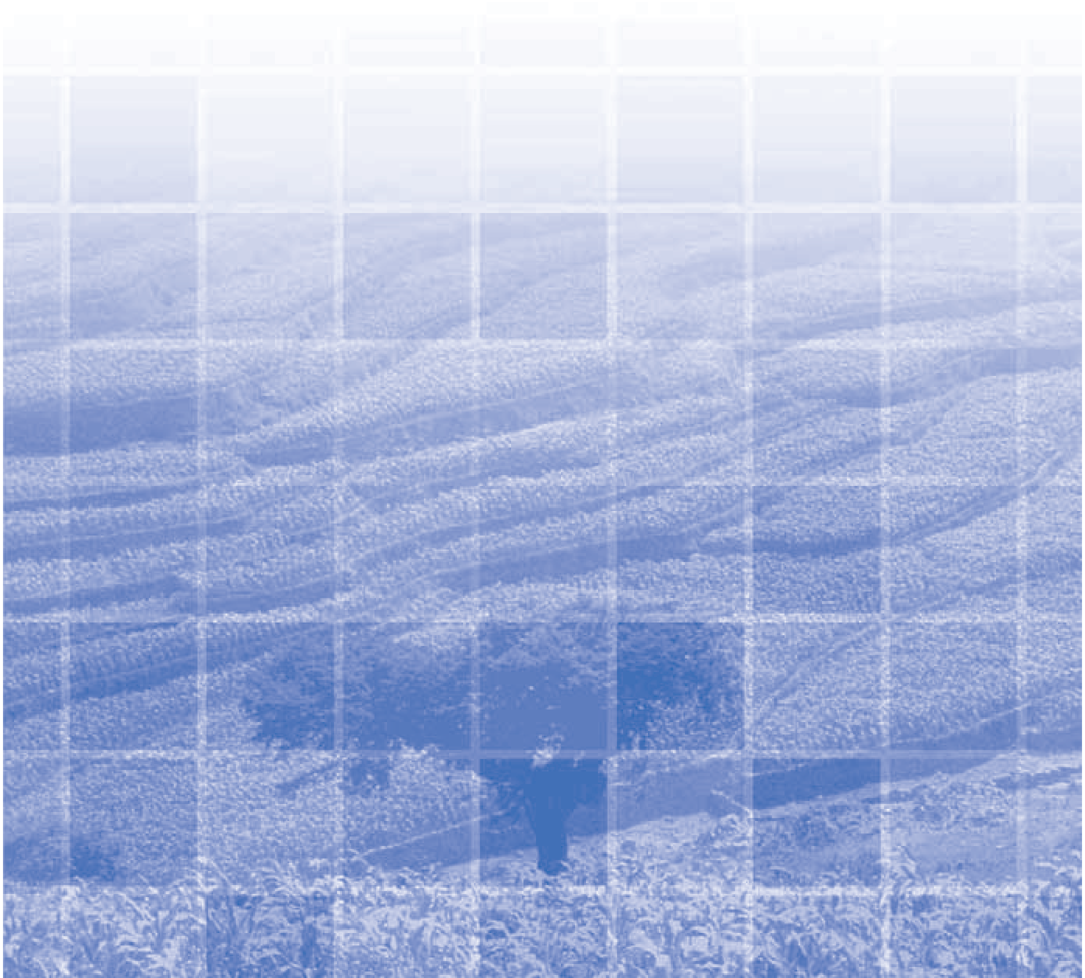
Chapter II

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.

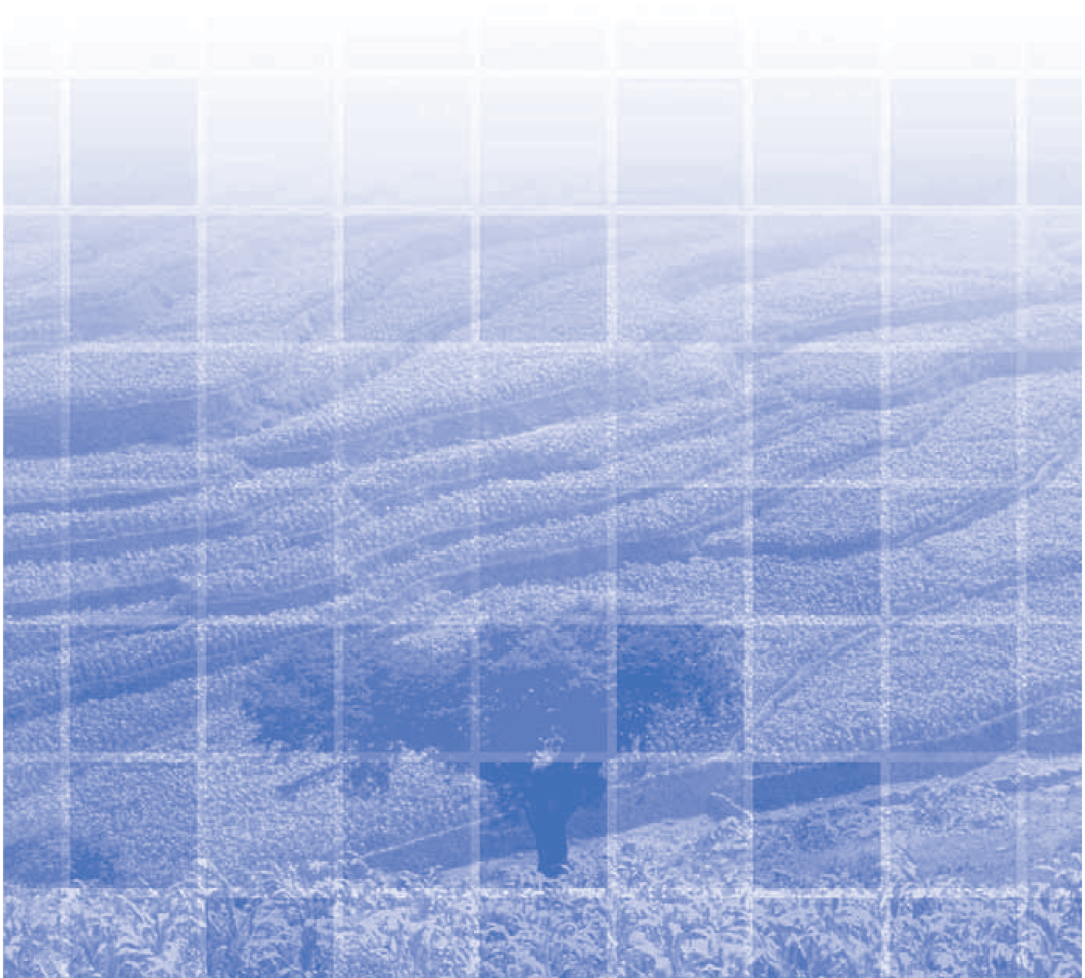
In some cases, specialized information is needed to determine such aspects as market characteristics, probable yields or the suitability of the zone for the proposed crop or product. It is therefore recommended that when a proposal deals with a matter involving information that goes beyond the knowledge 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 legallyestablished 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.

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!!!!

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 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.

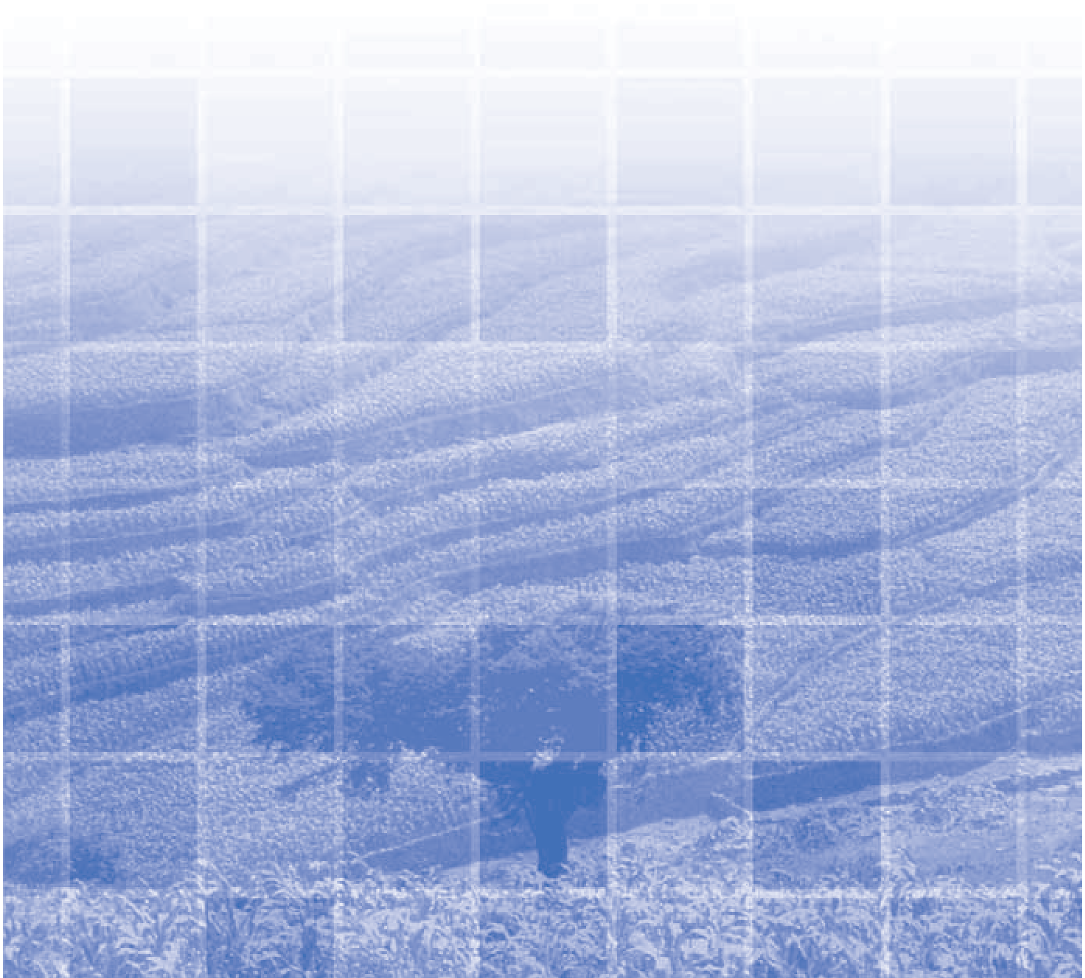
The cost of the investment to rebuild the bridge approaches was quite small, but how to measure the benefits? By counting traffic volumes, and talking with drivers to determine seasonal variation in traffic flows, an estimate could be made of the number of direct users. Given the lack of alternate routes, 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?

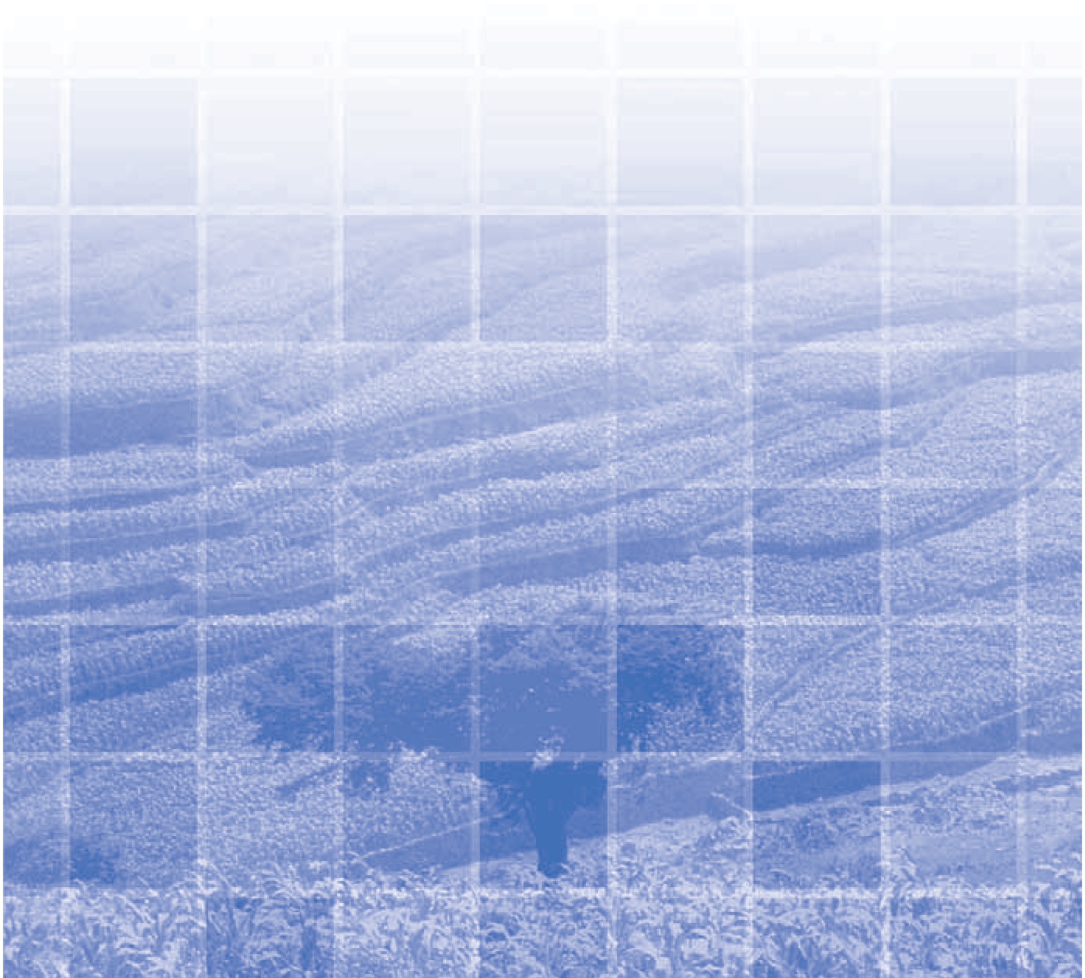
- Are there other users of the same technology in the project's operating area? Who are they? Are they satisfied with the attention they receive regarding parts and service?

- 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.

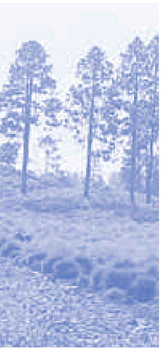
- Does the machine need service by an expert, trained in the factory? Can any competent mechanic maintain the equipment? If a formally trained expert is needed, where is the nearest person? How much does he charge per visit?

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:

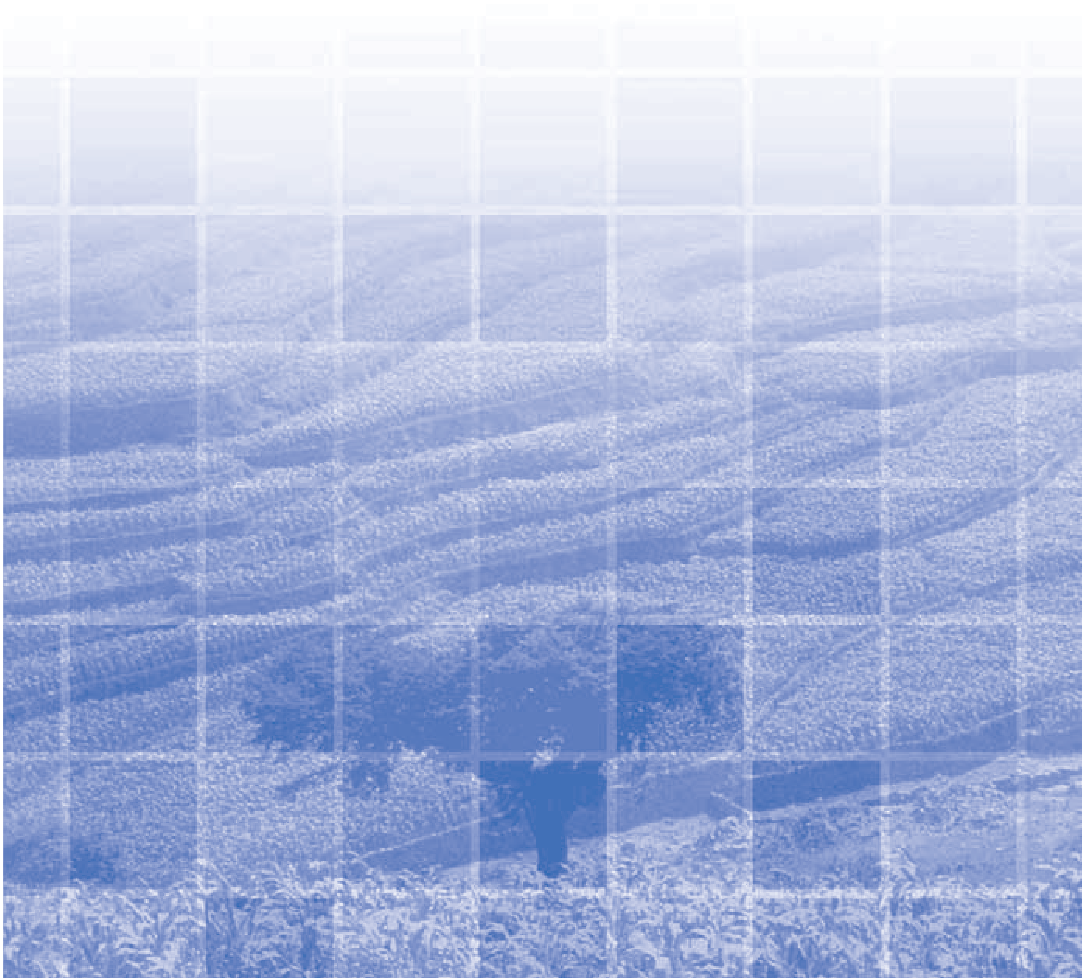
- Contributions in cash or in kind from the community itself, through an association of users (drinking water, latrines, access roads, etc.);
- Charging the beneficiaries (healthcare centres, schools, etc.) at least some portion of the service cost;
- Contributions from the local or municipal government, 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 Year 1	per block Year 2	per project Year 3	Years 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