Manual for Commercial Analysis of Small Scale Projects

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THE AUTHOR

Henry Jackelen is a member of the Small Enterprise Development Group at A.T. International. The group seeks to focus A.T. International's learning about the role small enterprise plays in development and provides assistance to field officers working on small enterprise projects in the Third World.

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INTRODUCTION

For a project to be financially self-sufficient it must often survive in an unfavorable economic environment. The purpose of this manual is to give you a better understanding of how a project must be analyzed to determine whether it has a chance to survive and how long it will need outside assistance before it can stand on its own two feet, so to speak.

The method of analysis outlined here is based on a standard commercial analysis that any bank would use to determine the credit-worthiness of a prospective client. This analysis is simplified for the purpose of analyzing small projects.

There are differences between this analysis and the more prevalent cost-benefit analysis. The latter attempts to quantify all direct and indirect benefits over time, to compare these to the costs, and to determine whether the benefits justify the costs. It uses an opportunity cost of capital that the project must cover in terms of its benefits.

This analysis is much simpler and less complete in terms of understanding the economic impact of a project. It is, however, more valid in one crucial aspect -- in determining the financial viability of an enterprise. Any commercial analysis asks a basic question: Can a project produce goods at a competitive price and can it sell enough to stay in business? The best analysis would first look at a project from the standpoint of commercial viability and then estimate its economic impact with a cost-benefit analysis. Combining both types of analysis permits more informed decisions about small-scale projects.

The initial purpose and design of this manual was for A.T. International staff. Subsequently, it became clear that no similar manual exists and based on the positive feedback from institutions collaborating with ATI, it was decided to disseminate the manual to a wider audience. It is hoped that it will help, in some measure, a wide variety of institutions in the developed and developing world who work with small scale projects.

This manual was designed with an interview format in mind. It is assumed that most projects will not generate the data in an organized fashion and that the interview process will be needed to gather information. Part I is a discussion of the concepts in commercial analysis. It is organized in the same sequence as the interview format or "tools" that the concepts are meant to explain. The tools are discussed in Part II. The concepts and the tools are organized in six sections:

I. Production Process

II. Costs

III. Calculating Total Capital Requirements and Financing Costs

IV. Price Distribution and Marketing

V. Break-Even Analysis

VI. Cash Flow Analysis

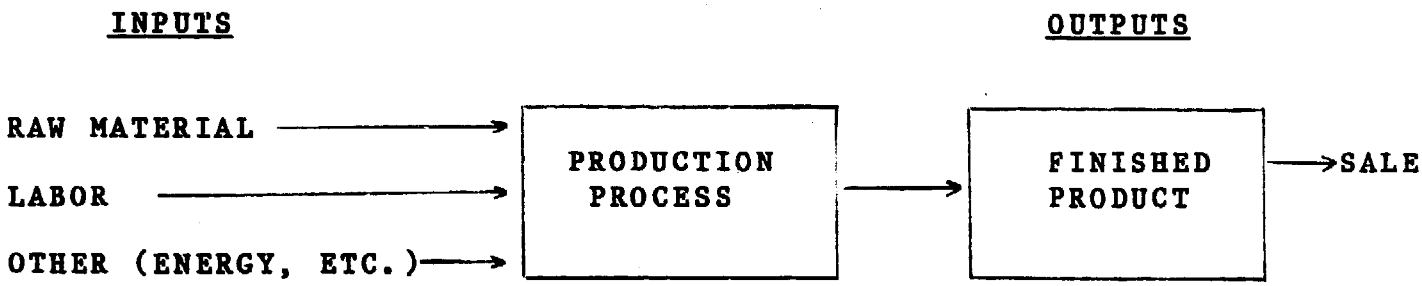
The sections entitled Production Process, Costs, and Price Distribution and Marketing will be completed on the basis of interviews. The other sections -- Calculating Total Capital Requirements and Financing Costs, Break-Even Analysis and Cash-Flow Analysis -- are designed to analyze the data collected in the first three sections. These tools attempt to organize systematically the data needed for analysis. However, there are a few analytical contradictions that should be mentioned. As costs are interrelated, for example, it will be necessary to jump back and forth when one section requires information from other sections.

The first level of information is a detailed description of the production process and how it affects the traditional technology. This requires no estimates of costs, only thorough knowledge of the process. Once the process has been documented, it is possible to proceed to the most difficult section -- Costs. Knowledge of the process will differentiate the costs. When the first two sections are completed, the first analytical section -- Calculating Total Capital Requirements and Financing Costs -- can be completed. The fourth section -- Price, Distribution, and Marketing -- will require information from interviews and analysis. Break-Even Analysis uses information from all four preceding sections. The last section, Cash Flow Analysis, will use all cost and income data over time to estimate how long it will take for the project to be self-sufficient.

Finally at the end of each section in Part I there will be two case studies to help illustrate the concepts discussed.

I. <u>WHERE TO START: THE PRODUCTION PROCESS</u>

The starting point in this analysis is, <u>in all cases</u>, the production process. You must understand this process to ask the questions that will produce the data for commercial analysis. This understanding is <u>not</u> of the technical aspects, but of the steps involved in processing raw materials into finished products.



The production process, as the simple graphic illustrates, involves those steps that have to be completed after the inputs of raw materials and labor are in place and that lead to the completion of a finished product for sale.

For example, the production process for the brickmaker would include the following steps:

1. Gathering sand and clay;
2. Mixing the sand and clay;
3. Forming the bricks;
4. Drying the bricks;
5. Firing the bricks;
6. Cooling the bricks.

Data collection tools have been designed (see Attachment A), to give you a clear understanding of the production process. And the understanding of the process is important because several analyses will use this data. An analysis is only as good as its underlying assumptions. And production data, organized around assumed categories of activity, will determine the quality of the final analysis.

There are no costs included in this part of the analysis, -- <u>only the process</u>. With this foundation in place, several different estimates of costs can be "plugged in" to analyze commercial viability.

The data collection tool is designed to answer the following questions:

1. What is produced?
2. How is it produced?
3. How much is produced?
4. What raw materials are needed?
5. How much raw material is needed?
6. How long does it take to produce?
7. How many people does it take?
8. How long does it take these people to produce?

In asking questions about the production process, you must be careful to communicate effectively so that <u>every</u> step is recorded. In a vast majority of cases, project holders will never have put these steps down on paper. Nonetheless, they do know how to make the product and can supply accurate information if you can make sure that the step-by-step logic is followed. The best approach is to start with the raw materials and see what happens in each step until you are satisfied you understand how the raw materials become finished products -- again, not in a technical sense, but in terms of a process.

These tools are designed with flexibility in mind. You will find that people involved in production projects think in different time frames. Our objective: to calculate <u>monthly</u> estimates of costs. If, however, the producer thinks in daily, weekly, or monthly units you must note this down. Using the example of the brickmaker, he may think in terms of maybe 10 days to make bricks:

1 day to gather sand and clay;
2 days to mix sand and clay;
2 days to form the bricks;
2 days to dry the bricks;
2 days to fire the bricks;
<u>1</u> day to cool the bricks;
10 days

If he produces 1,000 bricks in a 10-day production cycle, he will think of the costs of those 1,000 bricks. For our purposes, we will compile those costs and then convert to a 30-day cycle (i.e. multiply by 3).

In many cases, there will be more than one product. It is important to differentiate between separate products and by-products. In the case of by-products it is best to consider them part of the main product. Separate products require separate production sheets.

Finally, many projects will have a direct relationship to an existing traditional technology. It would then be important to map out that traditional technology in the same fashion. The purpose is to establish a baseline for evaluating the effects of the proposed technology. What is the impact of the proposed technology on the traditional process? Does it increase yield, or reduce production time?

INTRODUCTION TO CASE STUDIES

To illustrate the concepts in this manual, two case studies from the A.T. International portfolio will be discussed at the end of each section.

The first project, developed with Yayasan Dian Desa (YDD) in Jogjakarta, Indonesia, uses an under-utilized agricultural commodity, winged beans, as a substitute for soy beans in making soy sauce. This project is relatively large and sophisticated, but still useful for our purposes.

The second project developed with APICA (Associacion Pour les Iniciatifs Communautaires Africaines) in Douala, Republic of the Cameroons, will assemble and install village processing units for the manufacture of palm oil. This case is meant to be used as a contrast in size to the relatively large scale project in the first case.

Case I: YDD Winged Bean Plant
THE PRODUCTION PROCESS

Summary:

The winged bean processing plant produces a sauce comparable to soy sauce, a popular food item in Indonesia. The process sorts, grinds, and mixes the winged beans with several substances all of which are then put through hydrolysis which replaces fermentation and saves time. The "base" is then mixed with water, sugar, and spices and, finally, cooled, filtered and bottled.

Description:

STEP I SORTING: The first step consists of sorting winged beans, a procedure accomplished by one worker at the rate of 100 kgs. per hour. This step yields 95 kgs. of winged beans for every 100 kgs. sorted.

STEP II GRINDING: This step converts the winged beans into flour at the rate of 100 kgs. per hour with no loss of bulk. This process also requires one worker.

STEP III HYDROLYSIS: This step consists of 4 processes:

(A) mixing the flour with hydrochloric acid (20%);

(B) placing the mixture in 21 plastic containers, each holding 25 litres;

(C) placing containers in a chamber which is 3/4 flooded, with the water heated to the boiling point;

(D) cooking the winged bean mixture for six-eight hours. This step takes roughly 10 hours and requires two workers and one assistant.

STEP IV NEUTRALIZATION: The mixture settles for 30 minutes. The containers are then transferred to the neutralization chamber, where the mixture is put in a spinner to seperate solids from liquid. At full capacity this process yields 525 litres of mixture -- 200 of solids and 325 of liquified winged beans. The latter serve as the base for the sauce. The solids are a waste by-product. This step requires three workers to transfer the containers (45 minutes) and one worker to supervise the spinning (5 hours).

STEP V PREPARATION OF WINGED BEAN SAUCE: The base is transferred by gravity to a collecting tank, where it is mixed and cooked with water, sugar, and spices. The mixing takes

20 minutes. The proportions are as follows: one litre of WB preparation: one litre of water; four kgs. of sugar, and spices. This mixture is cooked for four hrs. at 150-180 degrees celsius. Labor for this step entails three workers for 5 hours.

STEP VI COOLING AND FILTERING: This final step requires one hour of cooling and three hours of filtering the sauce by hand with two workers. The sauce is now ready for bottling.

STEP VII BOTTLING: YDD produces three different sizes of winged bean sauce: 630 ml; 300 ml and 100 ml. The average time for bottling, capping and labeling will be between seven and nine hours for one full production cycle of 1500 litres. This step requires three workers for bottling and capping and five workers for labeling.

SUMMARY OF WINGED BEAN SAUCE PRODUCTION CYCLE

The total estimated hours for one full production cycle of 1500 litres of winged bean sauce is 33-37 hours. The labor force is approximately 25 full-time workers. YDD plans to rationalize its production in three phases over a three-day period: Phase I (steps I-III); Phase II (steps IV-V) and Phase III (steps VI-VII). At full capacity one full batch will be completed as follows:

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6
PHASES	I	I	I	I	I	I
		II	II	II	II	II
			III	III	III	III

So, by the third day after start-up, YDD plans to have one completed batch of 1500 litres bottled and ready for sale. YDD plans to have the plant operating for six days a week, a schedule which produces 9,000 litres of winged bean sauce weekly.

The above chart is only for the first week of production to show how the phases would work. The incomplete production of the sixth day would be transferred to the first day of production of the following week.

Case II: The APICA Colin Press
THE PRODUCTION PROCESS

Introduction:

This project varies significantly from the previous case since it attempts to introduce an appropriate technology that will bring about greater productivity in a traditional palm oil production. The project is based on the introduction of a hand-powered press (the Colin press) that was manufactured in France until the early 1960's. There are an estimated 200-300 of these presses in various states of disrepair in southern Cameroon. The first step in analyzing this project is to understand the traditional process used in the production of palm oil.

THE TRADITIONAL TECHNOLOGY

Summary:

Organizations working with village producers of palm oil estimate that a family harvests 6,750 kgs. of palm nuts annually. The palm nuts are sorted by hand and pressed by feet. A technical study revealed that it takes 52-person hours spread over a 9-10 day period to complete a production cycle, that the average amount of palm nuts harvested per production cycle is 224 kgs., and that the average yield is 31 kgs. of oil.

Description:

Day		Step	No. of Persons	Per Person Hours	Total Person Hours
1	A.	Seeding	1	2	2
2	B.	Cutting	1	4½	4½
	C.	Collecting and Transp.	1	2	2
3	D.	Breaking Apart	1	1	1
4-5	E.	Aging	-	-	-
6-7	F.	Picking	2	10½	21
8	G.	Transp. to Cooker	2	1½	3
	H.	Gathering of firewood	1	1	1
	I.	Cooking/prep.	1	1½	1½
	J.	Cooking/Sterilizing	0	-	-
9	K.	Depulping	3	2	6
	L.	Press	2	2½	5
	M.	Boiling/Purification	1	3½	3½
	N.	Bottling	1	½	½
			TOTAL	32½	51

TOTAL Estimated No. of days: 9 - 10
TOTAL Amount of Palm Nuts: 224 Kg. (Bulk)
Net Amount of Palm Nuts: 145.8 Kg. (Net)

Palm oil extracted: 31.0 Kg. = 34.75 LITRES

THE PROPOSED TECHNOLOGY

Summary:

Under the proposed scheme, farmers continue steps A-C, finally transporting palm nuts to a village processing unit composed of a bunch stripper, Colin press, and clarifier. This unit carries out the remaining steps in the production process in 4-6 hours. The unit requires one fundamental change in pattern: the farmers have to harvest 500 kgs. of palm nuts instead of the present 225 kgs. since the unit has the capacity for the larger amount. The benefits of this technology are twofold: an increased yield (traditional process yields 14%, proposed technology yields 22%); and more importantly, time savings (traditional technology takes an estimated 10 days to process 225 kgs. of harvested palm nuts yielding 31 kgs. of oil, proposed technology takes three days to process 500 kgs. of harvested palm nuts yielding 110 kgs. of oil).

Description:

STEP I GATHERING: It takes farmers two days to harvest, collect and transport 500 kgs. of palm nuts to the processing unit.

STEP II BOILING: Five oil drums each take 100 kgs. of Palm nuts that are boiled for 2.5-3 hours. The five batches are staggered to accomodate the time requirements of the other steps.

STEP III SORTING: The bunch stripper separates the nuts from twigs and branches, processing 100 kgs. of palm nuts in 15 minutes. As the batches complete the boiling phase, they pass through the bunch stripper and yield 60 kgs. of nuts ready for pressing.

STEP IV PRESSING: The hand-powered Colin press processes 120 kgs. of boiled palm nuts (two batches) in 30-40 minutes -- a total pressing time of two hours for all five batches. Each 120 kgs. yields 44 kgs. of oil (50 litres).

STEP V FILTERING AND BOTTLING: The final component of the unit is a converted oil drum and a pipe through which the palm oil is poured. Water collects the residue and the palm oil rises through a spigot into 20-litre bottles.

Labor requirement:

The farmer and his family will be trained to operate all the equipment. The unit will have an employed caretaker who will record and coordinate all use of the facility.

Capacity estimate:

APICA estimates each unit could process up to 700 kgs. of harvested palm nuts on a daily basis. As the process requires staggering the steps, we should try to understand how this would work. We will differentiate the five batches of 100 kgs. each and stagger these batches over time.

TIME REQUIREMENT FOR 500 kgs. OF HARVESTED PALM NUTS
(Five Batches: A; B; C; D; E)

hour of operation	Step II (3 hrs.)	Step III (15 min)	Step IV (40 min)	Step V (30 min)
0				
3	A&B			
4	C&D	A&B	A&B	
5	E	C&D	C&D	A&B
6		E	E	C&D
7				E

This table shows that two batches can be prepared and processed at a time. And that it should take a family seven hours to complete a batch of 500 kgs. of harvested palm nuts. Steps III and IV are feasible during one hour as the bunch stripper can process 100 kgs. every 15 minutes, a volume which can be immmediately transferred to the press while the second batch is put through the bunch stripper. The above table also shows that a second family could begin processing its oil by staggering the boiling phase. Batches would be ready by the sixth and seventh hour of operation. APICA's estimate of 700 kgs. capacity per day seems realistic. Based on the capacity of individual small farmers to harvest Palm Nuts, it is estimated that groups of 20-25 farmers will be required.

II. THE NEXT STEP: COSTS

Now that you understand the process, you're ready to investigate the costs. This is by far the most difficult section for there are many hidden traps caused by differences in perceptions between you and the interviewee. This section will give you the basic data to determine the level of production that the proposed enterprise needs to be self-sufficient (break-even point) and the cost to make a single product (unit cost). Unit-cost and break-even analysis are covered in a separate section, but keep them in the back of your mind so you know where you are going. Many project holders will already have an estimate of these indicators. Our objective is to get you and the project holder to think them out together in a step-by-step fashion to make sure all bases have been covered.

The Four Basic Categories of Costs:

This section categorizes costs. A general listing of costs is literally of no use for our analysis. Costs must be differentiated. Don't mix apples with oranges. The data-collection tools found in Attachments BI-BIV are designed to assist in differentiating all costs.

1. Capital Costs: The costs to acquire, build, and install all elements of the production unit to insure that it is fully commissioned and ready to start production.

2. Fixed Costs: These costs are incurred to operate the production unit regardless of the level of production.

3. Variable Costs: These costs directly relate to the level of production, principally raw materials and labor.

4. Start-Up Costs: These are one-time costs associated with getting started in business (legal, engineering fees, etc.).

Explanation of Types of Costs

1. Capital Costs

This category is self-explanatory. (See Attachment B-I, Capital Costs). It covers all physical installations, equipment, and machinery. The land required, the labor to build installations, transportation costs for the equipment and machinery.

2. Fixed and Variable Costs

a. The Differerences

Once you have estimated the capital costs of the project, we proceed to the confusing area of fixed and variable costs. You might ask, why bother with this differentiation? After all, a cost is a cost; let's just list all costs of production together. Actually you would be right if we could assume that all projects would produce at full capacity; but as you know, this hardly ever happens. We need to know WHAT IF it doesn't produce as expected, for whatever reason. Our analysis has to ask the question: If production is only at 40%, 50%, or 60% of planned capacity, is the project viable? Or better still, at what level of production is the project viable?

So what does capacity have to do with fixed and variable costs? If you have a project that is expected to produce 1,000 units and, instead it produces 600 units, the fixed costs remain the same while variable costs decrease. We must segregate these costs for separate analysis. The fixed costs are the overhead, while the variable costs determine unit costs. With these two categories of costs we will be able to accomplish one of the prinicipal objectives of this exercise: break-even analysis.

Here is a a simple example to help you differentiate fixed and variable costs: You buy a car for $5,000 and the dealer agrees to finance it. Your monthly payment is $200. Now, whether you drive the car one mile or 10,000 miles, you still have to pay your monthly installment of $200. This is a fixed cost. The gasoline, oil, and service to make the car operational are directly related to the mileage you drive. This is, you guessed it, a variable cost.

b. Fixed Costs

There are several costs that an enterprise will incur regardless of the level of production. Chief among them are:

(i) Financing Costs: Assuming that production projects should pay for themselves over time, our analysis must consider the capital necessary to begin production (total capital requirement). These funds will come from loans and whatever capital the project may own. This loan must be repaid on a scheduled basis. Thus, regardless of the level of production, the project will have to pay on a regular basis. You will have to estimate this on your own. This follows your estimate of net capital requirements, a procedure discussed later in this manual.

(ii) Depreciation Cost: Depreciation is a tricky concept. It is best understood as a cost of production; without it, the total cost of doing business would not be accurately reflected. For our purposes, we will assign a fixed useful life of five years to equipment (vehicles, tools, carts, etc.) and 10 years to machinery (presses, lathes, heavier machines) with no salvage value. Thus the cost of the machinery is charged to the units produced as a cost of production during the useful life of the machinery. In cases where the useful life exceeds these terms, use 10 years as the measure.

(iii) Maintenance and Repair: In addition to depreciation, all projects should estimate some provision for adequate maintenance and repair of machinery, equipment, and the physical plant.

(iv) Rental or Lease Fees: If the project rents facilities, equipment, or machinery, these costs should also be included in fixed costs. Rental is an excellent example of fixed costs that continue regardless of production.

(v) Salaries: The role of employees and how they will be paid generally determines how salaries are charged. The salaries of the project manager, accountant and secretary should be considered fixed costs. If the project intends to pay workers a fixed monthly salary, regardless of production, these salaries should be considered as fixed costs. Other wage related costs are discussed in variable costs (below).

(vi) There will be other costs which will vary from project to project, such as insurance, licensing fees, and the like.

c. Variable Costs

The easiest way to understand these costs is to take whatever is produced and ask two simple questions: How much raw material did it take to produce it? How much labor did it take?

There are two levels of analysis of variable costs: (1) What will be the estimated total monthly variable costs (assuming full production)? In other words, what will you pay for all raw materials and labor if you produce at full capacity? (2) What is the variable cost per unit produced (unit cost)? The second level is easy once you have completed the first part. You divide the total variable costs by the total number of units to be produced at full capacity.

The types of variable costs our analyses will consider include:

(i) Raw Materials: This includes all the raw materials to produce the finished product. Calculating raw material costs can be tricky because the quantities may vary with the number of units that can be produced. The chairmaker, for example, needs wood, nails, and varnish to make a chair. While he may purchase wood and nails in quantities small enough for one chair, a minimum quantity of varnish may be sufficient for five chairs. In small-scale agricultural processing units or building materials designed to help small farmers the cost of gathering and transporting these materials should also be included.

(ii) Labor: This includes all salaries that are not considered fixed costs. For the sake of analysis, all direct labor in production should be considered as a variable cost. In general, you'll find three general ways project holders will define how they pay labor:

(a) Plan to pay piece rate per unit produced, a variable cost.

(b) Plan to hire "x" workers and pay them a fixed weekly wage, a fixed cost.

(c) And, then, there's the confusing category where the project holders talk about paying a daily salary or hiring workers as needed. Labor then should be considered a variable cost as they intend to employ as needed, not on a fixed basis.

(iii) Other:

(a) Energy: This includes costs -- oil, gas, electricity, wood, -- related to operation of production equipment and machines.

(b) Transportation: This item includes the costs to get the finished product to the market, whether as a wholesaler, a retailer or a consumer.

(c) Marketing: Commissions to sales agents.

3. Start-Up Costs

These are one-time costs that are specifically related to getting the project going and are not already covered by capital costs. Examples of these costs are: legal fees, feasibility studies, engineering fees, licensing and registration fees, training fees, and other locally relevant items.

CASE I YDD
COSTS

A) CAPITAL COSTS

The following costs include all purchases of equipment and building costs and a market value for the land that YDD contributed. All costs are in Indonesian Rupiah (Rp.).

CAPITAL COSTS

(Rp.)

LAND 800m2 (Rp. 20,000 per m2)		16,000,000
BUILDING		
350M2 (Rp.80,000 per m2)	28,000,000	
electricity installation	3,112,000	
water installation	789,000	
TOTAL BUILDING		31,901,000
MACHINERY		
peeler/grinder	1,465,000	
stainless steel filter and pump	4,580,000	
" " " " " hydrolysis contain.	2,200,000	
separator	1,645,000	
neutralization equip.	4,180,000	
ferro cement tank	587,000	
extractor	8,120,000	
other equip.	2,201,000	
TOTAL MACHINERY/EQUIPMENT		24,978,000
TOTAL CAPITAL COSTS		72,879,000

B) FIXED COSTS (MONTHLY)

The following fixed costs do not reflect hypothetical financing costs or working capital requirements that will be included in the break-even analysis section.

Supervisor	200,000	
2 secretaries	120,000	
Production Manager	85,000	
Supplies	100,000	
Other	75,000	
depreciation	225,000	
TOTAL FIXED COSTS(MONTHLY)		805,000

C) VARIABLE COSTS

The following costs are based on one production cycle with an estimated yield of 1,500 litres of winged bean sauce per production cycle.

VARIABLE COSTS
(Rp.)

RAW MATERIALS (quantities/price and % of total R.M.cost)	
winged beans (100 kgs. x 250)	25,000 (3%)
hydrochloric acid (288 litres x 280)	80,640 (9%)
NA2 CO3 (189 kgs. x 220)	41,580 (5%)
cane sugar (1,472 kgs. x 310)	456,000 (54%)
coconut sugar (368 kgs. x 500)	184,000 (22%)
kerosene (280 litres x 150)	42,000 (5%)
spices	10,000 (1%)
tylose (1.5 kgs. x 1800)	4,200 (-%)
OTHER	
water (15 m3 x 75)	1,125 (-%)
electricity	1,800 (-%)
TOTAL RAW MATERIAL COSTS	846,665
LABOR (25 workers x 7 hours x 7.50)	18,750
DISTRIBUTION & SELLING COSTS	38,750
TOTAL VARIABLE COSTS PER PRODUCTION CYCLE (1500 LITRES)	904,165

UNIT COST CALCULATIONS:
904,165 /1500= 603 Rp. per litre

AS YDD WILL BE PRODUCING 3 DIFFERENT SIZES THE ABOVE REFLECTS COSTS WITHOUT COSTS OF BOTTLES,CAPS AND LABELS. UNIT COSTS FOR EACH SIZE ARE AS FOLLOWS:

UNIT COST OF 630ml SIZE

cost of winged bean sauce (603Rp. per litre x 63%*)	379.89
cost of bottle	75
cost of cap	2.5
cost of label	5.25
TOTAL UNIT COST 630ml SIZE	462.64

* 630ml equals 63% of 1 litre

UNIT COST OF 300ml SIZE

cost of winged bean sauce (603 x 30%)	180.9
cost of bottle	30
cost of cap	2.5
cost of label	5.25
TOTAL UNIT COST 300ml SIZE	218.65

UNIT COST OF 100ml SIZE

cost of winged bean sauce (603 x 10%)	60.3
cost of bottle and cap	17
cost of label	2.10
TOTAL UNIT COST 100ml SIZE	79.4

The above shows that the single most important raw material is sugar, representing close to 80% of total raw-material purchases. Cane sugar alone is responsible for 54% of total raw material costs. As the cost of sugar has escalated far beyond what YDD had originally estimated, the potential profitability of the plant has been altered significantly. It is important to note that YDD has been working on substituting molasses sugar available directly from villages at a much lower cost. As it seems probable that YDD will be able to solve this problem, the following is an amended variable-cost estimate using the low-cost sugar.

AMENDED V.C. AND UNIT COST ESTIMATES WITH LOWER SUGAR COSTS

cost of 1 kg. molasses	Rp70
cost of processing per kg.	65
contingencies	15
TOTAL COST OF PURCHASE AND PROCESSING 1 kg. MOLASSES	150

1kg. MOLASSES YIELDS .7kg. OF SUGAR

EQUIVALENT PRICE OF 1KG. SUGAR DERIVED FROM MOLASSES Rp214

PRESENT PURCHASE OF SUGAR PER PROD. CYCLE:
1,472kg. x 310 = 456,320

PRICE OF SUGAR FROM MOLASSES PER PROD.CYCLE:
1,472kg. x 214 = 315,008

NET SAVINGS PER PRODUCTION CYCLE: = 141,312

AVERAGE UNIT COST SAVINGS PER LITRE:
Rp.141,312/1,500 litres = Rp94.2 per litre (16%)

UNIT COSTS USING MOLASSES SUGAR

UNIT COST .630 ml SIZE	403.29
UNIT COST .300 ml SIZE	190.39
UNIT COST .100 ml SIZE	6.9.98

CASE II APICA
COSTS

A) Capital costs:

The village units will be established by APICA under a project with ATI. The commercial analysis for this enterprise (Outils Pour La Comunaute) shows that the unit can be installed for a total price of 2,860,000 FCFA (roughly $8,000). This price includes the cost of training and ongoing technical assistance.

However, as the group of 20-25 farmers cannot afford to pay this amount, a lease arrangement will be made between "OUTILS" and the villagers. This lease will require monthly payments and is calculated in the financing costs section.

The cost of building a small shed, valued at approximately 200,000 FCFA, to house the unit and store the oil will be built by voluntary labor and donated raw materials by the users. This project did not include this local contribution as a capital cost because it is a requirement for participating in the project.

B) Fixed costs (monthly):

The only fixed costs besides financing costs that the unit will incur are the costs of one full-time caretaker and maintenance expenses. Depreciation will not be applicable in this case for reasons that will be discussed in the section covering financing costs.

Caretaker monthly salary:	15,000 FCFA
Maintenance:	5,000
	20,000 FCFA total

C) Variable costs:

In this case there are no variable costs as the unit is essentially a service unit where farmers bring their palm nuts and process them. For this service they will pay 25% of all oil produced to the unit, which will then sell it to pay costs.

III. CALCULATING TOTAL CAPITAL REQUIREMENT AND FINANCING COSTS

Once you have a good idea of the total costs of the enterprise, we can proceed to the fundamental part of this analysis: How much capital will be required to get the proposed project established and in operation? The total capital requirement is the sum of three components: capital costs, start-up costs; and working capital provision.

Working Capital Provision: This is a tricky area in estimating total capital requirement. It is unrealistic to expect any project to become self-sufficient financially when it begins production. There will have to be a provision for carrying the project for a period of time until production problems are ironed out, sufficient stocks of finished goods are completed, and most important, enough funds are on hand to buy raw materials for the intial stages of production. Therefore, all costs of operation (fixed and variable) should be covered for a period of time. For the purpose of our analysis, a good rule of thumb is to use three months of total costs of production as the working capital provision.* These funds will give the project the liquidity to operate in a stable fashion. Many times this provision is overlooked and the very viability of projects is affected as plant and equipment are installed without the capital to get into production. The working capital provision cannot be completed until you have listed the fixed and variable costs, including the financing costs discussed below.

Financing Costs: Once we have determined the total capital required (refer to Attachment B-VI), then two questions become crucial to determining the commercial viability of a proposed project: (1) How much capital can the project holders raise locally as risk capital? (2) How much capital is needed from outside sources?

For our purposes, the capital from outside sources will be generally covered by grant giving organizations, banks, and the like. A cost must be attributed to this capital. Even though funds may be in the form of a grant, we must attribute a cost to these funds so that we know that the project can pay for itself over time. This cost and amortization of capital will form a major part of the fixed costs of the project.

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*This period may vary from project to project, but we will use three months to standardize the analysis.

The net-capital requirement will enable us to calculate the financing costs. You may have noted the discrepancy here: the calculation of total capital requirement requires us to include three months of fixed costs, yet we cannot calculate fixed costs until we have determined financing costs. The solution to this dilemma is simple. We will have two types of fixed costs: fixed costs without costs of financing; and fixed costs including costs of financing.

The second type will be the most important and crucial for our analysis. The first type will allow us to calculate a provision for working capital to complete the capital requirement section.

With the above modifications, we have obtained all information necessary to calculate total capital requirements and financing costs. The principle behind using financing costs is that, for our projects to be viable, they must show an ability to become financially self-sufficient. To do this they must be able to function within their local contexts and become credit-worthy enterprises. For this to occur we must apply a very strict rule: <u>Over time a project must be able to demonstrate that it can obtain and repay capital from local sources</u>. This requires that we obtain a good estimate of the interest-rate structure from financial institutions where the project is located. We should not use alternative forms of financing (money lenders) to determine this cost of financing. In many cases, the only financing available to our projects will be alternative credit. One of our main objectives to get these projects to become bankable. The best way to insure access to credit from established sources is to have an operating enterprise that has demonstrated its abililty to cover its costs and repay loan capital.

CASE I:YDD
FINANCING COSTS

For the purpose of analysis we will attribute a cost to all the net capital requirements of the project to insure that it has a reasonable chance of surviving in a commercial environment. The cost of this capital will be determined by the interest rate in Indonesia. For this type of activity, government bank rates are in the vicinity of 15% per annum.

NET CAPITAL REQUIREMENT

For our purposes total capital employed consists of all capital costs plus a provision for working capital (three months fixed costs and one month of variable costs).

CAPITAL COSTS:	Rp. 72,875,000	
WORKING CAPITAL:		
fixed costs (3 x 805,000)*	1,740,000	
variable costs (6 x 4 x 904,165)**	21,699,960	
TOTAL CAPITAL REQUIREMENT	96,314,960	
MINUS YDD CAPITAL CONTRIBUTION	16,000,000	(land)
NET CAPITAL REQUIREMENT	80,314,960	

For the most conservative analysis we will assume that this net capital requirement was borrowed on a five-month basis with a three-month grace period and equal monthly payments thereafter. In this case, the total monthly payment would be Rp 2,070,889 at an interest rate of 15% per annum.

* Cost of bottles, caps and labels not included
**Without depreciation

CASE II: APICA
FINANCING COSTS

As mentioned previously, it is impossible for the group of 20 farmers to afford the processing unit. The only way these units can be sold is through a lease/buy-out arrangement. Under this arrangement the group will agree to lease the extraction unit for five years, after which they will own the unit by paying a nominal fee. The lease will be for five years at an interest rate of 10% per annum (the interest rate available for rural loans) with a grace period of three months.

Price of Village Unit:	2,680,000
Conversion Factor:	.022111*
2,680,000 x .022111 =	59,000

IV. PRICE, DISTRIBUTION AND MARKETING:

Now that we have a grounding in the production process, in the costs for the project, and in the total capital requirement, we move to the next part of the analysis -- projected income for the project. Project income will depend on three factors: price, distribution, and marketing. How much do you charge for your finished products? How do you get the products to the market? Who is the target consumer?

The project holder's perception of the price that will be obtained for the product must be examined until you're convinced that all bases are covered. In estimating price, did the enterprise take into account the cost of getting the product to wherever it will be consumed? Who will be the final salesperson? What commission will be paid and what impact will that have on the final price the intended consumer will pay?

Most cases will be simple, involving a product already available in the market. However, there are often complicating factors: Will the project depend on a traditional network of middlemen? Will products be sold on credit or for cash? Will there be different prices for individual products and bulk quantities? Is the product a cheaper alternative to existing products? Will it bring some other benefits to them? And, finally, who can afford to pay for the product at the price the project can afford to sell it?

There are two ways to determine price: through an analysis of the costs of production or an assessment of the market. For our analysis, both methods should be used. Obviously, the market is the final determinant; however, there will be cases, especially with new products in which there is no basis for comparison in the local market. If that is the case, you can approximate the selling price by using the formula found in Attachment C-III, Estimating Price Using Production Costs.

Let's use the chair manufacturing example, once again, to illustrate this method of estimating price based on costs. The chairmaker estimated unit costs (or variable cost per unit) at $10. Fixed costs are estimated at $2,000. If all goes well, the chairmaker will be able to make 1,000 chairs in a month. What price does the chairmaker charge for each chair to make a profit? We know that $10 per chair would not cover its fixed costs. The best rule of thumb is to take fixed costs and divide by 50% of the units to be produced in a month. In that way, the project is reasonably guaranteed to cover its fixed costs and if it produces 70-80% of estimates, have a reasonable profit. Thus, a reasonable price for the chairs is $10 (unit Cost) + $4 (fixed costs [$2,000] - 50% of production capacity [1000]) = $14.

Estimating market value will entail more narrative than filling in the blanks (See Attachments C I-II). Try to ask about the middlemen in the area. Many times it may be possible to investigate alternative means to get goods to market. The middlemen could be selling goods at two to three times the price the project receives. You will find difficulty in getting this information, but a reasonable attempt may contribute an important element in the assessment of your project.

CASE I: YDD
PRICE, DISTRIBUTION AND MARKETING

Dian Desa based its prices on the assumption that the winged-bean sauce will substitute for soy sauce and that its taste compares favorably with high-quality soy sauce. Small production runs have actually been marketed at a number of small food shops; the response has been favorable to both the price and the quality.

YDD's price should then be compared to high quality sauce (Kikoman) and the cheap local soy sauces:

	SIZE		
TYPE	630ml	300ml	100ml
KIKOMAN	Rp1,800	1,300	700
YDD	500	250	85
CHEAP BRANDS	350	160	50

YDD prices itself closer to the cheap brands. And its quality means it will be able to compete successfully in this market.

PRICE vs. UNIT COST

The other test for pricing is, of course, production costs. The unit costs will depend on the type of sugar. Thus, we use both the current estimates and the projected estimates using molasses sugar. The gross margin for each product shows its profitability and, most important, its contribution to covering the fixed costs and eventual profitability of the entire enterprise.

GROSS MARGIN BY PRODUCT USING PRESENT ESTIMATES

	PRICE	UNIT COST (present)	GM(%)
630ml	500	462.64	37.36(7.5%)
300ml	250	218.65	31.35(12.5%)
100ml	85	79.40	5.60(6.6%)

GROSS MARGIN USING MOLASSES SUGAR

	PRICE	UNIT COST	GM (%)
630ml	500	403.29	96.71(19.3%)
300ml	250	190.39	59.61(23.8%)
100ml	85	69.98	15.02(17.8%)

The above demonstrates clearly the sensitivity of this product to the price of sugar. By lowering the cost 30%, the gross margin more than doubles for all products. Even without a breakthrough in the cost of sugar, the analysis indicates the pricing is sufficient to cover production costs.

CASE II: APICA
PRICE, DISTRIBUTION AND MARKETING

In this case, there is already an existing system of middlemen and an established price for the product. As the additional amount of oil will not be substantial in the beginning phases, marketing problems are inconsequential. The villages using these units are already linked to the palm-oil market as traditional producers.

The small farmer's oil fetches around 175 FCFA per litre. Year-round demand means there is little price variation. The price is important because village units will be financed by the sale of the retained 25% of the oil. Oil retention is a standard method of payment for this type of service in villages of the Cameroons.

V. BREAK-EVEN ANALYSIS:

The information may now be organized and analyzed to determine the following:

- At what level of production will the project be able to cover all its expenses?
- What is the minimum price needed for the project to be viable at different levels of production?
- What happens if financial assumptions of costs or prices are changed?
- What are the best, worst, and probable scenarios for the project?

These questions will be answered with break-even analysis. This determines the following: at what level of production will the product cover all its fixed and variable costs? This is the point where the project neither loses nor makes money. In the previous sections four important pieces of information have been estimated: production capacity; fixed costs; variable costs or unit costs of production; and price. But we need one more piece of information before we can proceed to break-even analysis -- gross margin.

Gross Margin

We have seen that the costs directly related to production (principally labor and raw material) are variable costs. Based on these costs, we were able to determine a unit cost of production. If we know the unit price and the unit cost of production, we will be able to determine the gross margin. The gross margin (GM) is simply the difference between the price (P) and the variable cost per unit (VCU) of production:

Price - Variable Cost per Unit = Gross Margin

Price then has two components -- variable costs (or unit cost of production) and gross margin.

If we have a project that produces chairs, for example, and our analysis shows that the cost to produce each chair is $10 and the price for which the chairs can be sold is $14, the gross margin will be $4.

Price $14 = $4 gross margin + $10 variable cost per unit.

The gross margin is the contribution of each unit of production to cover the fixed costs of the project and eventually the margin of its profits.

You now have enough information to try your hand at doing break-even analysis. There are three steps to determine break-even:

Step 1: P - VCU = GM

Price - Variable Cost per Unit = Gross Margin

Step 2: $\frac{\text{F.C.}}{\text{GM}}$ = BE Units

Fixed costs ÷ Gross Margin = Number of units needed to break-even.

Step 3: $\frac{\text{BE Units}}{\text{Full Capacity}}$ = BE %

Number of units to break-even ÷ Full capacity = Percentage of production capacity needed to break-even.

Appropriate Widgets Inc. has the capacity to produce 1,000 widgets per month. Each widget sells for 100 pesos. The unit variable costs are 60 pesos per month. The fixed costs for AWI is 20,000 pesos.

WHAT IS THE BREAK-EVEN POINT FOR AWI?

If you know unit price (100) and unit variable cost (60), then you know what the gross margin is:

Step 1: Price - Variable Costs per Unit = Gross Margin
(P) 100 - (VCU) 60 = (GM) 40

The only other costs we need to know are the fixed costs (20,000). If we have each unit yielding a gross margin of 40 to cover fixed costs, then:

Step 2: Fixed Costs ÷ Gross Margin per Unit = Number of Units needed to break-even

(FC) 20,000 ÷ (GM) 40 = (BE Units) 500 Units

With this information we can proceed to the next step.

Step 3: Number of units to break-even ÷ Full Capacity = Percentage of production capacity needed for break-even

(BE Units) 500 - 1000 Units (Full Capacity) = (BE %) 50%

The hard part of the analysis is compiling the <u>costs</u> and the <u>price</u>, which you will have already completed. The analysis per se is easy, as you have seen. The formula is found in Attachments DI-II.

<u>APPLICATION I: More Than One Product</u>

The analysis is relatively easy up to now as we have considered only <u>one</u> product. What happens if we have a project that intends to produce more than one product?

Let's return to our example of Appropriate Widgets Inc. to see how this is handled. Our interview reveals that the project intends to produce four products -- widgets, mini-widgets, gadgets and mini-gadgets. The following table shows estimated sales at full production:

Product	Quantity	Unit Price	Total Estimated Sales
Widgets	500	100	50,000
Mini-Widgets	500	50	25,000
Gadgets	500	40	20,000
Mini-Gadgets	500	10	5,000
	Total Estimated Sales		100,000

The following table shows the percentage of sales that each product represents at full capacity:

Product	Estimated Monthly Sales	-	Total Monthly Sales	% of Sales
Widgets	50,000		100,000	50%

Mini-Widgets	25,000	100,000	25%
Gadgets	20,000	100,000	20%
Mini-Gadgets	5,000	100,000	5%

If we know that AWI's fixed costs are at 20,000 per month, then we can determine the proportional share each product should contribute to fixed costs using the percentage each contributes to monthly sales:

Product	% of Monthly Sales	x	FC	=	FC Per Month
Widgets	50%		20,000		10,000
Mini-Widgets	25%		20,000		5,000
Gadgets	20%		20,000		4,000
Mini-Gadgets	5%		20,000		1,000
					20,000

Now that we know fixed costs per product, we can proceed to estimate a break-even point for each product using the information in Attachments D-I and D-II. Let's say we have established variable costs per unit as follows:

	Price	-	VCU	=	GM
Widgets	100	-	60	=	40
Mini-widgets	50	-	25	=	25
Gadgets	40	-	20	=	20
Mini-gadgets	10	-	5	=	5

Break-Even-Analysis

	FC / GM		BE Units	BE Per Product
Widgets	$\frac{10,000}{40}$	=	250 Units	(50%)
Mini-widgets	$\frac{5,000}{25}$	=	200 Units	(40%)
Gadgets	$\frac{4,000}{20}$	=	200 Units	(40%)
Mini-gadgets	$\frac{1,000}{5}$	=	200 Units	(40%)

We conclude that if the project produces only 50% of its widgets, and 40% of all other products, it will break even.

APPLICATION II: Estimating Profitability

Let's look again at AWI, now producing only one product.

Fixed Costs:	20,000
Price of Widget:	100
Variable Cost Per Widget:	60
Full Capacity:	1,000 widgets

We have already calculated the break-even point at 500 widgets. Now you should be able to determine AWI's profit if 1,000 widgets are produced.

If you haven't figured it out, let's stop a moment and think:

o Do you know the break-even point?

Yes. 500 units.

o What does the break-even point mean?

Level of production where the project will be able to cover all its fixed costs.

o What profits are made at the break-even point?

Zero.

o So what happens when the project produces 501 units? Is it profitable?

Yes. If you produce 501 units the additional unit over the break-even point will give you a profit. In this case, 40, or the gross margin of one unit.

Remember that unit prices are composed of two categories:

(1) Variable Cost per Unit -- those costs of raw material, labor, and other factors directly attributable to production; and (2) Gross Margin -- the amount each unit contributes toward the overhead costs or fixed costs and, once those are covered, the profits.

If the VCU is 60, and the price 100, the gross margin must be 40. If the break-even point is 50%, and capacity is 1,000 per month, profits will be as follows:

1,000 full capacity - 500 units (BE point) = 500 units

500 (units) x 40 (gross margin per unit) = 20,000

APPLICATION III: What if some of the data you collected is wrong?

There will always, I repeat, always be errors. So why bother? Because this tool allows you to control for errors caused by God, Man, or Technology. Thus, you should always do a best-case and a worst-case scenario, and assume the probable case lies between.

This part of the analysis asks you to act on your "gut" feelings. When you collect data, you will no doubt form impressions: They really seem to have a good grasp of the start-up costs, but are pretty confused about their variable and fixed costs. At this point you then build in an error factor to accommodate your perception. How much? It's arbitrary. I suggest you try 50% increases and see what happens. (This would come under our worst-case scenario.)

Best-Case Scenario:

Let's say the AWI example is the best case scenario:

Full Capacity	1,000 widgets
Fixed Costs	20,000
Price	100
Variable Cost per Unit	60
Gross Margin	40
BE Point	500 units or 50% capacity

Worst-Case Scenario (1):

If we increase fixed costs by 50% to 30,000 to compensate for possible errors, the new BE point would be:

$$\frac{30,000}{40} = 750 \text{ or } 75\% \text{ of capacity}$$

Worst Case Scenario (2):

If we increase variable costs per unit by 50% to 90, what effects would this have on the analysis?

P	-	VCU	=	GM
100	-	90	=	10

The new break-even point would be:

$$\frac{20,000}{10} = 2,000 \text{ units}$$

Guess what? You just put the project out of business! But wait. Did they really check out their prices? Go back to the project. If the price was set too low, then the benefits may justify a sales price of 150 for the product.

So, back to the books. If the price is 150, what happens with these variable costs?

P	-	VCU	=	GM
150	-	90	=	60

Break-Even point:

$$\frac{20,000}{60} = 33.3\% \text{ of capacity}$$

This situtation is not as crazy as you might think. There are many cases when groups wishing to maximize benefits to the buyers set prices too low and jeopardize the project's own viability. If they charged the proper price, they would produce at a small profit.

The tools for BE analysis enable you to work with the variables of price, cost, and production levels and to adjust the analysis according to judgment on the quality of the information available.

A Final Word on Break-Even Analysis

As you know, expectations and reality diverge greatly. This analysis allows you to determine objectively the viability of a project. If you discover that a project will have to operate at 70-80% of capacity, you might conclude that the project may not cover its costs. If the analysis shows that the project will break even at 40-50%, the chances that are much greater it will be viable.

CASE I YDD
BREAK-EVEN ANALYSIS

This analysis depends on four key assumptions: price unit costs, fixed costs of the activity, and most important, projected capacity of the productive activity. Using these assumptions, we can determine the level of production needed to cover all fixed and variable costs. The analysis is only as good as the quality of the assumptions. In YDD's case the information on costs and prices seems well established since the winged bean plant has had some trial runs. The crucial factor in this analysis is, however, the capacity to produce. It is the hardest of all variables to assess, and it entails careful questioning.

YDD is confident that the winged bean plant will produce six batches of 1,500 litres per week or 36,000 litres per month. But there is a problem: According to the analysis, the production cycle will take 30 hours to produce 1,500 litres of the bottled product. YDD feels the time will decrease since the biggest production bottleneck is bottling, capping and labeling, a process which takes nine hours and lends itself to several possible improvements. Still, this analysis should look at the overall viability of the plant at diminished levels of production.

Therefore, this analysis will control for two factors: production capacity and unit costs (with cane sugar and molasses). And we will use the financing costs calculated earlier to see whether, on a monthly basis, this activity could pay for itself with existing lines of credit. The following are case-by-case analyses using different assumptions and a proportional analysis based on YDD estimates, when there is more than one product. YDD expects to produce the following product mix: 630ml(30%), 300ml(43%), 100ml(27%). This means that every 1500 litres produced will take the following pattern:

630ml (1,500 x 30%) - 630 = 715 bottles x 37.36(GM) = 26,712

300ml (1,500 x 43%) - 300 = 2,150 bottles x 31.35(GM) = 67,403

100ml (1,500 x 27%) - 100 = 4,050 bottles x 5.6(GM) = 22,680

TOTAL GROSS MARGIN PER CYCLE USING CURRENT COSTS 116,795

USING MOLASSES

630ml 715 bottles x 96.71(GM) = 69,148

300ml 2,150 bottles x 59.61 (GM)=128,162

100ml 4,050 bottles x 15.02 (GM) =60,831

TOTAL GM PER CYCLE USING MOLASSES SUGAR 258,141

CASE I: BEST CASE SCENARIO AT PRESENT COSTS

ASSUMPTIONS

production capacity: 1,500 litres per day; 6 days a week;
26 production cycles per 30 day period.

gross margin per cycle: 116,795

fixed costs: 805,000

hypothetical financing costs: 2,053,654

BREAK-EVEN POINT

FIXED COSTS + (HYPOTHETICAL FINANCING COSTS) - GROSS MARGIN/CYCLE
= NUMBER OF PRODUCT
CYCLES NEEDED TO BE

$$805{,}000 + 2{,}053{,}654 = \frac{2{,}858{,}654}{116{,}795} = 24.5 \text{ cycles}$$

24.5 cycles/26 cycles = 94% of total projected
capacity to BE

CASE II BEST-CASE SCENARIO USING MOLASSES SUGAR

ASSUMPTIONS same except total GM per prod. cycle = 258,141

$$\frac{2{,}858{,}654}{258{,}141} = 11 \text{ production cycles to BE}$$

45% of projected capacity to break-even

profitability in CASE II: (15 x 258,141) = 3,872,115 per month

This analysis shows that the plant has a tremendous potential to be profitable if the molasses sugar can be used at the price YDD estimates. Even if YDD is overly optimistic about production capacity, this plant would still be profitable using molasses sugar at only 60% of projected capacity. Obviously in either case if we deduct the hypothetical financing costs, the plant would be more profitable. The problem then would become analysing the results to adequately compensate for the subsidy and more important, discovering whether the project can afford the cost of financing itself in the future.

CASE III: WORST-CASE SCENARIO AT PRESENT COSTS

ASSUMPTIONS

production capacity: 1500 litres per 2 days of operation; 6 days a week operation; 13 production cycles per 30 day period.

gross margin: 116,795
fixed costs: 805,000
hypothetical financing costs: 2,053,654
BREAK-EVEN POINT:

$\frac{2,858,654}{116,795}$ = 24.5 cycles needed to BE

$\frac{805,000}{116,795}$ = 7 cycles to BE without considering hypothetical financing costs.

profitability (without financing costs):

13 cycles - 7 cycles (BE) = 6 cycles
6 cycles x 116,795 (GM) = 700,770 (per month)

CASE IV: WORST CASE SCENARIO USING MOLASSES SUGAR

ASSUMPTIONS: same except gross margin: 258,141
BREAK-EVEN POINT (with financing costs):

$\frac{2,858,654}{258,141}$ = 11 cycles to BE (85%)

profitability: 11 cycles BE - 13 cycles = 2
2 cycles x 258,141 = 516,282 per month

The worst-case scenario at 50% of YDD's estimate shows the project will pay back its costs even at a high break-even point (85%). Without this breakthrough in sugar costs, the project will only be viable on a subsidized basis.

Finally, the probable-case scenario will simply estimate production capacity at a midway point between the best- and worst-case scenarios -- 19.5 production cycles per 30 day period.

CASE V: PROBABLE-CASE SCENARIO AT PRESENT COSTS

ASSUMPTIONS same as above except number of cycles 19.5
BREAK-EVEN POINT (with financing costs):
$\frac{2,858,654}{116,795}$ = 24.5 cycles or a loss

BREAK-EVEN POINT (without financing costs):
$\frac{805,000}{116,795}$ = 7 cycles

profitability: 19.5 (full capacity) - 7 (BE) X 116,795 (GM)
= 1,460,000

CASE VI: PROBABLE SCENARIO WITH MOLASSES SUGAR
BREAK-EVEN POINT (with financing costs):
$\frac{2,858,654}{258,141}$ = 11 cycles to BE (57%)

profitability: 19.5 - 11 x 258,141 = 2,194,200 (per month)

BREAK-EVEN POINT (without financing costs):
$\frac{805,000}{258,141}$ = 3.2 cycles to BE (16.5%)

profitability: 19.5 - 3.2 x 258,141 = 4,207,698 (per month)

The most probable scenario shows the project to be extremely profitable and viable using molasses sugar. Since the funds used to establish this project will not incur financial costs, YDD will generate surpluses in the range of 30-50,000,000 Rupiah per annum ($30-50,000), an auspicious beginning for their future activities.

CASE II APICA
BREAK-EVEN ANALYSIS

In the analysis that follows, one key assumption has been conservatively estimated -- the number of days the unit will operate on an annual basis. Even when the various rainy periods are taken into account, the number could reach as high as 300 days. Using 200 days (66%) compensates for any unrealistic assumptions on capacity and yield. Again the yield and capacity estimates are based on careful studies.

The terms of the lease-purchase agreement between APICA and the farmers' group will include the following terms:

- Annual interest rate of 10% per annum. This rate is based on government bank rates for agriculture at 8-10%, while regular commercial rates in the private banking sector are approximately 13.5%;

- A lease period of five years with a three month grace period, and equal monthly payments of approximately 59,000 FCFA thereafter;

- The lease guaranteed the equipment itself. All of the extraction unit equipment belongs to the lessor (APICA) until all payments are made.

The following figures show an analysis of the viability of the extraction unit based on the data given in this and the previous section on primary beneficiaries:

- <u>Costs of Extraction Unit</u>:

Sales Price of Extraction Unit:	2,680,000 FCFA
Monthly Lease Payment*	59,000 FCFA
Caretaker Salary	15,000 FCFA
Maintenance	5,000 FCFA
Total Monthly Costs	79,000 FCFA
Annual Costs (79,000 X 12)	948,000 FCFA

* Calculated at a conversion factor of .022111 (see page 22).

- **Extraction Unit Capacity:**

Processing Capacity	700 kgs. palm nuts per day;
Oil Produced (22% yield)	154 kgs. per day;
Equivalent Litres	175 litres per day
25% Retention	43.75 litres per day
Daily Income	7,656 FCFA (43.75 X 175)
Monthly Income (16 days/mo.)	122,496 FCFA
Days Unit Will Operate	200 days/year (16.66 days/mo.)
Annual Income	1,531,200 FCFA

- **Break-Even Analysis:**

Annual Costs to be Covered:	948,000 FCFA
Daily Income of:	7,656 FCFA
Days to Cover Costs:	124 days
Percentage of Full Capacity	62% Break-Even Point

APICA MARGINAL INCREASES IN INCOME AND PRODUCTIVITY TO THE FARMER

Finally, it is necessary to see if the users secure enough benefits after the costs of the units have been covered to justify the project. It should be noted that certain costs (firewood, bottles) have not been included since they would be equal in the traditional technology and the proposed technology. And some items, like firewood, are considered a "free" commodity.

Estimated Farmer Income Using Technology:

The major constraint on revenues generated by palm-oil extraction is the quantity of harvested palm nuts available to the farmer during a one-year period. An optimistic estimate is 6,750 kgs. per annum, based on a yield of 1500 kgs. per acre and 4.5 acres per farmer. Based on these assumptions, the following appears likely:

- About 6,750 kgs. of palm nuts, or approximately 30 production cycles (6,750 divided by 224 = 30) would be necessary if the family were to process all the oil itself.

- These 30 production cycles would yield a maximum potential annual income (again presuming no personal consumption) of 182,430 FCFA (6,081 x 30 = 182,430);

- This maximum potential annual income would then represent about 300 days of processing or about 1,560 total hours of labor.

However, these farmers rarely work more than 240 days, or 10 traditional cycles per year. This means that the probable maximum annual income would be closer to 145,944 FCFA.

Estimated Farmer Income Using Proposed Technology:

- The improved extraction process takes three days, or less than a third of the days in the traditional process.

- The oil yield will rise by 50%, from approximately 14% to 21-22%.

- If the farmer processes only 350 kgs. of Palm Nuts the yield in oil will be 77 kgs., or approximately 87.5 litres of oil, from which 21.875 (25%) will be withheld as payment for use of the press.

- The net yield of oil, 65.625 litres, can be sold for 11,484 FCFA (65.625 x 175 = 11,484).

- The average daily income for this process rises to 3,828 FCFA, and the average hourly income to 319 FCFA.

o Comparisons:

	Trad.	New	% Change
Estimated income/hour of labor	117	319	+172
Estimated income/processing day	608	3,828	+530
Maximum Potential Annual Income	182,430	221,477	+ 21
Maximum Probable Annual Income	145,944	221,477	+ 52
Days labor required for maximum potential	300	60	- 80
Days labor required for maximum probable	240	60	- 75

The above figures reveal the principal benefits of this project. Even if the projected benefits of the improved technology are wrong by 100% (the production cycle is six days instead of three), substantial benefits will still accrue to the users.

VI. Cash-Flow Analysis*

A critical aspect of project analysis is time phasing. It is not enough to know capacity, price, and break-even point. It is equally important to estimate how long it will take to get the project operational and, once in operation, the time required to reach its break-even point. The pre-production phase of projects differs greatly. It is important to map out these costs (essentially capital and start-up costs) in a realistic timeframe. Will it take three months, six months, or a year? Once in production, how long will it take the project to reach full capacity? Almost never will a project begin production and reach full capacity immediately. It may take several months before all of the complexities of production are properly worked out. Another set of complexities will be the marketing of the products.

For these reasons a cash-flow analysis is important to any project. It is a simple exercise whereby the outflows (costs) are matched to the inflows (income) of the project over a period of time to determine when the project generates sufficient revenues to cover its monthly operating expenses and therefore is no longer dependent on outside sources of financing.

Outflows (Costs)

On a quarterly basis, take the estimated costs and apportion them on a realistic basis. Thus, the first items should be capital and start-up costs. Fixed costs should be apportioned according to when they are incurred, and variable costs will depend on the level of production.

If the project secures debt finance, the service of this debt will be included in the fixed cost category. Therefore no separate debt service will be included. This should not be confused with hypothetical financing costs, also included in the cash flow format. This category shows how the cash flow picture would be effected, if the project had to secure debt finance instead of grant finance.

Inflows (Incomes)

In this category, do not confuse the amount produced with the amount sold. In many cases, it may be the same amount. But sales will depend on marketing, and seasonal fluctuations should be taken into account.

* Discounted cash flow methods are not used because they add a measure of complexity inconsistent with the analytical needs of small scale projects.

INTRODUCTION TO CASE STUDIES ON CASH-FLOW ANALYSIS (CFA)

For these case studies we will be extracting information from practically all the previous case-study sections. Since cash-flow analysis attempts to put costs and income on a quarterly basis, such information will be either time-phased or accumulated, depending on our needs.

The first priority of this exercise is to confirm how much capital is required, when it will be needed and when the project will be able to reach self-sufficiency. The YDD example will require substantial work due to its complexity.

There is only one strict rule for setting up a cash-flow analysis: only actual cash disbursements or income can be used. Donations in kind (land, buildings) and non-cash items (depreciation) must be separated out of the numbers used. The simplified cash-flow analysis in this manual is divided into five sections: (i) Outflows (costs) and (ii) Inflows (income) determines (iii) Net Cash Flow; net cash-flow, when negative, determines whether additional capital is required in the form of (iv) Grant/ Loans or, when positive, whether the project can absorb the (v) Hypothetical Financing Costs.

CASE I YDD
CASH-FLOW ANALYSIS

The following gives a detailed explanation of all numbers used in the attached cash-flow analysis. As has been stated previously in the YDD case we have to look at two scenarios: using cane sugar and molasses sugar. The reason for this is that the latter represents a change that YDD is still trying to work out while the former is known and possibly the only way to make the winged bean sauce.

Alternative I: Cane Sugar

(A) OUTFLOWS

Capital and Start-up Costs: Since the YDD project entails building a large structure and purchasing sophisticated equipment, a conservative assessment is needed. The land will be donated by YDD and will not be considered as part of the cash flow requirements. As we saw in the capital-costs section, the building costs will be a total of Rp.31,901,000, including all installations. A reasonable assessment is that it will take six months to complete the building. Once the building is completed, the following quarter should be sufficient time for the purchase and installation of all needed equipment. The fourth quarter would then see the start-up of the productive activity. Thus, these costs divide as follows: 1st quarter (14,000,000 for the building); 2nd quarter (17,901,000 for the building and installations); 3rd quarter (24,978,000 for the equipment).

Variable costs: The complexity of this project leads us to assume that three full quarters will be needed to install all plant and equipment. It would be unrealistic to expect the project to achieve full capacity when it begins operations. Thus, we assume that in the fouth quarter (the first quarter of operation) the project will be able to produce only at 50% of its capacity. Beginning in the fifth quarter, we assume 100% of capacity.

The YDD case is complicated by three different sizes and three different unit costs. From our break-even analysis, we have already estimated that YDD expects to sell the following product mix:

size	percentage	# of bottles per production cycle
630ml	30%	715
300ml	43%	2,150
100ml	27%	4,050

We also know the unit costs for each size using cane sugar (p.25), which, if multiplied by the number of bottles for each product for a production cycle, will give us the total variable costs of one production cycle of 1,500 litres of winged bean sauce:

size	unit cost per bottle	x	# of bottles per cycle	=	total unit cost per cycle
630ml	462.64		715		330,787
300ml	218.65		2,150		470,097
100ml	79.40		4,050		<u>321,570</u>
TOTAL VARIABLE COST PER CYCLE:					1,122,454

We also know that YDD plans to complete six production cycles per week. Total variable costs for one quarter at full capacity are:

6 cycles x 12 weeks x 1,122,454 = <u>80,816,688</u> or
40,408,344 at 50% capacity

<u>Fixed</u> <u>costs:</u> We estimate the project will begin to incur fixed costs in the second quarter. For the fixed costs, we make one minor adjustment -- taking our monthly fixed cost estimate (p.16) and subtracting the non-cash item (depreciation), and multiplying by three to get our quarterly estimates:

(805,000 - 225,000) x 3 = 1,740,000

(B) INFLOWS

<u>Sales:</u> Here we make an important assumption: all production will be sold within the quarters produced at no extra cost. This can become a dangerous bootleneck in any project as we have noted because marketing of products should never be taken for granted. Leaving this potential pitfall aside, we extrapolate the information on product prices and quantities as follows (see Price, Distribution and Marketing section in case study, page 25).

size	unit price x	# of bottles per = cycle	total sales
630ml	500	715	357,500
300ml	250	2,150	537,500
100ml	85	4,050	344,250
TOTAL SALES PER PRODUCTION CYCLE:			1,239,250

At full capacity YDD can sell the following each quarter:
1,239,250 x 6 cycles per week x 12 weeks = 89,226,000 or 44,613,000 at 50% capacity

Other: This category is used when a project sells an item not included in its product line. Examples: land, buildings, and equipment. In the YDD case, no such sales are contemplated.

(C) NET CASH FLOW AND CUMULATIVE CASH FLOW; AND

(D) GRANTS, INVESTMENT AND LOANS

In these sections, subtract the inflows from the outflows. If the inflows are greater, the net cash flow for the period will be positive. If the outflows are greater the net cash flow will be negative (these amounts will be shown in parenthesis). The cumulative cash flow is the sum of all the net cash flows.

The negative net cash flow tells us how much capital the project needs through grants, investments, or loans. The positive cash flow tells us the profitability of the project. The cumulative cash flow reveals, over time, when the project will pay back all invested capital.

In the YDD case, all cash requirements will be met through an ATI grant. So, for the first three quarters, a total of 60,359,000Rp. will be required to get the project under way.

(E) HYPOTHETICAL FINANCING COST ANALYSIS

This section asks whether the project can survive on a non-subsidized basis? Can it pay back all capital invested at a reasonable rate of interest? For YDD we calculated this financing cost (see p.21) and found that if the project were to pay back its investment at 15%, it would have to make monthly payments of 2,053,654 or 6,160,962 per quarter.

Our analysis shows that only if the project can maintain close to full capacity can this expectation be met.

YDD-WINGED BEAN
(Rp000)
Alternative I: Using Cane Sugar

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total Year 1	5th Quarter	6th Quarter	7th Quarter	8th Quarter	Total Year 2
A: Outflows										
Capital Costs	14000	17901	24978		56879					
Start-up Costs										
Variable Costs				40408	40408	80817	80817	80817	80817	323268
Fixed Costs		1740	1740	1740	5220	1740	1740	1740	1740	6960
TOTAL	14000	19641	26718	42148	102507	82557	82557	82557	82557	330228
B: Inflows										
Sales			44613	44613	89230	89230	89230	89230	89230	356920
Other										
TOTAL			44613	44613	89230	89230	89230	89230	89230	356920
C: Net Cash Flow (InFlow-Outflow)	(14000)	(19641)	(26718)	2465	(57894)	6673	6673	6673	6673	26692
Cumulative Cash Flow	(14000)	(33641)	(60359)	(57894)		(51407)	(44728)	(38055)	(31382)	
D: Grants and Loans	14000	19641	26718			60359				
E: Hypothetical Financing Cost				6161		6161	6161	6161	6161	
Net Cash Flow-Hypothetical Financing Cost				(3696)		512	512	512	512	
PRODUCTION CAPACITY				50%		100%	100%	100%	100%	

Alternative II: Using Molasses Sugar

All outflows remain the same in this variation with the important exception of variable costs which would diminish substantially with the use of molasses sugar. Inflows remain unchanged.

To calculate the new variable cost figures we will use the unit cost figures on p. 17:

size	# of bottles per cycle	unit cost	total cost per cycle
630ml	715	403.29	288,352
300ml	2,150	190.39	409,338
100ml	4,050	69.98	283,419
TOTAL VARIABLE COSTS PER PRODUCTION CYCLE:			981,110

Quarterly estimates at full production would be:

981,110 x 6 prod. cycles x 12 weeks = 70,640,000Rp. or 35,320,000Rp. at 50% capacity

CONCLUSIONS ON YDD CASE STUDY

As the two cash-flow analyses show, the YDD plant is extremely viable if YDD is able to use molasses sugar. This viability is shown by the fact that at only 50% capacity the plant has a high level of profit, more than enough to pay for all its capital if it needed to. If it is able to operate at full capacity the plant would be able to show a positive cumulative cash flow by the 7th quarter. YDD is correct in placing this substitution as a high priority for the project.

Using cane sugar the plant appears viable but at a much higher level of risk as there is little leeway for error. As most projects are not able to sustain full capacity in terms of their production for long periods of time using cane sugar YDD is vulnerable to a continued need for additional capital to keep the project operating.

YDD-WINGED BEAN
(Rp000)
Alternative II: Using Molasses Sugar

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total Year 1	5th Quarter	6th Quarter	7th Quarter	8th Quarter	Total Year 2
A: Outflows										
Capital Costs	14000	17901	24978		56879					
Start-up Costs										
Variable Costs				35320	35320	70640	70640	70640	70640	282560
Fixed Costs		1740	1740	1740	5220	1740	1740	1740	1740	6960
TOTAL	14000	19641	26718	37060	97419	72380	72380	72380	72380	289520
B: Inflows										
Sales				44613	44613	89230	89230	89230	89230	356920
Other										
TOTAL				44613	44613	89230	89230	89230	89230	356920
C: Net Cash Flow										
(InFlow-Outflow)	(14000)	(19641)	(26718)	7553	(52806)	16850	16850	16850	16850	67400
Cumulative Cash Flow	(14000)	(33641)	(60359)	(52806)		(35956)	(19106)	(2256)	14594	
D: Grants	14000	19641	26718							
Loans										
E: Hypothetical Financing Cost				6161		6161	6161	6161	6161	
Net Cash Flow-Hypothetical Financing Cost				1392		10689	10689	10689	10689	
PRODUCTION CAPACITY				50%		100%	100%	100%	100%	

CASE II APICA
CASH FLOW ANALYSIS

The APICA case is very straightforward. Since the press is leased and the small shed to house the the unit will be built by voluntary labor and with donated materials, the fixed costs will be the only category in project outflows. In the first quarter we assume that the only fixed cost is the caretaker's salary at 15,000 FCFA per month. The inflows from sales of the retained oil is calculated at 122,496 FCFA per month (see page 40). As the net cash flow is positive early on the units should have little problem in paying for themselves and in fact may have substantial surpluses to distribute as shown by the cumulative cash flow.

INTERVIEW FORMAT AND ANALYTICAL TOOLS FOR COMMERCIAL ANALYSIS OF SMALL SCALE PROJECTS

I N D E X

General Country Information

1. Population: Total

   % rural

   % urban

2. Literacy Rate:

3. Inflation: (previous 3 years) '83

   '82

   '81

   '80

4. Interest Rates:

   (i) Prevailing Commercial Rates:

   (ii) Possible interest rate project can receive from a bank:

   (iii) Middleman/Moneylender Rates:

5. Minimum Wage:

   Rural

   Urban

6. Estimated average per capita income in area where project is located________

7. Seasonality: Will the project operate for less than 1 year? How many months?

ATTACHMENT A: Production

CONTENTS

Production Process
(A-I)

A-I (Enter Information on Production Process Chart)

1. What is the product? ______________________
2. What are the steps in the production process?
3. How much time is required to complete each step in the production process?
4. How many people are required at each step in the production process?
5. How many person hours are required at each step in the production process?
6. Are there marketable by-products?

____

____

OVERALL DESCRIPTION OF PRODUCTION PROCESS

(using a step by step approach, describe how raw materials are collected and processed)

SUMMARY (Explain in one paragraph how and what is produced)

On a step by step basis, detail the process

STEP	DESCRIPTION
A____	

OVERALL DESCRIPTION (Contd.)

STEP	DESCRIPTION

A-II. TRADITIONAL TECHNOLOGY AFFECTED
OR CHANGED BY THE PROJECT

a) Describe the traditional process:

	STEP	DAY	NO. OF PEOPLE	HOURS PER PERSON	TOTAL PERSON HOURS
A.					
B.					
C.					
D.					
E.					
F.					
G.					
H.					
I.					
J.					
K.					
L.					
M.					
N.					

A-II. (cont'd)

b) Describe changes which will occur due to project. (Will there be increased productivity, time savings, better quality, etc.?)

Production Capacity
(A-111)

A-III.

A. Product

1. What is the product? ____________________

2. Are there marketable by-products? ____________; __________

B. Production Capacity

3. How long does it take to process (i.e. production cycle) the raw materials into a finished product?

   __________________ hrs/days/weeks

4. How much can be produced in the production cycle?

   __________________ hrs/days/weeks/months

5. How many hours in a day will the enterprise be in operation?

   __________________ hrs/days

6. How many days in a week will the enterprise be in operation?

   __________________ days/weeks

7. How many weeks in a year will the enterprise be in operation?

   __________________ weeks/years

C. Production Inputs

1. Raw Material Requirements (Enter information in Chart I)

   (a) What are all the raw materials required to complete one production cycle?

   (b) In what amounts will the raw materials be obtained?

   (c) How many units can be produced from the raw materials obtained?

D.- NUMBER OF PRODUCTION CYCLES

Per Day________

Per Week_______

Per Month______

Per Year_______

E.- LABOR REQUIREMENTS

(a) How many people does it take to produce the product?

(b) How long does it take them to complete one production?

(c) How many people will be employed?

________________full time

________________part time

________________casual

(d) Given the production facility, is there a limit to the number of people than can be employed?

_____________________no. of employees

A-III. WORKSHEET FOR ESTIMATING PRODUCTION CAPACITY

Product____________________

By-products________________

____

____

A.- PER PRODUCTION CYCLE:

1. How long does it take to complete one production cycle______________hrs/days/week
2. What is the quantity produced per production cycle:

Product:

By-products:

B.- RAW MATERIAL CONSIDERATIONS:

1. Are there ANY RAW MATERIAL CONSTRAINTS IN TERMS OF SUPPLY? ______ If so, what are they?

2. What raw materials are available:

Local____

Domestic____

Imported____

C.- Annual/Monthly Capacity Estimates

1. How many hours a day will the enterprise operate____________
2. How many days a week______________
3. How many weeks per month__________
4. How many months per year__________

Chart II
(A-III)

Raw Materials Required

	A. Raw Materials	B. Amounts	C. No. of Units	D. R.M./Prod. Cycle (B ÷ C)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

RAW MATERIAL PER PRODUCTION CYCLE

RAW MATERIAL	Step requiring Raw Material	Quantity required per step	Units of Production Required

LABOR AND OVERALL TIME ESTIMATES

FOR 1 PRODUCTION CYCLE

Product:______________________________

By-products:___________________________

____

____

STEP (Description) (A---)	Estimated time per step	No. of people required	Hours per person	Total hrs. per person	

ATTACHMENT B: Costs

CONTENTS

B-I: Capital Costs: Summary Worksheet (Start with B-Ia, b, c)*

A. Land, Buildings

1. Land Purchase ______________

2. Building Construction

a) Raw Materials ___________

b) Labor __________________

Total ________________

B. Equipment, Machinery

1. Equipment (enter totals from B-I(a))

____

2. Machinery (enter totals from B-I(b))

____

Total ________________

C. Other

1. Delivery Charges __________

2. __________

3. __________

Total ________________

Grand Total ________________

* On this summary sheet, you will record actual or estimated costs required to purchase land, construct the production facility, purchase equipment and machinery, and other costs directly related to the above.

B-1(a) Equipment List

The Equipment List includes those items (such as tools, vehicles) which are less durable with a useful life of 5 years or less.

Type	No. Required	Cost/Unit	Total Cost	Where Purchased

B-I(b) Machinery List

This section should be for the heavier more durable machinery (such as presses, mixers, lathes) with a useful life of 10 years or more.

Type	No. Required	Cost/Unit	Total Cost	Where Purchased

B-I(c): Equipment/Machinery Capacity/Characteristics

Type	Producer's Estimated Capacity	Characteristics*

*To include name of manufacturer, model and year, where produced.

B-II Fixed Costs: Summary Worksheet

1. On this sheet, you will record all fixed costs calculated on a monthly basis. If the enterprise operates on a different basis, stipulate the time period used (i.e., daily, weekly) and then extrapolate to reach monthly figures.

2. Fixed costs cannot be completed until the total capital requirement section ____ is calculated.

1. Depreciation

   (a) Equipment: Monthly depreciation change =

   total from B-I(a) ÷ 5 years ÷ 12 months ____________

   (b) Machinery: Monthly depreciation change =

   total from B-I(b) ÷ 10 years ÷ 12 months ____________

   Total Monthly Depreciation ____________

2. Maintenance and Repair: (project holders estimates or monthly depreciation charge ÷ 2)

   (a) Equipment: ________________

   (b) Machinery: ________________

   Total Monthly Maintenance and Repair ____________

3. Rentals

   (a) Equipment _________

   (b) Buildings _________

   (c) Other _________

   Total Monthly Rentals ____________

B-II Fixed Costs: <u>Data Collection Worksheet</u> (cont'd)

4. Salaries

   (a) Manager/Owner ________

   (b) Clerical Staff ________

   (c) Direct Labor ________

   (d) Taxes and Benefits ________

   Total Monthly Salaries ____________

5. Other

   (a) Transportation ________

   (b) Supplies ________

   (c) Utilities (electricity, fuel, etc.) ________

   (d) License Fees ________

   Total Other ____________

   Total Monthly Fixed Costs <u>without financing costs</u> ____________

6. Financing Costs (To be Completed After Capital Requirements Section)

7. Total Monthly Fixed Costs with financing costs ____________

B-III Variable Costs: Summary Worksheet*

1. How long is the production cycle? ____________

2. How much can be produced in one production cycle? ____________

3. How many production cycles/month? ____________

4. What are the variable costs/production cycle? ____________

   (a) Raw Material
       (Enter from B-III(b)) ____________

   (b) Labor
       (Enter from B-III(c)) ____________

   (c) Other
       (Enter from B-III(d)) ____________

   (d) Total ____________

5. What are the total variable costs/month?

Total Costs per Production Cycle	X	No. of Production Cycles/mth.	=	Total Monthly Variable Costs
____________	X	____________	=	____________

---

*The data collection worksheets in this section will accomplish two tasks:
- Determine the estimated variable costs with the project producing at full capacity.
- Determine the variable costs per unit of production or unit costs.

Our objective is to calculate monthly estimates of variable costs. The worksheets include a provision to calculate monthly costs based on the production cycle.

B-III(a) Variable Costs: Raw Material

List all materials needed for production with the bulk cost paid for them:

RAW MATERIAL	BULK QUANTITY PURCHASED	BULK PRICE

B-III(b) Variable Costs: Raw Materials

Production Cycle: Daily/Weekly/Monthly ____________

Number of Units Produced per Cycle ____________

Production Cycles per Month ____________

Raw Material Required per Production Cycle

	A Type of Raw Material	B Est. Requirement per Production Cycle	C Bulk Price from B-III(a)	D Cost (B x C)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				

Total Cost of Raw Materials per One Production Cycle ____________

B-III(c) Variable Costs: Labor

Production Cycle: Daily/Weekly/Monthly ____________

Number of Units Produced per Cycle ____________

Production Cycles per Month ____________

Labor Requirement per Production Cycle:

(If you are satisfied with the information in A-II, you may skip the detail and go to the bottom of the page.)

Production Step	Type of Labor	Man Days/Hours

Total Labor per Production Cycle ____________

What is estimated labor wage paid per days or hours ________

B-III(d) Variable Costs: Other

The following types of costs should also be estimated in terms of production cycles:

Fuel: Do they use wood/oil/kerosene/gasoline/coal, etc.? How much per production cycle?

Transportation: Do they pay a fee for bringing in Raw Materials or fuel? Do they have to pay to transport their finished goods?

Commission: Do they have to pay a commission to whoever sells their product?

Per Production Cycle

TYPE	AMOUNT

Total Other Variable Costs
per Production Cycle: ______

B-IV <u>Unit Cost</u>:

1. Cost of Raw Material for one Production Cycle ______________
2. Cost of Labor for one Production Cycle ______________
3. Other Cost - for one Production Cycle ______________

Total Costs per Production Cycle ______________

Number of Units per Production Cycle ______________

Total Cost per Production Cycle	÷	Number of Units per Production Cycle	=	Unit Cost
______________	÷	______________	=	________

B-V Start-Up Costs

List one-time expenses related to putting the project on line.

(Legal, engineering, feasibility studies, etc.)

	TYPE	COST
A.		
B.		
C.		
D.		
E.		
F.		

TOTAL: ________________

ATTACHMENT C

Total Capital Requirements and Financing Costs

CONTENTS

C-I Total Capital Requirements and Financing Costs

1. Capital Costs (See B-I) ____________
2. Start-Up Costs (See B-V) ____________
3. Working Capital (See C-I(a)) ____________
4. Total Capital Requirements (1,2,& 3) ____________
5. Minus Capital Provided by Project ____________
6. Net Capital Requirement ____________
7. Monthly Financing Costs:

Net Capital Requirement	X	Conversion Factor	=	Financing Costs Monthly*
____________	X	____________	=	____________

*This total should then be transferred to Attachment B-II, Fixed Costs

C-I(a) <u>Working Capital Provision (3 Months)</u>

1. Total Monthly Fixed Costs (Section B-II) ________________

2. Total Monthly Variable Costs (Section B-III) ________________

3. Total Monthly Variable and Fixed Costs (1&2) ________________

4. Working Capital Provision:

Total Monthly Variable and Fixed Costs	X	3 Months	=	Working Capital Provision
________________	X	________	=	____________

C-I(b): List of Conversion Factors for Calculating Financing Costs

Only for the sake of analysis a list of conversion factors* is provided for different interest rates for one type of financing:

Term: 5 years

Grace Period: 3 Months

Repayments: Equal Monthly Installments

To obtain monthly amount for financing costs, just multiply net capital requirements (C-I(7)) by the conversion factor for the interest rate prevalent in that country. To simplify our analysis the conversion factor will yield equal monthly payments (installment loan).

Example: A Project in Mauritania has total capital requirements of 150,000. The project will raise 50,000 locally and needs 100,000 from ATI and others. For our analysis we will estimate a monthly financing cost based on 10% (the prevalent interest rate in Mauritania). In this case we would:

		Conversion factor	=	Monthly Payment
100,000	X	.022111	=	2,211

*Conversion Factors

Annual Interest Rate	Conversion Factor
10%	.022111
15%	.025570
20%	.028701
25%	.032061
30%	.035647
35%	.039458
40%	.043488
45%	.047734
50%	.052182

ATTACHMENT D: <u>Price</u>

D-I: <u>Price</u>

D-II: <u>Distribution/Marketing</u>

D-III: <u>Estimating Price Based on Production Costs</u>

D-I: Price

Product or Products: (1)

(2)

(3)

1. What price do you expect for your product?

	(1)	(2)	(3)
Single item	________	________	________
Quantity (specify)	________	________	________

2. Do you intend to sell with credit terms?
3. How long (30/60/90 days)? ____________
4. What percentage of production? ____________
5. How did you estimate this price?

____

____

____

____

____

____

6. Other observations:

____

____

____

____

____

D-II Distribution/Marketing

1. Who will be the final buyers of your product (excluding middlemen)?

____

____

2. What do you estimate their average monthly income to be?

____

3. Where are they located?

____

4. If not in the immediate vicinity, how far?

____

   (a) How will you get these goods to the market?

   ____

   ____

5. How much of your production will you sell directly?

____

6. Will you depend on traditional middlemen to sell your product?

____

   (a) How much of your production will you sell this way?

   ____

   (b) At what price? ______________________

7. Try to get an idea of the role of the middleman in the area:

   How many are there, roughly? ____________________

   Do they provide loans and at what rate? ____________

   Do they have stores in the area? __________________

D-III Estimating Price Using Production Costs

1. Data Needed:

   (a) Monthly fixed costs: ______________

   (b) Variable cost per unit: ___________

   (c) Units produced monthly at full capacity: _________

2. Formula

   Price = [Fixed costs ÷ 50% of full capacity] + variable cost/unit

   P = [FC ÷ 50% full capacity] + V.C.U.

ATTACHMENT E: Breakeven Analysis

E-I: <u>Summary of Formulas</u>

E-II: <u>Breakeven Analysis</u>

E-I: Breakeven Analysis: <u>Summary of Formulas</u>

1. $P - V.C.U. = G.M.$

   Price - Variable Cost per Unit = Gross Margin

2. $\frac{F.C.}{G.M.}$ = B/E Units

   $\frac{\text{Fixed Costs}}{\text{Gross Margin}}$ = Number of Units Needed to Breakeven

3. $\frac{\text{B/E Units}}{\text{Full Capacity}}$ = B/E%

   $\frac{\text{Number of Units to Breakeven}}{\text{Full Capacity}}$ = Percentage of Production Capacity needed to Breakeven

4. Units Produced - B/E Units X G.M. = Profit

   Number of Units Produced - B/E Units X Gross Margin = Profit

E-II: Breakeven Analysis

1. Data Needed:

Price	________
Variable Cost per Unit	________
Fixed Costs	________
Full Capacity	________

2. Calculations: Breakeven

(a) P - V.C.U. = G.M.

____ - ____ = ____.

(b) $\frac{\text{F.C.}}{\text{G.M.}}$ = B/E Units

F.C. ÷ G.M. = B/E Units

____ ÷ ____ = ________

(c) $\frac{\text{B/E Units}}{\text{Full Capacity}}$ = B/E%

B/E Units ÷ Full Capacity = B/E%

________ ÷ ________ = ____

3. Calculations: Profitability

[Units Produced] - [B/E Units] X [G.M.] = Profit

(a) [40% of Capacity] - [B/E Units] X [G.M.] = Profit

________ - ________ X ____ = ____

(b) [50% of Capacity] - [B/E Units] X [G.M.] = Profit

________ - ________ X ____ = ____

(c) [60% of Capacity] - [B/E Units] X [G.M.] = Profit

________ - ________ X ____ = ____

(d) [% of Capacity] - [B/E Units] X [G.M.] = Profit

________ - ________ X ____ = ____

ATTACHMENT F

CASH FLOW FORMAT

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	5th Quarter	6th Quarter	7th Quarter	8th Quarter	Total Year 2
A: Outflows									
1. Capital Costs									
2. Start-up Costs									
3. Variable Costs									
4. Fixed Costs									
TOTAL									
B: Inflows									
1. Sales									
2. Other									
TOTAL									
C: Cash Flow									
1. Net(InFlow-Outflow)									
2. Cumulative									
D: Grants Loans									
E: Hypothetical Financing Cost									
F: Net Cash Flow-Hypothetical Financing Cost									
G: Production Capacity									