Evaluation Report

on the

INPUT/OUTPUT ANALYSIS WORKSHOP

held at

Islamabad

January 31 - Feruary 18, 1988

Instructors:

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ECONOMIC ANALYSIS NETWORK

Directorate of Agricultural Policy,
Ministry of Food, Agriculture and Cooperatives

Chemonics International Consulting Division
Colorado State University

INTRODUCTION

The Input/Output Analysis Workshop was organized to provide an introduction to the fundamental theory and analytical capability of Input/Output modeling. The intended participants of the workshop were the compilers and users of I/O models. Fifteen participants enrolled and graduated from the course. Instruction was provided by Dr. Mubarik Ali of EAN and R. G. Taylor of Colorado State University, USA.

This report summarizes various observations made during the workshop and highlights selected issues of interest to EAN/DAP as they contemplate subsequent workshops on I/O or other topics.

GOALS

The goals of the course were to provide the students with first the theory of I/O and then the tools to effectively and correctly implement the applications of I/O models. I/O can be though of as first an accounting technique, second a model of a production function of an economy and third as a subset of a general liner models of constrained optimization. The goals of instruction attempted to achieve an understanding of these aspects of Input/Output.

The first specific goal was to provide the students with the fundamentals of the theory of I/O accounting and modeling. In particular the techniques of applied importance were stressed. These techniques were the overview of the practical aspects of construction and interpretation of I/O accounts. No attempt was made to develop exact guide lines for construction of I/O accounts or commodity by industry accounting for Pakistan. The varied needs of the participants (in use of I/O models as opposed to accounting) and time constraints did not permit accounting applications to be discussed in detail. The second part of the theory was to develop I/O as a model. In this portion of the theory the applied aspects of multiplier and impact analysis were stressed in an attempt to provide the students with tools to analyze specific problems. The last portion of the theory dealt with I/O in a Linear Programming framework. Again, applied aspects were stressed.

The second specific goal was to provide the students with a working knowledge of the microcomputer techniques to conduct I/O research and policy evaluation. The computational needs of I/O analysis require computers to analysis even the simplest of class examples, let alone the Pakistan I/O models. Lotus and IMS (an I/O analysis program) were used through out the workshop.

WORKSHOP STRUCTURE

In keeping with the workshop's goals the daily schedule of the workshop was broken into two portions: the first was a theory lecture and second the hands-on microcomputer exercises.

LECTURES: The theory lectures were a preface to the applied analysis portion of the workshop conducted with the aid of microcomputers. Usually the theory lecture was conducted in the morning hours or immediately following lunch in the case of a very short lecture. These lectures were conducted in the lecture room.

EXERCISES: Even the simplest I/O problems require the use of matrix inversion which requires the use of microcomputers. The course was therefore prefaced with an intensive introduction to the use of LOTUS matrix routines. Further in the course a I/O computer program IMS was used by the students. The last week was devoted to I/O and LP and at this time a linear programming package (LP88) was used. Thus the students became fluent in three computer software packages-- LOTUS, IMS, and LP88.

The microcomputer labs were punctuated by frequent mini-lectures as problems with a particular applied problem appeared or the class moved on to a fresh example. Constant supervision and guidance were provided by both instructors through the microcomputer labs.

EXAMS: Two full scale exams were given in the course. The first exam was at the end of the first week and the second exam was given at the end of the second week. The exams had an open book portion comprised of microcomputer examples and a closed book section that reviewed key concepts of the past week. These exams were extremely important for the instructors as well as the students. The first exam brought to the instructors attention the need for a full day of review to reinforce several key concepts and exercises before continuing. But more importantly the exams showed each student his or her weaknesses. The time and effort expenses used in the exams paid dividends. These exams showed the students that this course was not a round-table discussion but rather a formal course at the Masters level and resulted in the students putting extra effort into the course.

STUDENT PRESENTATIONS: The final afternoon of the workshop was allocated to student presentations. Since many of the students worked for FBS and had access to basic data on the PIDE I/O model and national statistics several students volunteered to give class presentations on original research in an I/O topic. The presentations were excellent and gave the whole class a chance to exchange ideas concerning Pakistan.

SYLLABUS: The following is the actual schedule with a detailed syllabus followed for the entire course showing the mix of theory lectures and microcomputer exercises that followed each lecture topic.

EAN PROJECT APPLIED ECONOMIC ANALYSIS WORKSHOP

INPUT-OUTPUT ANALYSIS

SCHEDULE AND SYLLABUS

JAN 31

AM

Registration
Introductions
Overview of course
Introduction to Microcomputers (Dr. Riaz Lodhi)

PM

Fundamentals of matrix operations
Lecture: Methods of matrix operations (Taylor)
Exercise: Individual handouts (Mubarik)

FEB 1

AM

Matrix operations continued
Exercise: Lotus matrix routine (Mubarik)

Introduction to I/O as an accounting system
Lecture: Overview and History of I/O (Taylor)

PM

Lecture: Assumptions of I/O accounting (Taylor)
Lecture: Transactions matrix (Taylor)
Exercise: Example accounts and placement of examples (Mubarik)

FEB 2

AM

Pakistan I/O accounting system
Lecture: Description of Pakistan I/O accounts (Mubarik)
Exercise: Bring up 18 Pakistan on computer (Mubarik)

PM

Lecture: Relationship of I/O to NIPA (Taylor)
Exercise: Derive the Pakistan NIPA from Pakistan I/O (Mubarik)

FEB 3
AM

Introduction to I/O as a production model
Lecture: Assumption of I/O production function (Taylor)
Lecture: Technical coefficients and output solution (Taylor)

PM

Exercise: Lotus sample I/O (Mubarik)

FEB 4
AM

Linkage analysis
Lecture: Backward and Forward linkages (Taylor)
Lecture: Open vs closed models (Taylor)

PM

Exercise: Lotus sample I/O (Mubarik)

FEB 5 FRIDAY HOLIDAY

FEB 6 SATURDAY HOLIDAY

FEB 7
AM

EXAM

Past week review (Taylor)

PM
Multiplier analysis
Lecture: Output multipliers (Taylor)
Exercise: Multiplier analysis with Lotus (Mubarik)

FEB 8
AM

Lecture: Income and Resource multipliers (Taylor)
Exercise Multiplier analysis with Lotus (Mubarik)

PM Exercises: Continued examples of resource and income multipliers with IMS and Lotus

FEB 9
AM

TEST REVIEW

PM

REVIEW OF TEST EXAMPLES

FEB 10

AM Price Inflation

Lecture: Price inflation multipliers (Taylor)

PM

Exercise: price inflation multipliers with Lotus (Mubarik)

FEB 11

AM

Impact Analysis

Lecture: Assumptions and methods of multiplier impact analysis (Taylor)

Impact analysis beyond simple multipliers

Lecture: Modeling impacts of new industry (Taylor)

PM

Exercise: Lotus sample (Mubarik)

FEB 12 FRIDAY HOLIDAY

FEB 13 SATURDAY HOLIDAY

FEB 14

AM

EXAM

Past Week Review (Taylor)

PM

Introduction to Linear Programming

Lecture: Introduction to LP (Taylor)

Lecture: Example graphical LP problem (Mubarik)

FEB 16

AM Lecture: Continuation of LP graphical and numerical solution and Duality (Mubarik)

Exercise: Example of duality solution with LP88 (Mubarik)

PM

Exercise: Continued duality with LP88 (Mubarik)

FEB 17

AM

LP and I/O integration

Lecture: LP and I/O integration (Mubarik)

Exercises: I/O and LP with LP88 (Taylor)

PM

Exercises: LP and I/O under various objective functions and constraints (Mubarik and Taylor)

Lecture: Student presentations

FEB 18 COMMENCEMENT

THE PARTICIPANTS

Fifteen students enrolled and graduated from the course. Their names, titles and home institutions are listed in Annex A. A problem arose from the diversity of the participant's previous training and expectations of the course content. The first problem was that some previous experience was needed in the use of microcomputers. Only three of the students had any experience, thus intensive instruction was needed for the first week of the course to become literate with computers before instruction in I/O could continue at full speed.

The second problem was some of the class members had taken previous courses on I/O. These previous courses seemed to focus more on I/O accounts than on quantitative use of an I/O model. To these students there was some reduncey in the first week. However, in following weeks the material was almost all new and certainly the ability to apply I/O concepts with microcomputers was not redunant with previous workshops.

RECOMMENDATIONS

To insure continued success in the teaching of applied I/O analysis the following recommendations were developed.

1. Noting that the participants universally lacked skills in matrix algebra or were in need of a refresher and with the exception of one person had never used Lotus, we would recommend that instruction be given prior to the I/O workshop that integrates these two subjects. Also if the time is available instruction in LP and an LP microcomputer program also be mandatory.

2. The enrollment criteria of the students prior to the course were to be at MS level in economics. Few of the students met this requirement and we would recommend that greater economics or quantitative skills be required for entrance.

3. We recommend rigorous enforcement of no more that two students per microcomputer. We noticed that the two days that one of the machines was down several students suffered in lack of skills in those areas.

4. A month in advance several days should given to the instructor to compile materials and construct a tentative outline for EAN approval.

5. That the excellent on site assistance continue to be provided each course. In particular, an instructor with the EAN project that can provide Pakistan applied problems, work with the students in Urdu when necessary, and provide lectures on applied problems in particular.

6. Detailed syllabus and perhaps background readings should be made available to participants in advance.

7. Pakistani experts should be involved as guest lecturers to provide the students with awareness and problems of I/O in Pakistan.

PARTICIPANT EVALUATION

On the last day of class, participants completed an evaluation questionnaire on the workshop. The questionnaire used and summarized results are listed in Annex B. Most of the numerical answers are self explanatory. Many of the ideas contain suggestions for workshop improvement in the future. Several are specific to the I/O analysis topic while others are generic.

ANNEX A

LIST OF PARTICIPANTS

INPUT-OUTPUT ANALYSIS WORKSHOP
FAN PROJECT OFFICE
ISLAMABAD

JANUARY 31-FEBRUARY 18, 1988

S.NO	NOMINATING ORGANIZATION	NOMINEES	DESIGNATION
1	Directorate of Agricultural Policy	i Mr. Rao Shafique-ur-Rehman	Research Economist
2	Federal Bureau of Statistics	i Mr. S. Islam Ahmad	Director
		ii Mr. Asim Jamal	Director
		iii Mr. Mohammad Ajmal	Chief Statistical Officer
		iv Mr. MOhammad Nisar Ahmad	Chief Statistical Officer
		v Mr. Imamuddin Sheikh	Chief Statistical Officer
		vi Mr. Mansoor Ahmad	Statistical Officer
		vii Mr. Abdul Latif Abro	Statistical Officer
		viii Miss Khalida Nishat	Statistical Officer
		ix Mr. Ali Ahmad Jan	Statistical Officer
		x Mr. Zia ullah Khan	Statistical Officer
		xi Mr. Abdul Hakim Sheikh	Statistical Officer
		xii Mr. Shahid Kazmi	Statistical Officer
3	Pakistan Institute of Development Economics (PIDE).	i Miss Nighat Kazmi	Staff Economist
4	Applied Economics Research Centre, University of Karachi, Karachi	i Mr. Amjad Ali	Research Officer

ANNEX B

PARTICIPANT WORKSHOP EVALUATION
FOR
INPUT/OUTPUT ANALYSIS WORKSHOP

Please evaluate the effectiveness of this course. Your response will hope EAN and DAP improve this course and in the future.

Please write your comments as clearly as possible, and do not put your name on the questionnaire.

PLEASE CHECK OR CIRCLE YOUR RESPONSE

A. COURSE ENROLLMENT AND ORIENTATION

Before arriving at the class site:

	Yes	No
(1) Were the general objectives of the seminar clear?	80%	20%
(2) Were the arrangements for the seminar clear?	93%	7%
(3) Did your previous experience or training adequately prepare you to:		
(a) Read materials?	80%	20%
(b) Understand lectures?	93%	7%
(c) Participate in discussions?	87%	13%
(4) Was this course appropriate for your professional responsibilities?	93%	7%

(5) How help was your orientation at the site of the workshop?	Not at all helpful 1	2	Moderately helpful 3	4	Very helpful 5	MEAN 4.73

Please make any suggestions you feel appropriate regarding pre - workshop procedures:_____Four participants suggested distributing reading materials in advance, two participants suggested arranging students trips, and one participant suggested providing equal computer time to everyone.

B. TRAINING ENVIRONMENT AND SUPPORT ARRANGEMENTS

Please indicate your satisfaction with the following support arrangements:

	Not at all Satisfied		Moderately Satisfied		Very Satisfied	MEAN
Accommodations (for those who stayed in hotel)	1	2	3	4	5	0.71
Training facilities						
1) reading materials	1	2	3	4	5	4.62
2) overheads	1	2	3	4	5	4.54
3) computers	1	2	3	4	5	3.92
4) refreshments	1	2	3	4	5	4.38
Administrative support by training site personnel	1	2	3	4	5	4.64

Please comment if desired on the above arrangements: Two students suggested to fix the computer time for each participant or provide computer for everyone, one student suggested to have fifteen minutes tea break in the workshop

C. TRAINING OBJECTIVES

Please indicate your achievement of each training objective listed below:

Participants will develop the knowledge and skills to:	Not Achieved		Partially Achieved		Fully Achieved	MEAN
OBJECTIVE 1						
Understand the fundamentals of I/O accounting procedures	1	2	3	4	5	3.87
OBJECTIVE 2						
Understand multiplier and linkage analysis	1	2	3	4	5	4.20

Participants will develop the knowledge and skills to:	Not Achieved		Partially Achieved		Fully Achieved	MEAN
OBJECTIVE 3 Increased knowledge of impact analysis with examples for Pakistan	1	2	3	4	5	3.87
OBJECTIVE 4 Understand the integration of LP and I/O methods	1	2	3	4	5	3.47
OBJECTIVE 5 Increased ability to apply I/O and the analysis tools to Pakistan issue	1	2	3	4	5	3.47
OBJECTIVE 6 Gain a working knowledge microcomputer techniques in I/O	1	2	3	4	5	3.67

Comments/sugestions_____ Five participants suggested increasing the duration of the workshop to have more indepth discussions on linear programming and better working knowledge of PC's, one participant suggested providing a separate PC for every participant and one participant suggested arranging PC's in their offices.

D. INSTRUCTORS

(1) First Instructor: R. G. Taylor

	Poor		Satisfactory		Excellent	MEAN
Knowledge of subject matter	1	2	3	4	5	4.53
Clarity of presentation	1	2	3	4	5	4.40

(1) First Instructor: R. G. Taylor (continued)

	Poor			Satisfactory	Excellent	MEAN
Ability to relate sibkect matter to developing-country situations	1	2	3	4	5	4.00
Answer students questions clearly and effectively	1	2	3	4	5	4.53
Promptness in starting and ending class	1	2	3	4	5	4.47
Promptness in starting and ending class	1	2	3	4	5	4.47
OVERALL EFFECTIVENESS	1	2	3	4	5	4.33

Comments: _____Three students explained that Dr. Taylor is very lucid in his explanation andconcepts are very clear and he is an excellent teacher

(2) Second Instructor: Dr. Mubarik Ali

	Poor			Satisfactory	Excellent	MEAN
Knowledge of subject matter	1	2	3	4	5	4.67
Clarity of presentation	1	2	3	4	5	4.53
Ability to relate sibkect matter to developing-country situations	1	2	3	4	5	4.47
Answer students questions clearly and effectively	1	2	3	4	5	4.53
Promptness in starting and ending class	1	2	3	4	5	4.33
Promptness in starting and ending class	1	2	3	4	5	4.33
OVERALL EFFECTIVENESS	1	2	3	4	5	4.29

Comments: _____ Three students explained that Dr. Ali has a thorough knowledge about the subject matter, has been very helpful in teaching micro-computer routines and is an excellent teacher.

E. ORGANIZATION AND CONDUCT OF PROGRAMME

(1) How helpful were the following activities in facilitating your learning?	Not at all Helpful		Moderately Helpful		Very Helpful	MEAN
Lectures	1	2	3	4	5	4.27
Microcimputer training	1	2	3	4	5	4.33
Lecture and computer examples	1	2	3	4	5	4.67
Individual consultation with instructors	1	2	3	4	5	4.27
Class discussion	1	2	3	4	5	4.27

Comments:_____ One student suggested maintaining participant contacts after workshop.

(2) Was the amount of time devoted to each of the following:	Too little		About Right		Too Much	MEAN
Lectures	1	2	3	4	5	3.13
Microcomputer Examples	1	2	3	4	5	3.00
Individual consultation with instructors	1	2	3	4	5	3.00
Microcomputer Training	1	2	3	4	5	2.93

Comments: _____One student commented that the duration of the workshop was too short for such an extensive course.

	Too short		About right		Too long	MEAN
(3) Was the daily Schedule:	1		2		3	2.27
(4) Was the overall Length of course:	1		2		3	1.20
(5) Was the level of presentation:	1		2		3	1.87

If not, what would you change?_____ One student suggested increasing the workshop time to one month and another student suggested a two-month course with a daily schedule from nine to two.

F. MATERIALS

(1) How helpful were:	Not at all Helpful		Moderately Satisfied		Very Satisfied	MEAN
(a) the Training manual?	1	2	3	4	5	4.20
(b) the overheads?	1	2	3	4	5	3.80
(c) class handouts?	1	2	3	4	5	4.27

(2) Do you have any suggestions for improvement or use of these materials? One student suggested showing a VCR film regarding the subject matter and another student suggested giving training pads and pencils more liberally.

G. COURSE CONTENT

For this course what topics would you suggest to:

Expand: Three students suggested to expand the Linear Programming for I/O analysis, three students suggested to expand the discussion on Pakistani I/O table and it's analysis and another student to increase discussion time on multipliers.

Add: Five students suggested to add the regional I/O model in the analysis and

Shorten: None

Omit: None

	Not at all Relevant		Moderately Satisfied		Very Satisfied	MEAN
(1) How relevant to your work were the issues and problems discussed?	1	2	3	4	5	3.67

Comments: None

H. OVERALL SATISFACTION

	Not at all Relevant		Moderately Satisfied		Very Satisfied	MEAN
(1) Please indicate your overall satisfaction with the course:	1	2	3	4	5	4.13

Comments: One student mentioned that the workshop has given such knowledge and first of it's kind.

(2) Would you recommend this course to other participants with backgrounds and interests similar to yours?

Yes	No
100%	0%

DO YOU HAVE ANY FURTHER COMMENTS? One student thinks the course would have been much more satisfactory had it been one week long, another student wants to include more detail of the course without mentioning particular items to be included. Another student mentioned wanting closer discussion among various professionals working in the field.

I. PARTICIPANT DATA

The following information allows us to adopt courses presentations to match participants' backgrounds and experiences. We should appreciate any information you are willing to provide.

(1) Do you work for (check those applicable)

Federal Government	13	Parastatal	_____
Provincial Government	_____	University	_____
Private Sector	_____	Research Agency	2

(2) Please check the highest academic level you have achieved (or its equivalent):

None B.A./B.B.Sc. M.A/M.Sc (15)

(3) What is your primary professional or educational field?

statistician/economist (13) economist (2)

(4) Approximately how many years of work experience do you have?

MEAN -- 9.33 years

(5) Have you attended any other workshops on I/O	Yes	NO
	53%	47%

If yes, how would you compare this workshop with the previous?

Three of the students said this workshop was better than the previous one; another said that it was useful with reference to the use of PC's; one said that it gave sufficient knowledge about the subject matter; another wrote that it was useful in constructing I/O table for Pakistan; and another said that this workshop gave more emphasis on theory than the previous one and taught how to prepare and use matrices.