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An illustrative framework and methodology designed for projects imbedded in complex systems and characterized by dynamic interrelationships. The analytical approach entails five major steps: 1) delineation of decision points and objectives; 2) delineation of project activities; 3) delineation of socioeconomic and technical structure (i.e. the direct and indirect relationship of project inputs and assumptions to the objectives); 4) determination of key variables (or parameters) and data requirements; and 5) impact analysis and evaluation by dynamic benefit/cost methods. Part I presents the basic framework and methodology of the approach, while Part II presents an illustrative empirical application to the North Shaba (Zaire) Maize Production Project.

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AN APPROACH FOR ASSESSING RURAL DEVELOPMENT PROJECTS

PART I. BASIC FRAMEWORK AND METHODOLOGY

by

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Prepared for the Agency for International Development
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Methodology for Assessing Rural Development Projects

International Statistical Programs Center
Bureau of the Census
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AN APPROACH FOR ASSESSING RURAL DEVELOPMENT PROJECTS

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AN APPROACH FOR ASSESSING RURAL DEVELOPMENT PROJECTS

PART I. BASIC FRAMEWORK AND METHODOLOGY

A. INTRODUCTION

The term "assessment" has been used at various times to encompass pre-implementation appraisal, implementation monitoring, and interim and ex post evaluation. These usages reflect differences with respect to point of time, information availability, level of detail, and specific purpose. Pre-project appraisal operates with limited information to provide a somewhat aggregative prediction of cause/effect relationships relevant to a specific development problem situation; monitoring operates with information continually improving in relevant detail and validity to meet management decisionmaking needs with less emphasis on broader development goals or purposes; interim and ex post evaluation operates after implementation (in part or in total), again in the broader context of development objectives and cause/effect relationships when information availability will be at a maximum. As used here, assessment is taken to mean that activity which attempts prior to or after implementation to determine the results associated with various potential or actual project actions. The framework to be presented below is intended to emphasize the broader aspects of appraisal/evaluation, recognizing that a close information system interrelationship to implementation monitoring is necessary for a properly consistent assessment approach.

Rural development projects tend to present special problems for assessment because their action nature as well as their intended impact is generally different from those of straightforward capital projects. Rural development objectives are often specified in terms of improvement of rural well-being and sustainable local area development capability. Project actions tend to consciously deal more directly with target group individual aspirations, social action propensities, and similar characteristics of the development process. The process of rural development involves the interrelationship of many factors which are both difficult to specify and measure as well as complex in their basic social, economic, and technical characteristics. A major aspect of their complexity is their dynamic nature -- that is, the relationships among specific factors or variables may change during the course of the project, often as a result of project action. For example, resources required to extend a technology to the first potential acceptor will be different from those required for the later potential acceptors. Whether the requirements are less or more will depend upon many interrelated factors. The usual techniques for project assessment do not adequately deal with these more complex dynamic interrelationships.

Yet an appropriate rural development benefit/cost analysis approach at the project or program level is virtually unknown in both the literature and in actual practice. Economists, sociologists, and others concerned with the assessment of social and economic development actions have generally not addressed themselves to the problem because it requires an interdisciplinary expertise. Concern with explicit specification and

quantification is felt by some development planners to be unjustified. The argument is sometimes made that project planners and managers with their intuitive grasp of development situations are in a better position to make valid project assessments and related decisions without such analytical tools. Massive simulation models have been costly to construct and to operate. Attempts at more explicit measurement and analysis of social and economic interrelationships have tended to be too complex, and the cost of additional information provided to individual project-level decisionmakers has tended to exceed the benefit obtained.

It is not necessary to consider a new framework and methodology for assessing rural development projects as a replacement for existing techniques. Rather, a more general approach may be developed to complement existing methods when their underlying assumptions are more tenuous and less relevant to the real world. The value of such an approach may be its recognition of the complex and interdisciplinary nature of the development process. To be operational, however, an appropriate methodology must acknowledge the need for compromise. It is neither necessary nor useful to collect and analyze complete information concerning a project and its environment. How much and what kind of information is desirable can be ascertained by giving greater attention to the relationship between information and the decisionmaking activities. Principles can be developed for dealing with poor data and potential information error. For example, uncertain knowledge of potential acceptance of innovations in a project area does not necessarily

indicate only the options of either proceeding as though the knowledge is more certain than it is or engaging in major primary data collection. We may also use our experience with other projects to indicate the general nature of potential innovation acceptance curves. Values of some key variables and some estimate of their relation to such curves may well provide a more useful projection of acceptance than either trend extrapolation or simulation using a complex and detailed structural model. It is this compromise that we seek -- more valid and defensible than "back-of-the-envelope" methods, and yet operational for the project-level decisionmaker in terms of calculation complexity and data availability.

The International Statistical Programs Center, U.S. Bureau of the Census (BuCen), has initiated work on the development, testing, and initial dissemination of a basic rural development information processing and analytical methodology under a Resources Support Services Agreement with the Office of Agriculture, Technical Assistance Bureau, U.S. Agency for International Development (TA/AG). This methodology is being structured for use with currently or potentially available data of the developing countries; it will also take account of project management activities of the AID Missions and/or host countries. Its purpose is to facilitate on-site, ad hoc, cost-effective assessment of potential and actual benefits and costs of specific programs and projects intended to increase the well-being of the rural poor. Work has been initiated along two lines: initial system development; and field testing, modification, and implementation in cooperation with selected AID Missions and/or host countries.

The present report was developed as a by-product of this TA/AG-BuCen effort. Part I presents a basic framework and methodology, while Part II presents an illustrative empirical application to the North Shaba (Zaire) Integrated Maize Production Project.

B. OBJECTIVE

There is thus a recognized need for an operational benefit/cost analytical methodology that will serve as a practical policy tool to assess projects imbedded in complex systems and characterized by dynamic interrelationships. While various aspects of the TA/AG-BuCen approach have been used in various contexts, they have not been brought together into an integrated system that is easily accessible to potential users. The intent of the present study is to document the application aspects of this approach in such a way as to make the general methodology comprehensible to AID Mission and host-country officials who might collaborate in its further development. In this context, the present study will develop and document an illustrative framework and methodology for assessing rural development projects in terms of the achievement of specified developing country sector and social objectives (goals and purposes).

C. APPROACH

In brief, the approach entails the following steps:

- delineation of decision points and objectives;
- delineation of project activities;
- delineation of socioeconomic and technical structure (i.e., the relationship of project inputs and assumptions to the objectives);
- determination of key variables and parameters and data requirements;
- impact analysis and evaluation by dynamic benefit/cost methods.

Application of the approach involves an iterative process particularly as concerns delineation of project activities, delineation of the underlying socioeconomic and technical structure, and determination of key relationship values. In addition, the general step sequence depends in part upon whether a pre-implementation or post-implementation assessment is being undertaken. In pre-implementation the delineation of project activities will generally follow estimation of critical "bottleneck" factors and other key variables and parameters.

The nature of tabular and graphic presentation, data formats, calculation procedures, etc., appropriate for application will be different according to the particular characteristics and requirements for each project. The instruments presented in the discussion below must therefore be considered purely illustrative. Moreover, in that an illustrative empirical application of the approach will be presented in Part II of the present study, detailed presentation of specific instruments is felt to be unwarranted at this point.

1. Delineation of decision points and objectives

In AID usage, a development project is the total discrete endeavor to create, through the provision of personnel, equipment, and/or capital funds, an explicit product or condition directly related to a discrete development problem (or set of problems). The specific problem becomes identified in the course of carrying out sector assessments and preparing overall development strategies for the Development Assistance Program (DAP). In the course of considering alternative solutions and in selecting a preferred course of action the problem to be addressed will often be redefined. A particular course of action will generally solve certain aspects of the problem while other aspects will remain. The given problem for which a project is identified and proposed will generally be a subset of the more general problem (or problem set) initially considered. Consequently, the explicitly stated goals and purposes will be a subset of the total array of national objectives and concerns which remain implied. Rural development project assessments will emphasize the stated goals and purposes but should also take into account the unstated goals and purposes.

The extent to which one or another goal or purpose should be considered in an assessment should be determined by its relevance to the decisionmaker(s) for whom the assessment is being conducted. For instance, the interests of a host-country Ministry of Finance will usually include the short- and long-term effects of project actions on the balance of payments and on the current and potential tax base. The interests of a Ministry of Agriculture will include the short- and long-term effects on food and industrial crop production and marketing.

Whether for political or other reasons, the interests of AID and other donor agencies will include some weighted array of these host-country interests as well as other interests to which they may give special emphasis -- e.g., the short- and long-term effects on target groups and especially the less-advantaged segments of LDC societies.

A first task then is to identify the various decision points that are relevant to the project assessment as well as the particular concerns that these entities may have. In actual application, this delineation of decision points and objectives should be developed in a collaborative manner with the host-country and AID decisionmakers, taking into account explicitly how they define their concerns.* An illustrative set of major decision points may include the following:

Donor Agency (i.e., AID) --
- Headquarters staff
- Mission representatives
- Project representatives

Host-Country Agencies --
- Office of the President
- Ministry of Planning
- Ministry of Budget and Finance
- Ministry of Agriculture
- Other line ministries --
  - Natural Resources
  - Commerce and Industry
  - Transportation
  - Health
  - Education
  - Local Government

---

* In actual application, this delineation of decision points and objectives should encompass consideration of all entities relevant to the project -- including project management, local leaders, and individual farmers. Consideration of objectives within the project area will not only ensure relevance of project actions but will facilitate a better understanding of the context for project impact.

Major explicit and/or implicit objectives of these entities may include:

Balance of Payments

- Decreased imports
  - Food
  - Other agricultural products
  - Agricultural production inputs
  - Fuel
  - Capital goods (machinery, spare parts, etc.)
- Increased exports
  - Agricultural products
  - Non-agricultural products
- Favorable net foreign exchange effects

Human Resource Supply and Demand

- Increased/decreased labor demand by skill, sex, season, etc.
- Increased/decreased labor supply (demographic effects)
- Increased/decreased human capital use
  - need for skilled labor, professionals
- Increased human capital formation
  - training function

Food Production

- Decreased imports (increased exports)
- Lower consumer prices
- Improved nutrition
- Minimal decrease in non-food production

Energy Intensity and Use

- Minimal use of replenishable sources
- Minimal use of non-replenishable sources

Environmental Deterioration/Enhancement

- Improved water conservation and use
- Minimal atmospheric pollution
- Improved soil conservation and use
- Improved other natural resource conservation and use
- Efficient space use, minimal congestion

Net Income Benefits

- Favorable income benefit incidence (rural, urban, poor, elite, farmers, merchants, landowners, laborers, etc.)
- Favorable income cost incidence (rural, urban, etc.)
- Favorable net equity effect (taking into account tax and subsidy incidence)
- Favorable net efficiency effect

Other Socioeconomic Benefits and Costs

- Favorable health and other amenity benefit/cost incidence
- Favorable ethnic, cultural, and sociological effects benefit/cost with respect to group, leadership, and community patterns and structures

One or more of these objectives will be reflected explicitly in the project goal and purpose. Objectively verifiable indicators will be identified and cited in the Project Paper. The remaining implicit objectives generally will also have objectively verifiable indicators -- e.g., MT of maize sold, produced or imported; persons trained in skill X; number of migrants from area X to area Y; KWH-equivalents of energy consumed; percent organic matter in soil; health care extended to X persons. These measures of the relevant implicit objectives should also be explicitly identified.

Several types of instruments may be useful here. Table I presents an illustrative listing of relevant decision points together with reference to the explicit and implicit objectives at each point. Reference sources for the objectives as well as proposed objectively verifiable indicators are also shown. Similar adaptations of the AID Logical Framework may also serve the purpose of delineating decision points and the associated objectives.

Table I. DECISION POINTS AND OBJECTIVES: SMALL-FARMER TECHNOLOGY PROJECT*

Decision Point	Objectives			
	Statement	Type**	Measurement Indicator	Reference Source
Agency for International Development	Increase income of rural poor;	E	Real household income	FAA Section 123 As Amended; AIRCIRC 4567;
⋮	⋮	⋮	⋮	⋮
Host Country Agencies	Increase food production;	E	Production of food crops, edible livestock products	Ministry of Agriculture White Paper;
⋮	⋮	⋮	⋮	⋮
Project management	Successfully Implement New Sounor Maize Improvement Project	I	Selected MIS data	Project Paper of New Sounor Maize Improvement Project; Task Memo 8;
⋮	⋮	⋮	⋮	⋮
Individual farmers	Obtain annual real (family) income of more than $400;	I	Household income of farm families adjusted for home consumption, consumer good prices	Conversations of project design team with individual farmers, local leaders; Professor Doe, National University; Baseline survey, selected sample.
⋮	⋮		⋮	

* See also Logical Framework in Project Paper.
** Type: E = Explicit; I = Implicit.

2. Delineation of project activities

A second task is to explicitly delineate project implementation with respect to the AID Logical Framework output/input specification. This delineation will be derived initially for reference in the Project Paper. The delineation should be explicit so that a clear output/input relationship is indicated, recognizing that modifications may be called for during the course of project implementation. Some projects may be sufficiently complex such that the implementation delineation is best reflected by a set of sub-projects or project sub-systems. For example, consider a project having the purpose of increasing food production. Project design might indicate that the development and dissemination of a new small farmer technology will make a major contribution toward achieving this objective. The delineation of project activities might be outlined as follows:

Input --

- Detailed research design and specification
  - Research personnel resource input
  - Research capital resource input
  - Research commodity input
- Research success probability and time lag
- Detailed extension design and specification
  - Extension education sub-activity --
    - Extension personnel resource input
    - Extension capital resource input
    - Extension commodity input
    - Personnel trained and time lag
  - Technology dissemination sub-activity --
    - Extension personnel resource input
    - Extension capital resource input
    - Extension commodity input
    - Technology disseminated and time lag
- Adoption success probability and time lag

Output --

Adoption of new technology

Alternatively, the project might be subdivided into two or even three sub-projects.

It will be recognized that we are in essence specifying a production function for the project: Some specific level of output is expected to result from the given inputs. Specification of project activities should indicate physical quantities and costs of inputs as well as implementation timing. It should also show the specific social and economic changes which are expected as a direct result of the project. How many personnel of what skill level or training are required when? How many farmers can be reached with how many extension personnel, using what communication method (mode of transportation, etc.) within what time period? What changes in farm size are anticipated if the technology is successfully disseminated? What changes will occur in production levels?

Although this information can be grouped in various ways according to how the project activity inputs and outputs can best be described for assessment purposes, in general the instruments will be adaptations of management information system instruments. Tables II-A.1 and 2 present an implementation and financial schedule for a hypothetical eight-year multi-district crop improvement project. Tables II-B.1 through 4 present further detail on the illustrative project and its implementation. These types of instruments facilitate the delineation and analysis of

project operations -- inputs and outputs, direct costs and benefits, and implementation phasing.*

3. Delineation of socioeconomic and technical structure

As stated, however, the project activity delineation does not make explicit what are the linkages between project activity and higher-level purposes and goals. For example, to what extent does pulling extension personnel off from their present duties for training in the new technology detract from their carrying out tasks aimed at the alternative goal of increasing agricultural exports? If the new technology is adopted, to what extent does it mean increased energy consumption or commodity and capital good imports? Moreover, the specification does not indicate what underlying assumptions must hold. What are the factors that determine the research success probability? What are the labor availability and commodity price characteristics which will permit successful adoption by the farmers? Does adoption require changes in existing institutions which have not been addressed? These linkage characteristics need to be specified.

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* The Project Performance Network Chart already in common use in AID can also be used to portray the time-dependent interaction of project activity. For example and discussion, see Appendix 3G in AID Handbook 3 Project Assistance, 1 September 1975.

The interaction of decision (and action) points relevant to project implementation can perhaps best be delineated through the use of organizational responsibility charting. For example and discussion, see Chapter 13 in Earl R. Kulp, Basic Agriculture Program Management, undated, draft edition made available by Development Administration Division, TAB/AID. This instrument not only lists the various decisionmaking and action-taking entities involved with project implementation but also indicates the specific functions and tasks which they must execute in order for the project to be successfully implemented.

PROJECT AREA

(= District 1 + District 2 + ... + District J + ... + District N)

Table II-A.1 -- PROJECT IMPLEMENTATION/FINANCIAL SCHEDULE: SMALL-FARMER TECHNOLOGY PROJECT

Row	Item		Project Implementation Period - Year 1	2	3	4	5	6	7	8	Calculation Notes --
1.	Number of new adoptors		-	-	20	130	600	2250	5000	7000	Total numbers of farms:
2.	Number of adoptors, total		-	-	20	150	750	3000	8000	15000	16,000
3.	Farms not covered (percent)		100.000	100.000	99.875	99.062	95.312	81.250	50.000	6.250	(100.00 - r.4)
4.	Farms covered (percent)		0.0	0.0	0.125	0.938	4.688	18.750	50.000	93.750	(r.2/total number of farms)
5.	Number of new Farmer Centers		-	-	1	4	15	30	25	0	
6.	Number of Farmer Centers, total		-	-	1	5	20	50	75	75	
	Project Input/Cost Summary --										
	Research and Training --										
7.	Number of personnel required		9	10	10	5	3	0	0	0	
8.	Personnel cost	($1,000)	120	150	125	75	40	0	0	0	
9.	Capital cost	($1,000)	200	50	30	50	30	0	0	0	
10.	Commodity and misc. cost	($1,000)	50	50	50	50	50	0	0	0	
11.	R and T Subtotal	($1,000)	370	250	205	175	120	0	0	0	(r.8 + r.9 + r.10)
	Extension and Other --										
12.	Number of personnel required		2	4	6	22	50	75	125	125	
13.	Personnel cost	($1,000)	35	45	50	70	100	120	140	140	
14.	Capital cost	($1,000)	10	10	15	40	20	10	30	15	
15.	Commodity and misc. cost	($1,000)	10	10	15	20	70	40	20	5	
16.	Annual loan expansion	($1,000)	-	-	1	8	36	135	300	420	
17.	New Multi-year loans*	($1,000)	-	-	8	42	180	570	1100	1400	
18.	Less: Multi-year loan repayment	($1,000)	-	-	-	2	12	53	186	453	
19.	Total credit expansion	($1,000)	-	-	9	48	204	652	1214	1367	(r.16 + r.17 - r.18)
20.	E and O Subtotal	($1,000)	55	65	89	178	394	822	1404	1527	(r.13 + r.14 + r.15 + r.19)
21.	Total project costs	($1,000)	425	315	294	353	514	822	1404	1527	(r.11 + r.20)
22.	Net income - farms with tech.	($1,000)	0.0	0.0	5	36	180	721	1922	3605	(r.4 * 3,844)
23.	Net income - farms without tech.	($1,000)	1609	1609	1607	1594	1533	1307	804	101	(r.3 * 1,609)
24.	Total project area net income	($1,000)	1609	1609	1612	1630	1714	2028	2726	3704	(r.22 + r.23)
25.	Increase in total proj. area net	($1,000)	0	0	3	21	105	419	1119	2096	(r.24 - r.24:col.1)

* Assumes four-year development loan; repayment five percent late, five percent default.

Table II-A.2 -- PROJECT IMPLEMENTATION/FINANCIAL SCHEDULE: SMALL-FARMER TECHNOLOGY PROJECT (continued)

Row	Item		Post-Project Implementation Period - Year 9	10	11	12	13	14	15	16	17	18	19	20	Total Project Cost Gross	Total Project Cost Net
1.	Number of new adoptors		0	→	→	→	→	→	→	→	→	→	→	0		
2.	Number of adoptors, total		15000	→	→	→	→	→	→	→	→	→	→	15000		
3.	Farms not covered (percent)		6.25	→	→	→	→	→	→	→	→	→	→	6.25		
4.	Farms covered (percent)		93.75	→	→	→	→	→	→	→	→	→	→	93.75		
5.	Number of new Farmer Centers		0	→	→	→	→	→	→	→	→	→	→	0		
6.	Number of Farmer Centers, total		75	→	→	→	→	→	→	→	→	→	→	75		
	Project Input/Cost Summary --															
	Research and Training --															
7.	Number of personnel required		0	→	→	→	→	→	→	→	→	→	→	0		
8.	Personnel cost	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	510	
9.	Capital cost	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	360	
10.	Commodity and misc. cost	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	250	
11.	R and T Subtotal	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	1120	
	Extension and Other --															
12.	Number of personnel required		0	→	→	→	→	→	→	→	→	→	→	0		
13.	Personnel cost	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	700	
14.	Capital cost	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	150	1040
15.	Commodity and misc. cost	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	190	
16.	Annual loan expansion	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	900	900
17.	New Multi-year loans*	($1,000)	0	→	→	→	→	→	→	→	→	→	→	0	2594	3300
18.	Less: Multi-year loan repayment	($1,000)	785	747	617	364	16	0	→	→	→	→	→	0		(3235)
19.	Total credit expansion	($1,000)	-785	-747	-617	-364	-16	0	→	→	→	→	→	0	3494	965
20.	E and O Subtotal	($1,000)	-785	-747	-617	-364	-16	0	→	→	→	→	→	0	4534	2005
21.	Total project costs	($1,000)	-785	-747	-617	-364	-16	0	→	→	→	→	→	0	5654	3125
22.	Net income - farms with tech.	($1,000)	3605	→	→	→	→	→	→	→	→	→	→	3605		
23.	Net income - farms without tech.	($1,000)	101	→	→	→	→	→	→	→	→	→	→	101		
24.	Total project area net income	($1,000)	3704	→	→	→	→	→	→	→	→	→	→	3704		
25.	Increase in total proj. area net	($1,000)	2096	→	→	→	→	→	→	→	→	→	→	2096		

PROJECT AREA

= District 1 + District 2 + ... + District J + ... + District N)

Table II-B.1 -- PROJECT IMPLEMENTATION DETAIL - FARM PRODUCTION: SMALL-FARMER TECHNOLOGY PROJECT

Row	Item		Project Implementation Period - Year 3	4	5	6	7	8	Calculation Notes --
	Production inputs without tech. --								
1.	Item 1								(r.2a.3 *)
2.	Item 2								(r.2a.3 *)
	⋮								
	Production inputs with tech. --								
3.	Item 1								(r.2a.4 *)
	⋮								
	Production without tech. --								
4.	Crop 1	(MT)	29603	29362	28250	24083	14820	1853	(r.2a.3 * r.3a.8:col.3 * r.3a.8: col.11,12 * total number of farms)
	⋮								
5.	Crop 2	(MT)	1087	1078	1037	884	544	68	(r.2a.3 * r.3a.9:col.3 * r.3a.8: col.11,12 * total number of farms)
	⋮								
6.	Livestock 1	(units)	800	790	760	650	400	50	(r.2a.3 * r.3a.10:col.3 * r.3a.8: col.11,12 * total number of farms)
	⋮								
	Production with tech. --								
7.	Crop 1	(MT)	118	885	4425	17699	47196	88493	(r.2a.4 * r.3b.8:col.3 * r.3b.8: col.11,12 * total number of farms)
	⋮								
8.	Crop 2	(MT)	2	18	89	357	952	1785	(r.2a.4 * r.3b.9:col.3 * r.3b.8: col.11,12 * total number of farms)
	⋮								
9.	Livestock 1	(units)	*	10	40	150	400	750	(r.2a.4 * r.3b.10:col.3 * r.3b.8: col.11,12 * total number of farms)
	⋮								
	Total project area production --								
10.	Crop 1	(MT)	29721	30247	32675	41782	62016	90346	(r.4 + r.7)
11.	Crop 2	(MT)	1089	1096	1126	1241	1496	1853	(r.5 + r.8)
12.	Livestock 1	(units)	800	800	800	800	800	800	(r.6 + r.9)
	⋮								
	Change in production --								
13.	Crop 1	(MT)	81	607	3035	12142	32376	60706	(r.10 - r.3a.8:col.3 * r.3a.8: col.11,12 * total number of farms
	⋮								
14.	Crop 2	(MT)	1	8	38	153	408	765	(r.11 - r.3a.9:col.3 * r.3a.8: col.11,12 * total number of farms
	⋮								
15.	Livestock 1	(units)	0	0	0	0	0	0	(r.12 - r.3a.10:col.3 * r.3a.8: col.11,12 * total number of farms
	⋮								

Table II-B.2 -- PROJECT IMPLEMENTATION DETAIL - FARM PRODUCTION: SMALL-FARMER TECHNOLOGY PROJECT (continued)

Row	Item		Post-Project Implementation Period - Year 9	10	11	12	13	14	15	16	17	18	19	20
	Production inputs without tech. --													
1.	Item 1													
2.	Item 2													
	⋮													
	Production inputs with tech. --													
3.	Item 1													
	⋮													
	Production without tech. --													
4.	Crop 1	(MT)	1853	→	→	→	→	→	→	→	→	→	→	1853
5.	Crop 2	(MT)	68	→	→	→	→	→	→	→	→	→	→	68
6.	Livestock 1	(units)	50	→	→	→	→	→	→	→	→	→	→	50
	⋮													
	Production with tech. --													
7.	Crop 1	(MT)	88493	→	→	→	→	→	→	→	→	→	→	88493
8.	Crop 2	(MT)	1785	→	→	→	→	→	→	→	→	→	→	1785
9.	Livestock 1	(units)	750	→	→	→	→	→	→	→	→	→	→	750
	⋮													
	Total project area production --													
10.	Crop 1	(MT)	90346	→	→	→	→	→	→	→	→	→	→	90346
11.	Crop 2	(MT)	1853	→	→	→	→	→	→	→	→	→	→	1853
12.	Livestock 1	(units)	800	→	→	→	→	→	→	→	→	→	→	800
	⋮													
	Change in production --													
13.	Crop 1	(MT)	60706	→	→	→	→	→	→	→	→	→	→	60706
14.	Crop 2	(MT)	765	→	→	→	→	→	→	→	→	→	→	765
	⋮													
15.	Livestock 1	(units)	0	→	→	→	→	→	→	→	→	→	→	0
	⋮													

Table II-B.3 -- PROJECT IMPLEMENTATION DETAIL - LABOR UTILIZATION: SMALL-FARMER TECHNOLOGY PROJECT

Row	Item		Project Implementation Period - Year						Calculation Notes --
			3	4	5	6	7	8	
	Labor utilization summary without tech. --								
1.	Farm production	(1000 MD)	7591	7529	7244	6175	3800	475	(r.2a.3 * r.3a.4:col.MD total * total number of farms)
2.	Off-farm employment	(1000 MD)	1119	1109	1067	910	560	70	(r.2a.3 * r.3a.5:col.MD total * total number of farms)
3.	Unemployment	(1000 MD)	2797	2774	2669	2275	1400	175	(r.2a.3 * r.3a.6:col.MD total * total number of farms)
	Labor utilization summary with tech. --								
4.	Farm production	(1000 MD)	11	84	422	1686	4496	8430	(r.2a.4 * r.3b.4:col.MD total * total number of farms)
5.	Off-farm employment	(1000 MD)	1	11	53	210	560	1050	(r.2a.4 * r.3b.5:col.MD total * total number of farms)
6.	Unemployment	(1000 MD)	2	13	66	264	704	1320	(r.2a.4 * r.3b.6:col.MD total * total number of farms)
	Total project area labor utilization --								
7.	Farm production	(1000 MD)	7602	7613	7666	7861	8296	8905	(r.1 + r.4)
8.	Off-farm employment	(1000 MD)	1120	1120	1120	1120	1120	1120	(r.2 + r.5)
9.	Unemployment	(1000 MD)	2799	2787	2735	2539	2104	1495	(r.3 + r.6)

Table II-B.4 -- PROJECT IMPLEMENTATION DETAIL - LABOR UTILIZATION: SMALL-FARMER TECHNOLOGY PROJECT (continued)

Row	Item		Post-Project Implementation Period - Year											
			9	10	11	12	13	14	15	16	17	18	19	20
	Labor utilization summary without tech. --													
1.	Farm production	(1000 MD)	475	→										475
2.	Off-farm employment	(1000 MD)	70	→										70
3.	Unemployment	(1000 MD)	175	→										175
	Labor utilization summary with tech. --													
4.	Farm production	(1000 MD)	8430	→										8430
5.	Off-farm employment	(1000 MD)	1050	→										1050
6.	Unemployment	(1000 MD)	1320	→										1320
	Total project area labor utilization --													
7.	Farm production	(1000 MD)	8905	→										8905
8.	Off-farm employment	(1000 MD)	1120	→										1120
9.	Unemployment	(1000 MD)	1495	→										1495

A third task then is the delineation of the direct and indirect structural linkages relating project activity (outputs/inputs) and assumptions to the relevant objectives. The inability to assess rural development strategies effectively has often resulted in part from the lack of an analytical framework sufficiently accurate yet simple to manage, and in part from the lack of basic data. In many cases potentially useful data have been available but have not been used because a suitable framework was not readily accessible for policy analysis purposes; in other cases attempts have been made to develop such frameworks in the absence of the most essential data. In some instances we have tended to forget that an analytical framework is a tool and not an end in itself; we become engrossed in working out the detailed mechanics and design problems, and lose sight of the information needs and analysis requirements of the decisionmaker. At other times our attempts to trace the actual or potential impact of decision alternatives without taking into account the actual form and parametric values of structural relationships among technical, economic, and social activities, as well as over time and space, have been so lacking in precision as to be of little value for policy use.

The context of any project consists of a system of social, economic and technological resources, linkages, and products. This system defines the quantity of goods and services produced, the access to available resources, the distribution of the decisionmaking functions, and the technology utilized for production. It is this system which project interventions attempt to modify. A tentative set of linkage relationships depicting such a system will be implicitly derived from conceptual

and empirical efforts of the design process and reflected in the project design itself. What is needed is a more definitive and structured cause-and-effect framework of the project environment which gives explicit attention to both analytical and basic data requirements.

The manner in which the socioeconomic and technical structure of the project environment is delineated depends greatly on the type of analytical use for which it is intended. This delineation should be to a large extent as much a conceptual as an empirical undertaking for any given project context. The tabular and graphic instruments should be suggestive of what linkages might be relevant, and they should provide a context for the explicit empirical delineation of the key interrelationships subsequently developed for analytical use.

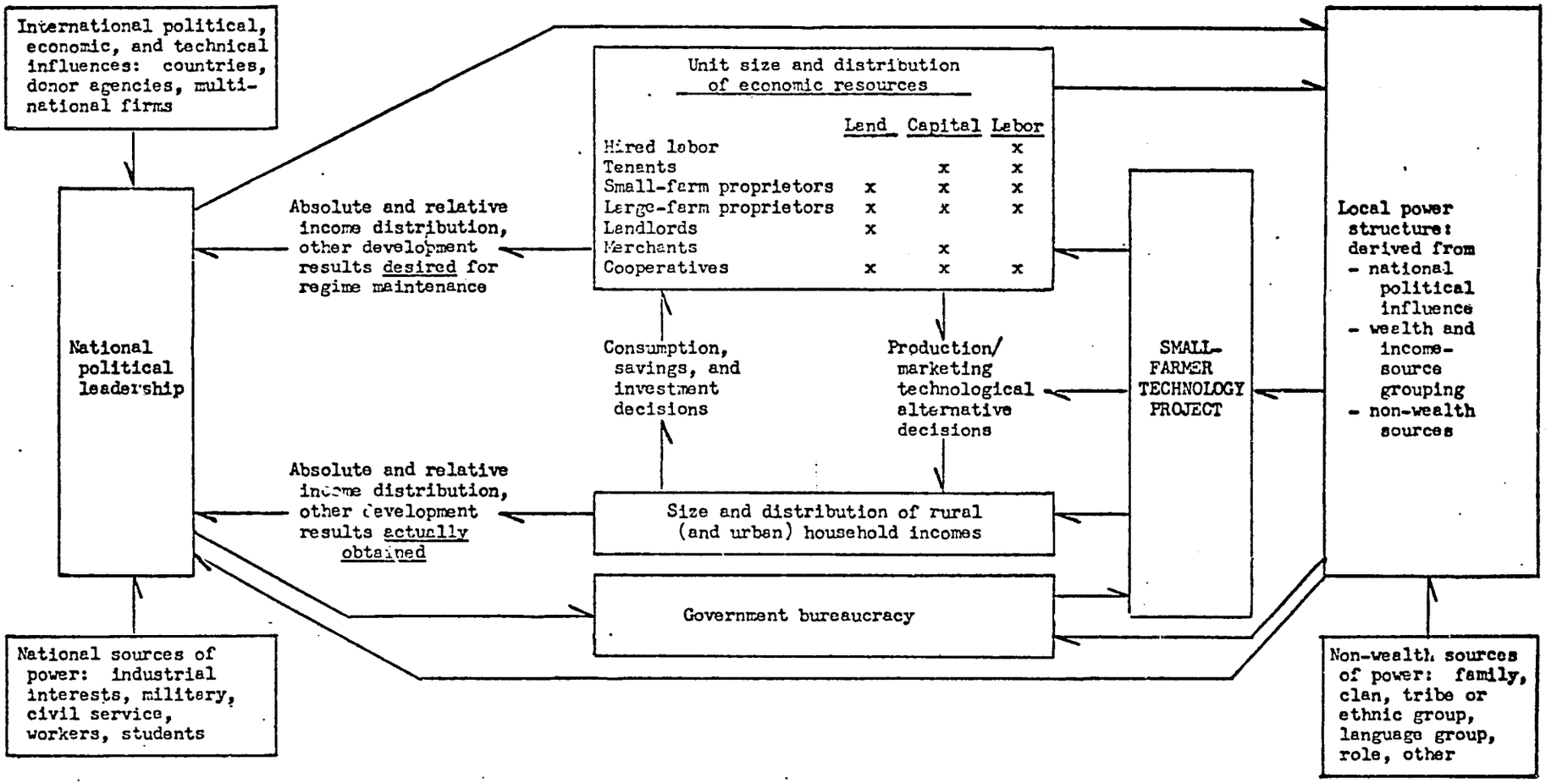
As an initial step, information on the project area should be synthesized into a structural system depicting the cause-and-effect interrelationships underlying the development problem of interest. With minor modifications this same synthesis will be used to evaluate project implementation and assess project impact. For illustration, let us again consider the project example cited above. The project involves the development and dissemination of a new small-farmer technology and is considered to consist of three subprojects: (a) technology development; (b) extension education; and (c) technology dissemination. The specified goal is increased food production, with consideration given to improved nutrition. Additional major policy concerns might be: increased real income of the target groups; improved employment opportunities; improved balance of payments; and the enhanced potential for continuing the social and economic development process.

For a general overview of the structural system underlying such a project, a chart such as presented in Figure 1 may be useful. This portrayal gives consideration to the organizational and decisionmaking context of the project environment, combining information provided by organizational responsibility charting with the related socioeconomic and technical aspects of the project area.

An illustrative (and abbreviated) alternative charting of the socioeconomic and technical structural system is portrayed by the matrix presented in Figure 2. This mapping depicts the linkages from the causal factors (rows) to the effects (columns). For example, the technology utilized in agricultural production (row 11) will directly affect the inputs and labor required for that production (column 12). Specifically, what is the monthly (or bi-weekly) labor requirement schedule? If some inputs are purchased, when are they required and in what quantity? In addition, the mapping indicates that the technology used directly affects farm production and the income factor (capital/labor) ratio. Additional inputs required for (causal factors influencing) technology adoption include the availability of production inputs and labor, product and input price relationships, the development of locally suitable technology, and communication of the technology to the individual farmers. Other cause-and-effect linkages are similarly indicated.

The intent of the matrix portrayal is to demonstrate a structural hierarchy of cause-and-effect which lends itself well to the tracing of project impact both conceptually and empirically, to the

FIGURE 1. DECISIONMAKING CONTEXT OF SOCIOECONOMIC/TECHNICAL STRUCTURE: SMALL-FARMER TECHNOLOGY PROJECT*



* Adapted from Carl Gotsch, "Economics, Institutions, and Employment Generation in Rural Areas," in Edward O. Edwards(ed.), Employment in Developing Nations, New York: Columbia University Press, 1974.

Figure 2. DELINEATION OF SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS: SMALL-FARMER TECHNOLOGY PROJECT

Causes	FROM \ TO	Effects: Outputs*			Intermediate*													End Objectives*				
		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Assumptions	1 Input availability, prices				x	x								x					x				x	
	2 Farm labor availability				x	x																		
	3 Farm product demand, prices				x			x					x			x			x				x	
	4 Consumer good availability, prices															x						x	x	
Inputs	5 Project personnel required	x	x	x																			x	
	6 Project capital required	x	x	x																			x	
	7 Project commodities required	x	x	x																			x	
Outputs	8 Technology development				x													x						
	9 Extension education				x													x						
	10 Technology dissemination				x													x						
Intermediate	11 Technology adoption, product mix					x		x							x									
	12 Inputs, labor required						x	x						x							x			
	13 Input marketing, transport required										x	x												
	14 Farm production								x	x			x						x			x		
	15 On-farm consumption												x									x		
	16 Prod. marketing, transport required										x	x												
	17 Marketing, transport labor required																				x			
	18 Marketing, transport net income																x			x				
	19 Gross farm income													x										
	20 Net farm income																x			x				
	21 Income factor ratio																x			x				
	22 Consumer real income																					x		
	23 Net capital formation																							x
	24 Human capital formation																							x
	25 Export/import substitution																						x	

* Cols. 8-10 -- (Outputs) should be labeled the same as rows 8-10.
Cols. 11-25 -- (Intermediate) should be labeled the same as rows 11-25.
Col. 26 -- Distribution of real income.
Col. 27 -- Employment.
Col. 28 -- Food production/nutrition.
Col. 29 -- Balance of payments.
Col. 30 -- Growth potential.

specification of analytical techniques, and to the identification of relevant data. The illustrative structure is only a partial example of economic linkages and is admittedly limited. Additional structural linkages -- economic as well as technical, social, institutional, management, and financial -- need to be considered. An illustrative checklist of potentially relevant technical, economic, and social interrelationship factors that will facilitate a more complete and proper delineation of such structural systems is presented in Appendix I. For example, what aspects of the social/political structure will enhance or impede the adoption of the proposed technology package (Checklist item 3: Structural system row 10, column 11).

In developing system syntheses there are both immediate as well as longer term advantages of a modular approach -- i.e., synthesis of subsets of relationships as components of the whole. The formulation of meaningful subsets of relationships facilitates a separate and focused analysis of the various components, thus providing greater assurance of logical consistency and empirical validity. In the longer term, the development of modules from a number of projects could lead to building a source library of information on interrelationships. Individual interrelationship modules might then be drawn upon to construct ad hoc analytical frameworks for specific project situations. The development of such a library would make accessible to project analysts a greater breadth and depth of insight and consideration than would generally be available within the time and budget constraints of a given project.

To meet the requirements of this third task -- delineation of the socioeconomic and technical structure -- it is not intended that a detailed and comprehensive empirical model be developed. Such would not be operationally manageable for cost-effective policy analysis. But a full consideration of potentially relevant relationships and project environment factors is desired. To develop this conceptual construct into an empirically operational analytical tool in a given project context, a determination of the key variables and the essential data requirements must be made.

4. Determination of key variables (or parameters) and data requirements

The key structure consists of that set of variables and parameters (relationships) for which empirical values need to be determined for valid project impact analysis and evaluation. A variable (or parameter) should be considered to be key when, in its range of probable values, it will directly or indirectly affect the findings of the benefit/cost calculus significantly. We will fail to take account of the effects of a key variable (or parameter) when: (a) our synthesis of the socioeconomic and technical structure as discussed above is either incomplete or in error; or (b) we have masked the variable (or parameter) by aggregating or grouping it with other variables. By synthesizing information into a structural system we introduce a sort of aggregation process which by its nature causes a loss of information. In this process we order or structure our knowledge of the world, and thereby constrain variety. That is, we define our system by

modelling or structuring our conceptualization of it, destroying its omnifarious character in the process. When we wish to regain real-world relevance to make and implement policy decisions and control aspects of the system, we must sufficiently increase variety to meet the specifications and circumstances of the control mechanisms. The analyses on which our policy decisions are based must be capable of generating the requisite variety to reflect the real-world situation at a level appropriate to secure an adequate level of performance. Valid identification and analysis of functional interactions among the social, economic, and technical characteristics which may be directly or indirectly significant to policy considerations requires consideration of this aggregation problem.

Specifically, valid analysis requires that the respective characteristics or variables of a structural system can be considered internally homogeneous -- that is, similar in the associated cause and effect linkages. Pragmatically, if individual items that comprise a characteristic or relationship in the framework exist in fixed proportions this similarity or homogeneity criterion will be met. Do the various characteristics or relationships hold equally over all types of farms in a project area district? Are the various districts sufficiently similar throughout the project area? If not, we must disaggregate. The more aggregated the characteristic or operation, the less likely will there be homogeneity. Maximum disaggregation, however, is not an optimum procedure because of the costs involved in constructing and using the analytical system. In general, there must be derived some reasonable balance between the need for homogeneity, the need to identify and measure substitutable processes or trade-off activities, and

the feasibility of constructing and utilizing the framework at acceptable cost.* While admittedly this is a somewhat esoteric consideration, it needs to be understood as a basic principle for developing valid cost-effective assessment methodologies.

Deriving the above cited reasonable balance in development of the system snythesis should be viewed as an iterative process in each project context. System implications of the initial synthesis effort should be compared with qualitative and quantitative information concerning the project environment which may not have been explicitly included or implicitly reflected. Verifiable indicators should be identified where feasible to facilitate the validation of the conceptualized structure as well as to permit the subsequent analysis of project impact. A continual process of system modification should be followed -- adding significant aspects which have been excluded, and deleting aspects which make a negligible contribution to the analytical validity of the system and to the usefulness of the information it provides for decision-making and assessment. The process of determining and isolating the crucial relationships of the system will facilitate the focusing of analytical attention -- i.e., to obtain further data and develop insights and understanding of the relationships that are critical to project success and relevant for valid project assessment.

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* The relationship between such detailed analytical and more relevant cost-effective approaches parallels the relationship between using census enumeration methods rather than a well-constructed sample in data collection. While census methods can be used to collect detailed data, with some prior knowledge of population characteristics sample surveys can also be used to collect detailed data at considerably less cost. The question then arises as to what is the appropriate sample size or level of detail. The size or level of detail adequate for decisionmaking purposes is directly proportional to the homogeneity of underlying interrelationships and inversely proportional to the error that can be tolerated.

Linkage mappings, tabular layouts, and other instruments to portray the key structure will generally be derived from those found useful in the delineation of the broader socioeconomic and technical structure for each respective project. For the example project referenced above, a delineation of the farm production system with and without the project will be required, regardless of what other instruments may be deemed useful. Tables III-A and B present an illustrative farm production system delineation.

Specification of the key variables and parameters will determine the data requirements for project assessment. Different strategies can be used to collect the specific data items. First, data on project inputs and resource utilizations can be provided prior to implementation by developing detailed implementation schedules and during implementation by standard accounting and management information methods. A second strategy for data collection is the systematizing of a two-way communication process between project participants and the project staff. This strategy is particularly relevant where a collaborative development approach is being followed (which is often the case in rural development). Properly designed reporting instruments can tap the two-way communication stream so that relevant data can be synthesized and passed on to meet data needs of project assessment as well as for on-going decisionmaking and analysis. Farm records and journals designed primarily as extension instruments can provide information on farm families and farming systems. Properly designed reporting and synthesis instruments can facilitate the systematic recording of communication activities of other project staff with farmers, farmer group leaders, local businessmen, etc.

Table III-A -- FARM SYSTEM ANALYSIS -- PRESENT: SMALL-FARMER TECHNOLOGY PROJECT

Row	Farm System Operation	Mandays by Month 1	2	3	4	5	6	7	8	9	10	11	12	Mandays, Total
	Present --													
1.	Crop 1	31	29	6	11	23	25	3	0	0	38	26	12	204
2.	Crop 2	7	0	0	0	0	0	21	6	16	13	12	23	98
	:	12	3	1	3	2	0	13	8	13	10	10	18	93
3.	Livestock 1	8	8	8	8	4	4	4	4	4	4	4	4	64
	:	2	2	2	2	1	1	1	1	1	1	1	1	16
4.	Subtotal farm	60	42	17	24	30	30	42	19	34	66	53	58	475
5.	Non-agricultural off-farm employment	5	10	10	5	5	5	5	5	5	5	5	5	70
6.	Mandays unemployed	-5	8	33	31	25	25	13	36	21	-11	2	-3	88
7.	Total	60	60	60	60	60	60	60	60	60	60	60	60	720

Calculation Notes --

Average size of farm 3.5ha.

Average cropland area 3.0ha

Full-time worker equivalents 60.0 mandays/months

Calculate operation values for those farms so engaged to obtain district totals, multiply values by proportion of farms so engaged.

	Production/Income Values -	Area Cropped* ha	Yield* kg/ha	Production kg	On-farm Consumption kg	Marketed kg	Price $/kg	Gross Income $	Input Cost $	Net Income $	Percent of Farms so Engaged	Net Income Average District Farm
8.	Crop 1	3.0	650	1950	1000	950	0.10	95	20	75	95	71.25
9.	Crop 2	0.8	500	400	100	300	0.12	36	2	34	17	5.78
	:							40	20	20	31	6.20
10.	Livestock 1	1.5	3.3	5.0	2.5	2.5	34.00	85	5	30	10	8.00
	:							6	0	6	25	1.50
11.	Subtotal farm	-	-	-	-	-	-	-	-	-	-	92.73
12.	Off-farm employment	-	-	-	-	-	-	70	2	68	12	8.16
13.	Total	-	-	-	-	-	-	-	-	-	-	100.89
14.	Less: Amortized costs	-	-	-	-	-	-	-	-	2	17	0.34
15.	Total, adjusted	-	-	-	-	-	-	-	-	-	-	100.55

* Or: Number of livestock units; production/units.

AVERAGE FARM -- DISTRICT J

Table III-B -- FARM SYSTEM ANALYSIS -- WITH NEW TECHNOLOGY: SMALL FARMER TECHNOLOGY PROJECT

Row	Farm System Operation	Mandays by Month 1	2	3	4	5	6	7	8	9	10	11	12	Mandays, Total	Calculation Notes --
	With New Technology --														
1.	Crop 1	20	23	17	31	[illegible]	[illegible]	4	24	24	28	15	12	263	
2.	Crop 2	9	0	0	0	[illegible]	[illegible]	8	8	4	3	13	16	61	
	:	15	14	13	6	[illegible]	[illegible]	21	5	11	18	20	17	158	
3.	Livestock 1	8	8	8	8	[illegible]	[illegible]	4	4	4	[illegible]	4	4	64	
	:	2	2	2	2	[illegible]	[illegible]	1	1	1	1	1	1	16	
4.	Subtotal farm	54	47	40	47	[illegible]	[illegible]	38	42	44	54	53	50	562	
5.	Non-agricultural off-farm employment	5	10	10	5	[illegible]	5	5	5	5	5	5	5	70	
6.	Mandays unemployed	1	3	10	8	[illegible]	10	17	13	11	1	2	5	88	
7.	Total	60	60	60	60	60	60	60	60	60	60	60	60	720	

	Production/Income Values -	Area Cropped* ha	Yield* kg/ha	Production kg	On-farm Consumption kg	Marketed kg	Price $/kg	Gross Income $	Input Cost $	Net Income $	Percent of Farms so Engaged	Net Income Average District Farm	
8.	Crop 1	4.6	1350	6210	1000	5210	0.10	521	270	251	95	238.45	
9.	Crop 2	1.0	700	700	100	600	0.12	72	4	68	17	11.56	
	:							50	22	28	31	8.68	
10.	Livestock 1	1.5	3.3	5.0	2.5	2.5	34.00	85	5	80	10	8.00	
	:							6	0	6	25	1.50	
11.	Subtotal farm	-	-	-	-	-	-	-	-	-	-	268.19	
12.	Off-farm employment	-	-	-	-	-	-	70	2	68	12	8.16	
13.	Total	-	-	-	-	-	-	-	-	-	-	276.35	
14.	Less: Amortized costs	-	-	-	-	-	-	-	-	38	95	36.10	
15.	Total, adjusted	-	-	-	-	-	-	-	-	-	-	240.25	
16.	Less: Present system, total adjustment	-	-	-	-	-	-	-	-	-	-	100.55	(r.15, Table 3a)
17.	Increase in income	-	-	-	-	-	-	-	-	-	-	139.70	

* Or: Number of livestock units; production/unit.

A third strategy is general coverage data collection which can periodically provide a broad overview of the agricultural and socio-economic development of the project area. While some data will be available from secondary sources, generally some primary data collection will be required. Indicators which have particular relevance to the project and its participants (such as purchases and prices paid by private merchants, transportation costs and marketing margins, and input availability and prices) can be continually monitored. Other indicators can be collected with area-frame sample surveys early in the project period and again towards its termination. A fourth strategy is special ad hoc collection of data which would otherwise be unavailable on specific situations or relationships characterizing the project or its environment. Data collection instruments for such special data collection can be developed as required.

5. Impact analysis and evaulation by dynamic benefit/cost methods

The fifth and last task in the approach is to carry out the project impact analysis and evaluation using dynamic benefit/cost methods. Considerations in the analysis should include the following: valuation of costs and benefits; validity of structural linkages; comparative-dynamic analytical procedures; domain and boundaries of the structural system; and uncertainty and sensitivity of values.

(a) Valuation of costs and benefits -- The identified cost and benefit streams must be valued if they are to be compared for project assessment. Non-economic costs and benefits must either be linked to economic

values or physically traced in an ad hoc manner. To the extent that we are concerned with economic benefits and/or costs of projects, the index to compare differing goods and services is a money price. A major reason why we undertake benefit/cost analyses is because market prices and other measurable indicators are inadequate reflections of the real values in a society. The currencies of developing countries are often overvalued, biasing assessments to favor goods and services inputs with a high import content. Wages may be set too high, making capital-intensive projects appear more attractive than they really are. Prices set by public authority may reflect particular momentary government concerns and often in practice are not being adhered to; long-term social considerations generally do not enter into private transactions where market prices are usually determined. There may be institutional rigidities, imperfect market information, monopoly aspects, price shifting as a result of special taxes or subsidies, and similar market imperfections. In recognition of these valuation problems, benefit/cost analysis makes use of "shadow prices" to provide a better estimate of the real value of benefits and costs to a society. The shadow prices most commonly used in benefit/cost analysis are the world market product price, the shadow foreign exchange rate, the shadow wage rate, and the shadow rate of interest, which are generally derived as adjusted or converted market prices.*

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* For a more detailed discussion of these methodological concepts and procedures, see: H.G. van der Tak and L. Squire, Economic Analysis of Projects, Baltimore: Johns Hopkins Press, 1975; J. Price Gittinger, Economic Analysis of Agricultural Projects, Baltimore: Johns Hopkins Press, 1972; Ian M.D. Little and J.A. Mirrlees, Social Cost Benefit Analysis, Vol. II of Manual of Industrial Project Analysis in Developing Countries, Paris: OECD Development Centre, 1969.

(b) Validity of structural linkages -- The validity of the structural system linkages depicting interrelationships among the variables and parameters is critical to valid evaluation. To ignore the descriptive structure of a problem because of incomplete data is an invalid procedure, for with or without a valid analysis decisions will be made. Best judgements of parameter and variable values are better than neglecting the linkage aspects entirely. Here we must be particularly concerned with relationship homogeneity and the aggregation problem discussed above. If the structure is inaccurately specified, we can put little faith in the results of sensitivity analysis and in our project assessment findings. It is therefore necessary that the synthesized structure used for project assessment be descriptive of project area conditions. One test of system descriptiveness is whether it can produce the observed symptoms of the problem situation -- that is, does it accurately produce conceptually valid and empirically reasonable descriptive values of the project area without the project. Here again the need for iterative structural system development should be recognized.

(c) Comparative-dynamic analytical procedures -- Structural matrix analytical methods are appropriate investigative tools where interactions of various social, economic, and physical variables are of interest. Such methods include qualitative techniques using logical frameworks to facilitate the structured tracing of cause and effect. The basic Logical Framework which is currently used by AID in project planning, as well as Figure 2 of the present paper, provide a basis for qualitative analysis of project impact. More formal activity analysis techniques such as

input-output and mathematical programming are common quantitative forms of structural matrix analysis. Even massive structural simulation models essentially depict a matrix interaction system.

Depending on the nature of the basic structural matrix used to depict the underlying real-world system, one or another of these techniques can be used to assess project impact with comparative-dynamic procedures. In effect, we wish to investigate key indicators of the system with and without the project using our structural system synthesis as an analogy of the real world situation. For example, what is the nature of the present farming system? What products are currently marketed? What is the current income picture and how are income values related to the social, economic and physical characteristics of the project area? Without the project will there be any significant changes in these conditions? What changes in structurally related variable values can be expected as a result of the project? When will these changes most likely take place? Does the empirical evidence support these impact hypothesis concerning the nature and timing of change?

(d) Domain and boundaries of the structural system -- The domain and boundaries of the structural system are largely defined by which benefit/cost trade-offs we wish to consider in our assessment and which ones we wish to ignore. These trade-offs can be over time, over space, or among activities, and generally will be implicit if not explicit in the project objectives.

In the dimension of time, our viewpoint generally will be that of the present. Future costs or benefits will not be given the same weight

as present costs or benefits. In benefit/cost analysis we therefore discount future values with a "social discount rate" which reflects the opportunity cost of project funds -- that is, the rate of return that project funds would have in alternative allocations -- and the social time preference -- that is, the relative value of benefits now as against benefits in the future.

Spatially we are generally concerned with the project area in a specific country. We tend to discount costs or benefits which may accrue to other countries or other areas of a given country. Such spatial externalities, however, are increasingly being considered in benefit/cost analysis. For example, when an irrigation project dam reduces river flow, we wish to know how much the cost of dredging downstream is increased. When increased grain supplies from a maize improvement project lower farmgate as well as consumer prices, what is the effect on farm incomes in non-project areas? How much do access roads for small-farmer areas increase incomes of consumer goods merchants and others in non-project area towns?

The domain implications of trade-offs among various activity aspects tend generally to be more directly associated with project objectives. Consider a project for improving grain production and marketing and for increasing farm incomes. With road improvement and increased farm production, truck transport and a central mill operation become economically feasible. Do we wish to weigh the potential for higher farmgate prices against the associated unemployment of women who previously milled the grain by hand and carried it to market in

headloads? If so, we must expand our system boundary so that the underlying cause-and-effect linkage structure can be considered in project assessment.

Implicit concern with financial feasibility -- in terms of both project-level funding and farm-level cash flow -- will lead us to consider possible subsidy and credit arrangements. Concern with institutional feasibility will lead to consideration of alternative organization and management structures. The iterative nature of structural system development should facilitate domain and boundary specification appropriate to the assessment requirements.

The domain and boundaries of the structural system established in each project context determine the scope of project impact analysis. An illustrative analysis of the direct economic benefit/cost effects discounted over time and limited to the project area is presented in Table IV for the example project referenced above. Values have been expressed in appropriate shadow prices.

Additional instruments are required if impact considerations such as income equity, social and cultural effects, the role of women, economic/social enfranchisement of other minorities, etc., are relevant concerns for the assessment. An application of comparative-dynamic benefit/cost procedures addressing some of these additional concerns is presented in Part II of this study.

(e) Uncertainty and sensitivity of values -- There is no agreed upon procedure for dealing with uncertainty in deriving estimates of

PROJECT AREA

Table IV-A.1 -- DIRECT ECONOMIC BENEFIT/COST CALCULATION: SMALL-FARMER TECHNOLOGY PROJECT

Row	Item		Project Implementation Period - Year								Calculation Notes --
			1	2	3	4	5	6	7	8	
1.	Total project costs	($1,000)	425	315	294	353	514	822	1404	1527	(r.2a.21)
2.	Increase in total net income	($1,000)	0	0	3	21	105	419	1119	2096	(r.2a.25)
3.	Annual net benefit	($1,000)	-425	-315	-291	-332	-409	-403	-285	569	(r.2 - r.1)
4.	Cumulative net benefit	($1,000)	-425	-740	-1031	-1363	-1772	-2175	-2460	-1891	
5.	Internal Rate of Return calculation*		-283	-140	-86	-66	-54	-35	-17	22	(see Gittinger (1972), pp. 66-87, App.)
			-340	-202	-149	-136	-134	-106	-60	96	
			-303	-161	-106	-86	-76	-54	-27	39	
			-315	-173	-118	-100	-91	-66	-35	52	
			-327	-186	-132	-116	-110	-83	-45	70	

* Trial-and-error and interpolation method --

IRR = lower DR + (higher DR - lower DR) * (NPW at lower DR/ABS(NPW at higher DR - NPW at lower DR))

PROJECT AREA

Table IV-A.2 -- DIRECT ECONOMIC BENEFIT/COST CALCULATION : SMALL-FARMER TECHNOLOGY PROJECT (continued)

Row	Item		Post-Project Period - Year												NPW	Calculation Notes --
			9	10	11	12	13	14	15	16	17	18	19	20		
1.	Total project costs	($1,000)	-785	-747	-617	-364	-16	0	→					0		
2.	Increase in total net income	($1,000)	2096	→										2096		
3.	Annual net benefit	($1,000)	2881	2843	2713	2460	2112	2096	→					2096		
4.	Cumulative net benefit	($1,000)	990	3833	6546	9008	11118	13214	15310	17406	19502	21598	23694	25790		
5.	Internal Rate of Return calculation*		75	48	33	20	11	6	4	3	2	1	0	0	-456	(r.3:DR = 50%)
			386	304	233	170	116	92	73	59	48	38	29	25	+542	(r.3:DR = 25%)
			138	100	68	44	27	19	13	10	6	4	3	2	-340	(r.3:DR = 40%)
			193	142	100	66	42	31	23	17	13	10	6	4	-199	(r.3:DR = 35%)
			271	208	152	106	70	52	42	31	25	19	15	10	+72	(r.3:DR = 30%)

Assuming project has a 20-year economic life, IRR of project as specified is approximately -- 31-32 percent.

benefits and costs. While some studies have attempted to treat uncertainty by increasing the social discount rate by some arbitrary factor, this is generally not a valid procedure. A better approach is the determination of the criticality of uncertainty to decision-making information and taking appropriate steps to reduce it where it shows to be significant. Isolating the most crucial parameters and variables, we can ascertain with sensitivity analysis how possible errors in estimation will influence policy recommendations. If a recommendation is not altered by the range of possible parameter or variable values, we can be more certain in the recommendation. If a recommendation is altered by such potential errors, we may collect additional data or carry out additional analyses in order to narrow the range of our estimates and hence our uncertainty. Analysis of the sensitivity of benefit and cost estimates to variable and parameter values should include consideration of variations in: project implementation timing and phasing; productivity (crop yields, etc.) and technical relationships; product and input market quantities and prices; and shadow prices.

As with uncertainty in general, many project assessment results will remain unchanged using alternative social discount rates. An alternative procedure is to determine the internal rate of return -- that is, that discount rate at which benefits equal costs. If the internal rate of return is reasonably high, we can generally be assured that the economic benefits of a project will exceed the economic costs. The problem becomes more difficult when we are attempting to comparatively assess two different projects which have similar internal rates of return. In such cases, greater consideration may be given to alternative considerations such as project externalities and non-economic benefit/cost factors.

APPENDIX I

ILLUSTRATIVE CHECKLIST OF TECHNICAL, SOCIAL, AND ECONOMIC INTERRELATIONSHIP FACTORS

APPENDIX I. ILLUSTRATIVE CHECKLIST OF TECHNICAL, SOCIAL, AND ECONOMIC INTERRELATIONSHIP FACTORS

National (and Interregional) Factors

1. Evidence of strong commitment by national government for RD -- policy statements; articulated RD concern; programs

2. Specific policies affecting RD --
   a. import/export biases; quotas, protection
   b. prices; implicit taxes and subsidies
   c. fiscal - incidence of taxes and subsidies; progressivity; urban/rural bias; industry/agricultural bias
   d. land and capital asset ownership, control; incidence of tenancy, skewness in distribution
   e. development resources - allocation, incidence of benefits
   f. technology and science - R & D, adaptation for RD needs
   g. regional authority, comprehensive and integrated decision-making
   h. rational planning process, systematic decision-making

3. Social/political structure -- social, cultural enhancements, impediments to mobility, economic activity (caste, race, sex), political representation, regionalization biases

4. Economic structure --
   a. existing and potential national (and export) markets; price levels and price stability;
   b. existing and potential national (and import) markets; price levels and price stability;
   c. comparative cost considerations
   d. general economic structural data for national, regional comparisons

5. Administrative/organizational structural interrelationships; organizational mapping, information flow, influence, communication

APPRENDIX I. ILLUSTRATIVE CHECKLIST OF TECHNICAL, SOCIAL, AND ECONOMIC INTERRELATIONSHIP FACTORS (continued)

Local (Including Relative Measure) Factors

1. Physical resource subsystem --

   climate, soils, topography, drainage and flood conditions, existing and potential land use, natural resources (including quality and availability, existing and potential), distribution

2. Spatial structure and infrastructure subsystem --

   transportation (roads, water, vehicles, institutions), activity location structures, size economies, functional viabilities, water, energy

3. Population structure subsystem --

   sex, age, household structure, economic activity (off-farm, commutation, seasonality), educational and skill characteristics, health and mortality characteristics, social/cultural heterogeneity, political and decision-making structure, risk preferences, asset and tenure patterns, fertility, migration structure, spatial distribution, characteristics of modal household(s)

4. Agricultural subsystem --

   farm sizes and types, production norms (yields and yield variations), existing input/output production relationships, labor requirement calendar, price/cost relationships, income structure; potential activities, market structure and demand, input requirements and supply, capital equipment requirements, compatibility with existing system, transport facilities, income potential, education and skills required, investment required, operating capital required, land characteristics required, minimum I/O level for economies of size, scale in input distribution, output marketing, credit, etc.; risk and uncertainty factors; incidence and severity of disease, insect, weed infestations

5. Agricultural-linked subsystem --

   inputs; outputs; finance and credit; storage, transport, marketing, processing activities; irrigation; land development

APPENDIX I. ILLUSTRATIVE CHECKLIST OF TECHNICAL, SOCIAL, AND ECONOMIC INTERRELATIONSHIP FACTORS (continued)

Local (Including Relative Measure) Factors (cont'd)

6. Non-agricultural-linked activity subsystem --

7. Institutional structure subsystem

national and regional agencies with local contact points; local groups; interrelationships, functions, existing and potential linkage strengths; motivation/incentive structure (awareness of leaders, of masses; attitude toward change, toward external intervention; general economic involvement; vested interests in status quo, in change(s) proposed);

communications infrastructure (education, extension, training), research, health and sanitation, public services, commerce, other industries; telecommunications, electric, water supply, road system, land use map, population distribution.

APPENDIX I. ILLUSTRATIVE CHECKLIST OF TECHNICAL, SOCIAL, AND ECONOMIC INTERRELATIONSHIP FACTORS (continued)

Activity Factors

For each existing and potential activity:

Product market -- structure, including home consumption demand potential

Input (supply) market -- structure
supply potential

Technology -- local adaptation
competitive/complementary character
prerequisite and complementary/catalytic inputs
rigidity of paramaters and nature of factor criticality, including lead-times
performance response to inputs, including risk and uncertainty factors

Transport --

Land -- development needed

Labor -- skills required
seasonal demand

Capital and asset structure -- who makes decisions, who pays for inputs, how is output allocated
investment and working
credit structure (control, access, price)

Group action characteristics -- economies of size in markets, extension, credit, special problems

Income potential -- change in income
return to labor
return to capital - fixed
return to capital - operating costs

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AN APPROACH FOR ASSESSING RURAL DEVELOPMENT PROJECTS

PART II. AN ILLUSTRATIVE APPLICATION

by

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Prepared for the Agency for International Development
in fulfillment of tasks under RSSA COM/CEN 3-75
Methodology for Assessing Rural Development Projects

International Statistical Programs Center
Bureau of the Census
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AN APPROACH FOR ASSESSING RURAL DEVELOPMENT PROJECTS

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DRAFT
30 March 1977

AN APPROACH FOR ASSESSING RURAL DEVELOPMENT PROJECTS

PART II. AN ILLUSTRATIVE APPLICATION

A. INTRODUCTION

To illustrate application of the approach, the North Shaba (Zaire) Maize Production Project has been selected. This is a six-year $19 million project to develop and test a rural development process for improving small farmer production and incomes that can be replicated in other parts of Zaire.

The North Shaba project area has a history of commercial cash crop production. Maize is grown both as a cash crop and a locally consumed subsistence food crop. Because several individual farm operations obtain fairly high yields, it is believed that maize production for the area as a whole can be substantially increased. The climate favors maize production -- in some parts of the area the duration of the rainy season permits two growing seasons. The soils in general are average -- some rather fertile for the tropics, while others have been depleted by the lack of tree cover and improper conservation.

The project area currently exports maize (16,000 MT in 1976) to the Minoka flour mills at Kakontwe. Rail transport is currently available at advantageous rates. A fairly extensive marketing infrastructure already exists, although it is not as effective as it might be. While the road infrastructure is well developed, road surfaces and bridges have deteriorated and at present are in very poor condition.

The present discussion of the North Shaba project must be considered purely illustrative. Time and resource constraints force us to neglect the iterative process required for valid empirical application of the approach. Specifically, discussion detail is severely constrained by the limited access to and interaction with host country and Mission personnel knowledgeable about the project and conditions in the project area. Information is limited to that available in the Project Paper and that obtained as a member/observer of the Project Paper team.

Moreover, to keep the illustration manageable we will assume away many considerations and the influence of many aspects which would have to be dealt with in any real dynamic and interactive project situation. These simplifying assumptions specifically include:

(a) decision points and objectives are limited to those specifically cited below.

(b) the GOZ will remain effectively committed to the project objectives and the project approach. This implies GOZ policy implementation supportive of (not in conflict with) project purposes in terms of: establishing prices; limiting the draft of farm labor for public works; providing support through the Office des Routes (primary road rehabilitation/maintenance), the Bank of Kinshasa (farmer/market credit), Petro Zaire (POL), etc.; making available qualified Zairois counterpart staff (by means of priority assignment, appropriate incentive for motivation, career recognition, etc.); being able and willing to continue project efforts in the project area after termination and to extend the project approach to other areas.

(c) required project equipment, materials, etc., are provided on site in accord with project design schedule; this implies theft and casualty losses in transit and on site will be minimal.

(d) the project area consists of a single reasonably homogeneous district -- that is, there is little variation among characteristics (climate, soils, farm size, social structure, etc.) throughout the project area.

(e) technologies suitable for local adoption will be developed according to the project design schedule.

(f) a sufficient cadre of extension workers can be trained in the new methods and the interactive research/extension approach according to the project design schedule.

(g) the local farmer population will cooperate in a collaborative manner with project staff in carrying out project activities (e.g., data collection, on-site agronomic experimentation, modification of socio/political institutions, etc.).

(h) production inputs (fertilizer, pesticides, etc.) are available in the two major market towns Kongolo and Nyunzu at exogenously specified prices such as to economically justify their use.

(i) hired farm labor is available at a market wage close to the shadow wage rate but is considered socially undesirable.

(j) farm products are demanded and consumer goods are available in the two major market towns at exogenously specified prices such as to provide adequate real income incentives for both farmers and merchants.

(k) net natural population increase is balanced by project area out-migration.

B. METHODOLOGY IMPLEMENTATION

1. Delineation of Decision Points and Objectives

An abbreviated presentation of decision points and objectives of AID projects in general and the North Shaba project in particular is given in Table V-A. Because specification of a detailed decision structure is possible only with on-site investigation and analysis, the present portrayal remains as abstraction particularly of decision points and objectives within the project area. A more detailed socioeconomic and political structure would delineate the interests of various political officials in the area, of traditional and organized religious leaders, of racial and ethnic subgroups, of families and clans, etc. The illustrative table also gives possible measurement indicators providing a link to potentially useful data collection and analysis activities.

The AID objectives are derived directly from the Congressional Mandate. The GOZ objectives are obtained from Cabinet-level position statements and reflect the balance-of-payments problems of the growing food deficit faced by Zaire. The AID/GOZ negotiated purpose reflects both AID and GOZ interests. It recognizes the horrendous dimensions of the growing food deficit problem and the need to emphasize self-help efforts. It seeks to determine what can be done in face of the severe constraints placed by the domestic transportation network in terms of reliable access to production input supplies and product markets. It emphasizes the need to develop an effective research and extension system that can test and disseminate improved methods which are compatible with the small-farmer socio-economic and production systems that already exist.

TABLE V-A -- DECISION POINTS AND OBJECTIVES: NORTH SHABA MAIZE PRODUCTION PROJECT*

Decision Point	Objectives: Statement	Type**	Reference Source	Possible Measurement Indicator
AID	Increase income and productivity of rural poor	E	Sec.102***	Real household income; production per man-year
	Increase agricultural land productivity	E	" "	Crop yields
	Reduce rate of unemployment and under-employment	E	" "	Employment/population ratio
	Promote greater equality of income distribution	E	" "	Gini coefficients
	Increase food production	E	" "	Production of food crops; edible livestock products
	Improve nutrition	E	" "	Food availability/population ratios
	Improve farm marketing infrastructure	E	" "	Quantities moved; efficient price structure; etc.
	Stimulate labor-intensive small-scale industry	E	" "	Non-farm employment structure
	Expand local/small-scale facilities and infrastructure (storage, farm-to-market roads, etc.)	E	" "	Road kms. constructed; storage facilities built; etc.
	Create/strengthen systems to provide services and supplies needed by farmers (extension, research, fertilizer, improved seed, etc.)	E	" "	Amount of services performed, supplies delivered, etc.
	Conduct agricultural research/extension so as to take account of socio-economic/technical environment at local level	E	Sec.103A***	Adoption of improved seeds, practices, etc.
	Improve productive skills of rural families	E	Sec.105***	Number trained
	Promote development/dissemination of locally appropriate intermediate technologies	E	Sec.107***	Adoption of improved technologies
	Develop self-help groups to enhance participation of rural poor in development	E	Sec.111***	Number and viability of farmer self-help groups, cooperatives

TABLE V-A -- DECISION POINTS AND OBJECTIVES: NORTH SHABA MAIZE PRODUCTION PROJECT* (contd.)

Decision Point	Objectives: Statement	Type**	Reference Source	Possible Measurement Indicator
AID (contd.)	Improve balance of payments position	I		Balance of payments
	Decrease/minimize increase in foreign debt	I		Foreign debt obligations
GOZ	Achieve self-sufficiency in food production	E	MOA Green Paper****	Net food exports
	Increase monetary income of rural poor	E	" "	Household income
	Improve standard of living of rural poor	E	" "	Real household income
	Improve balance of payments position	I		Balance of payments
	Decrease/minimize increase in foreign debt	I		Foreign debt obligations
AID/GOZ	Identify RD process for improving small farmer production and incomes that can can be replicated in other areas of Zaire	E	Project Paper	Documentation and analysis of project experience; extension of approach to other areas
Project Management	Successful implementation of project (for explicit objectives and targets, see Logical Framework, Appendix I.)	I		Selected MIS data
Local Farmer Leaders	Maintain/improve socio-political status; improve income/welfare of local farmers	I		Crop production; net farmer income; consumer good availability, prices
Local Farmers	Improve income/welfare position	I		" " " " " "

TABLE V-A -- DECISION POINTS AND OBJECTIVES: NORTH SHABA MAIZE PRODUCTION PROJECT* (contd.)

Decision Point	Objectives: Statement	Type**	Reference Source	Possible Measurement Indicator
Local Merchants	Conduct profitable business operation; increase net income	I		Merchant income (return to labor, capital)
Local Government Officials	Maintain/improve socio-political and career status; increase life-time earnings	I		Income and income potential; turn-over and recruitment difficulty

* Other objectives might be cited but are considered unnecessary for present illustration; see also Logical Framework, Appendix I.

** Type: E = Explicit; I = Implicit.

*** FAA of 1961 as amended.

**** New Forms of Agricultural Production, Kinshasa: Republic of Zaire, Department of Agriculture, June 1976.

2. Delineation of Project Activities

Project activities are grouped into six component subsystems. These are:

(a) Research and Extension Subsystem

(b) Farmer Group Development Subsystem

(c) Intermediate Technology Subsystem

(d) Marketing and Credit Subsystem

(e) Infrastructure Subsystem

(f) Monitoring and Evaluation Subsystem

A) Description

1) Research and Extension Subsystem

This subsystem includes the establishment of a research and training center at Mbulula where basic farming systems in use in the project area can be replicated and analyzed. Innovations will be tested within the context of these farming systems. Improved practices currently being used by the more productive farmers will be identified for dissemination to other farmers in the area to help increase yields. Basic agronomic research to develop more advanced technologies (including fertilizer use, modification of rotation patterns, etc.) will also be conducted. As appropriate, advanced technologies which have proven acceptable to farmers will be introduced.

The project research and extension activities will emphasize maximum farmer involvement through collaborative and interactive activities.

They will also emphasize the development of the extension system from the local level upwards. Agricultural assistants will be trained by the project to be stationed at each of the Farmers' Centers to be established under the Farmer Group Development Subsystem (as discussed below).

Project activities of this subsystem might be outlined as follows:

Input --

R/E facility construction/rehabilitation (see Infrastructure Subsystem)

Detailed research design and specification

- Research personnel resource input
- Research capital resource input
- Research commodity input

Research success probability and time lag

Detailed extension design and specification

- Extension education sub-activity --
  - Extension personnel resource input
  - Extension capital resource input
  - Extension commodity input
  - Personnel trained and time lag
- Technology dissemination sub-activity --
  - Extension personnel resource input
  - Extension capital resource input
  - Extension commodity input
  - Thchnology disseminated and time lag

Adoption success probability and time lag

Output --

Adoption of new technology

Given the resource inputs, success probabilities, and time lags relevant to the subsystem, some level of adoption of improved practices resulting in increased yields, production and incomes can be expected.

At specified resource levels the probability of success in developing locally appropriate technologies depends to a large extent on the input of data concerning the local environment. Farmer involvement in agronomic field experimentation will facilitate this information input as well as pave the way for adoption of those practices which are determined to have practical advantage. Note, however, that the appropriateness of a technology (and hence its probability of successful adoption) is therefore in part a function of other project actions -- e.g., the improvement of roads resulting in better access to input supplies and product markets, the improvement of market operations and information resulting in more reliable product demand, etc. It is also a function of determinants over which the project has limited control -- e.g., climate, the availability and price of inputs, etc.*

2) Farmer Group Development Subsystem

The efficiency of delivering production inputs (extension, fertilizer, etc.) and marketing farm products can be improved with cooperation among individual farmers. This subsystem will encourage the development of farmer groups or pre-cooperatives within the context of popularly defined needs and opportunities based on existing patterns of local cooperation. During the six-year implementation period the project will

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* These interactions are too numerous and complex to be dealt with properly in the present discussion; their significance on decision-making information requirements must nevertheless be recognized for the research/extension as well as other subsystems.

establish about 75 Farmers' Centers to be managed by Farmer Councils. Initially the farmer groups will carry out a limited number of simple functions (e.g., the sale of tools and implements (IT), the collection of data on agronomic practices, demonstration of improved practices, etc.). As their organization and financial capabilities improve the farmer groups will be encouraged to expand their activities into other areas (e.g., the marketing of farm products). The multi-level organizational structure ultimately created should greatly facilitate the flow of information, production inputs, and farm product outputs.

Project activities of this subsystem might be outlined as follows:

Input --

Farmer group development facility construction/rehabilitation
- Local self-help efforts
- Project infrastructure (see Infrastructure Subsystem)

Detailed farmer group development design and specification
- Farmer group development personnel resource input
- Farmer group development capital resource input
- Farmer group development commodity input

Farmer group development success probability and time lag

Output --

Farmer Councils organized; Farmers' Centers established and viably operating

3) Intermediate Technology Subsystem

The basic objective of this subsystem is to facilitate expanded production by alleviating critical labor constraints during peak work periods (e.g., during field clearing and harvest periods). The project

will establish an intermediate technology development, production, and training center at Kongolo. This center will produce such items as corn shellers, hand mills, peanut and rice decorticators, etc. The project will recruit and train Zairois to operate the center as well as train village blacksmiths to maintain the items produced at the center.

Project activities of this subsystem might be outlined as follows:

Input --

IT facility construction/rehabilitation (see Infrastructure Subsystem)

Detailed IT development design and specification

IT training sub-activity --
- IT personnel resource input
- IT capital resource input
- IT commodity input
- Personnel trained and time lag

IT production/distribution/maintenance sub-activity --
- IT personnel resource input
- IT capital resource input
- IT commodity input
- IT produced/distributed/maintained and time lag

IT adoption success probability and time lag

Output

IT center/village blacksmith production/maintenance capacity developed

IT produced/distributed/maintained

4) Marketing and Credit Subsystem

The basic objective of this subsystem is to facilitate the development of an expanded and more competitive private sector in the grain

marketing activities of the project area. The project will provide funds (to be administered by the Bank of Kinshasa) for credit to grain merchants, enabling them to purchase trucks and spare parts and to cover the cost of their grain purchases from farmers, and for production credit (if needed) to small farmers enabling them to purchase inputs, equipment, etc. In collaboration with SNCZ*, the project will improve and expand the loading facilities at key railheads to facilitate more efficient transfer of marketed grain. To develop business management capabilities in the project area the project will establish training programs for small grain merchants. The project will also provide information and communications assistance to the small merchants. In addition, the project will assist ONACER** in developing a prototype marketing program involving the provision of credit, training of ONACER agents, etc.

Project activities of this subsystem might be outlined as follows:

<u>Input</u> --

Detailed marketing structure design and specification

Equipment and facility sub-activity --
- Personnel resource input
- Capital resource input
- Commodity input
- Facilities constructed/rehabilitated and time lag; equipment operating on site and time lag

Credit sub-activity --
- Personnel resource input
- Capital resource input
- Commodity input
- Credit operations viable and time lag

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* National Railway System.

** National Office of Cereals.

Training sub-activity --
- Personnel resource input
- Capital resource input
- Commodity input
- Merchants trained and time lag

ONACER support sub-activity --
- Personnel resource input
- Capital resource input
- Commodity input
- ONACER effectively operating and time lag

Marketing development success probability and time lag

Output --

Marketing operations financially sound

Viable competitive equilibrium established in private sector

ONACER supportive of efficient private sector operations

Farm production surplus marketed

5) Infrastructure Subsystem

The basic objective of this subsystem is to facilitate farmer access to agricultural inputs and services as well as to product markets by re-opening production areas where deterioration of the road system has inhibited this access. The project will provide resources for the rehabilitation of 724 kms. of secondary roads and the rehabilitation/construction of 72 bridges. This work will be performed using a combination of mechanized equipment and paid manual labor. The project will also rehabilitate/construct 100 kms. of area penetration roads using paid labor and 500 kms. of farm access roads using unpaid labor. In addition, the project will provide support to the OR Brigade 19 to ensure effective primary road rehabilitation and maintenance.

This subsystem will also provide for the construction/rehabilitation of facilities at Kongolo, Mbulula, and Nyunzu to be utilized by all project subsystems.

Project activities of this subsystem might be outlined as follows:

Inputs --

Project facility rehabilitation/construction

Infrastructure personnel resource input
Infrastructure capital resource input
Infrastructure commodity input

Project facilities ready for use success probability and time lag

Detailed road/bridge construction/rehabilitation specification

Secondary and farm road sub-activity --
Construction personnel resource input
Construction capital resource input
Construction commodity input
Roads/bridges constructed/rehabilitated and time lag

OR Brigade 19 support sub-activity --
Construction personnel resource input
Construction capital resource input
Construction commodity input
OR Brigade 19 viable and operating (primary roads maintained) and time lag

Road rehabilitation/construction success probability and time lag

Output --

Primary, secondary, penetration, and farm access roads/ bridges constructed/rehabilitated/maintained

6) Monitoring and Evaluation Subsystem

The objectives of this subsystem are: (a) to monitor project implementation and achievement; (b) to analyze this and other data to determine causal relationships; and (c) to evaluate project performance and project implementation experience. The project will establish

a Data Collection and Analysis Unit which will develop and maintain an information system to meet the needs of decision-makers in the project area as relevant to the project goals.

Inputs --

DCA facility construction/rehabilitation (see Infrastructure Subsystem)

Detailed project monitoring and evaluation design and specification

DCA Unit sub-activity --
- DCA personnel resource input
- DCA capital resource input
- DCA commodity input
- DCA capability developed and time lag

Periodic evaluation sub-activity --
- Evaluation personnel resource input
- Evaluation capital resource input
- Evaluation commodity input
- Periodic evaluations achieved and time lag

Project monitoring and evaluation success probability and time lag

Output

Decision-maker information needs adequately and cost-effectively met

B) Activity Implementation*

Project activity implementation as reflected by inputs and costs is summarized by project subsystem in Table V-B.

Project activity implementation as reflected by selected direct subsystem outputs is presented in Table V-C. These subsystem direct

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* See also Project Performance Network Chart, Appendix II.

TABLE V-B -- NORTH SHABA MAIZE PRODUCTION PROJECT: INPUT/COST SUMMARY[1]

ITEM	Project Implementation Period - Year 1		2		3		4		5		6		Total	
I. Research/Extension Subsystem:														
Number of personnel required --		46		66		86		106		126		146		-
-- Excluding agric. asst.		26		26		26		26		26		26		-
-- Agric. asst.		20		40		60		80		100		120		-
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
Personnel cost	120	63	120	71	120	80	120	89	120	98	120	107	720	508
Infrastructure	30	97	-	-	-	-	-	-	-	-	-	-	30	97
Vehicles	53	-	3	-	3	-	3	-	49	-	-	-	111	-
Other equipment and supplies	88	20	34	13	33	17	68	23	30	20	28	23	281	116
Other	93	46	93	46	43	53	43	53	21	51	21	51	314	300
Total cost	384	226	250	130	199	150	234	165	220	169	169	181	1456	1021
II. Farmer Group Development Subsystem:														
Number of personnel required --		11		11[2]		11[2]		11[2]		10		10		
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
Personnel cost	80	20	104	20	104	20	104	20	-	20	-	20	392	120
Infrasturcture	24	36	-	-	-	-	-	-	-	-	-	-	24	36
Vehicles	22	-	-	-	-	-	22	-	-	-	-	-	44	-
Other equipment and supplies	9	5	1	3	3	3	5	2	4	5	1	4	23	22
Other	9	3	13	6	13	6	9	4	9	4	9	4	62	27
Total cost	144	64	118	29	120	29	140	26	13	29	10	28	545	205

TABLE V-B -- NORTH SHABA MAIZE PRODUCTION PROJECT: INPUT/COST SUMMARY (contd.)[1]

ITEM	Project Implementation Period - Year 1		2		3		4		5		6		Total	
III. Intermediate Technology Subsystem:														
Number of personnel required --		25[3]		25[4]		25[4]		25[4]		25[4]		25		-
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
Personnel cost	68	43	20	43	20	42	20	43	20	42	-	43	148	256
Infrastructure	60	45	-	-	-	-	-	-	-	-	-	-	60	45
Vehicles	13	-	-	-	-	-	13	-	-	-	-	-	26	-
Other equipment and supplies	114	42	31	21	6	21	1	1	1	1	-	-	153	86
Other	9	10	19	13	19	13	5	6	5	6	5	6	62	54
Total cost	264	140	70	77	45	76	39	50	26	49	5	49	449	441
IV. Marketing/Credit Subsystem:														
Number of personnel required --	[5]	22	[5]	22	[5]	22	[5]	22		22		22		-
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
Personnel cost	[5]	35	[5]	35	[5]	35	[5]	35		35		35	[5]	210
Infrastructure	30	20	-	-	-	-	-	-	-	-	-	-	30	20
Vehicles	62	75	-	-	-	-	-	-	-	-	-	-	62	75
Other equipment and supplies	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other (excluding credit fund)	17	7	19	9	19	9	15	7	15	5	15	5	100	42
Subtotal	109	137	19	44	19	44	15	42	15	40	15	40	192	347
Credit expansion --														
Truck investment		600		-		-		-		-		-		600
Crop purchase		450		-		-		-		-		-		450
Total cost	109	1187	19	44	19	44	15	42	15	40	15	40	192	1397

TABLE V-B -- NORTH SHABA MAIZE PRODUCTION PROJECT: INPUT/COST SUMMARY (contd.)[1]

ITEM	Project Implementation Period - Year 1		2		3		4		5		6		Total	
V. Infrastructure Subsystem:														
Number of personnel required[6] --		2		228		228		228		102		52		-
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
Personnel costs (foreign tech. only)	120	-	320	-	320	-	320	-	236	-	100	-	1416	-
Building and maintenance center costs	260	145	-	145	-	5	-	10	-	15	-	21	260	341
Vehicles/equipment	1560	-	-	-	-	-	-	-	-	-	-	-	1560	-
Materials/supplies and other	12	30	36	87	328	600	320	530	116	148	116	108	936	1503
Total cost	1952	175	356	232	648	605	648	540	352	163	216	129	4172	1844
VI. Monitoring and Evaluation Subsystem:														
Number of personnel required --		14		14		14		14		14		14		-
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
Personnel cost	88	49	88	36	48	36	80	36	80	36	80	45	464	238
Intrastructure	40	55	-	-	-	-	-	-	-	-	-	-	40	55
Vehicles	11	-	-	-	-	-	11	-	-	-	-	-	22	-
Other equipment/supplies	28	4	6	4	7	5	8	4	6	4	7	4	62	25
Other	-	24	-	40	-	24	-	24	-	24	-	24	-	160
Total cost	167	132	94	80	55	65	99	64	86	64	87	73	588	478

TABLE V-B -- NORTH SHABA MAIZE PRODUCTION PROJECT: INPUT/COST SUMMARY (contd.)[1]

ITEM	Project Implementation Period - Year 1		2		3		4		5		6		Total	
	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC	FX	LC
VI. Project Totals:														
Research/Extension Subsystem	384	226	250	130	199	150	234	165	220	169	169	181	1456	1021
Farmer Group Development Subsystem	144	64	118	29	120	29	140	26	13	29	10	28	545	205
Intermediate Technology Subsystem	264	140	70	77	45	76	39	50	26	49	5	49	449	441
Marketing/Credit Subsystem	109	137	19	44	19	44	15	42	15	40	15	40	192	347
Infrastructure Subsystem	1952	175	356	232	648	605	648	540	352	163	216	129	4172	1844
Monitoring and Evaluation Subsystem	176	132	94	80	55	65	99	64	86	64	87	73	588	478
Totals[7]	3520	1233	1106	699	1287	1071	1354	977	913	602	671	588	8851	5170
Total Project Cost (in $1,000)[8]		4954		1919		2532		2490		1613		1355		14863

FOOTNOTES:

1) Foreign exchange costs in $1,000; local costs in Z1,000; values derived from preliminary data and therefore exclude inflation and other correction/adjustment factors.

2) Plus 3 mm short-term consultations.

3) Plus 9 mm short-term consultations.

4) Plus 3 mm short-term consultations.

5) Expatriate advisor included with Farmer Group Development Subproject.

6) Excludes parttime and casual labor.

7) Includes project management.

8) Using exchange rate of 0.86Z = $1.00.

impact calculations do not reflect possible double-counting of benefits nor do they fully reflect the enhancement effects of one project subsystem on another.*

Estimates of the output targets to be achieved are based on the implementation plan and various assumptions concerning the probability of success and the time lag required. An alternate estimate reflecting failure to achieve targeted outputs by 10 percent is also calculated. As the project is implemented, more detailed information on the determinants of the subsystem success probabilities will be ascertained.

1) Farmer Group Development Subsystem

Organization of Farmer Councils and the establishment of Farmers' Centers is planned so that all farmers will be covered by the fifth year of the project (Table V-C.1). The location and number of such groupings assumes proper determination of certain central place orientation characteristics of farmers. The alternate estimate reflects the possibility that some farm units in the project area may not be adequately served by the Farmer Councils or FCs to be established -- for example, FCs may be attempted in wrong locations or socio-economic/political barriers may play an inhibiting role on involvement by selected farmers.

2) Research/Extension Subsystem

Three types of improved agronomic technologies are considered by the project (Table V-C.2). All are expected to have direct impacts on

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* The effect of project activity integration is considered more fully in the structural delineation and impact analysis sections below.

TABLE V-C.1 NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: FARMER GROUP DEVELOPMENT SUBSYSTEM

	Project Implementation Period - Year					
	1	2	3	4	5	6
I. Number of Farmer Centers:						
New FCs established	10	15	15	15	20	-
Total FCs established	10	25	40	55	75	75
II. Farm Units Reached:[1]						
By new FCs	2400	3600	3600	3600	4800	-
By all FCs	2400	6000	9600	13200	18000	18000
Relative coverage (%)	13	33	53	73	100	100
III. Alternative Farm Units Reached:[2]						
By new FCs	2160	3240	3240	3240	4320	-
By all FCs	2160	5400	8640	11880	16200	16200
Relative coverage (%)	12	30	48	66	90	90

[1] Assumes 240 farm units per Farmer Center.

[2] Calculated as 10% less than Section II value.

TABLE V-C.2a -- NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: RESEARCH/EXTENSION SUBSYSTEM

	Project Implementation Period - Year					
	1	2	3	4	5	6
I. Production with Current Technology:						
Total number of farm units	18000	18000	18000	18000	18000	18000
Total production (MT)[1]	21960	21960	21960	21960	21960	21960
Production marketed (MT)[2]	16000	16000	16000	16000	16000	16000
II. Production with Improved Technology:						
Farm units reached by FCs	2400	6000	9600	13200	18000	18000
Units newly adopting improved practices[3]	-	-	1440	1980	2700	2700
Total units adopting improved practices	-	-	1440	3420	6120	8820
Production with improved practices (MT)[4]	-	-	2635	6259	11200	16141
Units newly adopting improved seed[5]	-	-	-	-	2700	2700
Total units adopting improved seed	-	-	-	-	2700	5400
Production with improved seed (MT)[6]	-	-	-	-	2214	4428
Units newly adopting fertilizer[7]	-	-	-	-	-	1800
Total units adopting fertilizer	-	-	-	-	-	1800
Production with fertilizer (MT)[8]	-	-	-	-	-	1908
Total production with improved technology (MT)	-	-	2635	6259	13414	22477
Units not using improved technology	18000	18000	16560	16020	11880	9180
Production without improved technology (MT)[1]	21960	21960	20203	19544	14494	11200
Total production (MT)	21960	21960	22838	25803	27908	33677
Net increase in marketed production (MT)	0	0	878	3843	5948	11717
Net relative increase in marketed production (%)	0	0	4	18	27	53
III. Alternate Estimate:[9]						
Net increase in marketed production (MT)	0	0	790	3459	5353	10545
Net relative increase in marketed production (%)	0	0	4	16	24	48

TABLE V-C.2b -- NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: RESEARCH/EXTENSION SUBSYSTEM

	Post-Implementation Period - Year			
	7	8	9	10
I. Production with Current Technology:				
Total number of farm units	18000	18000	18000	18000
Total production (MT)[1]	21960	21960	21960	21960
Production marketed (MT)[2]	16000	16000	16000	16000
II. Production with Improved Technology:				
Farm units reached by FCs	18000	18000	18000	18000
Units newly adopting improved practices[3]	2700	2700	2700	-
Total units adopting improved practices	11520	14220	16920	16920
Production with improved practices (MT)[4]	21082	26023	30964	30964
Units newly adopting improved seed[5]	2700	2700	2700	2700
Total units adopting improved seed	8100	10800	13500	16200
Production with improved seed (MT)[6]	6682	8856	11070	13284
Units newly adopting fertilizer[7]	1800	1800	1800	1800
Total units adopting fertilizer	3600	5400	7200	9000
Production with fertilizer (MT)[8]	3816	5724	7632	9540
Total production with improved technology (MT)	31580	40603	49666	53788
Units not using improved technology	6480	3780	1080	1080
Production without improved technology (MT)[1]	7906	4612	1318	1318
Total production (MT)	39486	45215	50984	55106
Net increase in marketed production (MT)	17526	23255	29024	33146
Net relative increase in marketed production (%)	80	106	132	151
III. Alternate Estimate:[9]				
Net increase in marketed production (MT)	15773	20930	26122	29831
Net relative increase in marketed production (%)	72	95	119	136

NORTH SHABA MAIZE PROJECT IMPACTS: RESEARCH/EXTENSION SUBSYSTEM

TABLE V-C.2a and TABLE V-C.2b Footnotes:

1) Assumes average production of 1.22 MT per farm unit.
2) Level of shipments to Minoka mills using 15 truck equivalents (1976 marketing period).
3) Assumes 15% annual rate of adoption in terms of unit equivalents.
4) Assumes 50% average increase in annual yield (1.22 + 0.5 * 1.22 = 1.83).
5) Assumes 15% annual rate of adoption in terms of unit equivalents.
6) Assumes 45% average increase in annual yield (0.45 * 1.83 = 0.82).
7) Assumes 10% annual rate of adoption in terms of unit equivalents.
8) Assumes 40% average increase in annual yield (0.40 * (1.83 + 0.82) = 1.06).
9) Calculated as 10% less than Section II value.

TABLE V-C.3 -- NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: INTERMEDIATE TECHNOLOGY SUBSYSTEM

	Project Implementation Period - Year					
	1	2	3	4	5	6
I. Production with Current Technology:						
Total number of farm units	18000	18000	18000	18000	18000	18000
Total production (MT)[1]	21960	21960	21960	21960	21960	21960
Marketed production (MT)[2]	16000	16000	16000	16000	16000	16000
II. Production with Intermediate Technology:						
Number of local IT specialists trained	-	-	25	25	25	-
Total local IT specialists trained	-	-	25	50	75	75
Number of village blacksmiths trained	-	-	-	20	20	20
Total village blacksmiths trained	-	-	-	20	40	60
Units reached by FCs	2400	6000	9600	13200	18000	18000
Units newly using available IT[3]	-	-	5400	5400	5400	-
Total units using available IT	-	-	5400	10800	16200	16200
Production with available IT (MT)[4]	-	-	9234	18468	27702	27702
Units without access to IT	18000	18000	12600	7200	1800	1800
Production without IT (MT)[1]	21960	21960	15372	8784	2196	2196
Total production (MT)	21960	21960	24606	27252	29898	29898
Net increase in marketed production (MT)	0	0	2646	5292	7938	7938
Net relative increase in marketed production (%)	0	0	12	24	36	36
III. Alternate Estimate:[5]						
Net increase in marketed production (MT)	0	0	2381	4763	7144	7144
Net relative increase in marketed production (%)	0	0	11	22	33	33

1) Assumes average production of 1.22 MT per farm unit.
2) Level of shipments to Minoka mills using 15 truck equivalents (1976 marketing period).
3) Assumes 30% annual rate of availability/adoption in terms of unit equivalents.
4) Assumes 40% average increase in annual production (1.22 * 1.40 = 1.71).
5) Calculated as 10% less than Section II value.

TABLE V-C.4 -- NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: MARKETING/CREDIT SUBSYSTEM

	1	2	3	4	5	6
I. Production with Current Marketing:						
Total number of farm units	18000	18000	18000	18000	18000	18000
Total production (MT)[1]	21960	21960	21960	21960	21960	21960
Production marketed (MT)[2]	16000	16000	16000	16000	16000	16000
II. Production with Improved Marketing:						
Number of operating vehicles[3]	23	28	32	36	38	39
Production marketable with increased vehicle capacity (MT)	24533	29867	34133	38400	40533	41600
Net increase in marketed production (MT)	8533	13867	18133	22400	24533	25600
Net relative increase in marketed production (%)	53	87	113	140	153	160
III. Alternate Estimate:[4]						
Net increase in marketed production (MT)	7680	12480	16320	20160	22080	23040
Net relative increase in marketed production (%)	48	78	102	126	138	144

1) Assumes average production of 1.22 MT per farm unit.

2) Level of shipments to Minoka mills using 15 truck equivalents (1976 marketing period).

3) Truck-equivalents provided through project credit program.

4) Calculated as 10% less than Section II value.

TABLE V-C.5 -- NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: INFRASTRUCTURE SUBSYSTEM

	Project Implementation Period - Year					
	1	2	3	4	5	6
I. Production with Current Infrastructure:						
Total number of farm units	18000	18000	18000	18000	18000	18000
Total production (MT)[1]	21960	21960	21960	21960	21960	21960
Production marketed (MT)[2]	16000	16000	16000	16000	16000	16000
II. Production with Improved Infrastructure:						
A. Kilometers of improved roads/bridges						
1. Secondary --	-	-	250	374	-	-
a) Currently usable (55%)	-	-	193	206	-	-
35/k² density	-	-	47	-	-	-
15/k² density	-	-	110	104	-	-
2/k² density	-	-	36	102	-	-
b) Currently unusable (45%)	-	-	157	168	-	-
35/k² density	-	-	38	-	-	-
15/k² density	-	-	90	85	-	-
2/k² density	-	-	29	83	-	-
2. Farm penetration/access	-	-	150	250	100	100
a) Currently usable (100%)	-	-	50	50	-	-
2/k² density	-	-	50	50	-	-
b) New construction	-	-	100	200	100	100
35/k² density	-	-	50	50	25	25
15/k² density	-	-	25	100	50	50
2/k² density	-	-	25	50	25	25
3. Number of rehabilitated/construction bridges	-	-	31	34	7	-

TABLE V-C.5 -- NORTH SHABA MAIZE PRODUCTION PROJECT IMPACTS: INFRASTRUCTURE SUBSYSTEM (contd.)

	Project Implementation Period - Year					
	1	2	3	4	5	6
II. Production with Improved Infrastructure (continued):						
B. Farm units in accessed area[3]						
Along improved secondary roads	-	-	8338	12001	12001	12001
Along farm penetration/access roads	-	-	1346	3197	4065	4934
Total, all accessed area	-	-	9684	15198	16066	16935
C. Net increase in marketed production (MT)[4]	-	-	5907	9271	9800	10330
Net relative increase in marketed production (%)	-	-	37	58	61	65
III. Alternate Estimate:[5]						
Net increase in marketed production (MT)	-	-	5316	8344	8820	9297
Net relative increase in marketed production (%)	-	-	33	52	55	58

1) Assumes average production of 1.22 MT per farm unit.

2) Level of shipments to Minoka mills using 15 truck equivalents (1976 marketing period).

3) Assumes ± 1.5 kilometers on each side of newly constructed farm access roads, ± 4 kilometers on all other roads; assumes 7 persons per farm family.

4) Assumes 50% average increase in annual production (1.22 * 0.50 = 0.61).

5) Calculated as 10% less than Section II value.

crop yields as well as some secondary effect in increasing the size of cropping areas. The determination and analysis of current practices of better farmers and the dissemination of these practices to other project area farmers is expected to result in increased area production starting in the third year.* Building on PNM/CIMMYT** agronomic research, improved seed varieties are expected to be available for adoption in the project area by the fifth year. In addition, agronomic research is expected to develop an acceptable fertilizer package available for dissemination by the sixth year. Because of the lead times required to develop and fully disseminate locally appropriate technology packages, the direct project impacts extend well into the post-implementation period.

The success probabilities of these various efforts depend upon a variety of factors. In addition to technical questions such as relative risk in light of potential production gain, there exist problems of communication, availability of seed and production inputs, etc. The alternate estimate reflects that some of these factors may cause greater difficulties than considered in the project plan.

3) Intermediate Technology Development Subsystem

The availability of intermediate technology is expected to increase farmer productivity especially during critical bottleneck periods in the cropping cycle. Increased quantities and better quality of marketable

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* In the maize program in Western Kenya the introduction of such practices as early planting, increased plant density, and more frequent and timely weeding resulted in production increases of up to 72 percent.

** National Maize Program supported with CIMMYT technical assistance.

maize can be obtained with hand-operated mechanical corn shellers; land clearing and weeding labor can be more effective with serviceable tools and implements. Intermediate technology production, distribution and maintenance is expected to achieve full potential by the fifth year (Table V-C.3).

4) Marketing and Credit Subsystem

One major constraint on the quantity of maize shipped to meet the demand of the Minoka mills is the current capacity of the marketing sector. One aspect in relaxing this constraint is the development of loading facilities at key railheads. The project will also enable merchants to purchase trucks and spare parts so that grain can be moved more effectively from the farm production sites to the railhead transshipment points. The project projects a 50 percent increase in trucking capacity the first year followed by lesser increases in succeeding years (Table V-C.4). The alternate estimate reflects that this targeted increase may not be achieved.

5) Infrastructure Subsystem

The project plans to complete improvement of secondary and area penetration roads during the third and fourth years; construction of farm access roads will be completed in the sixth year (Table V-C.5).

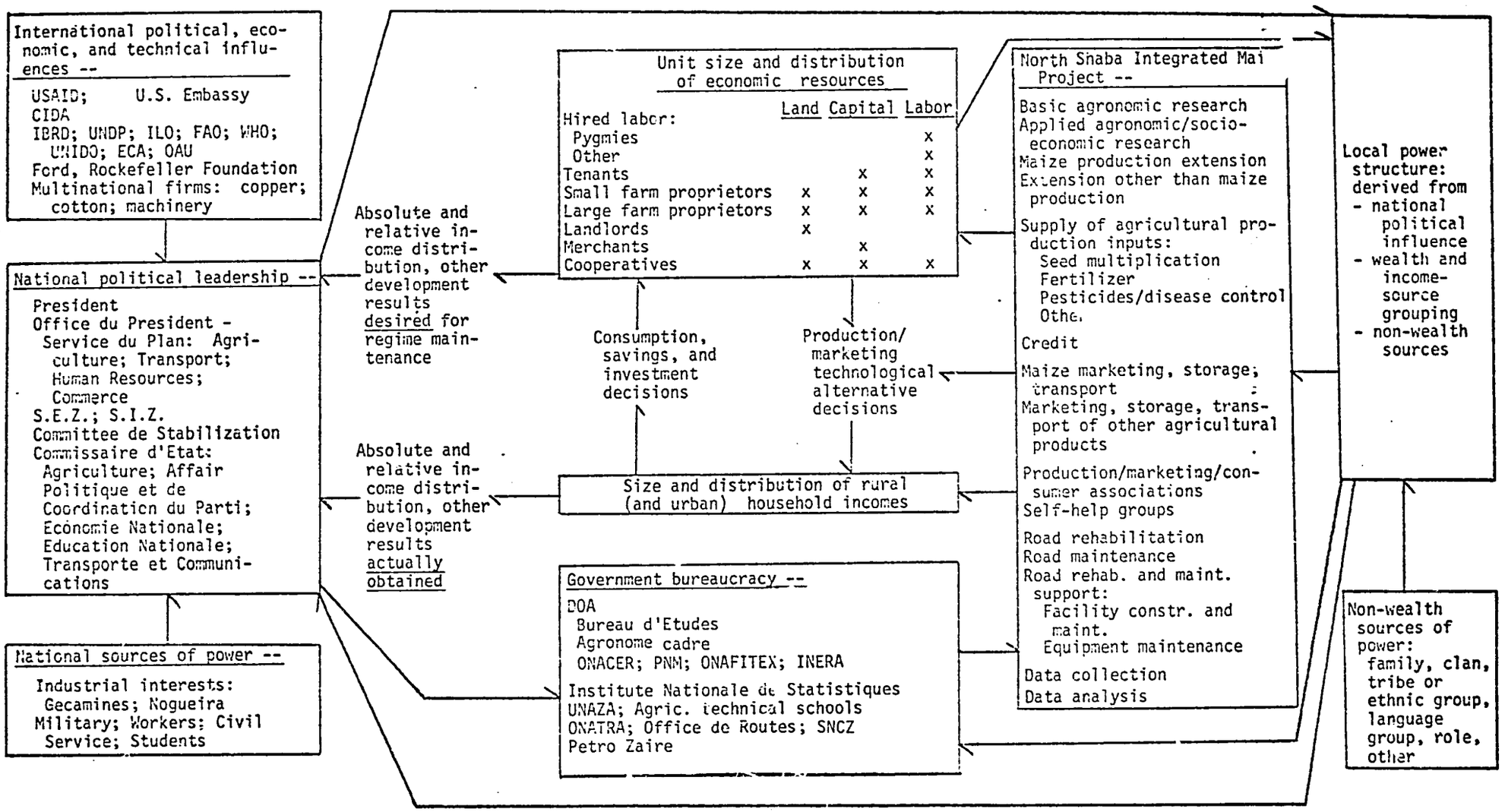
Two factors imply increased marketed production associated with road improvement. First, the improvement of existing roads will permit merchants to extend their range of market at given profit levels.

Operating costs for a typical 6.5-ton truck are estimated to average $0.521 and $0.304 per kilometer for unimproved and improved roads respectively. For each kilometer improved the merchants can extend their range 0.417 kilometers on unimproved roads or 0.714 kilometers on improved roads ((.521 - .304)/.521; (.521 - .304)/.304). The project expects intensified competition will reinforce the extension of range of market beyond improved roads. Second, farmers will increase their production in response to improved market access. For the project area this increased production will be a function of the number of farm units in the accessed area and the production increase per farm unit. An estimate of the number of farm units accessed through direct road improvement and through market extension is obtained by population density divided by the average size of farm family adjusted to reflect whether road access is currently or has been previously available for marketing. The project plan assumes a 50 percent increase in production per unit, resulting in a net relative increase in marketed production of 65 percent by the sixth year.

3. Delineation of Socioeconomic and Technical Structure

A general overview of the organizational and decisionmaking context underlying the North Shaba project is presented in Figure 3. While additional structural detail is required, certain aspects are already apparent. One important consideration is the nature of socio-political franchise at the local level. The project area is characterized largely by small farm units. While tribal groupings presently exist, it is not clear that introduction of highly indivisible inputs (such as associated with technology packages or communication approaches) will be successful in developing the franchise of the rural poor without direct conscious efforts being made to develop viable cooperative organization. The project recognizes this in its farmer group development subsystem. The pragmatic delineation of the social and political concerns underlying the objectives of rural development needs to be clarified and communicated through to the bureaucracy operating at the local level. The current vested interests in the local power structure will create strong and persistent pressures on the local bureaucracy to operate in ways which may well not be consistent with the project intent. That the national political leadership is largely independent of local elites may strengthen the project in its purpose of creating a more viable food-producing sector. Taken as a whole, the social and political environment of the project has strong elements conducive to successful project implementation. If project implementation is not sensitive to these potential pitfalls, however, project endeavors may be led astray and a socio-political environment creating difficulties for a continuing and self-sustaining development process may result.

FIGURE 3 -- NORTH SHABA MAIZE PRODUCTION PROJECT: DECISION-MAKING CONTEXT OF SOCIOECONOMIC STRUCTURE



Matrix portrayal of selected major cause-and-effect relationships is presented in Figure 4. There are many factors which are involved in the cause-and-effect linkages from project resource inputs to end objectives. At least four of the underlying assumptions are pervasive in that they affect almost everything in the project area. In particular, project success calls for: a clear comprehension of project objectives; identification of relevant decision points; effective continuing commitment of the GOZ; and the extent to which homogeneity of socioeconomic/technical characteristics can be assumed (A-1 through 3, A-11).

Various other assumptions will have particular relevance to various input/output/goal linkages -- e.g., the availability of farm labor (A-6) will affect the extent to which particular technologies will be adopted (O-7, O-8) the actual use of farm labor (I-1), and the nature and distribution of farm income (I-14).

Project personnel, capital and commodity inputs (IR-1 through 3) will be required for all project activities (IA-1 through 25). Given a particular implementation design, their level of availability (quantity, quality, timeliness) will have direct effects on the respective activity levels; they will have an effect on the balance of international payments in subsequent periods to the extent that they are funded by loan rather than grant funds.

Input activities are presented essentially as given in the Project Paper. They correspond closely to project outputs and reflect about the same amount of detail. In field application input activities will

FIGURE 4-I -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- PARTITION INDEX

CAUSES[1]	EFFECTS[1] C. Inputs-Activities 1 2 3 25	D. Outputs 1 2 3 26	E. Intermediate 1 2 3 19	F. End Objectives 1 2 3 13
A. Assumptions	A / C	A / D	A / E	A / F
B. Inputs-Resources	BC / C	BC / D	BC / E	BC / F
C. Inputs-Activities				
D. Outputs	D / C	D / D	D / E	D / F
E. Intermediate	E / C	E / D	E / E	E / F

[1] For cause and effect detail, see respective partitions. End objectives are as follows:

1 - Increase income and productivity of rural poor
2 - Increase agricultural land productivity
3 - Reduce rate of unemployment and underemployment
4 - Promote greater equality of income distribution
5 - Increase food production and improve nutrition
6 - Improve farm marketing infrastructure, especially local/small-scale storage, roads, etc.
7 - Create/strengthen service and supply systems (extension, research, fertilizer, seed, etc.)
8 - Conduct agricultural research/extension to take account of local environment
9 - Improve productive skills of rural families
10 - Promote development/dissemination of locally appropriate intermediate technologies
11 - Develop self-help groups to enhance participation of rural poor in development
12 - Improve balance of payments position; minimize foreign debt
13 - Increase monetary income of rural poor; improve rural poor standard of living

FIGURE 4-A/C. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- ASSUMPTIONS/INPUTS-ACTIVITIES PARTITION

A. ASSUMPTIONS	C. INPUTS - ACTIVITIES																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 - Limitation of project objectives and required decision points	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2 - Effective continuing commitment of GOZ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3 - Availability of project resource inputs on site on schedule	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4 - Availability of extension cadre; acceptance of interactive approach																									
5 - Availability of commodity inputs at economically reasonable prices																									
6 - Availability of farm labor at reasonable and equitable prices																									
7 - Demand for farm products at economically reasonable prices																									
8 - Availability of consumer goods/services ate economically reasonable prices																									
9 - Feasibility of locally suitable technologies																									
10 - Net natural population increase balanced by population out-migration																									
11 - Homogeneity of socioeconomic/technical characteristics	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

FIGURE 4-A/D. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- ASSUMPTIONS/OUTPUTS PARTITION

A. ASSUMPTIONS	D. OUTPUTS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1 - Limitation of project objectives and required decision points	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2 - Effective continuing commitment of GOZ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3 - Availability of project resource inputs on site on schedule	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
4 - Availability of extension cadre: acceptance of interactive approach				x	x																x	x	x			
5 - Availability of commodity inputs at economically reasonable prices								x																		
6 - Availability of farm labor at reasonable and equitable prices							x	x																		
7 - Demand for farm products at economically reasonable prices							x	x																		
8 - Availability of consumer goods/services ate economically reasonable prices																										
9 - Feasibility of locally suitable technologies							x	x																		
10 - Net natural population increase balanced by population out-migration																										
11 - Homogeneity of socioeconomic/technical characteristics	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

FIGURE 4-A/E. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- ASSUMPTIONS/INTERMEDIATE PARTITION

	E. INTERMEDIATE																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A. ASSUMPTIONS																			
1 - Limitation of project objectives and required decision points																			
2 - Effective continuing commitment of GOZ																			
3 - Availability of project resource inputs on site on schedule																			
4 - Availability of extension cadre; acceptance of interactive approach																			
5 - Availability of commodity inputs at economically reasonable prices		x												x					x
6 - Availability of farm labor at reasonable and equitable prices	x													x					
7 - Demand for farm products at economically reasonable prices						x							x			x			x
8 - Availability of consumer goods/services at economically reasonable prices																x			
9 - Feasibility of locally suitable technologies	x	x																	
10 - Net natural population increase balanced by population out-migration		x					x								x				
11 - Homogeneity of socioeconomic/technical characteristics	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

FIGURE 4-A/F. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- ASSUMPTIONS/END OBJECTIVES PARTITION

	F. END OBJECTIVES												
	1	2	3	4	5	6	7	8	9	10	11	12	13
A. ASSUMPTIONS													
1 - Limitation of project objectives and required decision points	x	x	x	x	x	x	x	x	x	x	x	x	x
2 - Effective continuing commitment of GOZ	x	x	x	x	x	x	x	x	x	x	x	x	x
3 - Availability of project resource inputs on site on schedule													
4 - Availability of extension cadre; acceptance of interactive approach													
5 - Availability of commodity inputs at economically reasonable prices												x	
6 - Availability of farm labor at reasonable and equitable prices													
7 - Demand for farm products at economically reasonable prices												x	
8 - Availability of consumer goods/services ate economically reasonable prices					x							x	
9 - Feasibility of locally suitable technologies													
10 - Net natural population increase balanced by population out-migration													
11 - Homogeneity of socioeconomic/technical characteristics													

FIGURE 4-BC/C -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INPUTS/INPUTS-ACTIVITIES PARTITION

B. INPUTS - NON-HUMAN	C. INPUTS - ACTIVITIES 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 - Project personnel required	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2 - Project capital required	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3 - Project commodities required	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C. INPUTS - ACTIVITIES																									
1 - Recruit/assign project staff																									
2 - Construct/rehabilitate required project center facilities (Mongolo, Mbulula)																									
3 - Develop interactive communications, project/DCA staff/farmer support																									
4 - Develop and test data collection and analysis procedures																									
5 - Collect and analyze data; communicate information to decision-makers																									
6 - Train(OJ) Zairois counterpart project staff for project/post-project oper.																									
7 - Identify existing/potential farmer groupings; select Farmer Centers																									
8 - Determine/analyze existing area agricultural practices; identify best																									
9 - Experiment with new technologies at Mbulula, FCs, on farmers' fields																									
10 - Select individuals from DCA staff/local population for training																									
11 - Train in agricultural practices, extension procedures, interactive approach																									
12 - Establish Farmer Councils; facilitate viable operations, promote activities																									
13 - Set up demonstration plots, disseminate technologies/market information																									
14 - Identify intermediate technologies appropriate for project area																									
15 - Establish intermediate technology production/training facility																									
16 - Train in production/maintenance of intermediate technologies																									
17 - Field test/distribute intermediate technologies through Farmer Centers																									
18 - Provide logistic/other support to GR Brigade 19																									
19 - Mobilize Special Brigade for project bridge/road activities																									
20 - Construct/rehabilitate bridges, secondary and farm access roads																									
21 - Organize on-going bridge/road maintenance systems																									
22 - Improve railhead marketing facilities and operations																									
23 - Provide merchants access to transport equipment (incl. credit operations)																									
24 - Facilitate market information system (farmer/merchant/mill)																									
25 - Document successful methodologies/institutions for DCA extension; develop post-project program																									

FIGURE 4-BC/D -- NORTH SMBA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INPUTS/OUTPUTS PARTITION

	D. OUTPUTS																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
B. INPUTS - [illegible]																										
1 - Project personnel required																										
2 - Project capital required																										
3 - Project commodities required																										
C. INPUTS - ACTIVITIES																										
1 - Recruit/assign project staff	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
2 - Construct/rehabilitate required project center facilities (Kamale, Mulule)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3 - Develop interactive communications, project/DOA staff/farmer support				x	x	x	x	x	x	x		x				x					x	x	x	x	x	x
4 - Develop and test data collection and analysis procedures	x	x	x	x	x	x	x	x											x	x	x	x	x	x	x	x
5 - Collect and analyze data; communicate information to decision-makers	x	x	x	x	x	x	x	x											x	x	x	x	x	x	x	x
6 - Train(OJT) Zambia counterpart project staff for project/post-project oper.					x																	x	x	x	x	x
7 - Identify existing/potential farmer groupings; select Farmer Centers				x		x	x	x	x	x	x	x														
8 - Determine/analyze existing area agricultural practices; identify best	x			x			x																			
9 - Experiment with new technologies at Mulule, FCs, on farmers' fields		x	x	x				x																		
10 - Select individuals from DOA staff/local population for training					x	x	x	x			x	x														
11 - Train in agricultural practices, extension procedures, interactive approach					x	x	x	x																		
12 - Establish Farmer Councils; facilitate viable operations, promote activities						x			x	x	x	x														
13 - Set up demonstration plots, disseminate technologies/market information							x	x																		
14 - Identify intermediate technologies appropriate for project area											x	x														
15 - Establish intermediate technology production/training facility											x	x														
16 - Train in production/maintenance of intermediate technologies											x	x														
17 - Field test/distribute intermediate technologies through Farmer Centers											x	x														
18 - Provide logistic/other support to GR Brigade 19													x													
19 - Mobilize Special Brigade for project bridge/road activities														x	x	x										
20 - Construct/rehabilitate bridges, secondary and farm access roads														x	x	x										
21 - Organize on-going bridge/road maintenance systems														x	x	x										
22 - Improve railhead marketing facilities and operations																	x									
23 - Provide merchants access to transport equipment (incl. credit operations)																		x	x							
24 - Facilitate market information system (farmer/merchant/mill)																		x	x	x						
25 - Document successful methodologies/institutions for GRZ extension; develop post-project program																									x	x

FIGURE 4-BC/E -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INPUTS/INTERMEDIATE PARTITION

	E. INTERMEDIATE			
	1 2 3 4 5	6 7 8 9 10	11 12 13 14 15	16 17 18 19
B. INPUTS - [illegible]				
1 - Project personnel required				
2 - Project capital required				
3 - Project commodities required				
C. INPUTS - [illegible]				
1 - Recruit/assign project staff				
2 - Construct/rehabilitate required project center facilities (Kengolo,Mulula)				
3 - Develop interactive communications, project/DOA staff/farmer rapport				
4 - Develop and test data collection and analysis procedures				
5 - Collect and analyze data; communicate information to decision-makers				
6 - Train(GTZ) Zairois counterpart project staff for project/post-project oper.				
7 - Identify existing/potential farmer groupings; select Farmer Centers				
8 - Determine/analyze existing area agricultural practices; identify best				
9 - Experiment with new technologies at Mulula, FCs, on farmers' fields				
10 - Select individuals from DOA staff/local population for training				
11 - Train in agricultural practices,extension procedures,interactive approach				
12 - Establish Farmer Councils; facilitate viable operations,promote activities				
13 - Set up demonstration plots,disseminate technologies/market information				
14 - Identify intermediate technologies appropriate for project area				
15 - Establish intermediate technology production/training facility				
16 - Train in production/maintenance of intermediate technologies				
17 - Field test/distribute intermediate technologies through Farmer Centers				
18 - Provide logistic/other support to GR Brigade 19				
19 - Mobilize Special Brigade for project bridge/road activities				
20 - Construct/rehabilitate bridges, secondary and farm access roads				
21 - Organize on-going bridge/road maintenance systems				
22 - Improve railhead marketing facilities and operations				
23 - Provide merchants access to transport equipment (incl. credit operations)				
24 - Facilitate market information system (farmer/merchant/mill)				
25 - Document successful methodologies/institutions for GTZ extension; develop post-project program				

FIGURE 4-BC/F -- NORTH SHABA PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INPUTS/END OBJECTIVES PARTITION

	F. END OBJECTIVES												
	1	2	3	4	5	6	7	8	9	10	11	12	13
B. INPUTS - [illegible]													
1 - Project personnel required												x	
2 - Project capital required												x	
3 - Project commodities required												x	
C. INPUTS - ACTIVITIES													
1 - Recruit/assign project staff													
2 - Construct/rehabilitate required project center facilities (Kongolo, Mbulula)	x		x	x			x						
3 - Develop interactive communications, project/DDA staff/farmer rapport													
4 - Develop and test data collection and analysis procedures													
5 - Collect and analyze data: communicate information to decision-makers													
6 - Train(TT) Zairois counterpart project staff for project/post-project ops.													
7 - Identify existing/potential farmer groupings: select Farmer Centers													
8 - Determine/analyze existing area agricultural practices: identify test													
9 - Experiment with new technologies at Mbulula, FCs, on farmers' fields									x				
10 - Select individuals from DDA staff/local population for training													
11 - Train in agricultural practices, extension procedures, interactive approach									x				
12 - Establish Farmer Councils: facilitate viable operations, promote activities													
13 - Set up demonstration plots, disseminate technologies/market information													
14 - Identify intermediate technologies appropriate for project area													
15 - Establish intermediate technology production/training facility													
16 - Train in production/maintenance of intermediate technologies													
17 - Field test/distribute intermediate technologies through Farmer Centers													
18 - Provide logistic/other support to GR Brigade 1													
19 - Mobilize Special Brigade for project bridge/road activities	x		x	x									
20 - Construct/rehabilitate bridges, secondary and farm access roads	x		x	x									
21 - Organize on-going bridge/road maintenance systems	x		x	x									
22 - Improve railhead marketing facilities and operations													
23 - Provide merchants access to transport equipment (incl. credit operations)													
24 - Facilitate market information system (farmer/merchant/mill)													
25 - Document successful methodologies/institutions for GOZ extension; develop post-project program													

FIGURE 4-D/C -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNOCAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- OUTPUTS/INPUTS-ACTIVITIES PARTITION

C. INPUTS - ACTIVITIES

D. OUTPUTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Maize and other crop development																									
1 - test of currently used technology identified																									
2 - new improved technology without imported inputs identified																									
3 - new improved technology with imported inputs identified																									
4 - on-farm collaborative experimentation implemented																									
Extension education and tech. extension																									
5 - extension staff trained																									
6 - FC leaders and para-professional agricultural assistants trained																									
7 - best of currently used technology disseminated/adopted																									
8 - new improved technologies disseminated/adopted																									
Farmer Center development																									
9 - Farmer Centers established; operations assure viability																									
10 - small farmer groups/subcouncils for women organized																									
IT production/maint. capacity development																									
11 - market center/village blacksmith prod./maint. capacity developed																									
12 - IT tools produced/distributed/maintained/self storage tools disseminated																									
Road/bridge construction/rehabilitation																									
13 - primary roads rehabilitated and maintained																									
14 - bridges constructed/rehabilitated and maintained																									
15 - secondary roads constructed/rehabilitated and maintained																									
16 - farm access roads constructed/rehabilitated and maintained																									
Marketing capacity expansion																									
17 - railhead facilities expanded, adequate for area production																									
18 - number of operating merchants increased																									
19 - marketing operation financially sound, viable; adequate for area production																									
20 - CNAGER operations financially sound, viable; supportive of private sector																									
Data collection and analysis system dev.																									
21 - data collection/analysis procedures operational, cost-effective, valid																									
22 - decision-maker information needs adequately being met																									
DCA/GOZ institutional development																									
23 - DCA/GOZ project/program staff trained																									
24 - rural development project capability transferred to GOZ																									
25 - DCA/GOZ post-project program for extension/continuation developed																									
26 - model institutional structure for GOZ extension developed/documented																									

FIGURE 4-D/D -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- OUTPUTS/OUTPUTS PARTITION

D. OUTPUTS

D. OUTPUTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Maize and other crop development																										
1 - best of currently used technology identified																										
2 - new improved technology without imported inputs identified																										
3 - new improved technology with imported inputs identified																										
4 - on-farm collaborative experimentation implemented																										
Extension education and tech. extension																										
5 - extension staff trained																										
6 - FC leaders and para-professional agricultural assistants trained																										
7 - best of currently used technology disseminated/adopted																										
8 - new improved technologies disseminated/adopted																										
Farmer Center development																										
9 - Farmer Centers established; operations assure viability																										
10 - small farmer groups/subcouncils for women organized																										
IT production/maint. capacity development																										
11 - market center/village (blacksmith) prod./maint. capacity developed																										
12 - IT tools produced/distributed maintained; 2 other m. tools disseminated																										
Road/bridge construction/rehabilitation																										
13 - primary roads rehabilitated and maintained																										
14 - bridges constructed/rehabilitated and maintained																										
15 - secondary roads constructed/rehabilitated and maintained																										
16 - farm access roads constructed/rehabilitated and maintained																										
Marketing capacity expansion																										
17 - railhead facilities expanded, adequate for area production																										
18 - number of operating merchants increased																										
19 - marketing operation financially sound, viable; adequate for area production																										
20 - CMACEM operations financially sound, viable; supportive of private sector																										
Data collection and management system dev.																										
21 - data collection/analysis procedures operational, cost-effective, valid																										
22 - decision-maker information needs adequately maintained																										
DOA/GOZ institut. and dev. development																										
23 - DOA/GOZ project/program staff trained																										
24 - rural development project capability transferred to GOZ																										
25 - DOA/GOZ post-project program for extension/continuation developed																										
26 - model institutional structure for GOZ extension developed/documented																										

FIGURE 4-D/E -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- OUTPUTS/INTERMEDIATE PARTITION

	E. INTERMEDIATE																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
D. OUTPUTS																			
Maize and other crop development																			
1 - test of currently used technology identified																			
2 - new improved technology without imported inputs identified																			
3 - new improved technology with imported inputs identified																			
4 - on-farm collaborative experimentation implemented	x	x																	
Extension education and tech. extension																			
5 - extension staff trained																		x	
6 - FC leaders and para-professional agricultural assistants trained																		x	
7 - best of currently used technology disseminated/adopted	x	x			x	x												x	
8 - new improved technologies disseminated/adopted	x	x			x	x												x	
Farmer Center development																			
9 - Farmer Centers established; operations assure viability								x	x										
10 - small farmer groups/subcounsils for women organized																			
IT production/maint. capacity development																			
11 - market center/village blacksmith) prod./maint. capacity developed																		x	
12 - IT tools produced/distributed/maintained; IT storage tech. disseminated								x	x										
Road/bridge construction/rehabilitation																			
13 - primary roads rehabilitated and maintained				x					x		x								
14 - bridges constructed/rehabilitated and maintained				x					x		x								
15 - secondary roads constructed/rehabilitated and maintained				x					x		x								
16 - farm access roads constructed/rehabilitated and maintained				x					x		x								
Marketing capacity expansion																			
17 - railhead facilities expanded, adequate for area production									x										
18 - number of operating merchants increased								x											
19 - marketing operation financially sound, viable; adequate for area production								x											
20 - ONACOM operations financially sound, viable; supportive of private sector								x											
Data collection and analysis system dev.																			
21 - data collection/analysis procedures operational, cost-effective, valid																			
22 - decision-maker information needs adequately being met																			
DGA/G & Institutional Development																			
23 - DGA/GOZ project/program staff trained																			
24 - rural development project capability transferred to GOZ																			
25 - DGA/GOZ post-project program for extension/continuation developed																			
26 - model institutional structure for GOZ extension developed/documented																			

FIGURE 4-D/F -- NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- OUTPUTS/END OBJECTIVES PARTITION

	F. END OBJECTIVES												
	1	2	3	4	5	6	7	8	9	10	11	12	13
D. OUTPUTS													
Maize and other crop development													
1 - best of currently used technology identified								x					
2 - new improved technology without imported inputs identified								x					
3 - new improved technology with imported inputs identified								x					
4 - on-farm collaborative experimentation implemented								x					
Extension education and tech. extension													
5 - extension staff trained							x		x				
6 - FC leaders and para-professional agricultural assistants trained							x		x				
7 - best of currently used technology disseminated/adopted								x	x				
8 - new improved technologies disseminated/adopted								x	x				
Farmer center development													
9 - Farmer Centers established; operations assure viability								x	x		x		
10 - small farmer groups/subcouncils for women organized								x	x		x		
IT production/maint. capacity development													
11 - market center/village blacksmith prod./maint. capacity developed							x		x	x			
12 - IT tools produced/distributed/main-tained; small farm tech. disseminated						x	x		x	x			
Road/bridge construction/rehabilitation													
13 - primary roads rehabilitated and maintained						x							
14 - bridges constructed/rehabilitated and maintained						x							
15 - secondary roads constructed/rehabil-itated and maintained						x							
16 - farm access roads constructed/ rehabilitated and maintained						x					x		
Marketing capacity expansion													
17 - railhead facilities expanded, adequate for area production						x							
18 - number of operating merchants increased													
19 - marketing operation financially sound, viable; adequate for area production													
20 - ONACEM operations financially sound, viable; supportive of private sector													
Data collection and analysis system dev.													
21 - data collection/analysis procedures operational, cost-effective, valid													
22 - decision-maker information needs adequately being met													
DOA/GOZ institutional development													
23 - DOA/GOZ project/program staff trained													
24 - rural development project capability transferred to GOZ													
25 - DOA/GOZ post-project program for extension/continuation developed													
26 - model institutional structure for GOZ extension developed/documented													

FIGURE 4-E/C. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INTERMEDIATE/INPUTS-ACTIVITIES PARTITION

	C. INPUTS - ACTIVITIES																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
E. INTERMEDIATE																									
1 - Production labor required																									
2 - Other production inputs required																									
3 - Input marketing																									
4 - Input transportation																									
5 - Soil fertility																									
6 - Farm production																									
7 - On-farm consumption																									
8 - Maize marketing																									
9 - Maize transportation																									
10 - Marketing/transp. labor																									
11 - Other marketing/transp. inputs																									
12 - Marketing/transp. income																									
13 - Gross farm income																									
14 - Net farm income																									
15 - Income factor ratio																									
16 - Consumer real income																									
17 - Net capital formation																									
18 - Human capital formation																									
19 - Export/import substitution																									

FIGURE 4-E/D. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INTERMEDIATE/OUTPUTS PARTITION

	D. OUTPUTS																									
E. INTERMEDIATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1 - Production labor required																										
2 - Other production inputs required																										
3 - Input marketing																										
4 - Input transportation																										
5 - Soil fertility																										
6 - Farm production																										
7 - On-farm consumption																										
8 - Maize marketing																										
9 - Maize transportation																										
10 - Marketing/transp. labor																										
11 - Other marketing/transp. inputs																										
12 - Marketing/transp. income																										
13 - Gross farm income																										
14 - Net farm income																										
15 - Income factor ratio																										
16 - Consumer real income																										
17 - Net capital formation																										
18 - Human capital formation																										
19 - Export/import substitution																										

FIGURE 4-E/E. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INTERMEDIATE/INTERMEDIATE PARTITION

E. INTERMEDIATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 - Production labor required						x								x					
2 - Other production inputs required			x	x		x								x					
3 - Input marketing										x	x	x							
4 - Input transportation										x	x	x							
5 - Soil fertility						x													
6 - Farm production							x	x					x						x
7 - On-farm consumption													x						
8 - Maize marketing										x	x	x							
9 - Maize transportation										x	x	x							
10 - Marketing/transp. labor																	x		
11 - Other marketing/transp. inputs														x					
12 - Marketing/transp. income																	x		
13 - Gross farm income														x			x		
14 - Net farm income																			
15 - Income factor ratio																			
16 - Consumer real income																			
17 - Net capital formation																			
18 - Human capital formation																			
19 - Export/import substitution																			

FIGURE 4-E/F. NORTH SHABA MAIZE PRODUCTION PROJECT: SOCIOECONOMIC/TECHNICAL CAUSE-AND-EFFECT (FROM/TO) RELATIONSHIPS --- INTERMEDIATE/END OBJECTIVES PARTITION

	F. END OBJECTIVES												
	1	2	3	4	5	6	7	8	9	10	11	12	13
E. INTERMEDIATE													
1 - Production labor required			x										
2 - Other production inputs required												x	
3 - Input marketing													
4 - Input transportation													
5 - Soil fertility		x											
6 - Farm production					x								
7 - On-farm consumption					x								
8 - Maize marketing													
9 - Maize transportation													
10 - Marketing/transp. labor			x										
11 - Other marketing/transp. inputs												x	
12 - Marketing/transp. income				x									x
13 - Gross farm income													
14 - Net farm income	x			x									x
15 - Income factor ratio				x									
16 - Consumer real income					x								x
17 - Net capital formation													
18 - Human capital formation	x												
19 - Export/import substitution												x	

need to be specified in greater detail so that specific output effects resulting directly and indirectly from various project decisions can be delineated.

Additionally, input activities will sometimes be concurrent with or prerequisite to other input activities -- e.g., interactive communication (IA-3) with respect to experimentation on farmers' fields (IA-9). Similarly, some project outputs will be concurrent with or prerequisite to other project outputs -- e.g., identification of new technology (O-2) with respect to adoption of that technology (O-8). Figure 4 excludes many of these linkages to simplify exposition. In field application such prerequisite and concurrent as well as feedback relationships will need to be specified.*

Project outputs will have direct and various effects on the technical, economic, social and political characteristics comprising the intermediate impact structure of the project area. For example, on-farm agronomic experimentation (O-4) will require farm labor and other inputs (I-1,I-2). The training of extension workers, Farmers' Center leaders, agricultural assistants, and IT workers as well as the effective extension of technologies to farmers, merchants, and others (O-5 through O-8, O-12) will result in an increase in the level of human capital for the project area (I-18).

In addition, project outputs will have direct effects on various end objectives. For example, the project will determine or develop an

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* In that such project implementation and socioeconomic/technical relationships are captured to some extent in the Project Performance Network chart (Appendix II), however, they are not totally neglected here.

array of technology suitable for locally-specific application (soils, climate, farm system, etc.). Project area characteristics indicate that such technology, whether it consists of improved practices or use of purchased inputs (seed, fertilizer), must be relatively low in cost and provide sufficient return to outweigh technical risk as well as risk with respect to dependence upon both input and product markets. The interactive approach in both research and extension concerning this technology as well as efforts in farmer group development should ensure the social and political acceptability of the project presence and facilitate the structuring of project actions so as to instill user confidence in project efforts. The nature and extent to which these various project outputs (O-1 through O-4, O-7 through O-10) are achieved will directly affect the extent to which the project takes account of the local environment in its agricultural research and extension efforts (EO-8).

The intermediate impact structure depicts the linkages of indirect effects. For example, the project will have direct effects on area incomes through the hiring of local construction workers, the purchase of local commodities, etc. It will have indirect effects on area incomes (I-13) to the extent that the marketed surplus of maize (I-6,I-7) is increased. Farm income is a factor not only in the intermediate structure but is also an end objective in itself (EO-1, EO-4, EO-13).

The distinctions between ends amd means is not always clear. AID end objectives reflect a theory or concept of the interrelationships necessary for viable rural development. Income and productivity

increases are designated as end objectives. Also designated as end objectives are the means to achieve such increases -- e.g., improve productive skills, conduct agricultural research/extension reflecting local conditions, etc. Although improved infrastructure aspects of product marketing are cited as an end objective, there is no explicit mention as either an end or a means objective of the need to create/strengthen product marketing and transportation system operations. However, the North Shaba project has identified this bottleneck in the resource/income flow and explicitly incorporated a marketing/credit subproject to ensure viable marketing operations.

4. Determination of Key Variables

A valid determination of the key variables in the impact structure requires more information than is available for the present paper. In lieu of such information, let us assume away the significance of non-economic factors. In addition, let us assume that we have empirically determined how one project subsystem interacts with another. With the key structure we can then trace the effect of project actions on specific end objectives such as farm income. Such a key structure might be depicted as shown in Figure 5.

FIGURE 5 -- NORTH SHABA MAIZE PRODUCTION PROJECT: KEY ECONOMIC IMPACT STRUCTURE

CAUSES	EFFECTS: Outputs 1	2	3	4	5	Intermediate 1	2	3	4	5	6	7	8	9	10	11	12	End Objective[1]
Assumptions																		
1 -- Labor availability, wages											x			x	x			
2 -- Purchased input availability, prices										x	x				x	x		
3 -- Product demand, prices																x		
4 -- Consumer good availability, prices																		x
Inputs																		
1 -- Personnel	x	x	x	x	x													
2 -- Capital	x	x	x	x	x													
3 -- Commodities	x	x	x	x	x													
Outputs																		
1 -- Farmer group development						x	x	x	x	x	x			x	x			
2 -- Research/extension						x	x											
3 -- IT capacity development								x										
4 -- Marketing/credit									x									
5 -- Infrastructure														x				
Intermediate																		
1 -- Technical information											x							
2 -- Improved seeds										x								
3 -- IT										x					x			
4 -- Credit										x					x			
5 -- Input distribution											x				x			
6 -- Production												x	x					
7 -- Home consumption																		x
8 -- Marketed surplus																x		
9 -- Roads															x			
10 -- Marketing services																x		
11 -- Farm net income																	x	x
12 -- Savings and investment									x									

[1] End objective is real net income.

5. Impact Analysis

Limiting the domain and boundaries of the structural system to economic considerations, the key structure presented in Figure 5 can be utilized to integrate the direct and indirect effects of the various project subsystems. As shown in Table V-D, these economic benefit and cost effects are limited to the project area and discounted over time. The relevant world market price of maize is considered to be the delivered price of Rhodesian maize at $189 per MT. Uncertainty is treated by examining a ten percent lower level of benefits obtained.

Project costs are obtained largely from Table V-B. The cost of farmer fertilizer purchases as well as the cost of GOZ continuation of efforts in the project area are included in total costs. Production increases associated with individual project subsystems efforts are obtained from Table V-C. These direct subsystem effects are integrated by arbitrarily weighting the sum of their individual effects. For example, in the initial years of project implementation the impact of the marketing/credit subsystem is essentially a relaxation of the marketing access constraint. This results from the provision of trucks and fuel even though there is still no change in road conditions. As roads are improved through the infrastructure subsystem, there occurs a multiplier effect such that improved roads and truck availability create a market access greater than the simple sum of individual subsystem effects would suggest. The continuing increase in marketed production beyond the project implementation period reflects a sort of "take-off" of the private sector -- for example, merchants continue to improve marketing services in the project area without the direct involvement and assistance of project efforts.

TABLE V-D -- NORTH SHABA MAIZE PRODUCTION PROJECT: ECONOMIC BENEFIT/COST CALCULATIONS

	1	2	3	4	5	6	7	8	9	10
I. Project Costs[1]										
Research/Extension	647	401	373	426	417	379	-	-	-	-
Farmer Group Development	218	152	154	170	47	43	-	-	-	-
Intermediate Technology	427	160	133	97	83	62	-	-	-	-
Marketing/Credit[2]	1489	70	70	64	62	62	-	-	-	-
Infrastructure	2155	626	1351	1276	542	366	-	-	-	-
Monitoring/Evaluation	320	187	131	173	160	172	-	-	-	-
Total direct outlays[3]	4954	1919	2519	2490	1613	1355	-	-	-	-
Farmer fertilizer purchases	-	-	-	-	-	46	92	137	183	229
GOZ continuation efforts	-	-	-	-	-	-	1600	1600	1600	1600
Total Costs	4954	1919	2519	2490	1613	1401	1692	1737	1783	1829
II. Net Increase in Marketed Production										
A. Basic estimate:										
Research/Extension (MT)	0	0	878	3843	5948	11717	17526	23255	29024	33146
Intermediate Technology (MT)	0	0	2646	5292	7938	7938	10319	13415	17440	22672
Marketing/Credit (MT)	8533	13867	18133	22400	24533	25600	33280	43264	56243	73116
Infrastructure (MT)	0	0	5907	9271	9800	10330	13429	17458	22695	29504
Total increase (MT)[4]	2000	4000	9000	15500	26000	36000	47000	57000	68000	78000
B. Alternate estimate (MT)[5]	1800	3600	8100	13500	23400	33300	42300	51300	61200	70200
III. IRR Calculation[6]										
A. Basic estimate:										
Increase in total net income[7]	378	756	1701	2930	4914	6804	8883	10773	12852	14742
Annual net benefit	-4576	-1163	-181	440	3301	5403	7191	9036	11069	12913
IRR of 37 percent[8]	-3340	-620	-318	125	684	817	794	728	651	554
B. Alternate estimate:										
Increase in total net income[7]	340	680	1531	2637	4423	6124	7995	9696	11567	13268
Annual net benefit	-4614	-1239	-988	147	2810	4723	6303	7959	9784	11439
IRR of 33 percent[8]	-3469	-700	-420	47	675	853	856	813	751	660

1) Using exchange rate 0.86Z = $1.00; values in $1,000.
2) Assumes revolving credit fund with no net payback.
3) Includes project management.
4) Arbitrarily weighted sum of subsystem effects.
5) Calculated as 10 percent less than basic effect estimate.
6) Values in $1,000.
7) Production value as import substitute for Rhodesian maize at $189/MT.
8) Assuming 10-year project life with no salvage value.

APPENDIX I

LOGICAL FRAMEWORK

LOG FRAME

GOAL: Achieve self-sufficiency in maize production.

OVI: 1. Net increase of 300% in quantity of marketed maize in the Kongolo and Nyunzu Zones within 6 years. Total Kongolo/Nyunzu production increase of maize from 22,000MT in 1976 to est. 98,000MT in 1986.

MOV: 1. Project records.

2. Department of Agriculture records.

ASSUMPTIONS: Higher order objectives and other long-term benefits:

1. improved economic and social conditions for rural population.

2. improved balance of payments.

PURPOSE:

Rural development process for improving small farmer production and incomes identified for replication in other parts of the country.

END OF PROJECT STATUS:

1. Annual maize marketed in North Shaba project area from 16,000 tons in 1976 to 48,000 tons in 1982.

2. Maize marketed in project area continues to increase at rate of 10% per year after project terminates thru 1986.

3. Production of manioc, peanuts, rice and palm oil increase by 20% between 1977 to 1982.

4. Net income of small farmer project participants increased 100% by end of project for those with at least 3 years' participation.

MEANS OF VERIFICATION:

1. Information system.

2. DOA records from zonal agriculture chiefs.

3. Information system.

4. Information system.

PURPOSE TO GOAL ASSUMPTIONS:

1. GOZ perceives benefits from project and gives full support (budget, personnel, etc.) to expanded rural development program.

2. Replicability of rural development process demonstrated by implementation in other parts of the country.

OUTPUTS:

1. Maize and other crop technologies developed to suit project area.

   a. Best crop technologies currently used in project area identified by 6/78.

   b. New technologies suitable for project area (not dependent on imported ag inputs) identified by 6/80.

   c. New technologies suitable for project area (dependent on imported ag inputs -- e.g., mechanized equipment, hybrid seed, fertilizer, insecticides) identified by 9/81.

   d. All technologies accepted as suitable only after successful experimentation on farmers' own fields (applied research).

   e. Research operation fully under GOZ control and supervision (for continued operation) at end of project (GOZ capability developed by project and tested by expatriate research director before termination).

2. **Improved technologies extended to local farmers.**

   a. 75 Agricultural Assistants, 20 middle-level extension staff, 4 senior level extension staff trained and operational by 9/82.

   b. 225 Farmers' Council Leaders receive para-professional training in agriculture by 9/82.

   c. 25% of small farmer participants adopt extended "best currently used" crop technologies by 5/79; 50% by 5/80.

   d. 25% of small farmer participants adopt extended new (non-imported ag inputs) technologies by 5/81; 50% by 5/82.

   e. 75% of small farmer participants show change in agricultural techniques by end of project.

3. Viable Farmers' Councils developed.

   a. Farmers' Councils and sub-councils initiated: 10 by 9/77; 25 by 9/78; 55 by 9/80; 75 by 9/81.

   b. 50 percent of Farmers' Councils (pre-coops) viable (revenue exceeds costs that include support of the Agricultural Assistant as well as Council activities) by 9/82.

   c. Small Farmer Groups (below Farmers'Council level) formed and carrying out economic production activities: 30 by 9/79; 75 by 9/80; 120 by 9/81; 165 by 9/82.

   d. 75% of Farmers' Councils have sub-councils for women.

4. Intermediate technology production and maintenance capacity developed.

   a. 40 village blacksmiths trained in intermediate technology production and maintenance techniques by January 1979; 80 by end of project..

b. Traimees make their own tools to take back to their villages.

c. A production capacity developed in urban areas (Kongolo/Nyunzu/Mbulula) for sustained production of technologies too sophisticated for village-level production. Heavy intermediate technology production equipment belonging to the project is transferred (or sold) to local private enterprises (if production viability is indicated). All by end of project.

d. A project intermediate technology production/training center producing supply of intermediate technology equipment sufficient to meet pre-coop demand until the end of the project.

e. Intermediate technology equipment not produceable (but maintainable) in project area distributed in project area through farmer councils.

f. ONACER capable of advising and assisting farmers in construction and use of improved storage facilities.

5. Roads (secondary and farm feeder roads) and bridges rehabilitated.

Rehabilitation completed as follows:

	Project Year					
	2	3	4	5	1/82	Total
KMS. Secondary Roads	0	350	374			724
KMS. Farm Roads						
No. of Bridges	4	26	35	7		72

6. Project area marketing capacity expanded:

   a. Number of merchants operating in project area increases 20% per year 1978-1982.

   b. Loading facilities at Nyunzu and Kongolo railyards expanded to meet full cash crop production needs of project area through 1982.

   c. Private sector marketing operation expanded to meet full cash crop production needs of project area through 1982.

   d. Private sector marketing enterprises judged by project marketing director as financially sound for continued operation after completion of project.

   e. ONACER marketing operations judged by project marketing director to be financially and administratively sound and supportive of private sector after completion of project.

7. Information system developed and functioning. Information system provides information in a timely manner adequate to meet decision-making needs for decision-makers at following levels: farmer, pre-coop, extension worker, researcher, IT village enterprise merchant, project management, local and national GOZ orgs. (e.g., sub-regional authorities, DOA, office of Pres.), external market and suppliers, USAID.

8. Integrated Department of Agriculture program developed for post-project operations in Nyunzu and Kongolo Zones.

   a. Zairois trained to undertake DOA operations in project zones.

   b. DOA program developed for post-project operations integrates agricultural support activities (research, extension, road maintenance, marketing, information system).

9. Model organizational structure developed for Department of Agriculture to carry out rural development process within other zones.

MEANS OF VERIFICATION:

1. a. Information system
   b. Information system
   c. Information system
   d. Information system
   e. Report of Expatriate Research Director

2. a. Information system
   b. Information system
   c. Information system
   d. Special survey

3. a. Information system
   b. Information system
   c. Information system

4. a. Information system
   b. Information system
   c. Report by Intermediate Technology Director
   d. Information system
   e. Information system

5. Quarterly reports by Construction Management Specialist.

6. a. Information system
   b. Special study by Marketing Director
   c. Information system
   d. Special study by Marketing Director

7. Special studies by evaluation teams

8. a. Information system
   b. Final Evaluation Report

9. Information system

OUTPUT TO PURPOSE ASSUMPTIONS:

1. Price structure for maize is maintained at level that allows maize to remain competitive in production with other crops; and that allows an adequate profit margin for grain merchants and millers.

OUTPUT TO PURPOSE ASSUMPTIONS: (continued)

2. Incentives exist for farmers to want to increase income through increased agricultural production (consumer goods available access to education, etc.)

3. Office des Routes continues primary and secondary road maintenance program after project terminates.

4. Local government officials do not implement obligatory public works that impinge upon agricultural production activities.

5. Department of Agriculture operations in project area subsequent to project termination continue to support farmer councils by providing information necessary for farmer council decisionmaking and, as appropriate, delivering inputs to farmer councils on low-cost and timely basis.

6. Cost of basic necessities does not increase at greater rate than price of food crops produced by project area farmers (relates to GOZ price policy).

7. Adequate fuel supply for private sector continues after project termination.

INPUTS: (ACTIVITIES)

1. a. Identify best existing agricultural practices in project area.

   b. Experiment with new technologies at research center and Farmer Centers.

   c. Test new technologies in farmers' fields.

2. a. Select extension workers from DOA staff and local population.

   b. Train extension workers.

   c. Select farmer groups as extension targets.

   d. Develop extension worker/farmer rapport, set up demonstration plots, communicate new technologies and market info to farmers.

2. e. Update extension worker knowledge of technologies from research center.

3. a. Identify farmer groups or potential grouping for pre-coop development.

   b. Establish Farmer Council and facilitate selection of president.

   c. Select, in collaboration with Farmer Councils, and train para-professional agricultural assistants.

   d. Train council presidents.

   e. Promote farmer group activities.

   f. Train participant farmers.

4. a. Distribute (sell) through Farmers' Councils improved intermediate technology.

   b. Identify existing technologies with utility in project area.

   c. Set up intermediate technology production/training facility.

   d. Select trainees from project villages.

   e. Train in production and maintenance of IT.

   f. Test new technologies in project villages.

   g. Identify and develop additional technologies as needed.

5. a. Provide support to Brigade 19 of OR.

   b. Mobilize special Brigade/construct project facilities.

   c. Rehabilitate secondary roads and bridges.

   d. Improve farm roads with manual road teams.

   e. Organize an on-going road and bridge maintenance system.

6. a. Provide credit to small merchants.

   b. Provide merchants with access to transport equipment.

   c. Improve railyard loading facilities.

   d. Facilitate merchant/farmer and merchant/mill communications.

7. a. Train senior Zairois DCAU staff and extension workers.

   b. Conduct baseline survey.

   c. Set up DCAU communications system.

   d. Collect data, analyze data, communicate info as needed for decision-making (for continuous monitoring and periodic evaluation).

8. a. Draw information from Planning and Evaluation Unit on successful project methodologies for GOZ intervention in the agricultural sector.

   b. Develop program for Department of Agriculture post-project operations in collaboration with DOA officials.

   c. Train DOA officials (counterpart on-the-job training) for post project operations.

(RESOURCES)

	Contract Services	Commodities	Participants	Other	Total
1. Research/Extension	$720,000	$324,000	$374,000	$36,000	$1,454,000
2. Farmer Group Dev.	$392,000	$ 97,000	$ 44,000	$12,000	$ 545,000
3. Intermediate Tech.	$148,000	$245,000	$ 32,000	$24,000	$ 449,000
4. Marketing & Credit	$ -	$ 92,000	$ 10,000	$90,000	$ 192,000

(Uninflated)

(RESOURCES) continued

	Contract Services	Commodities	Participants	Other	Total
5. Infrastructure Dev.	$1,416,000	$1,660,000	$ -	$936,000	$4,012,000
6. Monitoring & Eval.	$ 464,000	$ 94,000	-	$ 30,000	$ 588,000
7. Project Management Unit	$1,008,000	$ 375,000	$36,000	$ 30,000	$1,449,000
TOTAL (uninflated)	$4,148,000	$2,887,000	$496,000	$1,158,000	$8,689,000

INPUT TO OUTPUT ASSUMPTIONS:

1. The GOZ/DOA will establish a definitive supportive policy regarding the importation of advanced agricultural inputs (fertilizer, pesticides, etc.) for food crop production by small farmers.

2. Small farmers will cooperate with extension personnel on data collection activities.

3. Small farmers will accept applied research experimentation on portions of their own fields.

4. Small farmers will cooperate in selecting qualified local people who will work as Agricultural Assistants.

5. Small farmers will cooperate in the development and operation of farmer groups and Farmers' Councils.

6. Village elders will accept leadership position and operational responsibilities for Farmers' Councils.

7. Fuel for project (Special Brigade and Brigade 19, other) purchased with project FX, can be delivered to project.

8. Project equipment and materials can be delivered to project area on time without serious loss or damage.

9. Office des Routes staff seconded to project are qualified to handle assigned tasks.

10. Office des Routes Brigade #19 can rehabilitate primary roads to planned standards as per schedule.

11. Small farmers will continue to provide self-help labor to construct and maintain farm access roads.

12. Project trucks rented to merchants will not incur theft or improper use.

13. Fuel for private sector marketing will be available in sufficient quantity to allow for full-scale operation.

14. Likasi mill will not have prolonged breakdowns/ can obtain spare parts when needed.

15. Likasi mill will continue to make sacks available to merchants at reasonable cost.

16. Theft of agricultural produce transported by rail will not increase more than 10% over 1976 level.

17. Merchants can operate in 1977 at at least 65% of 1976 level.

18. Merchants can continue to make sufficient profit from marketing corn that they will not be lured away into other commercial activities (as a function of GOZ pricing policies).

19. GOZ can coordinate price setting so that price changes respond directly (and in timely manner) to market needs.

20. Local maize maintains competitive advantage over imported maize.

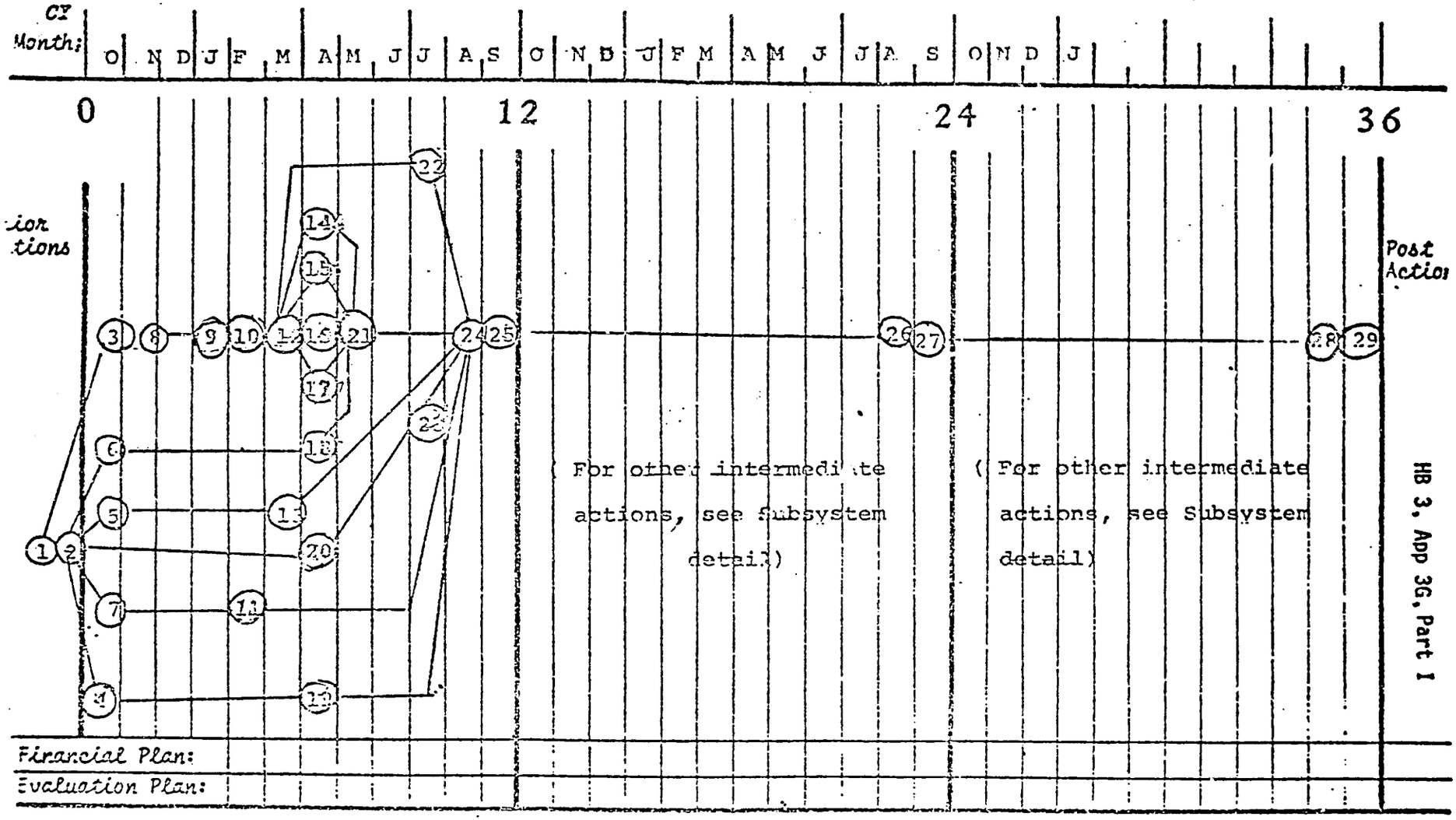
21. SNCZ capable and willing to transport all exportable agricultural products from project area.

APPENDIX II

PROJECT PERFORMANCE NETWORK CHART

PP' ORM
(May be Expanded as Appropriate)

Country: ZAIRE	Project No:	Project Title: PROJECT START-UP AND MANAGEMENT	Date:	/ / Original / / Revision #__	PPT appr



PROJECT PERFORMANCE NETWORK

PP' ORM
(May be Expanded as Appropriate)

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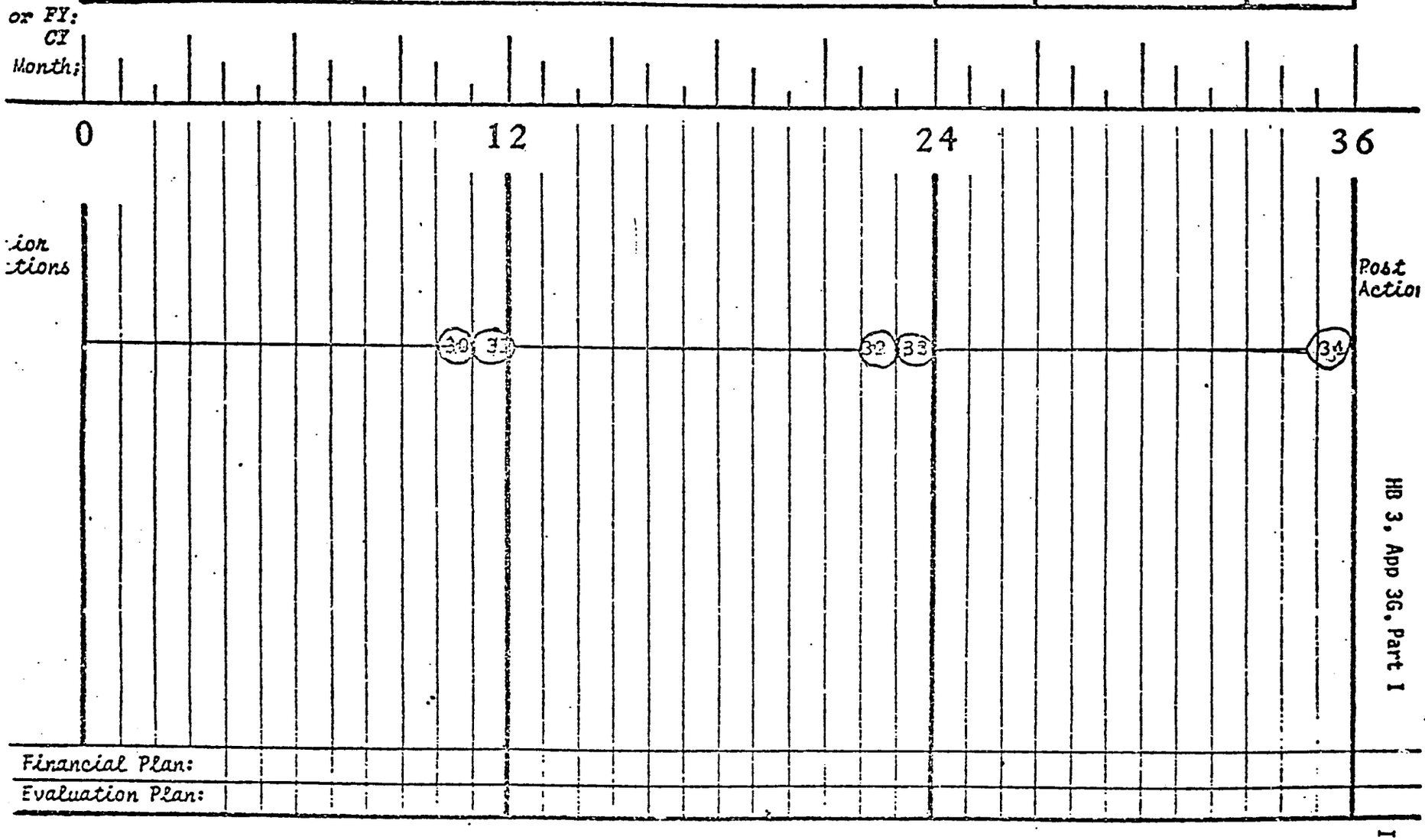


PROJECT PERFORMANCE NETWORK

IMPLEMENTATION SCHEDULE

Project Start-Up and Management

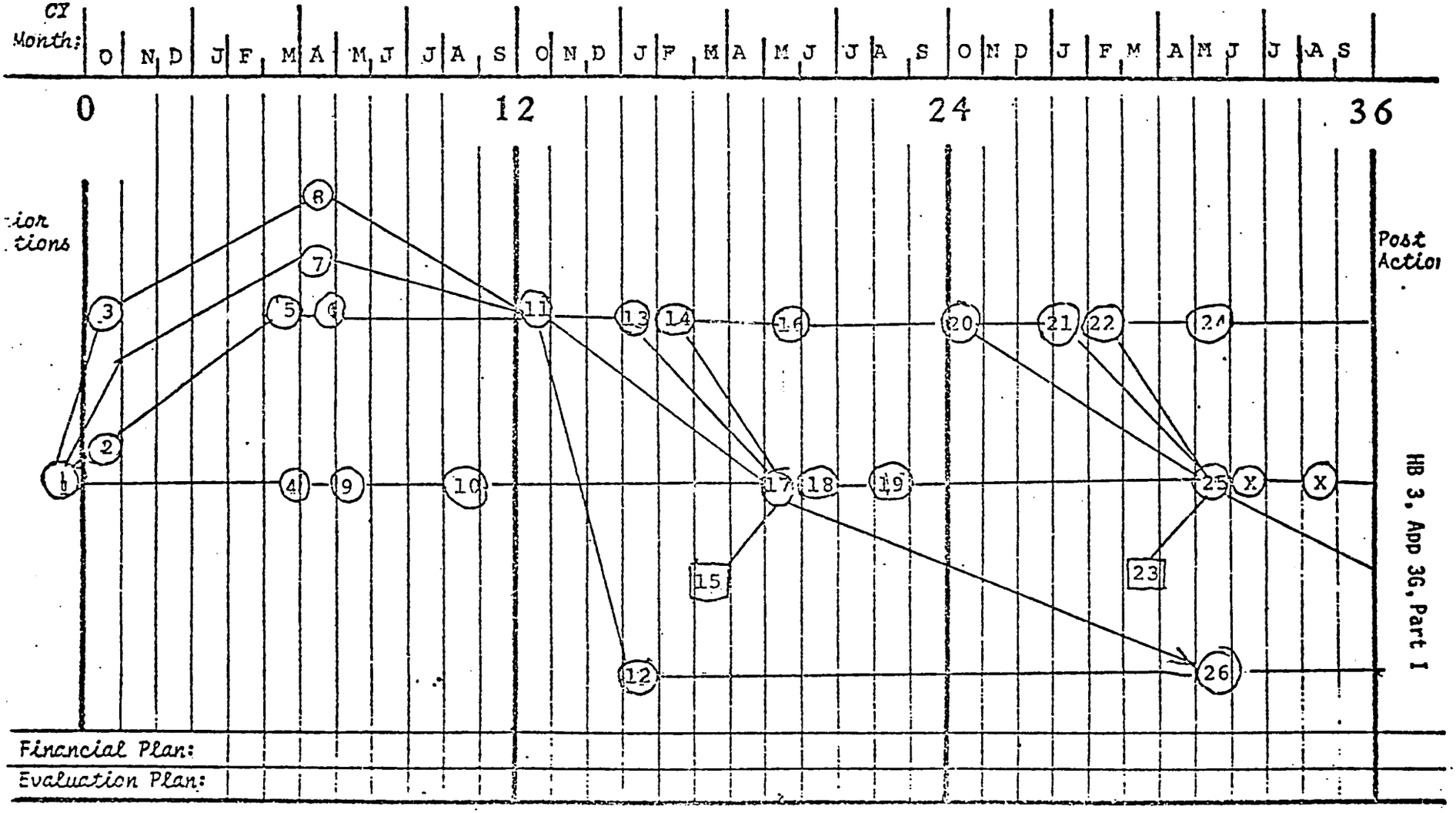
#	Date	Event	Action Agent
1.	15 Sep 76	Project Paper approved	AID/W
2.	25 Sep 76	Project Agreement signed	GOZ/USAID
3.	1 Oct 76	Start preparation of IFB	AID/W
4.		Start developing budget allocation procedures	GOZ/USAID
5.	15 Oct 76	Start recruiting USAID Project Manager (direct hire for Kinshasa station)	AID/W
6.		Start recruiting Project Director	GOZ
7.		Start recruiting Construction Management Specialist (personal services contract for pre-implementation)	AID/W
8.	1 Nov 76	IFB issued	AID/W
9.	1 Jan 77	Review contractor proposals	AID/W
10.	1 Feb 77	Contractor selected	AID/W
11.		Construction Management Specialist on site	AID/W
12.	1 Mar 77	Contract signed	Contr/AID/W
13.		USAID Project Manager on site	AID/W
14.	1 Apr 77	Deputy Project Director on site	Contr
15.		Agronomic Research/Extension Specialist on site (Two-week TDY Brussels prior arrival)	Contr
16.		Building/Bridge Construction Specialist on site	Contr
17.		Rural Development Specialist on site	Contr
18.		Project Director on site	GOZ
19.		Budget allocation procedures formalized	GOZ/USAID
20.		Start recruiting principal Zairois staff	Proj
21.		Start preparations FY78 Annual Work Plan	Proj

#	Date	Event	Action Agent
22.	1 Jul 77	Administration/Finance Specialist on site	Contr
23.		Principal Zairois staff on site	Proj
24.	1 Aug 77	Complete FY78 Annual Work Plan	Proj
25.	1 Sep 77	Annual Work Plan reviewed and approved	GOZ/USAID (incl. USAID Controller)
26.	1 Aug 78	Complete FY79 Annual Work Plan	Proj
27.	1 Sep 78	Annual Work Plan reviewed and approved	GOZ/USAID (incl. USAID Controller)
28.	1 Aug 79	Complete FY80 Annual Work Plan	Proj
29.	1 Sep 79	Annual Work Plan reviewed and approved	GOZ/USAID (incl. USAID Controller)
30.	1 Aug 80	Complete FY81 Annual Work Plan	Proj
31.	1 Sep 80	Annual Work Plan reviewed and approved	GOZ/USAID (incl. USAID Controller)
32.	1 Aug 81	Complete FY82 Annual Work Plan	Proj
33.	1 Sep 81	Annual Work Plan reviewed and approved	GOZ/USAID (incl. USAID Controller)
34.	30 Sep 82	End of project	

PP')RM
(May be Expanded as Appropriate)

Country:	Project No:	Project Title: RESEARCH AND EXTENSION	Date:	/ / Original / / Revision #__	PPT appr

1 of 2

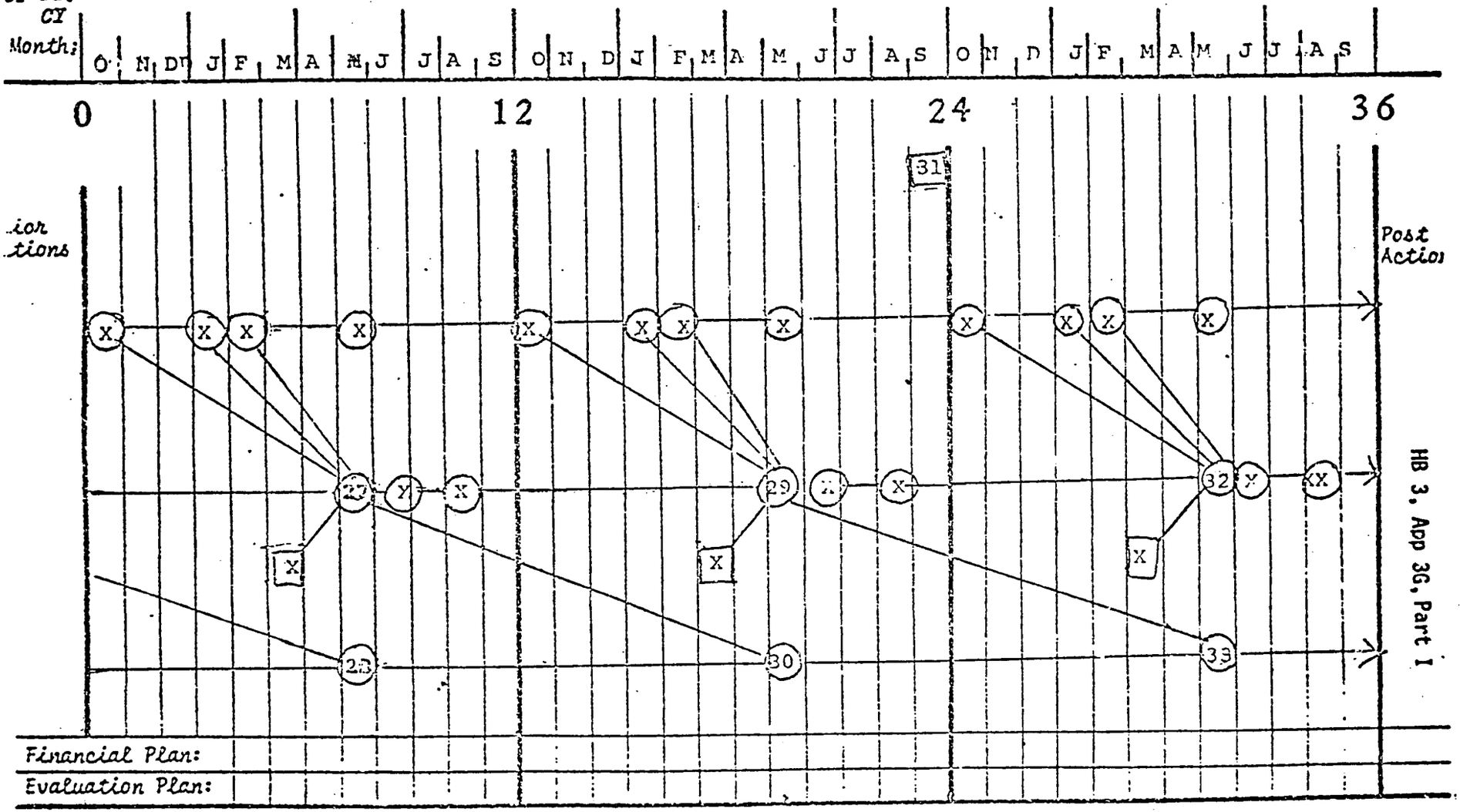


PROJECT PERFORMANCE NETWORK

HB 3, App 3G, Part I

PP' ORM
(May be Expanded as Appropriate)

Country:	Project No:	Project Title: RESEARCH/EXTENSION	Date:	/ / Original / / Revision #	PPT appr



PROJECT PERFORMANCE NETWORK

IMPLEMENTATION SCHEDULE

1. Research/Extension Subsystem

#	Date	Event	Action Agent
1.	Sep 76	PP approved; ProAg signed	AID/W;GOZ/ USAID
2.	Nov 76	Start recruiting Agronomic Research/ Extention Specialist	Contr
3.		Start recruiting PNM Agronomists (3)	GOZ/USAID
4.	Mar 77	Contract signed	Contr/AID/W
5.		Agronomic R/E Specialist two-week TDY Brussels researching soils, agronomic data for Zaire	Contr
6.a	Apr 77	Agronomic R/E specialist on site	Contr
7.		Start INERA research (soil testing, agronomic) on site	GOZ/Proj
6.b		Start field survey of farmer practices	Proj
6.c		Start preparation Mbulula Center for research and training activity	Proj
8.		PNM Agronomists (3) on site	GOZ/Proj
6.d		Order research equipment	Proj
9.	Jun 77	Select extension agents for taining space (20 - 25)	Proj
10.	Aug 77	Start training agents	Proj
11.a	Oct 77	Start Mbulula Center agronomic tests	Proj
11.b		Equipment arrives	Proj
12.a	Jan 78	Start training/seminars for Farmer Center leaders	Proj
13.		Complete series Mbulula Center agronomic tests; snalyze, report, and disseminate results	Proj
12.b		Start in-service training of extension agents	Proj
14.	Feb 78	Start series Mbulula Center agronomic tests	Proj

#	Date	Event	Action Agent
15.	Mar 78	Identify Farmers' Centers for agent placement	Proj
16.	May 78	Complete series Mbulula Center agronomic tests; analyze, report, and disseminate results	Proj
17.		Agents complete training (20 to date); begin working in Farmers' Centers	Proj
18.	Jun 78	Select extension agents for training (20-25)	Proj
19.	Aug 78	Start training agents	Proj
20.	Oct 78	Start series Mbulula Center agronomic tests	Proj
21.	Jan 79	Complete series Mbulula Center agronomic tests; analyze, report, and disseminate results	Proj
22.	Feb 79	Start series Mbulula Center agronomic tests	Proj
23.	Mar 79	Identify Farmers' Centers for agent placement	Proj
24.	May 79	Complete series Mbulula Center agronomic tests; analyze, report, and disseminate results	Proj
25.		Agents complete training (40 to date), begin working in Farmers' Centers	Proj
26.		Small farmer participant adoption of technology (25 percent to date)	Proj
		(INTERMEDIATE STEPS)	
27.	May 80	Agents complete training (60 to date); begin working in Farmers' Centers	Proj
28.		Small farmer participant adoption of technology (50 percent to date)	Proj
		(INTERMEDIATE STEPS)	
29.	May 81	Agents complete training (80 to date); begin working in Farmers' Centers	Proj
30.		Small farmer participant adoption of technology (75 percent to date)	

#	Date	Event	Action Agent
		(INTERMEDIATE STEPS)	
31.	Sep 81	Institutional transfer checkpoint	GOZ/Proj
		(INTERMEDIATE STEPS)	
32.	May 82	Agents complete training (100 to date); begin working in Farmers' Centers	Proj
33		Small farmer participant adoption of technology (75 percent to date)	Proj

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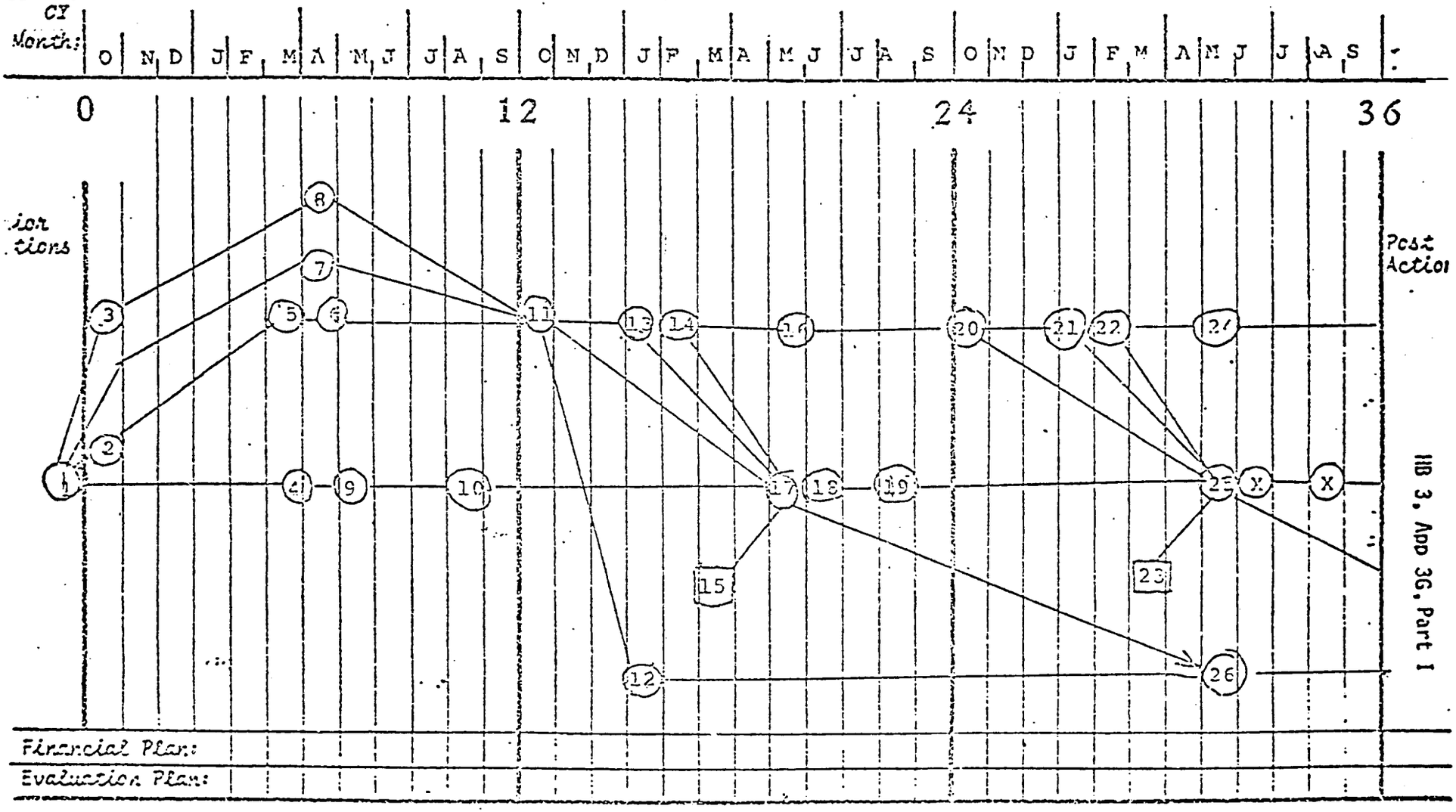

PROJECT PERFORMANCE NETWORK

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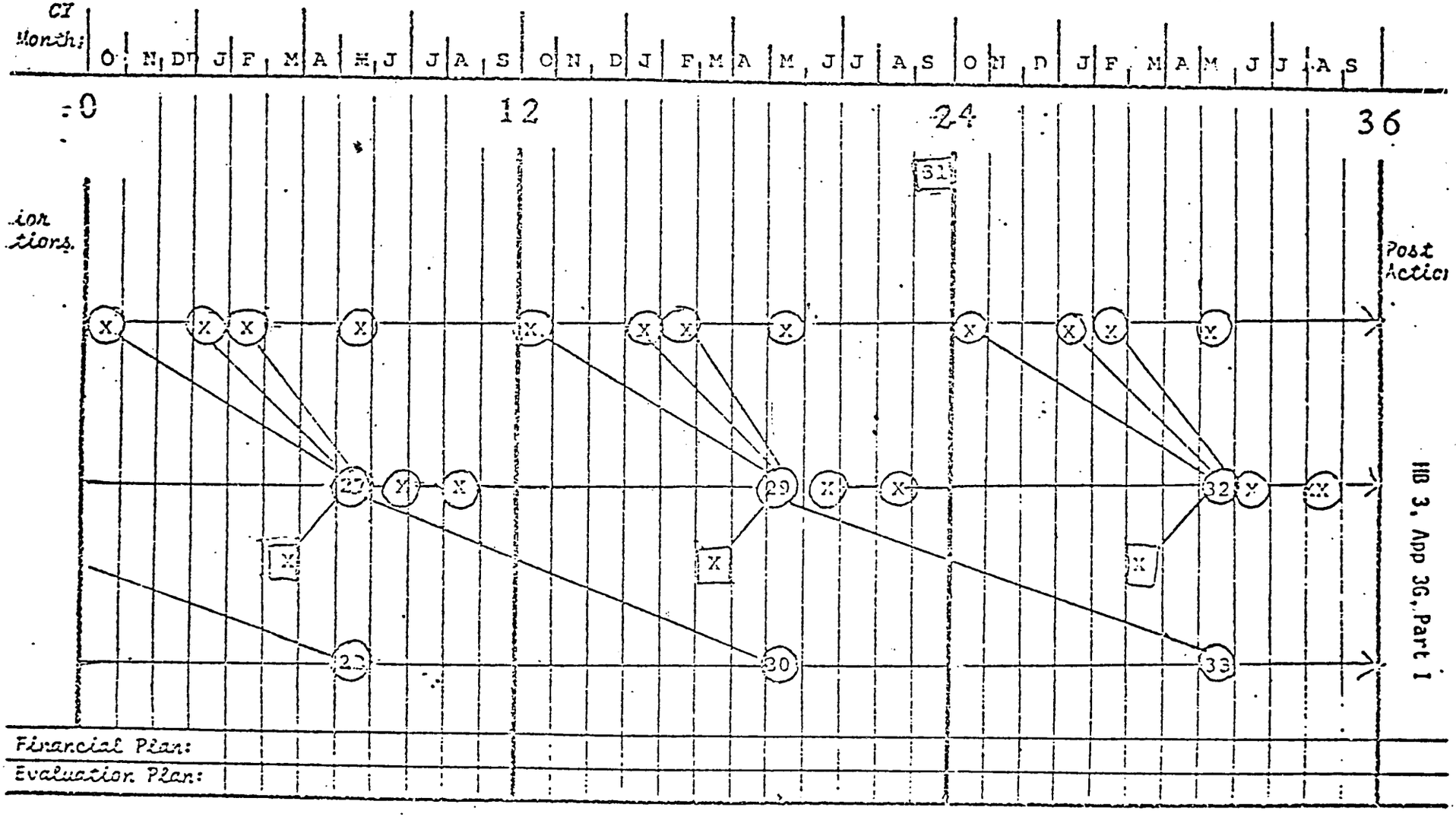

PROJECT PERFORMANCE NETWORK

IMPLEMENTATION SCHEDULE

2. Farmer Group Development Subsystem

#	Date	Event	Action Agent
1.	Sep 76	PP approved; ProAg signed	AID/W; GOZ/USAID
2.	Nov 76	Start recruiting Rural Development Specialist	Contr
3.	Mar 77	Contract signed	Contr/AID/W
4.a	Apr 77	Rural Development Specialist on site	Contr
4.b		Start recruiting Zairois Rural Development Workers (3)	Proj
4.c		Start selecting Farmers' Centers	Proj
5.	May 77	Zairois RD Workers on site (3)	Proj
6.	Jul 77	Initial Farmers' Centers selected	Proj
7.		Start encouraging Farmer Group development	Proj
8.	Sept77	Farmers' Centers established - Farmers' Councils formed (10 to date)	Proj
9.		Select RD Worker for Third Country training	Proj
10.	Nov 77	Start Third Country RD training (2 mos.)	Proj
11.	Sep 78	Farmers' Centers established - Farmers' Councils formed (25 to date)	Proj
12.		Select RD Worker for Third Country training	Proj
13.	Nov 78	Start Third Country RD training (2 mos.)	Proj
14.		Select Farmers' Center leaders for training/seminars	Proj
15.	Jan 79	Start Farmers' Center leader training/seminars	Proj
16.	Sep 79	Farmers' Centers established - Farmers' Councils formed (40 to date)	Proj
17.		Small Farmer Groups developed (30 to date)	Proj
18.		Select RD Worker for Third Country training	Proj

	Date	Event	Action Agent
19.	Nov 79	Start Third Country RD training (2 mos.)	Proj
20.	Sep 80	Farmers' Centers established - Farmers' Councils formed (55 to date)	Proj
21.		Small Farmer Groups developed (75 to date)	Proj
22.		Institutional transfer checkpoint	Proj
23.	Mar 81	Rural Development Specialist leaves	Proj
24.	Sep 81	Farmers' Centers established - Farmers' Councils formed (75 to date)	Proj
25.		Small Farmer Groups developed (120 to date)	Proj
26.	Sep 82	Farmers' Centers established - Farmers' Councils formed (75 to date)	Proj
27.		Small Farmer Groups developed (165 to date)	Proj

PP' ORM
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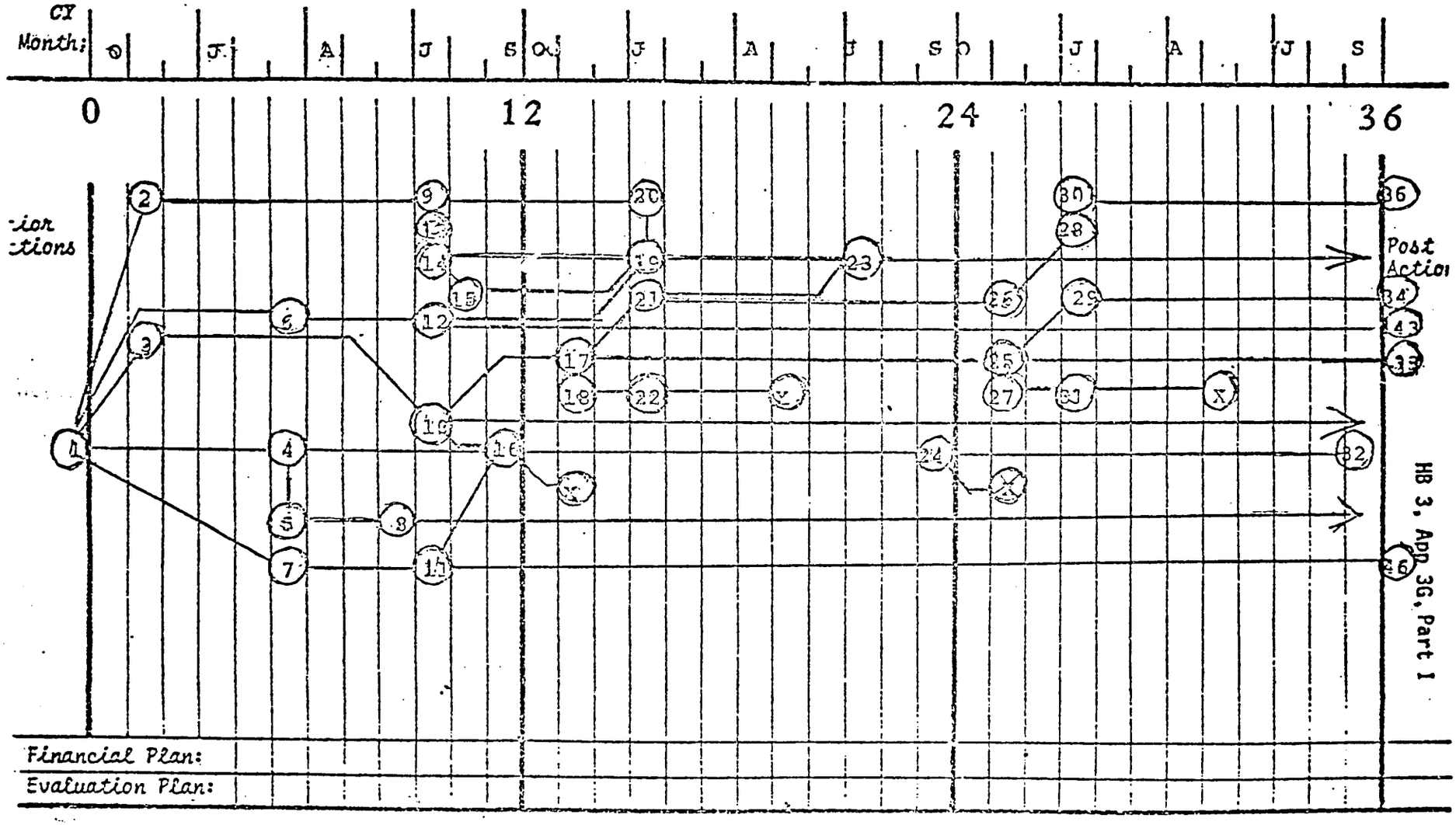
Country:	Project No:	Project Title: INTERMEDIATE TECHNOLOGY	Date:	/ / Original / / Revision #__	PPT appr



PROJECT PERFORMANCE NETWORK

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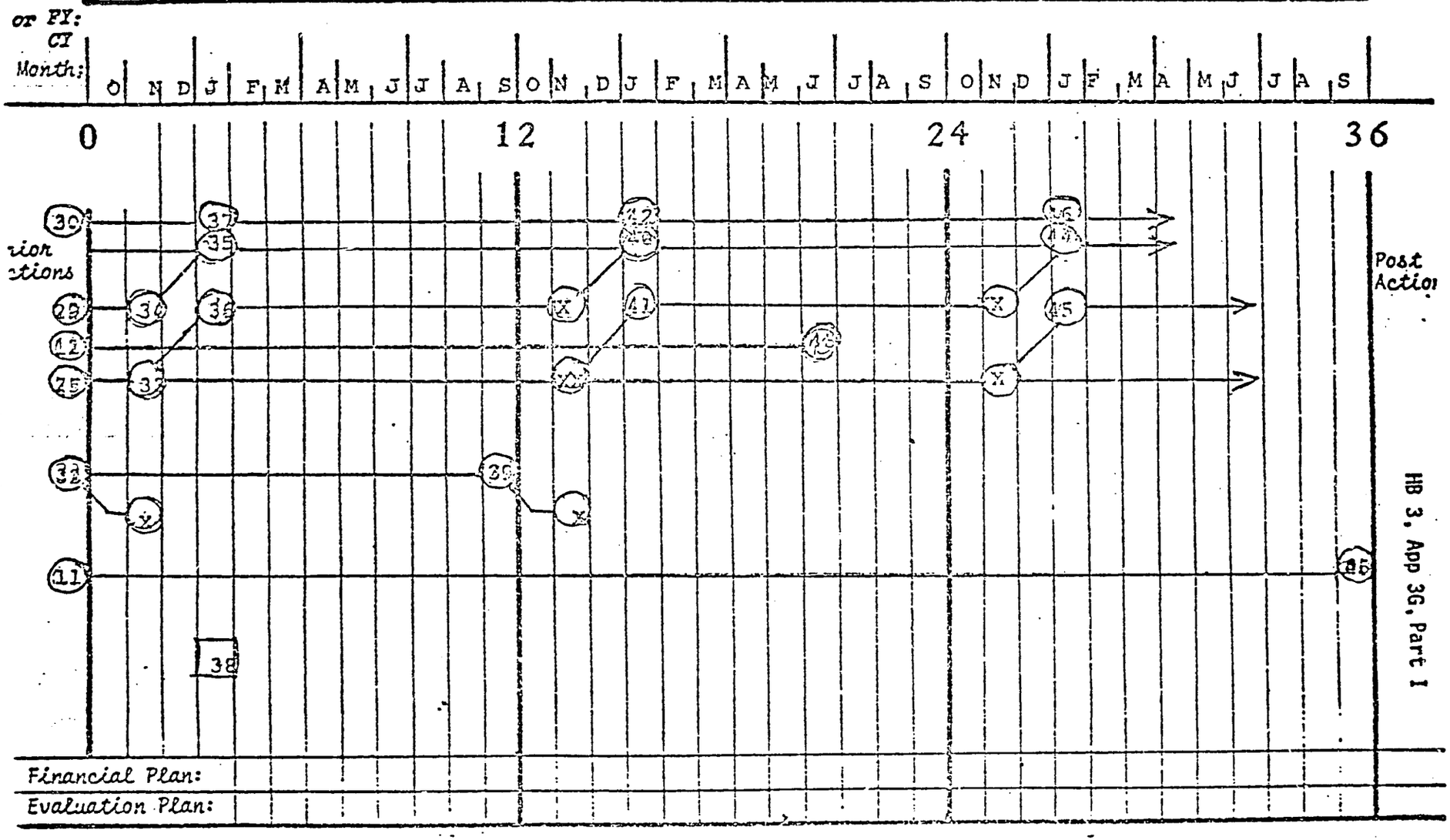
Country:	Project No:	Project Title: INTERMEDIATE TECHNOLOGY	Date:	/ / Original / / Revision #__	PPT appr



PROJECT PERFORMANCE NETWORK

HB 3, App 3G, Part I

IMPLEMENTATION SCHEDULE

3. Intermediate Technology Subsystem

#	Date	Event	Action Agent
1.	Sep 76	PP approved; ProAg signed	AID/W; GOZ/USAID
2.	Nov 76	Start recruiting Machine Shop Rehabilitation Specialist	Contr
3.		Start recruiting IT Center Director	Contr
4.	Mar 77	Contract signed	Contr/AID/W
5.		Order IT implements	Contr
6.		Negotiate arrangements for 2 PCVs	PC/USAID
7.		Start recruiting ONACER Crop Storage Specialist	GOZ/USAID
8.	Jun 77	IT implements on site; start distribution identified Farmers' Centers	Proj
9.	Jul 77	Machine Shop Rehabilitation Specialist on site	Contr
10.		IT Center Director on site	Contr
11.		Crop Storage Specialist on site	GOZ/Proj
12.		PCVs on site	PC/USAID
13.		Recruit Zairois rehabilitation staff	Proj
14.		Start machine shop rehabilitation	Proj
15.	Aug 77	Order any additional equipment/parts needed	Proj
16.	Sep 77	Short-term village/farm crop storage consultant on site (3 mon.)	Contr/Proj
17.	Nov 77	Select IT trainees (20-25)	Proj
18.		Select IT Specialist for Third Country training in IT development	Proj
19.	Jan 78	Complete machine shop rehabilitation	Proj
20.		Machine Shop Rehabilitation Specialist leaves	Proj
21.		Start training local IT Specialists	Proj
22.		Start Third Country training (5 mos.)	Proj
23.	Jul 78	Start local production of IT items	Proj

#	Date	Event	Action Agent
24.	Sep 78	Short-term village/farm crop storage consultant on site (3 mos.)	Contr/Proj
25.	Nov 78	Select IT trainees (20 - 25)	Proj
26.		Identify Farmers' Centers for Specialist placement	Proj
27.		Select IT Specialist for Third Country training in grain storage technology	Proj
28.	Jan 79	IT Specialists complete training (20 to date); begin working in Farmers' Centers	Proj
29.		Start training local IT Specialists	Proj
30.		Start village blacksmith short-courses (20/year)	Proj
31.		Start Third Country training (5 mos.)	Proj
32.	Sep 79	Short-term village/farm crop storage consultant on site (3 mos.)	Contr/Proj
33.	Nov 79	Select IT trainees (20 - 25)	Proj
34.		Identify Farmers' Centers for Specialist placement	Proj
35.	Jan 80	IT Specialists complete training (40 to date); begin working in Farmers' Centers	Proj
36.		Start training local IT Specialists	Proj
37.		Village blacksmiths trained (20 to date)	Proj
38.		Institutional transfer checkpoint	Proj
39.	Sep 80	Short-term village/farm crop storage consultant on site (3 mos.)	Contr/Proj

(INTERMEDIATE STEPS)

40.	Jan 81	IT Specialists complete training (60 to date); begin working in Farmers' Centers	Proj
41.		Start training local IT Specialists	Proj
42.		Village blacksmiths trained (40 to date)	Proj
43.	Jun 81	PCVs leave	Proj

#	Date	Event	Action Agent
		(INTERMEDIATE STEPS)	
44.	Jan 82	IT Specialists complete training (80 to date); begin working in Farmers' Centers	Proj
45.		Start training local IT Specialists	Proj
46.		Village blacksmiths trained (60 to date)	Proj
47.	Sep 82	ONACER Crop Storage Specialist leaves	Proj

PP' ORM
(May be Expanded as Appropriate)

Country:	Project No:	Project Title: MARKETING AND CREDIT	Date:	/ / Original / / Revision #	PPT appr

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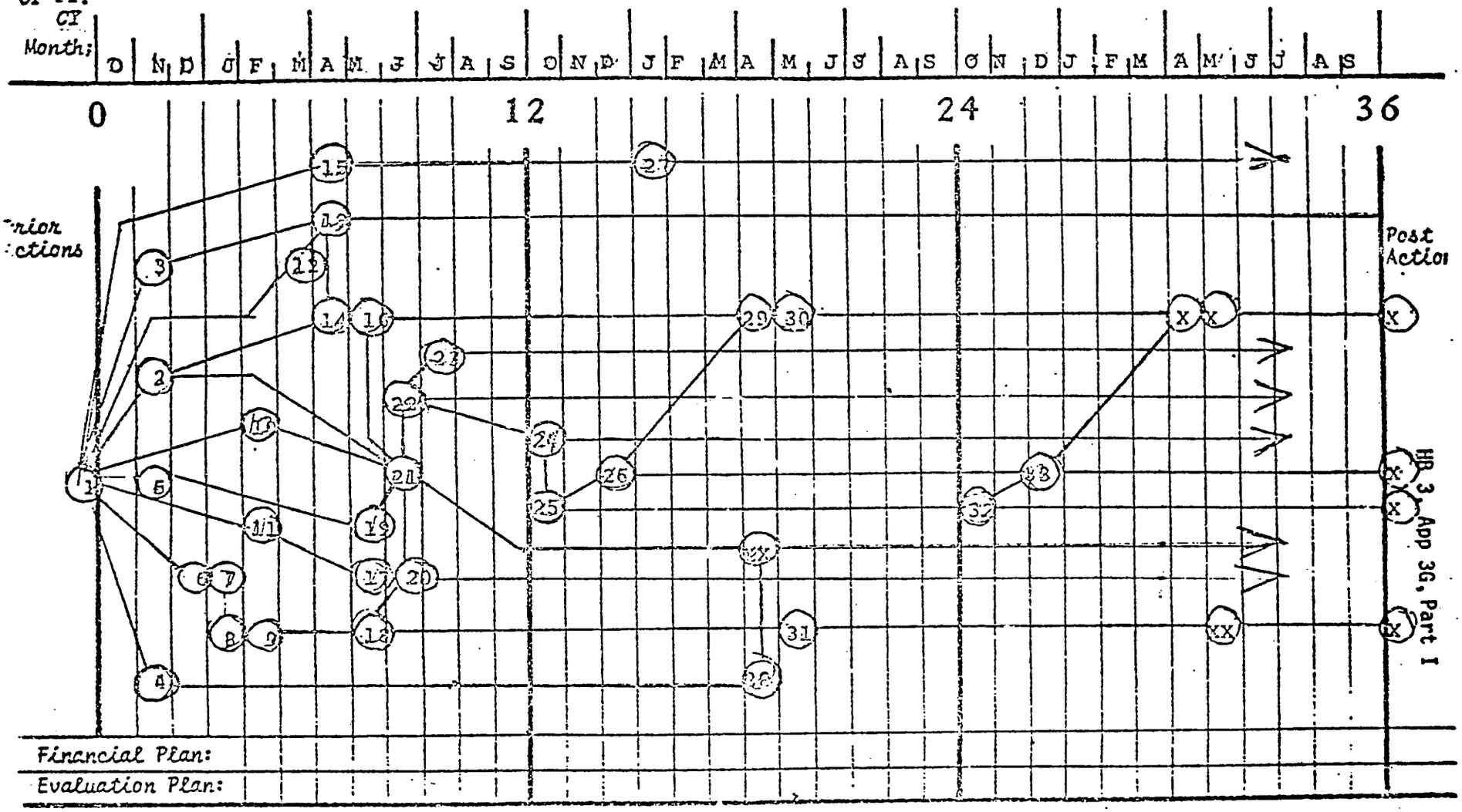

PROJECT PERFORMANCE NETWORK

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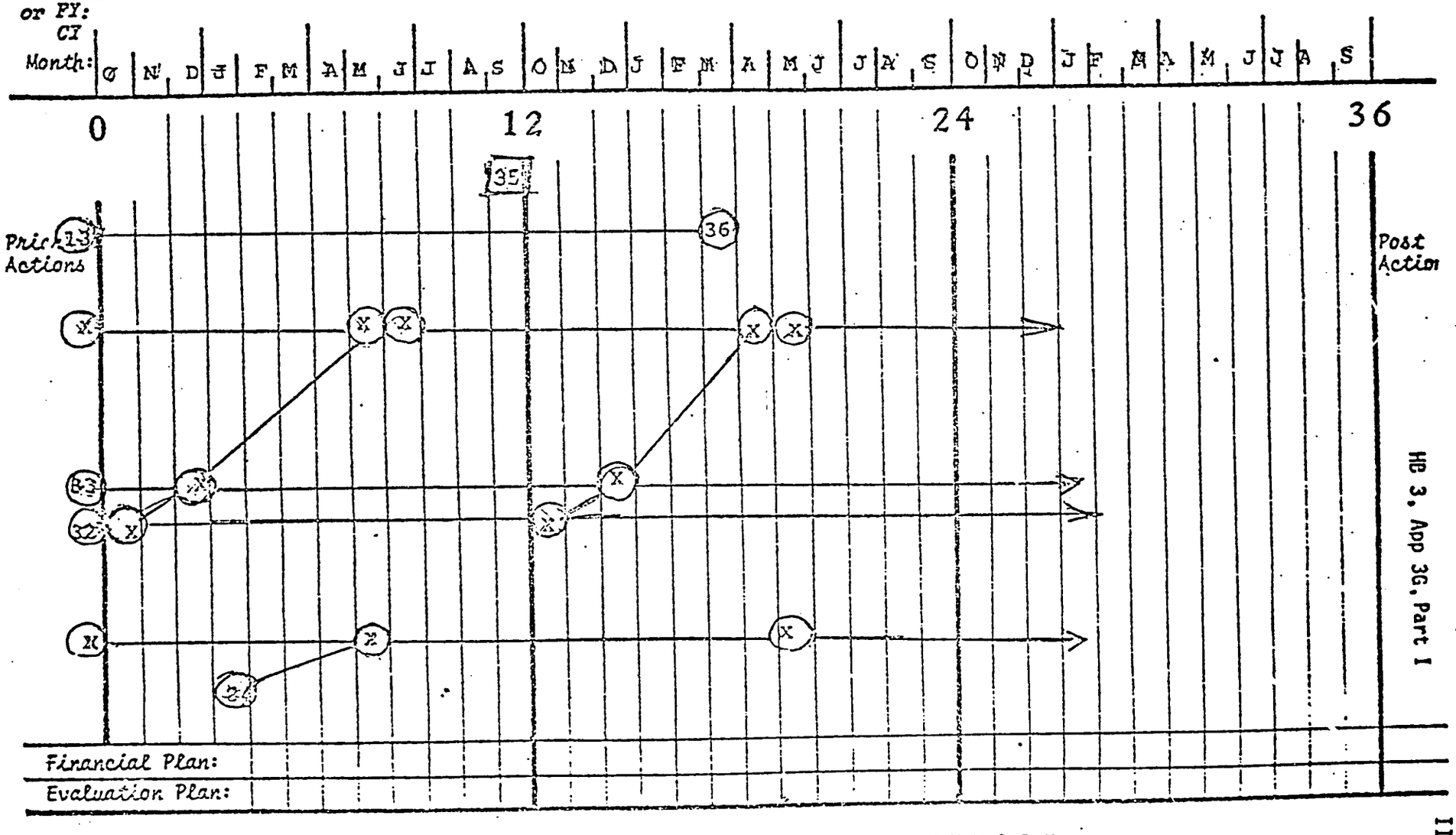
Country:	Project No:	Project Title: MARKETING AND CREDIT	Date:	/ / Original / / Revision #__	PPT appr



Financial Plan:

Evaluation Plan:

PROJECT PERFORMANCE NETWORK

4. Marketing and Credit Subsystem

#	Date	Event	Action Agent
1.	Sep 76	PP approved; ProAg signed	AID/W; GOZ/USAID
2.	Nov 76	Short-term Agricultural Credit consultant on site (4 weeks)	AID/W
3.		Start recruiting Rural Development Specialist	Contr
4.		Order six AWD pick-ups from U.S.	USAID
5.		Arrange with SNCZ for railhead facility improvement	GOZ/USAID
6.	Dec 76	Negotiate operations agreement for financial services	USAID/Bank of Kinshasa
7.	Jan 77	Operations agreement signed	USAID/Bank of Kinshasa
8.		Negotiate counterpart loan to financial institution	GOZ/USAID
9.	Feb 77	Counterpart fund loan agreement signed	GOZ/USAID
10.		Designate Zairois Marketing Directors for Kongolo and Nyunzy	GOZ/USAID
11.		Order 13 trucks/spare parts from A.C.A. (Kinshasa)	USAID
12.	Mar 77	Project contract signed	Contr/AID/W
13.	Apr 77	Rural Development Specialist on site	Contr
14.		Develop information for merchant licensing procedures	Proj
15.		Designate Zairois Training Assistant for small merchant business management training	GOZ/Proj
16.	May 77	Issue merchant licences	Proj
17.		A.C.A. trucks on site	Proj/USAID
18.		Financial representative on site (periodic short-term financial operations)	Bank of Kinshasa
19.		Complete railhead facility improvement by SNCZ	GOZ/Proj
20.	Jun 77	Start truck and harvest credit program	Proj
21.		Start Project/CNACER marketing operations	GOZ/Proj
22.		Start systematic data collection on grain marketing in project area (with specific reference to problems of small merchants)	Proj
23.	Jul 77	Institute market operations information service for farmers and merchants	Proj

#	Date	Event	Action Agent
24.	Oct 77	Analyze data collected on grain marketing in project area	Proj
25.		Evaluate Project/ONACER marketing operations	GOZ/Proj
26.	Dec. 77	Evaluate project market development strategy and redesign as required	Proj
27.	Jan 78	Start business management training program for small merchants	Proj
28.	Apr 78	AWD pick-ups on site	Proj/USAID
29.		Develop information for merchant licensing procedures	Proj
30.	May 78	Issue merchant licences	Proj
31.		Financial representative on site (periodic short-term financial operations)	Bank of Kinshasa
32.	Oct 78	Evaluate Project/ONACER marketing operations	GOZ/Proj
33.	Dec 78	Evaluate project market development strategy and re-design as required	Proj
34.	Jan 80	Short-term small farmer credit consultant on site (3 mos.)	Contr/Proj
35.	Sep 80	Institutional transfer checkpoint	Proj
36.	Mar 81	Rural Development Specialist leaves	Proj.

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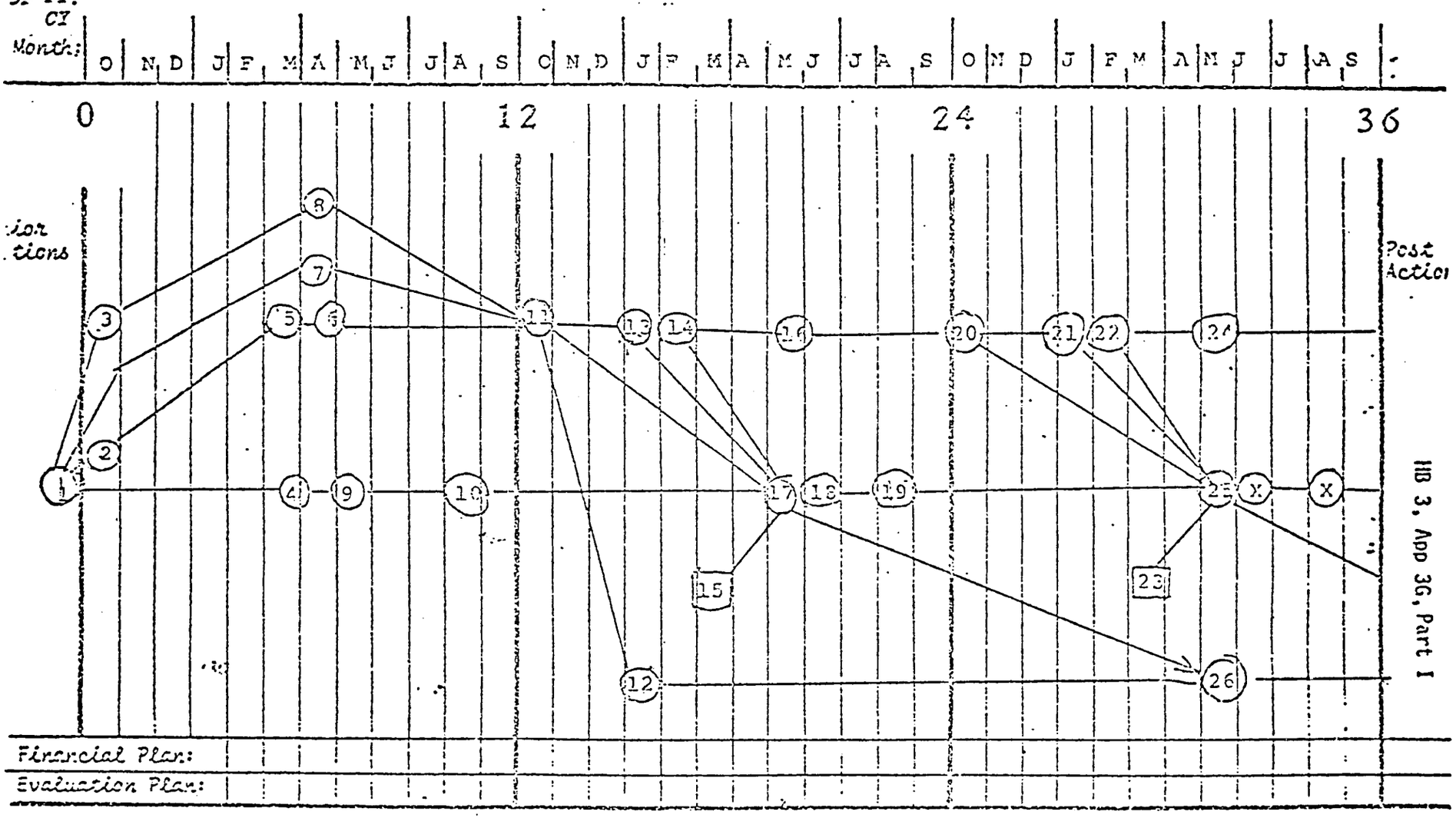

PROJECT PERFORMANCE NETWORK

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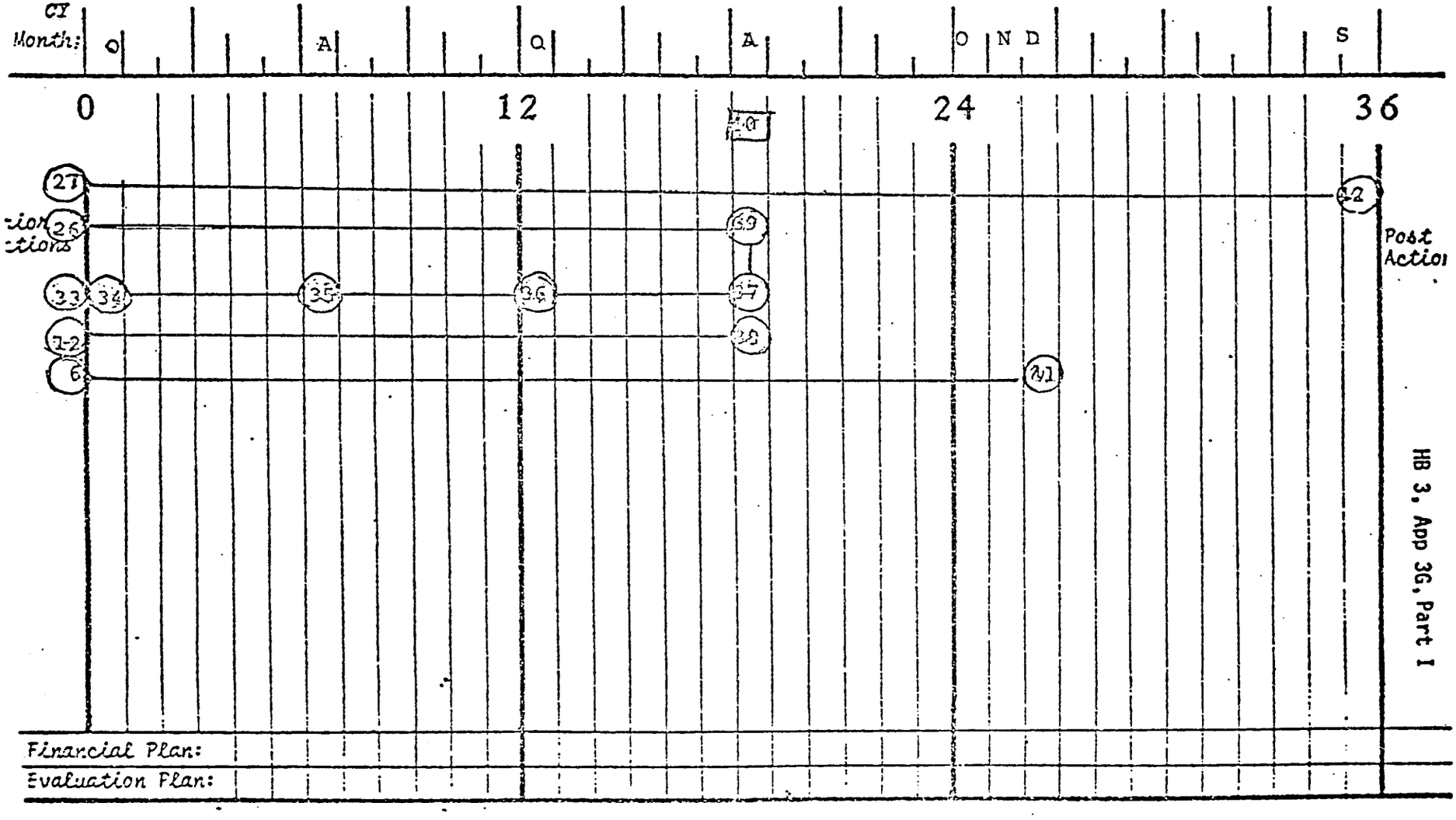
Country:	Project No:	Project Title: INFRASTRUCTURE	Date:	/ / Original / / Revision #__	PPT appr



PROJECT PERFORMANCE NETWORK

IMPLEMENTATION SCHEDULE

5. Infrastructure Subsystem

#	Date	Event	Action Agent
1.	Sep 76	PP approved; ProAg signed	GOZ/USAID/ AID/W
2.	Oct 76	Start recruiting Construction Management Specialist (personal services contract for pre-implementation)	AID/W
3.	Nov 76	Start recruiting Building/Bridge Construction Specialist	Contr
4.		Start recruiting Road Rehabilitation Specialist	Contr
5.		Start recruiting Equipment Maintenance Specialist	Contr
6.	Feb 77	Construction Management Specialist on site	AID/W
7.		Start equipment IFB preparation	GOZ/USAID
8.		Order local building materials and construction equipment	USAID
9.	Mar 77	Contract signed	Contr/AID/W
10.		Equipment IFBs issued	GOZ/USAID
11.		Order offshore GSA/local building materials	USAID
12.		Building/Bridge Construction Specialist on site	Contr
13.	Jul 77	Local building materials/equipment on site	Proj
14.		Start rehabilitation 2 buildings (Kongolo)	Proj
15.	Aug 77	Offshore building material on site	Proj
16.	Sep 77	Complete rehabilitation 2 buildings (Kongolo)	Proj
17.		Start rehabilitation 3 buildings (Kongolo)	Proj
18.		Start construction 2 buildings (Kongolo)	Proj
19.	Oct 77	Start OR training equipment operators, mechanics	GOZ/Proj
20.		Contract for sand, rock for 15 bridges	Proj

#	Date	Event	Action Agent
21.	Nov 77	Complete rehabilitation 3 buildings (Kongolo)	Proj
22.		Complete construction 1 building (Kongolo)	Proj
23.		Start all other Kongolo construction	Proj
24.		Start Mbulula, Nyunzu construction	Proj
25.		Re-order offshore building materials	Proj
26.	Dec 77	Road Rehabilitation Specialist on site	Proj
27.		Equipment Maintenance Specialist on site	Proj
28.	May 78	Complete all Mbulula construction	Proj
29.	Oct 78	Complete all Kongolo and Nyunzu construction	Proj
30.		Road construction equipment on site	Proj
31.		OR Equipment operators, mechanics on site	Proj
32.		Start construction of roads and bridges	Proj
33.	Apr. 79	Constr/rehabilitation phase completed (15 bridges, 150 km to date)	Proj
34.	Oct 79	Constr/rehab. phase completed (31 bridges, 350 km to date)	Proj
35.	Apr 80	Constr/rehab phase completed (48 bridges, 600 km to date)	Proj
36.	Oct 80	Constr/rehab phase completed (65 bridges, 724 km to date)	Proj
37.	Apr 81	Constr/rehab phase completed (72 bridges, 724 km to date)	Proj
38.		Building/Bridge Construction Specialist leaves	Proj
39.		Road Rehabilitation Specialist leaves	Proj
40.		Institutional transfer checkpoint	Proj/GOZ
41.	Dec 81	Construction Management Specialist leaves	Proj
42.	Sep 82	Equipment Maintenance Specialist leaves	Proj

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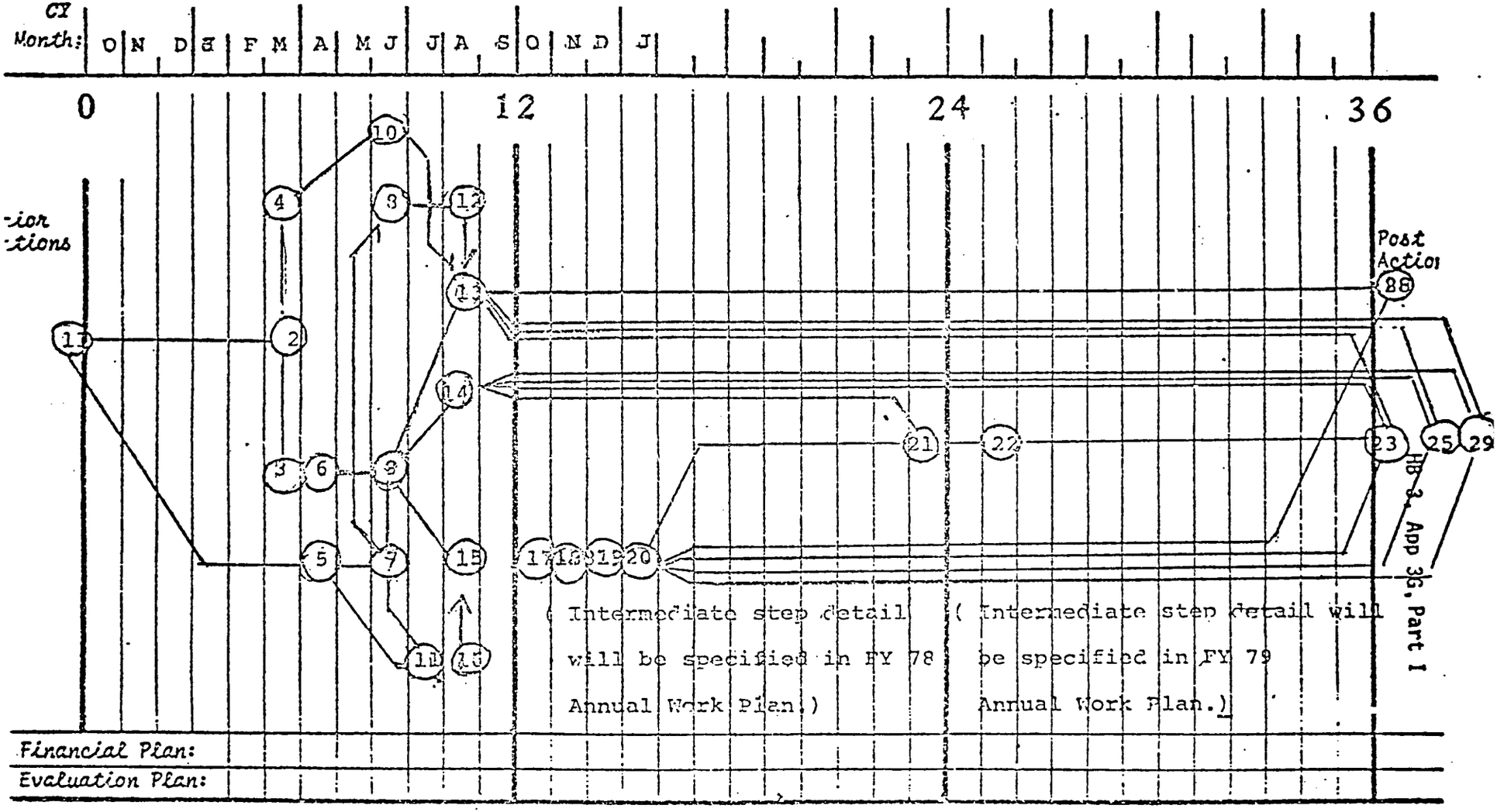
Country:	Project No:	Project Title: PROJECT MONITORING AND EVALUATION	Date:	/ / Original / / Revision #	PPT appr



PROJECT PERFORMANCE NETWORK

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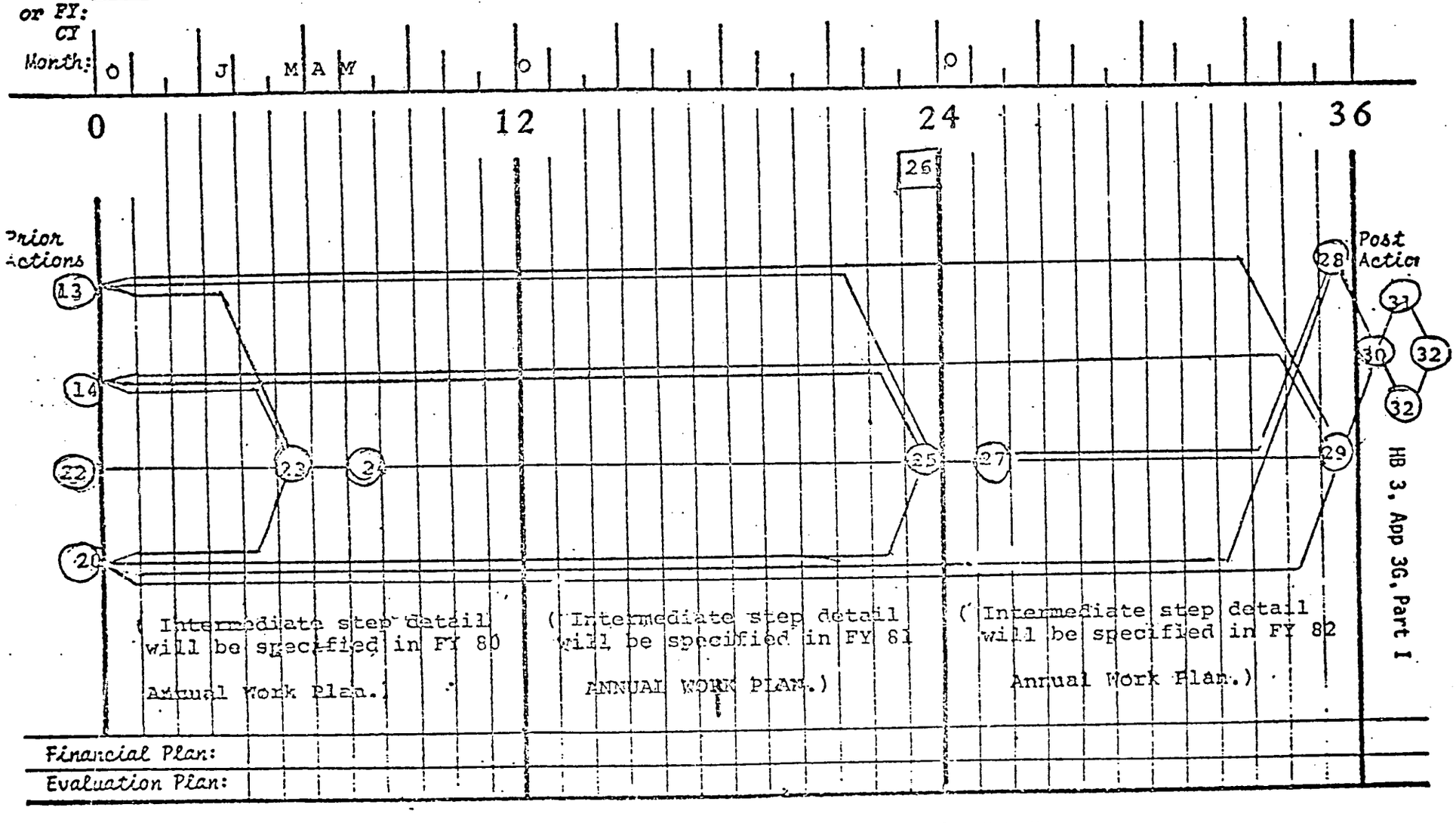

PROJECT PERFORMANCE NETWORK

IMPLEMENTATION SCHEDULE

6. Project Monitoring and Evaluation Subsystem

Date	Event	Action Agent
1. Sep 76	PP approved; ProAg signed	AIW/W; GOZ/USAID
2. Mar 77	Contract signed	Contr/AID/W
3.	Start structuring information needs	Contr/Consult
4.	Order offshore equipment	Contr
5.	Recruit DCA Chiefs, staff.	GOZ/Consult
6. Apr 77	Start structuring analytical requirements	Proj/Consult
7. Jun 77	DCA Center Chief on site	Proj
8.	Order local equipment/office supplies	Proj
9.	Start structuring data collection instruments; set up for Lubumbashi computer support	Proj/Consult
10.	Offshore equipment on site	Proj
11. Jul 77	Remaining DCA staff on site	Proj
12. Aug 77	Local equipment/office supplies on site	Proj
13.	Start development of project management information system	Proj/Consult
14.	Start *ad hoc* data collection and analysis as required	Proj/Consult
15.a	Select baseline survey sample	Proj/Consult
15.b	Develop and pretest survey instruments	Proj/Consult
16.	Train 20 agents/DCA staff for baseline field work/two-way communications	Proj/Consult
17. Oct 77	Start baseline data collection (4-6 wks)	Proj/Consult
18. Nov 77	Start baseline tabulation/analysis by CDA Center	Proj/Consult
19. Dec 77	Start baseline report preparation	Proj/Consult
20. Jan 78	Baseline Survey Report distributed	Proj/Consult
21. Sep 78	Start preparations for joint evaluation	Proj/Consult

	Date	Event	Action Agent
22.	Nov 78	Joint evaluation (2 mos.)	GOZ/Proj/ Consult/USAID
23.	Mar 80	Start preparations for joint evalu.	Proj/Consult
24.	May 80	Joint evaluation (2 mos.)	GOZ/Proj/ Consult/USAID
25.	Sep 81	Start preparations for joint evaluation	Proj/Consult
26.		Institutional transfer checkpoint	GOZ/Proj
27.	Nov 81	Joint evaluation (2 mos.)	GOZ/Proj/ Consult/USAID
28.	Sep 82	Start preparations for follow-up general survey	Proj/Consult
29.		Start preparations for final evaluation	Proj/Consult
30.	Oct 82	Start follow-up general survey field work	Proj/Consult
31.	Nov 82	Start follow-up survey tabulation/ analysis	Proj/Consult
32.		Joint evaluation (2 mos.)	GOZ/Proj/ Consult/USAID
33.	Dec 82	Prepare follow-up survey and final project evaluation reports	Proj/Consult