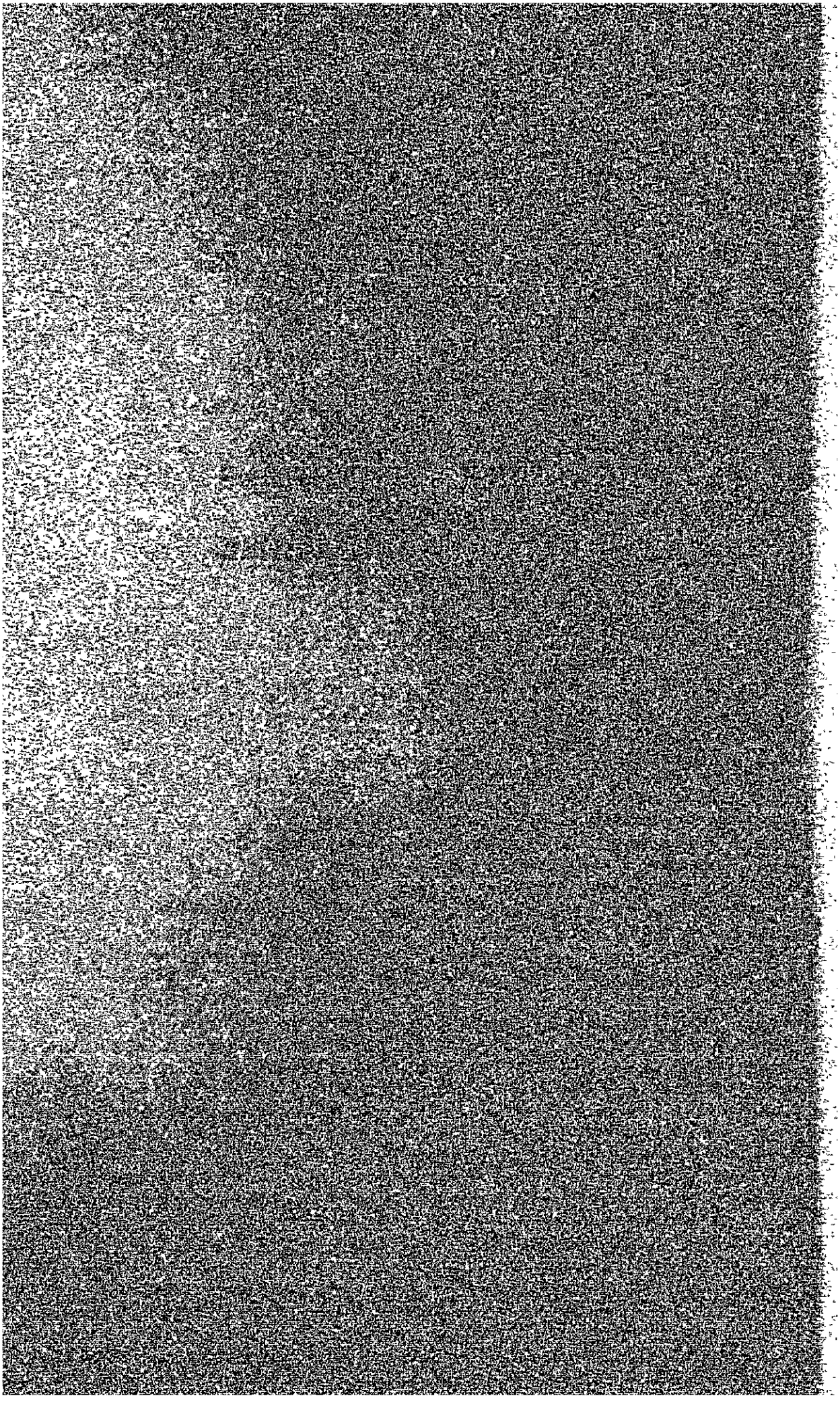
CHAPTER 7

HEAD OFFICE FUNCTIONS AND HEAD OFFICE EXPENSES



CHAPTER 7 HEAD OFFICE FUNCTIONS AND HEAD OFFICE EXPENSES

1 Head Office Functions

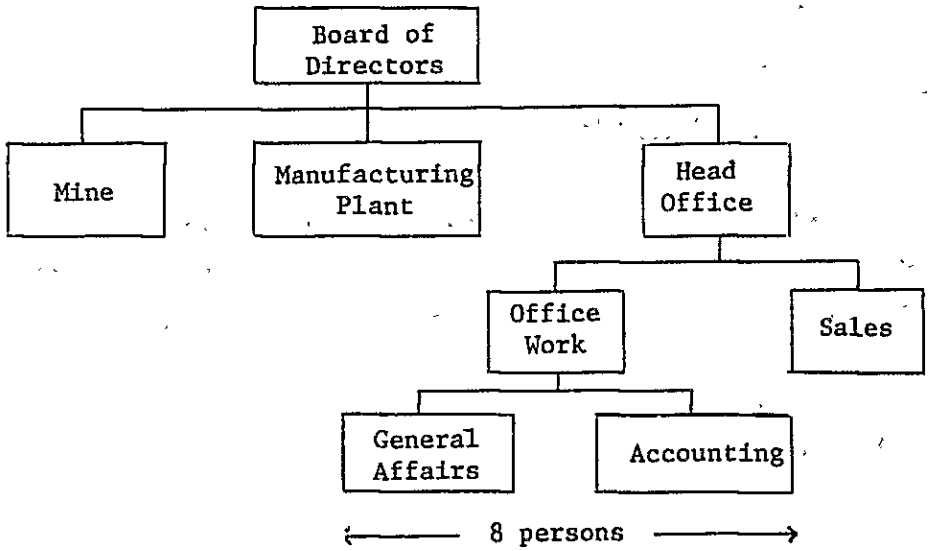
In addition to the mine and manufacturing plant, the bentonite project will be provided with a head office organization for overall control of product sales and mine plant operation.

Assumptions shown in Fig. 7-1 were made in order to postulate the cost of manufacture.

2 Head Office Expenses

The head office expenses will include personnel costs for overall control of sales activities and the project, miscellaneous expenses and incidental expenses for supplies. From the nature of its organization and functions, 68% of head office expenses will be fixed costs. As a consequence, the cost per ton of product will decrease along with increased output through the scale merit. The cost by each production stage is to be in the order of $3.81 - $1.93 - $1.15 per ton.

Fig. 7-1 Head Office Organization and Personnel



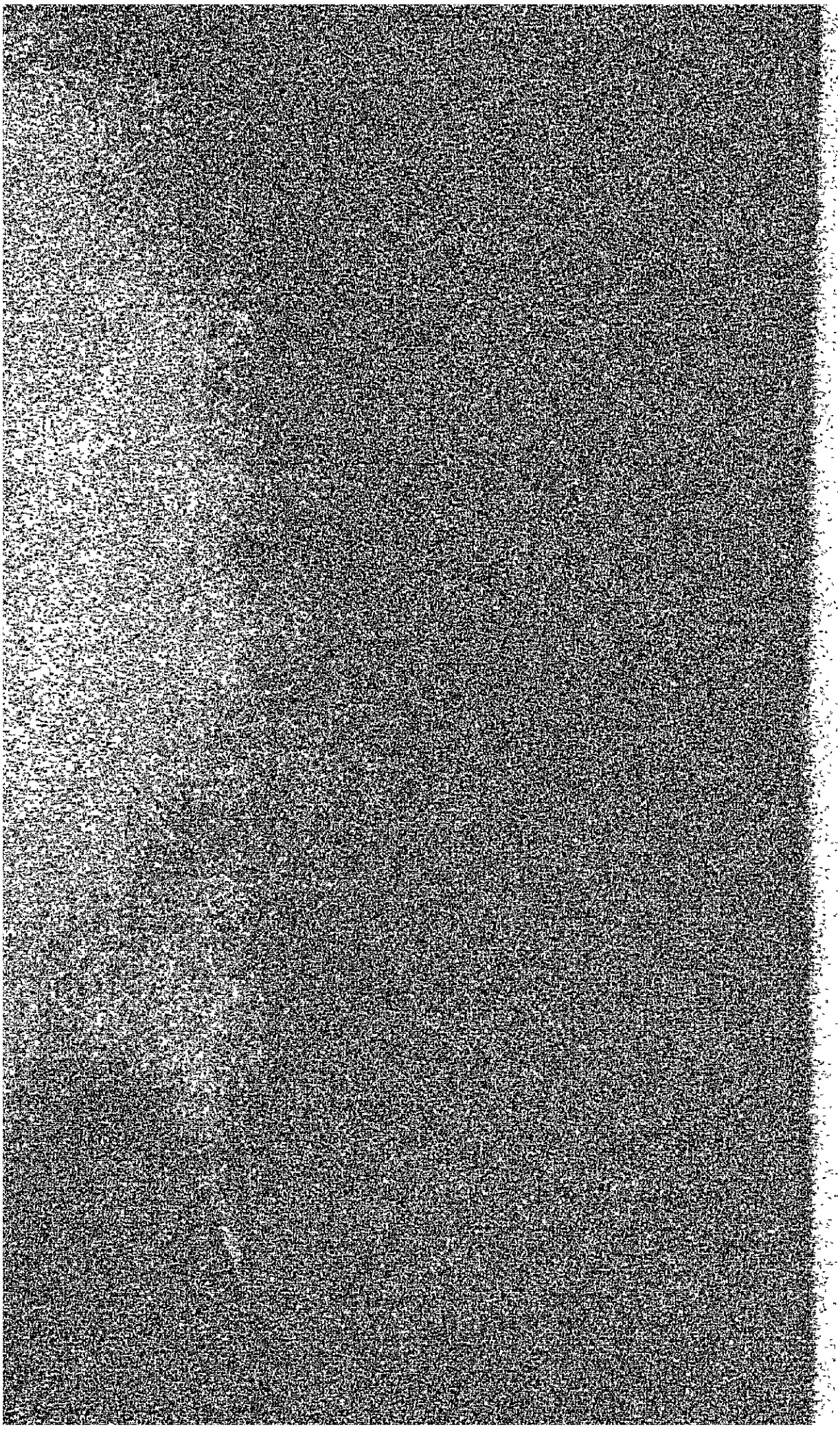
1st-stage operating period -- 36 (total personnel)
2nd-stage operating period -- 50 (")
3rd-stage operating period -- 63 (")

Table 7-1 Sales and Management Costs (Head Office Costs)

		Cost $/t				
		1st-stage operating period	2nd-stage operating period	3rd-stage operating period	Total	
					Total	%
Fixed Cost	Personnel Cost	2.17	1.10	0.65	3.92	
	Expenses	0.43	0.22	0.13	0.78	
	Total	2.60	1.32	0.78	4.70	68
Variable Expenses	Expenses	1.21	0.61	0.37	2.19	32
	Total	3.81	1.93	1.15	6.89	100

CHAPTER 8.

INFRASTRUCTURE



CHAPTER 8 INFRASTRUCTURE

The infrastructure of this project is not of the scale which requires special comments. The scale is such that the project itself is feasible because of small infrastructure costs. Though small in scale, there is incidental equipment indispensable to the development of the mine and operation of the manufacturing plant. These will be described below.

1 Roads

Road construction for mine development will be required between Los Cimientos and the Department highway, a distance of 1.2 km. The work consists merely of widening and repairing the existing side road. The cost will total $8,546.

2 Transportation

Some means of commuting between the City of Chiquimula and Los Cimientos is necessary. Jeeps or small buses will be used for this, and the cost of vehicles will be $62,000.

3 Communications

Communications between the mine and the manufacturing plant are important for the stability of operations. For this purpose two-way communications equipment will be provided.

4 Service Water

Service water is needed by workers at the mine and manufacturing plant, for cooling machinery, for washing equipment and so forth. As no water source is available in Los Cimientos, water will be transported in tank cars from the underground water pumphouse at the manufacturing plant. Water tanks will be set up at Los Cimientos.

5 Power Supply

Power supply is needed at the mine for operating the water draining pumps, for welding work and so forth. It is needed at the manufacturing plant for driving the machinery and equipment. The mine will be provided with two 10 kVA-class generators and one 3.5 kVA-class generator. The manufacturing plant needs a power supply of 530 kWH per unit. Power will be supplied from INDE.

CHAPTER 9

OVERALL EVALUATION

CHAPTER 9 OVERALL EVALUATION

1 - Viewpoint and Method of Overall Evaluation

Internal financial rate of return and internal economic rate of return will be found in order to undertake overall evaluation of this project. The former consists of the analysis of revenues and expenditures for the enterprise proprietor and the latter consists of the analysis of costs and benefits of the whole nation in connection with this project.

Consequently, in case both rates of return are either good or unsatisfactory, judgement as to whether the project should be implemented or not is easy to make, but if one is good and the other is not, judgement differs depending on the position in which the project is placed.

In other words, if the rate of return on a single enterprise basis is taken as important, the internal financial rate of return assumes a decisive importance, but if priority is given to benefits on a national basis, internal economic rate of return is considered more important. In this latter case, implementation of the project becomes possible if state or local public organizations directly assumes proprietorship or subsidizes the enterprise.

In financial analysis, analysis of the break-even point and the value added is added to calculation of the internal financial rate of return. The internal economic rate of return calculated in the economic analysis renders basic benefits for the whole nation understandable, but the income distribution, sector-by-sector effect, indirect effect and employment effect cannot be obtained unless analysis is undertaken from another angle.

In the case of a large-scale project, analyses of such effects and surveys of social development in the relevant region as a whole become necessary. However, as the bentonite project of Los Cimientos is very small in scale, calculation of the internal economic rate of return is judged sufficient for economic evaluation. In this report, nevertheless, analysis of foreign exchange earnings and savings effect will be included as part of the bentonite production project, since the Na activated bentonite products are supposed to be used as a substitute for the imported products and also as they are likely to be exported.

2 Revenues and Benefits

The bentonite market has been roughly analyzed in Chapter 3, Section 3. Here, problems, such as product price, quantity, uses and whether to supply the domestic market or the export market will be more concretely posed and the criteria of calculations of revenues and benefits necessary in future analyses will be clarified.

2-1 Uses and Supplying Policy

The bentonite produced in Los Cimientos is of such quality that it becomes usable for various purposes when it is put through Na activation treatment. As a consequence, manufacture of products with higher value added and of greater importance to the national economy is desirable.

In Guatemala and other Central and South American countries, bentonite for use in drilling and civil engineering works is imported in many cases. These countries mostly import high-priced bentonite from the USA. Under the circumstances, the primary need is to substitute domestic products for imported products and the second need is to channel the surplus domestic bentonite into th export route.

2-2 Prices

At present Guatemalan bentonite for detergent use is sold for 4.0 to 4.5 Q/kg. On the other hand, imported bentonite for drilling and other uses is presumable priced as follows:

USA export price:	$130 to $150 per ton
Marine transportation cost from USA to Guatemala:	$200 to $250 per ton
Import (CIF) price in Guatemala:	$330 to $400 per ton
Market price in Guatemala:	$400 to $450 per ton

In this project, the domestic sales and export price will be set at $130 per ton; a price of $120 per ton will also be analyzed in order to view the effect of price fluctuations.

The present Guatemalan import price will be set at CIF $350 per ton. As a consequence, $130 per ton will be set for the revenue in the financial analysis and for the benefits corresponding to the export portion in the economic analysis, but analysis will also be undertaken in connection with $120 per ton as well. The benefits of substitution for imports in the economic analysis will be set at $350 per ton.

2-3 Output

The basic plans for this project have been prepared in such a way as to permit realistic investment and operation, while taking into account the demand trends in Guatemala and the neighboring countries. For this reason, the annual output can be comparatively reliably estimated to be compatible with the demand market.

The Na Activated bentonite in a product usable for drilling and civil engineering works; regarding the domestic demand for such uses, 4,000 tons was estimated for 1980. An average annual growth of

Table 9-1 Bentonite Output and Demand Estimation

(t)

	1980	1984	1985	1986	1987	1988
Operating Year	Calculation Base Year	1	2	2	4	5
Output	--	12,600	12,600	12,600	12,600	12,600
Domestic Demand	4,000	4,862	5,105	5,360	5,628	5,190
Exports	--	7,738	7,495	7,240	6,972	6,690
Import Demand of Central American Countries	20,000	24,310	25,526	26,802	28,142	29,549

1989	1990	1991	1992	1993	1994	1995
6	7	8	9	10	11	12
12,600	24,900	24,900	24,900	24,900	24,900	24,900
6,205	6,516	6,841	7,183	7,543	7,920	8,316
6,395	18,384	18,059	17,717	17,357	16,980	16,584
31,027	32,578	34,207	35,917	37,713	39,599	41,579

Table 9-1 (Cont'd)

(t)

	1996	1997	1998	1999	2000	2001
Operating Year	13	14	15	16	17	18
Output	41,700	41,700	41,700	41,700	41,700	41,700
Domestic Demand	8,731	9,168	9,626	10,108	10,613	11,144
Exports	32,969	32,532	32,074	31,592	31,087	30,556
Import Demand of Central American Countries	43,657	45,840	48,132	50,539	53,066	55,719

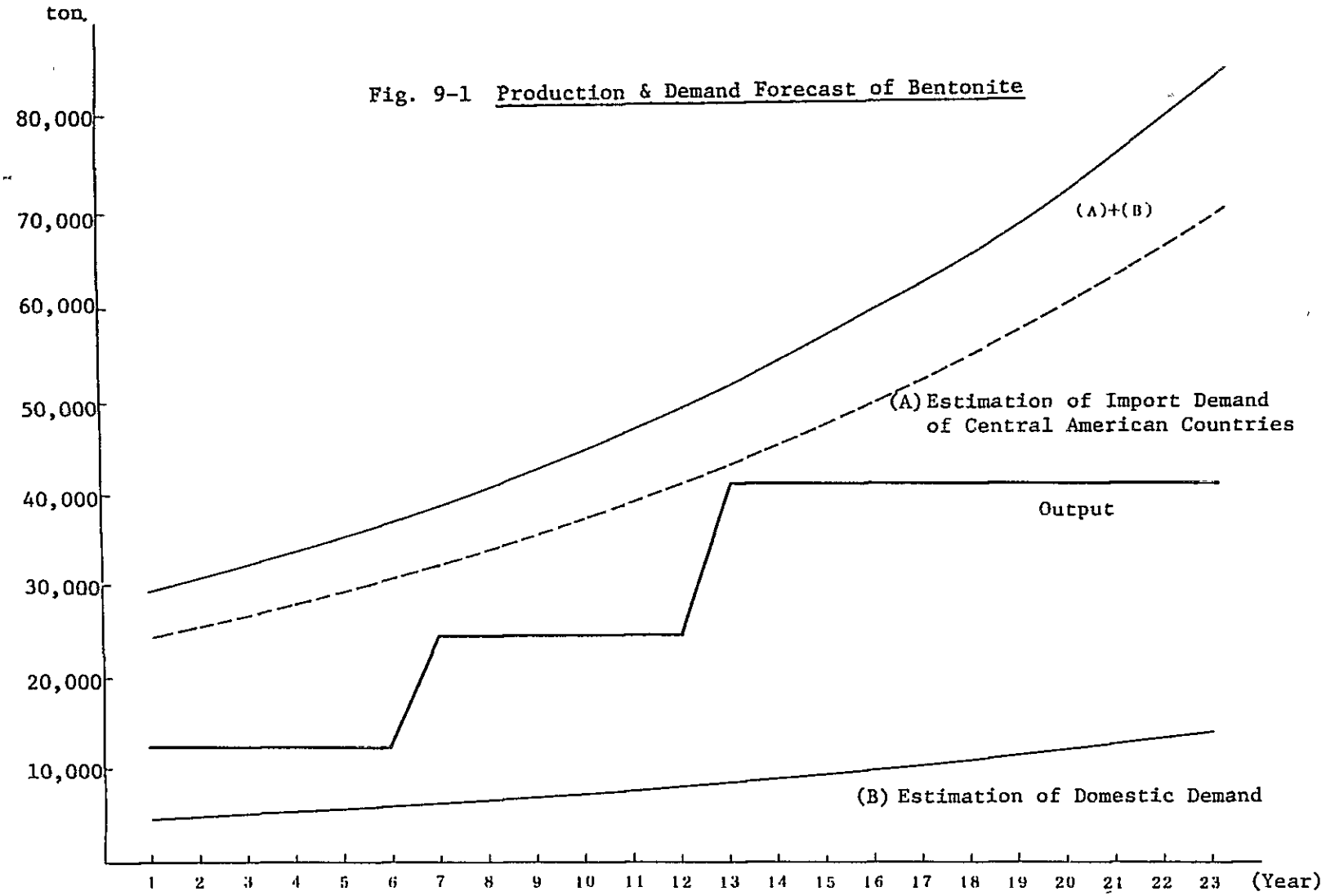
2002	2003	2004	2005	2006
19	20	21	22	23
41,700	41,700	41,700	41,700	41,700
11,701	12,286	12,900	13,545	14,223
29,999	29,414	28,800	28,155	27,477
58,505	61,430	64,502	67,727	71,113

about 5% is postulated for subsequent years. The surplus, therefore, will be channelled into export.

With respect to the total quantity imported by the Central American countries, including Mexico, 1980 imports were estimated at 20,000 t, and an average annual growth of 5% was postulated as in the above case. Export of the bentonite produced in Guatemala will be effective in satisfying this demand.

Furthermore, in addition to the Central American countries it is realistic to consider South America and Europe as export destinations. Finding of export destinations compatible with the output is, therefore, not considered too difficult.

Fig. 9-1 Production & Demand Forecast of Bentonite



3 Financial Analysis

3-1 Financing Plan

Funds needed for this project implementation consist of initial investment, additional investments and working funds. This survey report is devoted to analysis of the feasibility of the project. As a consequence, the financing plan is only a postulate for attempting financial analysis. The report does not make mention of the management form and the financing methods. The substance of the financing plan is as given below.

1) The initial investment will be borrowed in full internally reserve may be used for additional investment, but any shortages will be borrowed.

2) Working funds will be furnished from equity funds because of its small amount in comparison with the total.

3) There should be no external payments, such as dividends or officers' bonus payments.

4) Loans will be obtained for the first and second year of construction and for the sixth and 12th operating years when additional investments in the manufacturing plant will be made.

5) For interest on loans, 5% and 10% rates will be adopted.

6) The terms of repayment will be as follows:

For loan obtained in the first construction year:

Will have a grace period of 5 years. From the sixth year over the subsequent 10 years, the principal is to be paid back in annual installment.

Loan obtained in the second construction year:

Will have a grace period of 4 years. From the fifth year over the subsequent 10 years, the principal is to be paid back in annual installment.

Loan obtained in the sixth operating year:

Will have a grace period of 3 years. From the fourth year over the subsequent 10 years, the principal is to be paid back in annual installment.

Loan obtained in the 12th operating year:

Will have a grace period of 3 years. Two-tenths of the principal will be paid back in the fourth year, and from the fifth year over the subsequent 8 years, the principal is to be paid back in annual installment.

3-2 Funds Required

The funds required for this project have been estimated on the basis of prices as of October 1980 and at the foreign exchange rate of $1 = Q1. Particulars of required funds are given in Table 9-2 "Investment Program" and Table 9-3 "Working Fund Program".

Also, in connection with calculations of the investment fund, only the fixed property tax levied on the real estate in possession during construction has been additionally appropriated as other expenses. The tax has been included in the fixed expenses in the operating cost during the operating period.

Interest to be paid during the period of construction has been added to the initial investment. Furthermore, 5% of the initial investment and of the additional investments will be added to both as contingencies.

Working funds become necessary for stocking the product and raw materials, for filling delayed collection of accounts receivable and for keeping cash and deposits on hand, but in the present case, accounts receivable and accounts payable will be made to cancel each other. Bases for calculating other working funds are given below.

Inventory:

Raw materials:	Equivalent to mine operating cost for 1.5 months.
Auxiliary materials:	Equivalent to the purchasing amount for 3 months.
Fuels:	Equivalent to the purchasing amount for 0.5 month.
Finished product and half-finished product:	Equivalent to the total operating cost for 1 month.

Table 9-2 Investment Program

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Land	120.0															
Initial Stripping, Waste Accumulation Lot	42.8	35.0										7.8				
Access Road Improvement		8.5														
Pit Interior and Environs Improvement		3.4														
Stockyard		17.4						13.1						13.1		
Machinery and Equipment	253.4	20.5			18.0			102.2		40.9				2.8	14.5	59.1
Rolling Stocks	206.2				45.4	189.8			126.5	16.4	189.8			126.5	172.0	189.8
Buildings					15.0			21.0		7.9						
Total for Mine	622.4	84.8	0	0	78.4	189.8	0	136.3	126.5	65.2	189.8	7.8	0	142.4	186.5	248.9
Land	72.4															
Civil Engineering and Construction	117.1	28.2					145.2						117.1			
Water Pumps		51.3						8.9						8.9		
Plant Equipment Construction		3,086.3						3,082.9						3,082.9		
Rolling Stocks		180.7						164.3	164.3	16.4			164.3	164.3	219.1	
Total for Plant	189.5	3,346.5	0	0	0	0	145.2	3,256.1	164.3	16.4	0		281.4	3,256.1	219.1	0
Contingency	40.5	171.5	0	0	4.0	9.5	7.3	169.5	14.6	4.0	9.5	0.4	14.0	169.8	20.3	12.4
Total Investment	852.4	3,602.8	0	0	82.4	199.3	152.5	3,561.9	305.4	85.6	199.3	8.2	295.4	3,568.3	425.9	261.3

Table 9-2 (Cont.)

Unit: $1,000

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Land										120.0
Initial Stripping, Waste Accumulation Lot										85.6
Access Road Improvement										8.5
Pit Interior and Environs Improvement										3.4
Stockyard										43.6
Machinery and Equipment		40.9	95.4							647.7
Rolling Stocks		16.4	126.5	126.5	189.8					1,721.6
Buildings										43.9
Total for Mine	0	57.3	221.9	126.5	189.8	0	0	0	0	2,674.3
Land										72.4
Civil Engineering and Construction										407.6
Water Pumps				8.9						78.0
Plant Equipment Construction										9,252.1
Rolling Stocks		180.7	164.3	219.0			164.3			1,801.7
Total for Plant	0	180.7	164.3	227.9	0	0	164.3	0	0	11,611.8
Contingency	0	11.8	19.3	17.8	9.5	0	8.2	0	0	713.9
Total Investment	0	249.8	405.5	372.2	199.3	0	172.5	0	0	15,000.0

Table 9-3 Working Fund Program

($1,000)

	1984-1989	1990-1995	1996-2006
Output	12,600 t	24,900 t	41,700 t
Working Fund Required	168.2	316.5	502.7
Increase of Working Fund	+ 168.2	+ 148.3	+ 186.2

Table 9-4 Classification of Required Investment Fund into Domestic and Foreign Currencies

($1,000)

	Domestic Currency	Foreign Currency	Total
Initial Investment	1,794.0	2,661.1	4,455.1
Additional Investment	3,463.4	7,081.5	1,0544.9
Total	5,257.4	9,742.6	15,000.0

Note: Working fund will be wholly domestic currecy

Table 9-5 Fund Procurement Program

($1,000)

Year	Case 1 (120 $/t)	Case 2 (130 $/t)
1982	1,080	1,080
1983	6,000	4,000
1989	6,000	4,000
1995	4,000	4,000

Cash and deposit:

Labor costs:	Equivalent to wages for 1.5 months.
Other expenses:	Equivalent to the total expenses except for wages for 1.5 months.

Loans are as shown in Table 9-5.

3-3 Cost of Manufacture

The cost of manufacture consists of the operating cost, financing cost and the depreciation cost. The key portion of the operating cost is as mentioned before, and the financing cost will be calculated on the basis of the financing plan presented in this section. Here, as a consequence, the fixed assets tax and depreciation included in the operating cost will be explained.

1) Fixed property tax

The fixed property tax imposed on the real estate in possession is 6/1000 of the value of the property if it is worth $20,000 or more and 3/1000 if the property is less than $20,000. However, as it is not known as to what extent the taxable amount is assessed, the tax amount is roughly estimated to be $1,200 per year between the first year of construction and the sixth year of operation, and $1,600 subsequent to the seventh year of operation.

2) Depreciation cost

The fixed installment method (treating the salvage value as zero) will be adopted for depreciation. Individual depreciation periods are given below.

Bulldozer:	25 years*
Plant:	23 years
Office, stockyard:	20 years
Communications equipment:	20 years
Compressor:	15 years
Shovel (0.8 m^3):	15 years*
Others such as buildings:	15 years
Generator:	10 years
Shovel (1.8 m^3):	10 years*
Water tank, bus:	10 years
Initial cost of business:	10 years
Pump:	7 years
Jeep:	7 years
Water-drawing pump:	5 years
Truck:	5 years

* The comparatively long period of depreciation assigned to the bulldozer and other machines is the result of calculating the life-span from the required per-year operating time.

3-4 Calculation of Internal Financial Rate of Return

1) Premises of calculation

The internal financial rate of return of this project is calculated with the following items used as premises:

(1) The construction period will be two years and the operating period will be 23 years.

(2) Construction will begin in 1982.

(3) Manufacturing quantity:

First to sixth year of operation:	12,600 t/yr.
Seventh to twelfth year of operation:	24,900 t/yr.
Thirteen to twenty-third year of operation:	41,700 t/yr.

(4) Selling prices:
$120 per ton and $130 per ton.

(5) Salvage value of the assets will be set at $1,461,000. Breakdown will consist of $192,000 for lands and 50% of the salvage value for buildings and machinery.

(6) Income tax will be based on the tax rates of Guatemala.

(7) There will be no external payments such as divided payments on equity capital and so forth.

(8) Calculations will be undertaken on the following six cases:

Case 1-0:	Price	$120 per ton	Before tax profit
Case 1-1:	"	$120 per ton	After tax profit (5% interest)
Case 1-2:	"	$120 per ton	" (10% interest)
Case 2-0:	"	$130 per ton	Before tax profit
Case 2-1:	"	$130 per ton	After tax profit (5% interest)
Case 2-2:	"	$130 per ton	" (10% interest)

2) Result of calculations

Case 1-0:	15.50%
Case 1-1:	11.94%
Case 1-2:	13.36%
Case 2-0:	18.33%
Case 2-1:	13.14%
Case 2-2:	14.86%

3-5 Analysis of Break-even Point

Profit arising from certain sales amount (S) is indicated with the following equation:

$$S\ (1 - \frac{V}{F}) - F$$

where F : fixed expenses and V : variable expenses

As the operating program is divided into three stages in this project, a number of prices are set for the respective stages and the earnings situations are estimated.

Analysis is undertaken on the basis of the numerical values of the case where the price is $130 per ton, the interest rate is 10%, but no wide difference is seen even when numerical values of other cases are used as the basis.

3-6 Analysis of Value Added

The comparison of the value added generated from this project is analyzed for each production stage and for each selling price. The value added is a kind of profitability index. The calculation method of the value added is not standardized, but here the aggregate method of the Bank of Japan is adopted.

> Value added = net profit for the term + personnel costs + financing costs + rents + taxes and public charges + depreciation costs

The value added rate is calculated by dividing the amount of value added by the total sales. The result is shown in Table 9-14.

Table 9-6 Internal Financial Rate of Return
Case 1-0 (before tax, $120/t)

(Unit: Thousand dollar)

Year	Output (1,000 t)	Cash Inflow (Sales amount+ salvage value)	Cash Outflow				Net Flow
			Investment Cost	Working Capital (Add-deduct)	Operating Cost	Total	
1982	0	0	853.6	0	0	853.6	Δ 853.6
1983	0	0	3,604.0	0	0	3,604.0	Δ3,604.0
1984	12.6	1,512.0	0	168.2	774.8	943.0	569.0
1985	12.6	1,512.0	0	0	774.8	774.8	737.2
1986	12.6	1,512.0	82.4	0	774.8	857.2	654.8
1987	12.6	1,512.0	199.3	0	774.8	974.1	537.9
1988	12.6	1,512.0	152.5	0	774.8	927.3	584.7
1989	12.6	1,512.0	3,561,9	0	774.8	4,336.7	Δ2,824.7
1990	24.9	2,988.0	305.4	148.3	1,461.4	1,915.1	1,072.9
1991	24.9	2,988.0	85.6	0	1,461.4	1,547.0	1,441.0
1992	24.9	2,988.0	199.3	0	1,461.4	1,660.7	1,327.3
1993	24.9	2,988.0	8.2	0	1,461.4	1,469.5	1,518.5
1994	24.9	2,988.0	295.4	0	1,461.4	1,756.8	1,231.2
1995	24.9	2.988.0	3,568.4	0	1,461.4	5,029.8	Δ2,041.8
1996	41.7	5,004.0	425.9	186.2	2,324.1	2,936.1	2,067.9
1997	41.7	5,004.0	261.3	0	2,324.1	2,585.4	2,418.6
1998	41.7	5,004.0	0	0	2,324.1	2,324.1	2,679.9
1999	41.7	5,004.0	249.8	0	2,324.1	2,573.9	2,430.1
2000	41.7	5,004.0	405.5	0	2,324.1	2,729.6	2,274.4
2001	41.7	5,004.0	372.2	0	2,324.1	2,696.3	2.307.7
2002	41.7	5,004.0	199.3	0	2,324.1	2,523.4	2,480.6
2003	41.7	5,004.0	0	0	2,324.1	2,324.1	2,679.9
2004	41.7	5,004.0	172.5	0	2,324.1	2,496.6	2,507.4
2005	41.7	5,004.0	0	0	2,324.1	2,324.1	2,679.9
2006	41.7	6,465.1	0	Δ502.7	2,507.0	2,004.3	4,460.8

Note: Total figure is not necessarily equal to the accumulated figure as each figure is rounded to the place of US$10

Table 9-7 Internal Financial Rate of Return
Case 1-1 (after tax, $120/t, 5% interest).

(Unit: Thousand dollar)

Year	Output (1,000 t)	Cash Inflow (Sales amount+ salvage value)	Cash Outflow					Net Flow
			Investment Cost	Working Capital (Add-deduct)	Operating Cost	Corporate Tax	Total	
1982	0	0	853.6	0	0	0	853.6	Δ 853.6
1983	0	0	3,604.0	0	0	0	3,604.0	Δ3,604.0
1984	12.6	1,512.0	0	168.2	774.8	36.8	979.8	532.2
1985	12.6	1,512.0	0	0	774.8	36.8	811.6	700.4
1986	12.6	1,512.0	82.4	0	774.8	34.5	891.7	620.3
1987	12.6	1.512.0	199.3	0	774.8	46.8	1,020.9	491.1
1988	12.6	1,512.0	152.5	0	774.8	59.9	987.2	524.7
1989	12.6	1,512.0	3,561.9	0	774.8	0	4,336.7	Δ2,824.7
1990	24.9	2,988.0	305.4	148.3	1,461.4	216.3	2,131,4	856.6
1991	24.9	2,988.0	85.6	0	1,461.4	230.7	1,777.7	1,210.3
1992	24.9	2,988.0	199.3	0	1,461.4	261.9	1,922.6	1,065.4
1993	24.9	2,988.0	8.2	0	1,461.4	293.3	1,762.9	1,225.2
1994	24.9	2,988.0	295.4	0	1,461.4	330.5	2,087.3	900.7
1995	24.9	2,988.0	3,568.4	0	1,461.4	264.9	5,294.7	Δ2,306.7
1996	41.7	5,004.0	425.9	186.2	2,324.1	752.1	3,688.3	1,315.8
1997	41.7	5,004.0	261.3	0	2,324.1	766.5	3,351.9	1,652.1
1998	41.7	5,004.0	0	0	2,324.1	805.1	3,129.2	1,874.8
1999	41.7	5,004.0	249.8	0	2,324.1	824.1	3,398.0	1,606.0
2000	41.7	5,004.0	405.5	0	2,324.1	848.9	3,578.5	1,425.5
2001	41.7	5,004.0	372.2	0	2,324.1	872.1	3,568.4	1,435.7
2002	41.7	5,004.0	199.3	0	2,324.1	881.7	3,405.1	1,599.0
2003	41.7	5,004.0	0	0	2,324.1	891.3	3,215.4	1,788.7
2004	41.7	5,004.0	172.5	0	2,324.1	902.0	3,398.6	1,605.4
2005	41.7	5,004.0	0	0	2,324.1	940.6	3,264.7	1,739.3
2006	41.7	6,465.1	0	Δ502.7	2,507.0	992.6	2,996.9	3,468.2

Note: Total figure is not necessarily equal to the accumulated figure as each figure is rounded to the place of US$10

Table 9-8 Internal Financial Rate of Return
Case 1-2 (after tax, $120/t, 10% interest)

(Unit: Thousand dollar)

Year	Output (1,000 t)	Cash Inflow (Sales amount+ salvage value)	Cash Outflow					Net Flow
			Investment Cost	Working Capital (Add-deduct)	Operating Cost	Corporate Tax	Total	
1982	0	0	853.6	0	0	0	853.6	Δ 853.6
1983	0	0	3,604.0	0	0	0	3,604.0	Δ3,604.0
1984	12.6	1,512.0	0	168.2	774.8	0	943.0	569.0
1985	12.6	1,512.0	0	0	774.8	0	774.8	737.2
1986	12.6	1,512.0	82.4	0	774.8	0	857.2	654.8
1987	12.6	1,512.0	199.3	0	774.3	0	974.1	537.9
1988	12.6	1,512.0	152.5	0	774.8	0	927.3	584.7
1989	12.6	1.512.0	3,561.9	0	774.8	0	4,336.7	Δ2,824.7
1990	24.9	2,988.0	305.4	148.3	1,461.4	8.8	1,923.9	1,064.1
1991	24.9	2,988.0	85.6	0	1,461.4	28.1	1,575.1	1,412.9
1992	24.9	2,988.0	199.3	0	1,461.4	75.6	1,736.3	1,251.7
1993	24.9	2,988.0	8.2	0	1,461.4	130.6	1,600.2	1,387.8
1994	24.9	2,988.0	295.4	0	1,461.4	195.7	1,952.5	1,035.5
1995	24.9	2,988.0	3,568.4	0	1,461.4	76.6	5,106.4	Δ2,118.3
1996	41.7	5,004.0	425.9	186.2	2,324.1	584.1	3,520.3	1,483.8
1997	41.7	5,004.0	261.3	0	2,324.1	612.9	3,198.3	1,805.7
1998	41.7	5,004.0	0	0	2,324.1	685.1	3,009.2	1,994.8
1999	41.7	5,004.0	249.8	0	2,324.1	728.1	3,302.0	1,702.0
2000	41.7	5,004.0	405.5	0	2,324.1	776.9	3,506.5	1,497.5
2001	41.7	5,004.0	372.2	0	2,324.1	824.1	3,520.4	1,483.7
2002	41.7	5,004.0	199.3	0	2,324.1	843.3	3,366.7	1,637.4
2003	41.7	5,004.0	0	0	2,324.1	862.5	3,186.6	1,817.5
2004	41.7	5,004.0	172.5	0	2,324.1	882.8	3,379.4	1,624.6
2005	41.7	5,004.0	0	0	2,324.1	931.0	3,255.1	1,748.9
2006	41.7	6,465.1	0	Δ 502.7	2,507.0	992.6	2,996.9	3,468.2

Note: Total figure is not necessarily equal to the accumulated figure as each figure is rounded to the place of US$10

Table 9-9 Internal Financial Rate of Return
Case 2-0 (before tax, $130/t)

(Unit: Thousand dollar)

Year	Output (1,000 t)	Cash Inflow (Sales amount+ salvage value)	Cash Outflow				Net Flow
			Investment Cost	Working Capital (Add-deduct)	Operating Cost	Total	
1982	0	0	853.6	0	0	853.6	Δ 853.6
1983	0	0	3,604.0	0	0	3,604.0	Δ3,604.0
1984	12.6	1,638.0	0	168.2	774.8	943.0	695.0
1985	12.6	1,638.0	0	0	774.8	774.8	863.2
1986	12.6	1,638.0	82.4	0	774.8	857.2	780.8
1987	12.6	1,638.0	199.3	0	774.8	974.1	663.9
1988	12.6	1,638.0	152.5	0	774.8	927.3	710.7
1989	12.6	1,638.0	3,561.9	0	774.8	4,336.7	Δ2,698.7
1990	24.9	3,237.0	305.4	148.3	1,461.4	1,915.1	1,321.9
1991	24.9	3,237.0	85.6	0	1,461.4	1,547.0	1,690.0
1992	24.9	3,237.0	199.3	0	1,461.4	1,660.7	1,576.3
1993	24.9	3,237.0	8.2	0	1,461.4	1,469.5	1,767.5
1994	24.9	3,237.0	295.4	0	1,461.4	1,756.8	1,480.2
1995	24.9	3,237.0	3,568.4	0	1,461.4	5,029.8	Δ1,792.8
1996	41.7	5,421.0	425.9	186.2	2,324.1	2,936.1	2,484.9
1997	41.7	5,421.0	261.3	0	2,324.1	2,585.4	2,835.6
1998	41.7	5,421.0	0	0	2,324.1	2,324.1	3,096.9
1999	41.7	5,421.0	249.8	0	2,324.1	2,573.9	2,847.1
2000	41.7	5,421.0	405.5	0	2,324.1	2,729.6	2,691.4
2001	41.7	5,421.0	372.2	0	2,324.1	2,696.3	2,724.7
2002	41.7	5,421.0	199.3	0	2,324.1	2,523.4	2,897.6
2003	41.7	5,421.0	0	0	2,324.1	2,324.1	3,096.9
2004	41.7	5,421.0	172.5	0	2,324.1	2,496.6	2,924.4
2005	41.7	5,421.0	0	0	2,324.1	2,324.1	3,096.9
2006	41.7	6,882.1	0	Δ502.7	2,507.0	2,004.3	4,877.8

Note: Total figure is not necessarily equal to the accumulated figure as each figure is rounded to the place of US$10

Table 9-10 Internal Financial Rate of Return
Case 2-1 (after tax, $130/t, 5% interest)

(Unit: Thousand dollar)

Year	Output (1,000 t)	Cash Inflow (Sales amount+ salvage value)	Cash Outflow					Net Flow
			Investment Cost	Working Capital (Add-deduct)	Operating Cost	Corporate Tax	Total	
1982	0	0	853.6	0	0	0	853.6	Δ 853.6
1983	0	0	3,604.0	0	0	0	3,604.0	Δ3,604.0
1984	12.6	1,638.0	0	168.2	774.8	126.8	1,069.8	568.3
1985	12.6	1,638.0	0	0	774.8	126.8	901.6	736.4
1986	12.6	1,638.0	82.4	0	774.8	123.8	981.0	657.1
1987	12.6	1,638.0	199.3	0	774.8	134.7	1,108.8	529.2
1988	12.6	1,638.0	152.5	0	774.8	146.0	1,073.3	564.7
1989	12.6	1,638.0	3,561.9	0	774.8	72.5	4,409.2	Δ2,771.2
1990	24.9	3,237.0	305.4	148.3	1,461.4	412.6	2,327.7	909.3
1991	24.9	3,237.0	85.6	0	1,461.4	422.2	1,969.2	1,267.8
1992	24.9	3,237.0	199.3	0	1,461.4	443.8	2,104.5	1,132.5
1993	24.9	3,237.0	8.2	0	1,461.4	465.6	1,935.2	1,301.9
1994	24.9	3,237.0	295.4	0	1,461.4	493.2	2,250.0	987.0
1995	24.9	3,237.0	3,568.4	0	1,461.4	418.0	5,071.6	Δ2,210.8
1996	41.7	5,421.0	425.9	186.2	2,324.1	976.2	3,912.4	1,508.7
1997	41.7	5,421.0	261.3	0	2,324.1	985.8	3,571.2	1,849.8
1998	41.7	5,421.0	0	0	2,324.1	1,019.7	3,343.8	2,077.3
1999	41.7	5,421.0	249.8	0	2,324.1	1,033.8	3,607.7	1,813.3
2000	41.7	5,421.0	405.5	0	2,324.1	1,053.9	3,783,5	1,637.5
2001	41.7	5,421.0	372.2	0	2,324.1	1,072.2	3,768.5	1,652.5
2002	41.7	5,421.0	199.3	0	2,324.1	1,081.8	3,605.2	1,815.8
2003	41.7	5,421.0	0	0	2,324.1	1,091.4	3,415.5	2,005.5
2004	41.7	5,421.0	172.5	0	2,324.1	1,102.2	3,598.8	1,822.2
2005	41.7	5,421.0	0	0	2,324.1	1,140.7	3,464.8	1,956.2
2006	41.7	6,882.1	0	Δ502.7	2,507.0	1,894.1	3,898.4	2,983.7

Note: Total figure is not necessarily equal to the accumulated figure as each figure is rounded to the place of US$10

Table 9-11 Internal Financial Rate of Return
Case 2-2 (after tax, $130/t, 10% interest)

(Unit: Thousand dollar)

Year	Output (1,000 t)	Cash Inflow (Sales amount+ salvage value)	Cash Outflow					Net Flow
			Investment Cost	Working Capital (Add-deduct)	Operating Cost	Corporate Tax	Total	
1982	0	0	853.6	0	0	0	853.6	Δ 853.6
1983	0	0	3,604.0	0	0	0	3,604.0	Δ3,604.0
1984	12.6	1,638.0	0	168.2	774.8	27.5	970.5	667.5
1985	12.6	1,638.0	0	0	774.8	27.5	802.3	835.7
1986	12.6	1,638.0	82.4	0	774.8	25.3	882.5	755.6
1987	12.6	1,638.0	199.3	0	774.8	42.4	1,016.5	621.5
1988	12.6	1,638.0	152.5	0	774.8	61.0	988.3	649.7
1989	12.6	1,638.0	3,561.9	0	774.8	0	4,336.7	Δ2,698.7
1990	24.9	3,437.0	305.4	148.3	1,461.4	243.4	2,158.5	1,078.5
1991	24.9	3,237.0	85.6	0	1,461.4	265.3	1,812.3	1,424.7
1992	24.9	3,237.0	199.3	0	1,461.4	308.6	1,969.3	1,267.7
1993	24.9	3,437.0	8.2	0	1,461.4	352.2	1,821.8	1,415.2
1994	24.9	3,237.0	295.4	0	1,461.4	401.6	2,158.4	1,078.5
1995	24.9	3,437.0	3,568.4	0	1,461.4	252.2	5,282.0	Δ2,045.0
1996	41.7	5,421.0	425.9	186.2	2,324.1	832.2	3,768.4	1,652.7
1997	41.7	5,421.0	261.3	0	2,324.1	851.4	3,463.8	1,984.2
1998	41.7	5,421.0	0	0	2,324.1	914.1	3,238.2	2,182.9
1999	41.7	5,421.0	249.8	0	2,324.1	947.4	3,521.3	1,899.7
2000	41.7	5,421.0	405.5	0	2,324.1	986.7	3,716.3	1,704.7
2001	41.7	5,421.0	372.2	0	2,324.1	1,024.2	3,720.5	1,700.5
2002	41.7	5,421.0	199.3	0	2,324.1	1,043.4	3,566.8	1,854.2
2003	41.7	5,421.0	0	0	2,324.1	1,062.6	3,386.7	2.034.3
2004	41.7	5,421.0	172.5	0	2,324.1	1,083.0	3,579.6	1,841.4
2005	41.7	5,421.0	0	0	2,324.1	1,131.1	3,455.2	1,965.8
2006	41.7	6,882.1	0	Δ502.7	2,507.0	1,894.1	3,898.4	2,983.7

Note: Total figure is not necessarily equal to the accumulated figure as each figure is rounded to the place of US$10

Table 9-12 Calculation of Fixed and Variable Expenses

($1,000)

	1st to 6th Year of Operation	7th to 12th Year of Operation	13th to 23rd Year of Operation
Output	12,600 t	24,900 t	41,700 t
Fixed Expenses	1,021	1,465	2,192
Variable Expenses	521	1,025	1,673

Table 9-13 Analysis of Break-Even Point by Stage of Production Program

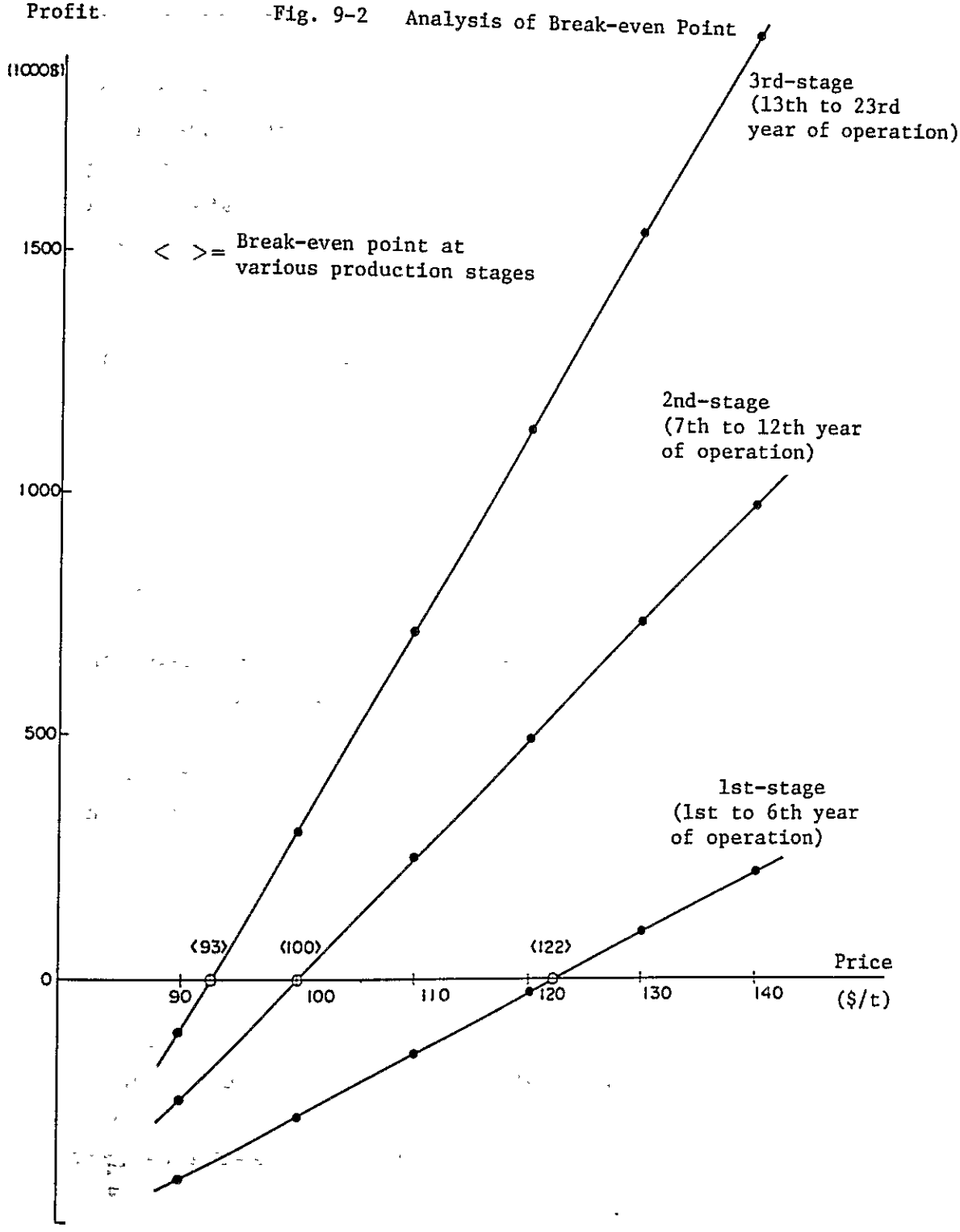
Price ($/t)	Profit ($1,000)		
	1st to 6th Year of Operation	7th to 12th Year of Operation	13th to 23rd Year of Operation
90	Δ 408	Δ 249	Δ 114
100	Δ 282	0	303
110	Δ 156	249	720
120	Δ 30	498	1,137
130	96	747	1,554
140	222	996	1,971

Table 9-14 Value Added Rate

(Unit: %)

Product Price	1st to 6th Year of Operation	7th to 12th Year of Operation	13th to 23rd Year of Operation
Case of $120/t	49	51	54
Case of $130/t	53	55	57

Fig. 9-2 Analysis of Break-even Point



3-7 Summary of Financial Analysis

The internal financial rate of return is satisfactory in either case. According to the break-even analysis, as the scale of production expands, the profitability of the project increases because of the scale merit, and in the third stage (from 13th to 23rd year of operation), it can be profitable even with the price of the bentonite at $100 per ton. The degree of profitability is shown by calculating the value added rate. According to the calculation, the rate is high at either price and at any production scale. Moreover, it increases in proportion to the expansion of the production scale. The result of the financial analysis thus indicated that the profitability of this project is extremely promising if the hypothetical bentonite price becomes a reality.

4 Economic Analysis

4-1 Calculation of Economic Analysis

The aim of the economic analysis is to investigate the economic feasibility of the project from the viewpoint of the national economy. All costs and benefits used in the economic analysis of the project have to represent real value to the national economy, and they are modified by deducting transfer items such as taxes and subsidies and also adjusted by using real prices, that is, shadow prices estimated on the basis of the opportunity cost.

1) Internal transfer items

The costs to be used in the economic analysis must be the ones which are to be beared by the national economy of Guatemala.

Consequently, transfer items such as taxes must be excluded from the financial costs.

In the analysis of this section, as to the goods to be imported for the project, it is assumed that 10% of the import price is to be added as customs duties. Concerning the goods to be procured within the country, the following is assumed to be added to the CIF price: 10% of the price paid on the foreign currency portion of the goods in question as well as 10% of the price as tax for the domestic transactions.

With regard to the domestic goods, 10% is also assumed to be added in the process of domestic transaction. Aside from the above, real estate worth more than $20,000 is subject to fixed property tax of 6/1,000 and the one worth less than $20,000 is subject to 3/1,000 property tax. These portions are adjusted from the financial costs.

2) Land

In the financial analysis $192,400 is estimated as the land purchasing cost. This amount breaks down as follows:

Mine:	75,250 m^2	$120,000	$1.6/$m^2$
Plant:	18,100 m^2	$ 72,400	$4.0/$m^2$

On the other hand, the annual economic cost of land calculated on the basis of the opportunity cost is estimated as follows:

Mine:	$3,600	$0.048/$m^2$
Plant:	$4,000	$0.221/$m^2$

The economic cost of the land for the mine is obtained on the basis of agricultural productivity. The data on the Guatemalan agricultural productivity do not necessarily agree with one another, but annual yield of corn is estimated at 1,200 kg per hectare and annual yield of frijol is estimated at 500 kg per hectare.

Crops raised in the Los Cimientos area are mostly corn and frijol. These crops are cultivated in the same field twice a year. Maize is priced at $0.30 to $0.35 per pound while frijol is priced at $0.09 to $0.11 per pound. The calculation of the opportunity cost is made on the following assumptions:

- corn price: $0.33/pound
- frijol price: $0.1/pound
- arable land: 70% of the total area
- rate of value added in the output: 70%

$$\left(\$0.33 \times \frac{1{,}200 \text{ kg}}{0.4536 \text{ kg}} + \$0.1 \times \frac{500 \text{ kg}}{0.4536 \text{ kg}}\right) \times 0.7 \times 0.7 \times \frac{75{,}250 \text{ m}^2}{10{,}000 \text{ m}^2} \fallingdotseq \$3{,}600$$

The plant site is not utilized at present. It is grassland and its use for dairy farming is conceivable. The calculation of the opportunity cost, in this case, is made on the following assumptions:

- a cow is to yield annual revenue of $250 by using 400 m^2 of land.
- effective land utilization rate: 70% of the total area
- rate of value added: 50%

$$\$250 \times 0.5 \times 0.7 \times \frac{18{,}100 \text{ m}^2}{400 \text{ m}^2} \fallingdotseq \$4{,}000$$

3) Labor force

In Guatemala, unskilled laborers are abundant. Consequently, it is necessary to obtain real labor cost by taking into account the opportunity cost in the evaluation of their wage. As to skilled laborers, their wages are assumed to reflect fully the effect of the opportunity cost so that they are used as they are for the calculation of economic analysis.

Table 9-15 Reference Data on Agricultural Productivity

	Corn			Flijol		
	Cultivated Area (Ha)	Output (t)	Output per Unit Area (kg/Ha)	Cultivated Area (Ha)	Output (t)	Output per Unit Area (kg/Ha)
Whole Country	499,834	572,495	1,145	134,462	35,061	261
Chiquimula	14,492	11,192	772	7,689	3,290	428

Source: Direccion General de Estadistica Ministerio de Economia "Anuario Estadislico" (1977/5 - 1978/4)

Table 9-16

		Corn			Flijol		
		Cultivated Area (Ha)	Output (t)	Output per Unit Area (kg/Ha)	Cultivated Area (Ha)	Output (t)	Output per Unit Area (kg/Ha)
Whole Country	1974	561,800	646,200	1,150	84,900	57,300	675
	1975	582,000	756,700	1,300	97,900	62,400	637
	1976	559,000	800,000	1,431	110,000	73,000	664

Source: Direccion General de Estadistica Ministerio de Economia, Estadisticas Agropecuavias Continuas, 1977

Table 9-17

(Unit: kg/Ha)

	Corn	Bean
Annual Avearge 1970-74	1,160	480

Source: Cuadoros Correspondientes por Cultivo del Documento de Diagnóstico del Desarrollo.

Table 9-18

(Unit: kg/Ha)

	Corn	Bean
1975	1,174	689
1976	1,310	375
1977	1,079	289
1978	1,148	262

Source: World Bank, Country Economic Memorandum - Guatemala, Feb. 4, 1980

In regard to the semi-skilled laborers, 50% of their wages is assumed as the opportunity cost of their labor. As for unskilled laborers, 20% of their wages in assumed as the opportunity cost.

4) Electric power

The economic cost of electric power is obtained by calculating marginal economic cost of electric power used for the project. However, as it is impossible to segregate all the power used for this project from the power program of the whole country, an average power economic cost for the whole country of Guatemala is to be estimated in the following manner: in order to calculate the future marginal cost of power for the whole country, the future power supply and investment programs are used as reference. In this report, the cost of power is calculated on the basis of the records of operation at INDE* from 1972 to 1979 and of the power supply and investment anticipated between 1980 and 1986. The average economic cost of power between 1973 and 1979 was obtained from Table 9-20 1.81 Q/kWH.

In Table 9-20, 10% is postulated as the internal transfer item with respect to "i", 50% is with postulated as the internal transfer item, since loans from abroad are likely to be large.

Table 9-19 Past Records of Power Supply

(Unit: MWH)

	1972	1973	1974	1975	1976	1977	1978	1979
Total Generated Power	451,670	555,096	603,007	649,478	716,331	916,817	969,278	979,997
Loss	18,724	24,358	26,666	40,333	31,264	36,327	52,036	83,704
Home Consumption	5,177	13,291	15,177	16,264	17,129	31,169	34,698	32,300
Net Power Supply	427,769	517,447	561,164	592,881	667,938	849,321	882,544	863,993

Source: Informe Estadistico 1979, INDE

Note: * Instituto Nacional De Electrificacion

Table 9-20 Record of Power Supply and Economic Cost

(Unit: Mil. Dollar)

	1972	1973	1974	1975	1976	1977	1978	1979
a. Net Power Supply (GWH)	427.8	517.4	561.2	592.9	667.9	849.3	882.5	864.0
b. Increase of Net Power Supply	58.0	89.6	43.8	31.7	75.0	181.4	33.2	Δ18.5
c. Investment Expenditure	8.82	10.20	13.00	24.94	41.44	66.67	114.30	159.35
d. Current Expenditure	36.72	42.64	50.83	60.76	79.09	103.54	133.87	154.39
e. Power Generation and Maintenance Cost	0.77	0.57	0.67	0.75	0.82	1.07	1.82	2.94
f. Power Transmission and Transformation Cost	0.42	0.47	0.73	0.87	1.03	1.24	1.66	1.92
g. Fuel and Machine Oil	1.48	2.25	7.58	11.36	13.56	24.29	25.01	37.68
h. Management and Personnel Cost	31.09	36.05	38.14	44.03	59.67	71.57	98.97	104.18
i. Insurance, Interest	1.13	1.23	1.36	1.33	1.36	1.25	1.72	2.01
j. Depreciation	1.83	2.07	2.35	2.42	2.65	4.12	4.69	5.66
k. Economic Cost of Investment	7.94	9.18	11.70	22.45	37.30	60.00	102.87	143.42
l. Economic Cost of Current Expenditure	30.95	36.02	43.09	51.97	68.25	88.98	115.57	133.05
m. Increase of Economic Cost of Current Expenditure	-	5.07	7.07	8.88	16.28	20.73	26.59	17.48
n. Wholesale Price Index (1950 = 100)	119.6	136.6	167.7	185.0	204.4	234.2	243.1	267.1
o. Deflator Using October 1981 as Standard	0.323	0.368	0.452	0.499	0.551	0.632	0.656	0.720
p. (k + m) ÷ 0	-	38.72	41.53	62.79	97.24	127.74	197.35	223.47

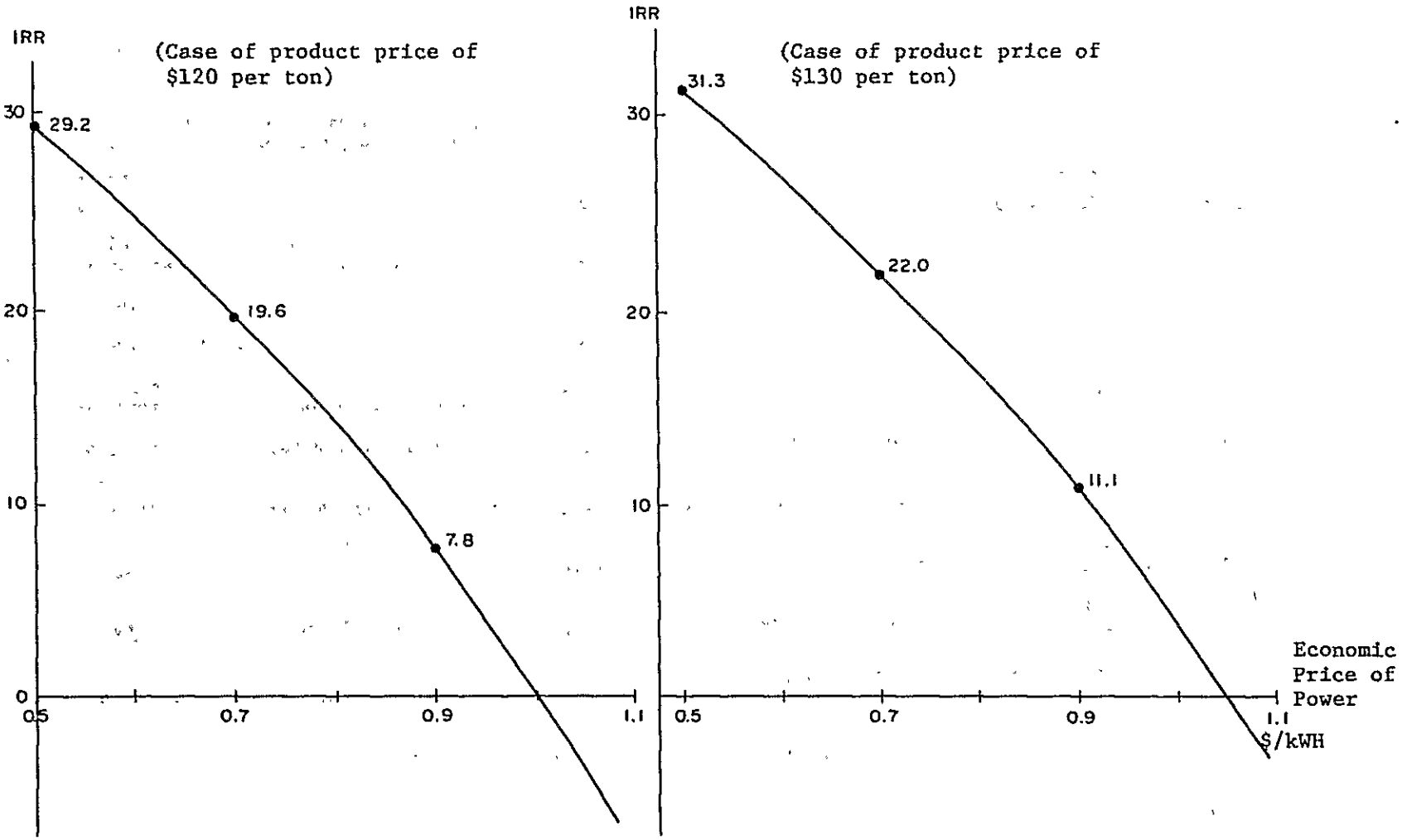
Source: Informe Estadistico 1979, INDE (Institute Nacional de Electrificacion)
Financiero y Estadistico, INDE (")

Table 9-21 Estimate of Power Supply and Economic Cost

	1980	1981	1982	1983	1984	1985	1986
a. Additional Power Supply (GWH)	295	0	1,235	362	0	397 174	1,562
b. Project	AGUACAPA	-	CHIXOY	EXMIBAL	-	GED. ZUNIL SANTA MARN II	CHULAC
c. Anticipated Investment ($1 million)	150	-	450	150	-	170 80	680
d. Net Additional Power Supply (GWH)	266	0	1,112	326	0	574	1,406
e. Economic Cost of Current Expenditure ($1 million)	165	165	395	462	462	568	857
f. Amount Already Invested ($1 million)	90	0	190	0	0	0	1
g. Economic Cost of Investment (")	170	0	304	176	0	293	794
h. Increase of Economic Cost of Current Expenditure	32	0	229	67	0	106	289
i. (g + h) ÷ 0.72	142	0	740	338	0	554	1,504

Source: Fnforme Estadistico 1979, INDE
Financiero y Estadistico, INDE

Fig. 9-3 Sensitivity Analysis for Economic Cost of Electric Power



The above past records of power supply and economic cost (1972-1979) are used as reference in postulating power supply and cost from 1980 to 1986. The estimate is given in Table 9-21. Taking into consideration the past performances, the net power supply is estimated at 90% of total power generation. It is assumed that there exists a correlation between net power supply and economic cost of current expenditures, and the correlation($\ell = -67.3 + 0.206a$, $\gamma^2 = 0.901$) for the years between 1972 and 1979 is used in the calculation of the future economic cost of electric power.

The most unclear part in the economic calculation of electric power is the size of the electric investment program other than the one concerning the power generation. But this is assumed at 30% of the power generating cost. Figures in Table 9-21 are shown at the prices of 1979. As a consequence, the wholesale price index for October 1981 is obtained as 370.8 (1950 = 100) and the figures are converted to the prices of that time.

The result of calculations shows the average economic cost of power to be 0.90 Q/kWH between 1980 and 1986. This value is adopted as the economic cost of power used for this project.

However, the total economic cost of electric power cannot be calculated with high precision in spite of the fact its percentage in the total economic cost of the project is quite big. In consequence, it is necessary to undertake its sensitivity analysis.

5) Costs of foreign exchange portion

In the economic analysis, shadow exchange rate, different from official exchange rate, is often used. In this case, however, it is not considered necessary to use dubious shadow exchange rate, though the Quetzal is rather weak against the US dollar. Moreover, as the World Bank also uses official rate for the economic analysis of their projects in Guatemala, in this report, official rate is adopted without modification.

Table 9-22 Guatemala's Export-Import and Export-Import Taxes

(Unit: Mil. dollar)

	Import	Import Tax	Export	Export Tax
1976	838.4	71.2	760.3	49.2
1977	1,052.6	99.4	1,160.2	152.2
1978	1,285.6	108.3	1,089.5	158.2
1979	1,5040.0	117.9	1,241.4	125.8
1980	1,598.2	111.6	1,519.8	149.4

Table 9-23 Guatemala's Shadow Exchange Rates Calculated on the Basis of Simple Equation

1976	1.01	Q/$
1977	0.98	"
1978	0.98	"
1979	1.00	"
1980	0.99	"

4-2 Calculation of Internal Economic Rate of Return

1) Result of calculations

The internal economic rate of return of this project is as given below.

Product price of $120 per ton:	7.82%
Product price of $130 per ton:	11.05%

2) Comments on calculation of internal economic rate of return

The calculated value of the internal economic rate of return is a rough value compared with the internal financial rate of return. The reasons are (1) shadow price which is not clearly set must be used, (2) to obtain useful data for price adjustment is difficult and (3) the conditions at the time of study are deemed constant during the project life (likewise, with the internal financial rate of return).

3) Sensitivity analysis for economic cost of electric power

In this project, the economic cost of power is a particularly big factor on the cost side, and there are also a number of uncertain factors. The internal economic rate of return was obtained on the basis of the economic cost of power of $0.90 per kWH, but in addition sensitivity analysis for the economic cost of power is undertaken both for the product price of $120 per ton and $130 per ton. The results are shown Fig. 9-3.

4-3 Foreign Exchange Earnings and Savings Effect

The foreign exchange reserve situation in Guatemala has been comparatively favorable among the Central and South America countries, but it has by no means been fully satisfactory. Particularly in recent years, outflow of foreign exchange has rapidly increased on account of the widening gap between domestic and overseas interest rates and of political instability of the country. The country, under these circumstances, is tightening restrictions against the outflow of foreign exchange. Thus contribution of this project towards increasing the country's foreign exchange is highly beneficial in the overall perspective.

Any increase or decrease of foreign exchange reserve because of this project results from import required for the project, from savings in foreign exchange through import substitution of domest products, and from foreign exchange earnings through exports.

Table 9-26 shows annual net flow and its cumulative net flow of foreign currency under 10% of discount rate. The figures indicate a very high foreign exchange earnings and savings effect of this project.

4-4 Regional Development and Indirect Effect

However, when not only the direct relation between the project and the economic and social realities of the region, but also the far-reaching effects of the project are to be considered from the viewpoint of macro-economy, the important role of the central government and local autonomous bodies should not be forgotten.

Calculation of the relative share of labor ($\frac{\text{total personnel cost}}{\text{value added amount}}$) in this project is shown in Table 9-27. The figures are rather low, but in this is attributable in part to high value added amount (denominator) of this project. But even when this fact is taken into account, the values are low.

Tabel 9-24 Internal Economic Rate of Return
Case 2 ($120/t)

(Unit: Thousand dollar)

Year	(1) Output (1,000t)	(2) Benefits (including economic salvage value)	(3) Total Capital	(4) Operating Cost	(5) Cost (3) + (4)	(6) Net Benefits (2) - (5)
1982	0.0	0.0	618.8	0.0	618.8	Δ 618.8
3	0.0	0.0	3,335.0	0.0	3,335.0	Δ3,335.0
4	12.6	2,630.3	175.8	2,009.7	2,185.5	444.8
5	12.6	2,686.2	7.6	2,009.7	2,017.3	668.9
6	12.6	2,744.8	83.4	2,009.7	2,093.1	651.7
7	12.6	2,806.4	192.1	2,009.7	2,201.8	604.6
8	12.6	2,871.3	148.5	2,009.7	2,158.2	713.1
9	12.6	2,939.2	3,302.0	2,009.7	5,311.7	Δ2,372.5
1990	24.9	4,486.7	438.7	3,973.5	4,412.1	74.5
1	24.9	4,561.4	86.5	3,973.5	4,060.0	501.4
2	24.9	4,640.1	192.1	3,973.5	4,165.6	474.5
3	24.9	4,722.9	15.2	3,973.5	3,988.7	734.2
4	24.9	4,809.6	281.4	3,973.5	4,254.9	554.7
5	24.9	4,900.7	3,308.6	3,873.5	7,282.1	Δ2,381.4
6	41.7	7,012.1	591.5	6,472.0	7,063.5	Δ 51.3
7	41.7	7,112.6	249.5	6,472.0	6,721.5	391.2
8	41.7	7,218.0	7.6	6,472.0	6,479.6	738.4
9	41.7	7,328.8	238.9	6,472.0	6,710.8	618.0
2000	41.7	7,445.0	383.0	6,472.0	6,855.0	590.0
1	41.7	7,567.1	352.2	6,472.0	6,824.1	743.0
2	41.7	7,695.2	192.1	6,472.0	6,664.1	1,031.2
3	41.7	7,829.8	7.6	6,472.0	6,479.6	1,350.2
4	41.7	7,971.0	167.3	6,472.0	6,639.2	1,331.8
5	41.7	8,119.4	7.6	6,472.0	6,479.6	1,639.8
6	41.7	10,812.6	Δ495.1	6,472.0	5,976.9	4,835.8

Note: As the fractions of .5 and above are rounded to the nearest whole number and fractions below .5 are cast away, the figures for the total columns and the figures totalling the breakdowns do not necessarily correspond.

Table 9-25 Internal Economic Rate of Return
Case 2 ($130/t)

(Unit: Thousand dollar)

Year	(1) Output (1,000t)	(2) Benefits (including economic salvage value)	(3) Total Capital	(4) Operating Cost	(5) Cost (3) + (4)	(6) Net Benefits (2) - (5)
1982	0.0	0.0	618.8	0.0	618.8	Δ 618.8
1983	0.0	0.0	3,335.0	0.0	3,335.0	Δ3,335.0
1984	12.6	2,707.6	175.8	2,009.7	2,185.5	522.2
1985	12.6	2,761.1	7.6	2,009.7	2,017.3	743.8
1986	12.6	2,817.2	83.4	2,009.7	2,093.1	724.1
1987	12.6	2,876.2	192.1	2,009.7	2,201.8	674.4
1988	12.6	2,938.2	148.5	2,009.7	2,158.2	780.0
1989	12.6	3,003.1	3,302.0	2,009.7	5,311.7	Δ2,308.6
1990	24.9	4,670.5	438.7	3,973.5	4,412.1	258.4
1991	24.9	4,742.0	86.5	3,973.5	4,060.0	682.0
1992	24.9	4,817.3	192.1	3,973.5	4,165.6	651.7
1993	24.9	4,896.5	15.2	3,973.5	3,988.7	907.8
1994	24.9	4,979.4	281.4	3,973.5	4,254.9	724.5
1995	24.9	5,066.5	3,308.6	3,973.5	7,282.1	Δ2,215.6
1996	41.7	7,341.8	591.5	6,472.0	7,063.5	278.4
1997	41.7	7,438.0	249.5	6,472.0	6,721.5	716.5
1998	41.7	7,538.7	7.6	6,472.0	6,479.6	1,059.2
1999	41.7	7,644.8	238.9	6,472.0	6,710.8	933.9
2000	41.7	7,755.9	383.0	6,472.0	6,855.0	900.9
2001	41.7	7,872.7	352.2	6,472.0	6,824.1	1,048.6
2002	41.7	7,995.2	192.1	6,472.0	6,664.1	1,331.2
2003	41.7	8,123.9	7.6	6,472.0	6,479.6	1,644.4
2004	41.7	8,259.0	167.3	6,472.0	6,639.2	1,619.8
2005	41.7	8,400.9	7.6	6,472.0	6,479.6	1,921.4
2006	41.7	11,087.4	Δ495.1	6,472.0	5,976.9	5,110.5

Note: As the fractions of .5 and above are rounded to the nearest whole number and fractions below .5 are cast away, the figures for the total columns and the figures totalling the breakdowns do not necessarily correspond.

Table 9-26 Foreign Exchange Earnings and Savings Effect

(Unit: Thoudand dollar)

Year	Unit Price ($120/t)				Unit Price ($130/t)			
	Foreign Currency Inflow	Outflow	Net Flow	Net Flow after 10% Discount	Foreign Currency Inflow	Outflow	Net Flow	Net Flow after 10% Discount
1982	0.0	374.4	Δ 374.4	Δ 374.4	0.0	Δ 374.4	Δ 374.4	Δ 374.4
3	0.0	2,286.7	Δ2,286.7	Δ2,078.8	0.0	2,286.7	Δ2,286.7	Δ2,078.8
4	2,630.3	1,321.9	1,308.4	1,081.3	2,707.6	1,321.9	1,385.7	1,145.2
5	2,686.2	1,321.9	1,364.3	1,025.0	2,761.1	1,321.9	1,439.2	1,081.3
6	2,744.8	1,377.4	1,367.4	934.0	2,817.2	1,377.4	1,439.8	983.4
7	2,806.4	1,475.2	1,331.2	826.6	2,876.2	1,475.2	1,401.0	869.9
8	2,871.3	1,330.1	1,541.2	870.0	2,938.2	1,330.1	1,608.1	907.7
9	2,939.2	3,652.1	Δ 712.9	Δ 365.8	3,003.1	3,652.1	Δ 649.0	Δ 333.0
1990	4,486.7	2,875.0	1,611.7	751.9	4,670.5	2,875.0	1,795.5	837.6
1	4,561.4	2,702.6	1,858.8	788.3	4,742.0	2,702.6	2,039.4	864.9
2	4,640.1	2,793.5	1,846.6	711.9	4,817.3	2,793.5	2,023.8	780.3
3	4,722.9	2,640.2	2,082.7	730.0	4,896.5	2,640.2	2,256.3	790.8
4	4,809.6	2,772.8	2,036.8	649.0	4,979.4	2,772.8	2,206.6	703.1
5	4,900.7	4,986.1	Δ 85.4	Δ 24.7	5,066.5	4,986.1	80.4	23.3
6	7,012.1	4,654.9	2,357.2	620.7	7,341.8	4,654.9	2,686.9	707.5
7	7,112.6	4,528.3	2,584.3	618.7	7,438.0	4,528.3	2,909.7	696.6
8	7,218.0	4,327.3	2,890.7	629.1	7,538.7	4,327.3	3,211.4	698.9
9	7,328.8	4,519.5	2,809.3	555.8	7,644.8	4,519.5	3,125.3	618.3
2000	7,445.0	4,639.2	2,805.8	504.6	7,755.9	4,639.2	3,116.7	560.6
1	7,567.1	4,613.6	2,953.5	482.9	7,872.7	4,613.6	3,259.1	532.9
2	7,695.2	4,480.6	3,214.6	477.8	7,995.2	4,480.6	3,514.6	522.4
3	7,829.8	4,327.3	3,502.5	473.3	8,123.9	4,327.3	3,796.6	513.0
4	7,971.0	4,460.0	3,511.0	431.3	8,259.0	4,460.0	3,799.0	466.7
5	8,119.4	4,327.3	3,792.1	423.5	8,400.9	4,327.3	4,073.6	454.9
6	8,275.3	4,327.3	3,948.0	400.8	8,550.1	4,327.3	4,222.8	428.7
Total	128,373.9	81,115.2	47,258.7	11,142.8	133,196.6	81,115.2	52,081.4	12,401.8

When the figure for the relative share of labor is big, this fact can be interpreted in two ways.

1) The low rate of personnel cost makes for a more financially sound enterprises (outlook from the enterprise side),

2) The workers' share of the earnings is small (outlook from the labor side).

It would be difficult to give a definite economic evaluation of these interpretations. If the subject that selects the project attaches importance to income distribution or consumption, the higher relative share of labor will probably be considered preferable. But if priority is given to savings, a lower rate may be preferred.

The indirect effect, however, presents problems related to more basic economic policies and activities, such as how the share of capital (1 - relative share of labor) will be ultimately redistributed through the taxation channels of the Government and the local autonomous bodies and how the value-added portion left in the hands of enterprisers will be spent.

Table 9-27 Rate of the Relative Share of Labor

(Unit: %)

Product Price	1st to 6th Year of Operation	7th to 12th year of Operation	13th to 23rd Year of Operation
Case of $120/t	12	8	5
Case of $130/t	14	9	6

4-5 Economic Analysis Round-Up

The value of internal economic rate of return cannot necessarily be considered high but if Guatemala's opportunity cost of capital is taken to be about 10%, this project is feasible if the product price is set at $130 per ton. However, as the internal economic rate of return does not indicate all the effects of the project on the whole country, consideration should also be given to other economic social effects.

In the case of this project, the scale is small and the business substance itself has little indirect effect worth mentioning. Nevertheless, foreign exchange earnings and savings are worthy of attention as direct economic effects. If this point is to be emphasized, the project may be feasible even at the price of $120 per ton.

5 Overall Evaluation

5-1 Validity of Investment in the Mine

The bentonite mined at Los Cimientos changes form the H type bentonite of higher grade when it is given Na activation treatment. It then becomes fit for uses with higher value added.

This project is very small in scale, since the deposit contains only 900,000 tons of which 890,000 tons are to be mined and 680,000 tons of end product are to be processed. However, processing of a product of higher value added makes the project highly favorable financially, and it is promising economically as well. In particular, high foreign exchange earnings and savings are likely to bring economic benefits.

Though it may be small in scale, the project is considered to promote decentralization of industries, which is the basic industrial policy of Guatemala, and to contribute to the development of natural resources.

5-2 Overall Measures and Proposals

As a results of pre-feasibility study of this bentonite project, promising financial and economic indications were obtained. As the preliminary surveys consist only of the basic portions of the factors constituting the project, more specific designing is necessary in case project implementation is planned. And since further surveys are needed for that purpose, the contents thereof will be presented and proposals relative to matters that should be undertaken in the future will be made.

1) Exploration

For clarifying the total deposits of the mine and mining areas by the quality, it is necessary to undertake the exploration described in Chapter 3, 1, 1-4, 1) and 2).

2) Property investigation

Confirmation of the chemical and physical properties of the additional survey samples will be needed with respect to the items of analysis presented in Chapter 3 Section 2. Further, analysis of uses that were not included in this survey, such as for pelletizing iron ore, will also be required.

3) Market research

In order to estimate the more detailed market conditions, it is necessary to make further research on the Central and South American bentonite markets and compare the result of the research with the contents of Chapter 3 Section 3.

4) Investment costs research

Studying the costs of investment needed for the mine development and the manufacturing plant construction in detail under the following conditions, implementation program is to be worked out.

(1) With regard to mine machinery, estimate the purchasing prices by practicaly surveying available equipment.

(2) With regard to the manufacturing plant, determine machinery and equipment needs by undertaking practical designing of the manufacturing process and then estimate the purchasing prices as in (1) above.

5) Feasibility study

Undertake financial and economic analysis using the basic data contained in items from 1) to 4) and make an overall evaluation.