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SUGAR CANE BURNING - WASTE AND POLLUTION IN SAO PAULO STATE

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Photos by Fernando Calzani/AE

Brazil's alternative fuel, sugar cane alcohol, may be creating more evil than good. The fuel alcohol, mixed with methanol and gas, though comparatively cleaner when burned, presents devastating environmental results in its growth and manufacture processes.

The state of São Paulo produces 132 metric tons of sugar cane a year, or over half the total Brazilian crop. During the six months of the harvest season, 3 million tons of carbon gas are spewed up into the atmosphere, because of the time-honored technique of burning the stalks and leaves of the cane before it is cut.

By September, at the peak of the cutting season, black columns of smoke can be seen billowing up into the skies from around 1,500 different fires. The resulting pollution is harmful to humans - it irritates the tear ducts, aggravates respiratory diseases, and fills the air with ash. It is also deadly for plant life.

The amount of ozone in the lower atmosphere triples at the height of the harvest. Some days, it far exceeds the acceptable limit of 800 parts per billion, at 2,000 meters above ground.

"The ozone interferes with photosynthesis and plant metabolism, causing dieback and blight", says Volker Kirchhoff, director of space and atmospheric sciences at the Space Research Institute in São José dos Campos. "The carbon gas is absorbed later on by the new cane shoots, but meanwhile it aggravates the greenhouse effect."

According to the São Paulo environmental agency, Cetesb, the tradition of setting fire every year to 1.8 million hectares of cane (10 percent of the arable land in the State) impoverishes the soil, and makes it more vulnerable to erosion. In addition to the carbon and ozone increase, Cetesb said the fires release 600,000 tons of hydrocarbons and 60,000 tons of nitrogen dioxide into the atmosphere.

Many people are worried about the waste as well as the pollution.

Significantly, grower's jargon refers to sugar cane leaves as "garbage," scientists argue, however, that this material has considerable potential as an energy source. It is the equivalent of 333,000 barrels of petroleum per day, burning away for two months - no less than \$1.4 billion dollars down the drain every year, said Ivo Clemente of Cetesb.

"Last year, they set fire to a cane field right next door to our barracks", recalls Lieutenant Samuel de Oliveira, of the 4th São Paulo Forest Police Division, which patrols an area containing 68 municipalities in the northeast of the State.

Among other laws enforced by the forest police is a 1988 State decree banning cane fires within one kilometer of any town. In Ribeirão Preto and the surrounding area, where more sugar cane, sugar, and fuel alcohol is produced than anywhere else in Brazil, the ban on burning applies to seven percent of the 647,000 hectares of cane fields in the area.

Lieutenant Oliveira and his men can fine law breakers, but they cannot prevent the deaths of thousands of pigeons, deer, monkeys, snakes and insects swallowed up by the fires.

"We're fighting a vicious combination of perverse aggression against the environment and irrational production methods", says Marcelo Goulart, public prosecutor in Sertãozinho, a small town not far from the regional center, Ribeirão Preto. Goulart is also working hard to enforce the partial ban on burning, and hopes to get it extended.

For space researcher Kirchoff, the entire approach to agriculture nationwide should be reformulated. "Many of our traditional farming techniques are totally outdated", he argued. "After all, in 1975, when the federal program to finance production of fuel alcohol from sugar cane was launched, there were only 676,000 hectares under cane in Brazil. Now, there are over 4 million hectares.

Bird's eye view of the fires

Every day, two polar-orbiting NOAA satellites pass over the State of São Paulo, one at about 2:30 a.m., and the other at around 2.30 p.m. Each takes 12 hours to return. As well as operating in the range of visible light, and infrared, the satellites are fitted with special sensors for measuring vertical variations in temperature and humidity.

Space research institute (Inpe) scientists feed the data received from the satellites into a software package they have developed for pinpointing the fires.

Three computer programs, created by researchers Alberto Setzer and Marcos Pereira, automatically adjust satellite images to a map with geographical coordinates. The computer then calculates the number of fires and their intensity. Since 1989, Inpe has sent daily reports on fires to regional offices of the Brazilian institute for the environment and renewable natural resources (Ibama), and to Cetesb.

The cane fields are usually set alight at sunset (around six p.m.), and burn all night until about five a.m. Growers say the dew which condenses during this period prevents the cane itself from burning, but for Kirchhoff, it would be better to burn when the sun is high in the sky.

"When you boil water, the liquid near the flame heats up first and rises to the surface of the kettle; the same is true of the air", he explained.

If the "garbage" were burned in the middle of the day, the gas and ash produced would be lifted straight up to a high altitude, and would quickly disperse. This way, pollutants would not concentrate in the vicinity of densely populated areas.

Cane cutters at risk

Little empirical research on the effects of the pollution caused by cane burning on public health has been conducted to date; but it is known that the 450,000 metric tons of particulate matter released by annual fires into the atmosphere _ in the form of soot and ash _ blacken thousands of homes, and penetrate the lungs and windpipes of even more of the area's inhabitants.

According to Escola Paulista de Medicina, a federal medical school and teaching hospital, one-fifth of the population of the cane growing zones in São Paulo State, or between 1.8 and 2 million people, are thought to have damaged lungs.

"It's impossible to blame the soot from cane burning alone, but it's undoubtedly the main factor", said Dr. Marcos Arbex, a lung specialist in Araraquara.

Bronchial and other respiratory problems normally become more intense in the dry winter months, coinciding with the start of the cane in May, June, and July. But in the towns surrounded by cane plantations, there is an exceptionally high incidence of respiratory disease, Arbex noted.

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The 500,000 cane cutters and harvest workers in São Paulo are probably the least concerned with the issue, however. Most of them are illiterate and too hard-worked to take time worrying about such apparently abstract problems.

Above all, they fear unemployment if mechanization of cane harvesting were to become commonplace. Even if a less drastic solution is adopted, such as cutting and processing the garbage instead of burning it, the result would be a severe loss of pay, cutters believe.

Already, cane cutters are among Brazil's worsts-paid workers. On average they take home less than twice the minimum wage (currently under \$80 dollars per month) for a ten-hour day _ and there is regular work in the cane plantations for only six months in the year.

One of the biggest federations of labor unions, Força Sindical, insists on an obligatory cane burning clause into its collective agreement. The other leading umbrella group _ CUT _ however, says its members will cut unburnt cane only if they are paid higher rates than normal.

"The truth of it is, that in addition to all the dirt, we spend the entire day swallowing cane ash", said Paulo Francisco Gastão, a 39-year-old cane cutter from Barrinha. "By midday you're already exhausted, and you always feel under the weather", he added.

In the 1960s, it was not common practice to set fire to the plantations. It would be a good idea to return to the old system, said Gastão, so as to "protect the environment", but he admits he is a minority.

Mechanization

At the São Francisco mill in Sertãozinho, owned by Leontino Balbo Jr., a cane harvester now being tested can cut 20 metric tons of unburnt cane per hour - more than 30 experienced cane cutters. Even so, Balbo said, the machine's efficiency will have to be enhanced at least 50 percent before it becomes cost-effective.

Another propotype being tried out at the Santa Luiza mill in Matão has the required efficiency, but is still 20 percent behind the yields obtained when cane is burned before harvesting. The mill owners refer to these test results to justify their opposition to a ban on burning:

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"Anyway, the cutters themselves insist on burning", said Balbo, who is a specialist in cane harvesting techniques. Any change in the present system would drastically push up costs and bring about mass unemployment, he argues.

Another objection raised by mill owners is that there are only three manufacturers of harvesters in Brazil, and they would not be able to meet full-scale demand in the event of a major shift to mechanization. Price is an obstacle too: imported machines cost around \$250,000 dollars, and locally-produced equivalents are only about a third cheaper.

In the Ribeirão Preto area, around 30 percent of the acreage under cane is mechanized, this is twice the rate for the State as a whole. "The problem is that no one has gotten around to serious planning, studying the social impact of mechanization or retraining the workers who will be laid off", says Manoel Sobral, a technologist at Copersucar the largest sugar-producing cooperative in the State (based in the town of Piracicaba).

Sobral said he has visited other cane-growing countries, such as Australia, where this problem has been solved. In Brazil, however, it would take at least five years to switch from manual to totally mechanized harvesting. In addition to investing in machinery, he explained, mills would have to restructure all the operations and install special equipment for trash processing.

The vegetable material potentially available, he reckoned, adds up to about seven million metric tons dry weight, seven times more than the total mass burned annually in the Amazon region. Cost-effective processing options range widely, added Sobral, from use in cattle feedlots, to electric power generation, and further: of fuel alcohol.