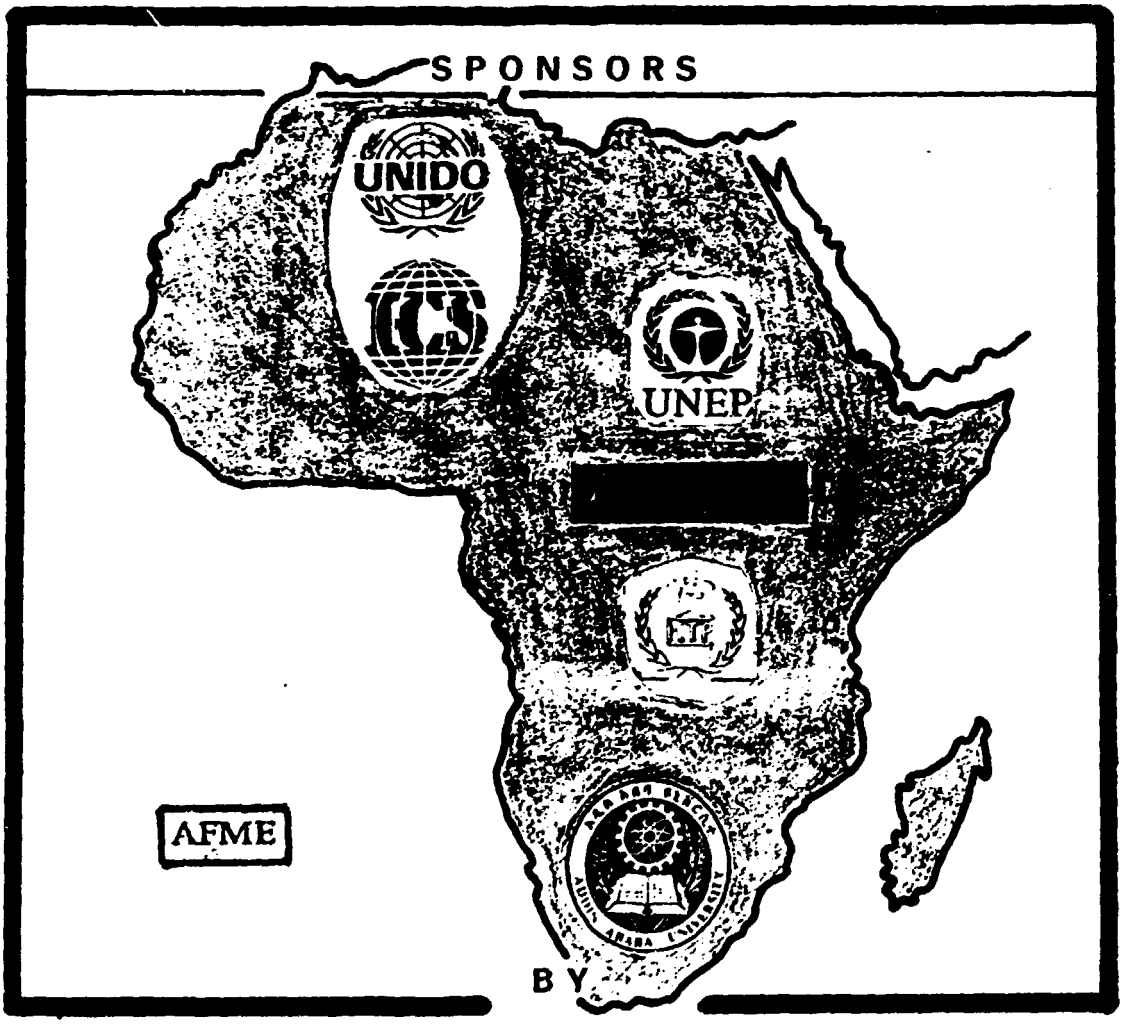
REPORT ON

The Scientific activities of "INTRODUCTORY MATHEMATICAL AND COMPUTER MODELLING COURSE FOR ECOLOGISTS IN AFRICA", 1 - 9 DECEMBER, 1992, FACULTY OF SCIENCE, ADDIS ABABA UNIVERSITY, ADDIS ABABA, ETHIOPIA.



BY

KIFLEMARIAM MELAKE

SECRETARY, A. F. M. E.

and DIRECTOR OF THE COURSE.

REPORT ON THE SCIENTIFIC ACTIVITIES

OF THE

Introductory Mathematical and Computer Modelling Course for Ecologists in Africa

1. BACKGROUND

The training course on "Introductory Mathematical and Computer Modelling" was devised and proposed by the "AFRICAN FORUM FOR MATHEMATICAL ECOLOGY (AFME) in November, 1990; Trieste, Italy.

It was proposed as part of the FORUM's initial activities by taking into account the nature, extent and magnitude of degradation of Africa's natural systems; considering the hazards that befell on all forms of life as a consequence of natural system's degradation; recognizing the utmost need of theoretical, methodological, and technical potential and know-how; affirming the ultimate necessity of trained and skilled human resource in the field of Mathematical Ecology in Africa and confirming the potential contribution of Mathematical Ecology as a tool to approach ecological problems in the continent.

The course mainly focused on the under listed three objectives.

- to bring together scientists working in the field of Biology, Medicine, Agriculture, Statistics, Mathematics, Environmental Physics, Environmental Chemistry, Economics, Geography, Sociology, Environmental Management, etc. in order to enhance multidisciplinary approaches to solving ecological problems in Africa.
- to introduce the present role of Mathematical and Computer modelling in carrying out ecological / environmental / developmental investigations in Africa; and

- to encourage the inclusion of Mathematical Ecology in the Curricula of African Institutions of Higher learning in Biological and Social Sciences.

The proposal's validity was kindly recognized by the ICS (IIEM) which incorporated it in its workshop and training activities of 1991-92. It was at last realised with the financial support and sponsorship of UNIDO/ICS, SAREC, ICTP/OPA, UNEP, the SAPAM and Science Faculty of Addis Ababa University.

Externally, the progress of the programme was directed and coordinated as well as was rendered with unreserved moral, technical and material support of Prof. Enrico Feoli (C.E.T.A., Italy) and the ICS office, Trieste, Italy. Mr. Elion-Mboussa, A. (Vice-Chairman, AFME) actively followed the progress and Kiflemariam Melake (Secretary, AFME) organized and directed it locally. Its coordination and materialization required persistent efforts and devotion.

2. COURSE CONTENT

The course embraced theoretical, methodological and technical aspects of Conservation, Epidemiology, Resource Management, Water Quality Management and Introductory Mathematics. Although the content of the course was highly diversified maximal efforts were made to deliberate basic scientific concepts of respective disciplines. Concepts of modelling and their practical utility either in research and training or in any venture to approach problematic environmental issues were significantly stressed. Speakers were mainly from Africa and Europe. Their preparations, presentations and ability to attract the attention of participants were found to be high. According to evaluative comments of participants (oral and written) processes of lecturing, discussions and problem assessments were rated excellent.

Topics that were covered within the duration include

On 2.1. **ECOLOGY, CONSERVATION AND RESOURCES**

a. Ecological problems in Tropical Areas.

b. Conservation and Applied Ecology in The Tropics

By Tewolde Berhan G.E., A.A.U., Ethiopia.

2.2. EPIDEMIOLOGY

a. Introduction to Epidemiological Modelling.

b. SI and SIR Models

c. SIS and SIRS Models.

d. Sexually transmitted diseases.

By L.S. Luboobi, Makerere University, Uganda.

2.3. **INTRODUCTORY MATHEMATICS**

a. Introduction to Modelling, Population Models and Framework of Modelling.

b. Linear and First Order Differential Equations.

c. Simple Interacting Populations and Equilibrium Analysis.

d. Stability and Classifications.

e. Prey-Predator Models/Competition/Epidemics.

By I.K. DONTWI, University of Kumasi, Ghana.

2.4. **ECOLOGICAL DATA ANALYSIS**

a. Analysis of Ecological Space - I

b. Analysis of Ecological Space - II

c. Modelling Vegetation Climate Interactions

d. Presentation of Multivariate Data Analysis Software I and II.

By Sun Chen Yong, IIEM, Trieste, Italy.

2.5. **MULTIVARIATE DATA ANALYSIS TECHNIQUES**

a. Ordination Methods and Data Analysis - I

b. Ordination Methods and Data Analysis - II

c. Demonstrations of Computer utilization and data analysis.

By Zerihun Woldu, A.A.U., Ethiopia.

2.6. ENVIRONMENTAL PROBLEMS AND LIFE

a. Ecological perspectives of environmental problems and life
b. Drought problems and Models for drought monitoring
c. "Drought hypothesis" and rates of environmental changes
d. Ecological monitoring, Management and "Information Theory".

By Kiflemariam Melake, A.A.U. Ethiopia.

2.7. WEATHER MODELS AND LONG RANGE FORECASTING

a. The Area Balancing Figure in Periodic Area Balancing (PAB) Technique.
b. Basic Theory on Periodic Area balancing (PAB) Technique
c. Demonstrations of the New Area Calculation Method (NACM) and major error sources of the PAB.

By J.G. Wairoto, Meteorology Department, Kenya.

2.8. ENVIRONMENT AND BIO-PHYSICAL PHENOMENA

a. Dispersion dynamics of two species in a heterogeneous space and Periodically fluctuating Environment - I
b. Dispersion dynamics of two species in a heterogeneous space and Periodically fluctuating Environment - II

By A. Elion - Mbotassa, DGRST/ORSTOM, Congo.

In addition to these lecture sessions:-

1. There took place computer demonstrations and practicals.
2. Participants presented brief reports dealing with their current activities. Their presentations not only enabled them to share their knowledge and experience, but also gave them the opportunity to evaluate their research techniques and methodology.
3. On Sunday December 6, 1992 (9:00 Am - 12:30 Pm) participants visited the Natural History Museum (A.A.U.) and the National Museum, Addis Ababa. Further visit was made to the National Institute of Health, Addis Ababa.

4. A separate discussion session gave the participants an opportunity to evaluate, comment and suggest on the activities, progresses, achievements and weaknesses of the Forum. Moreover, issues of environmental problems and shortage of trained human resource as well as the academic level of African Higher Institutions were assessed.

3. TIMING AND DURATION OF THE COURSE

The duration of the course was formerly planned to take place from 25 November, - 7 December, 1992. Then each lecture and practical was programmed with a time duration of 1 hour. A number of visits and excursion were also proposed. Nevertheless, at the final time of preparation there followed communication problems and late arrival of fund. Due to these, participants couldn't get their travel tickets to arrive on time. Certain unforeseen local organizational problems, relatively magnified the problem.

In order to solve these problems, the starting time of the course and its duration were changed to 1-9 December, 1992. These were accompanied by making the course intensive and by alloting a period of 1:30 hrs per lecture and/or practical. Daily academic activities started at 9:00 Am and ended at 5:30 Pm in most cases (but at 6:00 Pm in some cases) including lunch and coffee/tea breaks. The only free day was one-half a day on Sunday 6 December, 1992.

4. COMPOSITION OF PARTICIPANTS

A total of 26 Scientists and one supportive staff attended the course. (please find herewith attached a copy of the final list). This is 70.3% of the total 37 invited and expected number of speakers and participants. Of those who were not present, some regretted due to official or personal reasons, while some others attributed to communication problems eventhough their travel tickets were sent.

In terms of the diversity of field of specialization,

participants were from Botany, Zoology, Ecology, Mathematics, Geography, Epidemiology, Biophysics, Cartography and Environmental surveying, Medical health, Veterinary Science, Fisheries, Limnology, Biostatistics, environmental sciences and Forestry. The objectives to bring together a group of specialists from different disciplines undoubtedly was materialized.

This opportunity created an academic arena which facilitated mutual understanding among the participants and by and large they all unreservedly supported the proposed idea of multidisciplinary approach to ecological problems.

5. CONCLUSIVE REMARKS

This introductory course enabled to introduce the roles of Mathematical and Computer modelling in training, research and proactive or reactive measure to tackle ecological problems. It also facilitated the coming together of a group of African scientists of various different disciplines.

Mathematical Ecology as a branch of newly growing science and its contribution as a tool to ecological problems was little known not only in Africa at large, but also around the area where this course was conducted. The course provided a preliminary opportunity to introduce its essences and relevance in Institutions of Higher learning with special emphasis on Biological and social sciences.

Based on data from comments of participants, speakers, and auditing staff of A.A.U. as well as from its progress and outcome the course was a success. Its success makes happy not only the organizers but also all those who supported it financially, materially, technically and morally.

Moreover, speakers as well as participants have proposed that:-

a. All the sponsor organizations and individuals who did their best for the realization of this course be given their due respect and acknowledgement.

b. Such a course should continue regularly by correcting the problems encountered in this course and by incorporating various participants and speakers from other regions.

c. The teaching materials be binded as a proceeding of the course with the kind and unreserved cooperation of sponsor organizations.

d. the next activity of the FORUM be held in Kampala (Uganda) with its local organizer - Prof. L.S. Lubobi. However, the secretariat should remain stationed in Addis Ababa, Ethiopia.

e. The material, financial and technical problems of the FORUM be resolved through the active participation of its members and with the kind support of fund donating International Organizations - so that its long term goal could be realized.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY

INTERNATIONAL INSTITUTE FOR EARTH, ENVIRONMENTAL AND MARINE SCIENCES AND TECHNOLOGIES

Introductory Mathematical and Computer Modelling Course for Ecologists in Africa

1-9 December 1992

University of Addis Ababa,

Faculty of Science, Ethiopia

Preliminary Programme

Tuesday, 1 December

9:00	Welcoming address Teferi Gemetchu Head of the Biology Department
	Opening Professor Alemayehu Tefera President of the Addis Ababa University
	Presentation OEA Livingstone S. Luboobi
	Presentation of AFME A. Elion-Mboussa Vice Chairman of AFME
10:00	Coffee Break and Registration
11:00	Ecological Problems in Tropical Areas Tewolde Berhan G.E.
12:30	Lunch Break
14:00	Introduction to Epidemiological Modelling L.S. Luboobi

15:30 Coffee Break

16:00 Environmental Problems and Life - I
K.Malaka

Wednesday, 2 December

9:00 Analysis of Ecological Space
Sun Chang Yong

10:30 Coffee Break

11:00 SI and SIR Models
L.S. Luboobi

12:30 Lunch Break

14:00 Ordination Methods and Data Analysis (I.)
Zerihun Woldu

15:30 Coffee Break

16:00 Introduction to Modelling, Population Models and Framework of Modelling
I.K. Dontwi

Thursday, 3 December

9:00 Conservation and Applied Ecology in the Tropics
Tewolde Berhan G.E.

10:30 Coffee Break

11:00 SIS and SIRS Models
L.S. Luboobi

12:30 Lunch Break

14:00 Linear and First Order Differential Equations
I.K. Dontwi

15:30 Coffee Break

16:00 Modelling Vegetation Climate Interactions
Sun Cheng Yong

Friday, 4 December

[illegible]

[illegible]

[illegible]

14:00 Presentation of Multivariate Data Analysis Software
(I.) Sun Cheng Yong

15:30 Coffee Break

16:00 Environmental Problems in Africa/ARSO and its Activities.
Group Discussion
Elion-Mboussa

Saturday, 5 December

9:00 Stability and classification
I.K. Dontwi

10:30 Coffee Break

[illegible] Long Range Forecasting Weather Models I
J.G. Wairoto

12:30 Lunch

14:00 Presentation of Multivariate Data Analysis Software II and Computer demonstrations and tutorials.

Sunday, 6 December

9:00 - 12:30 Visits

Monday, 7 December

9:00 Prey-Predator Models/Competition/Epidemics
I.K. Dontwi

10:30 Coffee Break

11:00 Long range Forecasting Weather Models II
J.G. Wairoto

12:30 Lunch Break

14:00 Environmental Problems and life - II
K. Melake

15:30 Coffee Break

16:00 Ordination Methods and Data Analysis
Z. Woldu

Tuesday, 8 December

9:00 Long range Forecasting Weather Models III
J.G. Wairoto

10:30 Coffee Break

11:00 Discussion Problems of two species
[illegible]

12:30 Lunch Break

14:00 Computer Demonstrations
Zerihun Woldu

15:30 Coffee Break

16:00 Presentation by participants

Wednesday, 9 December

9:00 Environmental problems and life III-IV
K. Melake

10:30 Coffee Break

11:00 Dispersion Dynamics of two species II
A. Elion - Mboussa

12:30 Lunch Break

14:00 Presentation by participants

16:00 - 18:00 Discussion and Closing

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INTERNATIONAL INSTITUTE FOR EARTH, ENVIRONMENTAL AND MARINE SCIENCES AND TECHNOLOGIES

Introductory Mathematical and Computer Modelling Course for Ecologists in Africa

UNIVERSITY OF ADDIS ABABA, DEPARTMENT OF BIOLOGY

25 November - 7 December, 1992

LIST OF PARTICIPANTS

1	Prof. Enrico Feoli	CD	International Institute for Earth, Environmental and Marine Sciences and Technologies - IIEM Via Grignano 9 34100 Trieste	Italy
2	Mr. Kiflemariam Melake	CD	University of Addis Ababa Department of Biology P.O. Box 1176 Addis Ababa	Ethiopia
3	Dr. Berhan G.E. Tewolde	CD	University of Addis Ababa Department of Biology P.O. Box 1176 Addis Ababa	Ethiopia
4	Mr. Sun Chen Yong	CL	International Institute for Earth, Environmental and Marine Sciences and Technologies - IIEM Via Grignano 9 34100 Trieste	Italy
5	Dr. Isaac K. Dontwi	CL	University of Science and Technology Department of Mathematics Kumasi	Ghana
6	Dr. Livingstone S. Luboobi	CL	Makerere University Department of Mathematics P.O. Box 7062 Kampala	Uganda

CD - Course Director
CL - Course Lecturer
CP - Course Participant
CT - Course Trainee

7	Dr. Zerihun Woldu	CL	University of Addis Ababa Department of Biology P.O. Box 1176 Addis Ababa	Ethiopia
8	Mr. Gariel Abako	CP	Centre de Recherche Veterinaire et Zootecnique - CRVZ B.P. 235 Brazzaville	Congo
9	Mr. J.O. Ayieko	CP	Egerton University P.O. Box 536 Njoro	Kenya
10	Mr. Albert Elion-Mboussa	CP	Direction Generale de la Recherche Scientifique et Technique - DGRST/ORSTOM B.P. 181 Brazzaville	Congo
11	Dr. Seyoum Mengistu	CP	Addis Ababa University Department of Biology P.O. Box 1176 Addis Ababa	Ethiopia
12	Mr. Lisanwork Nigatu	CP	Addis Ababa University School of Graduate Studies P.O. Box 1176 Addis Ababa	Ethiopia
13	Mr. Mathias Ondongo	CP	Centre de Recherche Geographique et Reproduction Cartographique - CERGEC B.P. 125 Brazzaville	Congo
14	Mr. F.M. Salum	CP	Amani Medical Research Centre Box 4 Amani	Tanzania
15	Mr. Kibrom Tekele	CP	Addis Ababa University School of Graduate Studies P.O. Box 1176 Addis Ababa	Ethiopia
16	Mr. J.G. Wairoto	CP	Institute of Meteorology Department of Meteorology P.O. Box 30259 Nairobi	Kenya
17	Mr. Asferachew ABATE	CT	Addis Ababa University School of Graduate Studies P.O. Box 1176 Addis Ababa	Ethiopia
18	Ms. Tsehai Assefa	CT	National Research Institute of Health P.O. Box 1242 Addis Ababa	Ethiopia

CD - Course Director
CL - Course Lecturer
CP - Course Participant
CT - Course Trainee

19	Mr. Tesfaye Bekele	CT	Ethiopian Science and Technolgy Commission Food, Agriculture and Environment Research Department P.O. Box 2490 Addis Ababa	Ethiopia
20	Mr. Sirak Bishaw	CT	Addis Ababa University School of Graduate Studies P.O. Box 1176 Addis Ababa	Ethiopia
21	Mr. Amare Dejene	CT	National Research Institute of Health P.O. Box 1242 Addis Ababa	Ethiopia
22	Mr. Abebe Getahun	CT	Addis Ababa University Department of Biology P.O. Box 1176 Addis Ababa	Ethiopia
23	Mr. Amaha Kebede	CT	National Research Institute of Health P.O. Box 1242 Addis Ababa	Ethiopia
24	Mr. Yosef Mamo	CT	Wondo Genet College of Forestry P.O. Box 128 Shashemene	Ethiopia
25	Mr. Wondatir Nigatu	CT	National Research Institute of Health P.O. Box 1242 Addis Ababa	Ethiopia

CD - Course Director
CL - Course Lecturer
CP- Course Participant
CT - Course Trainee

Ecologist . . .

Science Faculty of the Addis Ababa University (AAU).

Attended by scientists from six African countries, the course will focus on aspects concerning mathematical and computer techniques for analyzing and solving environmental problems related to sustainable development activities.

Speaking at the opening session, [illegible] to [illegible] their efforts on an international level for the well-being of the future generations. He said that the introductory course will give a basic experience to young researchers on the importance of mathematical ecology as a tool to approach and suggest solu-

(Contd. on page 6 Col. 3)

Swedish Agency for Research Cooperation with Developing Countries, and the Office for External Activities (ICTP) have participated in organizing the course. Lectures will be given by scientists from African and European countries.

AAU President addressing the gathering.

(Engda's order)

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