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Renewable Energy Technology Project

THE ECONOMICS OF
IMPROVED ENERGY TECHNOLOGY IN LESOTHO

Notes for a Seminar in Economic Evaluation

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WHAT IS THE PURPOSE OF ECONOMIC ANALYSIS?

- To support decisions which require the expenditure of resources (costs) in pursuit of benefits.

WHAT KIND OF COSTS ARE IMPLIED?

- Cash expenditures to purchase: land, labor, and material goods such as food, fuel, tools, machinery, services, etc.
- Non-cash commitments such as labor, land, water, pollution, noise, ugliness and inconvenience. Also, dependency on unreliable or undesirable outside suppliers of goods and services.

WHAT KIND OF BENEFITS ARE IMPLIED?

- Cash returns from sale of goods and services, or from the value of increased production in a marketplace, or the value of goods and labor conserved.
- Non-cash benefits such as improved health, nutrition, education, safety, comfort, leisure, recreation, job satisfaction, and economic independence.

IS IT POSSIBLE TO ASCRIBE A VALUE TO NON-CASH COSTS AND BENEFITS?

- Yes, but:
 - There are no universal standard methods of doing so.
 - Estimates of value may differ among "experts."
 - There is a danger of distorting value estimate to reach a predetermined conclusion.

DOES THIS MEAN THAT WE SHOULD NOT ATTEMPT TO UNDERSTAND AND ESTIMATE THE VALUE OF ALL COSTS AND BENEFITS?

- No!
- It is often possible to estimate an equivalent value when there is a market. For example, when labor is conserved, there is in principle, a potential cash value.
- It is also possible to put a monetary value on all factors that contribute to current and future labor productivity such as health, education, safety and comfort.

DOES ECONOMIC VALUE HAVE THE SAME MEANING TO ALL DECISION MAKERS?

- No!
- It depends on
 - The role of the decision maker in the economic system.
 - The social and cultural values that prevail.

HOW CAN WE ESTIMATE AND DEFEND ESTIMATES OF VALUE WHEN THERE IS NO OBVIOUS CASH TRANSACTION?

- By understanding the economic culture.
- By knowing what people or institutions would be willing to spend to achieve a benefit, or to avoid a cost. [Examples: a benefit such as public recreation, a cost such as water pollution.]
- By applying the economic theory of "real value" which estimates the "shadow price" of goods and services where applicable.
- By obtaining the agreement of the decision maker that the basis for estimating values is meaningful to him---he will believe them and decide accordingly.

IN EVALUATING ECONOMIC DEVELOPMENT PROJECTS SUCH AS IMPROVED ENERGY TECHNOLOGIES, WHO ARE THE DECISION MAKERS?

- The customer or end user: person, institution, or business who makes a decision to purchase a device at a specified cost.
- The enterprise or producer and purveyor of the device who makes a decision to make a capital investment so that the device can be produced, marketed, installed

and serviced, at a price. The enterprise may be a private business investor, a publicly owned corporation, a non-profit foundation or a government agency.

- The financier or the donor who makes a decision to lend or grant funds to capitalize the enterprise, and to keep it functioning. Financers may include:
 - private profit-making banks which lend at market rates
 - national and international lending agencies, such as credit union, which provide extended loans at less than market rates (example, BEDCO)
 - national and international donor agencies which provide grants and outright subsidies for capitalization and operation.

WHAT ARE THE DECISION CRITERIA OF EACH DECISION MAKER?

- The customer wants to obtain value for any purchase he/she makes.
- The enterprise wants to meet its production and sales targets while achieving a desired level of profit.
[For a private enterprise the profit must be positive. For a public enterprise the profit may be negative, provided that the government or other donor is committed to a policy of subsidy to cover the negative profit (loss).]

- The financier wants to assure a target return on the investment.
- The private bank merely wants evidence that the enterprise will pay back the loan, with interest, on time.
- The non-profit agencies, such as development bank, and donor organization, want evidence that the enterprise will increase national productivity and/or that the investment will produce good economic and social effects.

WHAT SHOULD BE THE DECISION CRITERIA OF RET?

- The product should be marketable to the end user at a reasonable specific price.
- An enterprise should be capable of producing, selling, delivering, and servicing the product at prices which will sell.
- A donor agency should be willing to capitalize the enterprise, and to cover any negative profits.

HOW CAN WE QUANTIFY THE DECISION FACTORS FOR EACH DECISION
MAKER?

- See Table 1.
- Engineering and business analysis can quantify some of the factors.
- See the following discussion.

TABLE 1. DECISION FACTORS IN PROJECT ECONOMIC ANALYSIS

| <u>DECISION MAKER</u> | <u>COSTS</u> | <u>BENEFITS</u> | <u>CRITERIA</u> |
|---|---|--|--|
| Customer | <ul style="list-style-type: none"> ● Cash outlay ● Interest ● Maintenance & repair ● Own labor ● Own materials | <ul style="list-style-type: none"> ● Reduced fuel cost ● Reduced labor ● Increased cash earnings ● Increased production ● Improved health ● Improved safety ● Improved comfort ● Improved leisure ● Self esteem | <p>IS THE PRODUCT WORTH THE COST?</p> |
| Enterprise | <ul style="list-style-type: none"> ● Capital costs ● Production costs ● Marketing & selling ● Delivering & servicing ● Other business expenses | <ul style="list-style-type: none"> ● Profit | <p>IS THE ENTERPRISE FINANCIALLY MANAGEABLE?</p> |
| Financer on behalf of the national economy and welfare | <ul style="list-style-type: none"> ● Imported goods & services ● Labor ● Natural resources - land, water, etc. ● Materials/machinery ● Infrastructure/public service ● Social costs | <ul style="list-style-type: none"> ● Value added to the economy ● Employment ● Income distribution ● Improved quality of life ● Other social benefits | <p>IS THE INVESTMENT AS LOAN OR GRANT GOOD FOR THE COUNTRY IN THE LONG TERM?</p> |

WHAT SHOULD BE QUANTIFIED FOR THE CUSTOMER?

- Cash outlay in the initial year and each subsequent year as appropriate should be displayed.
- Cash outlays should include the effect of any credit to finance the purchase in the initial year, and the interest and loan repayment schedule thereafter.
- Any attribute of value to the customer should be quantified to the extent that it makes sense to the customer.

For example: if labor is saved, one must be sure that:

- (1) the customer believes that the labor is actually saved
- (2) the customer has stated or confirmed the cash equivalent to him of the labor saved.

[Ascription of value to non-cash benefits, and determination of price which will sell requires market research.]

- The cash flow to the customer, using values that he believes in, should be clearly displayed.
- The time to recover the cost of the product should be calculated.
- The cash flow must bear a sensible and manageable relationship to the customer's family budget.

WHAT ELSE SHOULD THE CUSTOMER KNOW?

- All other benefits that the product conveys in descriptive terms that are:

(1) honest and real

(2) meaningful to the customer.

Then, in view of the cash flow implications, and the customer's own judgement of what these benefits are worth to him, he will make a buy or no-buy decision.

WHAT KIND OF MARKET RESEARCH IS REQUIRED?

- Market research is a study of factors relating to a consumer's motivation to buy or not to buy a particular product.
- Most of the RET project work dealing with family and social aspects of Lesotho has already produced a considerable amount of the information needed. However, it needs to be interpreted in the light of each product to be evaluated.
- Additional market research will involve actual demonstrations of products, observing consumer use of the products, obtaining consumer evaluation of the product, and determining the response of others in the village.

WHAT SHOULD BE QUANTIFIED FOR THE ENTERPRISE?

- A conventional business cash flow and balance sheet projected over several years.
- The number of years should at least equal the length of loan pay-back.
- The internal rate of return on the investment should be computed.
- The effect of inflation on all aspects of business operations, including selling price of product should be factored in.
- The source of funds for initial capitalization, and of any subsidies should be shown, accounting for interest payments.
- When subsidies are factored in the net profit should be zero, or positive.

WHAT ARE THE CRITERIA FOR A SUCCESSFUL ENTERPRISE?

- For a privately owned profit-making enterprise the ultimate criterion is profit.
- For any enterprise, private or non-profit, the following are important:
 - ability to produce a high quality product or service
 - ability to promote and meet the demand for the product or service
 - efficient management so that the costs of producing, marketing, and distributing the product or service are minimized
 - a good public image for the enterprise. Consumer confidence in the product and the service
 - well-motivated, properly-trained, and fairly-paid workers.

WHY WOULD AN ENTERPRISE FAIL TO EARN A PROFIT?

- The price of the product may be less than the cost of production, in order to assure that people can afford it.
- The cost of production may be excessive because of management inefficiency, excessive salaries, too many persons on the payroll, waste of energy and materials, and illegal factors such as patronage, payoffs, and pilferage.
- The level of sales may be less than required to achieve a profit.
- The cost of working capital, conventionally through short-term commercial loans, may become excessive.

CAN AN ENTERPRISE THAT DOES NOT EARN A PROFIT BE CONSIDERED SUCCESSFUL?

- Yes!
- In this event the level of social benefit associated with the product must be considered to exceed the level of subsidy.
- In this event, the major reason for non-profit must be the setting of a product price low enough for customers to afford.
- If profits fail for reasons related to poor management, too low a level of sales, and otherwise poor business conditions, the enterprise cannot be considered successful.
- "Free" public services such as sanitation, police protection, and such, and special projects such as the RET project are examples of enterprise which are not expected to earn a profit in the way a private enterprise would.

HOW DOES AN ENTERPRISE RAISE MONEY FOR CAPITALIZATION?

- In the private sector, an investor puts up his own money to begin with. Additional capital may be raised by seeking investment partners. Finally, equity shares may be sold as stocks in the company.
- Starting with the equity capital pooled by all owners, the enterprise typically applies to a commercial bank for a long-term loan.
- For certain enterprises, government policy provides special loan funds at better than commercial terms. BEDCO in Lesotho is an example.
- For non-profit enterprise, the governments and foreign assistance agencies will often provide capital to launch the enterprise.
- A government-owned enterprise would be capitalized by the government. Sometimes, an enterprise is partly government and partly private.

WHY WOULD A GOVERNMENT AGENCY CREATE A GOVERNMENT ENTERPRISE,
OR LEND MONEY TO PRIVATE ENTERPRISE? WHY LEND IT AT LESS
THAN COMMERCIAL RATES?

- To stimulate economic development in sectors considered too risky by commercial banks which are typically conservative.
- To promote new entrepreneurs with little or no previous experience.
- To promote the production of goods and services needed in the national economy.
- To promote employment.
- Because it believes that the added value created by the new enterprise exceeds the costs of subsidized loan terms, and the extra risks involved.

WHY WOULD A GOVERNMENT AGENCY SUBSIDIZE AN ENTERPRISE THAT
DOES NOT YIELD A PROFIT?

- Because it believes that the social value of the enterprise exceeds the level of the subsidy.

HOW CAN WE DETERMINE WHETHER IT IS GOOD POLICY FOR THE GOVERNMENT TO CREATE AN ENTERPRISE, FINANCE A PRIVATE ENTERPRISE, OR SUBSIDIZE ANY ENTERPRISE--PUBLIC OR PRIVATE?

- We can measure all of the real economic costs and benefits of the policy.
- We can identify all of the social benefits and costs which do not readily translate to monetary value.
- See Table 1.

WHAT IS MEANT BY THE TERM "REAL" COSTS AND BENEFITS AND BY SHADOW PRICES?

- These are the monetary values after market prices have been corrected for factors such as taxes, subsidies, price regulations, and other factors that distort the "real" value of a commodity.
- The term "real" value is synonymous with "shadow" price. The term "shadow" infers that the real value is hidden; i.e., it is in the shadows and needs to be uncovered.
- Typically, a major shadow price correction applies to foreign exchange. When a country has an adverse balance of trade, and the foreign exchange rate is fixed by law, the shadow price of foreign exchange is that which would prevail in a free market, often reflected in an illegal currency market. Also,

for policy reasons related to economic self-sufficiency, a government economist may require that the market price of exports and imports be surcharged to make domestic investments appear more favorable.

- Labor also merits a shadow price correction. When there is full employment, the shadow price of labor is very close to the market price. When there is large scale unemployment, the shadow price of labor is very low, far below the market price or rate established by minimum wage laws. This has the effect of reducing the real cost of a project in the calculation.

WHAT ARE THE PROBLEMS OF USING SHADOW PRICES?

- They are mainly understood by economists. Policy makers who are not economists will often not trust or believe them.
- Among economists, methods for estimating shadow prices may differ.
- Accurate measurement of shadow prices requires detailed economic data, and an input-output model of the economy. Such data is often not available.
- In the absence of an experienced economist, a project planner or government policy analyst is prone to serious error.

IGNORING SHADOW PRICES, HOW SHOULD WE ANALYZE THE ECONOMIC IMPACT OF A PUBLIC POLICY DECISION TO SUPPORT AN ENTERPRISE AT THE NATIONAL WELFARE LEVEL?

- Looking at Table 1, the costs measured at the enterprise level will be identical to the national level, unless the government must expend additional funds beyond the enterprise for infrastructure support such as roads and water supplies, with a portion charged to the enterprise.

- Looking again at Table 1, the monetary benefits to compare with the cost is the value added by the project. The following items comprise the value added:
 - the value of increased goods and services in the national economy
 - reduced imports
 - reduced resource consumption such as fuel
 - the value of reduced labor requirements (as when a person spends less time gathering fuel)
 - the value of any capital resources formation:
 - (1) material---such as new production facilities, roads, water supplies, soil conservation; and
 - (2) human---such as improved education, health, and quality of life which all contribute to a more productive manpower pool.

All the above can be quantified in terms of monetary benefits, provided that appropriate data is available. It is usually possible to provide a reasonable and defensible estimate. However, the value of capital resource formation, material or human, may be difficult to measure and defend.

BUT WHAT ABOUT THE OTHER BENEFITS LISTED IN TABLE 1?

- Only the value added, computed with or without shadow price corrections, is commensurate with project costs. The ratio of benefits to costs in strict economic terms is the value added divided by the monetary costs.
- All of the other factors listed: employment created, income distribution effects, quality of life, and other social factors may be extremely important. Sometimes it is these economically exogenous factors which become the major policy determinants.
- Employment created and income distribution can usually be reliably quantified.
- Improved quality of life can often be well-defended in qualitative terms.
- Other social benefits may include improved nutrition, health, family stability, employment near the home, and other factors not quantified in the value added.