RuralInvest

A participatory approach to identifying and preparing small scale rural investments

MODULE 3

DETAILED PROJECT FORMULATION AND ANALYSIS

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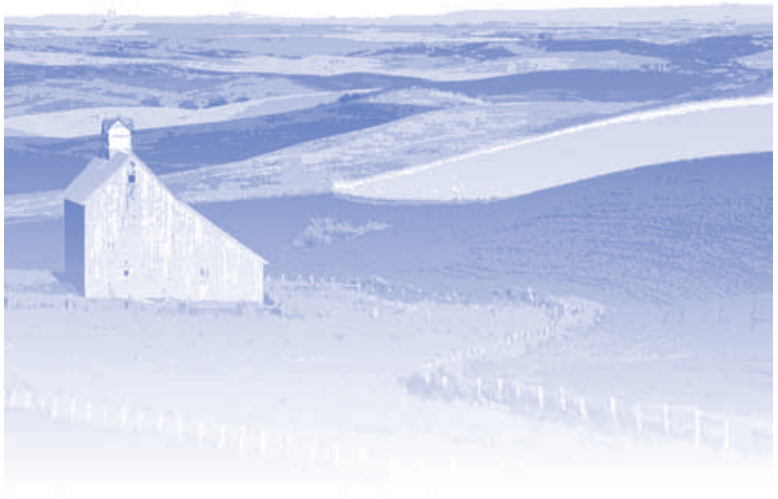

Investment Centre Division
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of the United Nations

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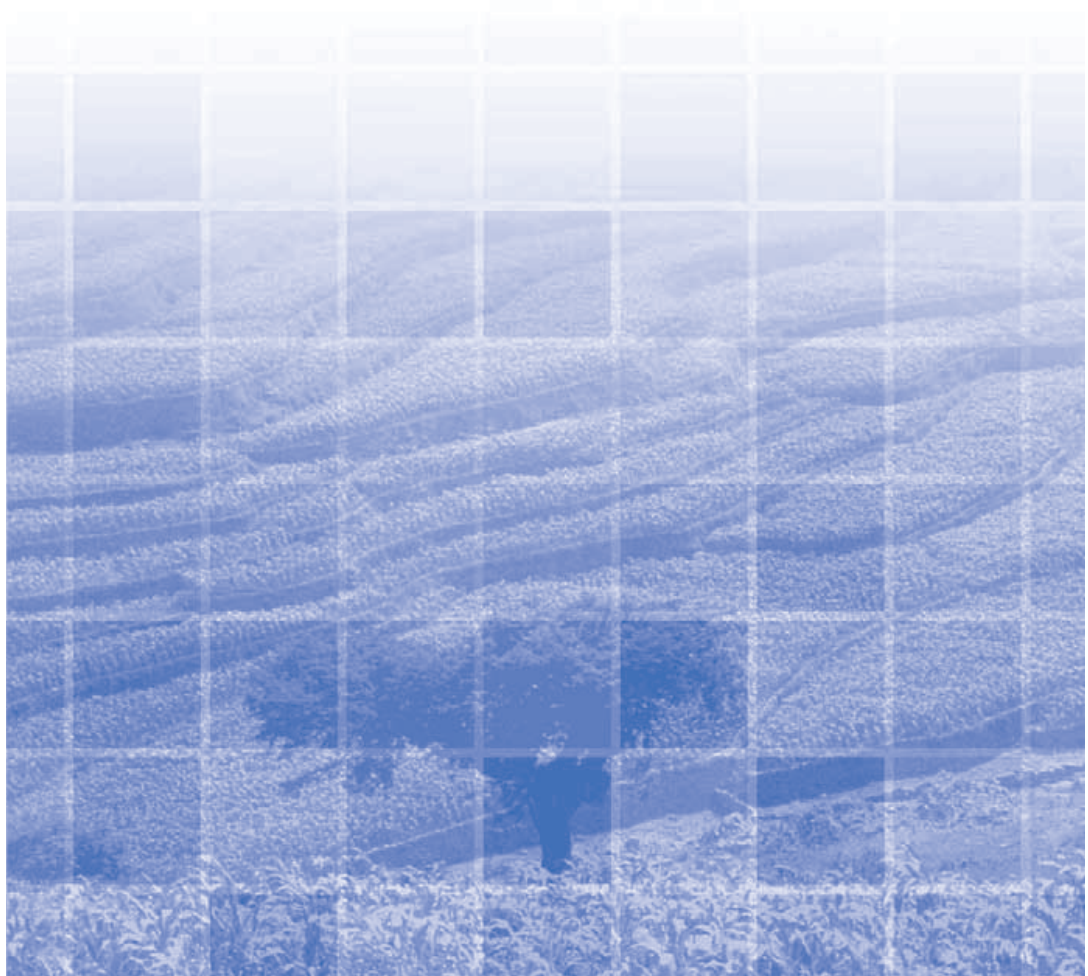
INTRODUCTION TO RURALINVEST



I INTRODUCTION TO RURALINVEST*

The following document forms part of a "toolkit" comprising manuals, training materials and computer software, that together provide a basis for a relatively simple, yet reliable, approach to the identification, formulation, implementation and evaluation of small-scale community or family investment projects in rural areas.

RuralInvest was originally developed by staff of the Investment Centre of the United Nations Food and Agriculture Organization (FAO) in response to requests for a readily usable approach to the identification and preparation of investments much smaller than those traditionally considered in published guidelines [1]

FAO, in cooperation with the multi-agency "Regional Unit for Technical Assistance" (RUTA) in Central America, translated these initial experiences into a general methodology and toolkit, which have now been tested in a number of countries with considerable success. As the number of users has grown, it has been possible to improve and expand the different elements of the RuralInvest toolkit, as well as offer the package in a number of other languages.

A. The Purpose of RuralInvest

In recent decades many governments have begun to encourage local communities to assume a more active role in decisions concerning their own development. Often referred to as Community Driven Development (CDD), this has included such measures as the transfer of financial resources to municipalities, the decentralization of public agencies, and the creation of local investment funds (sometimes known as Demand-Driven Rural Investment Funds or DRIFs). Using these approaches governments and international financial agencies have created new possibilities for people to effectively participate in, and influence, the decisions that contribute to the socio-economic development of their community, municipality or district.

Selection of investments at local level is not without its problems, however. It is not always easy to determine which investments will yield the best results. It may be that a bridge would have greater impact on a community than a new well, or that a dairy processing plant would make a greater contribution than an irrigation system, but how to decide between them? Furthermore, not all investments are sustainable. An investment that initially generates strongly positive results for the community may turn out to be simply too expensive to keep running (e.g. a local hospital), or to result in the destruction of natural resources that cannot readily be replaced (e.g. a sawmill).

Over the course of many years, most developing countries have built up a national capacity to formulate and analyse investment proposals, utilizing a small cadre of internationally trained staff located in those ministries and agencies responsible for economic and social planning. Using international formulation and appraisal procedures, and often supported by specialist consultants from international financing agencies, these highly trained staff have traditionally focused on preparing key multi-million dollar investments. The feasibility study for a new hydroelectric dam, for example, could take years and involve a multi-volume report costing millions of dollars.

However, these staff typically have little experience in the analysis of smaller scale projects, where such in-depth analysis is clearly not justified. Furthermore, even if these experts adapted their procedures to the study of small projects, there would simply be too few experts to support the dozens of decentralized projects, the scores of autonomous municipalities, or the hundreds of community groups that are now seeking to identify and formulate their own projects. What is needed is a different approach; one that that can be used to formulate and approve small-scale projects using only local technicians and resources.

In general, three possible procedures can be used to select and approve projects prepared at local level. These are:

1. Applying standard procedures and exclusions

The first option is for the funding agency to establish standard procedures and exclusions, and accept all projects that meet these criteria. These might include:

- Requiring the signature (or mark) of a majority of the community or group applying

* This document was prepared by Aidan Gulliver, Dino Francescutti and Katia Medeiros of the Investment Centre, FAO, Rome, with contributions from many other FAO and RUTA staff members.

1. "Guidelines for the Design of Agricultural Investment Projects", Technical Paper No. 7, Investment Centre, FAO, Rome, 1992. This is a good example of a methods and procedural manual, designed for the preparation and evaluation of large-scale projects.

- Requiring the approval of the local Mayor or Council
- Excluding certain kinds of investments (for example, no projects that might damage the environment or religious structures will be allowed);
- Excluding projects with investment costs which exceed a per capita limit (that is the cost per beneficiary).

This option offers the communities or applicant groups a high degree of autonomy in choosing their investments, but the absence of any evaluation mechanism creates a high risk of financing projects that are either infeasible or unsustainable.

2. Predefined investment models for each expected type of project

In this second option, a detailed study is carried out for a number of "model investments", each representative of the type of proposal that are expected to be received from participating groups, communities or municipalities. All proposals must then use these models as the basis for their submissions. This method has the advantage of ensuring generally well designed projects (because experts can be called in to design each model), especially for infrastructure projects that can be replicated from one place to another (e.g. a health clinic).

However, predefined projects do not easily allow for changes to the basic designs and thus risk funding investments unsuited to local conditions (e.g. an irrigation system). They also tend to limit the degree of local involvement and ownership, as designs are pulled "off-the-shelf", with little role for the local community. The need to follow standard designs and ensure identical construction also tends to favour the use of professional contractors rather than local labour, limiting local involvement even further. Finally, the use of model investments generally excludes the possibility of innovative projects for which no models exist. They are thus inappropriate when financing a wide variety of rural investments.

3. Local-level project identification, design and analysis

The design and evaluation of projects at local level offers significant advantages, including: (a) the design of projects that arise from, and respond to, local needs, priorities and circumstances; (b) the development of a local capacity not only to formulate and evaluate investment projects, but also to manage their own development process in a wider sense; and (c) the creation of a real commitment to, and ownership of, the proposals on the part of the applicants, as a result of their participation in the formulation process.

However, this approach undoubtedly requires a greater level of effort and cost than the others, both in the initial training of local technicians and in their subsequent work with applicants. In most cases local technicians will also need to be supported by subject-matter specialists (e.g. irrigation engineers, architects etc.) and be adequately supervised, to ensure the quality and correctness of the designs developed. A number of attempts to use this approach in the past have proven to be unsuccessful, largely due to the inability of local staff to effectively master the complex investment formulation tools developed for use in multi-million dollar projects.

To avoid these problems, the project design and evaluation process must be brought within the reach of local technicians and the communities they serve. RuralInvest provides the tools to achieve this objective, using a number of separate but interlinked modules which simplify the tasks of priority setting, project identification, detailed project design and analysis, and finally monitoring and evalaution of the implementation process.

B. The Special Nature of Rural Investments

The key factors to be considered in the identification, formulation and selection of an investment are the same whether it occurs in the rural or urban sector. In fact, it is possible to apply RuralInvest to any type of small or medium investment, rural or urban. However, RuralInvest considers a number of special features that are important only for projects in the rural sector:

a) **The seasonal nature of many rural activities.** Unlike urban investments, many rural projects must take into account the availability of resources (land, labour, capital) in different months of the year and relate them to differing production patterns (e.g. crop and livestock activities). In addition, fixed costs may exist which are spread throughout the year, including during periods when no productive activity is underway.

b) **The heavy dependence on the use of natural resources.** When evaluating possible rural investments, environmental and natural resource sustainability are often critical factors for long-term success.

c) **The dispersion of human and economic activities.** Rural populations tend to be

spread out, limiting access to infrastructure (roads, electricity) and services (schools, health clinics). Equally, input supplies, markets and other productive elements are also dispersed. This means that greater attention needs to be paid to such aspects as availability of inputs and the cost of delivering the finished product to the buyer.

C. Type and Scale of Projects Appropriate for RuralInvest

RuralInvest distinguishes between two broad types of investment projects: those designed to generate income, that is, for profit, and projects whose principal purpose is not profit related.

The category of **income-generating projects** covers a wide range of possible activities: agricultural production, aquaculture, rural shops, irrigation, agroindustry, handicrafts, tourism, transport, the fabrication of simple machinery and spare parts, and marketing services. A project may, in fact, require investment in more than one of these areas, and will frequently involve more than one type of productive activity from the same investment (e.g. production of different crops as a result of investment in irrigation)

The category of **non-income generating projects** also includes a broad range of activities and can be divided into three distinct sub-groups:

- *Production support*: Including access roads and bridges, electrification and communications, as well as primary irrigation infrastructure;
- *Social projects*: Health and education services, provision of drinking water and sewage disposal, and support for community organization;
- *Environmental projects*: Watershed and slope protection, reforestation and soil conservation.

It is important to note that **projects in the non-income generating category may often include a user fee or charge designed to recover some portion of the operating costs**. However, unlike the "for-profit" projects, this income never provides the justification for the project, but merely contributes to its sustainability.

Although the participatory methodology stressed throughout the RuralInvest approach renders it particularly appropriate for use with groups and communities, there is no reason at all why it can not be used by individuals or families. However, such personal applications generally omit the detailed needs identification and priority setting that is central to the first Ruralinvest module, and commence directly with the project profile.

The project profile is the starting point for both income generating and non-income generating projects. Micro-investments (very simple projects with an investment below US$5,000) often may not require further preparation beyond this stage, as financing can be decided on the basis of the 4-page profile.

Conversely, above a level in the region of US$250,000 – depending upon the complexity of the project as much as upon the value of the investment – it may be wiser to supplement, or even replace, the use of RuralInvest with a specialized project formulation team. This is important because RuralInvest is designed largely to be used by general technical staff, while above a certain investment cost it becomes worthwhile to contract specialists in a number of fields.

RuralInvest, therefore, is best used for small and medium scale projects that run from perhaps US$5,000 to somewhere not greatly exceeding US$250,000, always depending greatly on the complexity of the project design.

D. The RuralInvest Modules

As mentioned above, RuralInvest covers a series of phases or modules. The following is a description of the principal elements of each of them.

Module 1 – Participatory Identification of Local Investment Priorities

The first module of RuralInvest is primarily community focused, particularly through its support for the creation of a local development plan from which the specific investment projects will derive. Communities and groups which already have undertaken this type of process, or individual applicants who are generally much clearer on their priorities, may wish to pass directly to Phase Ib where the project profiles are developed.

RuralInvest provides detailed guidelines in this phase to help in the following tasks:

a) Define the current situation of the group or community, taking into account a range of aspects, including physical (the location of the community, availability of land and water, types of soils, slopes, etc.) environmental (forests, fishery, rainfall distribution), and socio-economic and cultural (availability of markets, current earnings of members of the community, migration, group solidarity, etc.);

b) Use this definition of the current situation to reach agreement on key problems and potentials faced by the community or group;

c) Develop a local development plan that defines priorities for action according to the needs of the applicants;

d) Identify one or more possible broad investments that would contribute to carrying out and achieving this plan.

For communities, this first phase almost always requires the support of a community worker or rural technician, trained in the use of RuralInvest and with experience in participatory planning. The technician will support and guide the applicants in using the tools and guidelines provided by RuralInvest. Ideally, she or he will already know the community, through residence or previous work in the area, but in many cases technicians will be assigned to work with the applicants by the supporting agency as the result of a specific request from the community.

Where there has been no prior contact between the technician and the applicants, and a local development plan or its equivalent has never been prepared, the diagnosis and identification phase may require the technician to make a series of visits over a period of as long as three to four months, depending on the degree of organization of the group, the complexity of the constraints and opportunities faced, and the accessibility of the community.

Where the community has previous experience in identifying local requirements and priorities, the process will be much more rapid, and the phase can often be completed after no more than a few visits.

In this first phase there is generally no need for specialized technical staff to participate, as the priorities and resulting development plan should largely be the work of the applicants themselves.

Module 2 – Creating and Using Project Profiles

The core of Module 2 is the preparation of a project profile for each priority investment proposal. These profiles provide enough information about the investment to allow both the applicant(s) and the eventual financing source to see which ideas have potential, and are thus worth the further effort and resources required to develop them in detail.

Most individual applicants will seek to by-pass the earlier community diagnosis and planning activities, which are often of little relevance for those who already have a clear idea of what investment they seek to make. Even whole communities which have previously undertaken some form of community development planning may wish to pass directly to profile preparation, as long as there is already a broad community agreement on development needs and priorities.

Few, if any applicants, however, should be permitted to jump directly to Module 3 of RuralInvest, as the resources required for detailed project development can not easily be justified unless a profile has already been approved. In addition, the profiles also provide considerable information that can be incorporated directly into the Module 3 models, so little work is lost in first preparing them.

Unlike Module 1, the local field technician may need to be supported during profile preparation by a subject-matter specialist. Where the proposed project involves an area for which little local knowledge exists (e.g. solar electricity generation for lighting), a specialist will be required who can provide key parameters concerning cost and performance, so as to avoid extensive work on a proposal that is clearly technically infeasible from the start.

Module 3 – Detailed Formulation and Evaluation

The second phase of RuralInvest consists of preparing a more detailed project proposal, using the Module 2 profile as the starting point. Participants in this phase may include not only the applicants and the local technician (community promoter, extensionist, etc.), but also a regional technician, trained in the use of the computerized RuralInvest models for project formulation and analysis. It is possible that the local technician assumes this function. Generally speaking however, the two roles are sufficiently different that a separation of responsibilities is required.

In the detailed project preparation stage additional external technical input may also be required, depending on the investment value and its complexity. External input may be needed from specialists in such areas as: environmental impact analysis; irrigation engineering; food processing, etc. Generally, however, their input is short, requiring no more than a few days to a week, in line with the value of the investment proposed.

The depth and level of detail required in the process of formulation and evaluation will depend on the complexity and the scope of the project. The regional technician will provide support to the applicants and to the local technician in some or all of the following tasks:

- Determination of demand and benefits;
- Evaluation of the proposal's technical feasibility and scale;

- Assessment of the project's operational sustainability, both in financial and in environmental terms;
- Determination of the detailed costs of the investment and its subsequent operation;
- Selection and specification of an appropriate management and administrative structure;
- Estimation of sources and costs of financing;

The process of formulation and evaluation requires the use of a computer and is not generally carried out in the field. For this reason it is essential that contact be maintained between the responsible technician and the applicant(s) to insure that the proposal truly reflects their needs. Furthermore, it may be that the detailed formulation reveals aspects of the investment that require the applicants to reconsider their plans (for example, competition for labour at key periods of the year, or high maintenance costs).

Depending on the degree of complexity of the project, it is estimated that the detailed evaluation will require between two and four weeks per profile and will call for several visits to the field by the technician working with the computer software.

Module 4 – Monitoring and Evaluation of Projects

Many institutions or internationally-financed projects adopting Ruralinvest support the preparation and financing of scores, or even hundreds, of rural investments. Furthermore, the process of identifying and preparing these investments is often undertaken in a number of local offices spread throughout the area covered. In these circumstances, adequately monitoring and evaluating the proposals received can be a difficult task.

As a result, a fourth module has been developed to provide organizations using RuralInvest with assistance in monitoring and evaluating all investment projects prepared using the system. To meet the monitoring requirements, a search engine capability has been built into the RuralInvest software. The search engine can rapidly identify and provide key data on all projects entered into the computer. In addition, all projects are now 'tagged' in order to track their progress through the project cycle and permit a comparison of initial proposals with later results for evaluation purposes. Each of these functions is described briefly below:

Monitoring Data on Project Characteristics

Using a number of key indicators defined in every detailed project proposal (for example type of investment, location, total investment, employment generation, type of beneficiary) it is possible to use the built-in search engine function in the software to identify all projects stored in that computer which meet selected criteria. These criteria can define the location or status of the project, its type, beneficiary or environmental category or the technician who prepared it. Key financial indicators can also be selected for, such as internal rate of return, net present value, total investment cost or the use of donated resources. For example, by selecting the indicators 'northern field office', 'beneficiary group women' and 'small livestock', a table would be generated that showed all projects meeting these criteria and their key characteristics.

Monitoring Data on Project Performance

Proposals and subsequent projects prepared using RuralInvest can also be labelled according to one of the following stages in the project cycle:

- Proposal
- Approved for financing
- Investment
- Operation

The indicators described above can then be used to classify projects at different stages in the project cycle. Furthermore, by entering new data into projects as they move from one project stage to the next, it is possible to evaluate the projects in comparison with earlier stages. For example, entering data on such elements as actual yields, prices or quantities sold once the project is underway allows returns, employment generation and other measures of project performance to be re-calculated automatically, and hence easily compared with original projections.

E. RuralInvest Users

RuralInvest is potentially useful for any group, organization or individual that wishes to elaborate an investment proposal that adequately takes into consideration all of the key elements in the identification, formulation and evaluation of a project. However, taking full advantage of the different tools offered by RuralInvest requires: (a) training in the RuralInvest methodology and tools, and; (b) access to investment and working capital in order to finance the selected projects. Experience has shown that RuralInvest is thus most applicable in contexts such as:

- An agricultural or rural development fund managed by a regional development project, a Ministry of Agriculture, or even an NGO;

- A Demand-driven Rural Investment Fund (DRIF) or Community Development Fund (CDF), as promoted by the World Bank and other international agencies;
- An environmental and biodiversity protection program or one aimed at the reducing the impact of natural disasters, such as are supported by the Global Environment facility (GEF) and other agencies.
- As a loan analysis and evaluation tool for use by private and parastatal banks with extensive operations in the rural sector.
- In the *ex-post* evaluation by Governments and international agencies of the impact and profitability of rural investments once they have been implemented.

With respect to training, although it is not necessary that the assisting local technicians be experts in financial matters or economic analysis, there are certain minimum requirements for the key positions of local technician and of regional technician:

Local Technician or Community Worker

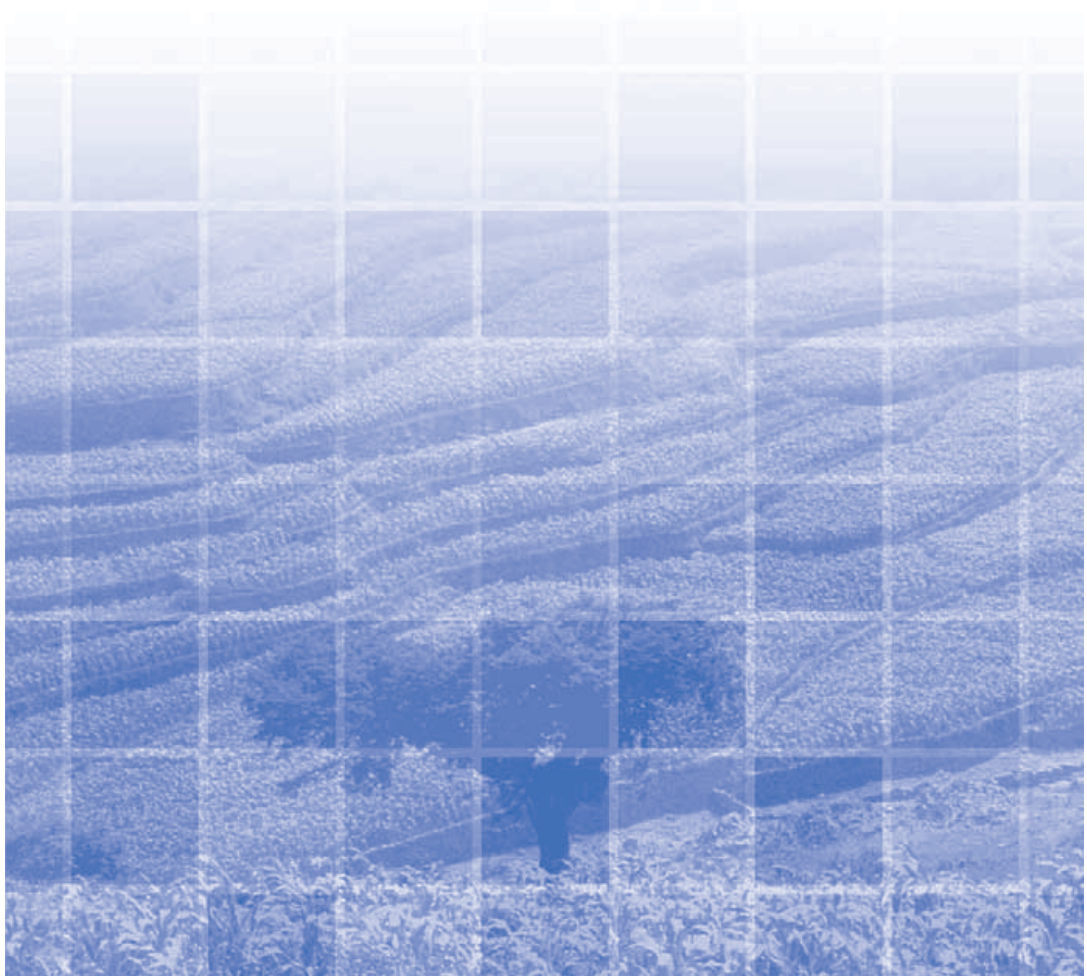
- Experience as organizer or facilitator of rural communities or groups of producers.
- A basic understanding of the concept of a project.
- The ability to communicate with rural individuals or groups.
- Experience in one or more of agricultural production, rural infrastructure and small enterprises.

Regional or Support Technician

- Professional qualification, such as: agronomist, economist, administrator, engineer or other similar profession.
- Basic knowledge of rural production systems.
- Prior experience in the use of computers and MS Windows.
- Familiarity with the basic financial concepts.
- Participation in the first training course for field technicians.

Chapter II

THE DETAILED FORMULATION AND EVALUATION PHASE



II THE DETAILED FORMULATION AND EVALUATION PHASE

This guide provides a detailed description of the methodology and procedures involved in the third phase of RuralInvest; that is, the phase of formulation and evaluation of detailed projects. Two prior modules exist offering similar support for the tasks of diagnosis and identification (Module 1) and the preparation of project profiles (Module 2). Each module is provided with a technical manual and an instructor's guide.

Normally, it is recommended that formulation and evaluation be carried out only after the corresponding Module 1 and 2 field work has been completed. However, Phase I (corresponding to Module I) may not always be necessary, and where the proposal is derived from a single family or individual, or in those cases where it is clear that the proposal represents the wishes and priorities of the applicants, it may be possible commence with Module 2.

The manual also highlights the importance of supporting the process that follows formulation and evaluation. Even once the financial committee of the supporting agency has approved the investment proposal, there remain many challenges to be faced by the applicants before they can initiate the project. It is hoped that these needs will be considered in greater detail in a proposed latter manual, which is to focus on the execution of small rural projects.

A. Main Elements of Formulation and Evaluation

The formulation and evaluation phase comprises seven main elements, described below:

1. **Estimation of demand and benefits**: This task determines the potential benefits that result from the investment. In projects that generate saleable products, the size and nature of market demand is estimated. In the case of non-income generating projects, the beneficiaries must be identified and the impact of the investment on those beneficiaries estimated. In both cases, the exercise helps define the scope of the investment and its characteristics.
2. **Evaluation of the technology**: The proposed technology is reviewed in light of the results of the evaluation of demand and benefits, in order to ensure that it is appropriate. The need for maintenance, repairs and machinery replacement and the possibility of alternate technologies is also considered.
3. **Sustainability and environmental impact**: This task considers the sustainability of the project not only from the perspective of natural resource usage and environmental impact. It is also critical for those projects not generating substantial income streams, where there is a need for operational support once the investment is completed: a school is not sustainable if there is no provision for paying the teacher's salary. For investments with the likelihood of a negative environmental impact, impact mitigation measures, or ways to modify the project design to avoid these impacts, must be identified.
4. **Estimation of costs and income**:
The next step is to define and calculate the costs and income associated with the investment and operation of the project. Although this may be a relatively easy step for simple investments, the introduction of variables such as perennial crops, livestock breeding or other complex activities can create significant complications.
5. **Financing the investment**:
With costs and income calculated, the financing needs can be considered, both for investments and for the working capital needed for daily operations.
6. **Organization and investment management**:
The most profitable project will fail if it lacks an adequate structure for directing and managing operations. The identification of these management needs is an integral element in the formulation and evaluation effort.
7. **Evaluation and preparation of recommendations**:
With all the individual elements of formulation and evaluation gathered, the full project evaluation can be undertaken. However, the results obtained only tell part of the story. It is also necessary to identify the key factors that will influence the eventual success of the investment and to determine the risk that these factors may differ from those foreseen in the project design, affecting the success of the project.
8. **Preparation for the investment**:
Aspects to be considered here are: task scheduling, negotiations with the financing sources, supervision of construction and other activities essential to the execution of the project.

B. Software Scope and Requirements

Given the custom software developed for RuralInvest, it is not necessary for users to be computer experts. However, access to a relatively modern computer and some level of familiarity with the Microsoft Windows operating system are indispensable. The use of a computer with a minimum of Microsoft Windows 95 (or later version) is recommended whenever possible.

Two principal types of operations are permitted by the software, the entry of project profiles (prepared in the field during Phase II) and the formulation of detailed project proposals. Electronic versions of the profiles can be used for management information purposes and can be sorted by key characteristics. They can also pass basic information automatically to the screens used for detailed formulation.

The detailed formulation option within the software permits automatic calculation of many of the steps necessary in the determination of project feasibility. Different screens exist for income generating and non-income generating investments. Once all required screens have been completed the software can generate project summaries or full project descriptions of between 8-25 pages, depending on the scale and complexity of the project. Information can also be passed from a computer in a local office or agency to a central headquarters, where projects prepared by different technicians can be grouped together. It is hoped that there will shortly be supplementary software available to permit the Management Information Systems (MIS) department of a Ministry, bank or large project to output detailed breakdowns of rural investment proposals by location and type of investment.

Finally, by subsequently replacing data used in the project models with real data once projects are in implementation, RuralInvest permits users to see clearly the differences between the project as envisaged when in preparation, and the project as it occurred in the real world. This comparison can be invaluable in helping to identify weaknesses in the project formulation process, and showing where more conservative assumptions or more detailed analysis, are necessary.

The computer software currently used by RuralInvest is largely developed in Microsoft Visual Basic with database functions derived from MS Access, and conforms to the structure used for the MS Windows Explorer package, which is found in all Windows desktops. While Windows is essential to run the RuralInvest package, there is no need for the user to have MS Access on his or her computer, as the package is self-executing (that is to say it carries its own programming code). A User's Manual provides additional support for the software, but the menu-driven structure and on-screen help renders the software easy to use once the underlying concepts have been understood (the key role of the training course).

The software offers two levels of entry, including user and administrator. Those with administrator-level access can modify a number of data entry parameters and output screens to meet the specific conditions of the country or institution supporting RuralInvest. For example, it is possible to define default currencies, administrative levels (e.g. municipalities, districts, provinces, states, etc.), regional or local offices, and project categories. It is also possible to set defaults for the financing aspects related to the investments, such as minimum and maximum duration of loans, the availability of grace periods, interest rates etc.

C. A Brief Warning

RuralInvest cannot work miracles. The quality and value of the final proposal generated as a result of using RuralInvest depends, to a large extent, on the care and thoroughness with which the different stages of analysis have been completed. Poor information entered will result in poor results generated at the end of the process.

In some cases, specialized information is needed to determine such aspects as market characteristics, probable yields or the suitability of the zone for the proposed crop or product. It is therefore recommended that when a proposal deals with a matter involving information that goes beyond the knowledge or capability of the group and its advisor (for example, determining if the flow of a stream is sufficient to support an irrigation system of a determined size), the opinion and support of experts in the particular field should be sought. Organizations and agencies using RuralInvest should make allowance for the cost of such supplemental technical input and it can be vital for project integrity.

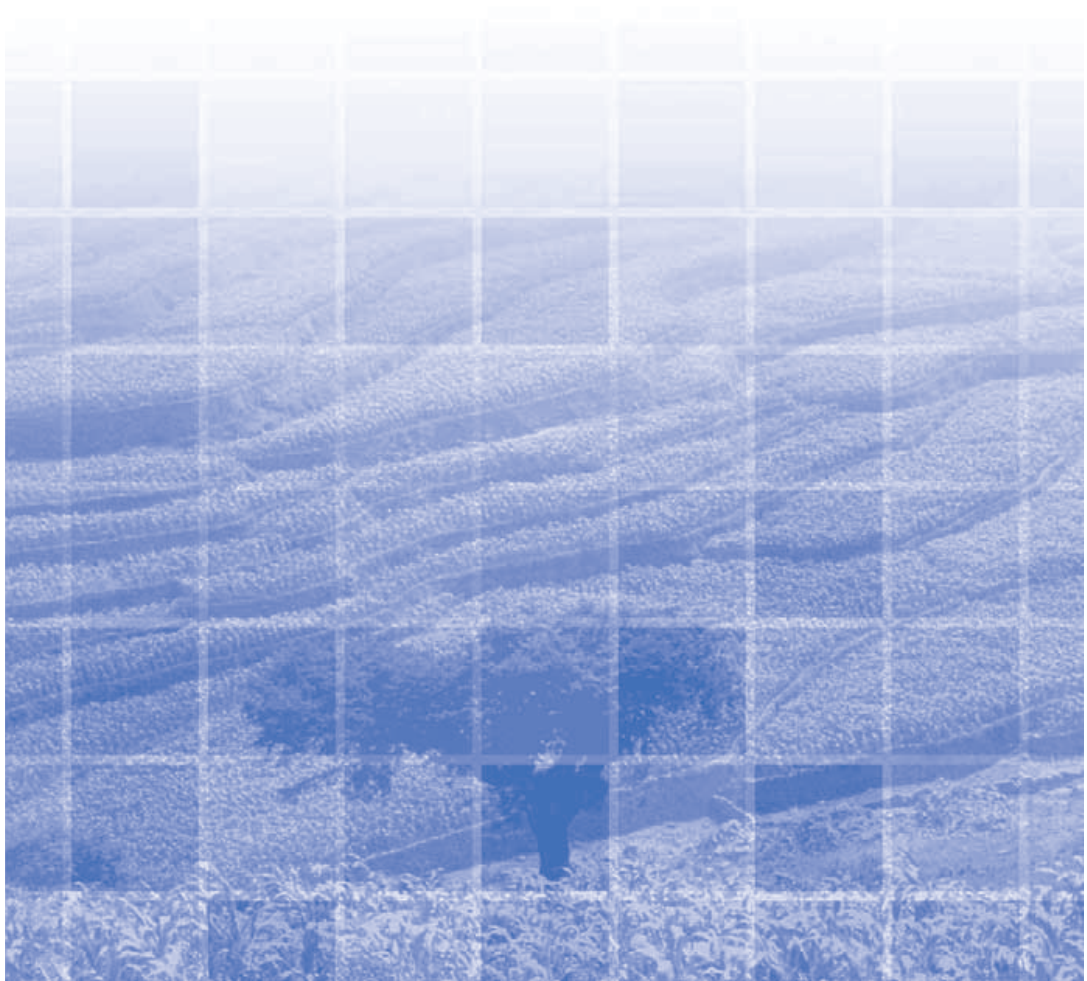
Of even greater importance is the treatment of much more common figures: yields, prices and costs. The computer software used in RuralInvest has only a very limited ability to identify and reject incorrect or over-optimistic numbers. Any proposal can appear attractive if the technician inserts very optimistic numbers into the formulation process and if she/he fails to give the necessary importance to such integral evaluations as marketing, technology, sustainability, management, etc., and treats them as unimportant tasks to be completed as quickly as possible. If the technician states that cheese from the dairy plant will sell for US$2.50/kilo when a realistic price is closer to US$1.25, the result is likely to be an apparently attractive project that

fails once it is put into effect. For this reason it is very important: (a) to not inflate figures to generate positive outcomes, simply because the first numbers used did not give the desired result, and; (b) identify those elements which are most likely to affect the overall feasibility of the project (yields, prices etc.) and use the power of the computer to run the model various times under different assumptions. This will soon show which changes could result in a failure of the project (this is discussed in more detail in Chapter 8 of this manual).

Remember: The recommendations that you present to the financing agency may have a profound impact on the lives of the applicants. If you fail to do your job properly, many lives can be adversely affected.

Chapter III

ESTIMATING DEMAND AND BENEFITS



III ESTIMATING DEMAND AND BENEFITS

The starting point for assessing any project must be the identification of demand and benefits. An understanding of these factors is critical because they determine whether the investment will be of value – either because people want to buy the output, in the case of income generating projects, or because the investment contributes to the quality of their lives, in the case of social, environmental and support projects. In particular, **the level of demand defines the scale of the investment** (and consequently, the volume of production and the operating costs), as well as many other characteristics (e.g. technology, ingredients, seasonality) that will be discussed in more detail later.

The method of estimating demand will vary according to the product or service being offered. The simplest case is that of non-perishable products with widespread demand (such as rice, wheat and maize), but we will also look at determining the demand for perishable, specialized or innovative products, as well as for services. We will also briefly address the costs associated with marketing the good or service produced.

Even projects that do not result in saleable goods or services are still dependent on demand. What is the purpose of constructing a school if there are no children to fill it? Demand may not be expressed in money terms, as it would be for a kilo of cheese, or a shirt, but it definitely must exist. In such cases the challenge is to identify who the users or beneficiaries might be, and what alternatives they have. Sometimes it may even be necessary to estimate the value of the benefits that users receive.

A. Estimating Demand in the Presence of Markets

The market is critical for any investment that is made with the intention of generating income and profits. Where a product or service is to be sold, the amount that people will buy is the measure of demand for that product. No income generating project can sustain itself if it fails to respond to the demands of the market. This means that when producing a product or service and delivering it to the buyer, the project must fulfil the characteristics that the buyers are looking for, in terms of volume, price, packaging, quality, and seasonality of supply, among other factors. If this is done, the product or service will be sold and money generated to continue operations and cover the cost of the investment.

The evaluation of demand (existing or potential) for a proposed product or service must therefore be the first step in determining whether an investment is feasible or not.

The evaluation of demand not only determines the general feasibility of the investment and often the scale of output, it may also have an important impact on the characteristics of the product to be generated, the technology applied; the inputs that can be used (for example, certain types of agrochemicals); and the scheduling of activities. Consequently, any investment proposal that fails to present an explicit examination of the market is, by definition, inadequate.

The tasks involved in evaluating market demand vary, depending on the type of product or service under consideration. Four main categories of goods and services can be identified, each of which has its own features, and requires a different approach to demand evaluation. These categories are:

a) Basic non-perishable products

b) Basic perishable products

c) Innovative or specialized products

d) Services.

Each of these categories is discussed in more detail below:

1. Basic Non-perishable Products

This is the simplest category of products in terms of evaluation. The key characteristics of basic non-perishable products are as follows:

a) They have well established and developed markets with multiple points of sale and purchase. That is to say, it is easy to find both buyers and sellers, and there are standard prices – often publicly available – for the products.

b) They suffer no rapid deterioration in quality after harvest or production, and thus any product not sold today may be sold tomorrow with little or no loss of quality. As a result, storage is relatively easy and prices normally change only slowly from month to month.

c) Price variations within a single market generally reflect widely recognized characteristics of the product (size, colour, variety, quality, etc.) and there is little or no distinction made as to the source of the products. Specific, sometimes legally-

established grades often exist that render it easy to see how quality and other characteristics affect prices: for example, no more than 5% broken grains.

Although the concept of "non-perishable" depends on the length of time being considered, this group can include: grains, roots and legumes; many of the traditional export products (coffee, cocoa, sugar, cotton, etc.); and some manufactured products, where there is little difference from one source to another, such as simple tools and agricultural inputs or construction materials (blocks, roofing tiles, etc.). Live animals may also be counted in this category, as there are generally well developed markets for poultry, pigs and cattle, and they are not perishable, in the sense of losing quality from one day to another.

The factors that characterize this category carry three important implications: (i) the market can absorb as much as a small or medium project is capable of producing, and therefore there is no concern about the scale of the investment from a market point of view; (ii) the price of the product is easy to ascertain and will not be influenced by the activities of the project; and (iii) the specifications of the product are generally well established (for example, the percentage of humidity in grain, or the size of a building block).

The only exception to this last rule is if a project decides **intentionally** to offer a basic product under new specifications (for example a construction block of a new size). However, the product would then no longer fit in this category, but would have to be analysed as an innovative or specialized product (see section below).

Market evaluations for basic non-perishable products are among the simplest to perform. Any concerns about the market would probably focus on price trends over the next few years, as changes in national or even international production, tariff barriers and technologies may result in substantial price shifts in the future. However, forecasts for future prices can frequently be found in publications, bulletins or the data bases of national public institutions or international agencies.

Although the market evaluation is typically very simple, it is still necessary to keep certain key points in mind, especially when dealing with processed foodstuffs;

- The selected price should be justified in the context of medium range tendencies, rather than based on its price during the week in which the market evaluation was carried out.
- Make certain that there is a clear understanding of the characteristics that the market demands of the product; a small difference in size, colour or humidity content can render a product unattractive to potential buyers. Remember: When there is not much difference between products, it doesn't take a very important fault to lead the buyer to choose a different one.
- If retail outlets, supermarkets or other sellers are going to be used to sell the product, don't forget the margin they charge for their service. Jewellery is frequently sold at margins of up to 100% or more and even food products can expect margins of 30 to 50%. Identify your distributors as part of the market evaluation if possible, and negotiate margins ahead of time.

2. Basic Perishable Products

Although basic perishable products also face well established markets with many buyers and sellers, they differ from the previous category in one key aspect; the product loses quality rapidly over time. And what a difference that makes to demand evaluation! A market evaluation for perishable products faces problems that are very different from those of non-perishable products. Due to the fact that perishable products are delicate and have a short life once harvested or produced, their markets (although typically widespread and active) are often characterized by variable supplies and strong price fluctuations. Such conditions make it very easy to over- estimate the potential income from the sale of these products.

Among the products found in this category are most fresh vegetables and fruits, fresh seafood, cut flowers and some processed and semi-processed foodstuffs such as bakery goods, fresh juice, milk, etc.

Some of the most important factors that are frequently overlooked in the market evaluation of perishable products are:

a) Losses suffered by the product during harvest, packing, transportation, and marketing can be appreciable. In some cases it is possible to end up selling less than 50% of the volume produced, and losses of 25 to 30% are not uncommon.

b) It is also common to find that the price in one week can be double (or half) the price of the previous week. For perishable products it is possible that the price changes in the course of a single day. These fluctuations can result from changes in demand, but are most frequently the product of changes in supply. If the product is delivered to market when supply is tight prices may be very high. By contrast, delivering to market when the product is abundant may yield only very low prices.

c) Unlike grain or roofing tiles, it is often difficult to keep a perishable product from one day to the next; in the extreme cases, a product that is not sold by the end of the day or week may not only loose all of its value, but also cause additional costs for garbage collection.

It is not surprising, then, that fluctuations in supply and price have a strong influence on the success or failure of a project that generates a perishable product. The extreme variability that affects the prices of perishable products demands exceptional care in estimating the average sale price (see the example presented in the box).

We recommend that when evaluating the market for perishable products, the following factors be given serious consideration:

- Relatively small quantities of perishable products can cause large fluctuations in the prices, especially in small markets. Talk to sellers and other market participants to determine the volumes passing through your selected market and the seasonality of supply. If your product would add significantly to these volumes, consider the feasibility of delivery at periods of short supply, or try and supply to more than one market.
- High prices can result from unexpected short-term conditions; check the price history over several years, if possible. Remember; high prices often attract other investors, resulting in more production and lower prices in the future.
- Be realistic about the physical losses that might be encountered. If the product is delicate, a minimum of 20–30% should be assumed, unless experience shows a way to reduce this figure. Sturdy products might suffer loses of 10-15%.
- Perishable products that are produced year round, such as eggs, milk and bread tend to suffer less price instability because supply is fairly constant. Even so, demand may vary, causing losses at the end of a day if there are too few buyers.

Consider the possibility of negotiating fixed contracts with consumers (agroindustries, restaurants, hospitals, etc.), who offer a guaranteed market, even if you have to accept a lower price.

3. Innovative or Specialized Products

In the two previous sections we considered the differences between perishable products and non-perishable products. But in both cases we dealt with standard products where, from the consumer's point of view, there is not much difference between the outputs of farm or plant "X" compared with that of farm or plant "Y". However, when dealing with innovative or specialized products, the situation changes drastically.

Innovative products (by definition) have no existing market price, as they are new, but it may

THE SEDUCTIVE TOMATO

The world is full of failed tomato production projects. Why? Because whenever anyone makes a calculation of its profitability, the tomato shines forth as fabulously profitable. Enormous earnings await those who are willing to invest in establishing just a few hectares of this golden vine.

Look, say the investors, the Ministry of Agriculture assures us that we can easily obtain yields of 6.5 tons of tomatoes per hectare, at a cost of no more than $2,750/ha. Last year, the price of tomatoes in the local market frequently surpassed $1.50/kg. Sometimes it got as high as $2.50! Taking the conservative figure of $1.50 would mean an income of $9,750/ha. or $7,000 profit after costs for every hectare. We can invest $50,000 in an irrigation system, a small building for selection and packing, and the equipment needed for cultivating 5 ha of land. We will make $35,000 in profits in the first year and we will have paid off the loan in less than two years. What an opportunity!!!!

The reality, however, turns out to be a little different. Luckily, there are no serious pest or insect problems in the first year, and the investors manage to harvest 6.25 tons/ha; close to the promised yield. But they lose 8% of the crop in the selection and packing stage, and another 15% in transporting the tomatoes to the closest market. With a supply of 24 tons being harvested in a period of just a few weeks, the local market is flooded with tomatoes. After watching the initial price drop from $1.80 to $0.50/kg. and still having unsold tomatoes at the end of the day, they decide to contract transportation at a cost of $0.40/kg to take the remaining tomatoes to the regional market. There the price is a little better, but they still get no more than $1.20/kg. and they suffer another 10% losses thanks to the poor condition of the road.

In the end, the investors managed to sell an average of only 4 tons/ha at an average price of $0.60/kg (after transport costs). Their total income from each hectare has fallen to $2,400. They are loosing $350 per every hectare planted. What a disaster!!!!

be possible to determine likely prices by looking at the price of competing products, or by looking at the price relationship in markets where the product does exist. An exotic fruit, for example, might be unknown in your market, but be sold at a price slightly more than an apple in the capital city. A word of caution here: If the product is known elsewhere, but not sold in your local market(s), ask yourself - why not? You may have hit upon an unexploited market opportunity, but maybe not. It may be instead that the buyers in your area simply do not have the income to afford such a product, or that it does not fit easily with the food and eating habits of the area.

Specialized products might include products with limited sales (where there are not many competitors because of the small size of the market), or they could be products with quite substantial markets, but where – in contrast to basic products - the buyers see important differences in taste, quality, or durability between the competing products. Specialized products could take the form of a jam, a shirt or even a car.

If you manufacture a car, you cannot simply suppose that you can put the same price on it as on a Toyota, and sell as many as you want. In fact it could be that you don't sell many even at half the price of a Toyota, because, as far as the consumer is concerned, your car and the Toyota are not the same.

This characteristic means that the market evaluation must not only determine the level of demand, the price and the seasonal sensitivity of the product (as in the case of basic products), but also the nature of the product that is in demand. ***The market defines the product.***

A shirt can have long or short sleeves, it can be white, blue or yellow, and it can have four or six buttons. In other words, every shirt is different, and a buyer looking for a formal shirt may not buy a sports shirt.

Products that will likely fall into the category of specialized products include: handicrafts (wooden, cloth or ceramic articles etc.); clothing; many

A TALE OF TWO PACKAGES

The importance of packaging to a processed product can be illustrated by these true stories of ways in which the packaging affected the fortunes of a food product.

The Princess

A group of women in Guatemala were using an abundant local supply of pears to prepare juice, packaging it in small "easy-open" cans, each with enough juice for one person. But the product had to compete with a range of juices from a large national processor already well established in the market. Sales of the local product were poor. Finally, the women decided that their problem arose from not offering a wide enough range of flavours. With the help of an NGO, they brought in fruit from other regions to process and thus increase the range of their products. But their problems only got worse; now they had cans of pear, pineapple and mango juice that would not sell. What to do?

Their real problem was the cost of the packaging. The fancy cans made up 80% of the total production cost, and their initial advantage - access to local fruits at low costs – was completely lost. They simply couldn't compete with the low-cost paper "tetrapaks" used by the large corporation. The solution lay in using a package more suited to the local market. Plastic bags, such as those used for milk and cream, allowed the group to sell larger quantities at reduced prices and thereby meet the demand of lower income buyers in the area.

The Cinderella

A small fruit processing plant in the Caribbean had a problem. It was hand making a guava jelly and selling it in simple glass jars in the local supermarket at $0.99 each. Unfortunately, Kraft Foods also had a guava jelly, and was offering it at the same price. Thanks to its famous trademark, Kraft managed to capture the lion's share of the market, and the local plant couldn't sell enough of the product to cover its costs. What to do?

A closer examination revealed that the fruit used by the processing plant came from a wild guava forest in the middle of the island. The trees had never been sprayed with chemicals or received any fertilizers. Here was an opportunity - but only if the product could be presented in the right way. With the help of a designer, the cheap packaging was replaced with an octagonal glass jar complete with satin ribbon and an elegant label. Instead of "Guava Jelly" the label now read "Sea Island Wild Guava Preserve. Hand-made with 100% organic wild tropical fruit." The newly packaged jelly was sold through a chain of luxury stores in the USA at over $4.00 each, and the plant received enough per jar to cover the additional cost of the packaging and to increase its profit margin. Now its problem became finding enough raw material to fill its demand!

processed foodstuffs (but not all; few consumers may readily distinguish between competing brands of milk); many fruits, vegetables and exotic products; and any innovative product (for example, construction materials, furniture, etc.)

Unless you are lucky enough to find a person with considerable experience in marketing the product in question, it might be necessary to carry out some sort of a market study:

- What is the characteristic of the product that will attract the attention of the consumer? Could it be the price, the quality, the origin, or an element of novelty in its appearance or content? Regardless, every product must offer something for the consumer and the first step in the market evaluation must be to identify that characteristic.
- What kind of person or client will be most likely to buy this product? If it is something out of the ordinary (an exotic fruit or vegetable), perhaps a luxury restaurant would be interested. But in this case it might not be advisable to offer the product in a poor neighbourhood.
- What marketing channel will be used? If the plan is to sell the product through a store, supermarket or other salesperson, you must be sure that they will accept the product and you must determine the profit margin they will charge. If you intend to sell the product directly, in a market or fair, you must identify the most adequate point of sale, based on the target consumer.

Keep in mind:

- In the case of processed products, the packaging is critical. However, even though the market demands attractive packaging, remember that what you are selling is the product, not the package. Therefore, make sure the packaging used is appropriate for the market.
- Generally, processed foodstuffs must comply with legal standards regarding labels (list of ingredients, health permit numbers, etc.). Establish those requisites as part of a market evaluation.

On the previous page two brief stories are presented (see box) that illustrate the importance of appropriate packaging for each product.

4. Services

The evaluation of demand and market characteristics for services raises issues that are quite different from for products. Services are crucially characterized by the transitory nature of their supply. A hotel that only fills 60 of its 100 rooms on one night cannot recuperate its losses on the next night by offering 140 rooms.

Each time a service is offered and there is no buyer, that income is lost forever. The same, however, cannot be said for the costs. Normally, a service company will incur costs whether there are clients or not (although costs may be higher when there is work).

As a result, the critical element in the evaluation of the market for a service consists in establishing the pattern of demand for services over the span of a year (or other period). Although some services (e.g. well digging or transportation) may have a more balanced demand pattern than others (i.e. hotels, agricultural services), it is not sufficient to assume a constant demand for any service, every week or month of the year. In the following example, it can be seen that the demand for the services of a tractor varies greatly according to the agricultural cycle; of an estimated 50 hours per month in January, April, September and October,

Estimate of Annual Use of Tractor Services (Hours / Month)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dic
	Land Prepn. 1st Cycle			Harvest 1st Cycle		Land Prepn. 2nd Cycle				Harvest 2nd Cycle	
Hours/Month											
50	190	190	50	90	90	160	160	50	50	85	85
Rate/Hour											
10	20	20	10	15	15	20	20	10	10	15	15
Income/Month											
500	3800	3800	500	1350	1350	3200	3200	500	500	1275	1275
Annual total (Hours): 1250				Annual total (Income): 21250							

to 190 in February and March, when preparation of the fields is in full swing.

If you anticipate that the demand is going to vary greatly, there are several available options: One is to charge a variable price for the service, to promote the volume in periods of low demand. Hotels, for example, frequently charge reduced rates for rooms during the "off" season compared with "high" season rates. In the example shown, a contractor selling tractor service offers three rates: $10/hour during the slackest period; $15/hour during the harvest; and $20/hr during the soil preparation period, when the demand is strongest. Remember: once the day (or night) has passed, the available service is worth nothing; the opportunity is gone.

5. Marketing Costs

Finally, it is important to bear in mind, as part of the market evaluation, the costs associated with the selling process. As we saw in the tomato example, these costs can have an important impact on an operation.

Among the types of costs to be considered are:

- The cost of packaging the product, including: the container (bag, bottle, jar, box, etc.); the label, and materials for protection during transportation (e.g. cartons for tins, wooden boxes for glass jars);
- Transportation costs from the point of production to the point of sale;
- Costs of distribution and representation (when the product is sold through a distributor or agent);
- The sales margin of the store or other point of sale (when using the final retail price as your base for calculation);

It is useful to remember that some sellers may insist on a policy of "sell or return" or sale on consignment, in which they only pay the producer when the product has actually been sold. This method is very common with handicrafts, such as paintings, jewellery or other works of art. It is also frequently used with new products, when the seller cannot easily calculate the level of demand. It is not a very attractive arrangement for the producer, but it may be the only way to begin the marketing process. Nevertheless, remember: products delivered under this system are not yet sold, and you have to be careful when starting a new round of production, based on these deliveries; they might end up being returned by the store.

B. Estimating Demand in the Absence of a Market

We have seen in the preceding section that the reliable determination of demand levels and prices can be difficult. However, in the absence of markets for the products generated by the investment, the estimation of the demand is even more complex. When a product is sold, you can say that the buyers of that product are its clients or beneficiaries, and the demand corresponds to the number of products sold to them. Of even greater importance is that it may be assumed that the market will give a clear indication of the value of the product, thereby facilitating the estimation of benefits[2]. But if the product is something like the protection of an ecosystem or a campaign for vaccinating children, then who are the beneficiaries? What is the level of demand? What value can be assigned to the products or services generated?

This problem is encountered by everyone who designs and finances investment projects which generate benefits without direct consumer markets, such as roads, health care centres, reforestation, etc. Many documents on the subject have been written, proposing complex methodologies for resolving these questions.

Of course, when we are dealing with US$10,000 or US$100,000 projects we cannot go into the same detail as for a project aimed at rehabilitating the national healthcare system, with a budget that may well exceed US$100 million. But, even when preparing small projects, it is necessary at the minimum, to determine and estimate the level of demand and benefits expected from the investment.

1. Who are the beneficiaries and how many of them are there?

Before considering the level of demand, it is necessary to first determine who the beneficiaries are. In some cases the answer can be clear; the beneficiaries of a healthcare centre are those who go there to seek medical attention. But it is not necessarily that easy. Should we exclude the people that live in the zone but have no need for the services in a given year? Perhaps they are beneficiaries, simply because they enjoy the availability of the facilities, even though they have not had recent occasion to use them.

Experience has shown that when a rural access road is constructed or improved, one of the greatest resulting impacts is an increase in agricultural production. In addition to facilitating the transportation of products to markets outside the zone, a road also allows for delivering input

2 In reality there are many factors that can distort the price paid in the market for the products, such as taxes, quotas, etc.

materials, and for the access of extension personnel to the zone. It may also help children to reach schools and the sick to reach medical care. Thus the beneficiaries are by no means restricted simply to those who drive the trucks and buses on the road; the most important beneficiaries are rather those who live and work nearby.

In some cases, it can be argued that the whole country, and indeed the entire world can be considered as a beneficiary. This is the logic that supports a new type of project, in which rich countries that generate vast quantities of carbon gases (coming from factories and other industrial activities), pay less developed countries to protect and increase their forested areas, where those gases are converted to wood and other organic materials by the trees and other vegetation. In this way the beneficiaries of these projects include people who live in distant continents.

Such great impacts are not to be expected from a small project. However, projects involving infrastructure and conservation of natural resources frequently benefit people living outside the zone. For example, a project for the protection and conservation of mangrove swamps may benefit the shrimp producers (because shrimp larvae live in mangrove swamps), the tourism sector (because mangrove swamps house a plethora of wildlife), and the agricultural producers of the region (because the mangrove swamps act as a buffer zone to protect agricultural zones from storms, erosion etc.).

In order to overcome the problem of direct and indirect beneficiaries, and at the same time, keep the procedures for preparing proposals simple, the RuralInvest methodology requests an estimate of two numbers for projects without direct markets for its products.

First, you should estimate the number of persons that will benefit directly from the project. This includes both employees (e.g. school teachers, nurses in clinics, park rangers, maintenance personnel, etc.), as well as clients and other direct users (patients, school children, vehicle drivers).

Determining this figure for an, as yet, unrealised investment may be difficult. It is often necessary to learn from the experience of others. For example, it may be that you have no idea of the number of patients that might be expected in a new community clinic. However you can find out the prior experience of other clinics of similar size (speaking with staff of Health Ministries or NGOs that deal with these types of activities).

Secondly, you should estimate the number of persons indirectly affected by the investment. In its most simple form, this task consists of calculating the population within a determined distance (e.g. 5 km.) from the site of the investment. This method probably is the most appropriate for clinics, roads, electrification, etc. But remember, there is no logic in saying that the entire population of a Province or Department is an indirect beneficiary of a small healthcare centre in the care of a single nurse. In the case of works such as the protection of a river basin or mountainside, you should attempt to estimate the number of inhabitants that may be affected by the investment, either down river or within the valley, etc.

2. Estimating the Value of the Benefits

Once the population of indirect and direct beneficiaries has been established, the next challenge is to quantify the impact; that is, determine the value of the benefits that will result. It is important to understand that the type and degree of benefit will never be the same for all users. People living near the project site may receive greater benefit than others. By the same token, the example of mangrove swamp protection shows us clearly, that the benefits enjoyed by different types of users - shrimp fishermen, the tourist sector and farmers - can also be very different.

Although there are exceptions, the problems involved in quantifying benefits (e.g. the value of education, or medical treatment that saves the life of a person) are generally far too complex to be attempted in the evaluation of a small project. However, there are cases where it is possible to offer an approximation (see the example in the box presented at the end of this section), especially if there are comparative data from other investments, or some group or agency that has conducted a recent study on the subject.

The difficulties in calculating a precise value for the benefits do not justify forgetting about them. It is very important to provide the financing agency with some description of the nature and magnitude of the expected benefits. In the absence of this analysis, it is highly possible that the agency will choose to finance an alternative proposal in which the applicants give a better explanation of the expected benefits.

3. Other Considerations

Any calculation of benefits assumes that the investment continue to function long enough to generate these benefits. This is where the importance of considering maintenance needs and costs comes in. This subject is discussed in greater detail in Chapters 5.H and 6.A.

It is also important to remember that there may be benefits, simply from the fact that the investment was made, in terms of jobs created in

its construction or preparation. If the investment generated a number of jobs during this period, it is important to indicate this benefit clearly in the proposal document.

SMALL INVESTMENT, LARGE BENEFIT

The north of Ghana, in West Africa, is almost completely separated from the south of the country by the largest artificial lake in the world. Some years ago, the only available route to the South was a single bridge. A ferry service had previously operated, but silting had left the docks far from the water and, in any case, it could carry few vehicles. The approach ramps to the bridge were deteriorating rapidly, and the highway engineer from the zone predicted that unless there was investment in their reconstruction, the bridge would become impassable by the end of the next rainy season.

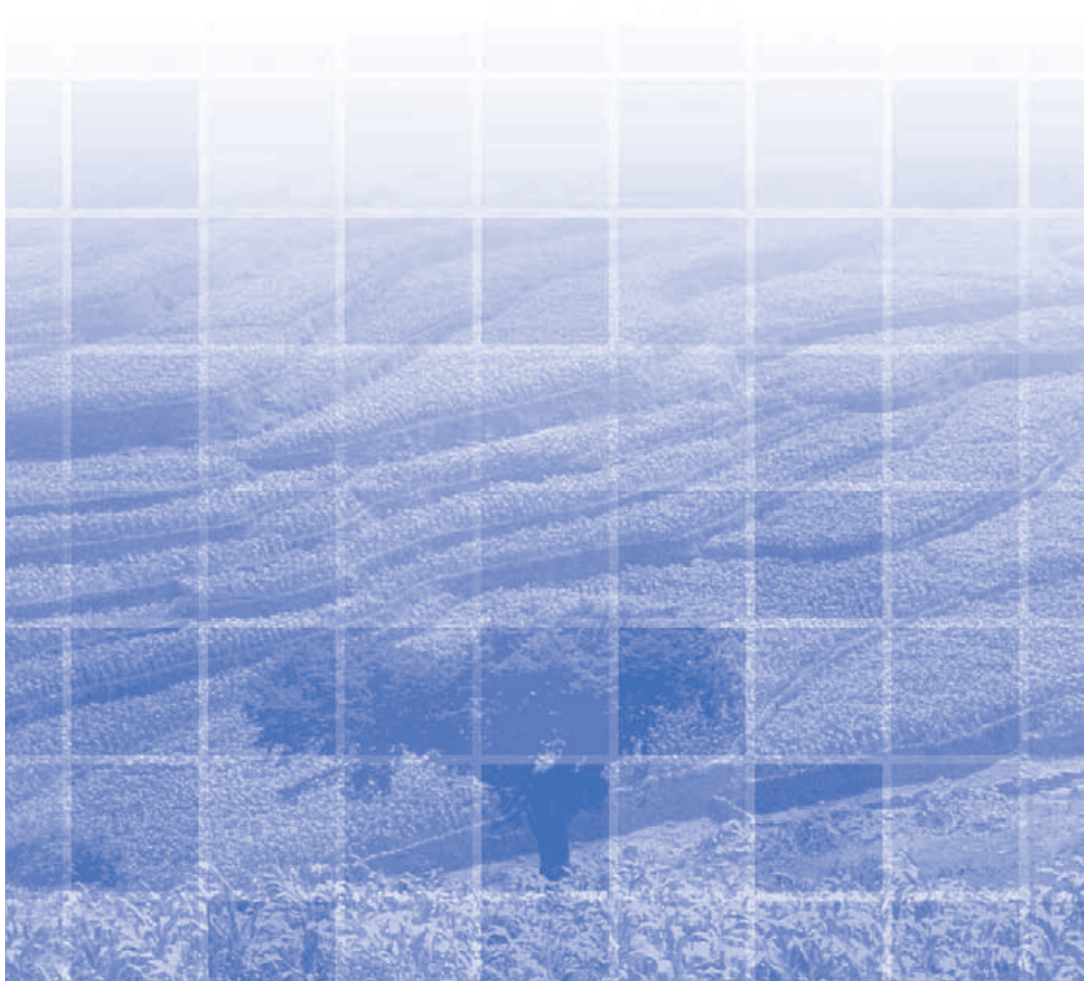
The cost of the investment to rebuild the bridge approaches was quite small, but how to measure the benefits? By counting traffic volumes, and talking with drivers to determine seasonal variation in traffic flows, an estimate could be made of the number of direct users. Given the lack of alternate routes, the number of indirect beneficiaries could be estimated as a major portion of the population of the northern part of the country. But what would be the value of the benefit that they would receive?

If the bridge became unusable, most buses and trucks would have no alternative but to travel up through one of the neighbouring countries and then cross back into Ghana in the extreme north of the country (there was no passable border crossing for much of the northern half of the country). This route would add several hundred kilometres to the distance travelled per vehicle. Without even considering the cost of passing through two sets of customs (on leaving the country and re-entering), and only taking the per kilometre operating cost of vehicles, the total additional transport cost without the bridge, and therefore the value of the benefits, could be calculated. Even if it was assumed that some vehicles could use the ferries, the benefits would only decrease marginally.

Of course a calculation of this type is vulnerable to many errors. It is no more than an approximation. No account has been taken of other losses, such as reduced sales of agricultural products, or increased travel times for passengers. And the reality is that supplies from the South might well be partly substituted by products brought in from neighbouring countries. The key principal, however, is to demonstrate that the benefits, although lacking precision, would without doubt far outweigh the cost of the investment.

Chapter IV

EVALUATION AND SELECTION OF TECHNOLOGY



IV EVALUATION AND SELECTION OF TECHNOLOGY

The idea for an investment project rarely starts with the technology to be applied. Instead the investor normally takes as a starting point the availability of some resource or the identification of a good market opportunity. In the case of non-profit generating investments, the justification of the project almost always lies in the response to a social or community need.

However, once the market evaluation (or the utility of the benefits in the case of social or production support projects) has been adequately completed, it is necessary to consider the technology to be used.

The use of the word "technology" does not normally imply investment in advanced and costly equipment. To the contrary, most of the investments considered in this manual use only simple machinery. In fact, it is not uncommon in the case of agricultural projects, for the investment to be inferior to the need for working capital.

A. Reconfirmation of the Scale of the Project

In preparing the detailed project, the appliants, together with the local technician, must make a series of assumptions about the scale of the investment. A first step, therefore, is to reconfirm and, if necessary, make adjustments in the scale of production proposed in the initial profile. This in turn, normally requires the results of the demand analysis discussed in Chapter 3. The analysis of the market (or the demand for projects without market for their products) should indicate whether the scale originally proposed is realistic, in terms of the demand and the prices.

The amount of resources that are available also may be relevant in establishing the scale of production. Although the applicants are usually conscious of the limits set by the availability of land, they frequently forget to take into consideration the equally important need for water - for example, in irrigation projects.

Another basic resource that is often taken for granted is the availability of labour. Although a project may be intended to benefit the entire community, it is often difficult to find the necessary manpower, especially if the need occurs precisely during harvest time. The migration of men to work in other zones of the country during part of the year may also significantly reduce the availability of manpower in certain months.

What other factors may determine the appropriate scale for the productive activity? The following are worth noting:

- Knowledge of, and experience in the market. The existence of a well established market for the product(s), the variability of prices from one month to the next, and the risks of losses (especially for perishable products) are all factors that should be taken into careful consideration when determining the scale of production.
- Prior knowledge of the technology. If the technology proposed is well known, the participants are experienced in its use, and repair and maintenance services are readily available, a larger scale of production may be justified. On the other hand, if there is considerable uncertainty regarding the production process, or if the supply of raw materials is problematic, a smaller scale of production may be wiser, as long as it is consistent with the objectives of the project.
- The number of persons or families in the group of applicants. Obviously, it makes little sense to propose a project that will generate $1,000 per year, if the project is expected to make a significant contribution to the incomes of 100 families.
- Managerial capacity. Generally speaking, the larger the investment and the more people involved, the more complex the job of directing the work will be. If the applicant(s) have no prior experience in managing investments, it would be unwise to start with a major investment. The lack of management capacity is probably the prime cause of failure in small companies.

When determining the appropriate scale of investment, always bear in mind the possibility of carrying out the investment in phases; that is, starting small, with the intention of expanding in the future if all goes well. However, phasing of production is possible only if the required financial resources are available over a long period of time. If the applicants have only a single opportunity to access financing, then using a phased investment approach will not work.

B. Choosing the Production Technology

Although the scale of the investment is, without a doubt, a primordial consideration in the selection of the technology, other elements must also be considered, even in the simplest of projects.

Among these are:

- What are the market requirements? If the market demands grain with no more than 12% humidity and the project is located in an area of heavy rainfall, it would be imprudent not to consider buying a drier, if the project involves grain production. If there is demand for shirts of a certain range of colours, it might be useful to include a dying plant as part of the investment necessary for a clothing factory. If the market pays a premium for out-of-season fruits and vegetables, it may be worthwhile to consider irrigation technology or greenhouses for a horticultural project.
- What are the legal requisites regarding the environment or sanitation? The law might demand treatment of effluent from the production process (Chapter 5) and many countries require specific measures (e.g. tiling, drainage, stainless steel counters, and insect exclusion) in facilities used for processing foodstuffs.
- Will it be necessary to warehouse raw materials or finished goods? When raw materials are available for only a few months out of the year, it may be profitable to invest in equipment (e.g. freezers) for the conservation of raw material and thereby extend the period of operations. If the prices of a finished good are highly variable, it might prove profitable to store the product (if it can be done) to sell in times of high prices.
- How flexible should the production process be? Up to a point, capital investment (machinery and equipment) can be replaced by hand labour and vice versa (see the following illustration). It is, therefore, important to identify, at the outset, the relationship of the tasks that will be done by hand with the available manpower. Furthermore, due to their investment cost, or operating capacity, some technologies are simply uneconomical below a minimum production level. If there is doubt as to whether that level is achievable, in light of the scale of production desired (see above) it may be necessary to consider other alternatives

All of these factors should be considered as part of the technological evaluation. Frequently, neither the applicants nor those that help them will have the technological capacity to answer all of the questions that arise. At minimum, it is important to speak with several sales people to find out what technologies are available which might be appropriate for the needs of the project.

Better yet, if the financial agency has access to non-reimbursable funds for technical assistance, would be to contract an independent specialist on the subject and work with that person. In this way you will be able to adequately consider the relationship between the market, the available resources and the production method.

C. Experience and Capacity of the Applicants

A frequently forgotten factor in the technological calculation is the relationship between the technology chosen and the experience and capability of the investors. If the technology demands a management level beyond the abilities of the group, it could cause grave problems in the quality of the product, or simply result in the failure of the entire process.

For example, if a group without prior experience in aquaculture plans to develop three hectares of

THE CHOICE OF TECHNOLOGY AND THE INVESTMENT PROCESS

When speaking of the selection of technology, we are generally thinking of the technology that will be used in the operation of the investment (machinery, irrigation, etc.). But the investment process itself is also influenced by the technology selected, above all in the case of non-income generating investments, such as buildings, roads and watershed protection.

In such cases it is important to balance the needs and requirements of the different participants. From the point of view of efficiency, for example, it might be better to contract a specialized company with the latest machinery to build the bridge within a few days. However, to ensure adequate local contribution and ownership, it will often be better to use simpler technology, which although slower, will allow the local inhabitants to contribute their manual labour and develop a pride of ownership in the structure.

The technology may also influence maintenance needs. On the one hand, structures built with high technology might require less maintenance (such as an asphalt road) or work more efficiently (wells with electric or gasoline pumps instead of hand pumps). However, maintenance and repair might be beyond the capabilities of the community, and the sustainability of the project would suffer.

ponds for the intensive production of tilapia, the proposal should be treated with extreme caution. Any form of aquaculture is subject to high risks from diseases and predators that can eliminate an entire population from one day to the next. When dealing with an intensive system, where the concentration may be up to ten times the normal population, the possibility of disaster is very high. In this case there are two broad alternatives:

a) Convince the investors to use a less demanding technology

b) Contract the services of a professional operations manager, with ample experience in intensive production

Even in the case of a simpler technology (for example semi-intensive production), if the participants have no prior experience, access to technical support should be included as part of the investment cost.

In general, it is unacceptable for the project to learn on a trial and error basis during the initial stages of implementation; buyers who receive a product of poor quality, or which does not comply with the demands of the market, simply will not come back again. Technical support can come in the form of training of project staff before start-up, and having technical experts on call to deal with problems that may arise.

No amount or type of training can prepare a person for all of the possible events of real life. If a group of milk producers wants to open its own processing plant, it should not expect that a month long training course can prepare them adequately for the operation. As a minimum they will need frequent visits from an advisor, and would do much better to contract a specialist in milk production, to guide them through the first four or six months of the project.

The following points should be seriously considered when choosing a technology

- Does the proposal call for very advanced, complicated or demanding technology? Unless the persons involved have ample prior experience with such technology, it is recommended that they contract an outside technical manager or select a simpler alternative.
- In which of the operations will there be a need for training (or at least, a strengthening of existing capabilities) for the project's personnel?
- Will it be possible for the project staff to draw on outside technical support during the first months (or years) of the project's activities? Would periodic visits be sufficient, or would the full time presence of an adviser be required for the initial months?
- Will there be a need for quality control equipment? (testing laboratory, humidity or colour analysers, etc.) Who will operate this equipment? Must they be certified or otherwise qualified?

D. Maintenance and Repair

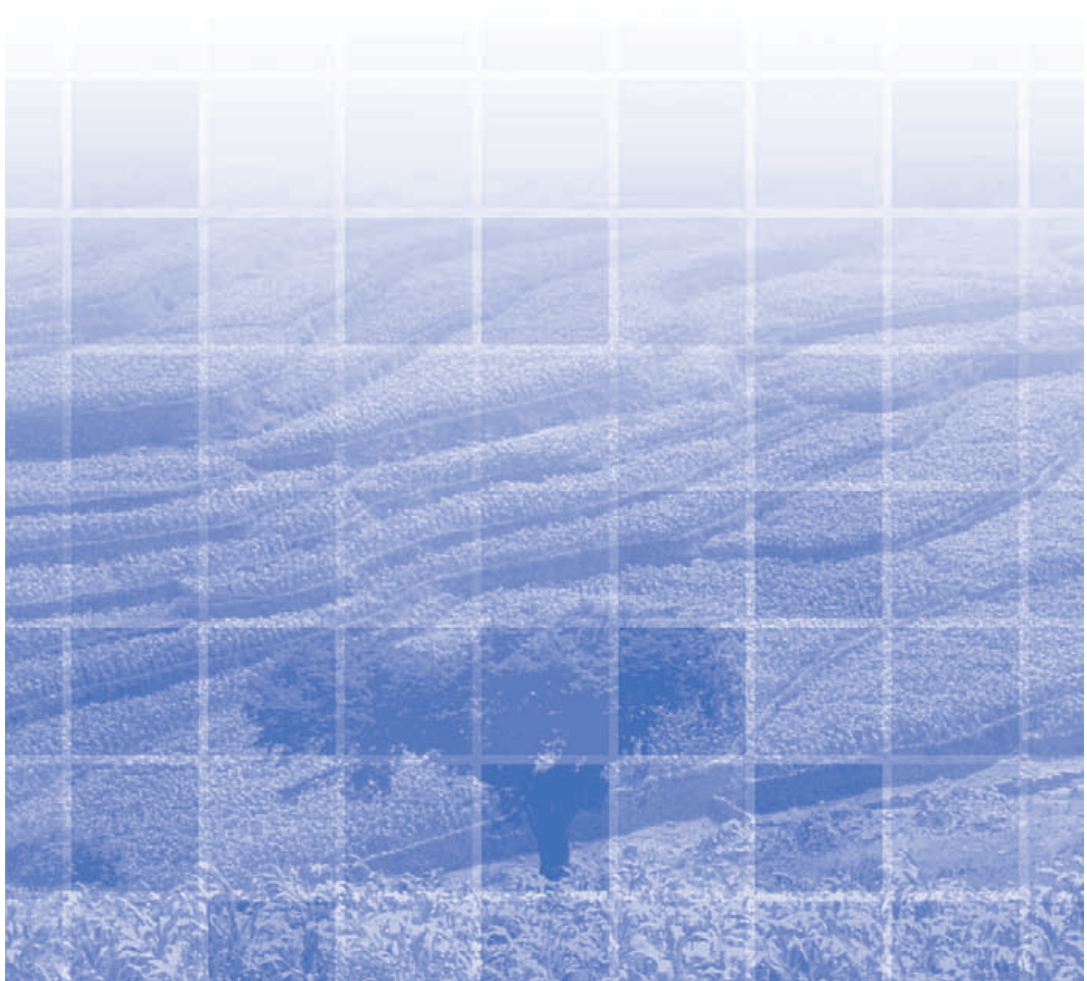
The need to consider the costs of repair and maintenance for the chosen technology is discussed in Chapter 6. Here we will consider the logistical side of the process. That is, when you select a technology you have to make sure that there exists a capacity to repair and maintain that equipment. This consideration applies not only to processing and manufacturing machinery, but also to vehicles and office equipment, especially "delicate" machinery such as copiers.

Among other factors for consideration are:

- Does the equipment come with a guarantee or service contract, under which the manufacturer guarantees to keep it in good condition. If so, for how long does the guarantee or agreement last? Who does the manufacturer use for this work, and how far away are they based?
- Are there other users of the same technology in the project's operating area? Who are they? Are they satisfied with the attention they receive regarding parts and service?
- What are the sources of parts for the machinery? Do these sources carry a broad enough inventory of parts? Or do they have to order them from the USA or from Europe? There is nothing worse than discovering, when a machine breaks down in the middle of the high season, that the vital part will take two weeks to arrive from the country of origin.
- Does the machine need service by an expert, trained in the factory? Can any competent mechanic maintain the equipment? If a formally trained expert is needed, where is the nearest person? How much does he charge per visit?

Chapter V

SUSTAINABILITY AND ENVIRONMENTAL IMPACT



V SUSTAINABILITY AND ENVIRONMENTAL IMPACT

The sustainability of an investment refers to its ability to continue generating benefits into the future. This, in turn depends upon a number of factors including the continued availability of resources used in the project, the management, and the long-term relationship of benefits to costs. Sustainability is probably the most important aspect in project design and evaluation, but is also the factor that typically receives the least attention – in part because it is hard to look into the future and predict whether an investment will be sustainable in the long run. Many are not, and most people have seen the abandoned factories, empty schools and broken-down tractors that all represent unsustainable investments.

People often think that sustainability is the same as profitability, and it is certainly true that **a project conceived to generate income can not be sustainable if that income does not exceed the costs of operating the project**. But profitability alone in no way guarantees sustainability. A poorly managed project will fail regardless of the underlying profitability of the investment, and this aspect of projects is considered in its own right in Chapter 8. A profitable investment will also fail if it depletes or damages the natural resources it depends upon, whether they be trees, water or the organic matter in soils, and a considerable part of this chapter will examine the factors affecting the environmental sustainability of rural investments.

As mentioned earlier, there are in addition many types of investment whose principal purpose is not the generation of income, for example a local school. While the sustainability of projects of this type does not depend on their profitability, other factors may be of importance, including environmental sustainability (particularly a concern for access roads, for example) and operational and maintenance costs. If a project generates little or no income, where is the money to be found to maintain and repair it year after year?

The financial sustainability of income-generating projects is dealt with in much greater detail in the next chapter. In this section we analyse the importance and impact of other factors influencing the sustainability of rural projects, and in particular environmental impact and financing of non-income generating projects.

A. Why Consider Environmental Impact?

For many communities and groups seeking investment funding, conducting an environmental impact evaluation may seem merely to increase the work required, while providing very little benefit. All too often, an environmental study is seen as being required for the sole purpose of satisfying the demands of the city slickers or foreigners who barely know anything about the problems that exist in the project area.

However the reality of the matter is very different. Environmental evaluation is not just an obstacle that the applicants must surpass before funding can be approved; rather, it is a tool that will insure that the resources invested will provide the project with the long term sustainability that is essential. At it is important to remember that not all investments require detailed environmental evaluation. Many social projects, involving education, health care, road repair or the provision of other simple infrastructure will have little if any environmental impact and thus require little time to be spent on evaluation.

What is the relationship between environmental evaluation and the sustainability of the project? Although many factors may influence sustainability, in the rural environment the use of natural resources, such as water, soils and vegetation (e.g. trees) is often at the heart of the investment project.

If, in the life of the investment, natural resources are used in such as way as to result in their damage or destruction, it is clear that within a very few years there will be nothing left to exploit. One very common example is the conversion of slopes or tree-clad hillsides into cornfields or other annual crops. Within a very short time, all of the soil on the slope has slid to the bottom of the valley, and been carried away by streams and rivers, leaving behind barren slopes which yield so little there is no point in continuing to farm them. And such bare slopes threaten not only the incomes, but also the very lives, of those living in the valley below. Without the protection provided by the vegetation that once covered the slopes, hurricanes, monsoons and heavy rain can cause giant mudslides, engulfing whole communities.

Poor environmental practices can cause damage not only to those responsible. If a processing plant (e.g. a slaughterhouse) discharges waste materials into a river, it can cause disease, loss of fish, and a reduced quality of life for the entire population downstream.

Sometimes the damages caused by an investment take time to become apparent. For example, the over-utilization of underground water resources

can result in effects that become apparent only during the lifetime of our children. Nevertheless they are important impacts and eventually our descendents will accuse us of ruining their lives in the name of a short-lived benefit.

The inhabitants of rural areas are more aware than city dwellers of the relationship between people and the natural world we live in. Of course, everyone wants to have sufficient resources to feed his or her family and to satisfy their needs for education and medical treatment. But a poorly designed project can result in a loss of income and reduced production in the future, which will leave the family in worse conditions than it faces today. The future should not be sold out so cheaply!

B. What is Environmental Evaluation?

Traditionally, environmental evaluation consists of a technical analysis of an activity or proposed project. It is generally undertaken to identify and assess possible negative environmental impacts that may result from the project, and to propose appropriate mitigation and monitoring measures.

It is important that the environmental assessment process is initiated early in project preparation so that these measures can be incorporated into project design. It is also increasingly recognized that the assessment cannot be a purely technical exercise, carried out by external specialists. Instead, it must involve project beneficiaries and other affected populations. Finally, recent environmental assessments are often not limited to the biophysical environment, but also cover economic, social and cultural aspects.

Environmental assessment (EA)

The general process of assessing environmental impacts associated with human development activities which may include studies ranging from comprehensive (EIA) to more limited reviews. It normally includes assessing potential negative impacts and elaborating measures to mitigate and monitor them.

Environmental Impact Assessment (EIA)

A tool used to identify and assess the potential impacts of a proposed project or activity, evaluate alternatives, and formulate appropriate mitigation, management and monitoring measures (generally in the form of an environmental management plan).

Environmental monitoring

Activities to measure and evaluate (i) environmental changes caused by a project and (ii) implementation of measures taken to prevent or mitigate these changes. Environmental monitoring is based on collection of data before, during and after the project. It often uses indicators, i.e. quantitative and qualitative variables which can be measured and which, if regularly observed, show changes in the project environment.

Environmental mitigation measure

An activity aimed at avoiding, minimizing, reducing the severity of, or controlling, adverse environmental or social impacts of a proposal through designing alternatives, scheduling, adding protective measures, and other actions.

Environmental screening

The first phase of the assessment process, in which an initial ranking is assigned to a project indicating the anticipated level of impact and the corresponding required EA "treatment".

The types of rural investment projects considered in this manual are of micro, small or medium scale. Many of these projects have little or no impact on the environment; their effect may even be positive (e.g. a decrease in erosion resulting from introduction of agroforestry). They generally do not require a full Environmental Impact Assessment (EIA), which are typically defined by national environmental laws. However, as explained in section A, even small rural investment projects may have environmental risks which need to be assessed and, if necessary, mitigated.

As a result, this manual provides simple procedures for environmental assessment which proposed in this manual provide a readily usable tool for environmental assessment of such projects. They are meant to be applied by local technicians, or other persons responsible for assisting the applicants in the preparation of their investment proposals. The procedures also indicate when the potential impacts of a project are so important that a specialized environmental expert is needed.

Some projects included in this manual - such as those involving infrastructure construction, forest exploitation and agroindustry, as well as those that promote agricultural expansion, even on a small scale - involve potentially significant environmental risks. These project types are, in many countries, covered by the national legislation on EIA. In these cases, the responsible parties should follow not only the recommendations proposed in this document, but also the relevant requirements established in the legislation.

C. Procedures and Stages of Environmental Evaluation

Pre-selection of Project Proposals (screening)

Before entering into details in the identification of potential environmental impacts of the proposed actions, the project should be classified into one of the environmental categories described below.

An initial classification should be done by the local technician, preferably during the preparation of the project profile (RuralInvest Module 2) so that the environmental assessment process can be launched at an early stage of project preparation. The classification should then be double-checked during detailed project formulation and evaluation (Module 3). When in doubt about the right category, the local technician should consult environmentally qualified regional/support technicians.

Category A

Projects in which no or negligible adverse impacts on the environment are foreseen and hence no mitigation measures are necessary.

Category B

Projects in which only low environmental impacts are anticipated. In these cases, possible impacts have to be identified as part of the project formulation process, and a series of mitigation measures has to be elaborated and incorporated into project design before the project is submitted for approval.

Category C

Projects whose environmental impacts may be moderate or significant but which are still mitigable. Category C projects normally require an environmental assessment, undertaken by an environmental specialist, and detailed mitigation measure proposals before submission for approval. The technician and the person/committee responsible for project approval should also check whether a full Environmental Impact Assessment (EIA) is required by the national legislation and consider whether specific environmental studies on critical aspects should be carried out.

Category D

Projects in which significant adverse effects are foreseen, for which there are no effective mitigation measures, or projects which are incompatible with the sustainable development policies of the concerned country or of international development agencies. This category also covers activities which are planned to be located within strict nature reserves or national parks[3]. In these cases, the project should either be completely reformulated/relocated or rejected for funding.

Annex 1a contains an illustrative list of investment projects that can be included in the categories described above. However, this list is only indicative, and the categorization of any individual project should reflect the specific characteristics of the project site. It is thus recommended that, before starting RuralInvest use, environmental expert advice is sought on how to apply these categories in the project area.

When a project involves activities in more than one category, the technician should classify it in the category that refers to the activities with most environmental impact. In other words, if a proposal includes activities listed in categories A and B, it should be classified as category B. It is also possible that, during the environmental assessment, the technician is convinced that the project should be classified in another category than the one originally selected. In that case, the project should be reclassified accordingly, and any new requirements followed.

According to this methodology, projects classified in Category A require no environmental mitigation, projects in category D would be excluded from financing, and categories B or C would require an environmental assessment to identify their environmental impacts and respective mitigation measures, which must be incorporated into project design. For these two categories, we recommend the following procedures.

D. Assessment Stages for Category B and C Projects

The procedures presented in this section are proposed for carrying out an environmental assessment in four stages. These procedures are meant to be applied by the local technician (or other person responsible for the environmental assessment) but s/he should closely involve project beneficiaries at all stages. The environmental assessment process should also be launched early enough (during phase 2, see Chapter 1) for the results to be incorporated in the project proposal.

Stage One: Detailed definition of the proposed activities

To carry out an environmental assessment, it is necessary to clearly define the project's proposed activities. In other words, the following questions

3 See section E.

should be answered: What does the project want to accomplish? Where? What kind of materials, tasks and resources will be involved? How many different ways are there to carry out these activities?

Stage Two: Definition of the environmental characteristics of the proposed project site and its immediate surroundings

At this stage, the environmental characteristics of the project area should be defined: type and quality of its water bodies (surface and groundwater); types of soil and vegetation (rangeland, bush, forest, etc.); existing or proposed protected areas; distance from ecological, historical, archeological or unique physiological sites; special constraints (slopes, aridity, etc).

In many cases, this information can be found in the local development plan or other similar document.

Stage Three: Identification and evaluation of possible environmental impacts

At this stage, it is necessary to identify and evaluate the environmental impacts that may be generated by the proposed activities in every phase of the project; whether they are probable or unlikely, positive or negative, direct or indirect [4] , reversible or irreversible, local or regional, temporary, permanent or periodic. Depending on the nature and characteristics of each particular case, the magnitude of the impacts should be estimated (e.g. insignificant, low, moderate or significant). In category C projects, whenever possible, the impacts should be quantified; for example, the amount of soil that may be lost, the degree of erosion that may occur, or the number of endangered forest species that may disappear from the project area.

To provide guidance for the technician or the person responsible for environmental evaluation, this manual includes a series of specific environmental checklists, applicable to different activities and investments in rural areas (see Appendix 1b). The technician should make sure that the factors presented on the checklists are considered when environmental impacts are analyzed.

Stage Four: Definition of mitigation measures and their incorporation in the project design

Once possible environmental impacts have been identified, the technician should define the measures that can be taken to prevent, minimize, mitigate or compensate them. S/he should also indicate the costs of these measures and define who should take responsibility on their implementation. The environmental checklists presented in Appendix 1b include examples of mitigation measures for impacts associated with a variety of rural activities and investments.

Finally, the analyst should present the results of the evaluation in such a way that the information on potential environmental consequences and possible mitigation measures can be used in the decision-making process. This should lead into the incorporation of the suggested measures into project design.

E. Special Cases

Protected Areas

The procedures described in section D are applicable to all rural investment projects, independent of where they will be implemented. In some cases, additional restrictions apply to the project due to its location. This is the case of protected areas, established by the national government or regional/local authorities to protect and maintain biological diversity, and natural and cultural resources. Protected areas often consist of a core zone, with stricter protection, and surrounding buffer zones or so called multiple usage zones, in which more human activities are allowed. In addition, most countries have established, through legislation, a system of protected areas, which often involves several categories with different use and management rules [5].

When a project is located within a protected area (or an area proposed for this classification), all investments and activities - agricultural, forestry, commercial, industrial or tourism - should be adapted to the following conditions:

- The activities should be located outside strict nature reserves, national parks, and core zones, or zones established to rehabilitate protected areas [6];
- Activities proposed for other types of protected areas, their buffer zones, or multiple usage zones, should be compatible with the Management Plan of the PA. To ensure this, the applicant needs to establish contacts with the competent environmental agency responsible for defining the conditions and standards for activities within the PA;

4 For example in road construction, cutting of trees along the road bed generates direct impacts (e.g. erosion and sedimentation in a nearby river) whereas indirect impacts may result from access to previously isolated areas, leading to the conversion of forest into farmland.

- The following is an illustrative list of activities which may be allowed/compatible with the Management Plan. However, even these need to be environmentally reviewed, and approved by the competent environmental agency.

  a) Sustainable extraction of non-wood forest products, that is, natural products other than wood that can be obtained from forests and wooded lands [7]. However, these activities should not involve pesticide use or the extraction of lumber;

  b) Sustainable agro-forestry activities;

  c) Rehabilitation planting with native species in deforested areas;

  d) Community forestry;

  e) Pasture management on natural pastures;

  f) Ecotourism.

Pest management

Pest management is a sensitive issue that requires special attention in rural investment projects in order to avoid potentially severe adverse health and environmental impacts. When preparing rural investment projects involving crop cultivation, livestock raising or forestry, the technician should ensure that the project adopts an "integrated pest management" approach (see below) and that the following three rules are respected:

First, purchase and use of pesticides classified by the World Health Organization as Extremely Dangerous (Class Ia) or highly dangerous (Class 1b) should be excluded from financing. These substances and examples of pesticide products are listed in Appendix 1a, Table 1.

Second, purchase and use of pesticides over large areas should be excluded from financing due to the significant risk of health and environmental hazards and difficulty of establishing an effective control system.

Third, purchase and use of pesticides classified by the World Health Organization as Moderately Dangerous (Class II) should be excluded from financing if the following preconditions are not met:

i) The country implements adequate legal restrictions on the distribution and use of these pesticides;

ii) safeguards are in place to prevent the use of, and access to, these pesticides by lay personnel, farmers, or others without appropriate training, equipment and facilities to store and apply them properly;

iii) Users adhere to precautionary methods proven to be effective under field conditions in developing countries.

All projects involving crop cultivation, livestock raising or forestry should adopt an **integrated pest management** (IPM) approach to reduce reliance on synthetic chemical pesticides and to promote the use of biological and environmental pest control methods. Pesticides should be used on an as-needed basis only, as a last resort component of an IPM strategy. In these cases, it should be ensured that (i) the selection of products minimizes health and environmental hazards, and (ii) these pesticides are correctly handled (including mixing and storage) and applied (including use of recommended protective gear and appropriate application equipment and techniques).

5 The categories used by the World Conservation Union (IUCN) are presented below to give an example of possible categorisation. However, the number and names of PA categories, and related use and management rules, vary from country to country. The local technician should become familiar with the PA system in use in his/her country.

IUCN categories:
I. Strict Nature Reserve/Wilderness Area: protected area managed mainly for science of wilderness protection;
II. National Park: protected area managed mainly for ecosystem protection and recreation;
III. Natural Monument: protected area managed mainly for conservation of specific natural features;
IV. Habitat/Species Management Area: protected area managed mainly for conservation through management intervention;
V. Protected Landscape/Seascape: protected area managed mainly for landscape/seascape protection and recreation;
VI. Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.

6 Since each country uses different names for the various types/categories of protected areas; the technician responsible for the environmental evaluation should adjust the names referred to above to those used in his country.

7 Non-wood forest products (NWFP) include products used as or with food (e.g. fruits, mushrooms, nuts, herbs, spices, cacao, honey, and animals hunted for meat), fibres (such as rattans), rubber, resins, gums, and plant or animal products used for medicinal, cosmetic or cultural purposes. They can be gathered from the wild, or produced in forest plantations, agroforestry schemes and trees outside forests. NWFP are vital to the daily subsistence of forest-dependent communities, and contribute to the subsistence and local commercial economy in other rural communities. Some NWFP are also commercialised in a larger scale (e.g. cork).

It is recommended that all projects involving purchase and use of pesticides, or that are likely to increase pesticide use, are classified in environmental category C (see section C). They would thus require, as a minimum, an environmental assessment, undertaken by a specialist, and detailed mitigation measure proposals before submission for approval.

F Monitoring Environmental Impacts

When carrying out the environmental assessment, the technician, together with future project personnel, should also identify indicators for monitoring the environmental impacts of the project and the implementation of the environmental mitigation measures. Environmental monitoring should be initiated at the start of project activities and continued throughout the project.

Through monitoring indicators, the project personnel can:

a) Verify that the environmental mitigation measures are implemented and are achieving the desired effect;

b) Detect possible unforeseen environmental problems in time to make the necessary adjustments in the operation of the project;

c) Provide information and inputs for the evaluation of the project.

In Appendix 1b, a tentative list of monitoring indicators is presented for different rural activities and investments, according to project type (agriculture, forestry, aquaculture, rural infrastructure, eco-tourism etc.). However, their applicability to micro and small-scale projects should be checked during project formulation. The indicators should be cost-effective, and adapted to the available skills and equipment.

In addition to monitoring the impacts of each investment/activity, it is often necessary to simultaneously evaluate the overall impacts of several investment projects implemented in the same area. For this purpose, a survey instrument is proposed. An environmental survey on each investment should be conducted at the end of the first year or, in the case of medium or long-term projects, every two years. These surveys could be contracted to a consultant firm specialized in the area or field concerned.

For these surveys, three environmental indicators are recommended:

a) Number of projects that have incorporated environmental mitigation measures;

b) Number of person-months contracted to provide technical assistance on environmental aspects;

c) Number of environmental checklists/test charts developed with technical assistance.

G. Specialized Support and Environmental Studies

1. TRAINING

For environmental impact mitigation measures to be effective, project personnel must receive training in environmental matters. This training should be provided to field technicians with technical responsibility on project execution, and/or to support/regional technician.

Training, which should be organized during the first two years of the project, could include, for example, a one-week course on environmental impact assessment methods.

2. TECHNICAL ASSISTANCE

It is also recommended that the project personnel seek support from technical assistance programs on environmental assessments. These programs could be tapped, for example, to contract – for short periods – an environmental expert during the first year of the project. This consultant would be responsible for providing information and assistance to project technicians on the evaluation of environmental impacts and their mitigation. S/he would also review the proposals presented for financing to identify possible environmental impacts and to determine if they were taken into consideration by the field technician working with the applicant.

3. ENVIRONMENTAL STUDIES

As mentioned above, in the case of Category C projects, a specialized environmental expert or firm may need to be contracted to study the critical aspects of the project or to undertake a full Environmental Impact Assessment (EIA). Specific studies may also be necessary, for example, in the case of agro-industrial projects, to evaluate the use of clean technologies or the design of waste treatment facilities.

H. Social Impacts of Rural Investment Projects and Sustainability

The small-scale rural investment projects considered in this manual aim at improving the

livelihoods of rural populations and, in many cases, also address social issues, such as health and education. It might thus appear improbable that they would result in major negative social impacts.

Nevertheless a number of potential investments in rural communities could result in profound changes in social relations within a community; changes that might ultimately threaten the sustainability of the investment itself. In one case in West Africa, for example, strong resistance developed among many local farmers to the operation of a recently established local school, as it was believed to have contributed to a steep increase in the migration of young people to urban centres and hence a reduction in labour availability within the community. The school was finally closed. Thus, all projects, even small-scale rural investments, should pay attention to possible social impacts.

Key types of projects which may have a significant social impact include:

- Those affecting human health. Poorly designed irrigation systems, for example, may lead to growth in water-related diseases because insects proliferate in water canals;
- Those related to changes in access to land and other resources. Development of agriculture in a traditional pastoral area, for example, may result in competition over water points. This illustrates the wider issue of benefit-sharing: if all the benefits of an investment go to a small group of people, it might lead to internal conflicts within the community;
- Those increasing the economic power of women or other disadvantaged groups. The provision of day care, access to markets (through new roads), or wage labour in local processing plants may all contribute to significant shifts in social relations within the community.
- Finally, a project may also have unforeseen negative impacts on vulnerable groups, such as indigenous people (if, for example, forestry activities are intensified in their living area) or women (if, for example, new agricultural machinery is introduced, and only men are trained in its use). Specific measures may be needed to ensure that these groups fully benefit from the investment.

The environmental checklists presented in Appendix 1b include some social impacts and possible mitigation measures, which should be considered in the environmental assessment.

I. The Sustainability of Non-Income Generating Investments

In addition to considering their relationship with natural resources, investments focused on production support, social benefits and even environmental improvement – in other words, investments whose principal purpose is not to generate income – face the challenge of remaining sustainable once external funding disappears. In contrast to those projects established to make a profit, projects of this type have no guaranteed income flow to finance their ongoing operating costs.

The sustainability of these projects is thus dependent on the necessary resources being available to continue operation, once the initial investment has been made. A school without a teacher, a clinic without a nurse or access to medicines, or a road that has been washed out by spring floods, are all examples of unsuccessful investments. In each case, there was a failure to maintain the availability of the necessary resources (personnel, materials or maintenance) needed to insure the long term functionality of the investment.

The process of formulation for non-profit projects requires that the source of these future resources be precisely identified, and that the nature of the guarantees made as to their availability be detailed. After all, an assurance of future resources is only as good as the guarantee that backs it up! Among the possible sources of resources for future maintenance and operating expenses, are the following:

- Contributions in cash or in kind from the community itself, through an association of users (drinking water, latrines, access roads, etc.);
- Charging the beneficiaries (healthcare centres, schools, etc.) at least some portion of the service cost;
- Contributions from the local or municipal government, including personnel, materials or cash;
- Contributions from an NGO;
- Contributions from national ministries (health, education, public works and transportation, etc.);

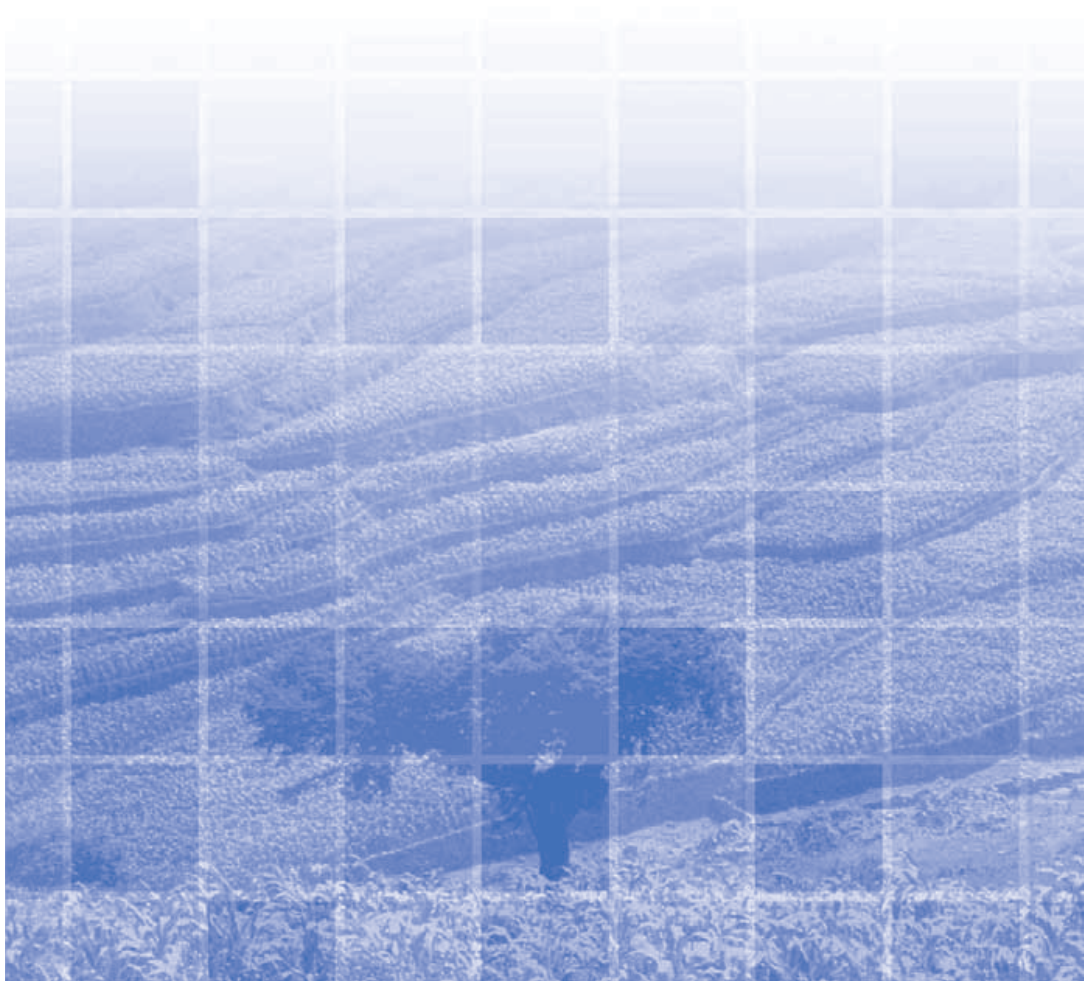
In fact a combination of several sources is generally necessary. Charging the beneficiaries is a frequent tactic, but rarely covers the entire cost of operations and upkeep.

Whatever the source(s) are, it is important to obtain and attach a letter of commitment to the

proposal, specifying the amount and the length of the guarantee. If the source is official (local government or a ministry), you should try and ensure that the organization's future annual budgets include this commitment.

Chapter VI

ESTIMATING COSTS AND INCOME



VI ESTIMATING COSTS AND INCOME

Costs and income, combined with the planned production schedule for the activity (the scale of the operation), together determine the profitability of income generating activities, as well as the need for subsidies or user charges in the case of non-profit projects.

Although the evaluations of market, technology and sustainability should have provided many of these parameters (product prices, cost of investment, etc.), at this point we are still far short of having total knowledge of all of the elements.

An important beginning step is to verify and classify the costs. Initial assumptions on the cost of different components of the investment should be checked out, and the costs of the investment, operation and general expenses each require a different treatment.

A. Verification and Classification of Costs

The essence of the process of evaluating an income generating investment lies in comparing the benefits generated to the costs incurred. By definition, only those projects in which the benefits are greater than the costs deserve to be implemented. Even in the case of non-profit investments, social, environmental or production support projects – knowing the costs is a prerequisite for calculating the value of the investment under consideration and for calculating the amount needed annually to cover operating expenses.

For profit-oriented projects, it is necessary to estimate both the costs of the investment and all those costs and incomes that stem from the operation of the project.

It is easy for an applicant, enthusiastic about his proposal, to underestimate the costs of a project or to assign them to the wrong category, which causes errors in the calculation of financing requirements. The process of preparing a project profile in the field lays little emphasis on verifying costs – best estimates are acceptable at the profile level. Therefore, as a first task in the process of formulation and evaluation, the applicants and their advisor should review all of the costs previously identified, in order to:

- Determine whether the initial costs are assigned to the correct categories (initial investment, replacement of investment items, annual operations, overheads);
- Break-down generalized costs into their specific components, e.g. breaking down the estimated overall cost of a building into such components as: site clearing and access; the foundation; construction per square meter; finishing (electrical and plumbing); furniture, etc;
- Identify costs not previously included, e.g. technical assistance, training, legal or hygiene requirements, mitigation of environmental impact, improvement of access roads, etc;
- Verify the validity of the costs to be used through direct contact with salespersons, transporters, engineers and other specialists knowledgeable of the area.

The contrasting costs of a project can be broken down into three principle categories:

a) Investments and their periodic replacement;

b) Production costs (which generally vary with the scale of manufacture);

c) General or overhead costs (which typically do not vary as a result of changes in the scale of production).

The following is a brief description of each category of costs.

1. Investment and Related Costs

The investment is the heart of any project. In fact a project can be defined as **an activity in which an investment is made now in order to obtain a benefit in the future**. An investment is a kind of expense, but it can be distinguished by the duration of its impact. If the impacts no more than a year, the cost cannot be considered as an investment and must instead be treated as an operating expense.

a. Types of investments

Not all investments take the form of physical assets, although investments in works and machinery are, undoubtedly, the most common. However, one can also invest in less tangible things: for example education, research and systems. When you buy a store or other business, you frequently will have to pay for the "goodwill" of the previous owner; that is, his network of commercial contacts. It is considered that the relationship, developed by the seller with his clients over the years, is an asset that is worth money.

Establishing a permanent crop (including the costs of labour) is also an investment. If small areas of

permanent crops are being replaced every year as part of an established cycle (for example, 5% of the trees every year), the cost is frequently included as part of the operating expenses. While this does not matter at this small scale, it is important to remember that the cost and availability of financing will often differ according to its purpose. If significant areas are to be established in new plantings, or it is necessary to replace a high proportion of existing plantings (e.g. following the purchase of a neglected farm), it rapidly becomes apparent that the high costs involved will cause problems in the operating budget. However, if the new plantings are treated instead as an investment (which they are), it will often be possible to obtain longer term funds at lower rates, and there may even be a grace period on the payment of the loan.

When estimating the cost of a physical investment, the following factors must be considered:

- The initial price of the asset (machinery, equipment or materials) at their point of sale;
- Any taxes levied on that price;
- Transportation of the asset to its final location, including insurance and, where the item must cross borders, import duties;
- Installation and, if necessary, testing of the item in its final location;
- Training of operators.

b. Economic Life

Some investments will last longer than the life of the project, especially in the case of physical works, construction and heavy machinery. Others, such as land, have no predetermined useful life, and it is generally assumed that their benefits will last indefinitely.

However, many investments will have to be replaced periodically, as they wear out (but remember: never less than a year, or it cannot be considered an investment). It is therefore necessary to consider the economic or useful life of each investment; that is, the number of years that it can be used until it is replaced.

Electronic equipment (computers, printers, telephones, etc.) are one of the categories with the shortest economic life - perhaps no more than four years. In these cases, the economic life of the asset is primarily determined by the rate of technological change. A computer is normally replaced, not because it has ceased to function, but because it is no longer compatible with the latest programs.

In the case of other investments, the economic life is strongly related to the use and maintenance of the item, and the increasing cost of repair as it gets older. A car or truck, for example, can last a quarter of a century, but when a truck is used on rural roads in developing countries, the economic life will not generally be more than 6 to 8 years. Remember, this doesn't mean that the truck can no longer run after that time; rather that the cost of keeping it on the road simply becomes too high to justify keeping it[8]. Most businesses decide around this time that it is cheaper to buy a new truck and sell the old one.

The replacement cost should be recorded in the year that replacement takes place. So, if you have to change the old truck in the sixth year, you should register the cost of the new truck (let's say, US$35,000) in that same year.

c. Salvage value and residual value

Frequently, when an asset is replaced at the end of its economic life, it still has value. Doubtless, the six year-old truck still is worth a lot, maybe 20 or 35% of its initial cost, depending on the tax structure of the country. This value is called the salvage value and it should be recorded as an **income** in the year it takes place, in the same way that the cost of the new truck is recorded as an **investment cost**. A few investments have almost no salvage value. These may include electronic equipment, fixed goods (such as wells, water catchment tanks, etc.) or permanent crops at the end of their useful life span.

It is also necessary to take into account, especially in the case of investments having very long economic lives, that they may possess a significant residual value at the end of the project life time. The residual value is what an investment is worth when the period analysed ends. For many assets this value is not enough to be worth recording, especially if it is in the distant future. However, when dealing with large assets such as buildings and land, the residual value will often be significant and can influence the profitability of the project.

To understand the importance of residual value, it is worth remembering that the project began without any resources, but it used loans and other sources of financing to obtain the goods it needed. During the period analysed, income from the project is applied to the payment of the loan. Before ending the analysed period, the cost of these goods has generally been completely paid for. However, in the case of land, buildings, etc., there still remains a great deal of value in these assets and that value must be recognized when the project period expires.

Nevertheless, it is very important to distinguish carefully between the ***annual cash flow*** and the ***financial rate of return (total profitability)*** - see

8 Also considering the cost to the project of having a truck out of service while it is awaiting spare parts.

Chapter 9. The buildings and other goods represent a value, but not an income. So you cannot claim residual values when dealing with cash flow, but you can include residual values in the calculation of profitability.

d. Depreciation

The subject of depreciation is always raised by students studying the RuralInvest methodology. Inevitably someone always asks why the cost of depreciation is not included in the calculations.

The answer is simple: depreciation is purely a tax-related measure, defined by the ministry of finance, internal revenue service or the treasury of the country in question, specifically in order to offer fiscal benefits to investors. The tax authorities dictate the manner in which a person or company making an investment can use the cost of that investment to reduce their taxes each year. This amount is the depreciation, and often has little relation to the actual life of the asset. It also changes from one type of investment to another, normally to support government policies towards certain sectors or activities. When a company charges depreciation in its accounts, it does not actually set aside funds for replacement of the asset, it merely reduces its tax burden.

As a result, the concept of depreciation is of relevance in a financial analysis only where taxes are being taken into account. Under RuralInvest taxes are given little importance, as the purpose of the analysis is to determine if the project is effective and sustainable, not to maximise after-tax earnings.

Given that the calculation of taxes normally is not a high priority among those who analyse rural investments of small or medium scale, you can leave the concept of depreciation aside until the project generates enough profit and calls for a mature consideration of tax matters.

2. Recurring Costs

Investments are not the only costs that a project faces. Once the project is under way, there are costs that must be met annually (or more frequently). Costs that are not investments are described as **recurring costs**; that is, they occur year after year. This concept deals with two distinct categories: production costs and general expenses.

a. Production Costs

These are all costs directly attributable to the process of production. For example, in the case of a small workshop producing clothing, the cost of raw materials (cloth, buttons, etc.), packaging materials, and the electricity used to operate the sewing machines and irons are production costs.

Labour is also considered a production cost if it is directly related to the output of the garment workshop. In fact, any cost that changes directly in relation to the production volume is a production cost. The estimate of these costs is dealt with in greater detail below.

b. General Expenses

These include any cost that does not normally vary according to the level of production. So, continuing with the example of the clothing workshop, we can identify as general expenses the salary of the workshop manager, the lighting of the building, and the salary of the truck driver, because these items do not change according to the level of production. General expenses may also include property taxes, insurance policies, telephone bills and accounting services.

In reality, the separation between production costs and general expenses is not always clear. Any cost will change if the scale of production increases enough. If it the business is very successful, for example, the workshop might need a new, larger building, or it might need to hire department managers. On the other hand, is the cost of labour really tied to the scale of production? For example, can you send the workers home in the middle of the day, without pay, if the workshop has orders only for half of the normal number of shirts? Only where workers are paid "piece-rate" – that is per shirt produced – can labour really be said to be a production cost.

Deciding whether an expenditure is a production (i.e. variable) or overhead (i.e. fixed) cost can be helped by the following "rule of thumb": Any costs that increase when the level of output increases (or decreases) by 10% will be variable costs. Costs that remain unchanged, however, will be overhead or general expenses.

3. Training Costs and Technical Assistance

The assignation of costs for training, education and technical assistance frequently cause confusion; however, the same rules apply here as for physical goods. Any expense for experts and training that only occurs once, or that is repeated only at long intervals, is an investment.

If, on the other hand, the expense is repeated annually or more frequently – as is typically the case for agricultural extension services or specialized technical advisors – it is considered a recurring cost. However, the cost of such services generally is not closely related to the output of the project. For example, the monthly visit of the veterinarian to visit a cattle herd would not be likely to increase to

a frequency of every 3 weeks just because the farmer increases the size of his herd[9]. As a result, the costs are recorded as a general or overhead expense and not a production cost.

Incremental Costs and Income

In some cases a proposed investment will build upon an existing activity – for example adding an irrigation system to an existing production operation, or upgrading machinery in a food processing plant. In these cases it is important to distinguish between total costs and income, and those that are **additional** or **incremental** to the project. Including all costs, including those presently paid, or all incomes, including those presently received, in the calculations for the new project, will give a wrong impression of the profitability of the proposed new activities. The question of incremental project activities is discussed in more detail in Chapter 9.

B. Assigning Costs and Income by Activity

In the identification stage (project profile) the simplifying assumption was made that the investment will result in a project with constant activities during the entire period analysed.

For example, an investment in a poultry operation may be initially be supposed to produce a certain number of birds per year, every year of the project, without any change. However, real life is not so simple. The truth is that in many cases, and for many reasons, project activities are not constant every year.

One aspect that often changes with time is the efficiency of the production process. Yields improve and losses are reduced. In the poultry operation, the rate of hatching is likely to improve after the first year, while greater experience in poultry management may well result in faster growth among the birds, and hence quicker production cycles, as the years go by. By year five it may be possible to complete a broiler cycle (chick to saleable bird) in only 7 weeks, as opposed to the 10 weeks required at the start.

Another change may arise from new or modified project activities. The poultry project may commence turkey production as from year four, thus adding a new activity. A dairy plant may wish to experiment with ice cream and yoghurt production, but not until the butter and cheese operations are well established and running smoothly.

Still another possibility is that the costs and income associated with the activity will not remain constant. Growth and mortality rates for chickens, and hence the costs and income from a poultry operation, may well differ between the summer and winter months. Tomato production in the dry summer months may result in higher costs (irrigation), but higher yields, lower losses (fewer pests), and better prices in the market, than the rain-fed tomato produced on the same land in the wetter winter months.

In all of these cases, it is not possible to talk of a constant pattern of production. Rather, production patterns will change over time, and perhaps seasonally as well.

When dealing with activities in which the production cycle extends over more than one year (for example, tree crops or dairy cattle) such changes in the production model over time are not only possible, they are inevitable. A plantation of avocados presents different costs and incomes as a function of its stage of development. As the tree grows from a sapling to a mature tree, the amounts of fertilizer, labour requirements for harvesting, and of course the income from the yield of fruit, will all change.

And if different plots are planted, or young stock purchased, in different years, the result will be a series of very complex changes, as the project will consist of a mix of new, young, and mature animals or plants which changes from year to year. As a result, in the detailed analysis of productivity it is essential to clearly define the changes in the costs and income of the project with the passing of time. This is the purpose of using blocks.

However, the use of blocks is not necessary in all cases. Most non-income generating projects, as well as lacking changes in income, tend also to have simple patterns of production, where many costs are fixed, and activities are few. As a result, blocks are used exclusively for **income generating projects**.

1. The Concept of Blocks: The Basic Unit of Analysis

A block is defined as any grouping of plants, animals or other production units that **share the same costs and income per unit of production**. An activity (for example the production of maize) may be the same as a block, but not always. Thus, summer maize may fall into a different block from its winter counterpart, **if the costs and income per hectare are different**, although it may be the same variety of corn in both cases. By the same token, a blouse and a shirt manufactured in a garment workshop may be quite different, but both may be considered in the same block, if the two pieces require the same amount of materials and labour and if they are sold at the same price.

9 However, the cost of inputs and materials used by the veterinarian – medications, drugs, etc. – can be considered as production costs, because they will change according to the number of animals treated.

The blocks don't always have to group physical things. For example, in an eco-tourism project, the block might be visitor/nights, while in a transportation project, the block might be passenger/miles. Once again, however, a visitor/night in a double room would not be in the same block as a visitor/night in a single room, because the income (and possibly the costs) would not be the same.

The unit of production, whether it be a hectare of citrus trees, a dairy cow, or a hotel room, may not stay always in the same block. A calf might be in a block of new-born cattle for its first year, but it will then move to the block of juveniles in the second year, before entering the mature dairy cow block in its third year. After that, the animal might stay in this block until it is sold in its tenth year.

Although the concept of blocks might seem complicated at first, it is a powerful tool for identifying and fine tuning the production patterns when changes take place from year to year. It is particularly useful for investments dealing with permanent crops, breeding animals and dairy production. The main problem for the user lies in the exact definition of the blocks in a specific case. The following points might help in determining what is or is not a block:

- All production units in a block (hectare, head of cattle, kilo of cheese, pair of shoes, etc.) will always share the same costs and income per unit. If those costs and income differ, it belongs in a different block;
- A project activity may be represented by a ***single block*** (if there are no changes in unit costs and incomes over the period analysed), or ***many blocks*** (where the activity experiences changes in per unit costs and incomes over the period analysed).
- In the case of agricultural production, it is not necessary for the areas to be physically connected to each other. Two hectares of cereals may be in the same block even though they are growing on different parts of the farm (or even on different farms, if they are in the same project);
- Breeding animals or perennial crops (for example, a cow or a mango plantation) will move from one block to another as they develop (and their costs and incomes change);
- Do not confuse the age in years of a project with the age of the plants or animals. Although a project may be in its fifth year, the almond trees may have been planted only three years ago;
- As all production activities involving natural resources (animals, crops, trees, etc.) will vary both between individuals and between years, it is theoretically possible to define an almost infinite number of blocks. Each coffee bush could be its own block. For the purpose of analysis, however, it is enough to group together those that are **similar**, even if they are not **identical**. For example, it would be possible to assign a block to each year of a dairy-cow's life, as milk yield slowly grows and then declines, resulting in perhaps ten blocks. In reality, however, the difference between the milk yield (and costs) once a cow has had her first calf are small, and a single block may well suffice to cover the years 3-8 or even 3-10.

2. Determining costs and income per block

In order to construct a model of the overall performance of a project over time we need to know three pieces of information about each block. These are:

- The costs and income per unit of production (e.g. a hectare) within each block;
- The timing of costs and income per block throughout the year. This tells us when costs are incurred (and hence the need for operating funds), and when income will be earned, and;
- The expected variation from year to year in the number of units per block (e.g. 20 breeding ewes this year, 25 next year), and hence the scale of the costs and benefits associated with each block in any particular year[10].

As we have seen, if the project is simple (without any change of characteristics during the period of analysis) the blocks will be equal to the products (that is, tomatoes may have only a single block), and annual production levels may remain constant from year to year.

Each block requires these three tables. Thus a perennial crop with blocks for each stage of its growth and production requires several sets of tables. For this reason, before considering blocks in further detail, we must carefully examine two key associated parameters: the unit of production and the production cycle.

a. The Unit of Production

The definition of the unit of production is critical because it will determine the manner in which

10 The need to estimate annual changes in production levels per block derives directly from a basic decision in RuralInvest to assess project performance on an annual basis (a standard practice in the financial world). Six monthly or even quarterly analysis periods could also be used, but would require considerably more work. In fact, monthly changes are recorded for the first year to determine working capital needs.

costs and income are measured. In many cases, the unit of production of a block or product is obvious. Generally, crops are measured by hectare, acre or other measurement of area. In this case, the use – and cost - of inputs (fertilizers, labour, etc.) can be calculated per hectare, and so can the yield at harvest. In the case of large animals, the unit may be the head, the breeding female, or the Livestock Unit.

However when dealing with other activities, the nature of the unit of production is not always so clear. In this case one must follow the rule that ***the unit of production is the most convenient unit for estimating costs and income***. For example, in the case of an aquaculture project, the unit could be the entire stock of fish, the pool or tank or even the individual fish, depending on which measure is more convenient when thinking of costs and income. If the farmer is more used to thinking of feed per tank of fish, then the tank is the obvious choice. However, if he or she thinks instead of the costs per fish sold, the individual animal may make the better unit.

A word of warning here: ***The larger the unit of production the less easy it is to make changes in the production level***. If the unit of production selected for a proposed fish farm is the tank (with an average of 5,000 fish), then you will be constrained to increases (or decrease) production levels by 5,000 fish at a time, or starting using fractions of a unit of production (0.5 of a tank, if a new tank will have only 2,500 fish). Size may not be a problem if the project uses standard sized units, but an overly large unit of production can be very inconvenient.

In the case of agro-industrial products or handicrafts, the unit of production is frequently equal to the ***unit of sale***; the piece of clothing, the kilo of cheese, the box of jars, etc. When dealing with services (hotels, transportation, etc.) the unit of production might be the passenger (or passenger/kilometre), the guest or the hour of machinery service. But remember: Once the unit of production has been selected, all costs and income must be expressed in terms of this unit.

DEFINING BLOCKS ON A COFFEE FARM

A family has just bought a 20 hectare coffee plantation, consisting of 11 hectares of mature plants, 5 ha of old bushes, and 4 ha of coffee planted one year before. Although the plants are dispersed around the farm, all of the areas with mature coffee plants are bearing fruit and using resources (agro-chemicals, etc.) on a fairly uniform level; that is, all share the same characteristics of costs and income. The old bushes are over 25 years old, and give lower yields than the mature plants. They also require more agro-chemicals to control diseases than the younger plants, so they form a different block. The newly planted bushes, which require care but, as yet, bear no fruit; constitute a third block. Of course, no plant is identical to its neighbour, and no area of the coffee farm is exactly the same as any other. However, the three blocks form groups of broadly similar plants. In the table below is a summary of the blocks in the first year of the project.

BLOCK	UNITS	CHARACTERISTICS
New plants	4 has.	Low maintenance costs, without yields or income
Mature plants	11 has.	Medium costs (including costs for harvesting). High yield and income.
Old plants	5 has.	Relatively high maintenance costs, Yields and income only moderate.

To determine how each block changes from year to year, more information is needed about the characteristics of the blocks and the family's plans:

a) The family decide to replace half of the 'old plants' block in each of the first two years of the project (that is 2.5 has. per year);

b) The 'new plants' block contains plants in both their first and second year of life. That is to say, the costs and income associated with plants in these two years are similar[11];

c) All of the areas within the 'new plants' block when the farm is purchased are in their second year of life;

d) None of the mature plants will move into the block of old plantings within the next five years.

Under these assumptions, we can predict the number of hectares of coffee plants in each block over the first four years of the project:

BLOCK	Hectares per block Year 1	per project Year 2	Years Year 3	Year 4
New plantings	4	2.5	5	2.5
Mature plants	11	15	15	17.5
Old plants	5	2.5	0	0
Total	**20**	**20**	**20**	**20**

11 In reality, coffee bushes do not pass directly from newly planted to mature in their third year, but the example has been simplified.

How did we arrive at the second table? The first year is the same as the first chart. But in the second year, we take away half of the old plants, leaving only 2.5 has. in the block and establish in its place 2.5 has. of new coffee plantings.

However, these new plantings are now the only ones in their block because the 4 ha of previous 'new plants' being already in their second year, have "graduated" to the block of the mature coffee plantings. The mature coffee plants now number the original 11 ha plus the new 4 ha. ***Note that the number of units (hectares in this case) in a block can change and need not be equal to that of the previous year***.

In the third year of the project the rest of the old areas (2.5 has.) is replaced, leaving the 'old plants' block empty. In its place a further 2.5 ha is added to the 'new plants' block. This block now consists of 5 ha because the other 2.5 ha planted the previous year are not yet old enough to graduate to the mature block. The mature coffee block thus continues with 15 ha. The reader can work out the area of plants per block for the fourth year of the project on his own.

b. The production cycle

The definition of the production cycle is important for the same reasons as the definition of the unit of production (above) - it determines the way inputs and yields are measured. When we speak of three 50kg sacks of fertilizer per hectare, we refer to the entire growing period of the crop, or production cycle, not per week or every 5 years. However, to properly understand the production cycle we need to know two things about it: how long it lasts (its duration) and how many cycles there are per year (its frequency) .

Duration of the production cycle: The duration of a production cycle is simply defined as the period necessary to complete the production activity. For most annual crops, it is the time between land preparation and harvest; perhaps 12 – 14 weeks for short cycle crops, such as vegetables. Grain and legume crops such as rice, maize and beans will generally require longer.

In some cases, however, this simple definition must be modified. Remember that all analyses in RuralInvest (except working capital) are undertaken on a ***yearly*** basis. Thus costs and incomes from an activity can not be calculated on a longer base than one year. As the production cycle is a key parameter or input in calculating these costs, the production cycle must not exceed 12 months either, even if the life of the entire activity – for example, a fruit plantation – spans 20 years or longer.

Beyond agriculture, a different problem can be encountered in trying to define the duration of the production cycle. Many activities, such as handicrafts, agroindustry, transportation, tourism and other businesses continue operating throughout the year, without a clear beginning and ending point for production. In this case several options are available. One alternative is to select the entire year as the production cycle. However, many costs (salaries, electricity, telephone, etc.) are typically paid monthly, so it may be more convenient to define the cycle as one calendar month. Alternatively, if the plant or workshop delivers the product for sale on, say, a two weekly basis, it might make sense to select two weeks as the product cycle duration. In the end, the choice may not matter very much, as long as the period is convenient and you are consistent in always measuring the inputs and outputs over the same period for each activity.

Frequency of the production cycle: We mentioned previously that RuralInvest uses an annual basis for almost all calculations. So it is not enough to know how long each production cycle lasts; we must also know how many cycles are completed in the year under analysis. For activities that are continuous throughout the year, the answer is simple: the duration of each cycle (in months), multiplied by the frequency of the cycles (also in months) will add up to 12. Thus, if the production cycle of a rural shop lasts one month, there will be 12 cycles per year.

However, not all activities continue throughout the entire year. In agriculture and other types of activities based on natural resources, there will often be periods in which no production is occurring. Although the production cycle of a crop may last 4 months, it is not at all guaranteed that there will be three cycles a year (producing 3 cycles x 4 months = 12 months). Even two cycles may depend upon the availability of irrigation. By the same token, a vegetable processor might define his production cycle as one month, but his or her plant may only operate for 5 or 6 months per year, due to the lack of raw materials in other months.

c. Estimation of volumes and quantities

Even with a very careful estimation of the amounts used or generated in the process of production, mistakes frequently occur in these measurements. Below we consider two factors that often cause errors in the estimation of input and output quantities.

Waste materials and losses: One factor which is frequently overlooked in estimating quantities is

that of losses, damaged goods and waste, all of which are a normal part of many production operations. If 8 tons of green or sweet peppers are harvested in the field, it is highly unlikely that all 8 tons will be sold. A certain percentage will be rejected as too small or bruised, another percentage will be damaged in transportation to the point of sale, etc. It is very important to take these sorts of losses into consideration if you want a reliable estimation of costs and income. Losses can also occur with respect to inputs. If you are bottling wine, it would be wise to assume that some of those bottles will be broken, and order a small additional quantity to cover such breakages.

Another example is the conversion of fruits and vegetables in a processing plant. Take, for example, a vegetable processing plant making pickles. We can imagine that each bottle of finished product requires around 120 grams of cauliflower, as well as carrots, zucchini, and other vegetables. However, it would be a bad mistake to estimate the requirement for cauliflower by multiplying the projected number of jars of pickle by 120 grams. In reality, about 40% of each cauliflower will be lost, as the stalk, leaves, and damaged sections are discarded as the cauliflower is prepared. In order to end up with 120 grams of cauliflower ready to use, you would thus need to buy approximately 200g for each jar of pickle.

Self-supply/auto-consumption: Another element that may cause confusion is that related to the source of inputs or the destination of products. Sometimes a project makes use of inputs that are not paid for, typically because they come from the same persons or families as own the project. This is called self-supply. A very common example in many rural activities is the use of unpaid family labour. Other 'free' inputs can include raw materials for processing, or even water, can also often be found. It is important to realise that these inputs, even if not paid for, still have a value. Even if he was not paid, a day's labour provided by your brother could have earned him a wage working on a neighbouring farm.

Similarly, if outputs are consumed on-farm (or by the owners of the project) without being paid for – for example grain is eaten, or kept for seed rather than being sold - this is auto-consumption. Here the reverse applies. Even though the family did not pay for the crops or animals they eat, they still had a value, one that could have been gained by taking the crop or animal to the nearest market.

The occurrence of either auto-consumption or self supply can lead to important differences in the results obtained from the two principal project measures used by RuralInvest. These are discussed in more detail in Chapter 9, but in cash flow analysis, 'free' inputs and consumed products are ignored, as the analysis deals only with cash. However, in financial terms, they must be taken into account, because financial analysis tries to account for all costs and benefits with a market value, even if it isn't paid. After all, if you consume something instead of selling it, you do not reduce the profitability of the operation, but you do affect your capacity to generate cash flow: a key aspect for the bank or financial agency when considering the possibilities of a loan.

When estimating costs, is it important to consider the value of auto-consumption or self supply? Normally, you should identify the cost (for self supply inputs) or the price (for auto-consumption of outputs) at the nearest market - adjusted by the cost of transportation, if it is at some distance – and use that figure for the financial analysis.

3. The importance of the project's first year

The first year in the life of any project is the most delicate and risky period. If a project is going to fail, in nine out of ten cases, it will do so in this period. Why? Because the first year of a project is the least secure; the employees are as yet unaccustomed to their duties; the management is less experienced; the suppliers and banks are more cautious; the buyers are less accustomed to the product.

More important, however, is the fact that during the first year of its life, a project typically lacks the reserves to absorb any setbacks or unexpected events. The lack of adequate resources for financing activities such as the purchase of raw materials, the payment of salaries or the cost of transporting finished product to the market can easily throw a new project into bankruptcy. To reduce this risk, it is necessary to deal with the first year of a project's life differently from other years.

4. Estimating the need for working capital

The lack of adequate operating funds has probably condemned more small projects to failure than any other factor. It is always necessary to calculate the needs for ***working capital***; that is, the funds needed for the project to pay its expenses in cash, until it has accumulated enough cash reserves to rely on its own resources. Many small projects begin operations relying on income from sales to pay their bills. But they have forgotten that, in the real world, it may take many months to obtain the payment you expect. However, especially when dealing with a new business, the gasoline station, project employees, and the feed or fertilizer salesman, will all demand to be paid in cash.

In general, working capital is required to cover all project expenses incurred as cash payments, from

the moment the expenditures begin until the funds are received from the sale of the finished goods or products. The stages of this period include:

a) Preparation for production, including activities such as: buying inputs (even if not yet delivered), preparing the soil; training employees; contracting the transport, etc.

b) The production period. This may be a short period (making a shirt, the production of a kilo of cheese) or long (growing a crop) but ***it can never be longer than 12 months***, for purposes of calculating working capital

c) Storage. You may be able to make a shirt in a few hours, but perhaps the finished shirts are only shipped to the wholesaler once a month. Sometimes, non-perishable products can stay in storage for months waiting for better prices.

d) Transportation and distribution. This may be a short period, but in the case of crops or other products for export by ship, it could mean a wait of several weeks.

e) Waiting for the buyer to pay. While selling in a market generates immediate cash, this can be the longest wait of all. Supermarkets frequently delay payment for up to 60 days and large agro-industrial plants sometimes follow the same policy.

f) Clearing payment. Cash is immediately available, but do not forget that banks frequently demand several days before crediting a cheque, and perhaps weeks if the payment comes from another country.

g) Accumulating reserves. Working capital will be needed not only to cover the periods described above, but also while the project is accumulating enough surplus to allow any operating loans to be paid (if you have one), and then reserves equal to the entire working capital needs.

The combination of all these factors can bring about a delay of many months, or even years, before the project ceases to require borrowed working capital.

5. Cash Flow

In the previous discussion, it was proposed that once the project begins selling its output and receiving income, it will be able to establish working capital reserves. However, this is not always true.

Some production processes are constant and thus working capital is readily accumulated. For example a workshop making shoes may face the same expenses every month, and can gradually build up working capital reserves from the margin earned each month (once money starts to flow in). Other business, however, are seasonal; in other words, there are only sales of the product during certain months, or the volume of production varies significantly from month to month. In other cases, you may have more than one product, each having its own costs, income and working capital needs.

For example, let us look at the production of a single product; tomatoes. We know that to produce one hectare, we will need $500 in local money in working capital to cover the four month period, from land preparation in February to the end of the harvest in May. As we have used up all our resources installing the irrigation system, we take a loan for the $500. However, when we sell the tomatoes in May and June we will earn $800, leaving us with a profit of $300 towards the working capital in our next cycle (less the interest paid on the loan). Unless we need the money for other purposes, we will need a loan of only $200 next time.

However, if the project will cover several different activities – say tomatoes, squash and beans – the situation becomes more complicated, because we must know the relation between the costs and incomes of each activity. The only adequate solution in these cases is to calculate exactly how much we must pay in expenses and how much we will receive in income for the three activities combined: this is **the monthly cash flow**.

With the generation of a cash flow chart the working capital needs become clear. In the following chart, we can see the monthly production costs for tomato, mentioned above, during the period from February to May ($125 per month, or a total of $500). Income from the sale of tomatoes starts with $400 in May and is followed by a further $400 in June. However, these amounts may not be received until late in the month, so they are only credited in the next month (that is June and July). All income is best credited in the next month, as expenses in a month may well become due before the income is received.

There are further complications. In May the project will also face costs of $100 arising from the start-up of squash production. Thus borrowing requirements will reach a maximum of $600 before income starts to come in from the sale of tomatoes. Even then, the project will still be short $300 until the next month, when the remaining $400 from the tomatoes enters the bank.

The chart also shows that the total amount received from the sale of tomatoes ($400 + $400, or $800) is not enough to pay both the working

capital loan for the tomatoes ($500) and, at the same time, cover the costs of squash production ($350). So, although the project breaks even in July, it will need still more funds to cover continuing production costs for the squash in August. If the working capital loan for the tomatoes was paid-off in July, the project would have to borrow further funds. Rather, it is necessary to wait until September before clearing the working capital loan. On the positive side, the combined profit from the tomatoes and the squash will be sufficient to cover the costs of the beans, although available cash will be reduced to only $350 by the end of the year.

Some readers may ask why the costs and income from beans for the months of January through April **do not** enter into the calculation. If you think about it, the answer is clear: the production cycle for beans doesn't start until September. If the project commences in January, as it does in this example, it is impossible to have costs (or income) for beans in the early months of the year, as they could not have been planted the previous September!

The chart shown here is simplified and lacks some of the elements that would have to be considered in a real analysis. For example, the costs shown above reflect only the production process itself. Any project will encounter other costs – both general and fixed – that need to be paid during the first year of operation (like electricity, real estate taxes, family sustenance, the manager's salary, etc.). Therefore, an extra row is normally inserted below to include general costs. But remember: only include cash expenditures in the cash flow.

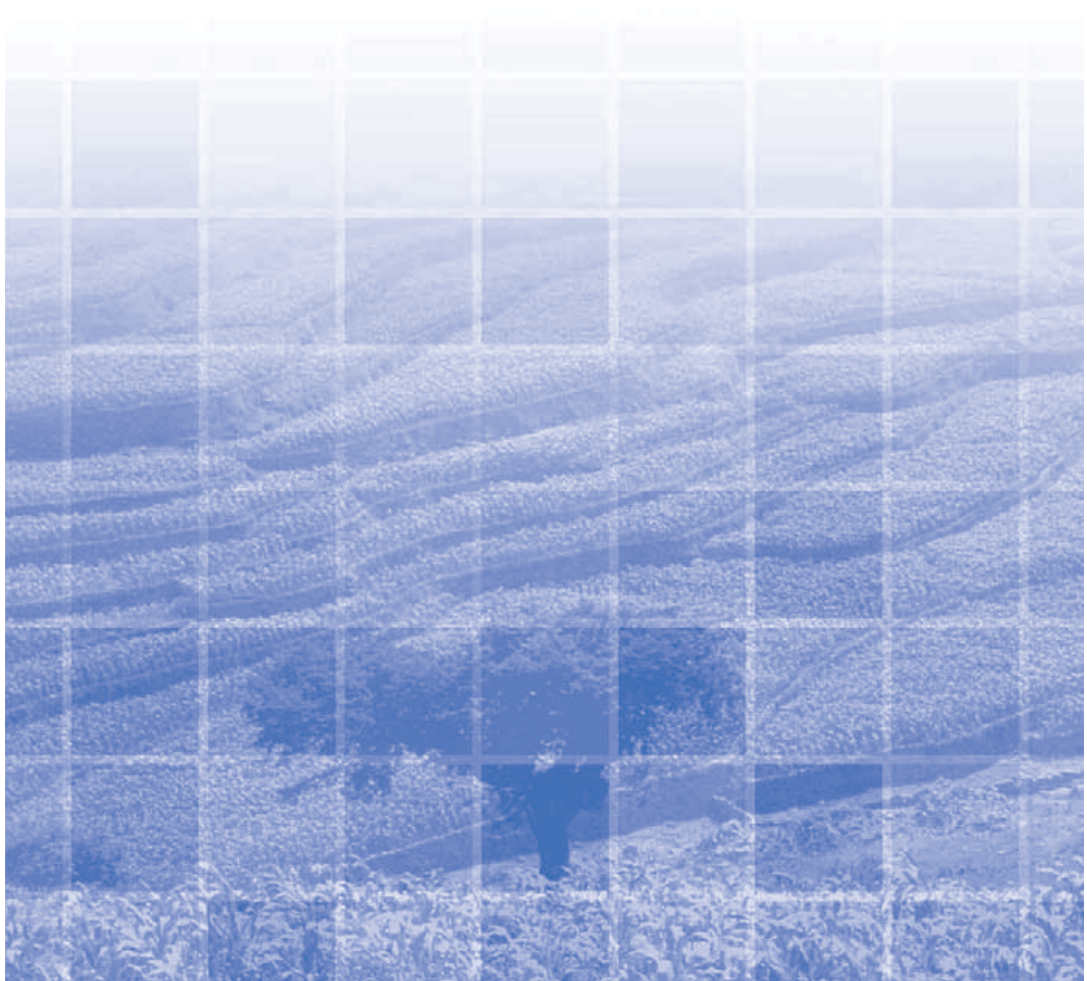
It might be that the net income predicted for the end of the first year is negative (for example, owing to perennial crops that do not yield in the first year) or, although positive, isn't sufficient to cover the costs in the second year (as in the example above). In these cases, working capital loans would be needed in a second and perhaps even a third year. However, in general it is not necessary to lay out a cash flow for each year. If costs and income in the second year are similar to those of the first year, you can simply repeat the working capital needs of the first year in the second.

It is not usually necessary to prepare cash flow projections for projects with one simple activity, or for very small projects. However, for those with multiple activities, or for larger projects, they are usually essential. In any case, RuralInvest provides a completely automated cash flow projection, so the monthly cash flow chart is generated directly once the data on costs and expenses have been entered for each block.

ACTIVITY	COSTS AND INCOME BY ACTIVITY OR BLOCK											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dic
Tomato: Costs per month		125	125	125	125							
Income per month					400	400						
Squash: Costs per month					100	100	100	50				
Income per month								600				
Beans: Costs per month	50								50	50	50	50
Income per month		150	150	150								
Montly balance	0	-125	-125	-125	-225	300	300	-50	550	-50	-50	-50
cumulative total	0	-125	-250	-375	-600	-300	0	-50	500	450	400	350

Chapter VII

FINANCING THE INVESTMENT



VII FINANCING THE INVESTMENT

Although there are a number of rural investment funds directed solely at non-profit investments, the majority of financing provided to communities and individual applicants in the rural sector also contemplate the financing of activities that generate income; that is to say, profit-oriented activities. Although they might receive subsidies, investments in income generating projects almost always require that the recipient(s) accept part of the cost of the investment in the form of a loan.

In this section, we characterize the different needs for reimbursable (or repayable) financing and discuss the loan features that can influence the cost of financing.

A. Credit Requirements

Credit or loans are required to finance two basic costs, and can be calculated as follows:

- Investment Loans: The total cost of the investment less (i) any grant funds offered by the supporting agency; (ii) donations from other sources (e.g. NGOs, government, churches etc.), and (iii) personal resources provided by the applicants.
- Working Capital: Funds to cover operating expenses (as defined in Chapter 6) less donations and personal resources.

The availability of donated funds will depend on the supporting agency and its resources. In many cases, in addition to covering the cost of the field technicians assisting in the preparation of the investment proposal, grant funds are also available to reduce or eliminate the cost to the applicants of human resources and systems development (training, designing accounting systems, etc.) and for environmental studies and mitigation measures. In some cases, a supporting agency may offer grants or subsidies for investments in what are called 'common goods' – that is items that can be used by a wide range of people, such as access roads, water collection works, etc. Less frequently, a supporting agency might subsidize the cost of productive investments or working capital for the operation of these investments.

One warning about the excessive use of donations and subsidies: Although they might appear to be very attractive to the applicant, he or she must be careful to ensure that ***the product would continue to be feasible or profitable even if these grants or subsidies were not available***. Why? Because when the time comes to replace the investments, the project may not be able to cover these new costs and can fail. Thus there is a real risk of undertaking an unsustainable project.

Although the question of financial feasibility tends to apply more to income generating projects than to social or environmental investments, it should not be forgotten in these cases, either. For these non-income generating projects, donations frequently cover most, if not all, the investment cost. When the time comes to repair the roof, or replace the furniture, there are simply no resources available to cover the cost.

A certain level of personal contribution on the part of the applicants is important, and is generally required by the financial agency. A significant contribution of personal or community capital (in cash or kind) demonstrates the borrower's commitment to the project, and insures that, if it fails, the borrower will also suffer from the loss of his or her own capital.

1. Financing for investment

Investment financing normally occurs through single credit with a loan duration of 4 to 5 years or longer. Typically, in small and medium sized projects, a single loan is obtained to cover the total amount. However, in larger projects, it may be wise to split the cost of the investment into two amounts, especially if land is purchased. One loan can cover either land or other long term investments with long life spans (structures, heavy machinery, etc.). The second can be used for investments with short to medium life spans (vehicles, electronic equipment, etc.). On this basis, two loans would be requested, each with a different payback period, and probably interest rate.

It may also be the case that the financing agency imposes limitations regarding the type of items that it will consider, (for example, it might not allow loans to finance the purchase of vehicles). In this case it might be useful to divide the financing into two parts: the majority of the costs to be financed would be covered by the supporting agency, while alternative sources (e.g. commercial bank, cooperative, savings and loan association, etc.) would be sought for the financing of the excluded items.

2. Financing working capital

Loans for financing working capital are always short term. They may be 'rolled over', or renewed, from one year to the next but are rarely extended

beyond one year. Thus, if there is a need to continue to use external financing for working capital in the second year, it would be more customary to pay off the current year's loan at the end of the year, and then obtain a fresh one for the following year.

This short term nature of working capital loans affects the way that the loan is recorded in the accounts of the project. Given that the loan is both ***received*** and then ***paid back*** within the same year, ***the only element of a working capital loan that appears in the annual accounts is the interest cost of the loan***. The actual loan amount will neither appear as an income nor as an outstanding capital debt as would be the case for an investment loan – only the interest payment remains. This is illustrated below in comparison with an investment loan.

Amounts	Loan Investment	Working Capital
Borrowed at the beginning of the year	$ 2,000	$ 200
Principal repaid at the end of the year	$ 400	$ 200
Interest paid (at 10%)	$ 200	$ 20
Principal outstanding	$ 1,600	$ 0

B. Loan Characteristics

It is impossible to carry out a financial analysis of an investment without defining some of the key characteristics of the loans involved. Among these features, the most important are the interest rate, the grace period and the duration of the loan.

a) Interest rate

Interest rates will be determined by the financial agency that supports the investment. In some cases, these rates will be subsidized. Normally, the interest rate for a medium or long term loan (for investment) will be different from the rate for a short term loan (working capital). As RuralInvest works with constant costs and prices, real – rather than nominal – interest rates should be used for medium and long term loans. The importance of this, and why it is done, is discussed in more detail later in this Chapter.

b) Grace period

A grace period is the time during which the borrower need not make payments on his loan. It is common for even commercial banks to offer grace periods for medium and long term loans, but it is rare for them to do so for short term credit.

There are two types of grace period. The first refers only to the payment of the loan capital. This is the most common. During the grace period on principal, interest is fully paid by the borrower but the principal (or capital amount) remains untouched. Thus after one year, the borrower owes the same amount as at the beginning. The second type of grace period refers to interest. In this case, the interest is not paid, but instead is added to the principal, **thereby increasing the total amount of the loan**. Grace periods on interest are less common than on the principal and, if offered, tend to be shorter. A bank or other lender may, however, offer to provide six months or one year's grace on interest where it is clear that no income will be generated in the first months of the project.

It is important to understand that neither of these two types of grace period signify the forgiveness of any part of the loan. They only postpone payment, and where interest payments are not made, will actually increase the size of the debt.

FINANCING THE PURCHASE OF A COMPUTER

The managers of a small business finally decide that the time has come when they can no longer survive without a computer to keep their accounts straight and to prepare their invoices. They determine that a computer (with its printer, software and other necessities) will cost an equivalent of US$5,000. They estimate that the equipment will have a useful life span of 4 years and will have no significant resale value at the end of its life. If the rate of interest on the loan is 10% per year, what will be the impact of taking out a US$5,000 loan for 2, 4, or 6 years?

	2 years	4 years	6 years
Annual Payment:	2,881	1,577	1,148
Total Payment:	5,762	6,309	6,888

You can see that the annual payment is almost double for the two year loan compared to the four year package; that is, although the total cost of the loan for 4 years is US$547 more than that of the 2 year loan (because interest is paid over a longer time period), the annual cost is US$1,300 less. The 6 year loan is even cheaper in annual terms: only US$1,148. However, at the end of the fourth year, when the computer must be replaced, the company will still owe US$2,300 and must now also finance the cost of replacement.

c) Duration of the loan

The ideal loan is one that lasts just as long as the item being financed. However, in real life, loans are used to buy a series of goods, each with its own life span. So, you must define a period that covers the majority of the investments; especially the most important of them, in terms of cost.

If the loan has a shorter term than the life of the article being purchased, the project will have to find a larger amount each year in order to pay it off quickly. However, if the loan lasts longer than the item, the project could find itself in a position where it is starting a new loan to finance a replacement, while it has still not yet finished paying off the original loan (see box).

In any case, the life of a loan for investments should not be longer than the period of analysis of the project. If the nature of the goods and the project itself justify a 20 year loan, then it is necessary to analyse a period of 20 years.

C. The Changing Value of Money over Time

As we mentioned earlier, a possible definition of a project is "an investment today in order to generate a flow of benefits in the future". However, this difference in time – the investment today and the benefits tomorrow – causes complications. We all recognize the fact that something received in the future is worth less than the same thing received right now. For this reason, it is not possible to say that a project is feasible simply because its future income is greater than the present investment. Everything depends on the relative value of the money (or other benefits) today and in the future.

Below, we will consider the impact of time on the value of money and describe how to take this fact into account when analysing an investment.

1. Inflation and Future Value

When we speak of the difference between money today and in the future, many people immediately think of inflation.

It is true that when there is inflation, the future value of money is less, as a consequence of the rise in prices. However, ***the methodology used by RuralInvest attempts to eliminate the impact of inflation by calculating all of the elements of the project in terms of constant prices***. That is to say, it is assumed in the analysis that the prices of all goods, inputs, labour, products, etc. will stay the same during all of the years analysed. Thus, if a day of work in the workshop or school costs $2.50 in the first year, it will cost $2.50 throughout the period of the analysis, even if it is 20 years.

How is it possible to do this? The answer is that although it is probable that the **costs** will rise with the passing of the years, the **prices** received for the sale of the products will also rise. So the rise in costs will balance out the increase in income, and there will not be a significant distortion in the results[12]. Excluding inflation from the calculation eliminates the need to calculate new costs and prices for each year of the analysis, an exercise that may well be justifiable in projects involving multi-millions, but not in small or medium sized investments.

However, inflation is not the only factor that makes something in the future less valuable than today, and entices us all to prefer something now than in an uncertain future.

According to *The Economist* magazine, prices in Europe in 1914, at the beginning of the First World War were not, on the average, higher than they were in the 17th Century; that is in 200 years there had been no inflation. But the banks in Europe continued offering positive interest rates for deposits during this entire period, although often no more than 2 or 3% per annum. So, even without inflation, people demanded some compensation (the interest rate) for waiting until the future to have their funds.

Below we discuss what factors influence interest rates in the absence of inflation.

2. Constant Prices and the Real Interest Rate

If constant prices are to be used for inputs and products, they should also be used for the cost of money; that is, the interest rate, as interest rates are heavily influenced by inflation, both actual and expected. For medium and long term loans, therefore, the model used by RuralInvest deducts the current inflation rate from the 'nominal' interest rate (that is the one paid by the client), thereby leaving a "constant" or "real" interest rate.

The question of real interest rates on loans is the area which presents RuralInvest users more difficulties than perhaps any other. To understand how inflation affects the interest rate, let us consider the different elements that combine to determine the rate charged by a lender (bank, cooperative, project, etc.):

a) **The initial cost of the funds**: the price that a bank or other lender pays the deposit holders whose money they use;

b) **The cost of administering the loan**: this is commonly the highest cost for small loans, as

12 In fact, in the absence of very different inflation rates among the different elements of the project, probably the most important impact in using constant prices found in the underestimation of the needs for working capital.

it takes almost the same time to process a loan for $500 as it does for $500,000;

c) **The risk of loss or delays in payment**: this varies with the kind of security offered by the client and how well the bank knows the client;

d) **The profit margin required by the bank**: the part of the loan cost that generates profits for the bank.

Expectations concerning the inflation rate over the life of the loan clearly influences at least two of these elements – the cost of funds and the bank's profit margin. To compensate for any decrease in the value of funds due to inflation (either the bank's own funds or those of its depositors), the bank will have to increase these two elements, increasing the overall interest rate.

Where inflation rates are significant, there can be a major difference between nominal and real rates. In fact at very high inflation rates, real interest rates will often drop below zero, because it takes some time for people to believe that inflation will stay so high into the future.

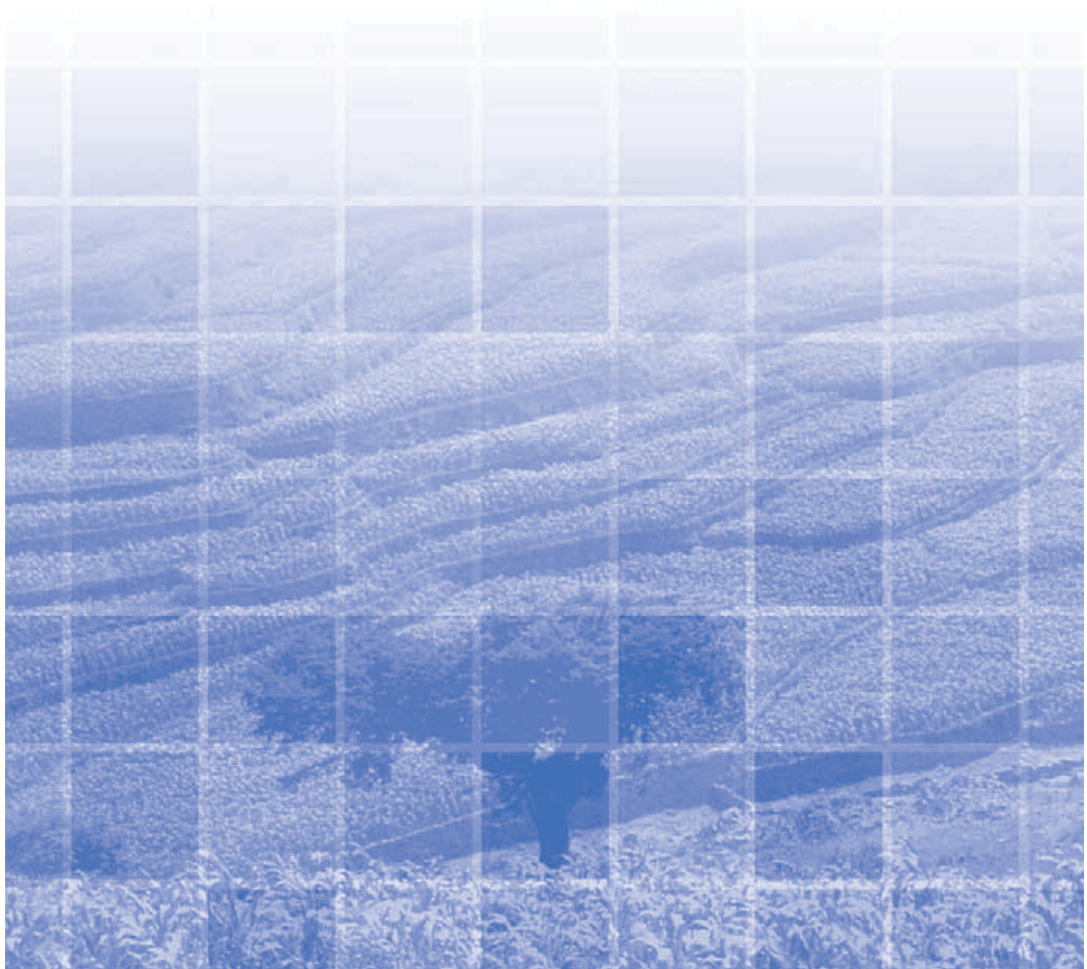
It is very important to be clear about one thing. The use of a 'real' interest rate (that is one that excludes inflation) helps us to determine the underlying feasibility of the project – ***it does not tell us how much the project will pay every month or year to the financing agency***. That is not its purpose, although a user can get some idea of these actual payments by setting the inflation level to zero in the RuralInvest software. This will force the computer to make the 'nominal' interest rate equal to the 'real' rate, and the payments calculated will be thus be at the nominal rate.

Even if the nominal rate is used, however, extreme care must be taken in assuming (or even worse, telling the applicants) that the amounts calculated by RuralInvest are those that the project will pay once underway. This is because there are many ways to schedule repayments, as well as to incorporate associated loan charges. For example, while it is common to equalize payments over the life of the loan (as is done with mortgages and in RuralInvest), this is not essential, and some lenders will vary payments according to the amount outstanding, which will mean high payments in the early years. Still others will 'balloon' payments at the end, resulting in low costs early on, but high costs towards the end of the loan period. All involve the same interest rates, but result in a quite different pattern of payments. In a similar manner, some agencies will charge cash for loan services, while others will add them to the loan amount, or to the early payments, and so forth. Thus, ***the loan payments calculated in RuralInvest are not a good guide to actual payments that will be faced by a project***.

In theory, the same method of eliminating inflation could be used for working capital, but the relation between constant prices and real interest rates is less clear over short periods, because some prices respond more quickly than others. For this reason, in the case of less-than-one-year loans, the models use current interest rates, which give us a higher cost than necessary; but it is considered better to take a conservative position.

Chapter VIII

ORGANIZATION AND MANAGEMENT OF THE INVESTMENT



VIII ORGANIZATION AND MANAGEMENT OF THE INVESTMENT

The organizational and managerial aspects of an investment proposal constitute an area that rarely receives the attention it deserves. The majority of effort is generally dedicated to financial and technical factors, and very little time is spent on defining an appropriate and effective managerial structure. As a result, many small and medium investments - especially those that are owned by groups or communities - fail because of problems of control or management.

Rural communities typically do not have many people with management and business administration experience, and it is risky to assume that these are functions that will solve themselves, or that their definition can be left for the stage of project execution. Below, we discuss the three most important factors determining project organization and management:

a) the ownership structure

b) supervision and oversight

c) daily management

There is also a brief discussion on the use of technical assistance by the management team.

A. Ownership Structure

The first task that is encountered in determining the organizational and managerial model for an investment is the choice of its ownership structure. Typically, there are several available options, including both informal and formal structures. However, the decision depends to a great extent on whether the operation or investment will be carried out by a single person or family or by a group of persons or families.

1. Individual Owners

In the case of an investment made by an individual, or a single family, the principal decision concerns the necessity and usefulness of formalizing the legal status of the activity by registering it as a corporation.

This manual offers no guidelines on legal aspects, mainly due to the number of countries in which it may be utilized. It is therefore the responsibility of the people in charge of the process of formulation and evaluation of the investment to determine what the legal requirements are, as well as the advantages and disadvantages of registering a small business in each specific case.

In broad terms, however, formal registration of a project as a company may bring some of the following benefits:

a) It can facilitate access to formal sources of credit (banks, etc.) as well as government programs that support small enterprises;

b) It will often permit the business to reclaim value added taxes (VAT) on goods and services purchased;

c) It may help employees to access state medical insurance and social welfare programs;

d) It may give the company the right to import certain products (for example, packaging materials and inputs) tax-free, in those cases where the end product is destined for export.

Among the possible disadvantages of registration are:

a) Bureaucratic red tape, which is frequently time consuming and frustrating;

b) The need to maintain a variety of records and documents in order to comply with legal requirements;

c) Responsibility for collecting VAT on sales and remitting it to the fiscal authorities;

d) The possibility of attracting more attention from the tax authorities

2. Multiple Owners

When dealing with an activity that involves a group of persons, or an entire community, further options can be added to those discussed in individual investments (informal and company). The most common alternative is the use of a cooperative structure, although some countries also offer other types of ownership for groups.

It is not recommended that cooperatives be founded for the explicit purpose of managing an investment. A successful cooperative is the result of a series of developments involving a number of community efforts. A process of maturation and learning is required before a cooperative can successfully take on the responsibility for directing and controlling a project of significant size. However, if the community already has an active and well managed coop, this may be the most attractive solution.

Nevertheless, in spite of all their ideals, in many countries cooperatives have had a disappointing

history, and most success stories appear to result from the efforts and dedication of a single dynamic individual. If a cooperative structure is considered, therefore, it is necessary to insure that there is a firm commitment on the part of its members to make it function adequately.

Should you instead select the corporate structure for a project that belongs to a group or community, certain key decisions must be made regarding the nature of the corporation, and it is highly recommended that a lawyer be consulted if possible to ensure that the options available are clearly understood.

One possibility is to issue shares to all of the participants, in much the same way that a company on the stock exchange does. At the end of the year, the company will distribute any earnings according to the number and distribution of its shares. In this case, however, the right of the shareholders to sell their shares (and to whom), and the requirement that they actively participate in the project must be established from the very beginning. For example, if a community corporation is used as a marketing channel for products derived from only some villagers, it may be considered important that these participants have the right to increase their shares in comparison to those of non-participants.

B. Supervision and Oversight

Any project or operation that manages significant resources, and represents the interests of more than two persons, requires some form of board or supervisory committee. Obviously, the size and responsibility of such a group depends on the scale of the project.

If a small group of families establishes an operation involving 5 workers, there is no need for a Board of Directors with 12 members that meets every month. However, even a small operation, or one that only performs one task (for example, selling the agricultural product of the member families), needs some kind of oversight. If this doesn't exist, the enterprise runs the risk of misuse of funds or resources by the person or persons that administer it.

In the case of relatively small groups, it is possible that everyone involved can participate in the duties of direction and general follow-up of the activity.

When dealing with larger groups, however, it is necessary to rely instead on the formation of a board or steering committee. Such a Board will require bye-laws, which define matters such as:

a) How many people constitute a committee? We recommend a minimum of 5 and a maximum of 8 or 9 persons

b) How much time can each person serve as a member of the board or committee? There may be no limits, but frequently a maximum of two or three years is appropriate.

c) Should the duties of the President, the secretary and the treasurer be defined? This is generally not recommended, except for the smallest of committees.

d) How often should they meet? This could be monthly, quarterly or even every six months, according to the scale of the operation and the complexity of its operations.

e) How frequently should the Board present their report to the other members? It is advisable to do so once a year.

The supervision of the project can be as important regarding what it does not do, as for what it does do. While a Board of Directors or any supervisory committee should play an important role in monitoring the progress of the project and the strategic decision making process, it is not an adequate forum for making managerial decisions (and even less so when supervision is the responsibility of all of the participants). Many projects have been destroyed by boards and supervisory committees that obstruct the manager from fulfilling his responsibilities.

The by-laws of the company, cooperative or group, in addition to defining the structure of the board or supervisory committee should specify the following:

a) Areas of responsibility of the Director's Committee:

- Hiring (and firing) the manager or person in charge of the day to day decisions;
- Review and approve the bi-annual or annual accounts of the project;
- Make decisions regarding the bookkeeping method for the project accounts, and the use (if any) of auditors;
- Strategic decisions, such as: types of activities to be carried out; approval of significant investments and possibly, the determination of employee salaries.
- Call general annual or extra-ordinary meetings.
- Make decisions concerning the contracting of external experts to review or assist the operations of the project

- Establish general procedures for selecting suppliers, contracting personnel and carrying out other similar activities.

b) Areas normally out of the competence of the Director's Committee:

- Making decisions on production levels (within the range determined by staffing levels and equipment capacity);
- Buying and selling input materials and products (including the determination of prices and the selection of markets);
- Administrative activities, such as keeping records, dealing with bills, invoices and receivables, and relations with clients and suppliers;
- Personnel selection (within agreed upon staffing levels).

It is important that the Board or Steering Committee allow the manager of the operation to manage the activity according to his or her criteria, and not attempt to dictate day-to-day decisions. If the committee lacks confidence in the manager, it must refuse to renew their contract at the end of the agreed term and seek a replacement. By revoking or changing management decisions, they only destroy the manager's ability to run the project in an efficient manner.

Only when the committee finds (or suspects) the manager guilty of illegal activities, or activities contrary to the previously established and agreed upon guidelines, should there be grounds for a direct intervention in the activities of the operation. Even in this case, it is recommended that the Board or steering committee seek the approval of an extra-ordinary general assembly before acting.

C. Daily Management

Once the structure and the mandate of the supervisory and oversight group have been determined, project management and administration needs should be defined.

The smallest of projects may need no more than one person, responsible for all tasks in both areas. However, it would be a false economy to place all of the responsibility on one person when the project generates significant costs and income.

A common combination for a small project is a general manager backed up by a bookkeeper. This second person may also carry out the duties of secretary. In a larger operation, the following positions may supplement the general manager, according to the types of activities carried out. One of these positions may be the particular responsibility of the general manager:

- Field manager: in charge of field operations including raw materials and inputs production or procurement;
- Plant manager: responsible for all operations within the facility, including processing, packaging, storage etc.;
- Sales manager: responsible for all marketing of the finished product;
- Financial manager/Accountant: Responsible for maintaining project accounts, dealing with banks and managing payments and receivables;
- Personnel officer: responsible for managing employees including labourers, field hands, secretaries, technicians and administrative staff;
- Foremen: supervision of routine labours in the field or in the production process.

Nevertheless, only a very large operation could justify filling all of the positions described above. Remember: these positions represent fixed costs. In other words, costs that are paid regardless of the volume of production. Furthermore, although each additional person in management has no direct impact on the volume of production, they do increase the general expenses (telephone, office supplies, office space requirements, etc.) Extreme caution is therefore needed in defining a large managerial structure.

Among the areas covered by the general manager's mandate and which he/she may delegate to his assistant managers, the following are worth noting:

- Decisions on the daily production volume or the combination of products to produce;
- Decisions on planting or harvest dates, or the beginning of seasonal operations;
- The selection of supply sources for raw materials and inputs and the price to be paid (in some cases, according to guidelines laid down by the management committee);
- The selection of markets, timing of supply, and the decision over sale prices;
- The determination of the number of employees needed and their selection, frequently within the limits set by the supervisory committee

- Approval of normal expenses, such as office supplies, fuel purchases, electricity, water, maintenance, etc.

D. Technical Assistance and Managerial Support

The demands of management and administration of a business or other rural activity are frequently beyond the capabilities and experience of the participants. In order to bolster this area, it may be worth considering three broad levels of external support.

A project might require one or more of the following types of assistance, at least during the first years of its operation.

1. Professional Full-time Managers

This option is recommended when dealing with a fairly complicated operation or which involves technical activities that are very demanding on the participants and for which they have little prior experience. A common example might be a food processing operation, such as cheese or juices, where poor quality can not be tolerated. It is rare that a project, except in the case of the largest, need more than one outside manager

In some cases, it may be that the community or the investors have technical capability, but no administrative abilities, or that the marketing process calls for a highly experienced expert. As a result, it is not always the general manager post that is the position to be filled, an external accountant, plant manager or sales manager being more valuable.

When using an external manager, it is recommended that his or her contract be for a long enough period to allow the business or activity to become established on a firm base. This could be for a minimum of two or three years, with the right of earlier termination, in case the investment fails to meet determined levels of volume, sales or other indicators. In addition, it must be made clear from the outset that the position is not permanent, and that the manager must train one or more assistants from the community or group, who can eventually replace him.

In addition to the right to terminate the contract, it is also suggested that the rewards of the job (salary, benefits) be linked to the performance of the business. For example, a moderate basic salary plus a portion of yearly profits, which will yield a good income if the project performs well.

The cost of an experienced, successful manager can be substantial. It is, therefore, not often feasible to employ one on a small project, where the earnings are insufficient to cover their cost and leave some profits for the owners/participants. Nor should a full-time manager be used for social or environmental investments (which generate little or no income) unless an NGO, international donor or state agency is willing to guarantee financing the position.

2. Management Consulting and Periodical Administration

In cases in which the size or complexity of the operation does not justify contracting full-time experts, serious consideration may be given to using a periodic consulting or advisory service. As a minimum, a small or medium sized investment could benefit in the following areas:

- Financial systems: Help is often needed to establish and train staff in the operation of the accounting system, including periodic follow-up visits to review the financial accounts. For medium size or larger projects, it is recommended that professionally qualified persons be used and that the operating rules call for a certified accountant to carry out one – or better yet – two inspections of the financial accounts per year.
- Strategic Planning: Assistance in this area can provide significant support for the Board or supervisory committee and the management in the preparation, execution and monitoring of a coherent plan for the growth and development of the operation, including decisions about the goals, changes in the activities themselves and new investments. This type of support normally need be no more frequent than once a year, and is frequently undertaken at longer intervals (every two to five years).
- Marketing: Consultants or advisors familiar with the product can carry out an evaluation of the existing markets, identify potential new markets, and draw attention to the need to modify the product (or some aspect of its presentation) in order to improve its market position. Again, unless the operation is facing a crisis, assessment in this area is not recommended more than once every two or three years.
- Technical processes: Support may be needed for overall product quality control, solving specific problems, and reviewing technical procedures. Generally, this type of support is particularly useful during the first 12 to 24 months of the operation, but it may continue, on a reduced scale (half-yearly visits) indefinitely, particularly if the

specialist(s) bring knowledge of developments in other countries or markets which the project management is not familiar with.

- General Management: This is most often required when the inexperienced manager of a small investment does not know where to look for help in solving the problems that he encounters. It may, in fact, be difficult to distinguish whether a problem is bad enough to justify calling upon external assistance. Sometimes a government agency or internationally funded project will cover the cost of having a management expert visit the project on a periodic basis to assess whether the operation is proceeding well.

Whether or not the last of these services is available or utilised, it is very useful to have someone who is available by telephone in an emergency, to advise the manager on how to evaluate a problem and suggest where he can find help, if necessary. The ideal solution is that the person who helped in the evaluation of the investment, that is, the person that applied RuralInvest, stay in contact with the investors beyond the formulation stage to give them support in all of the areas they need. This matter is discussed in the following sub-section.

3. Teaching Skills and Training

With the exception of the smallest investments, it is rare for a project not to have at least some need for training. In the previous sub-sections, we analysed some of the areas where it is often necessary to strengthen the skills of project staff, including those working in accounting systems, financial control, marketing and sales, and strategic planning. Also there might be a need for training the technicians in production processes, packaging, quality control and management of inputs or finished goods, among other areas.

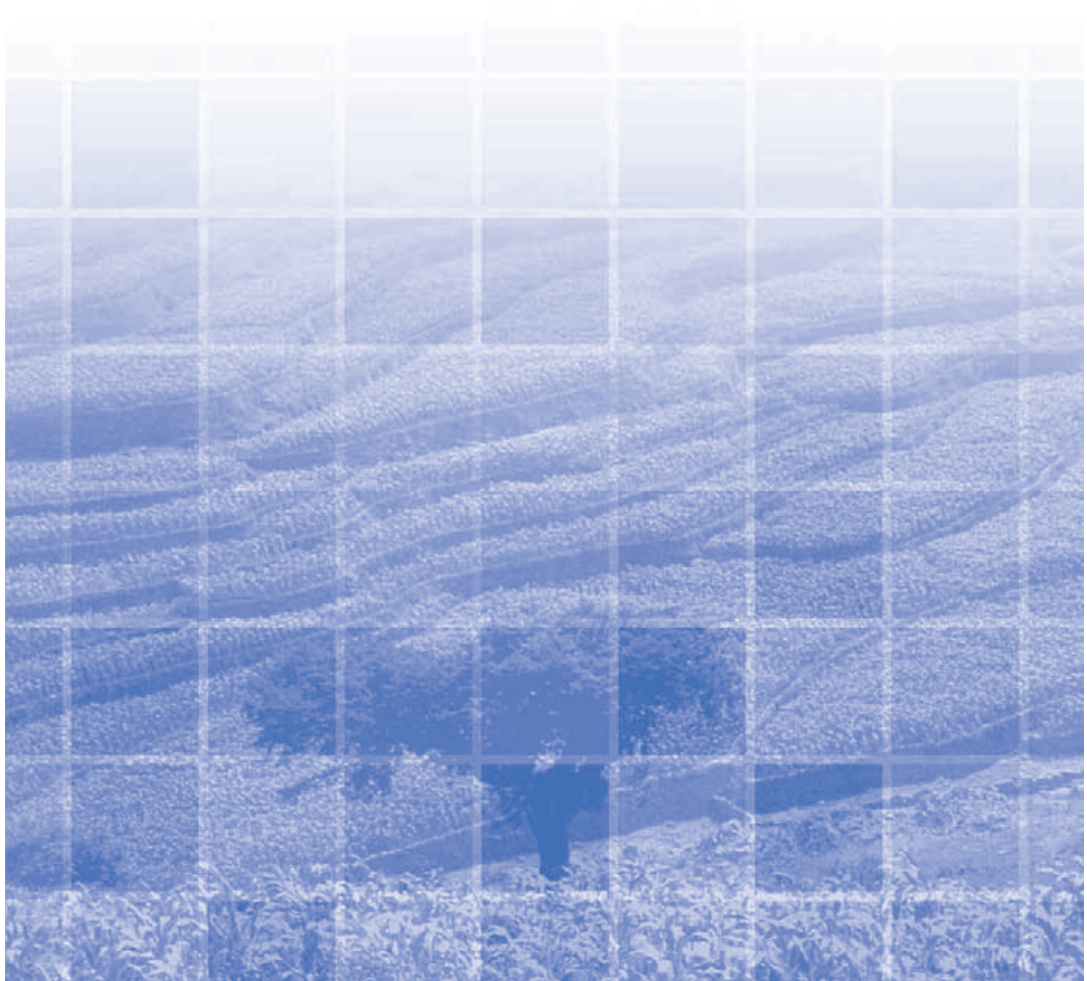
It is not necessary to carry out all training prior to project start-up. In some cases it is preferable to focus training initially only on the areas most critical in getting a process started. Such areas as strategic planning or inventory control can be left for a later date.

It is worthwhile remembering, when programming training activities, that some of the persons being trained will not be available later on, whether because of leaving their jobs, illness, or simply vacations. It is therefore strongly recommended that, where finances and scheduling permit, at least two – and preferably three - persons be sent to each training activity that takes place outside of the actual project, to insure the availability of a second person.

As with the case of technical assistance, it is frequently possible to find grant funds to pay, or at least subsidize, the cost of training for the personnel of small scale investments. If the investment proposal is not linked to a support agency with this type of funds, it is worth contacting the Ministries of Agriculture, Rural Development or Economy, in addition to the NGOs active in matters of rural business development, to see if there are grants or other sources of funds available.

Chapter IX

FINANCIAL ANALYSIS AND THE PREPARATION OF RECOMMENDATIONS



IX FINANCIAL ANALYSIS AND THE PREPARATION OF RECOMMENDATIONS

Financial analysis applies mainly to projects designed to generate income. It is possible to analyse social projects, environmental undertakings or production support activity, by calculating and assigning artificial prices, but such 'economic analysis' is generally far too complex for small or medium scale projects [13].

For income generating projects, the profitability of the activity is the first and most important factor determining sustainability, because no 'comercial' project will survive which does not generate enough income to cover operating expenses and pay financial costs. However, there is more than one way to determine the profitability of an investment. Each approach has its strengths and weaknesses. It is therefore convenient to use more than one method.

It is also important to understand that the figures generated through financial analysis are not very useful on their own; they need to be interpreted. It is the responsibility of the technician who carries out the formulation and evaluation process for the project to explain to the applicants, as well as to the committee reviewing the application for financing, the significance of the results, as well as to combine the profitability calculations with other indicators of likely success and sustainability, such as the capability and commitment of the applicants, the reliability of the market, the complexity of the technology, the environmental impact and the degree of organization of the management.

A. Measurements of the Investment's Feasibility

Once all of the costs and incomes have been determined for the analysis period (whether 8, 12 or 20 years), the following questions should be asked: What measurements will be used to determine the feasibility of the investment, in financial terms? How can we interpret these results?

There are two distinct measurements used in the RuralInvest models for this purpose, each having its advantages and disadvantages. Together they provide a comprehensive vision of the proposed project's feasibility.

1. Annual Cash Flow

The annual cash flow largely avoids the problem of comparing costs in one year with benefits in another year by evaluating costs and incomes each year, using only cash costs and incomes. The cost of the investment enters into this analysis through the payment of the loan taken out to finance it.

The annual cash flow is calculated by adding all cash income from each year and subtracting all cash costs for the same year; the result is the net yearly income. Then subtract the cost of financing (capital and interest) from this result. If the remaining amount is still positive, then the project will generate sufficient income during that year to cover all production costs, as well as the costs of credit, and still leave some amount of profit (the remaining amount).

The annual cash flow is the measure of greatest interest to the potential lender (bank, project, cooperative etc.), as it shows whether the project will be able to generate enough cash to pay all costs and still meet the financing costs. It is also typically the measure most easily understood by the applicants themselves, although they should understand that by taking only cash, this approach can miss out important costs and benefits that are not in cash terms.

2. Financial Profitability

The cash flow measurement represents only a snap-shot of the cash position each year; it does not offer an overall evaluation of the project. It is therefore not very useful for comparing different projects, or for assessing a project against some form of benchmark. If a government, a development project or even the applicant himself or herself wishes to choose the most productive use for available funds, they will need a different measurement This requires an evaluation of the financial profitability of the project.

A financial analysis takes the results of all of the years under study and presents them in terms of a single figure. However, to achieve this objective, the methodology must take the decreasing value of money and the general benefits that occur with the passage of time into account. How should this analysis be carried out?

We will use the following as an example: If a person were offered the opportunity to invest in a project in which the expense is US$1,000 today, but which generates an income of US$2,000 tomorrow, there are few who would hesitate (assuming faith in the honesty of the project managers). However, if the offer instead is an

13 The prices calculated under economic analysis not only provide values for those inputs and products that have no market prices, but also frequently adjust market prices which do not adequately reflect the true value of the good or service (due, for example, to taxes, protective measures, or minimum wage levels).

investment of US$1,000 to earn US$1,001 in 5 years, there would be no takers. The question, therefore, is to decide: What rate of return will make it worth while to invest in a project? In other words, what rate of return represents a favourable investment and good use of the available resources?

There are two main measurements that attempt to respond to this question: Net Present Value (NPV) and Internal Rate of Return (IRR). Both have several key elements in common:

- They charge the total cost of the investment in the year in which it takes place, so that the financing method and cost do not affect the result of the analysis. Remember, **the purpose of the analysis is to identify a good project, not to select the best financing option**.
- They both include the value of the main project assets at the end of the analysis period (such as buildings, machinery and other substantial items). These are not in cash, of course, and so are excluded from the annual cash flow analysis, but they are of value and should not be forgotten.
- They both place a value on self supply (e.g. unpaid family labour) and auto-consumption (outputs used or consumed but not paid for in cash).
- They adjust the value of future benefits in such a way that a US$1 today is worth more than a US$1 in one year, which in turn, will be worth more than a US$1 in two years, etc. This process is called discounting the future benefits in comparison to benefits today.

a) Net Present Value

The simplest measurement is Net Present Value (NPV). After calculating the net annual income for each year (as in the annual cash flow, but with the differences noted above), a discount rate is applied to reduce the value of both net benefits and losses in future years. Remember that a discount rate is the opposite of an interest rate. If I have $1, an interest rate of 10% will give me $1.10 in one year. By the same token, a discount rate of 10% will mean that $1.10 received a year from now is worth only $1 today (its present value). So, the NPV is a figure that represents the value of the project after discounting the net future benefits.

If for example I require an 8% interest rate on my money, then applying an 8% discount rate to the

NPV CALCULATION (Discount rate = 8%)	YEAR						
	0	1	2	3	4	5	6
Net income generated by project in Year 6:							50
Year 6 net income discounted to Year 5:						46.30	
Net income generated by project in Year 5:						+50	
Total net income in 5th year						96	
Year 5 net income discounted to Year 4:					89.16		
Net income generated by project in Year 4:					+50		
Total net income in 4th year					139.16		
Year 4 net income discounted to Year 3:				128.85			
Net income generated by project in Year 3:				+50			
Total net income in 3th year				178.85			
Year 3 net income discounted to Year 2:			165.61				
Net income generated by project in Year 2:			+50				
Total net income in 2nd year			215.61				
Year 2 net income discounted to Year 1:		199.64					
Net income generated by project in Year 1:		+50					
Total net income in 1st year		249.64					
Total Earnings		249.64					
Initial Investment		250.00					
Net Present Value:	-0.34	-0.36					

future net benefits of a project will ensure that I get that return. If the amount left (the NPV) is 0, the project is generating exactly the 8% required. If the NPV is positive, I have obtained my required rate (the 8%) and have that sum as a bonus. When the NPV is negative, it means that the investment cannot yield the expected 8%; it would have to earn (after discounting) an additional amount equivalent to the NPV amount to reach break-even.

For example, let us imagine that a project in which an investment of $250 results in six years of benefits of $50 each year, or a total of $300 (see previous page). It would appear that there is a profit of $50. But this is true only if you do not take the time-value of money into account. If instead you apply an 8% discount rate you can see that, in reality, the project is not very attractive. The NPV of the $250 investment is -$0.34. That is to say, if you require an investment to yield an 8% interest rate, it fails to meet this goal by an amount of $0.34.

Clearly, the critical aspect of the calculation of NPV is the selection of the discount rate (or interest rate). A high rate will result in the rejection of more projects and will favour those projects that generate their earnings in the first years. A low discount rate will normally result in acceptance of more projects and will give more weight to the benefits generated in the more distant future.

But, how do you choose the discount rate? The most correct definition, as stated by the World Bank, is that it is the rate equal to the increase in the Gross Domestic Product (GDP) resulting from the investment of one additional dollar in a given country. So if a dollar causes an increase of US$1.07 in the GDP of the country in which you live, the discount rate should be 7% - because then your investment will be equal to or better than the average for the economy as a whole. Such a definition, however, is easier said than measured, because there is no easy way of making the necessary calculation.

For practical purposes, it is better to say that the discount rate is the rate of annual net earnings (excluding inflation) that is required for an investment to be worth the effort. However, this rate will not remain the same for all investors or all investments. It will depend greatly on the alternatives that are available and, even more, on the risks that the project faces. An investor in a big solid bank would probably require a lower discount rate on future earnings than someone putting money into a petroleum exploration company, where rewards can be high but bankruptcy is always a possibility.

It has become customary in many cases to use 8%, but any figure between 6% and 12% would be acceptable. However, remember that investments with high levels of risk need a higher rate of return, and that if few other uses can be identified for the available funds, it might be acceptable to lower the rate.

b) Internal Rate of Return

The Internal Rate of Return (IRR)[14] uses a methodology very similar to that of the NPV. The key difference is that, in using the IRR, one is asking what discount rate (or interest rate) will this investment support? If the IRR is 15%, that means that the initial investment will yield an interest rate of 15% over the life of the project.

Calculating the IRR is tricky, as one must first guess at the IRR, then run the NPV calculation and see if the resulting NPV is positive or negative. The estimated IRR is then adjusted (up if the NPV is positive, down if it is negative) and the calculation repeated again. This goes on until the NPV reaches exactly zero. This then is the IRR.

Making these calculations used to be a most tedious procedure, but nowadays the computer has made it easy, doing in a second what the analyst might have taken many minutes to do a few years ago.

B. The Impact of Taxes

The RuralInvest methodology places little emphasis on the calculation of taxes, especially on those related to income. Although these taxes may prove important in well established and successful projects (for example, in the case of an agro-industrial plant), they are irrelevant for the determination of the feasibility of small investments. The problem that these projects face is more one of survival than estimating taxes on earnings.

When dealing with other types of taxes (for example, property taxes) the RuralInvest methodology considers them simply as other indirect or general costs and they should be included in the tables for these costs.

C. Preparation of Recommendations

A blind faith in the results of a financial analysis, as a guide to the approval of an investment proposal, is dangerous for the following reasons:

a) A computer can only process the data that is fed into it. Therefore the quality of the calculation generated by the formats depends, to a large extent, on the quality of

14 Also called the Internal Financial Rate of Return, IFRR, to distinguish it from the Internal Economic Rate of Return, IERR

the information provided by the applicants and their support technicians. In the real world, very little information is 100% reliable. Estimations of prices, costs, volumes and duration can be wrong, in spite of the best efforts of the persons involved. So it is important to remember that a financial analysis represents the results ***under the assumptions made by those who supplied the information***.

b) A project that is profitable may be successful, but is in no way **guaranteed** to be a success. Even if the figures used for the calculation are reliable, a project can still fail. Among other factors, problems arising from poorly committed participants, an ineffective management, or unexpected price changes can destroy a profitable project. Therefore, it is vital that you consider all of the factors that may influence the success of the investment, and not only the financial profitability.

How can these risks be recognized and taken into account in presenting the results of the evaluation? First, it is crucial to take advantage of the considerable speed and power of the computer. Once the data have been entered it is very easy to test alternative possibilities without having to repeat all the earlier work. One can immediately see the impact of a change, sometimes by altering a single number. This is called "sensitivity analysis" and its purpose is to indicate how the results of the study will change with small changes in the assumption made.

For example, if a product has an average price of $10, what will happen if the price drops to only $8 If the profit disappears completely (or even becomes a loss), you know that the profitability of the investment depends very closely on the price of the good or service it produces and sells. The same procedure can also be used for a non-profit project. How would the running costs of a community health clinic be affected if the number of patients attending were lower than expected? If the community relies on a standard subsidy per patient from the Ministry of Health, then lower than expected patient numbers might mean the clinic can not meet its overhead costs (nurse, lighting, repairs etc.) and has to close down.

To make a sensitivity analysis, the technician must:

a) Identify those elements of the project for which: (i) doubt exists as to the correct number to use (e.g. should the price be 6, 8 or 10), and (ii) which are expected to be of importance to the project (there might be doubt over the price of paperclips, but it would probably not be worthwhile testing the impact of this change on project performance). Commonly, such elements include: prices of outputs, number of anticipated users, cost of inputs; production volumes, the efficiency of the production process (i.e. how much input is needed to produce 1 kg. of output), the time needed to start-up or yield (in the case, for example, of tree crops) and once production is underway, the time needed to reach the full production level.

b) Determine a likely range of possibilities for each factor. For example, for a price analysis, one might say that, although the average price is $10, the possible range is from $7 to $12.

c) Insert new figures into the RuralInvest computer tables and note the results. The best way of presenting the results is to organize the figures into a chart, demonstrating the profitability of the investment for each factor (price, cost, etc.) with average, pessimistic and optimistic assumptions, but this is not essential.

d) In the transmittal letter that must accompany the detailed analysis, the analyst should identify those factors for which the project is most sensitive and indicate how variations in these factors might change the profitability of the investment, for example:

"Although the proposal to install an irrigation system looks quite profitable, it must be noted that it is very sensitive to variations in the yields of the vegetables grown. If, instead of 12 metric tons per hectare (mt/ha), only 10 mt/ha are obtained, the project becomes marginal. If the yield drops further to 9 mt/ha or less, the investment ceases to be profitable."

e) When a proposal shows high sensitivity to changes in key factors, the technician's report should consider the probability of these variations occurring, for example:

"However, the applicants have extensive experience in growing vegetables and already obtain yields in excess of 12 mt/ha in the few areas where there is now access to water during the summer. The risk of lower than expected yields is not therefore considered to be very high".

The steps described above insure that the people considering the financing proposals have the information that they need to make an informed decision.

With respect to the relative importance of financial and other factors in project success, it is the responsibility of the technician in charge of

formulation and evaluation to carefully consider and identify any other aspect of the proposal that could influence in its feasibility, and not rely solely on the financial analysis. The transmittal letter for the proposal should make reference to the ability of the applicants to manage and administer the investment, to the sustainability of the project, in terms of environmental impact and the utilization of resources and the risks that the investment might encounter.

Remember, you are doing no one a favour by recommending an investment that does not have a good possibility of success. Where the project is financed with credit, a failure can leave a group or community in debt, with no possibility of paying it off (probably restricting its access to financing in the future). Even in the case of a project that only uses donated funds, you must remember that every failure means that there was another good project that was unable to obtain the resources it needed for success.

Investing in an Existing Activity – the Importance of Incremental Costs and Revenues

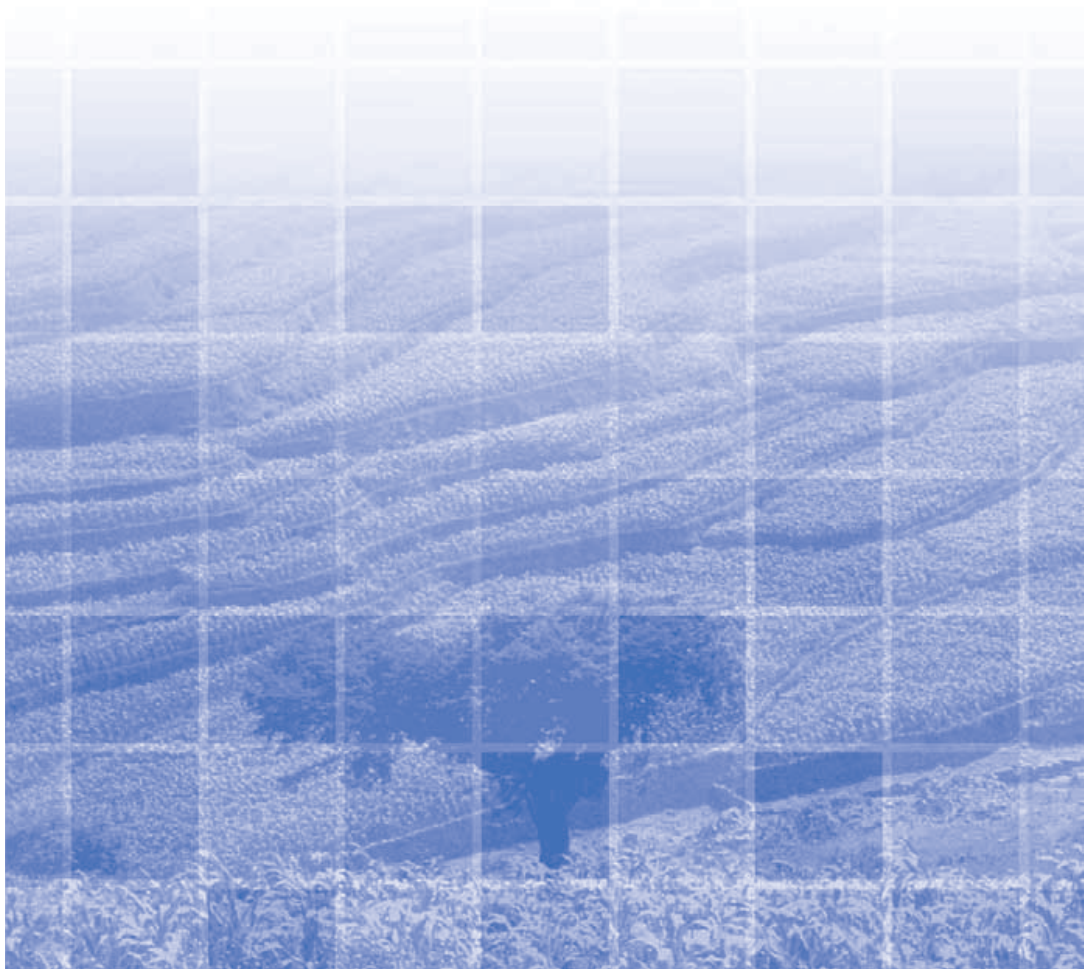
The procedures explained in this chapter largely assume that the proposed investment is completely new, and thus all costs and income will be directly attributable to the project. This is certainly the simplest case. But what if the investment is applied to an earlier, existing activity where there are already costs and revenues? How can the impact of the new investment be properly reflected in the financial analysis? The answer is that, where the proposed investment will give rise to changes in an existing activity, it is necessary to look at costs and revenues both with and without the new project.

Take, for example, the case of a group currently growing melons on a 3 hectare field. They wish to install a pump which will bring water from a nearby stream during the dry season to provide supplemental irrigation. Clearly the cost of purchasing and operating the pump are new costs, but what about the actual production? As more water is available, it may be worthwhile adding more fertilizer and other nutrients, to allow the melon plants to make full use of the new supply. Currently, the group is applying 2.5 bags of fertilizer per hectare, but the group decides to increase this to 3.5 bags if water is available. The incremental fertilizer usage would thus be 1 bag/ha, and the incremental cost would be the price of 3 additional bags (for 3 hectares). Equally, yields are currently 5 tons/ha, but the group is confident that this can be increased to 8 tons/ha with irrigation. Incremental revenue is thus 3 tons per hectare, or 9 tons in total, times the price per ton received for the melons. Other incremental costs incurred by the new project may arise from changes in the amount of seed sown, the increased number of melons to be harvested, and the increased number of bags or boxes needed for packaging.

Remember, if you apply all costs and income anticipated after the new investment, you may well come up with the wrong answer as to the profitability of the additional investment. In the case above, it is important to compare only the incremental costs (the pump and additional fertilizer etc.) with the incremental output of 9 tons of melons. If fuel for the pump is expensive, or if the projected increase in yield is small, it is not impossible that the group would be better of without irrigation, but they can not know unless they use **incremental** costs and revenues.

Chapter X

PREPARATION FOR THE INVESTMENT AND BEYOND



X PREPARATION FOR THE INVESTMENT AND BEYOND

It would be very unfortunate if the support given to a community, group or individual applicant were to end with the presentation of the investment proposal to the financing agency. Although this may have seemed to be the final goal while formulation was underway, in reality it is just the beginning.

Between the formulation of an investment proposal and the actual launching of the project, lie many tasks that are extremely difficult for persons who have no experience in negotiating with bankers, lawyers and government officials, (either municipal or from the central government, as is the case when applying for health permits). Even when these obstacles have all been surpassed, there is still the enormous challenge of making the investment function smoothly. If the group encounters a problem after a few months of operation, where does it go for help?

A. The Importance of Support and Follow-Up

In order to achieve a successfully functioning project, it is vital that the small investors have a reliable and accessible source of support and follow-up during the preparation and start-up period. The best person to provide this support is, without doubt, the same person that helped the group identify and formulate the proposal. If for some reason it is impossible for the field technician to continue with the group, he or she may be replaced by someone else, but some support should always be made available during this critical period. If it is not provided, the entire effort is at risk, because there is a good possibility that the project will never get underway as it was conceived.

Among the most important tasks to be taken care of during this period, are the following.

(a) Helping the applicants to reaffirm their commitment to the project and their participation (especially in the case of community-based projects);

(b) Accompanying the applicants in financial negotiations, the acquisition of legal permits, etc.;

(c) Support in preparing the start-up plan;

(d) Procurement or contracting of goods and services needed in the investment and their installation and supervision;

(e) Follow-up in the execution process.

Below, each of these tasks is described in detail.

B. Reaffirmation of the Commitment of the Applicants

To ensure the applicants' full commitment to the final project, it is first of all necessary to have their active participation throughout the process, starting with identification. As the final design emerges from the formulation process, it is important to verify that the group is both capable and willing to provide its contribution as stipulated in the final design, as and when needed, be it in cash, labour or in the supply of materials. To evaluate this capacity and availability, the technician, working with the applicants, should conduct at least one meeting before presenting the final proposal to the financial agency, to explain it to the applicants and to insure that the final product reflects their intentions and interests.

He or she should conduct an additional meeting, once the formulation and evaluation process is concluded, organized by the members of the applicant group, at his request. One condition that the group must fulfil is attendance and the personal involvement of all adult members (men, and women of the participating families) in the meetings. As a result, they should develop an outline of the plan of execution, which specifies:

- Necessary activities, deadlines and persons responsible for their performance.
- Financial and material contributions by members of the group.

C. Accompanying the Applicants in Financial Negotiations and Seeking Legal Permits.

The field technician, with the approval of the applicant group, should make contact with the financial institutions that collaborate in the process of investment. This could involve periodic consultations with the financing agency on the progress of the proposals in formulation, or may require only a single presentation upon completion of the detailed proposal. However, once the formulation and evaluation phase is completed, the technician is responsible for advising the applicants as to any specific

administrative requisites of the financial agency. This might include, for example, attaching a variety of legal documents relating to the applicants to the investment proposal.

The financing agency may also require the applicants, or at least their selected representatives, to attend a formal meeting for the review of their application, and they should be supported at this meeting by the technician. He or she may also help by gathering information on legal aspects, or assisting them in filling out mandatory forms.

It is possible that the group may need guidance on selecting between alternative financial options.

D. Support in Preparing a Start-up Plan

Whether during the detailed formulation and evaluation phase, or during the resource procurement stage, the field technician, should assist a working group, chosen by the applicant group itself, to prepare a plan for the implementation of the project, based on the investment proposal. This plan must contain:

- Overall guidelines as to the timing and objectives of the implementation process;
- A listing of the specific activities needed and their schedule of implementation;
- The identification of the persons responsible within the applicant group for these activities;
- Any organizations or institutions which have promised to provide technical support in different activities;
- The exact financial and material contributions to be made by members of the group for the different activities, and the timing of these contributions;
- Indicators for monitoring of the implementation process, including book-keeping and measuring physical quantities (where relevant).

It is essential that the groups be provided with adequate training on the administration of funds. Among other tasks, the field technician might advise them on aspects of accounting and general administration. Alternatively, he or she might act as an intermediary in obtaining such assistance from another advisor.

Once the project is underway, the technician will normally only make periodic visits to follow up on the progress of the investment. In particular, it is important to try and identify problems before they cause serious difficulties and help the project members to obtain appropriate advice on how to deal with these problems. In this regard, it is recommended that the agency sponsoring the investment process, keep a register of specialist advisors from governmental and non-governmental institutions to which projects with problems can turn.

Such a register of approved advisors can serve as a powerful tool, by laying down specific requirements for those who wish to offer their services. Those wishing to be listed in the register can be required, for example, to participate in RuralInvest training, and those who perform poorly can be removed from the register (this latter procedure makes it necessary for the work of each advisor to be evaluated by project members). However, the significance of the register can be even more important; having a list of approved experts will allow the sponsoring agency to leave in the hands of the applicant group the selection of the person they want, and thereby, strengthen their participation in the process.

E. Purchase and Contracting of Goods and Services

The financial agency will probably have requirements and standards for the procurement of goods and services, for example, demanding three quotes and a transparent selection process. Even if such established procedures are missing, it is important that the applicants follow a clear process of identifying, evaluating and selecting vendors and service providers. Furthermore, there must be norms for the monitoring and control of the activities carried out by the contractors, including procedures for materials control, register of advances and certification of the time dedicated to the job by the contractor and his team.

F. Follow-Up to the Implementation Process

Each agency or financing project should have its own methodology for the process of follow-up on the implementation of the investment. The important aspect is that it have a methodology. Investments that are begun without some form of follow-up will be more likely to fail, in comparison with those that receive support and advice.

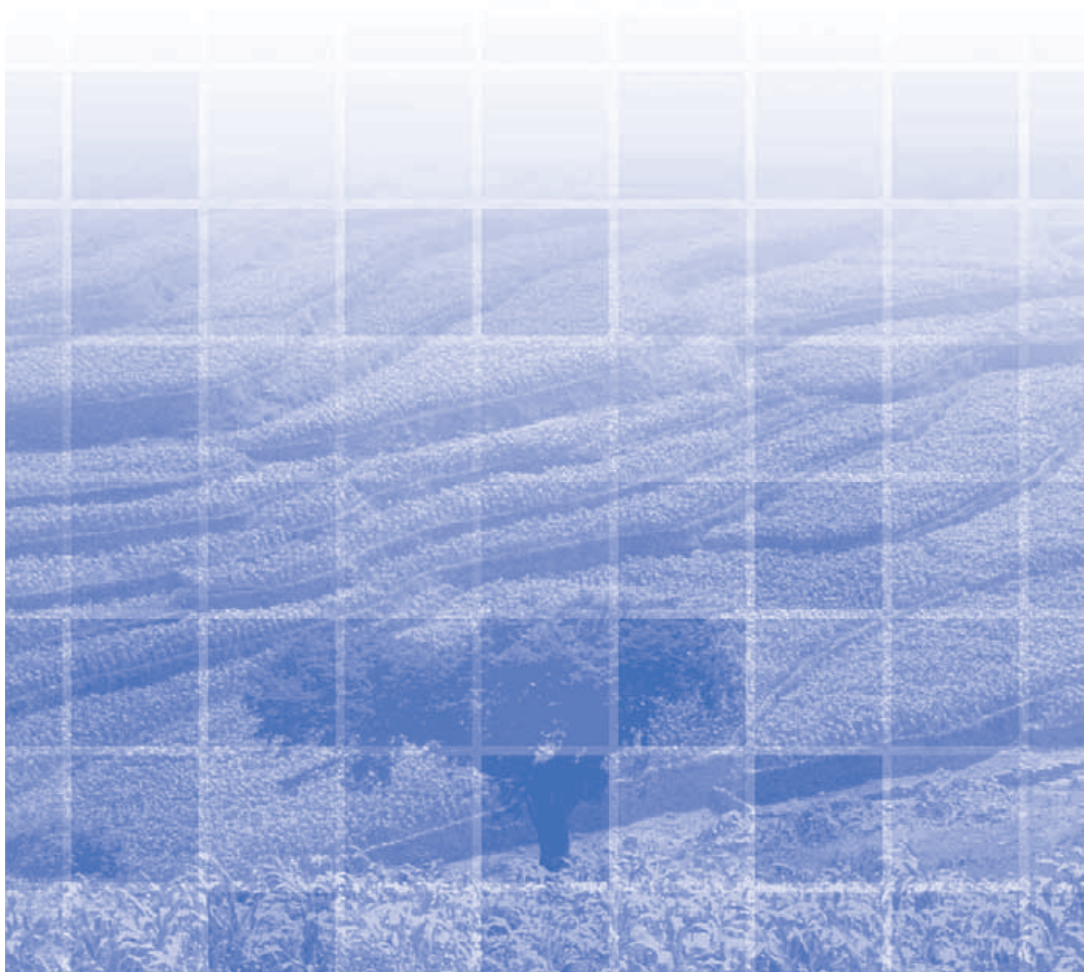
In many cases, project participants will need training in accounting and in the local laws, in matters concerned with taxes, health permits, and social benefits for employees, among other things.

Frequently, project managers will need training in planning, marketing and similar subjects. If the project involves the management of production processes, it is possible that there will be technical problems during the first year of operations.

There are two general models for handling this type of support. The first is to continue with the field technician or community promoter, playing the role of "family doctor"; this means that the technician visits the community or investment every month or six weeks and keeps an eye on the progress of the work. If a problem comes up, it is the responsibility of the technician to request the approval of the financial agency or the sponsor, to use specialized consulting and to select, or to help the investors to choose, the right person for the work required.

The second model, is to contract a local consulting firm, NGO or other group to take on the total responsibility for supporting the project members during a period of one or two years. With a set amount of resources available, the advisors arrange for all of the support the group needs. On a more sophisticated level, it should be possible to relate the remuneration received by the advisors to the success of the investment, although, in practice, this arrangement is not that easy.

ANNEXES



Appendix 1a: Environmental Categorisation of Projects

The following is an indicative list of investment types that could be included within the four environmental impact categories described in Chapter 5.

It must be noted that the list is only a guide for assessing each project, without loosing sight of its characteristics and merits. It is recommended that, before starting RuralInvest use, environmental expert advice is sought on how to apply these categories in the project area. It is also strongly recommended that a program of training and technical assistance in environmental assessment be designed and implemented, to improve the understanding of field technicians on the meaning of these categories. This would enable the technicians themselves to propose modifications in the classification to ensure the inclusion of local productive systems and hence the incorporation of appropriate environmental mitigation measures into project design.

For Category A:

Projects in which no or negligible adverse effects on the environment are foreseen and which, consequently, require no environmental mitigation measures.

- Soil conservation activities, for the purpose of improving farmland productivity, hence avoiding the conversion of forests into cropland/pasture;
- Controlled experimentation (agricultural/ pastoral/forestry) for research purposes and demonstration in small parcels, except in highly sensitive areas[1];
- Small-scale organic agriculture[2];
- Cultivation of permanent crops under the forest canopy that does not involve pesticide use;
- Sustainable harvesting[3] of non-wood forest products[4];
- Construction of rural warehouses, if limited to small collection centres for the storage of grains or other agricultural products, community stores and structures for harvest drying;
- Initiatives for integrated micro-watershed management;
- Small-scale initiatives on the conservation and sustainable use of biodiversity.

For Category B:

Projects with possible low adverse environmental impacts, which can readily be mitigated. In this case, a detailed identification of the possible environmental impacts has to be made and mitigation measures incorporated in project design (see section D of chapter 5).

- Small or medium-scale agricultural and/or pastoral activities in areas with no or little constraints of slope (e.g. cultivated soils on slopes not greater than 6%)[5], rockiness, drainage, effective depth, water availability and/or soil fertility;
- Agroforestry associated with annual crops[6] in areas with little constraints of slope (e.g. cultivated soils on slopes not greater than 6%), rockiness, drainage, effective depth, water availability and/or soil fertility;
- Agroforestry associated with perennial crops in areas with moderate constraints of slope (degree of slope less than 10%), rockiness, drainage, effective depth, water availability and/or soil fertility;
- Construction or rehabilitation of small-scale irrigation infrastructure for areas up to e.g. 50 hectares;
- Pasture management on natural pastures;

1 Highly sensitive area refers to ecologically sensitive sites such as areas with steep slopes (more than 10 degrees), riparian vegetation, vegetation around springs, critical habitats for local species, etc.

2 However, in the case of organic coffee, category A is only applicable when the producers do not use wet coffee processing methods, which can cause river and stream pollution.

3 Sustainable harvesting refers to the extraction of plants and other resources from forests which does not affect the availability of these resources in the long term and does not damage the ecological integrity of the forest.

4 Non-wood forest products (NWFP) include products used as or with food (e.g. fruits, mushrooms, nuts, herbs, spices, cacao, honey, and animals hunted for meat), fibres (such as rattans), rubber, resins, gums, and plant or animal products used for medicinal, cosmetic or cultural purposes. They can be gathered from the wild, or produced in forest plantations, agroforestry schemes and trees outside forests. NWFP are vital to the daily subsistence of forest-dependent communities, and contribute to the subsistence and local commercial economy in other rural communities. Some NWFP are also commercialised in a larger scale (e.g. cork).

5 Source: Jain, Urban, Stacey, Balbach: Environmental Assessment. MacGraw-Hill, 1993, p.90/373.

6 Systems of permanent plantings associated with trees (isolated into blocks or plantations, whether these be fruit species or others for the purpose of lumber and other forestry products).

- Community forestry;
- Rehabilitation planting (with native species) in areas that have been deforested;
- Eco-tourism;
- Construction or rehabilitation of minor rural roads and bridges (within farms) which do not cross ecologically sensitive areas[7];
- Establishment or improvement of small-scale agro-industries (e.g. processing of milk products with an average daily consumption of less than 100 lt. of milk, meat processing with an average daily output of less than 50 kg of meat, wet coffee processing with less than 1,500 cwt. of coffee berries per week);
- Small-scale artisan workshops, including small clothing and textile workshops (e.g. silk screen printing done by hand);
- Establishment or improvement of small-scale aquaculture activities (e.g. total area of ponds less than 0.5 hectare);
- Construction or improvement of small-scale water supply and sanitation infrastructure (less than 100 persons)[8];
- Construction or rehabilitation of small schools or health centres (if not located in ecologically sensitive areas).

For Category C:

Projects with possible moderate or significant adverse environmental impacts, but where mitigation is possible. These projects require an environmental assessment, undertaken by an environmental specialist, and detailed mitigation measure proposals have to be incorporated in the project design. Commissioning of specialised environmental studies on critical aspects, or a full Environmental Impact Assessment (EIA) may be necessary.

- Controlled and regulated exploitation of timber and other wood products of a forest[9];
- Small/medium-scale agricultural and/or livestock activities in areas with strong (but not severe) constraints of slope (degree less than 10%), rockiness, drainage, effective depth, water availability and/or soil fertility;
- Agroforestry involving with annual crop-tree systems in areas with strong (but not severe) constraints of slope (degree less than 10%), rockiness, drainage, effective depth, water availability and/or soil fertility;
- Construction or rehabilitation of medium-scale irrigation infrastructure for areas of more than 50 hectares;
- Purchase and use of pesticides, other than those listed in Table 1, or project activities that are likely to increase pesticide use (e.g. construction of irrigation schemes, establishment of orchards, etc.) (see also category D);
- Construction or rehabilitation of small rural roads and bridges which do not cross ecologically sensitive areas[10];
- Establishment or improvement of medium-scale agro-industries (e.g. processing of milk products with an average daily consumption of more than 100 lt. of milk, meat processing with an average daily output of more than 50 kg of meat, wet coffee processing activities with more than 1.500 cwt. of coffee berries per week, palm oil mills, wool scouring);
- Medium-scale textile industry (e.g. silk screen printing done by machine in less than 100 m^2 / day);
- Small-scale artisan workshops involving fibre dying and tanning;
- Saw-mills and processing plants for forestry products;
- Establishment or improvement of medium-scale aquaculture activities (total area of ponds more than 0.5 hectare);
- Construction or improvement of water supply and sanitation systems (e.g. for more than 100 persons);
- Establishment or improvement of solid waste collection and disposal structures;
- Initiatives in the buffer zones/multiple usage zones of protected areas;
- Initiatives that might affect endangered species (e.g. introduction of exotic species) or negatively affect their habitat (tropical forests, mangrove swamps and other wetlands, etc.).

7 Highly sensitive area refers to ecologically sensitive sites such as areas with steep slopes (degree more than 10%), riparian vegetation, vegetation around springs, critical habitats for local species, etc.

8 Source: World Bank Environmental Guidelines for Social Funds; D. Graham et. al, 1998).

9 These activities may be counterproductive unless they have an adequate Management Plan, approved by an environmentally competent institution.

10 Highly sensitive area refers to ecologically sensitive sites such as areas with steep slopes (degree more than 10%), riparian vegetation, vegetation around springs, critical habitats for local species, etc.

For Category D:

Projects with potentially significant adverse environmental effects, for which there are no effective mitigation measures, or projects which are incompatible with the sustainable development policies of the country or of international development agencies. In this case, the project has to be completely reformulated or excluded from financing.

- Agricultural activities that involve deforestation and/or conversion of forested areas into farm and/or pasture land (whether they be deforestation of primary forests[11], deforestation of natural or artificial forests established for protection purposes (including the protection of riverbanks and slopes), or cutting of trees around ponds, springs or artesian wells, puddles and natural or artificial lagoons, archaeological sites, etc.);
- Forestry activities that involve deforestation or exploitation of wood products from natural forests, except when these are consistent with the Forest Management Plan approved by the competent forestry or environmental institution;
- Colonisation in primary forests;
- Exploitation of trees from mangrove swamps;
- Construction, improvement and maintenance of roads that pass through unexploited natural forests;
- Any activity in strictly protected areas such as nature reserves, national parks, and core zones or rehabilitation zones of protected areas;
- Initiatives that might significantly affect endangered species or negatively affect their habitat;
- Changes to less sustainable agricultural systems such as the transformation of shade- covered coffee plantations into unshaded plantations;
- Agricultural activities involving the planting of annual crops in areas with severe constraints (steep slopes (more than 10 degrees) etc.);
- Purchase and use of pesticides classified by the World Health Organization as Extremely Dangerous (Class Ia) and Highly Dangerous (Class Ib), see Table 1;
- Purchase and use of pesticides classified by the World Health Organization as Moderately Dangerous (Class II) if (i) the country lacks restrictions on their distribution and use, or (ii) they are likely to be used by, or accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly;
- Purchase and use of pesticides over large areas.

11 Natural forests in pristine conditions, undisturbed by humans.

Table 1. Pesticides classified by the World Health Organization as Extremely Dangerous (Class Ia) and Highly Dangerous (Class Ib)

The users of this table should note that the actual hazard classification of a formulated pesticide product available on the market depends on a number of factors, including the toxicity of the active ingredient, its concentration, and the physical state of the product (liquid or solid). The actual classification of the formulated product should be provided on the label. In many - but not all! - cases, it will be the same as the classification of the active ingredient. The table below provides an initial indication of the hazard classification of active ingredients ("common name") and formulated products ("trade names and trademarks").

The list of trade names and trademarks are commonly available products. Particularly in developing countries, there may be other trade names that are not on this list. The list should therefore not be considered as exhaustive but rather as a list of examples.

It should also be noted that, in addition to the extremely and highly dangerous pesticides listed in this table, World Health Organization classifies moderately hazardous pesticide formulations in Class II. Even if less hazardous than Class I products, use of Class II pesticides still requires a high degree of precautions and may cause lethal or otherwise severe poisoning if used improperly. Preconditions for the use of Class II pesticides include: (i) adequate and enforced legal restrictions on their distribution and use; (ii) safeguards to prevent the use of, and access to, these pesticides by lay personnel, farmers, or others without appropriate training, equipment and facilities to store and apply them properly; and (iii) user adherence to precautionary methods proven effective under field conditions in developing countries.

The final column of the table includes some of the most common trade names and trademarks used by basic producers and formulators of pesticides. It is based on information contained in the MeisterPro Version of the Farm Chemicals Handbook (Electronic Pesticide Dictionary), edition 2001.

CLASS 1a		
Common name	**name***	**Trade name or trademark**
aldicarb	I-S	Aldicarbe, Temik, Sanacarb
brodifacoum	R	Brobait, Forwarat, Havoc, Micedie, Mr. Morton, Nofar, Sorexa, etc.
bromadiolone	R	Acilone, Atila Pellets, Bromalone, Killrat, Lafar, Obamice, etc.
bromethalin	R	Vengeance
calcium cyanide	FM	-
captafol	F	Santar, Foltaf
chlorethoxyfos	I	Fortress
chlormephos	I	Dotan, Sherman
chlorophacinone	R	Actosin, Lepit, Dicusat, Trokat Bait, Ramucide, Ratomet, Raviac, Topitox, etc.
difenacoum	R	Frunax-DS, Neosorexa, Sorexa
difethialone	R	-
diphacinone	R	Diphacin, Promar, Ramik, Tomcat, etc.
disulfoton	I	Ekatin, Disyston, Bay 19639, Disultex, Disulfoton P10, etc.
EPN	I	-
ethoprophos	I-S	Mocap, Fertiprophos, Vimoca, Rifenfos
flocoumafen	R	Storm, Stratagem,Kukbo Coumafen
fonofos	I-S	Dytonato
hexachloro-benzene	FST	Bent-cure, Bent-no-more, No Bunt
mercuric chloride	F-S	-
mevinphos	I	Phosdrin, Duraphos, Mevidrin
parathion	I	Alkron, Ekatox, Folidol, Rhodiatox Paration Metilico, Chimac Par H, Pox Konz, Woprophos, Alleron, Aphamite, Corothion, Etilon, Orthophos, Panthion, Paramar, Phoskil, Soprathion, Stathion, Fighter, etc.
parathion-methyl	I	Cekumethion, Fulkil, Metacide, Bladan M, Folidol M, Metacide, Amithion, Agrodol, Paration Metilico, Agro-Parathion, Vitamethion, Penncap-M, Folidon, Devithion, Dhanudol, Dhanumar, Pox M20, Metpar-200, Fosforin'M, Bration, Methion, Kildot, Korthion, Parathol, Faast, Dipathio M, Vegfru Klofos, Probel MP-35, Proficol, Woprophos- M, Parasul, Gearphos, Metaphos, Partron M, Tekwaisa, etc.
phenylmercury acetate	FST	-
phorate	I	AC 3911, Granutox, Thimet, Agrophor, Frotox, Dhan, Chimifor, Pestophor, Chim, Tuskar, Phoril, Kurunai, etc.
phosphamidon	I	Dimecron, Phosron, C 570, Fosfamid, Alfamidon, Chemphos, Devimidon, Phos-All, Pradhan, Mitekron, Midon, Phos-Sul, etc
sodium fluoroacetate	R	-
sulfotep	I	Bladafum, Dithio, Thiotepp
tebupirimfos	I	-
terbufos	I-S	Plydax, Contrave, AC 92100, Turbolux, Contraven, Counter, Biosban, Pilarfox, Terborox, Tertin, Fortune-T1, etc.

* AC = acaridicide, FM = product for fumigation, F = fungicide, FST = fungicide for treatment of seeds, H = herbicide, I = insecticide, L = larvicide, MT = miticide, N = nematocide, O = other use for plant pathogens, R = rodenticide, S = applicable to the soil.

CLASS 1b		
Common name	**Use***	**Trade name or trademark**
acrolein	H	Aqualine Magnacide
allyl alcohol	H	-
azinphos-ethyl	I	Bay 16259, Gusathion, Sepizin L, Crysthion
azinphos-methyl	I	Azimil, Azinugec, Carfene, Metazintox, Sepizin M, Pancide, Gusathion, Guthion, Azinfosmetil, Agrothion, Chimithion P.B., Crysthyon, Cotnion'H, Azin, Azition, Mezyl, Probel G-20, etc.
blasticidin-S	F	Bas-S
butocarboxim	I	-
butoxycarboxim	I	Plant Pin, Co 859
cadusafos	N, I	Apache, Taredan, Rugby
calcium arsenate	I	Spra-cal, Turf-Cal
carbofuran	I	Carbodan, Carbosip, Yaltox, Rampart, Furacarb, Vitafuran, Curaterr, Diafuran, Chemfuron, Fertifuran, Furasun GR, Carbo-Tox, Carboter, Damira, Caribo, Curasol, Fury, Volfuran, Furadan, Woprofuran, Buraon, Furasul, Thodfuran, etc.
chlorfenvinphos	I	Birlane, Supona, Steladone
3-chloro-1, 2-propadeniol	R	-
coumaphos	AC,MT	Asuntol, Co-Ral, Penzin
coumatetralyl	R	Racumin, Kukbo Stunt
zeta-cypermethrin	I	-
demeton-S-methyl	I	Metasystox, DSM, Mifatox, Metaphor
dichlorvos	I	Aminatrix, Canogard, Dedevap, Mafu, Acivap, Agrona, Cazador, Agro-DDVP, Dichlorate, Vitavos, Ouo, Cekusan, Nuvachem, Devikol, Domar, Didivane, Foravap, Didifos, Hercon Vaportape II, Hilvos, Kilvos, Koruma DDVP, Stevie, Novos, Midiltipi DDVP, D.D.V. Paz, Vantaf, Woprylphos, Rupini, Dadasul, De De Vap, Tazusa, etc.
dicrotophos	I	Bidrin, Dicron, Ektafos
dinoterb	H	Herbogil
DNOC	I-S,H	Hercynol, Trifinox, Polartox, etc.
edifenphos	F	Blastoff, Hinosan, Bay 78418, Edisan, Vihino
ethiofencarb	I	Croneton
famphur	I	-
flucythrinate	I	Cybolt, Cythrin, Pay-Off, Fluent
fluoroacetamide	R	Rhodex, Fluorakil, Navron, Yanock
formetanate	AC	Carzon, Dicarzol
furathiocarb	I-S	Deltanet, Promet
heptenophos	I	Hoe 02982, Hostaquick, Ragadan
isazofos	I-S	Miral, Triumph, Victor
isofenphos	I	Bay 12869, Oftanol, Lighter
isoxathion	I	Karphos, E-48
lead arsenate	L	Gypsine, Soprabel, Afos
mecarbam	I	-
mercuric oxide	O	-
methamidophos	I	Tamaron, Monitor, Bay 71628, Tam, Sinator, Amiphos, General, Metamidofos, Agromon, Vitaphos, Nuratron, Sherman, Tamanox, Erkuron, Matón, Amidor, KASA, Metalux, Metaron, Metafós, Methamidopaz, Woprotam, Thodoron, Vetaron, etc.

CLASS 1b		
Common name	**Use***	**Trade name or trademark**
methidathion	I	Supracide, Supra, Supradate, Datimethion, Medacide, Bumerang, Ultracidin, etc.
methiocarb	I	Draza, Mesurol
methomyl	I	Flytec, Dupont 1179, Kipsin, Lannate, Aldebaran, Acinate, Metholate, Avance, Dumil, Dunet, Memilene L, Lanox, Fertiomyl, Matador, Dynamil, Lanomac, Lanomed, Methopaz, Metopron, Methylan, Agrinate, ect.
monocrotophos	I	Azodrin, Nuvacron, Susvin, Aminophos, Monoglen, Monocrotofos, Monacron, Aimocron, Monochem, Devimono, Monodhan, Crisodrin, Foradrin, Hukron, Atom, Agrodrin, Inisan, Kilphex, Hazodrex, Luxafos, Monofos, Azakron, Milphos, Agrophos, Cropaphos, Monolex Lucadrin, Croton, Woprotect, R C Pos, Monosul, Thodocron, Vacron, etc.
nicotine	I	Nico Soap
omethoate	I	Folimat, Modern, Le-mat
oxamyl oxydemeton-methyl	I	Blade, Vydate Aimcosystox, Anthonox, Metasystox R, Oxydemetchem, Dhanusystox, MSR2, Mesh
paris green	L	-
pentachlorophenol	I,F,H	Pentacon, Sinituho, Penchloral
pindone	R	-
pirimiphos-ethyl	I	Solgard, Primicid
propaphos	I	Kayaphos
propetamphos	I	Catalyst, Blotic, Safrotin, Seraphos
sodium arsenite	R	Arsenipron L, Prodalummol Double
sodium cyanide	R	Cyanogas A
strychnine	R	-
tefluthrin	I-S	Attack, Forca, Forza, Force, Komet
thallium sulfate	R	-
thiofanox	I-S	Decamox, Dacamox
thiometon	I	Ekatin, Bay 23129, Thiotox
triazophos	I	Hoe, Hostahion, Able, Fulstop, Triumph, Trelka, Trihero, Try, Sutathion, Perfect, Tries
vamidothion	I	Kilval, Trucidor
warfarin	R	Dicusat E, Luxarin, Ramorin 2, Woprodenticide, Warfotox, Cov-R-Tox, Rodex, Tox-Hid
zinc phosphide	R	Deviphos, Fastkill, Zinphos, Fokeba, Phosvin, etc.

* AC = acaridicide, FM = product for fumigation, F = fungicide, FST = fungicide for treatment of seeds, H = herbicide, I = insecticide, L = larvicide, MT = miticide, N = nematocide, O = other use for plant pathogens, R = rodenticide, -S = applicable to the soil.

Appendix 1b: Checklists for Environmental Assessment

TABLE 1 - Crop cultivation: Practices associated with environmental risks. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Cultivation of annual crops using ploughing:		
Wind and water erosion due to ploughing; Water erosion due to slope; Loss of soil fertility.	Conservation Agriculture based on integrated practices such as zero tillage, minimum tillage, crop rotation and permanent soil cover (for more details, see FAO Conservation Agriculture website: http://www.fao.org/ag/ags/AGSE/Main.htm; Strip cropping or contour planting, by i) direct seedling, e.g. by planting cocoa mother trees' seeds in the furrows, or ii) contouring with grass (preferably native); Earth bunds, stone lines, contour terraces (using rocks, trunks, etc.); Protection of cultivated plots with fences, border grasses and windbreaks.	Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences, as well as in downstream water bodies; Depth of rills/gullies; Changes in yields and total production; Changes in the soil's water retention capacity; Data on sediment loads in streams and dams if available from a nearby hydrological station.
Cultivation of grain crops using hoe:		
Loss of soil fertility and proliferation of weeds due to shortened fallow periods; Water erosion due to slope.	Increased fallow periods; Use of compost and/or green manure (using legumes) in rotation with grain crops (e.g. velvet bean in rotation with corn improves corn yields, protects the soil from erosion and from evaporation, and prevents the growth of weeds; besides, harvest residue is excellent fodder); Inter-cropping with leguminous trees and or annual leguminous crops; Enriched fallow with leguminous crops.	Change in humus content of soil; Change in the height of root pedestals; Depth of rills/gullies; Changes in yields and total production; Data on sediment loads in streams if available from a nearby hydrological station; Appearance or disappearance of weeds.
Monocultures:		
Proliferation of pests; Soil and water contamination resulting from intensive pesticide use; Soil depletion; Water contamination resulting from intensive fertilizer use.	Crop diversification practices, inter-cropping, relay cropping; Crop rotation practices; Integrated Pest Management (IPM): see below; Cultivation of nitrogen fixing species (e.g. leguminous plants that fix nitrogen in the soil); Use of green manure.	Appearance or disappearance of pests; Pest management practices, including use levels of pesticides; Area of barren land; Change in the height of root pedestals; Depth of rills/gullies; Changes in yields; Sediment loads in streams if data available from a nearby hydrological station.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Use of pesticides:		
Contamination of soil, surface and ground water; Appearance of and/or increase in intoxication cases among farm workers or rural populations; Appearance of and/or increase in cases of death by contamination in wild flora and fauna, including beneficial organisms such as earth worms, termites and pollinators; Pesticide residues on crops affecting public health and product marketing; Old pesticide stocks turning into toxic waste.	Integrated Pest Management (IPM) to reduce reliance on pesticides. IPM refers to the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and minimize risks to human health and the environment. IPM emphasizes the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms. Techniques that can be applied under an IPM approach include e.g.: crop rotation, crop diversification, selection of pest resistant crop varieties, biological control or other non-chemical techniques, selective pesticide use as a last resort control option. For more details, see IPM website http://www.fao.org/globalipmfacility/home.htm. Where pesticide use remains necessary: substitution of highly and moderately hazardous and broad-spectrum pesticides with less dangerous and more target specific products, and reducing the concentration and number of applications to a minimum; Knowledge and enforcement of pesticide legislation to eliminate products or applications that are not permitted and to ensure appropriate packaging and proper labeling; Product knowledge, use of adequate personal protection equipment during handling and application and correct use of appropriate application equipment; Proper storage of pesticides.	**Direct:** Uptake of IPM practices; Incidence of poisoning cases and pesticide related chronic health problems among farmers and workers using pesticides; Incidence of health problems due to consumption of produce or drinking water contaminated with pesticide residues. Water quality in drinking water wells and pesticide residues on food crops; Changes in populations of beneficial organisms, wildlife, and flora. **Indirect:** Training courses on the subject; People being trained on the subject; Requests for technical assistance on the subject; Sales of dangerous pesticides in the area; Total sales of pesticides in the area.
Use of chemical fertilizers:		
Deterioration in groundwater quality through infiltration as a result of inappropriate application; Excessive growth of algae and aquatic plants in water bodies due to upstream use of fertilizers, leading to oxygen depletion and eventually to fish kill.	Knowledge about the substances being used, correct storage and application; Reducing fertilizer use or substituting chemical fertilizers with manure or other organic fertilizers.	Water quality in drinking water wells (if measurements performed); Visible changes in aquatic plants in downstream water bodies; Number of farmers using organic fertilizers.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Use of machinery:		
Soil compaction; Erosion and soil degradation.	Conservation Agriculture (see above).	Formation of barren soil; Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences, as well as in downstream water bodies; Depth of rills/gullies; Changes in yields; Sediment loads in streams if data available from a nearby hydrological station.
Burning of plant residues in the fields:		
Salinization of soil; Erosion.	Stop burning of residues and adopt the following: ▶ Mulching with crop residues; ▶ Use of plant residues to create humus; ▶ IPM to control pests and diseases (see above); ▶ Agricultural extension and applied research on the prevention of soil salinization.	Deaths or decreased productivity of plants and soil organisms due to salinity; Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences, as well as in downstream water bodies; Depth of rills/gullies; Changes in yields; Sediment loads in streams if data available from a nearby hydrological station.
Social impacts from land use changes:		
Competition between different users for land and water resources; e.g. crop farmers and livestock breeders over the use of water sources or most fertile lands.	Participatory land use planning at village level; Creation of water user associations and training of their management committees, etc.; Crop/livestock integration (use of crop residues as fodder, use of manure as fertilizer, etc.).	Number of land use plans prepared; Number of management committees in operation.
Impact of technology changes on women :		
The impact of new agricultural crops/practices/machinery on traditional division of labor between men and women; Elevated vulnerability of women to pesticide poisoning.	Participation of women in technology development and adaptation; Mainstreaming gender considerations in training and attention to gender balance in training; Access of women to agricultural extension services. IPM – see above.	Number of women participants to training courses; Changes in pesticide use by women and occurrence of pesticide poisoning symptoms.

TABLE 2 - Livestock husbandry: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Impacts of overgrazing:		
Soil compaction, increase in surface run-off and erosion due to overgrazing and excessive trampling; Degradation of vegetation and reduction of most palatable species, in particular around water points.	Reduction of stocking density: ▶ Selective culling of animals in the herd; ▶ Pasture rotation, deferred grazing; ▶ Farm diversification (e.g. agro-tourism). Increasing carrying capacity: ▶ Pasture management and fertilization; ▶ Supplementary forage production; ▶ Supplementary feeding; ▶ Inclusion of forage shrubs and trees. Erosion control: ▶ Cover crops & direct seeding; ▶ Crop residue management & treatment; ▶ Avoid grazing fragile areas. Elaboration of drought survival strategies: ▶ Livestock markers; ▶ Temporal slaughter houses. For more details, see Livestock, Environment and Development website http://www.fao.org/lead/.	Area changes of degraded pastures; Size of "desertification circles" around water points; Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences; Depth of rills/gullies; Sediment loads in streams if data available from a nearby hydrological station; Animal population & density; Changes in weed incidence.
Lowering of water table due to increased extraction of groundwater through cattle wells; Groundwater contamination through cattle wells.	Strategic placement of water sources; Regulation of water use: control of waterpoint use, limitation of well capacity, closure of permanent water sources during the rain season, covering of wells, appropriate watering structures, well management committees, etc.	Changes in water table levels in wells; Water quality in drinking water wells (if measurements performed).
Deforestation for grassland establishment:		
Biodiversity loss; Change and loss of natural habitats.	Silvopastoral systems for conservation of biodiversity and carbon sequestration; Farm diversification.	Area changes in forested areas and grasslands.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Use of pharmaceuticals and hormones (in commercial feed concentrates) and acaricides:		
Contamination of animal products destined for human consumption.	Preparation of balanced feeds on the farm.	Chemical analysis of animal products destined for human consumption.
Intoxication of workers handling tick killers and/or persons using empty bottles; Water contamination from inadequate disposal of chemicals; Tick resistance to acaricides.	Choice of tick killer chemicals, methods and timing that minimize environmental impacts (see also Table 1, on the use of pesticides); Training and awareness-raising of livestock owners and herders on acaricide & insecticide use and handling.	For monitoring the use of tick killers, see Table 1; Water quality in water bodies (if measurements performed).
Animal breeding:		
Reduction of agro-biodiversity due to breed choices; New breeds less adapted to local conditions.	Promotion of local breeds; Maintaining variability within populations; Unconventional livestock production (e.g. alpaca, llama).	Proportion of local breeds in cattle population; Number of breeds grown in the area.
Impact on wildlife:		
Increased killing of wildlife considered as pests or predators; Competition for food and water resources; Increase in diseases; Loss of habitat or migratory routes.	Creation of protected areas; Range management strategies that minimize impacts on wildlife; Agro-tourism; Appropriate methods of pest and predator control (e.g. traps instead of poison, see also Table 1 on pesticides).	Cases of wildlife killing and poaching; Number of predator poisoning cases; Size of Protected Areas.
Pollution from animal waste:		
Contamination of surface and ground waters; Odor problems & greenhouse gases.	Proper manure storage and management: ▶ Reduction in water use; ▶ Separation of solids; ▶ Proper storage until application time; ▶ Anaerobic fermentation & biogas production.	Water quality in streams; Proportion of farmers with manure storage facilities; Volume of biogas produced.
Nutrient enrichment of soils.	Manure application to soils at recommended fertilizer rates; Use of high yielding crops.	Nutrient concentration in soils (N, P, K); Changes in crop yields.
Social impacts:		
Social and cultural changes due to change from nomadism/transhumance to stable livestock production.	Access of mobile pastoralists to veterinary and other services; Consultation of all affected communities; Recognition of traditional land use rights and practices.	

TABLE 3 - Small-scale irrigation infrastructure: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

Small-scale irrigation may include one of the following categories: run-of-river schemes, small reservoirs or ground water schemes (deep and shallow wells).

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Construction of irrigation infrastructure:		
Reduction of minimum flow in rivers, affecting aquatic flora and fauna and reducing water availability downstream; Changes in the natural course of waterways; Soil- and tree-cutting along riparian areas where water will be drawn (uptake for irrigation), resulting in erosion along riverbanks; Vertical drainage associated with high concentration of wells for pumping ground water and the consequent lowering of water table.	Proper siting and participatory planning, including studies on water availability; Community participation in design and construction (walkthrough with farmers and Participatory Rapid Appraisal (PRA)) and establishment of water users association before construction; Design of works so as to minimize the need to change natural watercourses; Soil conservation; Control on boring of new wells; Reduction in the density of wells or limitation of pump capacity (it should be pointed out that in the case of water logging, vertical drainage might be deemed necessary to lower the groundwater level).	Changes in the level of lake/river flow; Changes in fish catches from the affected water body; Area of exposed riverbanks; Fall of water table in wells; Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences, as well as in downstream water bodies; Depth of rills/gullies; Sediment loads in streams if data available from a nearby hydrological station.
Operation of irrigation system:		
Reduction of minimum flow in rivers, endangering aquatic flora and fauna and reducing water availability downstream; Water logging (rise of water table) associated with low irrigation efficiency; Overexploitation of groundwater through wells and consequent lowering of water table; Salinization or alkalization of soil; Erosion; Degradation of water quality in reservoirs or receiving water bodies (algal blooms, aquatic weeds, etc.); Increase in waterborne diseases; Disease transmission through contaminated irrigation water;	Control of irrigation water volumes, respecting minimum flows and aquifer capacity; Operation and maintenance plans for irrigation infrastructure; Agricultural extension, training and applied research on soil salinization and related issues (water logging, alkalization, etc); Micro-watershed management; Quality tests on irrigation water, including monitoring of pesticide contamination; Particularly for larger schemes: good irrigation management, i.e., a more rational and efficient use of irrigation water, by: a) closely matching irrigation demands and supply to reduce seepage and increase irrigation efficiency; b) providing drainage if water is of good quality, and c) maintaining canals to prevent seepage, and reduce inefficiencies resulting from siltation and weed;	Changes in the level of lake/river flow; Changes in fish catches from the affected water body; Changes in water table in wells; Volume of water used per hectare; Visible changes in the water quality in receiving water bodies; Water quality in drinking water wells (if measurements performed); Change in the area of barren lands; Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences; Depth of rills/gullies;

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Operation of irrigation system:		
Conflicts over the use of water and irrigated land; Unsustainable crop production and excessive use of pesticides, resulting in water contamination and diminishing returns on investment in the irrigation scheme.	Training in sanitation and hygiene; Protection of canals from livestock; Consultation of all affected communities, establishment of management committees, etc. IPM – see Table 1.	Deaths or decreased productivity of plants and soil organisms due to salinity; Alkalinity: increase in soil pH; Number of operation and maintenance plans; Number of micro-watershed management plans; Changes in water-related disease levels; Number of serious land use conflicts; Pesticide residues in water; Pest management practices and use levels of pesticides.

TABLE 4 - Agro-industry: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Agro-processing:		
Contamination of surface and ground water from wastewater; Over-extraction of surface and ground waters; Air pollution; Noise and odor pollution. Contamination of products with pesticides due to improper post-harvest pest control.	Location of agro-industries in zones where water supply can be ensured and which have sewage and wastewater treatment systems; Minimization of water and chemical use; Promotion of transformation processes based on bio-degradable substances; Use of "clean" production technologies; Treatment of wastewater, and atmospheric emissions; Acoustic protection methods in plants that create excessive noise; Non-chemical post-harvest pest control.	Volume of water use; Changes in the level of lake/river where the water is drawn; Changes in water table level in wells; Visible changes in the water quality in receiving water bodies; Changes in fish catches from affected water bodies; Water quality in drinking water wells (if measurements performed). For bigger plants (in addition to the above): Quantity and quality of wastewater discharges; Quality of air emissions. Complaints on noise and odor from local populations; Chemical analysis of products destined for human consumption.
Contamination of the environment due to accumulation of solid waste, introduction of hazardous waste, and/or decomposition of organic materials.	Use of organic waste as fertilizer on agricultural/pasture soils; Reduction of solid waste through the use of cleaner technology, recycling residues, etc.; Treatment and disposal of solid waste according to the regulations on solid waste management; Proper treatment and disposal of hazardous waste (disposal in regulated landfills).	Volume of solid waste (not recycled); Volume of organic waste (not reused); Volume of hazardous waste; Water quality in drinking water wells (if measurements performed); Final disposal of waste (regulated or unregulated landfills).
Deficient hygienic practices:		
Contamination of processed foodstuffs.	Strict hygienic standards; Product quality control; Training of workers.	Chemical and bacteriological analysis on foodstuffs.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Consumption of fuelwood in agro-industry:		
Deforestation in forests near agro-industry; Incentives for deforestation for sale to agro-industry; Air pollution.	Use of alternative energy sources; Use of energy efficient equipment; Use of agro-residues as fuel; Woodfuel plantations (but see Table 5).	Volume of fuelwood use per plant; Size of degraded forest around the plant.
Changes in livelihoods:		
Decreased demand for certain agricultural products or for micro-scale agro-processing.	Consultation and participation of the whole community in project preparation.	

TABLE 5 - Small-scale forestry operations: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

All tree plantations of one hectare and above, and all forest harvesting operations should be carried out in accordance with an approved simple management plan. Each **management plan** should include an outline environmental assessment, which should prescribe many of the mitigation measures listed below. Where possible, small-scale operators should be encouraged to form cooperatives or producer associations/organizations so as to reduce management costs. It would also facilitate the introduction of forest certification, a process that can confirm that the forest products are being harvested from sustainable sources. This is especially important for products destined for export.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Establishment of forest plantations:		
Reduction or loss of bio-diversity.	Avoid clearing indigenous forest; Give complete protection to critical habitats; If adequate samples of the original vegetation do not exist outside the plantation, create protection areas (set-asides) of representative samples (10%) inside the plantation.	Field inspection/maps Changes in populations of Indicator species Protection Areas identified in management plan.
Soil erosion during land preparation.	Plant up as soon as possible after land clearing.	Increase in areas subject to erosion and depth of rills/gullies.
Siltation of streams.	Do not clear steep, unstable slopes or highly erosive soils, and limit site preparation to the dry season.	Sediment loads in streams.
Soil compaction.	If ploughing is needed, it should be done along the contour using tractors with flotation tires.	Presence of hardpan (i.e. soil/subsoil condition in which the soil grains become cemented together by such bonding agents as iron oxide and calcium carbonate, forming a hard, impervious mass).
Reduction in stream flow and lowering of the water table.	Conserve all riparian forests (areas located on the banks of rivers, creeks and springs); plant with indigenous species; Conserve all wetlands and marshes.	Changes in dry season water levels and water table level; Management plan and field inspection.
Soil contamination due to use of herbicides and insecticides.	Ensure that only the correct dosage of herbicides and insecticides are used, that workers are properly trained in their use, and closely supervise field operations.	Level of contaminants in ground water and streams.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Establishment of forest plantations:		
Increased incidence of pests and diseases.	Use mixed species plantations; Implement a simple, ocular system of pest and disease monitoring.	Increase or decrease in the incidence of pests, damage to trees.
Wild fires.	Clear firebreak in the area if burning is to be used for clearing and keep adequate labor available to control fires.	Fire records.
Use of exotic species in plantations:		
Changes in soil structure and loss of fertility.	If possible, use exotic species in agroforestry/silvopastoral systems only, and use only organic fertilizers.	Nutrient levels in soils organic content and pH of soil.
Reduced stream flow and lowering of water table.	Conserve riparian forest and wetlands; use wider tree spacing.	Changes in dry season water levels in wells and dry season flow in streams.
Increased risk of pests and diseases.	Implement simple ocular systems of pest and disease monitoring.	Increase or decrease in pest and plant disease levels.
Forest harvesting, including wood and non-wood products:		
Reduction or loss of biodiversity, especially in natural forest areas.	Products from natural forest must be harvested in accordance with an approved harvesting plan which must be based on growth data and inventories; logging must include pre harvesting climber cutting, minimum diameters limits, an adequate felling cycle, annual coupes, directional felling, well planned skid trails and protection areas.	Approved management plan and, if practical, certification received.
Fragmentation of habitats and disruption of biological corridors.	Identify critical habitats and prohibit intervention, avoid sensitive areas and provide passageways to link corridors.	Inventories to monitor populations of indicator species.
Forest/ecosystem degradation.	Harvest in accordance with prescriptions of management plan, and have the operation certified; In plantations, avoid areas of natural vegetation.	Management plan and field records.
Uncontrolled human settlement and deforestation.	Ensure the existence of enforceable property rights and the institutional capacity/commitment to control settlement.	Cases of new illegal human settlements; Existence of legislation/institutions regulating human settlements.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Forest harvesting, including wood and non-wood products:		
Conflicts with traditional users.	Define and enshrine traditional user rights in management plan.	Management plan.
Soil compaction and erosion.	Use cable ways instead of roads; Where roads are the only alternative, they must be well planned and constructed in accordance with technical specifications appropriate to local conditions; Minimize canopy disturbance and damage to the understorey through better road alignment; Use animal extraction.	Management plan and field observations; Erosion indicators (see above tables).
Siltation of streams.	Conserve riparian forest and minimize canopy and understorey disturbance.	Sediment load in streams.
Illegal hunting and accidental fires.	Implement environmental education programs for forest workers and forest communities in and around forest; Ensure that adequate legal protection exists to control hunting.	Bushmeat consumption surveys, species inventories and forest fire records.
Small scale processing plants:		
Air pollution – carbon dioxide, carbon monoxide smoke and dust.	Legislation, emission control, cyclone dust removal, use of hydropower.	Air quality monitoring.
Soil and water pollution – extractives of bark, wood preservatives, additives, sawdust, charcoal, acids, tars, vehicle fuel oils and lubricants.	Legislation, spill ponds, oil traps, recovery of waste wood.	Soil and water quality monitoring.
Noise.	Legislation, careful site planning, insulation, noise abatement.	Noise level monitoring; Complaints from local populations.
Indigenous forest-dependent people:		
Changes in livelihoods and cultural identity; Spread of infectious diseases.	Careful site selection avoiding indigenous areas, participation of indigenous people in project planning, indigenous peoples' plan.	Consultations and workshops with local people; Medical records.

TABLE 6 - Ecotourism: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Campsites and cooking fires without adequate protective measures:		
Fires in forest and grasslands.	Construction of proper campsites and fireplaces; Regulation, supervision and control of tourist activities.	Changes in the frequency and severity of forest fires.
Construction of small-scale infrastructure (trails, signboards, campsites etc.):		
Disturbance of wildlife; Erosion associated to trail construction; Increased human presence in isolated areas that may lead to illegal logging or land conversion.	Proper siting avoiding ecologically sensitive areas; Awareness-raising and training of local communities and visitors; Schemes for sharing benefits from ecotourism.	Changes in occurrence of wild animals; Depth of rills/gullies along trails; Cases of illegal logging or land conversion; Training sessions for local communities.
Unsustainable consumption of vegetation, wildlife and other natural resources:		
Loss of bio-diversity; Loss of natural resources.	Prohibition/restriction on tourism in sensitive sites; Restriction on the extraction of plants or other resources in Protected Areas (in consistency with their management rules, see section E of chapter 5); Prohibition on the hunting or removal of endangered plants and animals; Prohibition/restriction on coral collection and/or extraction or other marine life; Awareness-raising of visitors and guides; Supervision and control of tourist activities.	Wildlife monitoring; Cases of illegal hunting; Cases of coral collection; Degradation/disappearance of plants, corals or other resources.
Solid waste:		
Accumulation of garbage and rubbish at tourist sites.	Proper waste collection facilities and services	Occurrence of non-collected waste at sites.
Social and economic impacts:		
Impact on indigenous and local communities.	Involvement of these communities in project design; Benefit-sharing schemes.	Stakeholder consultations during project design.

TABLE 7 - Aquaculture: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Intensive and super-intensive culture:		
Pond culture: Contamination of downstream water-bodies in particular when draining ponds due to excessive organic loading and accumulation in pond water and pond bottom sediments; Higher risk of diseases among cultivated fish related to stress and, eventually, in neighboring wild populations; New bacterial diseases due to the use of medicated feeds. **Floating cages**: continuous pollution of surrounding waters and bottoms when cages are in shallow waters; Impact on local fauna from escapes from cages.	Proper siting of ponds and cages avoiding sensitive water bodies; Distance between cages and sufficient depth to reduce impact on bottom; Use of reservoirs for treatment of effluents in pond farms or use of pond recirculating systems to treat water. Closed systems (i.e. without effluent discharge) are more desirable in intensive systems; Use of vaccines preferable to routine use of antibiotics and chemicals (use chemicals and drugs only in extreme cases when symptoms of disease are apparent); Use of species present in nearby waters to avoid impacts on biodiversity.	Changes in water quality within the system and in neighboring water bodies; Changes (degradation) in bottom fauna and flora in the case of floating cages; Cases of fish disease within the system and in neighboring water bodies; appearance of bacterial strains resistant to antibiotics; Changes in composition of catches in surrounding waters.
Semi-intensive and extensive culture systems		
Large seed mortality rates of non target species due to the collection of shrimp or fish seed from the wild; Destruction of mangroves and wetlands for construction of coastal ponds; exposure of acid sulfate soils; accelerated coastal erosion by reduction of mangrove forest; Soils and groundwater salinization due to percolation of saltwater; Elimination/reduction of local species due to the introduction of exotics for stocking purposes; Introduction of diseases due to transfer/import of seed.	Utilization of hatchery-produced seed for stocking; Use of barren areas bordering mangroves using pumping and not tides to fill ponds, separation of pond farms to avoid creation of barriers behind mangroves; Avoid pond construction in coastal areas close to agricultural fields or freshwater wells. Use of liners to avoid water percolation in proximity of agricultural field and freshwater wells where viable; Carry out studies on potential impact on existing fauna prior to introducing a new species in an open water body. Utmost care with the introduction of predator species. Improve regulations on introductions; Quarantine practices for seed and introductions; use of hatchery produced certified disease-free seed. Improved education of farmers and improved regulations on movements of seed/adults.	Monitoring of seed collectors operation, changes in species abundance and composition in catches of fishermen; Testing of soils for potential acidity prior to pond construction; Measurable increase in salinity in water extracted from coastal wells near aquaculture farms; Displacement or elimination of local fish species; Occurrence of epidemics or noticeable presence of disease in farms or surrounding water bodies.

TABLE 8 - Small rural access roads and bridges: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Impact on soil and water bodies:		
Compaction of soil during construction; Slope and riverbank destabilization: landslides, collapse of gullies and steep slopes, side-tipping of spoil material; Degradation of vegetation along riverbanks, road bed or at sites where construction materials are drawn; Hydrological changes (e.g. increased runoff and flooding, waterflow diversion, channel modification); Erosion due to the above reasons; Clogging of drainage works, creation of stagnant water pools; Siltation, sedimentation and degradation of water bodies; Changes in groundwater table levels; Contamination and health risks from oil and hazardous waste; Dust and noise during	Careful route and site selection avoiding steep slopes and rivers with low flow, minimizing cutting of trees, minimizing number of water crossings and disruption in waterflows; Careful design to minimize impacts of water crossings, to balance filling and cutting, and to avoid creation of steep cut slopes; Buffer zones between road and water bodies; Construction in dry season; Ensure use of proper and appropriate construction standards (incl. protection of soils during construction, construction site clean-up and rehabilitation); Proper drainage and infiltration ditches; Stabilization of vulnerable surfaces: terraced slopes, retaining walls/ponds, barriers, riprap, gridwork, crib walls etc.; Replanting (with native species) early in the construction process; Proper disposal of oil and hazardous materials; Dust control by water and other means.	Change in area of denuded slopes/length of exposed riverbanks; Number of landslide cases affecting traffic; Change in the height of root pedestals; Accumulation of silt/sand at the foot of bushes, posts and fences; Depth of rills/gullies; Changes in yields in neighboring fields; Flow and sediment loads in streams if data available from a nearby hydrological station; Visible changes in water quality in neighboring water bodies; Changes in water table levels in wells; Changes in fish catches from the affected water body; Changes in levels of water-related diseases.
Access to previously isolated areas:		
Restriction of biological corridors, barriers to the free movement of wildlife; Disruption or destruction of wildlife, road kills; Loss, fragmentation and disturbance of natural habitats (incl. aquatic); Disturbance of protected areas, threats for endangered species; Increase in forest fires caused by increased human activity; Illegal hunting, see Table 5;	Careful route and site selection to avoid important habitats, sensitive or protected areas; Conservation of natural corridors; Creation of animal crossings under and over roads, fencing; No construction during breeding season; Awareness-raising and training among rural communities on sustainable use of forested areas and their resources; Vigilance and monitoring by both local communities and police and wildlife authorities; Establishment and maintenance of firebreaks;	Changes in occurrence of wild animals; Changes in hunting/fish catches; Rates of extraction of timber and non-timber forest products; Cases of illegal logging/land conversion.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Access to previously isolated areas:		
Deforestation and loss of biodiversity from increased logging, tourism, and conversion of forest areas into pasture or farmland.	Elimination of flammable materials in construction; Educational programs to reduce the incidence of fires; Establishment of protected areas.	
Social impacts:		
Loss of buildings, property , or economic livelihood; Impact on human health from traffic accidents and transmission of diseases along roads; Degradation of historical/cultural sites; Social changes from new roads to isolated communities; Impacts on indigenous people.	Careful route selection avoiding economic losses, indigenous peoples lands, cultural sites, etc.; Safety designs: regulation, signposting, visibility, speed limits, etc.; Special measures to protect cultural sites.	Traffic accidents; Disease cases.

TABLE 9 - Small social infrastructure investments: Practices associated with environmental risk. Possible adverse impacts, mitigation measures and indicators for monitoring.

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Water supply and sanitation:		
Contamination of surface and groundwater from wastewater at site or downstream; Lowering of water table due to overexploitation; Creation of stagnant water pools; Unpleasant odors; Degradation of soil cover and vegetation; Disturbance of natural habitats and wildlife; Increase in waterborne diseases.	Siting studies to avoid sensitive sites; Consultation and participation of all affected communities; Regional water use planning; Minimal distance from human settlements and fields; Proper drainage; Wastewater treatment systems: settling ponds, screens, aeration systems, connection to larger sewage systems; Odor-control technology; Soil and vegetation protection during construction, stabilization (e.g. re-vegetation); Operation and maintenance plans and training; Protection from livestock; Water quality tests; Hygiene training.	Changes in water table levels in wells; Water quality in wells (if measurements performed); Visible changes in water quality in receiving water bodies; Size of area of degraded vegetation at site; Number of operation and maintenance plans and regional water use plans; Disease cases.
Solid waste collection/disposal:		
Pollution of surface and groundwater from landfill; Smog, haze and particulate contamination from burning garbage (incl. impact on human health); Unpleasant odors; Contamination and health risks from hazardous waste; Disease transmission; Unpleasant living conditions close to site.	Siting studies (covering also transport needs); Proper design of collection and disposal systems; Proper drainage; Spread and cover garbage at landfill site, prohibit or minimize burning; Separate disposal system for medical or hazardous waste; Operation and maintenance plans and training; Recycling programs; Safety procedures and training.	Water quality in wells (if measurements performed); Visible changes in water quality in receiving water bodies; Number of operation and maintenance plans; Illegal landfills; Cases of garbage burning; Disease cases.
Construction of buildings (health centers etc.):		
Water and soil contamination from building waste; Degradation of vegetation at site and along transport routes;	Proper siting and selection of transport routes; Protection of soil surfaces and vegetation during construction; Dust control by water or other means;	Water quality in wells (if measurements performed); Visible changes in water quality in receiving water bodies;

IMPACTS	MITIGATION MEASURES	MONITORING INDICATORS
Construction of buildings (health centers etc.):		
Water contamination from inadequate sanitation; Accumulation and soil contamination from solid waste; Contamination and health risks from medical waste; Construction accidents. Dust and noise during construction; Disturbance of habitats and wildlife;	Control and daily cleaning of construction sites; Provision for adequate waste disposal and sanitation during construction and operation; Separate disposal facilities for hazardous waste; Special attention to drainage; Safety measures and procedures.	Size of area of degraded vegetation at site; Disease and accident cases.

RURALINVEST

In recent years, locally designed and managed investment projects have assumed increasing importance as effective tools for sustainable rural development. Supporting local communities to conceive and implement their own projects – whether for income generating activities or for social investments – not only ensures greater ownership and commitment to those projects, but also strengthens the capacity of communities to contribute to and manage their own development. However, the increasing adoption of this approach by national governments, international financing agencies and rural banks has also highlighted the critical importance of providing adequate support and guidance to national technicians working with communities and other groups in identifying investment needs, defining potential projects, and developing them for external financing.

RuralInvest answers this need by offering a series of modules, developed over a number of years and tested extensively in the field, which provide such support through a range of materials and training courses, and include technical manuals, custom developed software and instructors' guides. Modules currently in use or under development include:

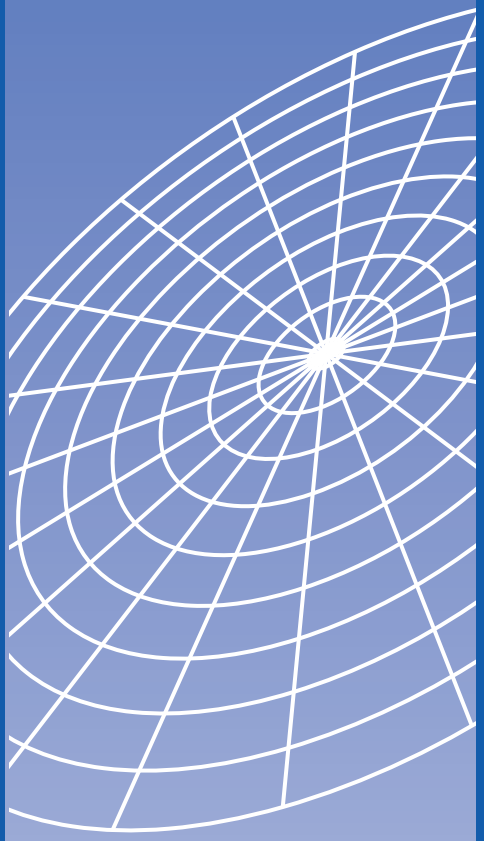
Module 1: **Participatory Identification of Local Investment Needs**
Module 2: **Preparing and Using Project Profiles**
Module 3: **Detailed Project Formulation and Analysis**
Module 4: **Monitoring and Evaluation of RuralInvest Projects**

An associated training course "**Assessing Demand for Rural Investments**" is also available to assist technicians to evaluate market and non-market demand for project outputs.

Module 3: Detailed Project Formulation and Analysis

Following on from earlier needs identification and project definition activities, Module 3 provides guidelines to assist local technical staff in developing high quality project proposals suitable for external appraisal and subsequent monitoring and evaluation. Drawing on MS Windows-compatible software which can be extensively customised to meet user needs, the Module facilitates the presentation of essential project data and automates key calculations such as cash flow, working capital requirements, rates of return, employment generation and costs per beneficiary. The Module comprises this technical manual, software with a user's guide, and training materials with an associated instructor's guide.

MODULE 3



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