

This is a category III project according to IIC's environmental review procedure because specific impacts may result which can be avoided or mitigated by adhering to generally recognized performance standards, guidelines or design criteria. During project evaluation the following potential environmental and labor effects were analyzed: sugarcane plantations and use of agrochemicals, liquid effluents, air emissions, solid wastes, hazardous chemicals and wastes, emergency response and fire prevention, occupational safety and hygiene, and other labor and social issues. The sponsor provided IIC and its consultant with environmental and safety information related to its proposed operations.

Principal Environmental Impacts Sugarcane Plantations: The company operates on land it owns or rents, and it does not encroach on indigenous land, nor have any disputes been brought in regard to their possession. There is an indigenous reserve in the municipality of Nioaque whose boundaries have already been surveyed. The company currently employs about 100 indigenous workers from this reserve. The sugarcane plantations required to meet the increase in production capacity from the project do not require removal of vegetation, since all of the areas of expansion are located on land already used for farming and livestock. Soil preparation is being done either on land that already has been used to grow cane or other crops, such as corn or soybeans. The farming operations include a program for burning the sugarcane that is overseen by IBAMA (Brazilian Environmental Institution); application was made to IBAMA in early 2003 for the relevant permit. The program includes a plan with a timeline for determining the controlled quantity and location of the sugarcane to be burned, and it includes participation and training from the municipal fire department.

Use of Agrochemicals: Soil analyses taken before the start of soil preparation work indicate the need to add lime or gypsum. Additive application rates, whether for conditioning newly incorporated land or reconditioning land in renovation, are determined by the appropriate chemical analyses and then carried out before or during soil preparation. In addition to the indicated dosages of lime and/or gypsum, extra phosphate will be applied when needed. Fertilizer application to ratoon cane is based on replacements of nitrogen (N), phosphorus (P), and potassium (K) per ton of removed plant material. The fertilizing effect of distillery slops on fields has allowed the following reductions of kg/ha fertilizer application rates: For N - from 100 to 90, for P - from 35 to 0, for K - from 35 to 0. This means that only N needs to be applied, which may be done by using urea. A general preemergent application of herbicide is provided at planting, with the product and application rate varying with the characteristics of each plot. Subsequently, herbicide is applied locally by tractor or by hand if this turns out to be necessary. On occasion, aerial spraying of herbicides has also been used. Most pests are controlled mechanically or by biological control. The cane borer (*Diatraea saccharalis*) is controlled by setting free *Cotesia flavipes*, its natural enemy, according to monitoring data. Monitoring starts when a stand is six months old. *C. flavipes*, a wasp, is currently the most promising parasite to place its eggs in borer larvae. It is purchased from a commercial multiplier. Mites are controlled mechanically at plowing, and chemical control is applied locally when needed. Leafhoppers are controlled biologically and chemically if monitoring warrants it. *Migdolus* is checked mechanically during soil preparation, followed by chemical application.

Liquid effluents: Typically, an environmental problem of primary concern in the sugar industry is the consumption of water and the production of wastewater. However, this is not a problem for this company, because there are cooling towers for recirculating and reusing water, and no industrial wastes are discharged into bodies or streams; the effluents generated in the industrial process are used on the plantations for irrigation and fertilization. The approximately 100 m³/h of slops generated by the distillery and the about 700 m³/h of wastewater coming from cane washing, cooling tower overflow, and general factory uses are captured in a 16,000 m³ reservoir, where they may be mixed as required. These effluents are used in the irrigation system through a distribution

system that consists of electric-motor-driven pumps, and pipelines. One of them goes to an open reservoir on the top of a hill. From there, slops are distributed by gravity through a set of open canals, which directly serve the suction valves of the application pumps. Distillery slops, which cannot be discharged into public streams, constitute the mainstay of this system. Field application of slops solves the environmental problem of their disposal, while at the same time it guarantees a minimum dry season coverage of irrigation to part of the cane fields. In addition, the slops supply the cane with part of its fertilizer requirements. Sewage from the village or "Agrovilla" (the company settlement near the mill where most of the permanent employees live) is treated by septic tanks. Part of the project for expanding the company's industrial production capacity also envisions a reduction in the levels of water now being used, from the current 3.2 m³ to a consumption of 1.0 to 1.5 m³ per ton of sugar cane.

Air emissions: The main air emissions from sugar processing and refining result primarily from the combustion of bagasse (the fiber residue of sugar cane). Fly ash present in the flue gases from the combustion of bagasse are emitted by the boiler stacks. Other potential air emission sources include juice fermentation units, evaporators, and sulfitation units. A sugar mill often generates odor and dust, which need to be controlled. Although the company does not currently have measurements of its emissions of fly ash, it is known that typically, for these industries, approximately 5.5 kilograms of fly ash per metric ton (kg/t) of cane processed (or 4,500 mg/m³ of fly ash) are present in the flue gases from the combustion of bagasse. The flue gases emitted from the combustion in the boilers are monitored twice a day with an Orsat apparatus to determine the percentage of CO₂ and O₂ and determine the surplus air required to improve combustion of the bagasse. Nonetheless, there are neither a log for recording these measurements nor devices for monitoring the air emissions. Cooling equipment is being used that relies on coolants containing R22 (chlorofluorocarbons), whose use will be discontinued, this being a restricted substance under the Montreal Protocol on substances that deplete the ozone layer.

The company has agreed to comply with all IIC standards, in particular for control of particulate matter and gaseous emissions. In order to mitigate these impacts, the company will take the following actions, among others: (a) conduct a study to assess the environmental impact of fly ashes and gases emitted from the combustion of bagasse (monitoring emissions from the chimneys, spatial distribution, winds and ground level concentrations); (b) based on the results of the study, the company will implement measures to control the air emissions by installing air pollution control equipment required in order to comply with the IIC's standards regarding this matter. Monitoring and control of odors, noise and dust will be conducted as part of the Environmental Management Plan to be required by the IIC.

Solid Wastes: The solid waste generated in the industrial area are (i) ferrous materials which are sold to specialized companies for use in smelting and subsequent reuse; (ii) plastic materials that are sold to companies specializing in recycling; and (iii) bagasse from sugar cane and paper that is used as fuel in the boilers for generating steam and electricity; all bagasse generated from milling the cane is used as fuel in the boilers to generate steam; and (iv) filter cakes and fly ash, which are added to the soil at the plantations to meet required potassium and organic fertilizer levels. The cake resulting from filtration of the sludge or lees in rotary filters that is obtained in the purification process of sugar production has optimum qualities as an organic fertilizer, since its composition is rich in organic matter and minerals such as phosphate, potassium, and various micronutrients.

Hazardous Chemicals and Wastes: There are four tanks for storing the alcohol produced (three tanks with a capacity of three million liters and one tank with six million liters). The tanks have retaining walls in case of spills, and they are grounded in accordance with safety regulations for preventing the risks of explosion and fire. In addition, there are three underground tanks, located in

the filling station that supplies vehicles with fuel, for storing fuel oil, gasoline, and alcohol. In order to detect any potential leaks, the IIC will require that the company maintain records of the volumes of fuel received and extracted from the tanks. There is a tank in the distillery area with a capacity of 20 m³ that is used to store cyclohexane (used in the alcohol distillation process) and another tank of the same size that stores sulfuric acid. These two tanks, which currently do not have retaining walls, will be relocated as part of the investments scheduled by the company and will adhere to the measures required by the applicable international regulations. There are also sacks of gradated sulfur oxides (SO₂), used in the sugar refining process, as well as plastic bags containing caustic soda. The electrical transformers use oils that are free of polychlorinated biphenyls, whose use is associated with health risks. Oil discarded from the turbine equipment is sold to a local firm for recycling. An account is kept of the use of each chemical product; commercial containers are collected and made unusable, and then returned to the distributor.

Emergency Response and Fire Prevention: The company enforces an Environmental Risk Prevention Program (PPRA), owns two fire trucks equipped with firefighting equipment, and has a firefighting unit on hand for each work shift. During the appraisal visit, the company was seen to be equipped with properly recharged fire extinguishers and tank cars (hogsheads) with water for firefighting. Adequately charged extinguishers and safety signals were observed at the company facilities. As a safety measure for preventing the risks of explosion and fire in storage tanks and facilities, there are systems of lightning rods, grounded tanks and retaining walls for tanks storing flammable liquids.

Occupational Health and Safety: All workers entering the firm take part in an employment orientation program, where they receive instruction and training according to the duties they will perform. They are instructed in the handling of hazardous products, handling and application of phytosanitary products, first aid, of individual protective gear, boiler operation, oxyacetylene welding, and other items. Safety is important for the company, and all safety matters are coordinated by the Human Resources Manager. The company has hired a local consulting firm specialized in safety engineering and industrial health services to supervise these matters. The firm has an occupational safety engineer, four occupational safety technicians, a physician specializing in industrial health, two clinical physicians, three nurses' aides, three drivers of support vehicles, and one ambulance. Through its Environmental Risk Prevention Program (PPRA), the company is complying with the current labor laws, as well as with the distribution and mandatory use of all individual protective equipment according to the nature of each job or activity. All chemical materials used in weed and pest control, cane ripening and other possible uses, as well as the application equipment and applicator protection devices, are handled through the Centro de Protección Individual (CPI). All protective suits, gloves, and masks are washed every day after being used. There is a sufficient supply of requisite individual protective gear.

Labor and Social Issues: Demonstrating its commitment to combat child labor, it is company policy not to employ workers who are under 18 years of age. Workers receive orientation and incentives, and penalties under the regulations if they perform any activities that place their health or physical integrity or that of others at risk. The company's officers include a union leader, and there are no restrictions on any workers wishing to join the union. Workers receive the benefits provided by law. Approximately 980 people are employed directly in the agricultural sector, in cane production and harvest, in field mechanization and in other services. There is a minimum wage that has been agreed and is about 23% higher than the national wage. Part of the general work force is hired on a temporary basis, usually for the duration of the harvest. Subsequently many of these workers go to their homes, where they have families and plots of land, which they attend during the rainy season. These employees are provided with lodging, and accommodations observed were adequate. Most of the permanent employees live either at the company settlement near the mill

("Agrovilla"), or in the nearby villages, or in the town of Maracaju. The temporary workers, who are single or come without their families, live in company-owned lodging houses. They are served three meals a day in the adjoining canteen. To those engaged in cane cutting, a hot meal is taken to the field at noon. The company settlement of Agrovilla provides public services, including electricity, phone service, a post office, and a municipal school. There is also a medical and dental clinic, recreation areas for children, a soccer field, supermarket, coffee shop, bakery and pharmacy, and the owners of these shops are members of the Agrovilla community. There is also a cafeteria at the plant that serves the employees.

Monitoring

The company will be required to implement an Environmental Management Plan acceptable to the IIC. Among other measures, this plan will include (1) a description of planned environmental improvements to comply with IIC standards, including monitoring and controlling air emissions due to the combustion of bagasse, emitted from the boiler chimneys; potential odors, noise and dust;(2) a schedule for implementing all of the environmental and safety measures mentioned herein; and (3) the components that are subject to yearly oversight. Throughout the project, the IIC will ensure compliance with its own environmental and labor policies, review the monitoring reports that the company submits regularly, and make field visits as part of the project supervision process.