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An Information Framework for  
the Monitoring and Evaluation  
of Appropriate Technology  
Projects

by

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Appropriate Technology International (ATI) is a private, non-profit, development assistance organization funded by the United States Agency for International Development. ATI's purpose is the commercialization of appropriate technology to increase employment, income, savings, capital formation, and the productivity of the poor in less developed countries. ATI's program centers around the development and implementation of field projects in three fields: 1) agricultural product processing and the use of agricultural wastes; 2) local use of mineral resources; and 3) production and distribution of equipment and supplies for small farms. The purpose of this paper is to describe ATI's system for monitoring and evaluation of projects.

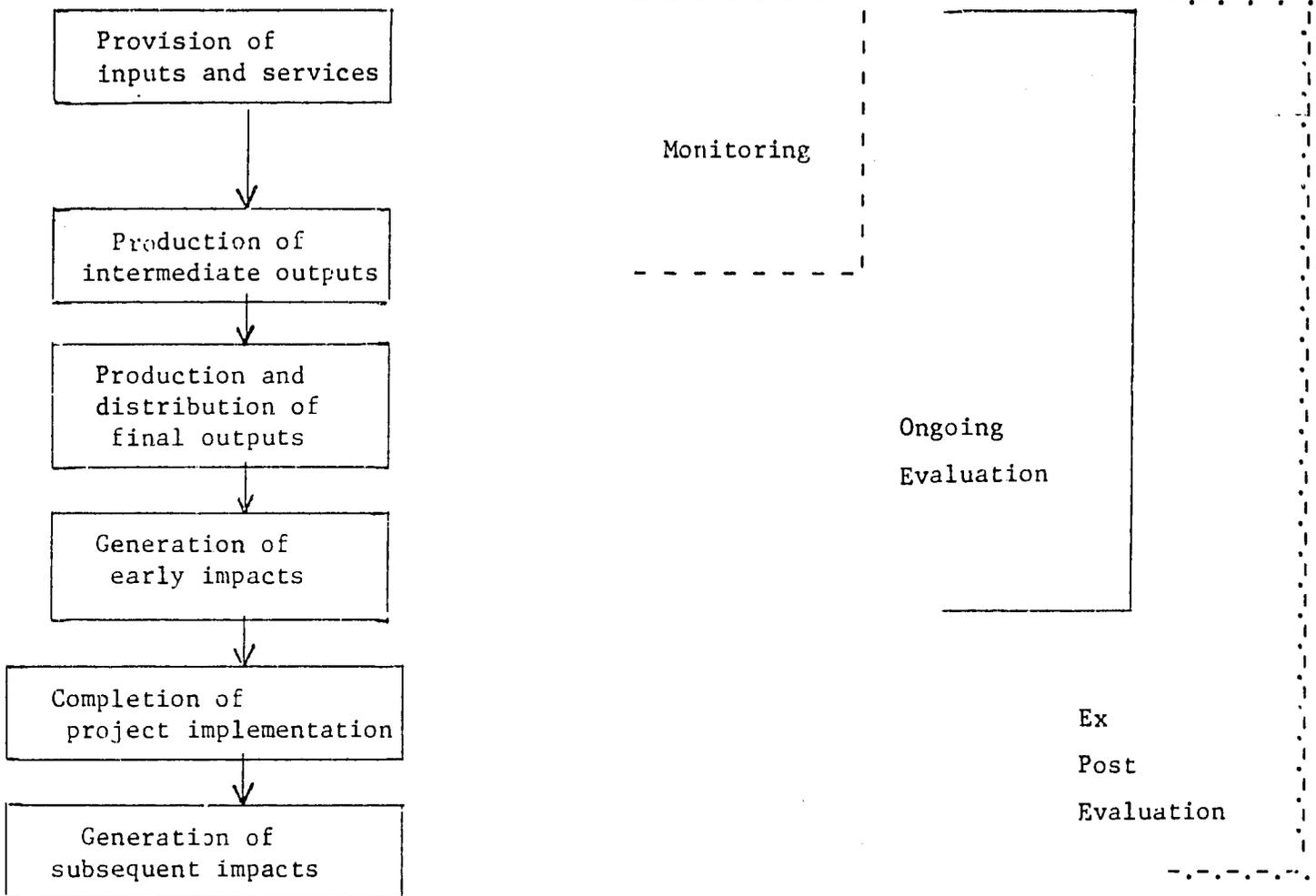
The purpose of **monitoring** is to improve the operation of a project as designed. Thus, monitoring focuses on the project's use of inputs, day-to-day management, and the production of outputs. In contrast, **evaluations** can help decision makers re-examine the design of the project and assess the project's impacts. **Ongoing evaluations** take place during project implementation and can be useful in making changes in the strategies, techniques, institutional arrangements, resource allocations, and policy contexts for the project. **Ex post** evaluations occur after completion of the project and can 1) indicate whether the technologies adopted under the project are likely to continue to be used in the project area or even spread to other places without

external assistance; 2) help in the design of complementary projects in the project area and replications elsewhere; and 3) identify the need to compensate people adversely affected by the project or to mitigate unintended environmental impacts. Figure 1 summarizes the main elements of monitoring, ongoing evaluation, and ex post evaluation.

Careful monitoring and evaluation are especially important for appropriate technology projects. Appropriate technology projects often are innovative, at the verge of demonstration and commercialization, or are adapted versions of technologies in use elsewhere. Broadly defined here, the term "technologies" includes equipment, machines, and processes. These projects frequently differ from conventional technology projects because they rely on small-scale equipment and processes (often locally-manufactured), and different amounts, kinds, and sources of raw materials and natural resources. As a result, appropriate technology projects tend to be more sustainable and more favorable on environmental grounds. Compared to conventional technologies, appropriate technologies typically are less capital-intensive, less dependent on scarce foreign exchange for imported goods, and more labor-intensive. Yet, appropriate technologies often are labor-saving in comparison with traditional methods of production. Appropriate technologies typically are more productive per unit cost than either conventional or traditional alternatives. Frequently, the outputs of appropriate technology projects are intended for local use (subsistence or marketed). The outputs often are less expensive than those produced by conventional technologies and of

FIGURE 1

Typical Elements of a Project Addressed  
in Monitoring and Evaluation



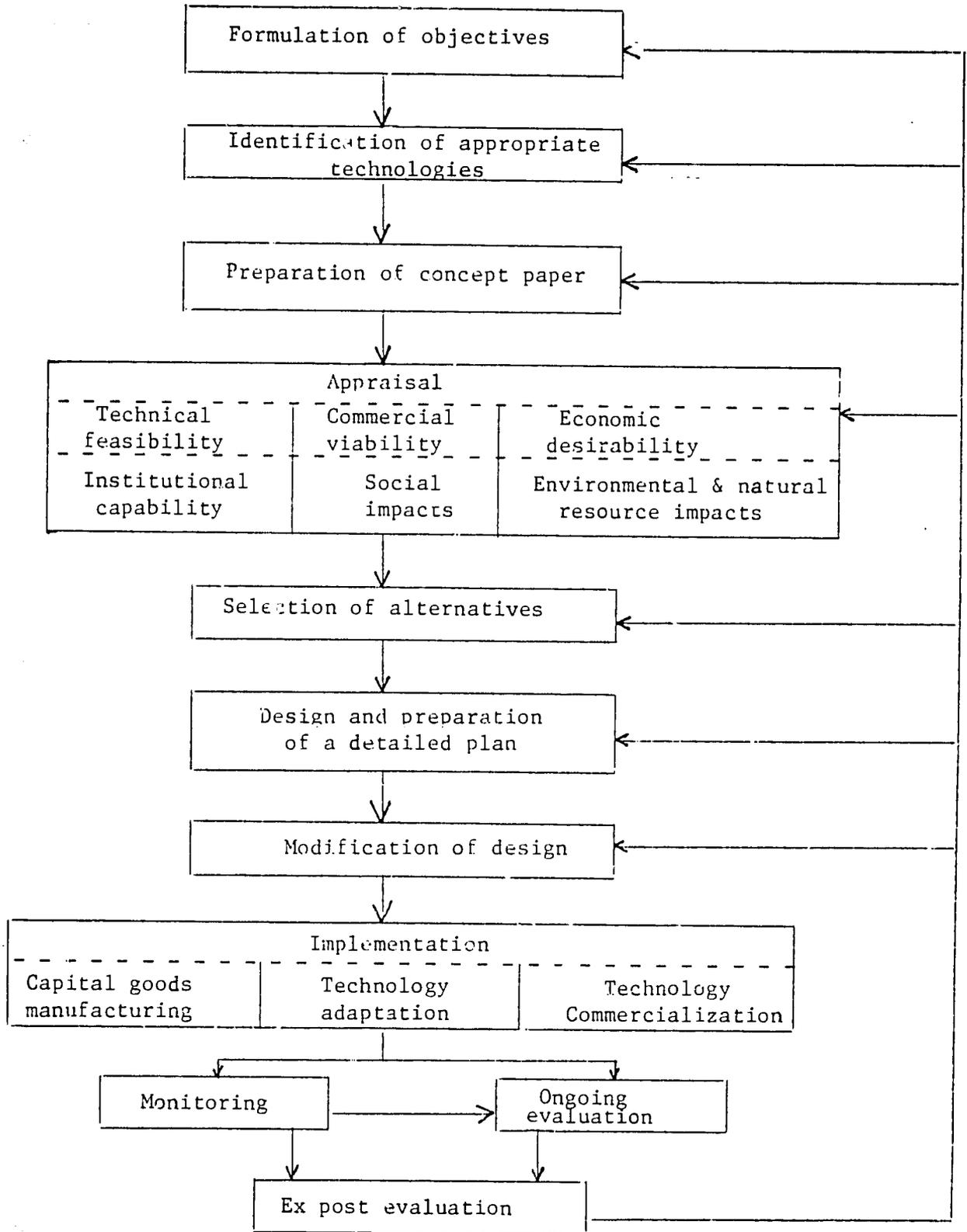
superior quality to those produced by traditional methods. The outputs of productive activities that employ appropriate technologies commonly fill gaps in demand that are poorly met by large-scale industries designed to serve urban or export markets. Perhaps the most important aspect of appropriate technology is its potential for significant impacts on the economic and social well-being of the poor and near-poor, in rural as well as urban areas.

A focus on targets encourages a rigorous, quantitative approach to monitoring and evaluation. However, planning targets established in advance of project implementation can be somewhat arbitrary. If targets have been set too low, a project may appear more successful because it met all of the targets. Conversely, targets might not be reached because they have been set unrealistically high. In fact, the appropriate targets may evolve over time in response to changes in conditions or even as a result of the project itself. Thus, nonattainment of a target set at the time of project appraisal does not necessarily indicate a failure. What is more important is understanding the reasons for accomplishments and shortfalls in order to determine whether changes in the targets are necessary.

Figure 2 depicts the role of monitoring and evaluation in ATI's planning process. ATI places more emphasis on monitoring and ongoing evaluation than on ex post evaluation because the former two analyses can lead to changes that improve the project. Some of the information for monitoring and ongoing evaluation is obtained continuously while the rest is obtained at regular

FIGURE 2

ATI's Project  
Planning Process



intervals (quarterly or annually). ATI also considers ex post evaluations important because sharing information across projects and countries is part of ATI's program.

The analyses conducted in the appraisal stage establish the basis for judging projects in monitoring and evaluation. The principal categories of questions are listed below:

- How well do the technologies work?
- Are the productive activities profitable enough to entrepreneurs and investors so that they can continue on their own once established?
- Do the enterprises increase net value added in the economy, after accounting for the opportunity costs to society of land, capital, and resources?
- Do the project-implementing organizations and intermediary organizations carry out their activities efficiently and effectively?
- Do skills and institutional performance improve as a result of the project?
- Does the project produce favorable effects on employment, the distribution of income, health and safety, and other aspects of social development?
- Is the productivity of the natural resources used by the enterprises sustainable and are there any positive or negative environmental impacts off-site?

The monitoring and evaluation system used by ATI is based on a collaborative approach between the project-implementing organizations in developing countries, ATI's field operations staff, and ATI's Evaluation Group. Shortly after approval of project plans, ATI's evaluation officers meet with ATI's field operations staff to discuss project-specific issues to be considered in data collection and analysis. ATI's field operations staff discuss these issues with the implementing organizations during their routine missions abroad. After their return from missions, operations field staff hold debriefing meetings with evaluation officers for timely recording of information and accuracy of interpretation.

To the extent possible, monitoring and evaluation data are obtained from progress reports and financial reports submitted by the implementing organizations quarterly and annually. During the course of the project and after its completion, ATI's evaluation officers travel to the field for rapid reconnaissance. In some cases, more extensive surveys of participants and non-participants in the project area will be commissioned or carried by the implementing organizations in collaboration with ATI. This process helps the Evaluation Group obtain the necessary data at minimum cost and reduces the time burden on the field operations staff. It also ensures the objectivity and consistency of the analysis across projects because the task of interpreting and writing up the findings is reserved for the Evaluation Group.

#### **ATI's Information Framework for Monitoring and Evaluation**

A common problem with monitoring and evaluation systems for rural development projects is that they often collect too much or too little data, or the wrong type of data. As a result, reports are produced too late to be useful to project management and the systems have been costly. In order to avoid the above pitfalls, ATI has developed a flexible framework for data collection and analysis. This framework, known as PMES (Project Monitoring and Evaluation System), helps avoid the collection of unnecessary data or the omission of important data. It also serves as a guide to interpretation, facilitating comparisons across projects.

Sometimes, surveys are needed to obtain information on socioeconomic impacts. When surveys are necessary, ATI's

Evaluation Group and the cooperating organizations work together in setting the sample size, sampling procedure, and survey techniques. The PMES can assist in the design of survey questionnaires for specific projects.

As much as possible, the questions in the PMES are quantitative. Qualitative variables are expressed in terms of levels (as ordinal variables) to facilitate analysis. Likely responses to questions involving qualitative variables have been anticipated, but it is recognized that other responses will need to be specified and explanations added in many cases.

The PMES should be viewed as a checklist of the factors to be considered in monitoring and evaluation. Not all of these factors are relevant for any particular project. Although the checklist is meant to be broadly applicable, some factors pertinent to a specific project may not be included. The PMES is a structured way of asking the questions that are likely to be important.

The PMES is a single information framework suitable for monitoring, ongoing evaluation, and ex post evaluation. During monitoring and ongoing evaluation, the following sections of the PMES usually can be filled out: nature of the technology, organizations and participation, inputs, project activities, credit (if part of the project), outputs, and markets. Because of the emphasis ATI places on commercialization of productive enterprises, financial performance will be tracked throughout implementation on a quarterly basis. The final financial and economic analyses will be reserved for the ex post evaluation.

Other sections of the PMES primarily intended for the ex post evaluation cover impacts, linkages, and displacements and policy issues and replication. The rest of this paper briefly discusses some of the issues that fall under the various sections of the PMES.

### Technology

A **productive activity** relies on one or more technologies for combining inputs to produce outputs. An **enterprise** is a single administrative unit that carries out productive activities; it may be privately-owned or a parastatal. ATI projects may involve development or adaptation of traditional or modern technologies; design of a prototype, or field tests.

Most ATI projects transfer a technology to capital goods manufacturers or potential users. The advantages and disadvantages of the technology should be noted: costs (capital, labor, raw materials and natural resources, maintenance and replacement, and transport and distribution); productivity and production time; useful life and downtime; consumer prices; quality of output; flexibility and simplicity; foreign exchange savings or earnings; occupational health and safety; and the ability of small producers to participate in productive activities. The timeliness of installing the technology is affected both by the nature of the technology itself and a wide variety of administrative/managerial factors that should be explained. Machinery and equipment manufactured in the project area may be distinguished from that produced elsewhere in the country or abroad in order to estimate effects on the local economy and to provide some

indication of how fast parts can be repaired or replaced.

### **Organizations and Participation**

ATI awards grants to organizations that are best able to implement appropriate technology projects that benefit the poor in less developed countries. Often, these implementing organizations carry out the projects directly. Sometimes, the implementing organizations establish a special division concerned solely with the project for greater efficiency, to meet legal requirements, or to separate profit-making activities from charitable or voluntary activities. In other cases, the implementing organizations subcontract with intermediary organizations that are better able to work with certain groups, cover particular geographic areas, or offer specific substantive expertise.

Cooperating organizations (implementing or intermediary organizations) may be composed of small enterprises directly; represent them as an association, cooperative, or common service group; or have broader purposes such as economic social, or technology development. Generally, ATI works with nongovernmental organizations including private voluntary organizations, private companies, and trade associations that work with small enterprises. In some cases, parastatals, government development banks, and government agencies may have some involvement in a project. The cooperating organizations may work at a local, provincial or state, national, or international level. It is important to note the budget, staff size, and age of the cooperating organizations because these may influence other factors that affect the success of the project (e.g., managerial

and technical expertise, administrative efficiency, and degree of decentralization of decision making).

The cooperating organizations may provide a variety of incentives and services such as grants, subsidies, credit, technical or managerial assistance and training, input supply, marketing arrangements, and representation in policy debates. The number of units, average size, and location of each type of productive activity supported should be recorded.

Participants are those people who actually take part in the project. Intended beneficiaries are the people whom the project was designed to involve. If the intended beneficiaries are not informed about the existence of the project, are not interested in the project, or lack the resources and skills needed then the actual participants may not be from the target group. Consequently, key characteristics of the actual participants such as income (cash and in-kind), age, sex, education, ethnic or cultural affiliation, household size, prior occupations, and geographic location should be determined. The number of participants also may differ from the planned target depending on the awareness of the project and its terms, incentives for participation, cultural attitudes, administrative factors, technical or financial resources, geographic location and infrastructure, marketing potentials, ability to bear risk and uncertainty, and past experience with other development projects. Many of these same factors affect the drop-out rate among participants.

Sometimes, new organizations developed under a project start out successfully (unsuccessfully), but their effectiveness and

efficiency change over time. These changes may result from the restructuring of leadership, the degree of openness of decision making within the group, availability of financial resources, staff turnover, and relationships with other organizations. If surveys are conducted, participant evaluations of the effectiveness of implementing organizations may be obtained. However, in some cultures, there is a tendency for people to avoid expressing negative judgments about an organization when representatives of that organization are present.

### **Project Activities**

Other activities that are commonly part of development projects include outreach and promotion, the processing of applications, administration, provision of technical and managerial assistance, training, and reporting. The main focus of **monitoring** should be on reasons for positive and negative aspects of these activities, and on ways of improving their efficiency and effectiveness. Bottlenecks in processing applications such as slowness, complexity of paperwork, high application costs, travel costs and time, the difficulty of obtaining supporting materials, and poor coordination with other governmental or non-governmental organizations can hinder participation. Estimates of administrative costs are included in a benefit-cost analysis of a project to society. They also can provide an indication of whether administrative reforms are needed.

Common problems in extension include the shortage of extension staff or high turnover; high cost of reaching a large number of people, difficulty of transport to remote areas, insuf-

efficient education or experience of staff, weak links to research institutions or other services, cultural attitudes, irregular scheduling, and provision of a disproportionate share of extension services to the relatively well-off. Sometimes, the recommended technical packages are too costly or time-consuming for the intended beneficiaries or are not suitable for the actual sites that are available. Flexibility is necessary because changes in the original technical packages may be desirable.

In **monitoring** training, the number of people trained and the duration and subjects of the training can be compared to the targets. It is more difficult to **evaluate** training because its effects may be diffuse or long-term. Common problems that follow training include the lack of suitable employment that builds on the skills learned, lack of complementary equipment (e.g., computers), or the promotion of trained individuals into new jobs where they no longer use the newly-acquired skills.

### **Credit and Equity Investments**

Even where most of the preconditions for successful entrepreneurship exist, lack of capital can be a serious constraint to the adoption of improved technologies and the expansion of small enterprises. In these cases, ATI has supported credit programs and venture capital companies. Many of the same questions that apply to monitoring and evaluation of credit programs are relevant in modified form to venture capital equity investments.

Loan approvals may be greater than or less than targets depending on the ability to locate applicants with acceptable

managerial skills and appropriate technologies, publicizing of loan availability, perceptions of collateral requirements and loan terms, complexity of the approval process, and cultural attitudes toward debt. It is important to monitor the sizes of approved loans to ensure that most of the funds do in fact flow to small enterprises. Also, if the loan size is not adjusted over time for inflation, enterprises either may face cashflow problems or may be unable to afford the cost of recommended technical packages. Conversely, if the loan size is too large, borrowers may find repayment difficult and loan funds may be diverted to unauthorized uses. Sometimes, loan disbursements fall below targets even when loan approvals have met targets. Possible reasons for this shortfall include paperwork or legal requirements, lack of timeliness in site inspections, failure of applicants to complete the work tied to loan releases, and cashflows within the credit-granting organization.

The length of the grace period and repayment period generally are matched to the planned cash flows of the enterprises, but these may differ substantially from the actual cash flows. Small enterprises are more concerned about their ability to meet repayments out of cashflows and still reach their minimum goals for net income than they are about the interest rate. Loan repayments and taxes are financial costs, but not economic costs.

Some organizations are reluctant to classify a loan as being in default while others write off late repayments more quickly. Consequently, statistics on lateness and defaults across projects must be compared together with the definitions.

Reasons for late repayments or defaults include lower-than-anticipated profitability of the enterprises; unfavorable loan terms; inadequate screening or supervision of applicants; lack of experience with formal credit; limited legal recourse; diversion of funds for unauthorized purposes; or the breakdown of a group credit system. It may be useful to determine whether enterprises that are late or in default in making payments have common characteristics in terms of size, prior socio-economic status, geographic location, or type of technology adopted.

The incidence of repeat loans is not necessarily an indicator of project success since that depends on whether the credit program was originally structured with short-term or long-term loans and whether enterprises are drawing down assets needed for their long-term viability in order to repay their loans.

### **Inputs**

If additional land is required for a project, the change in the land area used should be recorded, keeping the irrigated and nonirrigated hectarage separate. Even if there is no change in the amount of land used, this land has an opportunity cost because it could have been devoted to some other use.

In most developing countries, labor is costly even where it is abundant. While some unemployment may exist among unskilled workers, the demand for semiskilled and skilled labor usually exceeds the supply. Usually, some opportunity cost is incurred in tapping this labor because underemployment is more prevalent than unemployment among the unskilled. In many rural areas, there is little unemployment during peak periods for

agricultural work, but seasonal variations in work opportunities may be large. Thus, the seasonality of the project's labor demand should be noted. Even though household labor or volunteer village labor might not be paid a direct wage, it still has an opportunity cost because this labor could have been hired out or devoted to other productive activities. If part of the wage is paid in-kind (for example through food), the value of the in-kind benefits should be added to the cash wage rate.

The composition of the labor also matters. Where women's work or children's work is seen to be less prestigious or rewarding, technologies that increase the productivity of these occupations may have desirable social benefits. When school-age children in less developed countries no longer attend school or are away from school, they usually are involved in productive work activities.

Data generally are available on the unit prices and the quantity of raw materials and marketed natural resources required per unit of output. However, use records rarely are kept for unpriced natural resources such as water even where it is scarce. Tracking the availability and timeliness of raw materials and natural resources supply is an important task of monitoring. It indicates whether the 1) substitution of other types or sources of raw materials and natural resources will be necessary, 2) schedule for purchases of complementary inputs or provision of services should be changed, 3) inventories of inputs are too large, or 4) potentially-available materials and natural resources are sufficient to support an expansion of current production.

All **costs** (cash outflows) and **benefits** (cash inflows) should

be charged to the years in which they are incurred and properly discounted to reflect the time value of money. By a common accounting convention, all benefits and costs incurred during a year accrue at the end of that year. Several discount rates should be used to test the sensitivity of the results to this parameter. All nominal costs and benefits are converted to real (constant value) monetary units. Except in countries with hyperinflation, it is sufficient to make this adjustment on an annual basis. To facilitate comparisons across similar projects in different countries, values may be converted to U.S. dollars at the prevailing exchange rates at the time that they accrue.

The principal cost categories for both financial and economic analyses are capital (structures and buildings; and purchase, delivery, and installation of machinery and equipment); land; labor (unskilled versus semiskilled and skilled); consulting services; raw materials and natural resources; other operating, maintenance, and replacement; and marketing, transportation and distribution.

**Working capital** is the money that businesses need to have on hand in advance of making expenditures in order to avoid cashflow problems. Working capital is not counted as a cost until the money is spent because it would be double-counting to include it together with the operating costs for which it is used. However, interest costs for borrowing working capital are a financial cost, although not an economic cost. Depreciation and net inventory changes are excluded because they are accounting concepts rather than actual financial or economic costs. However,

depreciation may affect taxes paid. It may be desirable to shadow price foreign exchange or labor costs following the practices of planning agencies in the country.

### Outputs

Each output may have a different time cycle for production. Home consumption of output is included in production data; however, physical losses in processing, storage, and transport should be deducted. Losses due to theft are subtracted from production in a financial analysis, but not in an economic analysis.

Common reasons for differences between actual production and expected output include the availability and quality of spare parts, raw materials, natural resources, or labor for production and repair; external conditions such as weather, natural disasters, or pests and diseases; theft; technical or managerial considerations; or infrastructure. If market demand is low, it may be financially and economically desirable to reduce production. Seasonal variations in supply and demand should be noted.

The quality of the output may be compared to the planned quality and the quality of the most likely substitutes for the product. The major attributes of quality include appearance, taste, nutrition, storability before use, convenience, strength, power, useful life, health and safety impacts, suitability for further processing, and conformance to industrial standards or government regulations.

## **Markets**

When projects produce outputs that already were on the market before the project, market prices may fall as a result of the expansion in the quantity produced. The new prices should be used in the financial and economic analyses.

In many cases, good data on consumption rates are unavailable. Written records of sales rarely are kept in rural areas and if they are kept, may not be accurate due to the dispersed nature of small transactions, barter, and efforts to circumvent taxation or government regulation. The output may be new products not previously on the market in an area.

Consumer acceptance of a product can be difficult to predict in advance, particularly when the product is new or differs in quality from what previously was available. If incomes are rising due to general economic development, the financial viability and economic desirability of an enterprise can be dramatically boosted over time due to increases in the per capita demand for the outputs. Thus, consumer acceptance and the factors affecting it deserve careful attention in monitoring and ongoing evaluation. Promotion and marketing costs often are high at first for new products, but may decline over time as consumers become familiar with the new items.

## **Commercial and Economic Viability**

**Gross benefits** include income from sales, other income; and salvage value. **Salvage value** is calculated as the estimated market value of the assets of the enterprise at the end of the period of analysis or, alternatively, as the present value of

additional net benefits that could be obtained after the expected project life without any additional capital investment or replacement expenditures. Working capital left over at the end of the period of analysis also may be included as a salvage value. Subsidies and loan receipts are counted as gross revenues in a financial analysis, but not in an economic analysis.

**Net benefits** are the difference between gross benefits and costs. Net benefits can be retained for use by the enterprise; distributed as dividends, capital gains, and taxes; or invested in other productive activities. An economic analysis is indifferent to how the net revenues are split across these three categories because before-tax profits are the measure of economic gains to society. However, in a financial analysis, taxes are deducted because they reduce the surplus available to the enterprise. The costs and benefits of each productive activity and enterprise aggregated to evaluate the project as a whole.

In an economic analysis, import and export prices are converted into border prices. Thus, imports are valued at cost, insurance, and freight (c.i.f) at the port of entry including unloading charges. The c.i.f. cost excludes subsequent delivery charges to the point of use, domestic tariffs, and other taxes or fees. Exports are valued free on board (f.o.b.)--the price at the border loaded for shipment abroad. The distribution of the output (local, nonlocal, domestic, or export) matters because meeting unfilled gaps in local demand is an explicit goal of many appropriate technology projects. Conversely, exports that bring in scarce foreign exchange sometimes are attributed a higher value due to shadow pricing.

The net benefits to producers and sellers are affected by who bears the costs of transportation and distribution or promotion and marketing although the social benefit-cost analysis would remain unchanged. It is important to consider the extent to which middlemen capture the value-added of small producers through harvesting, processing, or marketing contracts, arrangements involving forward selling, mortgaging of output, or overly selective buying.

### **Impacts, Linkages, and Displacement**

The principal impacts considered in monitoring and evaluation are increases in net incomes (cash and in-kind) and employment resulting directly from the project's productive activities. There also may be other direct social and environmental impacts. Social impacts may follow improvements in education, nutrition, community participation and cohesiveness, self-reliance, and security.

**Linkages** refer to secondary changes in net incomes or employment that are indirect outcomes of the project. **Backward linkages** pertain to industries supplying inputs for the project. **Forward linkages** refer to industries that process or sell outputs of the project.

In an economic analysis from the viewpoint of the nation, the relevant measure of net efficiency benefits is the change in Gross Domestic Product (GDP). GDP is the value of final goods and services generated within the country's borders. GDP's geographic scope differs from Gross National Product (GNP) because the latter is based on ownership of factors of

production. Employment within a less developed country is more related to the GDP than the GNP. Neither the GDP nor the GNP counts the total value of intermediate goods and services (backward linkages) in addition to that of final goods and services because this would be double counting. For example, the value of cooking oil already includes the sale price of the oilseeds used to produce it. If the oil is then used to fry tortillas that are sold in markets, (a forward linkage), then the value of the tortillas includes the sale price of the cooking oil that is consumed. However, if households prepare the tortillas themselves, then the cooking oil and the flour used are both final goods. Another way of counting the total value of final goods and services is to sum the value-added at each intermediate stage of production.

Forward linkages also are omitted unless it can be shown that the same value would not have occurred anyway in the absence of the project, either using different sources of similar inputs to produce the same output or different inputs to produce other outputs. It generally is difficult to justify inclusion of forward linkages on economic efficiency grounds.

Secondary benefits from backward and forward linkages can be counted as economic efficiency benefits only under special circumstances: when there is excess capacity in existing production units, or labor or other resources are tapped which would have been unemployed and had no opportunity cost. Otherwise expanding output in one area means withdrawing resources from other uses. However, these special circumstances usually are

handled by shadow pricing on the cost-side rather than by augmenting benefits.

Some technologies reduce production costs. In those cases, a financial analysis would focus on how the reduction in costs affects the profits of the enterprise. In contrast, an economic analysis examines changes in final demand which are measured in terms of consumer prices. Due to the effects of mark-up in distribution, the change in consumer prices may exceed the reduction in production costs. An increase in consumer prices which is below the inflation rate amounts to a decrease in real prices.

Even though backward and forward linkages are not counted in determining the size of the economic pie, they are relevant in estimating the distributional impacts--how the pie is sliced. If markets are competitive, a production process that uses inputs produced by small farmers or cottage industries is likely to have favorable impacts on the distribution of income. The same is true when the outputs of a production process are marketed by small-scale sellers or undergo further processing by cottage industries before sale. It is best to separate these income distribution benefits from economic efficiency benefits. Multiplier effects from respending of an initial injection of money should not be counted as project benefits because they would be generated by any investment of comparable size. Income and employment changes directly resulting from a project should be estimated separately for unskilled, semiskilled and skilled workers, and entrepreneurs. Income quartiles are a convenient measure of relative incomes. If income quartile data

are not available, income ranges may be based on fractions of GDP per capita. Yet, the average income in the project area may differ substantially from the national average. Since the mean may be skewed by a few exceptionally high incomes, the median better represents typical income levels.

Employment is mainly important because of the income that it brings in, but employment also may increase perceptions of self-worth. Since productive activities differ in their degree of labor-intensiveness and skill levels of jobs, employment impacts are not necessarily directly proportional to the income generated by a project. Often, the employment associated with a development project is proclaimed as a benefit while the amount of labor displaced is erroneously ignored. It also is important to monitor what happens to displaced workers because these groups may react in ways that jeopardize project success (e.g., arson, vandalism, or theft).

Increases in land values sometimes are incorrectly attributed as an economic benefit of a project. In theory, the price of land reflects the present value of net benefits from the highest-valued use of the land. If the increased output resulting from a project is valued along with changes in land double-counting is occurring. Where markets for land are absent or land prices poorly reflect productivity, the opportunity cost of additional land required for a project may be calculated directly as the product of per hectare yields and output prices. In some cases, land prices may exceed the opportunity cost due to speculation, the desire to hedge against inflation, or

the status value of land holdings. In those those cases, although land prices should be used in a financial analysis, the opportunity cost should be used in an economic analysis.

### **Policy Issues and Replication**

Government policies and the relationships among government agencies, parastatals, transnational corporations, national businesses, and local businesses can have major positive or negative effects on the operation of a project. Yet, sometimes it is hard to decide how well the project would have operated if policies and institutions had been different. These policies and institutions can affect the quantity or quality of inputs and outputs, costs and location of production, and output prices. Key areas to look into include subsidies and taxes; foreign trade restrictions (tariffs on inputs, foreign exchange quotas, imbalanced exchange rates that distort import and export prices, and export levies or bans); licensing and permitting requirements (fees, paperwork, delays, and restrictions on operation); minimum wage laws and labor rules; price controls on other inputs; location and pricing of infrastructure (water resources, energy, and transportation); availability and cost of external credit and information services (when not a part of the project); and price controls or quality codes and standards for outputs. Policy issues also have a large bearing on the transferability of monitoring and evaluation findings to other areas.

**Replication potential** refers to the maximum realistic number of commercially-viable enterprises that could be set up in a particular place over a certain time period. In order to be most

useful to readers, an **evaluation** should assess the potential for local; nonlocal, domestic; and foreign replications. The relevant time frame varies with the nature of the technology, institutional capacity, and availability of resources for carrying out similar projects. Usually, a set of time frames such as less than 5 years, 5-10 years and 10-20 years will suffice. Some judgments also can be made about the 1) likely scale of the replicated units, 2) expected control over operation (households; small private enterprises; large private companies, village associations of small enterprises; cooperatives, or common service organizations; parastatals; or foreign companies); and 3) expected sources of financing (self-help and family savings, domestic commercial bank credit, bonds, stocks, government credit and foreign credit).

## Summary

An information framework for monitoring and evaluation 1) makes data collection more systematic and matched to the analysis; 2) facilitates uniformity in comparisons across projects; 3) emphasizes quantitative indicators that can support rigorous scrutiny; 4) includes important qualitative factors; 5) assists in coordination of activities of the evaluation staff, field operations staff, and cooperating organizations; and 6) helps in testing hypotheses about appropriate technology.

Following the guidelines of this paper, the authors have prepared a Manual for the Monitoring and Evaluation of Appropriate Technology Projects. This manual consists of three parts. The first part contains the information framework forms which list the questions that need to be asked and some likely response choices. The second part is an explanatory text that elaborates on the forms. The third part is an example of the forms filled out for a hypothetical project. Copies of this manual are available at cost from Appropriate Technology International.