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### LA MINOTERIE D'HAITI AN ANALYSIS OF PRODUCTION COSTS AND MILLING OPERATIONS



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AN ANALYSIS OF PRODUCTION COSTS AND MILLING OPERATIONS

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## EXECUTIVE SUMMARY

The team's purpose was to study production costs and the flour extraction rates under the present conditions and "efficient" operation of La Minoterie D'Haiti. The observations included herein are the result of the analysis based on the first impressions of the mill operation and the information obtained by the team.

La Minoterie D'Haiti is the only flour mill in Haiti and is state-owned. La Minoterie D'Haiti is a well laid-out and well-equipped flour milling plant capable of carrying out an independent operation. It is equipped with a good ship unloading system, power plant, carpentry shop, fire station, roll fluting shop, and a maintenance shop which has the necessary machine-tools required to maintain an operation of this size. The total mill storage capacity is about 36,000 short tons (st) of wheat and 675 st of holding bin capacity. The bulk flour storage capacity is 800 st and the packed flour storage is about 3,000 st. However, some machinery in some of its departments need urgent repair. The original design production capacity of this mill was 10,000 to 11,000 cwt of flour for 24 hours of operation. This mill at present employs 882 persons (492 permanent and 390 temporary).

This mill performs well in quality control with a solid laboratory and experienced technicians. The French technical assistance team definitely contributes to the improvements in mill operations. The follow-up in the maintenance program, even if it is rudimentary, is definitely showing an increase in production and extraction rates. It is the impression of this team that the technical personnel of the mill are fully capable and readily accept the responsibility that this type of milling operation demands. A maintenance program has been undertaken during the last few months with the support of mill management. This program has resulted in a direct increase in production rate, and the average extraction rate based on clean tempered wheat has reached over 75 percent.

The scale control system of the mill is in disrepair, making it impossible to have full control over certain specific mill operations, such as screening inventories, dirty wheat yields, product yield, and wheat inventories. The roller mill renewal program is almost completed but the Allis Chalmer roller mills need specific attention. The pneumatic system of the mill is not properly maintained and as a result there are mill "choke ups". The safety and sanitation conditions of the mill are significantly below standard and need immediate follow-up. The packing and warehouse operations could be significantly improved to make them more efficient and less costly.

The total production costs of the mill have been increasing during the last year. For the months of March, April and May 1989, the average production cost was \$5.802 per bag of flour produced. This production cost, along with the raw material cost increases, is responsible for no benefits for the mill for these 3 months. Major items for the increase in the total production cost are plant labor, power consumption, and administrative expenses. This increase in production cost has not been accompanied by an increase in the flour and millfeeds sale prices, sale prices that are defined by the Government of Haiti (GOH). In this regard, the mill management is considering the reduction of 140

temporary employees by October 1989, along with the freezing of positions of permanent employees, following a policy of attrition. The reduction of the power cost is also included in the management agenda for cost reduction by connecting the flour mill to the national electrical company of Haiti.

#### Conclusions and Recommendations

It is the team's conclusion that La Minoterie D'Haiti is a very important milling operation for Haiti and that it has a technical and managerial group committed to it. As a grain processing enterprise, it could be improved by undertaking technical and administrative reforms that will have immediate impact on its operation and high production costs.

The suggested technical reforms are: (1) immediate repair and maintenance to insure good working conditions on all the scales of the milling operations, (2) correction of the power factor of the mill to 0.9, (3) a complete revamping of the pneumatic conveying system to achieve an increase in the production rate of at least 5 percent of the present mill load capacity, (4) an increase in the flour production rate of at least 0.5 percent over the already present extraction rate, and (5) implementation of an immediate program to improve the safety and sanitation conditions in the mill.

The suggested administrative reforms are: (1) to implement the mill management plan to reduce the temporary labor force in the mill by 140 employees by October 1, 1989, (2) to reduce the administrative costs by an average of 24 percent of their present costs, and (3) to reduce the cost of bags by implementing a policy of competitive pricing.

Using the average production costs for the March-May/89 period as a model, the team has estimated that the combined impact of the technical and administrative reforms could reduce production costs by \$0.915 and increase the mill revenues by about \$1.01 per bag of flour produced. Therefore, based on the model for average costs, production costs per bag of flour could be reduced to \$4.89. In addition, an extra savings of \$0.15 per bag of flour could be obtained in the purchasing of bags. However, the time frame required to implement these reforms (up to 8 months) will determine its impact in La Minoterie production costs. Additionally, the high production costs demand an action plan from management to reduce them in a specific period of time. The figures that resulted from the suggested measures for production costs reduction could help mill management to estimate the impact of further cuts; cuts that could be a part of a strategic plan to make the mill more efficient.

The raw material price, especially the wheat price, has been increasing during the past year. Therefore, in order to bring the mill to a level of reasonable profitability under present conditions, a sale price increase in the mill products should be considered. Prior to the price increase, the mill must make a big effort to reduce high production costs; also, the impact on the Haitian market of a price increase in the mill products should be considered.

The team estimates that a toll charge for the mill (under present conditions) based on the average production costs of the March-May/89, could be \$7.288 per bag of flour produced. Once the suggested technical and administrative reforms

are implemented, the toll charge could be reduced to \$6.13 per bag of flour produced.

La Minoterie D'Haiti could benefit from a technical assistance program oriented toward training its technical and managerial personnel. This program should consider the practical and theoretical aspects of milling science, mill maintenance, mill management operations, and grain marketing activities.



## SECTION I

### INTRODUCTION

The purpose of the Kansas State University (KSU) team's visit to Haiti was to review the operations of La Minoterie D'Haiti to provide the FVA/FFP Agency for International Development (AID) with:

1. Its evaluative judgment of what La Minoterie's milling production and delivery costs are now and what these costs should be under an efficient operation.
2. What La Minoterie's extraction rate is now and what it should be under an efficient operation.
3. Based on 1 and 2 above, what La Minoterie's price for its products is and what a fair price would be under an efficient operation for either (a) flour owned and sold by La Minoterie, and (b) a toll milling charge for wheat/flour not owned by La Minoterie.

The following sections of this report present a description of the mill and the findings, conclusions, and recommendations of the team. Section II presents a description of the mill's facilities, organizational structure, and production and sales information. Section III presents the team's findings in regard to production costs and flour extraction. Section IV presents the milling operations of La Minoterie with specific recommendations. Section V includes the team's conclusions and recommendations. For the purpose of this report the currency used was U.S. dollars at the official exchange rate at the time of the team's visit to Haiti (US\$1.00 per Haitian G5.00), bags are referred to as hundred pounds of product, and La Minoterie D'Haiti is referred to as the mill or La Minoterie.

The information presented herein was given to the team by the mill's staff and by the AID mission in Haiti. While in Haiti (July 17 to 26, 1989), the team made several visits to La Minoterie. Due to time limitations and to the nature of the visit, the team's observations are based on a first impression of the mill's operation and on the information given by the mill's executives and AID personnel.

## SECTION II

### DESCRIPTION OF LA MINOTERIE D'HAITI

La Minoterie D'Haiti is the only flour mill in the country and is state-owned. It has the monopoly in wheat and flour imports and in the production of wheat flour. It is located about 16 miles from Port-au-Prince and constitutes one of the major government enterprises. It was sold to the GOH by a private company and then managed by Maple Leaf of Canada until 1982. Since 1982, the mill has received technical assistance from the French company Grands Moulins de Pantin. La Minoterie has been a source of funds for the GOH budget.

#### Organizational Structure

The flour mill is under the Ministry of Finance of Haiti. It is managed by the General Director, Mr. Ives José, who reports to an Administrative Board appointed by the GOH. The administrative staff that reports to the general director is grouped into four divisions: administration, financial, production and commercial. There are two units at the advisory level reporting to the general manager: (1) the consultants, technical advisor, auditor, and lawyer; and (2) the coordinator of the mill's regional offices. The personnel currently employed at the mill consist of 882 people; 492 are permanent employees and 390 are temporary employees. Although the current organizational structure is in a process of reorganization, the main units of each of the four divisions will be described in the following paragraphs.

The following departments belong to the administration division: personnel, correspondence (secretarial booth), general services, and the dispensary. The current administrative director is Mr. Maxime Antoine.

The financial division of the mill is in charge of the following departments: accounting, cost accounting, and balance sheets, and budget. The current financial director is Mr. Charles-Irene Altidor.

The commercial division consists of three departments: purchasing, domestic and foreign sales, and marketing studies. The current commercial director is Mr. Carl Ferailleur.

The production division contains four departments that report directly to the general director: flour mill, quality control, mechanical maintenance and electrical maintenance, and the power plant. The current head miller is Mr. Lionel Perdriel, the head of quality control is Mr. Justin Najac, the head of mechanical maintenance is Mr. Saint Louis Vincent, and the head of the electrical maintenance and the power plant is Mr. Daniel Joseph. The mill has one electrical engineer and one electro-mechanical engineer with academic degrees on its staff. The French technical assistance team consists of one senior miller (Mr. Henry Chasles) and his assistant; they work closely with the production division group.

The general director has a weekly staff meeting with the division directors. The maintenance heads, the head miller, the senior French consultant, and the

engineers have weekly staff meetings with the administrative director to review the production schedules and results, maintenance plans, new projects, and to provide follow-up about the objectives of previous meetings. This technical group constitutes the Technical Bureau of the mill. The department heads have a monthly meeting with the general director.

### Milling Facilities

La Minoterie D'Haiti was originally set up with all the necessary supporting departments for running an independent and efficient operation. But, over the years, the condition of the machinery and operational procedures have fallen into negligence. La Minoterie consists of the following sections: ship unloading, grain and flour storage, and the mill.

The ship unloading/wheat receiving system has a capacity of 160 metric tons/hour and is equipped with an 8 inch pneumatic nozzle. Due to soil erosion and subsequent silting of the channel, the system can only receive 15,000 mt shipments. The wharf wheat receiving scale is not operational.

The total wheat storage capacity of La Minoterie is 36,000 st of which the silos hold 15,195 st. The flat storage can hold 10,000 st and the silos at CNSG (the national grain storage facility which is under Minoterie's administration) can hold 11,460 st. This is equipped with a high capacity Clipper precleaner, a dump scale, and a grain drier. The screenings from the precleaner are used in feed production. Adjacent to the CNSG there is a feed mill with 10 ton/hour pelleting capacity. La Minoterie is one-third owner of this facility.

At present, power for the Minoterie's milling operation is supplied by its own power plant. There are two power plants, one comparatively new plant which is 10 years old and operating and an older plant which is on standby for emergencies. The Minoterie supplies power to its subsidized employee housing project and sells it to nearby facilities. Fuel oil for the plant is stored in a 60,000 gallon capacity tank installed nearby.

La Minoterie is equipped with a well laid out machine shop. Three center lathes, two milling machines, one shaper, one radial drilling machine, one sheet metal shear, one folding machine, two rolling machines, two welding machines, and a hydraulic press fitting machine are installed in this shop. They are equipped to handle all kinds of maintenance jobs including roller-mill reconditioning. Minoterie employs 32 people in the machine shop.

The Minoterie has two roll "fluting and polishing" machine shops. The Sangati machine operates with a single point cutting tool in European style. The "Pratt and Whitney" machines are equipped for fluting in American style with a multipoint cutting tool.

There is a carpentry shop which is used for maintaining sifter and roller mill frames. Sieve boxes are also made in this shop along with sieve frames.

The flour mill was originally designed for a capacity of 10,000 to 11,000 cwt or bags of 100 lb per 24 hours. The cleaning house has a cleaning capacity of 800 metric tons of wheat per 24 hours. It is equipped with 10 wheat holding

bins of 675 st total capacity. The first temper bins can hold 280 st and the second temper bins can hold 50 st. The finished flour bins can hold 15,480 cwt of flour. The flour mill section is equipped with 34 double roller mills, 19 square sifters, and 12 purifiers. The packing of flour and mill feed are carried out with manual auger packers and these operations are very labor intensive. The only operational scales in the mill are the scale for clean, tempered wheat and the scale for finished flour.

The quality control of finished products is strongly supported by a well-equipped laboratory and knowledgeable crew. This lab houses a test bakery, an alveograph, kjehldahl apparatus for protein determination, air oven and muffle furnace for moisture and ash determinations, and a Chopin experimental mill for wheat evaluation. Finished products, i.e. superior flour, all purpose flour, all grades of semolina and mill feeds, along with wheat to mill are regularly checked and analyzed on every shift.

All these operations are supported by an organized store. At the request of various departmental supervisors, the store originates the purchase request. After clarification from the administrative director's office, the equipment is purchased, cataloged, and stored.

The outgoing load-out product is weighed on a 30 ton weigh bridge and is cross checked with the number of sacks of flour or mill feed loaded on that transaction. A new 100 ton weigh bridge, with electronic printout and security system, is being installed at this time to make the control over outgoing products more efficient.

Fumigation and sanitation supplies are maintained in a separate building under lock and key. Phostoxin tablets, methyl bromide canisters, malathion liquid, creolin disinfectant, and fogging chemicals are some of the supplies stored in the building. Also, there is a fire station equipped with pumps and hoses to combat any emergency fire breakout.

La Minoterie runs a subsidized housing program for its employees where a three-bedroom unit rents for \$50/month. Power is supplied free. It also runs a free dispensary and a subsidized cafeteria for the benefit of the employees.

#### Production and Sales Information

The main products manufactured by La Minoterie D'Haiti are three types of flour and three classes of semolina. The flour types are: superior flour, all purpose flour, and whole wheat flour. The distribution of production among the flour products for the last 3 years has averaged: 97.02 percent for superior flour, 2.96 percent for semolina flour, 0.01 percent for all purpose flour, and 0.01 percent whole wheat flour. The millfeeds (son du blé) are sub-products of the milling process and are products which are high in demand and which are valuable for animal feed in Haiti.

The FOB or ex-factory price of the mill products is fixed by the Ministry of Finance. Currently, all the mill products, with the exception of the millfeeds, have the following taxes per bag of 100 lb (pounds) of product: \$1.81 for superior flour, \$1.85 for semolina, \$3.29 for whole wheat flour, and \$3.27 for

all purpose flour. Table 1 shows the different superior flour sale prices (including tax) and the millfeeds sale prices for the last 3 years.

TABLE 1  
FLOUR FOB PRICES FOR SUPERIOR FLOUR AND MILLFEEDS  
(\$/bag of 100 lb)

Period	Superior Flour	Millfeeds
October 86 - July 87	22.31	
October 86 - May 87		2.25
August 87 - May 88	19.00	
June 87 - December 87		2.00
January 88 - March 88		5.00
June 88 - July 89	21.00	
April 88 - July 89		4.00

Source: Financial Division, La Minoterie D'Haiti.

Figure 1 (from Table 1, Appendix I) shows the flour and millfeed production for the 12 months previous to July 1989. Figure 2 (from Table 2, Appendix I) shows the net flour production of La Minoterie for the last 3 fiscal years. Figure 3 (from Table 3, Appendix I) shows the net flour sales of the mill for the last 3 fiscal years. This figure indicates an apparent seasonal cycle for the mill's flour consumption in Haiti. This cycle is reflected in the increase in flour consumption during the months of December (for the last 3 years) and for March (for the last 2 years). The sales for the 1986/87 period decreased drastically from 9,678 st in March 1987, to a low of 4,603 st in July 1987. The low sales of the 1986/87 period started to recover in August 1987, and sales have not reached such a low figure since that period. It should be noted that the flour price was reduced in August 1987, from \$22.31/bag to \$19.00/bag.

The December and March sales peaks for flour consumption are also shown in Figure 4 (from Table 3, Appendix I). Figure 4 indicates the pattern for the flour sales volumes and the flour production volumes for the last 12 months. The difference between the production and sales for a given month is the flour ending inventory of the mill for that month. Figure 4 indicates how a larger ending inventory for a given month is compensated by a reduction in production hours for the following month. For the last 12 months, the low months for the mill's flour sales have been: July 1988; with 8261 st; September 1988, with 8044 st; and January 1989, with 8518 st.

Table 2 shows the flour and millfeeds sales of the mill for the last 3 fiscal years. In these years, the largest sales took place in the 1987/88 period. The

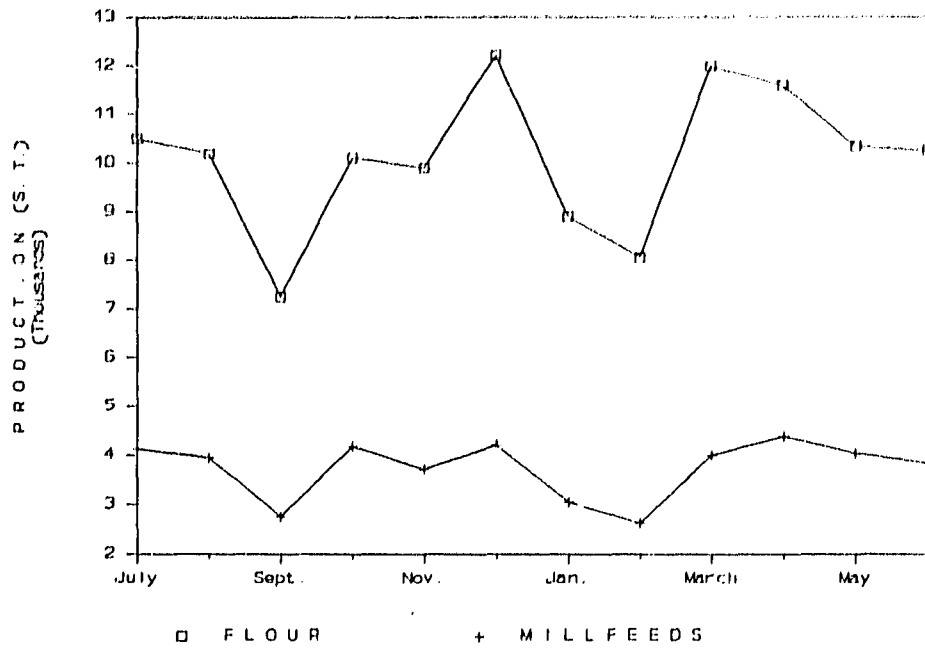


FIGURE 1. La Minoterie's Flour and Millfeeds Production (July 1988 to June 1989)

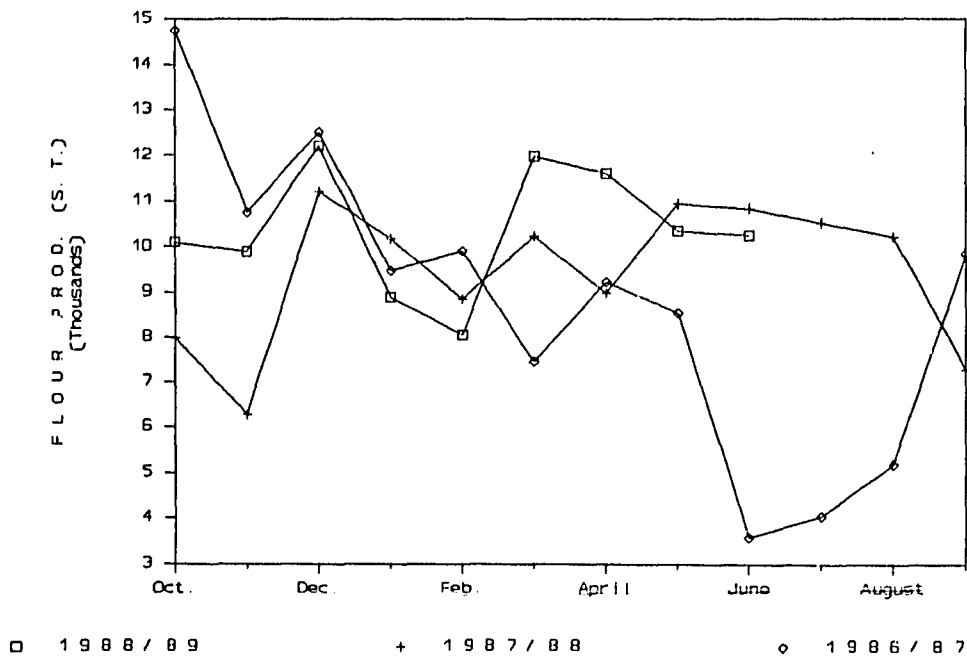


FIGURE 2. Net Flour Production of La Minoterie D'Haiti

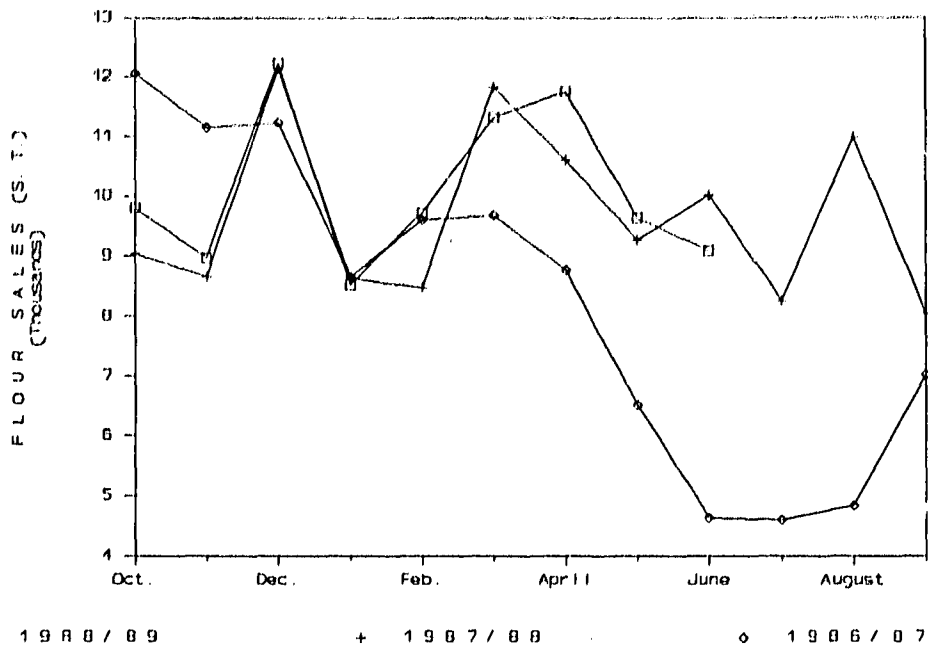


FIGURE 3. Net Flour Sales of La Minoterie D'Haiti

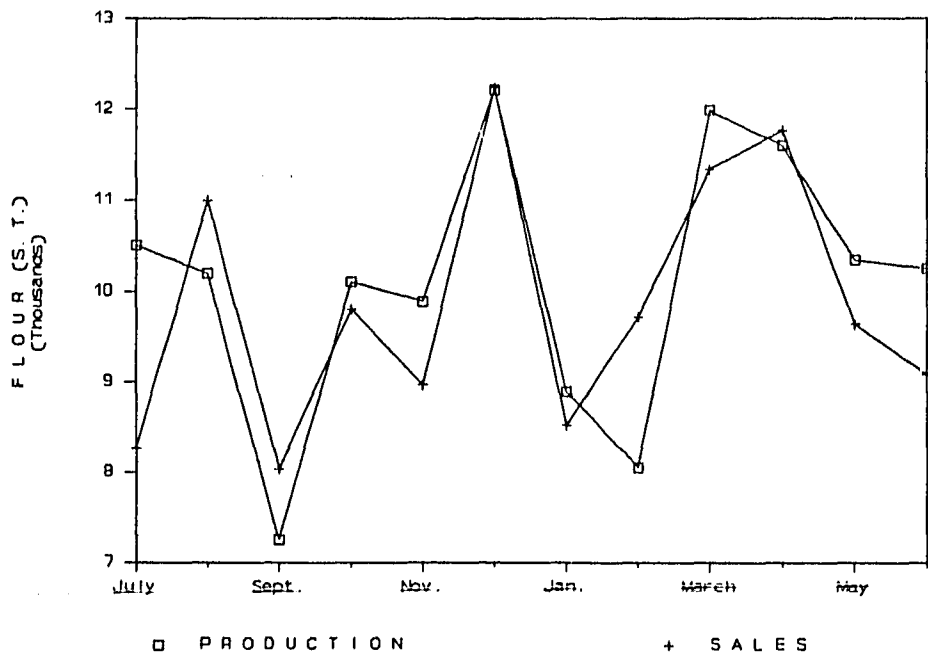


FIGURE 4. Flour Production and Flour Sales for La Minoterie D'Haiti (July 1988 to June 1989)

sales for the current fiscal year indicate an average of 202,311 bags of flour per month during the first 9 months of this fiscal year. If this average for monthly sales is kept constant for the rest of the 1988/89 fiscal year, the total sales could reach 2,427,727 bags for the whole period; 108,673 bags more than for the 1987/88 period.

TABLE 2

FLOUR AND MILLFEEDS SOLD IN THE LAST 3 YEARS  
(bags of 100 lb)

Fiscal Year 1/	Total Flour	Millfeeds
1988/89 2/	1,820,795	775,450
1987/88	2,319,054	969,458
1986/87	1,974,968	793,679

1/ Fiscal year: October 1 to September 30.

2/ Considers sales from October 1988 to June 1989.

Source: Financial Division, La Minoterie D'Haiti.

The rate of flour production for the mill is presented in Figure 5, (from Table 4, Appendix I) for the months of the last 2 periods. Flour production rate is a mill productivity index. It is defined as the amount of flour (in short tons) produced per hour worked by the mill. The 1987/88 production rates are substantially lower than the ones for the 1988/89 period. The 1987/88 period average production rate was 16.8 st/hr, while in the last 9 months of the 1988/89 period the average production rate has been 20.3 st/hr, a 21 percent increase over the 1987/88 average. Figure 5 shows how the mill's rate of production sharply increased from September 1988 to December 1988, from 16.27 st/hr to 21.15 st/hr respectively. Since December 1988, the rate of production has averaged 21.78 st/hr; with the lowest rate of 20.37 st/hr occurring in February 1989, and the highest rate of 21.03 st/hr occurring in June 1989.



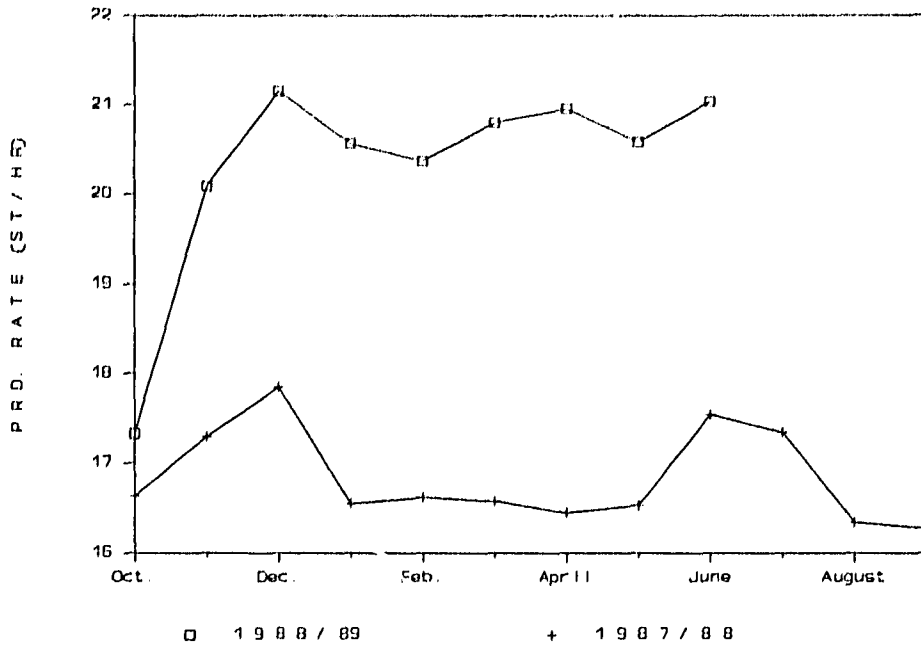


FIGURE 5. Flour Production Rate of La Minoterie D'Haiti

## SECTION III

### PRODUCTION COSTS AND FLOUR EXTRACTION RATE

#### Production Costs

Any kind of manufacturing industry has its particular method for estimating and reporting the costs of converting raw materials into a finished product. This method could depend on the type of industry, its management needs, government regulations, and many other factors intrinsic to the operation and its environment. However, it is a common practice in agroindustrial processes for main finished products of the process to be the ones that carry on the manufacturing costs. Also, a credit is applied to the cost of the finished product for the sale of the resulting by-products of the process.

The definition of the sale price of a finished product has to take the market into consideration and it is not based only on the sum of the raw material cost, manufacturing cost, other enterprise costs (depreciation, interest, insurance, taxes, etc.), and estimated profit. The sum of raw material costs, manufacturing cost, other enterprise costs, and estimated profit will define the bottom line from which the enterprise is going to be measured as profitable or not. In the case of the salable by-products, the sale price is defined more from marketing reasons than from manufacturing costs.

The main objective of any wheat flour milling operation is the production of flour. Because flour is the main product, it carries all the processing or manufacturing costs during the conversion of wheat into flour. The millfeeds are by-products of the milling operation. For this reason the only costs that are charged to them are the manufacturing costs that take place after all the "millfeed components" are separated from the flour streams and sent to packaging.

The method La Minoterie D'Haiti has used in reporting manufacturing costs in its monthly statements consists of allocating a percentage of the total manufacturing cost to the flour and the remainder to the millfeeds. However, the KSU team was informed that the financial division intends to change this system to a system like the one described above. Under the above system the main finished product, in this case the flour, will carry all the cost, and the by-products, in this case the millfeeds, will be credited to the final flour pricing formula. The 1988-1989 budget of La Minoterie D'Haiti is structured in this way.

The current cost accounting system of La Minoterie D'Haiti identifies the independent components that affect the milling process as direct costs and general costs of manufacturing. The direct costs include all the raw material costs (wheat, additives, bags, thread, and manufacturing labor). The general costs of manufacturing include all the costs that are not identified as direct costs, administrative costs, and financial costs. The mill's accounting system has been allocating about 20 percent of the direct costs to the millfeeds and 80 percent to flour. Four percent of the general costs of manufacturing, administration, sales, and financing have been allocated to the millfeeds and 96 percent to flour. A sample of one monthly production cost report of La Minoterie is shown in Appendix II.

The current cost accounting system gives plenty of information about the different budget items that have been used in the milling operation. This system seems to work well from an accounting point of view; however, it lacks identification of the costs by mill sector or process component. The current system does not give management the required flexibility that an enterprise of this size demands. Management should have, in addition, a report that allocates costs by mill sector or by major components of the process.

In order to summarize production costs of this operation, the monthly production costs reported by the mill for the last 11 months (July 1988, to May 1989) were arranged and grouped under different categories. The last month studied was May 1989; the last month with cost information available at the time of the team's visit. A sample of the arranged production costs and further calculations are shown in Appendix II. The veracity and preciseness of the mill's monthly reports were not questioned at any time. It was not the purpose of the KSU team to carry out an audit of the mill.

Costs were studied in the following manner: all the manufacturing costs were charged to flour produced and millfeeds were credited to the final flour cost, with the exception of millfeeds bags and some specific items that affected the millfeeds (the cost items that received 4 percent of the total item cost were: millfeeds packing and handling labor, energy, parts and accessories depreciation, administration, financial); and the costs were grouped under two categories: production costs and raw material costs. Production costs include the following items: plant labor, power consumption, maintenance, depreciation, equipment renewal expenses, interests, insurance and taxes, administrative and sales expenses, and other plant expenses. Raw material costs include the CIF mill wheat cost, bags, additives, and thread. The millfeeds credit was calculated as a fraction of total millfeeds produced per bag of flour in the month under study.

Table 3 presents the summary of raw materials and production costs for the 11 months under study. These results are plotted in Figures 6, 7, and 8.

Figure 6 shows the variation on the production and raw material costs for the 11 months. The raw materials costs reported for the months of July and December 1988 are too low to be a consequence of low market prices for wheat. Nonetheless, with the exception of these months (July and December 1988), the raw material costs had an increasing trend since January 1989. The wheat cost represent 93 percent of raw materials costs as an average for these 11 months. Table 3 shows how the wheat cost has been increasing during all the months of 1989, from 12.28 \$/bag in January to 17.35 \$/bag in May. The second component of the raw material costs is the cost of the bags, which have an average cost of 0.81 \$/bag for the 11 months studied.

The total production costs plotted in Figure 6 show how the peaks take place in September 1988, in February and May 1989, with 7.88 \$/bag, 6.97 \$/bag, and 6.90 \$/bag respectively. Figure 7 shows the main components of production costs: plant labor, administrative and sales expenses, power costs, and maintenance costs. These four items made up 87.75 percent of the total production costs from

TABLE 3

SUMMARY OF THE PRODUCTION AND RAW MATERIAL COSTS OF FLOUR BY SYSTEM COMPONENTS (July 88, May 89)  
(\$/bag of flour)

Item	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
PRODUCTION COSTS:											
Plant Labor	1.972	1.588	1.834	2.029	2.240	1.916	2.250	2.815	1.839	2.584	3.352
Power consumption	0.958	0.944	1.545	0.172	0.589	0.664	0.655	0.651	0.748	0.648	0.823
Maintenance	0.209	0.273	0.634	0.236	0.242	0.227	0.332	0.229	0.318	0.348	0.343
Equipment renewal expense	0.991	1.021	1.436	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	0.418	0.435	0.617	0.445	0.459	0.376	0.520	0.579	0.392	0.469	0.021
Interest	0.105	0.028	0.007	0.011	0.015	0.165	0.292	0.268	0.217	0.041	0.254
Insurance	0.069	0.071	0.100	0.072	0.073	0.059	0.081	0.090	0.059	0.070	0.066
Administrative and Sales Exp.	1.695	1.168	1.615	1.262	1.219	1.272	1.614	2.295	1.495	1.288	1.976
Other plant expenses	(0.007)	0.039	0.094	0.794	0.021	0.018	0.041	0.047	0.020	0.074	0.064
Sub-total	6.410	5.567	7.881	5.026	4.859	4.698	5.784	6.973	5.089	5.523	6.900
RAW MATERIAL COSTS:											
Wheat cost CIF mill	3.757	14.155	12.079	14.795	14.776	8.793	12.284	12.795	13.321	14.775	17.353
Additives and packing thread	0.097	0.101	0.109	0.093	0.154	0.106	0.236	0.093	0.088	0.111	0.144
Bags	0.915	0.630	1.220	0.680	0.679	0.740	0.983	0.770	0.620	0.900	0.890
Sub-total	4.768	14.886	13.409	15.567	15.610	9.639	13.503	13.658	14.030	15.786	18.387
TOTAL COST FOB MILL	11.179	20.453	21.290	20.593	20.468	14.337	19.287	20.631	19.119	21.309	25.287

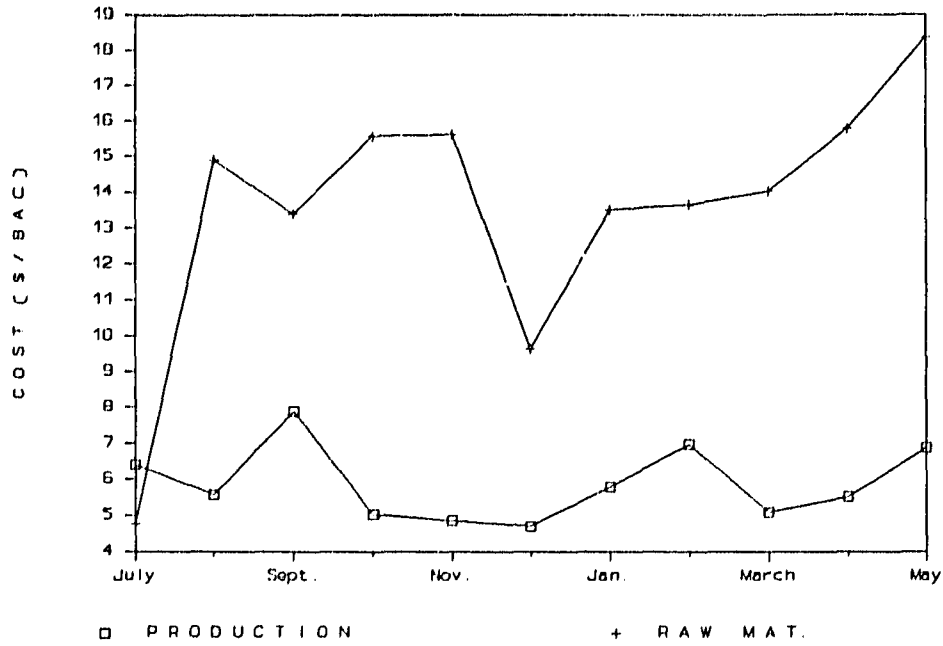


FIGURE 6. Production and Raw Materials Costs for La Minoterie D'Haiti (July 1988 to May 1989)

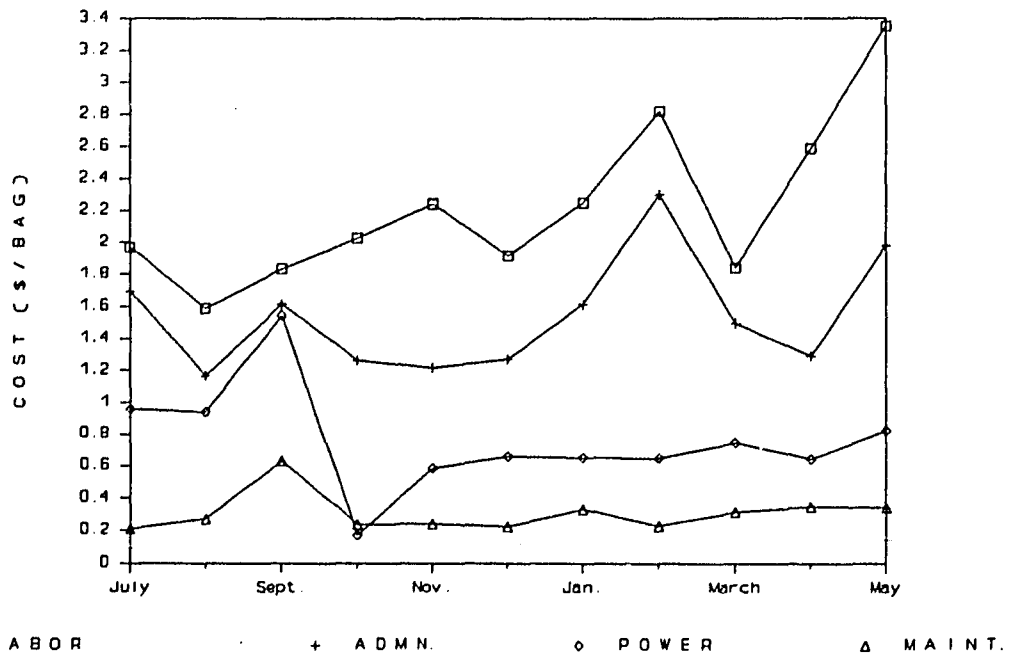


FIGURE 7. Major Components of La Minoterie's Production Costs (July 1988 to May 1989)

December 1988 to May 1989. The other 12.25 percent of the production costs consist of the following items: mill depreciation, interest, insurance, other plant expenses, and equipment renewal expenses.

Plant labor. This item includes all temporary and permanent employees working at the mill (direct and indirect labor) and the social charges. Plant labor made up for 42.2 percent of total production costs during the last 6 months studied and it has been increasing from 1.97 \$/bag in July 1988, up to 2.82 \$/bag in February 1989. In March 1989, it went to a low of 1.84 \$/bag, but in April increased to 2.58 \$/bag and in May reached the highest peak of 3.35 \$/bag during the first part of 1989. Plant labor costs at La Minoterie tend to fluctuate with the production of the mill, behaving more as fixed costs than as variable costs. Plant labor in a milling operation is a variable cost and should be one affected only by inflationary factors, without so many ups and downs. Perhaps, these ups and downs are the result of keeping a constant labor force working in the mill.

Administrative and sales expenses. This item includes all administrative and sales expenses reported by La Minoterie's production costs. The major items of the administrative and sales expenses are: administrative salaries, life insurance, products for the cafeteria, depreciation, security and professional services. Administrative and sales expenses made up 28.43 percent of the production costs of the last 6 months studied. The lowest cost for this item was 1.17 \$/bag in August 1989, and the largest was 2.30 \$/bag in February 1988. Administrative costs have followed the plant labor costs trend during the 11 months studied. The ups and downs in plant labor and administrative costs present the pattern of fixed costs because they fluctuate with mill production. Administrative and sales expenses are typical fixed costs that have a constant total figure independent of the mill production; therefore, an attempt should be made to keep them low.

Power consumption. The production cost report of La Minoterie does not identify the power consumption as a single item, but identifies a figure for fuel and lubricants, and generators maintenance. The power used by La Minoterie is generated at its power plant by using diesel fuel generators; therefore, the power consumption item herein identified includes the fuel and lubricants item and generators maintenance (in the mill's report, lubricants are not identified separately). The income that resulted from energy sales of the mill to nearby facilities was applied as a credit to this item. The power consumption item made up 11.98 percent of the production costs of the mill during the last 6 months. The highest cost for this item was 1.55 \$/bag in September 1988, when the generators received extensive maintenance. After November 1988, the power consumption has not shown large fluctuations. Prior to September 1988, the average power consumption rate was 0.95 \$/bag; after November 1988, the average power consumption for those 7 months was 0.68 \$/bag, resulting in a reduction of 28 percent in the power consumption item. The power consumption for May 1989, increased to 0.82 \$/bag.

Maintenance. This item includes all those items identified in La Minoterie's production cost report as: maintenance and repair, tools, materials, parts and accessories, and maintenance products. The maintenance item made up for 5.14 percent of the production costs during the last 6 months studied. The largest

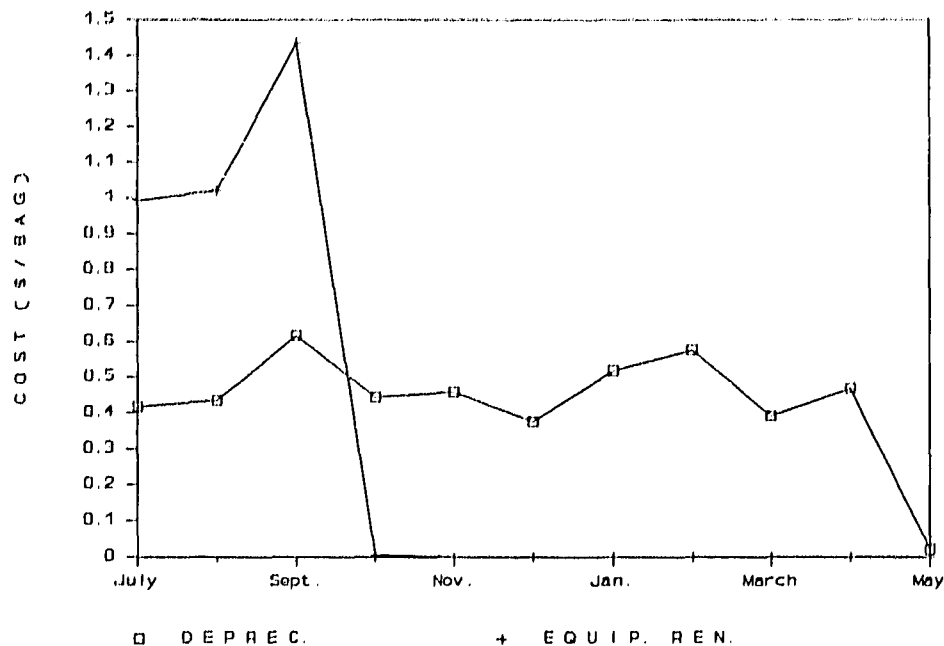


FIGURE 8. Depreciation and Equipment Renewal Expenses Allocated by La Minoterie (July 1988 to May 1989)

maintenance expenses took place in September 1988, for a cost of 0.634 \$/bag. After September 1988, the production rate of the mill increased considerably from 16.27 st/hr in September to 20.08 st/hr in November 1988 (see Figure 5). From October 1988 to February 1989, the maintenance costs averaged 0.25 \$/bag. The last 3 months studied, from March to May of this year, the maintenance costs have been increasing from 0.32 to 0.34 \$/bag. This maintenance cost increase could be the result of the mill management policy, indicated to the KSU team, to improve the mill equipment.

Depreciation. This item includes the figures reported by La Minoterie in its production costs as mill depreciation and mill rent, and it is a figure defined by the mill's accounting department. During the last 6 months the depreciation represented 6.74 percent of the production costs. Figure 8 shows the variation in the allocation of the depreciation costs for the 11 months studied. From July 1988 to April 1989, the depreciation allocation averaged 0.47 \$/bag; however, in May 1989, the depreciation allocated was 0.021 \$/bag.

Interest. This item includes the financial costs reported in La Minoterie's production costs report, which include interests and banking costs. During the last 6 months this item have represented 3.54 percent of the production costs, for an average of 0.206 \$/bag.

Insurance. This item includes the insurance costs reported in La Minoterie's production costs report. During the last 6 months this item has represented 1.22 percent of the production costs. The average amount for the 11 months was

0.072 \$/bag. Due to reduction in production of the mill in September 1988, and January and February 1989, the mill paid insurance of 0.10 \$/bag.

Other plant expenses. This item includes the following costs reported in La Minoterie's production costs report: fumigation, laboratory products, and other production costs. During the last 6 months this item represented 0.75 percent of the production costs. The average amount for the 11 months was 0.037 \$/bag.

Equipment renewal expense. This item includes the equipment renewal expenses reported in La Minoterie's production costs report. During the last 7 months this item represented 0.0 percent of the production costs. Figure 8 presents the variation in this item which had allocations from the months of July to October 1988. The highest allocation corresponds to September 1988, for 1.44 \$/bag. The last allocation was in October 1988, for 0.005 \$/bag.

TABLE 4  
AVERAGE PRODUCTION COSTS FOR LA MINOTERIE D'HAITI

Item	1988-1989 Averages		1987 Agland Study
	July - May	Dec.-May	
Plant labor	2.207	2.459	1.97
Power consumption	0.812	0.698	0.83
Maintenance	0.299	0.299	
Equipment renewal expense	0.285	0.000	0.96
Depreciation	0.419	0.393	
Interest	0.129	0.206	0.10
Insurance	0.072	0.071	
Administrative and sales exp.	1.515	1.657	1.20
Other plant expenses	0.037	0.044	0.69
Total	5.775	5.828	5.75

Table 4 presents: (a) the average production costs for La Minoterie for the 11 months studied (July 1988 to May 1989), (b) for the last 6 months (December 1988 to May 1989), and (c) the costs reported in the Agland Consultants study for 1987. The December-May average is higher than the 11 month average. The Agland Consultants study does not refer to the specific allocation of costs; however, for comparative purposes it could be noticed that, between the 1987 study and the average of the last 6 months considered in this study, the following items have suffered major cost increases: 24.8 percent in plant labor, 38.0 percent in administrative and sales expenses, and 106.1 percent in interests. The following items have been reduced since 1987 compared with the last 6 months: 15.9 percent in power consumption, 100 percent in equipment renewal expense, 93.6



in other plant expenses. The maintenance, depreciation and insurance costs were not indicated in the Agland Consultants study. The average total production costs for the last 6 months indicates an increase of only 1.35 percent over the 1987 Agland Consultants costs. However, in order to make a fair comparison with the 1987 figure, the itemized information of the Agland Consultants study, not available at the moment of writing this report, should be considered.

It was indicated in the first paragraphs of this section the definition of the flour sale price for a mill must take into consideration a market study. It is very important to have this matter clear, because, even in a place in which the mill has the monopoly, there are many other variables that can affect the demand for its products in this "captive market". An increment in the flour price or in the millfeeds price, to cover the high production costs of La Minoterie and to obtain transfers from the mill to the GOH treasury, could increase the demand of alternative products such as rice or alternatives product sources such as contraband. Such alternatives should be studied and considered before increasing the products prices.

It was not the purpose of this study to do a market analysis for flour and millfeeds products in Haiti. For this reason, the team has limited its considerations to indicate the flour production costs of La Minoterie, based on information given by the mill. However, to estimate the flour sale price, the desired kind of profit margin should be added to the total cost FOB mill.

The KSU team was informed by the administration director of La Minoterie about a market study in process ordered by the mill management and carried out by the Haitian firm SOGEFINE (Societe de Gestion Financiere). Among the main objectives of this study are: to obtain a description of the Haitian flour market, to identify the best flour distribution channels, to determine the impact of the flour contraband in the market, and to analyze primary and secondary centers of consumption. This study is supposed to be finished by the end of August 1989.

For the purpose of summarizing the production costs analysis, it is more convenient to consider the average production costs of the last 3 months studied. Table 5 presents the average production costs for flour and millfeeds for March to May 1989. These average costs result from averaging all the items presented in La Minoterie's production costs report for these 3 months. The itemized averages are presented on Table 3 in Appendix II. Table 5 also presents an estimation of the total benefit for the mill per bag of flour sold, assuming that all costs are considered and indicated in the production costs reports of La Minoterie.

The consideration of a toll charge for milling wheat not owned by the mill under, current conditions, must be calculated over the present total production costs. Commonly, the toll charges are calculated by adding: production costs, additives, bags, and a profit or benefit applied as a percentage of the total production costs. For example, a toll charge that considers 10 percent over current production costs in dollars per bag of 100 lb of flour processed will be:

$$\begin{aligned} &5.802 \text{ (production costs)} + 0.113 \text{ (additives and thread)} \\ &+ 0.793 \text{ (bags)} + 0.580 \text{ (benefit, 10\% prod. costs)} = \$7.288/\text{bag} \end{aligned}$$

The resulting toll charge figure of 7.29 \$/bag of flour processed considers millfeeds as property of the mill that carries on the processing.

TABLE 5  
AVERAGE PRODUCTION AND RAW COSTS BY MAJOR PROCESSING COMPONENTS  
(March to May 1989)

Item	Average cost (\$/bag)	
	Flour	Millfeeds
PRODUCTION COSTS:		
Plant labor	2.554	0.277
Power consumption	0.741	0.070
Maintenance	0.335	0.000
Equipment renewal expense	0.000	0.000
Depreciation	0.298	0.034
Interest	0.174	0.020
Insurance	0.065	0.002
Administrative and sales expenses	1.584	0.180
Other plant expenses	0.051	0.000
Sub-total	5.802	0.584
RAW MATERIAL COSTS:		
Wheat cost CIF mill	15.060	0.000
Additives and packing thread	0.113	0.020
Bags	0.793	0.799
Sub-total	15.966	0.819
TOTAL COST FOB MILL	21.768	1.402
FOB mill sale price 1/	19.190	4.000
Sale price - Total cost	-2.578	2.598
Millfeed credit per bag of flour	0.950	
Total benefit per bag of flour	-1.628	

1/ This price has the tax already deducted.

The situation presented in Table 5 indicates how increasing production costs of La Minoterie along with increasing CIF wheat prices are affecting the bottom line of the mill, in this case referred to as benefits. Among the raw materials costs, wheat price is a factor almost impossible to control by the mill, however,

good buying techniques, improvement in ship unloading facilities and rates, good procedures for presenting grievances for grain quality and weight discrepancies, and good quality control of the product purchased and received will help in keeping the lowest possible wheat landed cost.

The price of the bags and production costs and are under the control of mill management. The price of the bags, \$0.79/bag in the last 3 months, is considerably higher than the price of bags in any part of the U.S. It is understandable that the mill buys Haitian made bags, but the high price of the Haitian bags is being transferred to flour and millfeed consumers. For example, a reduction of \$0.15 per bag in its purchase cost will improve benefits by the same amount. In this regard, the mill should look for alternative sources by implementing a competitive pricing policy and/or let the two bag manufacturers of Haiti understand the mill's situation, so they can be part of the solution.

The plant labor, administrative costs, and energy costs are the main production cost components that should be addressed in order to make this operation profitable and capable to make transfers to the GOH treasury. In this regard, the mill management must establish an emergency plan to obtain substantial cost cuts. The team was informed of the mill's management plan to reduce temporary employees from 390 to 250 by October 1989, and to eliminate the permanent positions that are left vacant. This cut in temporary employees could produce an approximate reduction in production costs of \$0.12 per bag of flour produced<sup>1</sup>. Additional cuts in permanent employees could have a greater impact on the production costs reduction; their higher salaries and fringe benefits are larger than for temporary employees. A plan to optimize mill labor in La Minoterie needs to be designed and implemented.

The mill management should design a plan to cut increasing administrative costs, such as a system of austerity measures that limit expenses, reduce management salaries and fringe benefits, and keep only indispensable services. For example, using as a model average production costs for March through May 1989, a reduction of 24 percent in administrative costs (excluding sales costs) could reduce production costs to about 0.355 \$/bag and increase final benefits to about 0.370 \$/bag.

The mill produces its energy needs with diesel fuel generators, therefore, it is limited in options for actions to reduce energy consumption costs. The energy consumption costs can be reduced only by making the present system energy efficient. Power consumption costs are part of the current management concern and hook up to the electric national system is being planned by the mill's management. Other specific recommendations for energy savings are given in the next section of this report.

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<sup>1</sup> According to La Minoterie's financial director the temporary payroll is about \$65,000 per month. Estimating 195,000 bags of flour produced per month for 390 temporary employees, it gives \$0.00085 per bag of flour per employee. Therefore, for 140 less temporary employees the estimated cost reduction is about \$0.12/bag.

The mill management, along with the mill's technical bureau, should design a strategic plan to improve all operations of the flour mill. This improvement plan must look for an efficient and effective operation at all technical and administrative levels of the mill. The KSU team understands that La Minoterie has a social impact on the Haitian labor force and drastic labor cut measures could produce negative effects; therefore, the transition to that "efficient mill" should be planned carefully but carried out with strength. The mill production costs have an effect on the whole Haitian society, the positiveness or negativeness of this effect will depend on how effectively the mill management and technical staff can bring them under control.

The level of profitability of the mill and the funds transferred to the GOH treasury should be considered in terms of social benefits transferred by the mill to the Haitian society, by producing a cheaper product of good quality or by the return on the investment of the transferred funds. A good quality product at a cheaper cost could have a different impact on the Haitian society, than a more expensive product with more transfers to the GOH treasury. Perhaps, the balance to consider should study alternatives such as cheaper food for more people versus the economic and social return on investments produced with the funds transferred by La Minoterie to the GOH.

#### Flour Extraction Rate

It is necessary to explain and define the terms "YIELD" and "EXTRACTION RATE" as used in flour milling in order to eliminate any confusion in understanding these two terms. The term YIELD as used in flour milling has reference to the amount of wheat required to produce a unit of flour (100 lbs). There are three methods of calculating yield:

1. Elevator wheat yield
2. Tempered wheat yield
3. Products yield

Elevator yield or dirty wheat yield is the amount of uncleaned wheat required to make a unit of flour. This yield is calculated on the basis of untempered wheat before any screenings have been removed.

Tempered wheat yield has reference to the amount of clean, tempered wheat required to make a unit of flour. Tempered wheat yield can also be expressed in percent extraction or as extraction rate.

Products yield is the yield calculated on the basis of the weight of flour products obtained against the total weight of all products included in feed and flour. Feed products include bran, shorts, germ, and red dog. Flour products include all grades of flour and semolina. Usually products yield will be higher than the tempered wheat yield or the extraction rate. This is because the weight of total products is less than the weight of tempered wheat due to moisture loss, stock spillage, etc.

These concepts can be better understood when an example is studied. For this purpose, the production report of La Minoterie D'Haiti (Rapport De Production Des Moulins) for the month of June 1989, is included in Appendix III.

For La Minoterie D'Haiti, it is not possible to calculate dirty wheat yield or elevator wheat yield because they cannot obtain the weight of untempered wheat before any screenings are removed due to the fact that the dirty wheat scale in the cleaning house is not operational. It is also necessary to point out that in the production report the values of "Farine Supérieure" (superior flour) and "Blé Moule" (clean tempered wheat to mill) are the only entries supported by accurate scale readings. The values reported for "Tout Usage" (all purpose flour), "Semoule Ordinaire" (ordinary semolina), "Semoule Spéciale" (special semolina), "Semoule #2" (#2 semolina), and "Son en Sacs" (millfeeds in bags) are reported based on the numbers of bags packed. The item "Criblages" (screenings) is an estimated value based on pure guess work and does not have any basis. The millfeeds weight reported as "Son en Sacs" is the combined weight of actual millfeeds product from the mill and the estimated screenings weight. Also, it is not possible to get an accurate weight of millfeeds by itself; because, the millfeeds scale in the mill is not operational and the millfeeds bags are not weighed one by one as they do with the flour bags.

With this explanation, it is clear that it is not possible to calculate accurately the "products yield" either. The total product weight can only be obtained by deducting the "criblage" (screenings) weight from "son en sacs" (millfeeds) weight which makes it guess work also.

Finally, it is clear, under the circumstances, that the only yield that can be calculated with any kind of accuracy is the "tempered wheat yield" which can also be expressed as "extraction rate". It is because both, the flour weight and "tempered wheat to mill" weight, are supported by accurate scale readings. With this background, for the purpose of this report, the scope is limited to the extraction rates based on "clean tempered wheat" to mill weights.

The average daily extraction rates from three shifts are presented on Table 6 for the months of January, February, March, and June 1989 (months chosen at random), also, the average extraction rate for April 1989, is included. From Table 6 it is obvious that the average extraction rates based on clean tempered wheat are 75 percent or above. The impression that La Minoterie D'Haiti's extraction rates are in the 71 percent range seem to be a misunderstanding because even the evaluation done by the Agland Consultants in 1987 points out a 74 percent extraction rate.

It was indicated by the chief miller that the management, during the last 6 to 7 months, has encouraged and made available a number of spare parts requested by the French milling assistance team and the chief miller. The mill's technical bureau organized a maintenance program, though rudimentary, to fix a number of roller mills, sifters, and purifiers. This has directly resulted in an increase in daily production as well as extraction rates of flour. The average extraction rate reported for the five months is 75.02 percent. This present level of extraction rate is comparable to the extraction rate in the United States.

TABLE 6

## FLOUR EXTRACTION RATES OF LA MINOTERIE D'HAITI

	Daily Averages (1989) (%)				
	January	February	March	April	June
72.21	75.74	76.35		71.67	
75.08	74.40	75.00		72.26	
75.50	75.05	75.90		73.51	
76.24	75.29	75.25		72.20	
73.00	76.02	77.41		73.85	
75.50	75.82	74.28		74.66	
76.20	76.64	75.65		75.85	
76.00	77.32	75.16		77.74	
75.80	74.70	75.60		74.09	
72.28	74.25	74.53		75.81	
72.70	75.31	75.69		73.84	
73.77	75.01	76.22		74.53	
75.20	76.90	75.97		73.82	
74.20	74.61	76.53		74.92	
74.34	75.95	75.31		74.41	
75.74	75.43	76.21		75.25	
76.13	76.49	76.59		75.87	
75.19	76.24	75.29		74.87	
73.84	75.65	76.66		74.36	
75.43	77.14	75.85		75.76	
		73.80		77.52	
		75.69		77.09	
		76.18		76.80	
		75.23			
		74.33			
		76.12			
		75.61			
		77.42			
Number of Days	20	20	28	23	
Monthly Average	74.67	75.70	75.74	74.38	74.65
Average Extraction Rate					75.02

Source: Head miller's daily production report, La Minoterie D' Haiti.

## SECTION IV

### MILLING OPERATIONS

An efficient milling operation can be defined as an operation where maximum profits are achieved with minimum input through innovative technical and managerial practices at the lowest possible cost. The efficiency is always relative to intrinsic factors that surround the operation. Among those factors are: geographic location of the mill with reference to the source of raw materials, possibilities to select wheat sources and qualities, sources of energy available, availability of a qualified labor force, wheat transportation means, technical resources available in the area, market alternatives to protect the enterprise from price fluctuations of the grain markets (future markets), type of market for the manufactured products, etc.

The above factors will restrict any comparison to be made among flour mills. The conditions that make one mill efficient in one part of one country may not be available in another part of that country. What is efficient in one country may not be in another country. Each mill management will try to be as efficient as possible under conditions unique to its operation. When an attempt is made to visualize an efficient operation at La Minoterie D'Haiti, it will only be an efficient operation relative to its own unique conditions. Any attempt to compare it to conditions in the United States or any other situation is not practical.

Taking these conditions into consideration the KSU team did an evaluation of the different parts of La Minoterie to identify those factors that could be upgraded or improved to make the mill more efficient. The following parts of this section present those sectors of the mill in which the team identified as possibilities for improvement. A complete and detailed analysis of a flour mill the size of La Minoterie requires more than 4 working days in the mill; therefore, by no means is this an exhaustive analysis of the mill, but is limited to the main elements that call for immediate attention.

#### Power Generation and Distribution

According to the power generation information supplied for the months of January, February, March, and April 1989, Minoterie used an average of 4.959 kwh per 100 lb bag of flour produced. The industry standard for this size mill is 5.0 kw/cwt. According to the electrical engineer of La Minoterie, the power factor at present is 0.68. This is obviously true because of the number of small motors used and the absence of capacitors in the circuits. On the average, for the above months, 0.45 gallons of fuel oil was consumed for every bag of flour produced. At a price of \$1.45 per gallon of fuel oil, the cost of fuel oil consumed per bag of flour produced was \$0.65. This is more than double the cost of power/cwt of flour in the U.S.

Any reduction in power costs at La Minoterie will have to come through reduction in fuel oil consumption. The quantity of fuel oil consumed by the generators is directly proportional to the KVA, i.e. "the apparent power" but not KW which

TABLE 7

ESTIMATED SAVINGS IN COST OF POWER BY IMPROVING THE  
POWER FACTOR (Example applied to April 1989)

Actual Power Factor	0.68
Target Power Factor	0.90
Actual Power Consumed (KW)	1,080,793
Apparent Power in KVA at 0.68 p.f.	1,589,407
Apparent Power in KVA at 0.90 p.f.	1,200,881
Reactive Component in KVAR at 0.68 p.f.	1,256,562
Reactive Component in KVAR at 0.90 p.f.	523,452
Fuel Oil Consumed in Gallons	97,725
Price of Fuel Oil per Gallon in Dollars	1.45
Value of Fuel Oil Used in April 1989 (dol.)	141,701
Cost per KW (fuel oil only) (cents)	13.11
Projected Fuel Oil Consumption at 0.90 p.f (gal.)	73,836
Value of Fuel Oil that will be Consumed at 0.90 p.f. (dol.)	107,063
Cost per KW if p.f. is 0.90 (cents)	9.9
Flour Produced in April 1989 (cwt)	229,500
Actual Cost of Power (fuel oil only) per cwt of Flour (cents)	61.74
Projected Cost of Power (fuel oil only) per cwt of Flour at 0.90 p.f. (cents)	46.65
Projected Savings in Cost of Power (fuel oil only) per cwt of Flour (cents)	15.09
Projected Savings in Cost of Power/Month (dol.)	\$34,425
Projected Annual Savings in Cost of Power (dol.)	\$413,100



is the actual power consumed. This can only be brought down by correcting the power factor and bringing it up to 0.9 or thereabouts by introducing capacitor banks and other necessary switch gears into the circuitry.

If the power factor is corrected to 0.9, the reduction in fuel oil consumption and the resultant savings in fuel costs was estimated using the month of April, 1989, as a reference. Table 7 (based on data in Appendix IV) shows that \$413,000 could be saved annually in fuel oil costs alone, about \$0.15 per bag of flour if the power factor correction project is implemented.

This project of power factor correction is essential for cost control at Minoterie even if management decides to discontinue power generation at Minoterie and hookup to the Electricite D'Haiti (EDH). EDH will probably impose rate penalties on La Minoterie if the mill continues to run at the present low power factor.

### Pneumatic Conveying

The general condition of the flour mill's pneumatic system seems to be in better condition than was reported in the 1987 report by Agland Consultants. The filters are running well and pressure differentials are being monitored. But the physical condition of the lifts and their maintenance is very poor. At almost every joint, with a compression coupling, the lifts are left crooked. Rubber gaskets, if in position, are brittle or cracked. Cyclones are all beaten up. Inspection glasses are broken and patched with loose gaskets and clamps. All these things lead to two problems: (1) Loss of air volume, and (2) dynamic pressure losses because of turbulence caused by crookedness in the pipes. Obviously, this is showing up in the daily chokeups in the lifts especially under elevated production rates of 10,000 to 10,500 cwt/24 hours.

It is very important that the mill's pneumatic system be repaired and maintained in good condition thereafter. The lifts need to be straightened out at every joint and all leaks stopped by replacing gaskets, sight glasses, and compression couplings. Then the whole pneumatic system needs to be balanced to make it work efficiently. If the chokeups in the lifts are eliminated, the savings in labor alone will be enormous.

The KSU team estimates that by a complete revamping of the pneumatic system the mill load can be increased, and with the mill load the production rate. For example, assuming an increase in the mill load of 5 percent and using the average production costs for March-May/89 as a model, this increase could represent a reduction in the production costs of \$0.259 per bag for an additional estimated benefit of \$0.27 per bag of flour produced.

### Unloading Facilities

The limitation on the size of wheat shipments that can be received at present cause an increase in freight charges of the total wheat quantity received. If the channel depth is increased from 25 foot to 31 foot, Minoterie will be able to receive 20,000 mt shipments instead of 15,000 mt and thereby save on the freight. The mill management indicated to the KSU team that they have this improvement on their agenda.

It is also necessary to reactivate the temporary cap storage facility in order to be ready to receive more wheat at any given time. The unloading wharf scale has to be brought into operation immediately to make the whole operation accountable. Right now, there is no cross check on the amount of wheat received in ship, wheat unloaded, and on screening contents of the wheat.

The precleaning equipment that is available should be installed and used. This will enhance the cleaning efficiency of the cleaning house, improve flow characteristics of wheat from the holding bins, and wheat can be stored longer.

### Cleaning House

The piping connections to the cleaning house equipment and the aspiration duct connections are loose and need maintenance. It is evident that when the machinery in the cleaning house was upgraded to a capacity of 800 mt/24 hours, the transition to the new machines from old machines was not properly done.

Much of the old equipment has been left in the mill with some open piping and aspiration ducting still connected to the running system. This confusion has resulted in lots of dust blowing out of the open pipe ends and chutes. At least one of the two cleaning house filters is not working.

Bin top inlets with incoming chutes are not properly sealed. Inspection doors in the chutes are being left open. Inspection doors on elevator legs and heads are being left open. This has resulted in dust blowing out of the equipment when wheat is transferred from system to system.

In general, sanitation in the cleaning house is very poor and below standard. A crash program needs to be developed and implemented to eliminate all dust leaks and maintain the cleaning house under safe and sanitary conditions so an unwanted dust explosion can be prevented.

### Flour Mill

Grinding. The mill flow has been changed from a five-break system to a four-break system. The roller floor rehabilitation is complete. But under the acutely short flow being used, the new Sangati and Ocrim rolls are being loaded to the maximum and the Allis Chalmers rolls which are grouped to run the tail-end streams are getting very little load. The Allis Chalmers roll stands are in disrepair also. The new mill flow is very sensitive to any load fluctuations and in combination with the poorly maintained pneumatic system has resulted in mill chokeups. If improvements are carried out on the Allis Chalmers rolls and the roll surface is utilized properly in conjunction with the revamped pneumatic system, there is a big potential for increasing the production rates beyond the 11,000 cwt of flour/24 hours and perhaps at better extraction rates and quality. For example, using the average production costs of March-May/89 as a model, an increase of 0.5 percent in the flour produced (an increment in the extraction rate) could represent a reduction of \$0.031 in the production costs and an increase in the estimated benefits of \$0.10 per bag of flour produced.

Sifting. The 19 square sifters are in good condition and will last indefinitely if properly maintained. Six of the 12 purifiers are not connected to the mill

flow anymore. Spouting and open-end chutes should be tightened and closed respectively in order to avoid stock spillage. The area around flour bin tops is very dusty. The flour bins should be aspirated to relieve pressure that builds up when flour is blown into the bins. It has been brought to the team's attention that the possibility exists to sell more semolina than is being produced at La Minoterie at present. It would be beneficial if this avenue were explored through a market survey. With a higher semolina extraction, the overall extraction and production rates could also be improved.

Test Runs. The Minoterie mill is well equipped to conduct test runs. In fact, there are records showing that they conducted test runs until 1983. Since that time, the procedure has been discontinued. This process should be reactivated. Test runs will provide: (1) a current check on extraction rates under known and recorded conditions; (2) product sampling relative to wheat mix, flour treatment, and individual flow streams; and (3) a check on flour scale weights versus pack out weights. Test runs should be established for at least once every 3 months or whenever a major change is made in the mill flow.

#### Packing and Storage

Packing of finished products is being done on manual auger packers. There is no counter to keep track of the number of bags packed. Flour bags are check weighed individually and are stacked 15 high in big lots of 300 bags each. It is very difficult to keep track of the inventory on hand. This situation could be corrected with the installation of a mechanical counter on the bag conveyor on which all bags have to pass.

The millfeeds bags are not check weighed. There is no control over the millfeeds that is packed in each bag. A check weigh scale should be installed immediately on the millfeeds line. Millfeeds bags could also be palletted and stacked with the aid of a lift truck.

The flour warehouse needs a detailed operations analysis. This warehouse is La Minoterie's department which has the higher "accumulation" of people working in it. The large number of personnel in the warehouse increases the mill's production costs, delays the flour dispatch, makes the warehouse controls ineffective, increases the flour waste, and creates adequate conditions for accidents to happen. A mechanized system of lift trucks and pallets could expedite the warehouse operations reducing production costs, increasing the flow of flour to the market, and making the flow of trucks in and out of the mill grounds controllable and smoother.

The sanitary conditions in the flour warehouse are poor. The main reason is the way flour bags are handled. There are chutes to discharge the bags from belt conveyors but are not used all the time causing unnecessary spillage and damage to the bags. Flour bags in the stacks are unloaded by pulling the bags in the bottom; again this is a source of bag damage and spillage.

The number of bags per wooden pallet needs to be standardized. Then, by stacking standard pallet loads as high as space permits, with the aid of a lift truck, the storage and inventory could be effectively controlled. Current dispatch controls in the flour warehouse might need a revision from the mill management.

### Laboratory

The laboratory at Minoterie is well equipped and strongly supports the quality control of the products. At present, an Extensograph and Farinograph machine need repair and are not being used. These two machines should be repaired and used. The machines will enhance the physical dough testing capability and will enable lab technicians to monitor the baking quality of dough more closely.

### Scale Control

The wharf scale has been in disrepair for the better part of this decade. The dirty wheat scale in the cleaning house is not working. The mill feed dump scale does not work either. There is no check weigh scale on the mill feed packing line. The only scales that work are the clean tempered wheat to mill scale (600 lb/dump) and the finished flour scale (500 lb/dump) in the mill. The 30 st weigh bridge for the load-out is working but is not useful for bigger loads; therefore, big trucks are not weighed.

The new weigh bridge that is being installed has a capacity of 100 st and is capable of printing the weights and code number of the truck on the ticket. This is being fitted with a video security system as well. When finished, this should be adequate to cross check any size truck.

An immediate program to repair all the scales at the Minoterie should be undertaken and once done all the scales should be maintained in good working order. The wharf scale should be used to cross check weights of the wheat shipments received. The dirty wheat scale in the cleaning house needs to be moved directly under the holding bins so that the scale will physically keep track of all wheat that passes through the cleaning house. The smaller dump scale near the hammer mill should be used to weigh screenings. The check weigh scales in the packing area should be maintained in good working order and calibrated with a standard weight everyday.

Scale control at the Minoterie simply does not exist. This situation constitutes the major and most urgent problem to solve in La Minoterie. Without an operating scale system, all the mill's statistics and accounting system can be questioned at any time. The team was informed by mill management of their intentions to contract the repair of all the mill scales in the next 4 months.

### Sanitation

The fumigation and sanitation supplies are kept under lock and key in a separate building. This is a good practice. But there is no record kept on the sanitation schedules, finished job records, and the fumigation supplies inventory. It is very important that a written sanitation program for rodent control, insect control, and general sanitation of the mill be developed and implemented. All the mill employees should be aware of the importance of the sanitation program.

### Safety

Safety should be given top priority. All unsafe practices in the mill should be identified and corrected as soon as possible. The man lift wells on every floor do not have guard rails. This directly violates man lift safety regulations. The guide rolls for the step frames are worn out. Employees are using the man lift steps to carry choke feed bags to the feed hopper on the third floor. All these current practices make the operation of this man lift potentially unsafe. These conditions should be corrected immediately.

### Maintenance

A written maintenance program should be developed for preventive maintenance as well as breakdown maintenance. The equipment that is available and the manpower available should be utilized to implement the maintenance program aimed at making La Minoterie more efficient and more profitable. The mill engineers and specialized personnel should collectively develop a good preventive maintenance plan that can keep this facility running under more efficient conditions.

## SECTION V

### CONCLUSIONS AND RECOMMENDATIONS

It is the team's conclusion that La Minoterie D'Haiti is a very important milling operation for Haiti and that it has a technical and managerial group committed to it. As a grain processing enterprise, it could be improved by undertaking technical and administrative reforms that will have immediate impact on its operation and high production costs.

The suggested technical reforms are: (1) immediate repair and maintenance to insure good working conditions on all scales of the milling operations, (2) correction of the power factor of the mill to 0.9, (3) a complete revamping of the pneumatic conveying system to achieve an increase in the production rate of at least 5 percent of the present mill load capacity, (4) an increase in the flour production rate of at least 0.5 percent over the already present extraction rate, and (5) implementation of an immediate program to improve the safety and sanitation conditions in the mill.

The suggested administrative reforms are: (1) to implement the mill management plan to reduce the temporary labor force in the mill by 140 employees by October 1, 1989; (2) to reduce the administrative costs by an average of 24 percent of their present costs; and (3) to reduce the cost of bags by implementing a policy of competitive pricing.

Using the average production costs for the March-May/89 period as a model, the team has estimated that the combined impact of the technical and administrative reforms could reduce the production costs by \$0.915 and increase the mill revenues by about \$1.01 per bag of flour produced. Therefore, based on the model for average costs, the production costs per bag of flour could be reduced to \$4.89. In addition, an extra savings of \$0.15 per bag of flour could be obtained in the purchasing of bags. However, the time frame required to implement these reforms (up to 8 months) will determine its impact in La Minoterie production costs. Additionally, the high production costs demand an action plan from management to reduce them in a specific period of time. The figures that resulted from the suggested measures for production costs reduction could help mill management to estimate the impact of further cuts; which could be a part of a strategic plan to make the mill more efficient.

The raw material price, especially the wheat price, has been increasing during the past year. Therefore, in order to bring the mill to a level of reasonable profitability under present conditions, a sale price increase in the mill products should be considered. Prior to the price increase, the mill must make a big effort to reduce the high production costs; also, the impact on the Haitian market of a price increase in the mill products should be considered.

The team estimates that a toll charge for the mill (under present conditions) based on average production costs of the March-May/89, could be \$7.288 per bag of flour produced. Once the suggested technical and administrative reforms are implemented, the toll charge could be reduced to \$6.13 per bag of flour produced.

La Minoterie D'Haiti could benefit from a technical assistance program oriented toward training of its technical and managerial personnel. This program should consider the practical and theoretical aspects of milling science, mill maintenance, mill management operations, and grain marketing activities.

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APPENDIX I  
PRODUCTION AND SALES INFORMATION

TABLE 1

NET PRODUCTION FOR LA MINOTERIE D'HAITI  
(July 1988 to June 1989)

Month	Total Net Production (s.t.)	
	Flour	Millfeeds
July	10,509.75	4,139.45
August	10,199.80	3,950.20
Sept.	7,254.65	2,761.25
Oct.	10,105.69	4,178.40
Nov.	9,891.02	3,710.00
Dec.	12,212.22	4,219.30
Jan.	8,892.09	3,046.18
Feb.	8,048.61	2,621.91
March	11,981.69	4,004.45
April	11,593.46	4,386.30
May	10,338.58	4,044.60
June	10,244.91	3,840.45

Source:

Financial Division, La Minoterie D'Haiti.

TABLE 2

## NET FLOUR PRODUCTION OF LA MINOTERIE D'HAITI

Month	1988/89		1987/88		1986/87	
	(s.t.)	(bags)	(s.t.)	(bags)	(s.t.)	(bags)
Oct.	10,105.69	202,114	7,974.60	159,492	14,752.10	295,042
Nov.	9,891.02	197,820	6,284.30	125,686	10,754.50	215,090
Dec.	12,212.22	244,244	11,210.30	224,206	12,512.00	250,240
Jan.	8,892.09	177,842	10,183.90	203,678	9,473.85	189,477
Feb.	8,048.61	160,972	8,848.50	176,970	9,902.75	198,055
March	11,981.69	239,634	10,226.00	204,520	7,439.65	148,793
April	11,593.46	231,869	8,980.60	179,612	9,214.80	184,296
May	10,338.58	206,772	10,926.40	218,528	8,531.50	170,630
June	10,244.91	204,898	10,823.95	216,479	3,581.90	71,638
July			10,509.75	210,195	4,040.90	80,818
August			10,199.80	203,996	5,185.00	103,700
Sept.			7,254.65	145,093	9,827.35	196,547

Source: Financial Division, La Minoterie D'Haiti.

TABLE 3  
NET FLOUR SOLD BY LA MINOTERIE D'HAITI

Month	1988/89		1987/88		1986/87	
	(s. t.)	(bags)	(s. t.)	(bags)	(s. t.)	(bags)
Oct.	9,805.55	196,111	9,041.60	180,832	12,072.20	241,444
Nov.	8,967.95	179,359	8,657.90	173,158	11,152.50	223,050
Dec.	12,230.70	244,614	12,141.15	242,823	11,233.95	224,679
Jan.	8,518.05	170,361	8,628.80	172,576	8,651.15	173,023
Feb.	9,717.80	194,356	8,477.35	169,547	9,594.45	191,889
March	11,330.75	226,615	11,834.35	236,687	9,678.35	193,567
April	11,757.90	235,158	10,600.90	212,018	8,759.40	175,188
May	9,632.05	192,641	9,265.80	185,316	6,515.70	130,314
June	9,079.00	181,580	9,010.40	200,208	4,633.15	92,663
July			8,261.35	165,227	4,603.30	92,066
August			10,988.50	219,770	4,832.35	96,647
Sept.			8,044.60	160,892	7,021.95	140,439

Source: Financial Division, La Minoterie D'Haiti.

TABLE 4  
FLOUR PRODUCTION RATE OF LA MINOTERIE D'HAITI

Month	1988/89		1987/88	
	(hours)	(st/hr)	(hours)	(st/hr)
Oct.	583.30	17.33	479.40	16.63
Nov.	492.50	20.08	363.45	17.29
Dec.	577.30	21.15	628.15	17.85
Jan.	432.35	20.57	615.50	16.55
Feb.	395.20	20.37	532.55	16.62
March	576.00	20.80	617.00	16.57
April	553.15	20.96	546.15	16.44
May	502.35	20.58	661.20	16.53
June	487.05	21.03	617.20	17.54
July			606.05	17.34
August			624.40	16.34
Sept.			446.00	16.27

Source: Financial Division, La Minoterie D'Haiti.

APPENDIX II  
PRODUCTION COSTS

LA MINOTERIE D'HAÏTI  
COUT DE PRODUCTION  
JANVIER 1989

	TOTAL	FARINE	SON
<b>COUTS DIRECTS</b>			
Ble	\$1,936,083.62	\$1,448,384.16	\$487,699.46
Frais sur achats ble	249,140.93	186,382.33	62,758.60
Additifs	41,406.62	41,406.62	0.00
Sacs	236,206.56	174,792.85	61,413.71
Ficelle	823.12	609.11	214.01
	-----	-----	-----
Total matiere et emballage	\$2,463,660.85	\$1,851,575.07	\$612,085.78
Main d'oeuvre directe	390,805.38	375,173.16	15,632.22
	-----	-----	-----
Totals Couts Directs	\$2,854,466.23	\$2,226,748.23	\$627,718.00
<b>FRAIS GENERAUX DE FABRICATION</b>			
Main d'oeuvre indirecte	\$9,082.50	\$8,719.20	\$363.30
Charges sociales	16,568.58	15,905.84	662.74
Loyer-Moulin	91,818.50	88,145.76	3,672.74
Entretien Power-Plant	6,508.11	6,247.79	260.32
Entr. et Rep. Moulin	13,993.23	13,433.50	559.73
Entretien Batiment	35,948.30	34,510.37	1,437.93
Petit Mater. & Outillage	34.00	32.64	1.36
Pieces et accessoires	0.00	0.00	0.00
Amortissement moulin	4,445.02	4,267.22	177.80
Assurances - Moulin	14,479.18	13,900.01	579.17
Produits d'entretien	9,008.87	8,648.52	360.35
Produits Fumigation	1,273.48	1,222.54	50.94
Produits Laboratoire	824.45	791.47	32.98
Carburants et Lubrifiants	120,439.35	115,621.78	4,817.57
Frais divers de production	5,164.62	4,958.04	206.58
Frais renouvel. Equipement	0.00	0.00	0.00
	-----	-----	-----
Total frais generaux	\$329,588.19	\$316,404.68	\$13,183.51
	-----	-----	-----
<b>COUT TOTAL DE PRODUCTION</b>	<b>\$3,184,054.42</b>	<b>\$2,543,152.91</b>	<b>\$640,901.51</b>
	-----	-----	-----
Production en sacs		177,886	60,924
Cout unitaire de production		\$14.30	\$10.52
Frais d'adm. et de vente	\$299,046.70	\$287,084.83	\$11,961.87
Frais Financiers	54,050.35	51,888.34	2,162.01
	-----	-----	-----
<b>PRIX DE REVIENT TOTAL</b>	<b>\$3,537,151.47</b>	<b>\$2,882,126.08</b>	<b>\$655,025.39</b>
<b>PRIX DE REVIENT UNITAIRE</b>		<b>\$16.20</b>	<b>\$10.75</b>

TABLE 1

## PRODUCTION COSTS WITH CHARGES MADE TO THE MAIN PRODUCT

Item	January, 1989 (\$)		
	Flour	Millfeeds	Total
<b>DIRECT COSTS</b>			
Wheat	1,936,083.62	0.00	1,936,083.62
Freight and insurance	249,140.93	0.00	249,140.93
Additives	41,406.62	0.00	41,406.62
Bags	174,792.85	61,413.71	236,206.56
Pack-thread	609.11	214.01	823.12
Sub-total	2,402,033.13	61,627.72	2,463,660.85
Direct labor	375,173.16	15,632.22	390,805.38
<b>Total direct costs</b>	<b>2,777,206.29</b>	<b>77,259.94</b>	<b>2,854,466.23</b>
<b>GENERAL MANUFACTURING COSTS</b>			
Indirect labor	9,082.50	0.00	9,082.50
Social charges	15,905.84	662.74	16,568.58
Mill rent	88,145.76	3,672.74	91,818.50
Power plant maintenance	6,508.11	0.00	6,508.11
Mill maintenance and repair	13,993.23	0.00	13,993.23
Facilities maintenance	35,948.30	0.00	35,948.30
Small materials and tools	34.00	0.00	34.00
Parts and accesories	0.00	0.00	0.00
Mill depreciation	4,267.22	177.80	4,445.02
Mill insurance	14,479.18	0.00	14,479.18
Maintenance products	9,008.87	0.00	9,008.87
Fumigation products	1,273.48	0.00	1,273.48
Laboratory products	824.45	0.00	824.45
Fuel and lubricants	115,621.78	4,817.57	120,439.35
Various production costs	5,164.62	0.00	5,164.62
Equipment renewal	0.00	0.00	0.00
Sub-total general manuf.	320,257.34	9,330.85	329,588.19
<b>SUB-TOTAL PRODUCTION COSTS</b>	<b>3,097,463.63</b>	<b>86,590.79</b>	<b>3,184,054.42</b>
Production (bags)	177,886	60,924	
Unitary cost (\$/bag)	17.41	1.42	
Administration and sales	287,084.83	11,961.87	299,046.70
Financial costs	51,888.34	2,162.01	54,050.35
<b>TOTAL PRODUCTION COSTS</b>	<b>3,436,436.80</b>	<b>100,714.67</b>	<b>3,537,151.47</b>
Unitary product. cost (\$/bag)	19.32	1.65	
Electric energy sales income	5,558.78	231.62	5,790.40

Source: Financial Division, La Minoterie D'Haiti.

TABLE 2  
 PRODUCTION COSTS BY MAJOR COMPONENTS

Item	January 1989 (\$/bag)	
	Flour	Millfeeds
PRODUCTION COSTS:		
Plant labor	2.250	0.267
Power consumption	0.655	0.075
Maintenance	0.332	0.000
Equipment renewal expense	0.000	0.000
Depreciation	0.520	0.063
Interest	0.292	0.035
Insurance	0.081	0.000
Administrative and sales exp.	1.614	0.196
Other plant expenses	0.041	0.000
Sub-total	5.784	0.638
RAW MATERIAL COSTS:		
Wheat cost CIF mill	12.284	0.000
Additives and packing thread	0.236	0.004
Bags	0.983	1.008
Sub-total	13.503	1.012
TOTAL COST FOB MILL	19.287	1.649
FOB mill sale price 1/	19.190	4.000
Sale price - Total cost	-0.097	2.351
Millfeed credit per bag of flour	0.805	
Total benefit per bag of flour	0.708	

1/ This price has the tax already deducted.



TABLE 3

## AVERAGE PRODUCTION COSTS WITH CHARGES MADE TO FLOUR

Item	Average, March-May 1989 (\$)		
	Flour	Millfeeds	Total
<b>DIRECT COSTS</b>			
Wheat	3,020,198.92	0.00	3,020,198.92
Freight and insurance	235,167.10	0.00	235,167.10
Additives	20,406.99	0.00	20,406.99
Bags	171,487.70	63,145.02	234,632.72
Pack-thread	4,114.65	1,586.76	5,701.42
Sub-total	3,451,375.35	64,731.79	3,516,107.14
Direct labor	499,435.84	20,809.82	520,245.67
Total direct costs	3,950,811.20	85,541.61	4,036,352.81
<b>GENERAL MANUFACTURING COSTS</b>			
Indirect labor	25,534.00	0.00	25,534.00
Social charges	27,029.55	1,126.23	28,155.78
Mill rent	59,996.27	2,499.85	62,496.12
Power plant maintenance	27,918.66	0.00	27,918.66
Mill maintenance and repair	43,955.11	0.00	43,955.11
Facilities maintenance	20,664.78	0.00	20,664.78
Small materials and tools	319.72	0.00	319.72
Parts and accessories	0.00	0.00	0.00
Mill depreciation	4,388.45	182.85	4,571.30
Mill insurance	13,998.45	189.17	14,187.62
Maintenance products	7,497.45	0.00	7,497.45
Fumigation products	995.89	0.00	995.89
Laboratory products	581.38	0.00	581.38
Fuel and lubricants	137,444.14	5,726.84	143,170.98
Various production costs	9,443.54	0.00	9,443.54
Equipment renewal	0.00	0.00	0.00
Sub-total general manuf.	379,767.39	9,724.93	389,492.32
<b>SUB-TOTAL PRODUCTION COSTS</b>	<b>4,330,578.58</b>	<b>95,266.54</b>	<b>4,425,845.13</b>
Production (bags)	216,166	79,077	
Unitary cost (\$/bag)	20.03	1.20	
Administration and sales	342,476.36	14,269.85	356,746.21
Financial costs	37,597	1,567	39,163.98
<b>TOTAL PRODUCTION COSTS</b>	<b>4,710,652.37</b>	<b>111,102.95</b>	<b>4,821,755.32</b>
Unitary product. cost (\$/bag)	21.79	1.40	
Electric energy sales income	5,162.27	215.09	

APPENDIX III

LA MINOTERIE D'HAITI'S PRODUCTION REPORT

**MINOTERIE D'HAITI**  
**RAPPORT DE PRODUCTION DES MOULINS**

Hrs de Production 487.05 Relève 1 - 2 - 3 Date Mois de juin 1989 Rapport No 685/746

Produits par Balance	Poids par Bascule	Commencé à No	Arrêté à No.	Nombre de Bascules	Total S/T	Moyenne Hre	REMARQUES
Farine Supérieure	0,25 S/T	117912	156080	38168	9542.00	20.44	
					415.75		By pass
Tout Usage	0,05 S/T			10	50		
Semoule ordinaire	0,05 S/T			1369	68.45		
Semoule spéciale	0,05 S/T			4308	215.40		
Semoule # 2	0,05 S/T			100	5.00		
Son en Boules	0,05 S/T						
Son en Sacs	0,05 S/T			81044	4052.20	8.32	
Criblages					211.75		
Blé Moulu	0,30 S/T	725993	771583	45590	13723.50	28.17	
Blé Nature	0,30 S/T			155			

10247.10 S/T Farine Produite  
 2.19 S/T Moins Additions  
 10244.91 S/T Farine Produite-Net  
 3840.45 S/T Son Moins Criblages  
 14085.36 S/T Production Totale-Net  
 13723.50 S/T Blé Moulu  
 361.86 S/T Gain ou Perte  
 % d'extraction du Blé moulu 74.65  
 % d'extraction du Blé Nature

**ADDITIONS**

2.19 S/T Ingrédients  
 1 S/T Retour de Produits  
 2.19 S/T Total

**MELANGE DE BLE**

NS-100... % No. 1 ..... % Protéine  
 ..... % No. 2 ..... % Protéine  
 ..... % No. 3 ..... % Protéine  
 ..... % No. 4 ..... % Protéine

REMARQUES : ..... La production totale de Farine .....  
 ..... par jour est : 504.86 TQ = 10097 sacs

*[Signature]*  
 Meunier de service

APPENDIX IV  
POWER GENERATION AT LA MINOTERIE D'HAITI

90'

TABLE 1  
POWER GENERATION AT LA MINOTERIE D'HAITI  
1989 (up to April)

	Jan.	Feb.	Mar.	Apr.	Total
Wheat consumed (s.t.)	11,883	10,615	15,849	15,401	53,748
Power consumed (kw)	901,070	832,105	1,135,098	1,080,793	3,949,066
Fuel oil used (gal.)	80,230	75,600	104,950	97,725	358,505
Power used by plant only (kw)	716,875	668,250	938,383	892,138	3,215,656
Ratio (kw/gal.)	11.23	11.01	10.82	11.06	11.02*
Ratio (kw/wheat, s.t.)	75.83	78.59	71.62	70.08	74.54*
Price of fuel per gallon (dol.)	1.45	1.45	1.45	1.45	
Value of fuel consumed (dol.)	116,333	109,020	152,177	141,701	519,832
Cost/kw (cents) fuel oil only	12.91	13.17	13.41	13.11	13.16*
Flour produced (cwt)	175,001	161,090	230,832	229,500	796,832
Fuel oil/cwt of flour (gal.)	0.458	0.469	0.455	0.526	0.450*
kw/cwt	5.149	5.165	4.915	4.709	4.959*
Cost of fuel/cwt of flour (dol.)	0.665	0.680	0.659	0.617	0.653*

\* Average

Source: Milling Department, La Minoterie D'Haiti.

APPENDIX V

THEORETICAL ESTIMATION OF FLOUR YIELD FROM A WHEAT CARGO

## THEORETICAL ESTIMATION OF FLOUR YIELD FROM A WHEAT CARGO

The preciseness of a theoretical estimation of flour yield from a wheat cargo depends on the correction factors used to adjust the estimation to actual conditions. These factors depend on the type of machinery used to process grain, adjustment of that machinery, losses in the system, type of labor used in the process, environmental conditions, specifications and characteristics of the wheat cargo, uniformity of the grain cargo under study, wheat storage time, tempering time, and other factors that affect the specific operation.

To obtain adjustment factors the operation under consideration must have good historical records of the process or an independent study should be carried out to determine them. The application of the model described in the following equations should have the above factors in consideration otherwise a range should be specified for the estimated results.

To describe the theoretical estimation the following nomenclature is used:

- $W$  - size of the cargo (mt)
- $W_c$  - clean wheat in the cargo (mt)
- $W_t$  - amount of wheat that goes to first break (mt)
- $S_c$  - screenings or material removed in the cleaning process (mt)
- $MC_i$  - moisture content of the cargo (%)
- $MC_t$  - moisture content of the wheat after tempering (%)
- $D_i$  - dry matter content of the cargo (%)
- $D_t$  - dry matter content of the wheat after tempering (%)
- $FE$  - estimated flour extraction from the clean tempered wheat (%)
- $F$  - amount of flour produced from the cargo (mt)
- $Y_D$  - dirty wheat yield (%)
- $C_n$  - correction factor for a given stage of the process
- $n$  - 1, 2, ..., m; is the process stage
- $P$  - non-millable material in the cargo (%)

The screenings are calculated by:

$$S_c = W * P * C_1 / 100 \quad [1]$$

The amount of clean wheat in the cargo is calculated by:

$$W_c = W - S_c \quad [2]$$

The dry matter contents are calculated by:

$$D_i = 100 - MC_i \quad [3]$$

$$D_t = 100 - MC_t \quad [4]$$

The amount of wheat that goes to milling (first break) is calculated by:

$$W_t = W_c * D_i * C_2 / D_t \quad [5]$$

The amount of flour produced from the cargo is:

$$F = W_1 * FE * G_3 / 100 \quad [6]$$

The dirty wheat yield is calculated by:

$$Y_D = F * 100 / W \quad [7]$$