SCIENCE FOR THE PEOPLE

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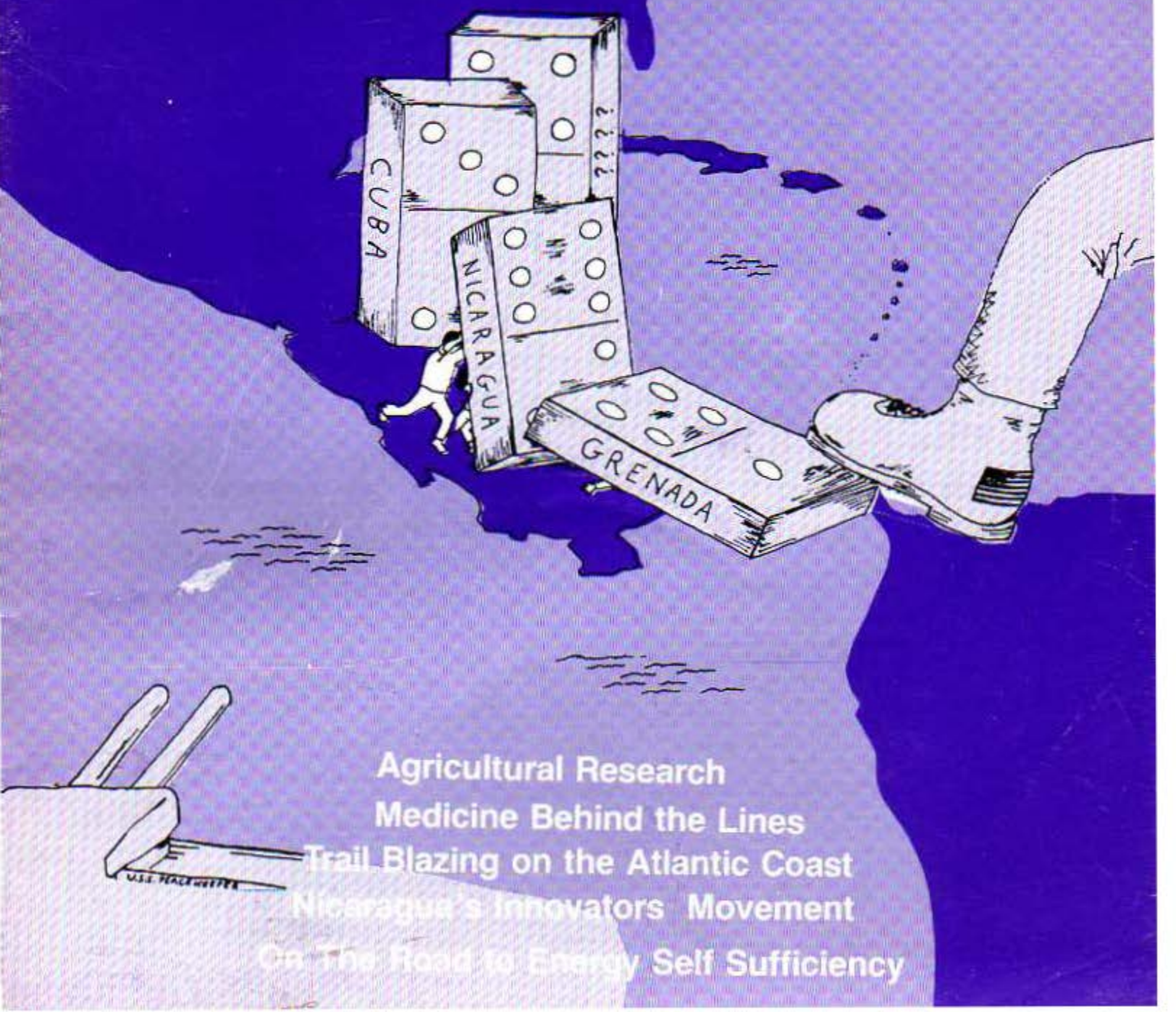
SCIENCE UNDER SIEGE

Science and Technology in Nicaragua and El Salvador



Agricultural Research
Medicine Behind the Lines
Trail Blazing on the Atlantic Coast
Nicaragua's Innovators Movement
On the Road to Energy Self Sufficiency

about this issue

The Reagan administration wages war in Central America and the media drones on about the wisdom, or lack of it, of our actions there. The image of Vietnam won't go away no matter how many times "wise" professors and "respected" diplomats claim that Central America is not another Vietnam. Grenada may be only the beginning. Two thousand marines already stationed in Honduras are likely to see action soon, further fueling the debate on whether or not our interests are best served by military action in the region.

The attitude taken by leading liberal thinkers is, as usual, moral outrage accompanied by an admission that the conservatives "have some good points." Liberals normally begin their analysis of the so-called conservative good points with tongue firmly planted in cheek to establish credibility. Unfortunately, they frequently wind up believing the myths that they originally embraced as nothing more than window dressing.

Thus, while the liberal opposition to Reagan's Central American war grows, so does a sort of unspoken assumption about the liberation forces of the region. Establishment media now seem to require a sort of disclaimer with every anti-war statement. "The Sandinistas increase their totalitarian hold on the people," or "no one wants to see the communists take over El Salvador" are typical examples of what must precede any appeal for the US to stop making war in Central America. Unfortunately this sort of nonsense tends to catch on and we already are beginning to see something of a deterioration in support for liberation forces at the same time that anti-war sentiment builds.

Such attitudes are tragic, for in the midst of all the fighting, some remarkable events are taking place – events that are not apparently notable enough to be regularly reported in the mainstream media. In Nicaragua, and to a lesser extent in the liberated areas of El Salvador, new forms of political and social organization are being created. A new society is evolving, certainly making mistakes, but nevertheless with its destiny in its own hands for the first time.

The new political forms inevitably involve the scientific and technical issues commonly covered by *SftP* magazine. In this issue we provide a sampling of a few of the technical issues as they currently are evolving in revolutionary Central America. Specifically, we present several scientific and technical aspects of the current situation in Nicaragua plus one piece on health care behind the lines in El Salvador. We hope these offerings will help to dispel the notion that some sort of evil empire is evolving in Nicaragua, and that the liberation forces in El Salvador are nothing more than terrorists. Beyond this, they illustrate new forms that science and technology can take, when they are guided by the people they serve.

In the article *Agricultural Research and Breaking the Cycle of Dependency in Nicaragua*, the historical conditions that put Nicaragua in a position of dependency are related to the current situation in agricultural research there. Being totally dependent on agriculture for foreign exchange, scientific and technical capability in the development of new agricultural technology is a necessity if Nicaragua is to remain truly independent. The yoke of dependency makes such a development especially difficult.

In *The IPM Revolution in Nicaragua: Breaking the Circle of Poison*, we see how a perfectly viable and useful technology, integrated pest management, was a failure under the Somoza regime, and how the Sandinista government has been much more able to put this rational alternative in place.

Nicaragua: Towards a People's Science describes a new and innovative method of incorporation of workers into the process of developing technology. The innovators movement encourages workers to devise new instruments of production, thus incorporating many people into the research process.

Nicaragua's overall energy policy is analyzed in *On the Road to Energy Self Sufficiency*. The recent opening of the geothermal plant at Momotombo is just one aspect of a complex but rational plan, involving hydroelectric, geothermal, and fossil fuel sources, all within the proprietary boundaries of Nicaragua.

Trail Blazing on the Atlantic Coast recounts a meeting of health care brigadistas (Nicaragua's version of barefoot doctors) on Nicaragua's Atlantic coast, providing insights into the processes and problems of operating a people-oriented health care system in a primitive rural area under fire from counterrevolutionaries.

Finally, Charlie Clements, medical doctor and former U.S. air force pilot, in *Health Care in Guazapa: Medicine Behind the Lines*, describes some of his experiences in health care behind the lines in El Salvador. A remarkable system of organization is already in place in the liberated zones of El Salvador, providing hints as to what the future may bring.

UPCOMING ISSUE OF SFTP

The East Coast Editorial Committee is now soliciting articles for the March/April 1984 special issue on "Babies and Science: From Reproductive Technologies to Parental Bonding." Please send articles, outlines, graphics and other material to: SCIENCE for the PEOPLE, 897 Main St., Cambridge, MA 02139.

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news notes

Genetics Group Launched

This fall a group of scientists, trade unionists, bioethicists, and public health experts released a statement calling for public involvement in decisions regarding biotechnology and genetics at a news conference in New York. The group, including several SftP members, announced the formation of the Committee for Responsible Genetics.

Dedicated to insuring that new biotechnologies be developed in the public interest, the group hopes to create a national forum for compiling, evaluating, and exchanging information about the social applications of genetic technologies. These applications include a wide variety of important issues such as: human genetic engineering, industrial biotechnology, biological waste disposal, biological weapons development, genetic screening, and agricultural genetics.

For more information about the group, or to receive their newsletter, write to the Committee for Responsible Genetics, P.O. Box 759, Cambridge, MA 02238.

Water Contamination Update from Michigan

As if the contamination of great lakes fish with dioxin, brought to you by Dow Chemical of Midland, Michigan (see *SftP* 15:4) wasn't enough, Michigan residents recently received more bad news when it was revealed that there was a cancer "epidemic" in walleye and sauger fish populations in Torch Lake in the Keweenaw Peninsula (the northernmost extensiono of Michigan's Upper Peninsula.) The 23 September *Detroit Free Press* quoted a government researcher as saying that "the rate of cancer in walleye is high, but it is 100 percent (emphasis ours) in sauger, which makes it shocking." Other species have apparently not been affected (yet?).

The most likely cause so far seems to be heavy metals, such as copper, lead, and nickel, found in the mill tailings routinely dumped into the lake by the copper mining industry. It would be bad enough if it were an isolated fishing lake, but as part of the Keweenaw inland waterway system, Torch Lake connects directly to Lake Superior, and cancerous fish have already been caught in other parts of the waterway.

While this is not the first lake in the U.S. to have a high increase of cancer in fish, the news is certainly not heartening. Human cancer rates have been found to unusually high in five other areas that have caught cancerous fish – Puget Sound, and the Black, Buffalo, Hudson, and Niagra Rivers. The Torch Lake situation has gained much local attention in the media, and groups such as the Public Interest Research Group in Michigan (PIGRIM) had already targeted toxic waste dumps as a major emphasis for this year. But with the nation's longest shoreline, bordering the largest inland water system in the world, water resource issues in Michigan will continue to demand close attention.

SEND US A NOTE

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SEVESO TRIAL UPDATE AND CORRECTIONS

In the article "Seveso Update: A Dioxin Disaster Seven Years Later," which appeared in the last issue of *SftP,* we reported on the political and scientific implications of the chemical explosion and consequent dioxin contamination, which happened in Seveso, Italy in 1976.

On September 24, during the publication of the issue, the Seveso trial, aimed at ascertaining who was responsible for the explosion of the reactor at the ICMESA factory, ended in Milan. All of the defendants were declared guilty of disastrous negligence and disregard of safety measures, according to the original requests of the Public Prosecutor. Herwing von Zwahl, director of the ICMESA plant, and Joerg Sambeth, technical director of Givaudan, have been condemned to five years in jail; Guy Waldvogel, president of ICMESA, and general administrator of Givaudan, and Fritz Moeri, designer of the plant, each got four years; Giovanni Radice, another director of the factory, got two and a half years. All the defendants received a reduction of two years on their terms.

The major implication of the trial is that the thesis of the "unpredictability of the reaction" has been refuted, while it has been recognized that the information already available at the time of the "accident" did necessitate stricter safety measures. Only 20 out of the original 200 private citizen plaintiffs at the trial were granted compensation; but the number of those claiming compensation had progressively decreased since the original incident as they were somewhat defrayed by Hoffman-LaRoche. (See last month's article for more details.)

As of today, Hoffman-LaRoche has paid a total of $112 million for compensation; $25 million of this has been given to the Regione Lombardia, $7 million to the city of Seveso, and $4.3 million to the Italian federal government. The remaining money has been distributed among the other towns involved in the disaster, single enterprises, and private citizens.

In the original article, several accidental omissions unfortunately undermined some of the article's original intent. See page 13 of this issue for the additional figures and corrections.

Counterrevolutionary Attacks Aim to Disrupt Agricultural Production in Nicaragua

U.S. backed terrorist attacks from Honduran territory seem to be increasingly directed towards disrupting production and the delivery of state services in the rural areas of Northern Nicaragua. Attacks on cooperatives and state farms, and the murder of agronomists and other governmental workers, has placed a heavy burden on this country's struggle for both food self-sufficiency and good foreign exchange earnings from the agricultural secor. The targeting of production units in the countryside apparently is part of the Reagan Administration's comprehensive program of economic destabilization directed at Nicaragua's fragile economy.

In the last year alone (May 1982 - May 1983) damage to the agricultural sector inflicted by *contra* attacks has totalled almost 250 million *cordobas* (1 *cordoba* = $0.10 US). This includes about 100 million *cordobas* in damage to machinery and infrastructure, 13 million worth of cattle killed or stolen, and 135 million in crops destroyed. According to the Managua daily *La Barricada* (6/27/83), "the direct economic effects of these losses are small in comparison to the drop in production caused by the terrorist activities of these groups. Campesinos are forced to retreat to zones closer to the cities for their own protection, and the timely arrival of inputs and extension workers is hindered. The consequence has been a reduction in the production of basic grains," most of which are produced in the campesino sector.

Often attacks are directed at the important export crops produced in the Northern sector, coffee and tobacco. During the coffee harvest earlier this year, brigades of volunteer pickers composed of students and workers from the cities were repeatedly targeted. And in one state farm alone, 43 million *cordobas* worth of tobacco processing equipment was destroyed.

Government workers have been singled out for assassination, in an apparent attempt to disrupt the delivery of state services through terrorism. Before the 1979 revolution, most of the campesino producers had never been visited by an extension agent, had never seen a doctor, and had certainly never been to school. The provision of these services by the Sandinista government is the most tangible benefit these marginalized people have received from the revolution. U.S. strategists apparently believe that by cutting off these services, they will be able to undermine support for the revolutionary government.

The concrete evidence of this program has been the assassination during the last year of 6 agronomists employed by the Ministry of Agricultural Development and Agrarian Reform (MIDINRA), and the murders of 45 rural schoolteachers and twelve doctors (including a West German and a Frenchman). In addition, reports are common of campesinos receiving death threats it they accept government farm credit or join the unions of farmworkers (ATC) or peasant producers (UNAG).

The Nicaraguan people have responded to these terrorist attacks with a new concept in rural cooperativization. The newly formed "Self-Defense Cooperatives" that are springing up in the Northern war zone are formed entirely by members of the Popular Militias, and cultivation and defense duties are rotated amongst all of the members. In addition government extension agents continue to visit campesinos in remote rural areas, with one important difference: they go armed to defend themselves against the frequent ambushes.

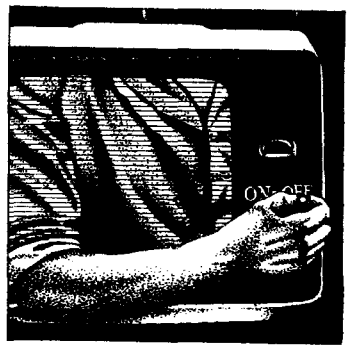
Source: Most of the information in this note comes from an article in *La Barricada* (6/27/83) entitled "Economic Effects of Aggression."

—Peter Rosset
—information from La Barricada, *6/27/83*

FLOC Newspaper Campaign

The Farm Labor Organizing Committee (FLOC), by now familiar to regular readers of *SftP* (see *SftP* 11:3; 13:1;14:1), is currently in its fifth year of building the nationwide boycott of Campbell's and Libby's products. This boycott supports FLOC's strike against tomato fields contracted to these processing companies in Ohio. FLOC is demanding the right to participate in crop price negotiations between the processors and the farmers, which determines whether farmers in turn are able to provide decent wages and working conditions for farm labor. This past summer, more than 50 FLOC members marched 560 miles from Toledo, Ohio, to Campbell's headquarters in Camden, New Jersey to demand justice. This fall FLOC is focusing on raising funds to take out full page ads in the 10 largest newspapers in the U.S., to publicize both the boycott and FLOC's childrens campaign which seeks to raise public awareness of the continuing widespread use of child labor in the fields. The goal is $200,000 by the end of 1983. FLOC requests the help of all concerned people in raising funds, and yes, this includes donations! Write to FLOC; 714½ S. St. Clair St.; Toledo, Ohio; 43693 (ph: 419-243-3456).

Video Game Brands OSHA "Workers Enemy"



Well, the makers of offensive video games have done it again, this time taking a crack at the notion of occupational health and safety. The game in question, "Hard Hat Mack" pits Mack, "a real working class hero" against OSHA, Mack's "arch governmental enemy."

In the game, manufactured by Electronics Arts, Mack the worker is trying to do some "honest hard work," in the words of the advertising campaign, constructing buildings in "record-breaking time," only to be penalized by OSHA. The game, and its accompanying advertising campaign present the view that OSHA, the governmental agency responsible for ensuring a safe and healthful workplace, is actually an enemy of workers. But as the Bay Area Committee on Occupational Safety and Health (BACOSH), in Oakland, California has pointed out, as well as perpetuating the labeling of OSHA as the enemy of workers, the game will teach children who play it only that OSHA (an unexplained acronym) is evil.

AGRICULTURAL RESEARCH AND BREAKING THE CYCLE OF DEPENDENCY

by Robert Ambrose

We are countries with economies destroyed by the actions of imperialism, which has abnormally developed the industrial or agricultural resources necessary to complement its complex economy. "Underdevelopment," or distorted, development, carries with it a dangerous specialization in raw materials containing a threat of hunger for all of our people. We, "the underdeveloped," are those of the single crop, the single product, and the single market.[1]

—Ernesto Che Guevara

On June 18, 1983, the multinational chemical producer FMC, Inc., sponsored a symposium in Nicaragua's luxurious Intercontinental Hotel in Managua to promote their nematicide Furadan. Agricultural technicians from both the state and private sectors attended the conference and enjoyed elegant food, drink and lodging at the expense of FMC, leaving with a greater understanding of Furadan as well as an assortment of gifts bearing its name: hats, pens, decals. Three days later eighteen farmworkers on a Nicaraguan state-owned plantation were severely poisoned as they applied this nematicide without observing proper safety precautions.[2]

These events are part of a pattern that illustrates a technological dependency that permeates Nicaragua's agricultural infrastructure, a dependency that continues in spite of the sweeping social and economic changes rendered by the Sandinista revolution. This dependency manifests itself in three main characteristics: 1) an economy based on the sale of a few export crops on the world market 2) an absolute reliance on the import of technology used in the production process, and, 3) an ideological bias towards the use of these imported technologies. An analysis of technological dependency must begin with a study of the social role and origins of technology.

Bob Ambrose was a technical assistant to the Nicaraguan Ministry of Agriculture in the Matagalpa/Jinotega region. He is a member of the New World Agriculture Group and a Science for the People activist.

The Origin of "Advanced" Agricultural Technology

Modern agricultural technology developed at the beginning of this century when chemicals were discovered that seemed to control effectively insect and disease pests. However the use of these chemicals began before there existed a clear understanding of the ecology of agroecosystems, and the common and apparently successful use of these "cures" seemed to obviate the need for this understanding. As a result, as the century progressed the use of agrochemicals became increasingly more extensive.

The evolution of this technology involves a fundamental change in its control, passing from the hands of the farmer towards those of the burgeoning agrochemical companies. From that point in time, the development of agricultural technology took as its basis an economic structure. This change in control resulted in a correlated change in agricultural research: its focus became a search for new chemicals to be marketed. Instead of using biological and ecological knowledge to design methods of cultivation, research took on a strategy of developing technologies that would require an economic transaction for their transferal. In other words, research priorities became those that included the promise of profits for the agrochemcial companies.[3]

Agrochemical companies realized the importance of agricultural research in the formation of agricultural practices, and began to intervene at the institutional level to insure that research programs would maintain their focus of profitability. They accomplished this intervention by using their financial resources to become the principal source of research funds in the United States university system. The United States government, working alongside of major capital interest groups like the Rockefeller and Ford Foundations, helped to establish this research structure and to spread it worldwide through "aid" institutions such as the State Department's Agency for International Development (USAID).[4]

The Creation of Dependency

The major capitalist countries have had the appropriate tool to introduce their technology throughout the world: economic imperialism. It is clear that in the underdeveloped world the economic interests of capitalism are inseparable from the agricultural technology it installs as a part of economic penetration. "Advanced" agricultural technologies, in fact, offer a double profit for capitalists when exported to the Third World:

1. Profits reaped through the sale of products such as fertilizers, pesticides and "improved" seed.
2. Profits produced as the result of increased yields of export crops with the use of these products, since the market of export crops is controlled by transnational capital.

The United States and other capitalist countries established enormous plantations of banana, coffee, cotton, cocoa and rubber in Latin America to exploit their lucrative world markets. In order to maintain high yields from these monocultures, "advanced" or "high-technology" cultivation programs were required, and were duly provided by transnational agrochemical companies. As the economies of most Latin American countries based themselves on the sale of these crops, a strict dependency towards the consumer countries' markets developed. At the same time, a dependency on the imported agricultural products necessary for intensive production also developed.

In order to maintain the monopoly of this capital-intensive technology, with the dependency it generates, the United States and other capitalist countries allocated sufficient financial resources to build educational/research centers throughout the Third World. The Ford and Rockefeller Foundations, with the help of USAID, established the prestigious Latin American research centers: CATIE in Costa Rica, CIMMYT in Mexico, and CIAT in Colombia.[5] While it may seem that the research these institutions produce is independent and derived from the experiences and ideas of Latin American scientists, their clear purpose is to project the ideas of capitalist technology. The ideology produced at these institutions, therefore, is completely dependent on the ideas created at homologous institutions in the United States and other developed countries. This third level of dependency assures that the focus of agricultural research in the underdeveloped world remains in the interests of transnational capital.

1900-1960: Setting the Research Foundation

In order to understand the legacy of agricultural research in Nicaragua, it is necessary to view its development in the socioeconomic and sociopolitical context in which the country has evolved. Only from this perspective is it possible to comprehend the class character that has been incorporated into research.

The first major agricultural incursions in Nicaragua occurred in 1889 and 1900 as the United Fruit Company and the Manhattan Rubber Company established their first large plantations.[6] These investments came as the national coffee elite emerged to be a national power, taking control of the government as the Liberal Party with General Jose Santos Zelaya in 1893.[7] With the aid of a U.S. military intervention, the traditional oligarchy regained power in 1910, only to be challenged once again by the coffee elite in 1911, led by Benjamin Zeledon. U.S. occupation lasted until 1925, when it appeared that the oligarchy's Conservative Party had regained control. But nationalist liberal forces provoked the Constitutionalist War, which resulted in the termination of the oligarchy as an important power in the country despite another armed intervention by U.S. marines.[8] Led by General Augusto Cesar Sandino, the Anti-Imperialist War for National Liberation was born as a challenge to the liberal coffee elite, who tried to consolidate power by accomodating U.S. economic interests in the country. This land-holding class only succeeded in solidifying their control after the expulsion of the marines by Sandino's forces and the subsequent assasination of Sandino and the annihilation of his army in 1934 by the U.S. trained National Guard, led by Anastasio Somoza Garcia.[9]

The world economic depression of the 1930s caused the collapse of Nicaraguan coffee exports, virtually the only major export crop of the time, clearly demonstrating the binding dependency that had developed between the agroexporting bourgeoisie and the capitalist world market.[10] The wounding of the coffee bourgeoisie helped the Somoza clan consolidate its economic power in the country.

United States agricultural penetration in Nicaragua resurfaced in 1942 as the U.S. searched for strategic raw materials to support its participation in the Second World War. The two countries signed a treaty whose objective was to promote the cultivation of crops such as rubber, cotton, palm oil and hardwood trees.[11] Two Atlantic coast research stations were formed as a result of this treaty: El Recreo and Cukra Hill. In 1950 another accord was signed in which the United States agreed to aid the formation of the Nicaraguan Departments of Agronomy, Horticulture, Agricultural Extension, Cattle and Forestry.[12]

Agricultural education was also in the realm of U.S. control, as the Department of Vocational Education was assigned a North American advisor. Until 1965 the only agricultural education available to Nicaraguans was equal to a vocational high school training, and graduates were called *tecnicos medios*, literally translated as "half" or "medium" technicians. It was not until 1958 that college level training was offered.[13] The prototype of technicians produced, always under the supervision of North American advisors, possessed an acritical ideology, separated from reality and protective of the status quo. In other words, the goal of agricultural education was not to understand the problems faced by Nicaraguan farmers; its function was to facilitate the

Continued on page 30

Breaking the Circle of Poison

THE IPM REVOLUTION IN NICARAGUA

by Sean L. Swezey and Rainer Daxl

Now we're close to Leon. Liberated territory.
A burning reddish-orange light,
like the red-hot tip of a cigar.
Corinto:
the powerful lights of the docks flickering
on the sea.
And now at last the beach at Poneyloya and the
plane coming in to land
the string of foam along the coast gleaming
in the moonlight.
The plane coming down. A smell of insecticide.
And Sergio tells me: "The smell of Nicaragua!"
Ernesto Cardenal[1]

On the eve of the victory of the Popular Sandinista Revolution in Nicaragua on July 19, 1979, Nicaraguan Minister of Culture Ernesto Cardenal wrote this account of his return to Nicaragua from exile in Costa Rica. While the struggle against the Somoza dictatorship was nearing conclusion, the smell of insecticide so common to the Pacific plain of Nicaragua remained as testimony to a continuing struggle taking place in agriculture in liberated Nicaragua. It is the historical struggle of a traditionally pesticide-dependent agro-export economy to free itself from an exploitative and costly imported technology.

Sean Swezey is a professor in the masters program in integrated pest management at the Autonomous University of Nicaragua at Leon.

Rainer Daxl is an advisor to the Nicaraguan Ministry of Agriculture.

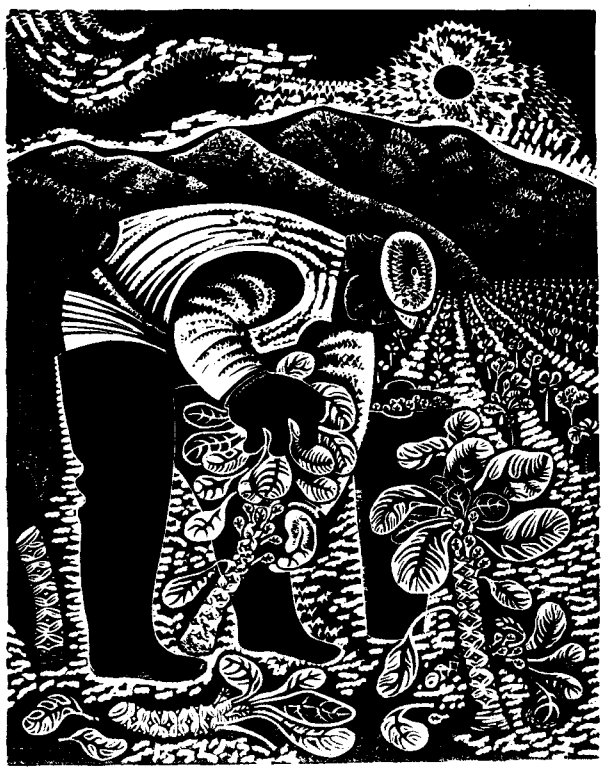
Historical Introduction

In the mid-twentieth century, intensive cotton agriculture was developed in Nicaragua. Coffee, which accounted for about 50% of agricultural exports before 1950, was displaced by cotton, whose area of cultivation rose from 15 to 250 thousand hectares between 1950 and 1973.[2] From 1961 to 1967, seedcotton yield in kg/hectare rose by nearly 25% per year, and in 1971, Nicaragua was the fifteenth largest producer of cotton in the world, ranking fifth in average yield at 947 kg/ha (almost twice the average production per hectare of the United States for that year). Cotton constituted over 40% of the total value of Nicaraguan exports, consistently the largest percentage of any Central American economy.[3]

The expansion of cotton planting involved the legal, political, and even ecological expulsion of small landholders, tenants, and peasants from lands on the Pacific Coast suitable for cotton cultivation. This "clearing" of the land was accomplished by the expulsion of tenants and sharecroppers from national lands, fraudulent seizures and foreclosures of small landowners, programs of "agrarian reform," relocation of farmers to the Atlantic Coast, and concentration of credit and technical advising on *latifundios* (large farms greater than 200 manzanas in size). Consequently, a large landless class of rural workers was formed, functioning as a labor reserve for the December to March cotton harvest period. Between 1952 and 1967, the cotton area expanded 400%, while cropland dedicated to food grains (corn and beans) by small producers in the cotton-growing area dropped over 50%[4]. By the mid-1960s cotton was cultivated on 80% of the total arable land of the Pacific Coast (40% of all cultivated land in Nicaragua).[5]

The Pesticide Treadmill

As cotton production expanded, so did the use of a myriad of insecticides. Chemical insecticides were imported into Nicaragua by multi-national corporations



CPF

such as Bayer, Monsanto, Hercules, Shell, American Cyanamid, Dupont, Union Carbide, and ICI. By 1965, Nicaragua was importing over 19 million kilograms of insecticide at a cost of over 10 million dollars per year. Eighty-seven percent of this imported pesticide was used in cotton agriculture.[6] Forty percent of all U.S. pesticide exports were sold in Central America by the mid-1960s, and Nicaragua was turned into a testing ground for insecticide formulations not approved for use in their country of origin.[7]

But the miraculous properties of these pesticides were short-lived. by the 1965-66 season a decade of heavy insecticide use had increased the number of economically important insect pests from five to nine.[8] Yield fell 11% from the previous year's high and this trend continued for three more years until 1970. In the late 1960s, the average yearly number of insecticide applications has risen from 5-10 in the mid 1950s to 28 (literally an application every 4 days) and in extreme cases some fields were being sprayed as many as 35-50 times a season. Insect control costs were more than 32% of total production costs for the year 1968.

The Nicaraguan cotton latifundistas had become trapped on the "pesticide treadmill," a syndrome re-enacted in pesticide-dependent cotton cultivation throughout the world.[9] Several cotton pests had evolved resistance to the insecticides, while populations of beneficial predators and parasites, "natural enemies" of insect pests, were devastated every year by the increasing insecticide applications. Cotton growers responded to this alarming chain of events by applying more insecticides, at higher doses and shorter intervals. The "treadmill" had been put into motion. The more insecticides were applied, the more they were needed to stem the tide of the ecological disruption they caused.

Social Costs of Pesticide Use

In 1965, DDT became ineffective against the mosquito vector *Anopheles albimanus* in the cotton-growing regions of Leon, Chinandega, and Managua. In 1970, the transmission of Malaria in Nicaragua reached its highest recorded level ever—28,500 reported cases. During the years 1962-1972, more than 3,000 pesticide poisonings occurred annually among Nicaraguan farmworkers.[10] Health hazards were increased by cotton worker illiteracy, unfamiliarity with the hazards of insecticides, close proximity of workers' housing to treated fields, and contamination of food and drinking water.

In 1977, a United Nations report estimated that insecticide-caused environmental and social damage had a total yearly economic cost of 200 million dollars to Nicaraguan society, while foreign exchange earned for cotton amounted to a maximum 141 million dollars in 1973.[11] The economic disaster of the cotton industry and its concentration and reliance on imported insecticide technology had as its "hidden cost" an environmental and human health disaster of immense proportions.

In the face of the economic crisis of the cotton industry and the declining availability of foreign exchange, a movement among growers, agronomists and field technicians slowly began to take shape. In 1967 a USDA scientist, George D. Peterson, and a group of Nicaraguan technicians, initiated the first stage of the Integrated Pest Management (IPM) movement: the evaluation of the problem and the collection of the basic information which formed the basis of the integrated control concept in Nicaragua. The United Nations Food and Agriculture Organization (FAO) funded a program to initiate an experimental design for an IPM project in Nicaragua's cotton-growing regions. Dr. Louis A. Falcon, professor of entomology at the University of California, Berkeley, was appointed by FAO as IPM specialist.

The IPM philosophy makes maximum use of naturally-occurring insect controls, using biological, environmental, cultural, and legal methods in a complementary fashion. IPM holds the use of chemical tools to a minimum, and when pesticides are used, they are applied only when indicated by a careful survey of the insect populations in the field under consideration. Insect populations are continuously monitored, and control measures are taken based on specifically calculated economic thresholds (i.e., levels of insect damage at which losses occur), rather than mere pest presence or calendar date.

The IPM philosophy rapidly became accepted in Nicaragua, especially among large cotton growers who quickly grasped the profit implications of these tech-

niques. While Nicaragua reduced its overall pesticide consumption in cotton by approximately one third in 1972, El Salvador and Guatemala, which had no equivalent national IPM program, increased their use by the same amount during the first half of the 1970s.

During the latter half of the 1970s, a reversal of this trend occurred in Nicaragua. By 1976, insecticide imports totaled 25.8 million dollars, over double the pre-IPM levels of expenditure. More ominous was the instability of international cotton prices which entered into a depressed period from late 1973-1975, falling more than 40% compared to prices in early 1973.[12] IPM specialists considered the increase in pesticide use, especially its economic implications, a retrogression of the IPM philosophy.

The problem began when private producers did not offer the limited number of IPM technicians who graduated from the university programs adequate salaries. Thus, most technicians were forced to supervise more hectareage than they could adequately monitor.[13] In order to save the cost of the salary of a farm administrator, many producers required additional administrative tasks of IPM technicians, which took valuable time away from pest management decisions. Field scouts, whose technical expertise in monitoring pesticide populations is the working force behind the implementation of IPM programs, could not be adequately supervised nor their work carefully evaluated under these conditions.

Spiralling land rents, unregulated by the Somoza regime, rose from 300 cordobas per manzana in 1972-1973 to 844 cordobas in the 1977-78 season, making profit margins on rented cotton land more and more narrow.[14] This established an unequal competition between large landowners who could afford profitable IPM programs, and medium and smaller producers who could not afford technical advice due to short-term economic demands for labor and inputs. Frequently, the decisions of IPM technicians were countermanded by the farm owner under the pressure and misinformation of chemical company advertising and field salesmen who commonly dispensed hats, pens, watches and other advertising apparel along with free commercial information about the need for their products.

The concern with generating ever-increasing amounts of foreign exchange allowed the cotton pesticide treadmill to grind on, institutionalizing maximum yields and short-term profits rather than rational profit and reduced insecticide use advocated by IPM specialists. Some of the more prosperous cotton families also had financial interests in pesticide distributing firms, and had even bought the rights to registered trade marks or formulations, and built infrastructure such as landingstrips and warehouses to provide aerial spray services. The high degree of development of these productive forces ensured their inflexibility toward less chemical-intensive methods.

National IPM advising programs attempted to reduce insecticide use at the same time as bank loans were used increasingly to guarantee the availability of imported pesticide inputs to a concentrated group of producers who qualified for such loans. These contradictions were the structural impediment to the IPM programs attempted under the Somoza regime, the reality of an agricultural system whose rapid private profits were fueled by the sale and use of foreign insecticide inputs, producing a socially and ecologically exploitative system for the benefit of a small sector of Nicaraguan society.

Revolution and Transformation

During the period that IPM was losing ground, the popular forces of Nicaragua were rapidly advancing in their political evolution culminating in the war of liberation from the Somoza dictatorship in 1978-1979. These forces had responded to the corruption and brutality of the Somoza regime as well as the social inequalities of the agro-export economy. However, the final insurrection severely disrupted cotton production. During the last year of the war, 70% of the cotton production area went unplanted, and cotton yields slumped to a twenty year low. Cotton accounted for only 10% of the value of Nicaraguan exports in 1980.

After the revolution, the Somocista landholdings, which included many of the largest and most highly developed cotton farms, were nationalized. The reorganization of the cotton industry was not an easy task. Post-war consolidation of production in the state sector has been affected by: the scarcity of trained personnel and administrators to manage the huge area of expropriated landholdings (approximately 20% of the cotton-growing area in 1981); the shortage of foreign exchange to secure adequate inventories of pesticides and fertilizers; and the slow process of inventory and reorganization of

productive apparatus (tractors, trucks, cultivators and irrigation equipment), much of which was decapitalized or damaged during the war.

The policy of the state cotton enterprises has been to raise production to its pre-war levels. This would establish the basis for effective and profitable production necessary for the improvement of living standards of farmworkers, and generate foreign exchange for the importation of critically needed raw and manufactured materials. This is not merely a technical problem, but also a process of political education and organization of workers who have achieved the right to increased wages, meals, and social services such as education and health care as a result of the revolution.

Despite these difficulties, the accomplishments of the state cotton farms in Leon have been encouraging. In the 1981-82 cotton season, state farms produced 4 quintales more seedcotton per manzana than private farms (32.98 vs. 28.71), countering the myth that the state farms are lagging in productivity.[15]

The Government of National Reconstruction (GRN) has given high priority to rationally rebuilding the cotton economy as a source of much-needed foreign exchange. The technical advances in integrated control made during the last decade of the Somoza dictatorship now have an economic environment favorable to their widespread implementation. The economic goals central to the program of the GRN, including efficient use of foreign exchange, increased agricultural productivity, and improved worker health and safety are goals shared by the philosophy of IPM.

The state now manages 20% of the country's cotton lands in the People's Property Area (APP), most of which have highly developed infrastructure including roads, airstrips, and warehouses. Cotton land rent has been slashed to a regulated rate of 300 cordobas per manzana as an incentive for production. The use of bank loans is monitored so that funds are used for purchase of inputs (for example, fertilizer, pesticides, seed, equipment, etc.). This policy has eliminated outside speculation with bank loans on "phantom" hectareage so common before the revolution. A set government price of seedcotton is offered before planting, as an incentive for restraint in the use of inputs. The government price acts as a subsidy against losses in marginal years and regulates profits in productive seasons. Productive land left unplanted can, under the Agrarian Reform Law, be nationalized into the state lands system or deeded to farming cooperatives.

In order to generate foreign exchange, cotton is considered a short-term alternative superior to coffee and beef which are longer-term investments. Before the revolution cotton was considered an economically and ecologically exploitative crop. It enriched the upper class and dominated productive relationships in the countryside through the displacement of small landholders and the creation of unhealthy living conditions for the farm labor force. Under a socially and environmentally rational political system, cotton agriculture can be transformed into a productive generator of foreign exchange. As such, cotton agriculture will now be used as the basis of *social capital* for the benefit of all sectors of the agricultural economy.

It is well recognized that the implementation of IPM is essential to the profitability of cotton agriculture. Insecticide costs continue to be the most critical factor in cost control, but are also amenable to significant reductions, as IPM programs have demonstrated. The National Committee on Integrated Control began its work by: (1) recommending area-wide economic threshholds for key cotton pests, and (2) releasing a list of 18 effective insecticides for these pests. The Committee selected the most appropriate insecticides based on their effectiveness, safety, price, and environmental impact in IPM programs. Since the revolution, all insecticides are now imported through the Empresa Nacional de Insumos Agricolas (ENIA), a public office advised by the Committee. As a result of this action, the number of common-name insecticides imported into the country for cotton agriculture was reduced by 75%, contributing to a de-commercialization of insecticide choice.

At the same time, the Nicaraguan Ministry of Labor banned the importation for agricultural use of the insecticides DDT, benzene hexachloride (lindane), leptophos (phosvel), and the nematocide dibromochloropropane (DBCP), which are prohibited for agricultural use in the United States due to their human health hazard. A national pesticide regulation act, which includes the prohibition of the formulation, manufacturing, or handling of any pesticide banned in its country of origin, is now being prepared by a MIDINRA committee and is under review by the National Committee on Integrated Control.

The Cotton IPM Program

Essential to the success of cotton pest management is between season control of the key pest, the cotton boll weevil. To avoid population carry-over in cotton stalks where the beetles remain between growing season, cotton stalks must be destroyed. Nationwide crop residue destruction laws have been implemented and producers who do not comply are fined. In addition, regional programs maintain a system of small, post-harvest "trap crops" (cotton stalks that are not destroyed), which occur at a density of approximately one trap crop per manzana. The trap crop attracts boll weevils which are destroyed daily by insecticide application. In early May, a month or two before the commercial crop is planted, a second trap crop is planted adjacent to the stalks. This "living" trap crop, which is more mature throughout the growing season than the commercial crop and therefore attractive to the weevils earlier in the season, is sprayed periodically. Early population build-up of the boll weevil is suppressed saving future insecticide applications.[16]

The trap-crop approach was investigated by the FAO project in the mid-1970s, but was never generally implemented due to the indifference of private producers.[17] MIDINRA pest manager Ivan Gallo revived these techniques on a state farm near Leon in 1980. The use of early-season trap crops reduced subsequent pesticide applications by 30%, and produced a cotton yield nearly 15% higher than that in fields which received nine more insecticide applications and were not originally trap-cropped.[18]

Within the trap crop program further reduction in pesticide applications may be brought about by the use of non-disruptive biological control techniques. These techniques include: the mass release of laboratory-reared parasitoid *Trichogramma* which attacks the eggs of lepidoptrous pests; the application of the bacterium *Bacillus thuringiensis* to control the cotton leafworm and beet armyworm; and the application of the nuclear polyhedrosis virus (NPV) to suppress *Heliothis zea* (the cotton bollworm). Chemical insecticides are used only when and where necessary.[19]

While the initial results have been promising, these techniques (especially trap-cropping) requre area-wide implementation for success because pests are widely distributed and highly mobile. State implementation of regional IPM programs began early in 1982, when MIDINRA approved a 24,000 manzana pilot trap crop program designed on more than half the cotton area of Leon. This is the largest single-season mobilization of private and public resources for IPM in cotton ever undertaken in Nicaragua. The program trained more than 180 farmworker-scouts to supervise the management of 6,000 trap crops and relied on a network of several hundred trained workers to survey and control the boll weevil in the field. Popular participation and decentralization of the IPM process has been firmly set in place through this program. The combined effect of the large-scale boll weevil suppression and the IPM program delayed the first broadcast application of insecticides an average of 3 weeks, compared with non-trapped controls. The suppressed population buildup of boll weevil eliminated 5-6 pesticide applications in the trap-cropped area. Subtracting program costs, a net savings of 2 million dollars in imported insecticide costs was made in the area in 1982.[20]

Due to the success, the program is being expanded to cover 80,000 manzanas in 1983 (½ of the projected national cotton hectareage) and nationwide trap crop programs are a goal set for the near future. The trap-crop program, staffed by public employees and technicians, is implemented as an area-wide service to state farms and private producers, who are charged a portion of the cost of the program, depending on the area of their lands planted to cotton. Growers are thus not required to plan trap-crop maintenance, and all producers in the area have participated in the program financing in order to unify efforts to control the boll weevil.

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Conclusion

The popular democracy of post-revolution Nicaragua has allowed, for the first time, the ecological problems in agriculture to be evaluated with concern for the future direction of agricultural development. Undoubtedly, cotton will remain an important crop in the future for the generation of foreign exchange. In addition, regional planning and an organized workforce make IPM in export crops, such as cotton, as well as basic grains, such as corn, export beans, and rice, an achievable goal as well as an economic imperative. Reduced pesticide use will also allow the reestablishment of stable corn and grain agriculture in the cotton regions, either as irrigated rotation crops in the dry season or small-producer plantings during the rainy season. Increased food production in the cotton-growing areas is part of a national goal for food self-sufficiency, and was previously precluded by ecological disruption and economic concentration.

IPM is a system more amenable to local forms of decision making. This is because of its skill-intensive techniques which include: insect monitoring; directed control strategies; mass-rearing and release of natural enemies; and coordination of regional programs integrated through a structure of university trainees, state and private technicians, and rural workers. It is a system which relies on the human capital of knowledge, training, and organization, as much as the penetration of new forms of technology. For these reasons, it is a system less susceptible to manipulation or domination by capital. The Nicaraguan IPM movement continues to demonstrate that the forces for stopping the pesticide treadmill can be organized within any country and do

not require a highly technical base. The process requires mass basing of the IPM philosophy within an economic and political system which promotes its logic.

On December 1, 1981, at the inauguration of the International Conference on Agrarian Reform and Farmworkers Movements, Commandante Jaime Wheelock, minister of MIDINRA, urged the Nicaraguan workers to break the ties to external domination which have in the past prevented Nicaragua from controlling its costs of production of agricultural goods. Integrated Pest Management is a vital part of this transformation —an agrarian reform in which Nicaragua profits from the more efficient and self-sufficient use of one of its most productive resources: the people and their organized will.

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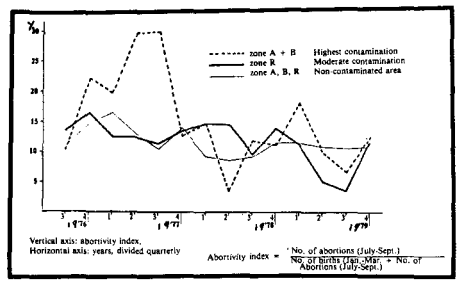
SEVESO ARTICLE ADDITIONS AND CORRECTIONS

(Continued from Newsnotes, page 4)

On page 21, the second line of the first paragraph refers to Figure #4, which is printed below:



The second paragraph on page 21 refers to tables 1 and 2, also omitted in the original.

Table 1 Number of birth defects in the Seveso area

Year	Born with defects (#) (Old notification system)	Born with defects (#) (Registry)
1973	2	—
1974	5	—
1975	3	—
1976	4	—
1977	37	92**
1978	53*	146
1979	—	168
1980	—	127

* This number refers to the period January-June
** This figure is based on a retrospective estimate since the registry started operating in 1978.

Table 2 Number of birth defects detected through the registry according to type and year of occurence

Year	Total #	Cutaneous	Non-cutaneous
1977	92	25	67
1978	146	48	98
1979	168	87	81
1980	127	68	59

The 2nd column, 2nd paragraph, 3rd line should read: "A recent review of the work of the Atomic Bomb Casualty commission of Japan stressed that: 'In emergency situations, the development of research activities is not of the sort of a definite research protocol . . . [but] it represents an adaptative process dependent from many factors, few of which can really be labelled as scientific.' "

And finally, also omitted were references and acknowledgements: Most of the information in this article is derived from two special issues of the Italian magazine "Sapere": 1) "Seveso: un crimine di pace," *Sapere* (1975) #796; 2) "Seveso: sei anni dopo," *Sapere* (1982) #848; 3) Norman C., "Vietnam herbicide legacy," *Science* (1983) 219:1196; 4) Poland A., Kende A., "Tetrachlorodibenzo-p-dioxine: environmental contaminant and molecular probe" *Fed. Proc.* (1975) 35:2404.; Abelson, P., "Editorial," *Science* (1983) 220.

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TRAIL BLAZING ON THE ATLANTIC COAST

A Report on the Health Care Brigadistas in Nicaragua

by Mary Elsberg

In 1981, Popular Health Campaigns (JPS) were implemented throughout Nicaragua. People were chosen to work as health-care brigadistas by their local communities. They were trained in health training sessions held periodically at the regional health center. The first training courses for the brigadistas were held in some of the larger rural villages in South Zelaya, shortly after the triumph of the Sandinista Revolution (July 19, 1979). The courses, attended by representatives from the surrounding villages, were carried out independently, on the initiative of the rural doctors. Designed to create a support network for their work in the communities, the courses also provided basic information about environmental hygiene, nutrition, etc. These courses were of great importance in motivating the communities to improve their health conditions and to participate in health programs. At the same time, the experience provided a basis for defining a health strategy for the region.

JPS helped to unite large sectors of the population which previously had not been organized. These campaigns also served to promote the Popular Health Council at regional and municipal levels, marking the first opportunity for mass participation in health activities such as vaccination, sanitation, and anti-malaria campaigns. The JPS have also played an important role in increasing regional organization by providing a pool of participants many of whom later joined one of the other mass organizations such as local Defense Committees and Sandinista Youth.

While the health campaigns had their greatest impact in the cities, they were perhaps more important in rural Nicaragua, where a majority of the population lives. Such rural areas presented special difficulties. In particular the area of southern Zelaya, on Nicaragua's rainy Atlantic coast, is one of the most isolated and underdeveloped areas of Nicaragua. There are no roads, and a single house might be two or three hours from the next. Under such conditions, new and creative strategies had to be developed, ones that would allow for maximum community participation.

The minimal services which could be provided to the rural communities were hardly an adequate response to the grave health problems which plague the campesinos. A different strategy was called for, one that would allow the community to participate in the analysis and solution of their problems in a conscious and ongoing manner. Based on the earlier experiences of the health brigadistas, a plan was drawn up for the systematic training of brigadistas throughout the region using popular training methods.

The Brigadistas: The great majority of the brigadistas (85%) are Spanish-speaking campsinos who migrated from the Pacific interior in the last twenty years. There is also a small number of Miskitu, Sumu, and English-speaking brigadistas. Sixty eight percent of them recently learned to read and write in the National Literacy Crusade, or have less than a third grade education. Of these, 28% participate currently in the Basic Adult Education Program. Sixty percent are less than 30 years old.

There are presently 190 primary health care brigadistas, representing 135 communities, or one brigadista for every 232 inhabitants. In addition, most brigadistas have organized Popular Health Councils in their communities, usually with 5-10 members, which bring the total number of persons participating in health activities in the rural area to about 600. This year a new program was initiated for training and technical support of the traditional midwives working in the rural villages. So far, 40 traditional midwives have participated in workshops on childbirth.

Mary Elsberg has been in Nicaragua since 1980. She participated in the literacy campaign in native languages on the Atlantic Coast, and is currently in charge of popular health education in South Zelaya.

Lack of modern medicines creates the need for alternative medicines. Here health care brigadistas display medicinal herbs collected locally.

Popular Health Training: The key to the success of the brigadista program has been the health training workshops, conducted at regional health centers, in which brigadistas participate periodically. In the workshops, brigadistas learn about preventive as well as curative medicine. They learn how to vaccinate, build latrines, and to prevent disease through improved nutrition and hygiene. They also learn first aid skills, and how to treat common diseases such as malaria, diarrhea, parasites, and skin diseases. Each brigadista, after completing his or her basic training, receives a first aid kit and is supplied periodically with eight basic medicines. Most importantly, the workshops serve as an opportunity for the health team and the brigadistas together to discuss the problems facing their communities, to analyze the economic and social causes of the problems, and to look for solutions in which the community itself can participate.

The teaching methods used encourage creativity and initiative as well as develop organizational and teaching skills. In fact, small groups of brigadistas often study different subjects and then teach each other what they have learned, using theater, demonstrations, puppets, stories, and poems. But perhaps the most important objective of the workshop is to promote, among the brigadistas, an understanding of their work, not as an isolated program, but rather as an integral part of the Revolution's overall strategy to improve the lives of the Nicaraguan people.

For the brigadistas' work to significantly transform health conditions in their communities, they are taught to be concerned with promoting the economic and political transformations which will make improvements in health conditions possible. At the present, when Nicaragua is confronted with the threat of invasion, and while North American-sponsored counter-revolutionaries are spreading terror throughout the countryside, the brigadistas' efforts acquire a new significance. Their sacrifice has made them targets for the counter-revolution. By continuing to promote health in their communities, they risk their lives, but renew their revolutionary consciousness. The following is a first-hand report on the brigadistas from Southern Zelaya:

Report from a Health Training Workshop

It is the night before the workshop begins in Tortuguero, and the brigadistas are beginning to arrive. Some of them have come paddling up the Kukarawala River in dugout canoes. Others, who have to wade through swampy jungles two or three days to get to the health center have not arrived yet. The brigadistas are enthusi-

Regular visits by brigadistas make health care available to rural people for the first time in their lives.

astic because they have not seen each other in months. The immediately begin to exchange experiences. Aniseto complains for the fiftieth time that he could not read the doctor's writing on the invitation and was not sure what day to come. "He always forgets that we just learned how to read and write in the Literacy Crusade, and that we can't understand his fancy writing." He came anyway, just in case, "because it would be better to make an extra trip than miss the workshop." Alfonso tells the others how he had to come through the bush, breaking trails, because the Contra (counter-revolutionary bands) killed two people last week in his village, and he heard that they were waiting for him on the trail.

After a night on the wooden floor of the schoolhouse, and a breakfast of rice and beans, the brigadistas are ready to begin. There is a small ceremony inaugurating the workshop, in which the doctor, nurse, and health educator participate, along with the new delegate of the FSLN for the area. (The previous delegate, Noel Ortega, was assasinated in November, 1981 by counter-revolutionaries, just prior to a brigadista workshop. On that occasion, the brigadistas had to take turns studying, while others stood guard.)

Altogether there are about sixty people including many new faces. In addition to the brigadistas who coordinate health activities in the community, members of the Popular Health Comission of each community were invited to participate in the workshop. Several communities, like Cano Silva, which is about two days by foot from Tortuguero, sent their entire Health Commission.

Reports from the Bush

The first activity is a group evaluation of the work the brigadistas have done in the last three months. The group divides into squads, according to their communities. After choosing a name for the squad (after a martyr from the region, killed while serving the country), and electing a coordinator, secretary and "resource monitor" (in charge of getting materials for the group), the brigadistas begin to discuss questions about their work, problems they have had, and possible solutions. When they finish, a plenary session is held to discuss their conclusions.

HEALTH CARE CONFERENCE IN NICARAGUA

The largest group of North American health professionals ever to visit Nicaragua will be teaching in Managua the week of November 21, 1983. The occasion is a major conference on Public Health Services and advances in medical care. The 120 member group is drawn from 20 different U.S. states and consists mostly of physicians but also has representation from nurses, and laboratory technicians. The government of Nicaragua has expressed its endorsement through the Ministry of Health and the Nicaraguan Federation of Physicians. The Pan American Health Organization (PAHO), the American Public Health Association (APHA), and the American Medical Student Association (AMSA) have also endorsed the conference which will be attended by at least 600 Nicaraguan health professionals.

This activity is part of a campaign by a North American group, the Committee for Health Rights in Central America (CHRICA), to develop a dialogue with health professionals in Latin America.

Advances in nutrition, health education and the provision of health services in Nicaragua since the defeat of Somoza have been documented in the *New England Journal of Medicine*, the American Public Health Association's *The Nation's Health*, and elsewhere. Despite these advances, serious limitations of highly trained medical personnel, of medicines, medical supplies and equipment, and of resources for continuing education of medical providers remain. The Nicaraguan Ministry of Health has recognized the need for technical assistance and material aid in these areas, and has received substantial international support from European and Latin American governments as well as the World Health Organization. The United States government aid has dropped to 1% of its former levels, making the work of American voluntary agencies and organizations critical.

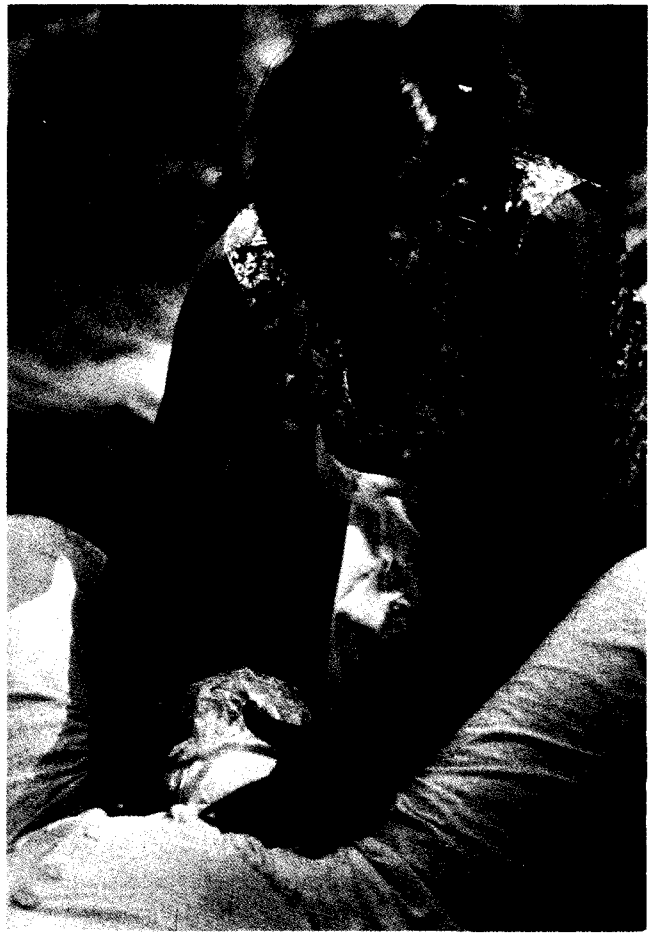
The Committee for Health Rights in Central America put out a call for 40 health professionals to participate at their own cost in this first United States-Nicaragua Health Colloquim. Over 170 applicants responded, eager to share their medical knowledge and to obtain first-hand information about the direction, accomplishments, and problems of the Nicaraguan public health services. □

The brigadistas have a lot to report. Many communities are building latrines with the tools that the Health Center lent them. Next month they will have to turn them over to another community so they too can promote latrine-building. Many brigadistas have cleared trails and built log bridges, and nearly all have been giving talks in their communities on breastfeeding, nutrition, hygiene, and other subjects. Now that the rainy season has begun, a lot of sick people have been arriving to receive treatment for worms, malaria, diarrhea, and skin diseases, which are particularly bad at this time of year. Last month Felipe saved the life of a man who had been badly wounded, by stopping the bleeding and carrying him on his back for twelve hours to Tortuguero where he could receive medical attention. José tells how he delivered his first baby, "what else could I do? There she was all alone, giving birth, with no one to help her."

Most of the brigadistas repeated the last workshop they participated in with members of the Popular Health Commission in their community. Bernabé even brought a detailed account of the issues discussed in the workshop and the questions people asked, so he could take the answers back to them for their next meeting.

The brigadistas had done a great deal in the last few months, but there have been some serious problems as well. Right now the Contras have been active in the area, and the brigadistas are a special target. Juan Reyes was shot in the leg last month and told he would be killed if he reported it. A brigadista from another community found out, and came every day to treat Juan's wounds until he could get word to the doctor. Many brigadistas have had their first aid kits robbed by the Contra and have been warned to stop working. Arnulfo from Sultagne explained that he keeps his medicine hidden in the bush, so that luckily when the Contra came to rob him, they could not find anything. Esteban Perez from Waspado told how he was attacked and robbed two times, once in his home, and another time on his way to the health center. He was warned that he would be killed if he tried to vaccinate his community. Everyone is very moved as he recounts how he escaped to Tortuguero by a different route and returned to vaccinate Waspado before the Contra found out. Most of the brigadistas are afraid but none have mentioned quitting. They realize how much their communities depend on them, and do not want to let them down.

A major complaint of the brigadistas is that they need more medicines, since what they have runs out too quickly, and it is difficult to return to the health center for more. There is also talk of having better control over the medicine, to make sure it does not get into the hands of the Contra. One brigadista did a census in his community and found that every family but one was affected with leishmaniasis, or mountain leprosy. He and the health team decided to carry out a special intensive treatment campaign in the village.



Practicing midwifery with the aid of obstetric pants.

One of the brigadistas criticizes the doctor harshly for not having arrived on the date he promised. Marcial had to walk six hours to meet him on the trail, and the doctor never showed up. Now everyone in his community is angry with him and says that he is a fake. The doctor apologizes profusely, but explains that it was not his fault; he had been delayed in one of the communities, and the ice chest did not hold out. All of the vaccine was lost, and he had to return to Tortuguero.

Many brigadistas still have problems getting their communities to participate in health-related activities. Fileno Rios from La Guitarra complains, "The people in my community are hard-headed, nobody wants to build latrines." Luciano also complains about participation in his community; he says that nobody shows up when he gives talks. Juan Pablo offers the suggestion to, "grab people when they are at church, and use theater and games to make the talks more fun." Everyone asks to review first aid skills, and to hear more about how to treat common diseases. Jose Santos confides, "You know, there's always someone who's sharper than me, and it's terrible not to know the answers to their questions."

Brigadistas practicing first aid.

Health Under Somoza

After finishing the evaluation, the brigadistas return to their squads to discuss a workbook, in the style of a comic book called *Health and Somocismo on the Atlantic Coast*. As they read out loud, the brigadistas discuss the causes of disease. At the beginning many say that people get sick because of "carelessness," or unclean habits. Shortly, however, they begin to analyze living conditions in their communities, such as the lack of drinking water and/or latrines, poor diets, and high illiteracy prior to the Literacy Crusade. They decide that all those factors affect their health as well, but that still does not explain why living conditions on the Atlantic Coast are so bad. As they continue reading, the brigadistas examine past economic exploitation by the North American and Somoza-owned companies. "It's true," says one, "before there were so many companies here taking away our lumber, bananas, and fish. With all the money they made off of our wealth, no one ever bothered to build schools or health centers for us." Someone else adds, "and they still won't leave us in peace. After all, the United States is supporting the counter-revolutionary bands that are giving us so much trouble."

In the end, the brigadistas conclude that the causes of disease are a lot more complicated than just "carelessness," and that they are closely related to the political and economic systems that people live under. After this historical analysis, it is not hard for the brigadistas to agree that the Sandinista Revolution was the first step towards improving health conditions.

Improving people's health standards will not be easy. "It's just like corn," says one, referring to his work, "first you have to plant it in order to reap it later on. Right now, we're barely planting our first crop." Another compares the brigadistas' task to trail-blazing: "We've already cut out the paths, now we just need to clear the brush in order to walk straight ahead." In *Health and the Revolution*, they read about the Ministry of Health's commitment to bring health care to the farthest reaches of the country, and the importance of popular participation in health programs. Someone comments, "The doctors can't do anything alone; we have to organize ourselves well if we're ever going to get ahead."

When they finish studying the workbooks, each squad was asked to give a presentation to the group which summarized their feelings about the subject. One group wrote a story about a village where everyone was sick and where nobody knew how to organize. When the Contra came to the village and took over, no one could stop them. Finally, some members organize the Militias and oust the Contra. After that experience the village realizes how important organization is, and they form a Popular Health Council, Adult Education Collectives, and a farming cooperative. These advances bring more unity, more production, and less disease.

The brigadistas practice diagnosis and treatment through role-playing, where some volunteers take turns acting out symptoms, while others give treatment and advice for the ailment. Afterwards, the group comments on the volunteers' responses, and how they could be improved. During one of these sessions, one of the brigadistas mentions that he knows a root that is very good for curing worms. In the discussion that follows, it turns out that most of the brigadistas have at least some knowledge of medicinal plants. In fact, many have been using them along side the medicine that they receive from the Health Center.

The coordinators of the workshop decide that this unexpected discovery is worth pursuing and divide the brigadistas into squads again, to compile lists of plants they know that can cure the most common diseases in the region. After compiling their lists, the brigadistas take some time to look in the bush for samples of these plants, which they then present to the group. They are delighted with this new project, and many refer to it as the best part of the workshop. At the end of the workshop the brigadistas promised to find more plants in their communities and bring them to the health center on their next visit.

In the closing period of the workshop, Aniseto speaks on behalf of the other brigadistas, saying, "these workshops are the only schooling I've ever received. Before the Revolution we never even got to learn to read and write, much less learn how to prevent diseases." He recalls the words of Noel Ortega, who was murdered by the Contra, "Every militia member should be a health brigadista, and every brigadista should join the Popular Militias," because, "that's the only way to defend the Revolution and to improve the people's health."

The next morning the brigadistas all set out again, each one on a different trail, each with renewed enthusiasm and a deeper commitment.□

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TOWARDS A PEOPLE'S SCIENCE

The Innovators Movement in Nicaragua

by Peter Downs

The technical and scientific revolution imples [that] the old concept of an educated elite and a mass of illiterate peasants and workers is bound to disappear. In simple words, science implies socialism. —J.D. Bernal

Science is *social relations. —Bob Young*

Sandinista Revolution has spawned a huge amount of interest in science and technology in Nicaragua. Adult education and popular health campaigns have increased everyone's awareness of science. Public discussion about development projects underscores popular interest in technology. People perceive that science, by virtue of its ability to multiply the productivity of human labor, has given millions of people in other countries the option of living in comfort. Nicaraguans want their children to have that same choice.

Poverty or Plenty

But the fruits of science are unevenly distributed. In the United States, millions of people still live in poverty, lacking heat and food. While doctors develop new artificial organs, many Americans cannot afford even basic health care.

The control of science is even more narrowly circumscribed than are it's benefits. Government and corporate research is often wrapped in secrecy. Scientists demand freedom from public scrutiny while claiming the ability to settle disputes over public policy "objectively."[1] Governments ignore democratic process and turn to the experts to make decisions solely on the technical criteria involved. Few people can gainsay such technical arguments, for few people are scientifically literate. Contrary to the optimism of J.D. Bernal, many are hardly literate at all. In Missouri, for example, officials estimate that 44 percent of the adult population is functionally illiterate.[2]

The contrasts are even more glaring in developing countries. In most such countries over 50 percent of the population is illiterate. Sophisticated electronic weaponry exists side-by-side with mass starvation. In Guatemala, for example, one-half of all deaths are deaths from hunger of children between one and five years of age.[3] Many reformist governments have tried to import technology as a way of developing the economy and improving the people's living conditions. They can purchase machinery and spare parts, but such things are manufactured elsewhere. Seldom can they purchase the training needed to permit their countries to build such things themselves. And purchased equipment is expensive. The only way such countries can obtain the dollars needed to buy such equipment is from foreign sales. But foreign trade is controlled by corporations based in the developing countries. So, the only things they can sell are those things on which the foreigners will make a hefty profit. That means that countries normally must concentrate first on importing technology that will increase exports, even though such technology may have little effect on the living conditions of the majority of the population. When export prices fall, as they have for at least the last decade, governments end up deeper in debt and the mass of people remain poor and illiterate.

The Sandinista government of Nicaragua is trying to break out of that straitjacket. Arguing that science should serve the people, it has gone into debt to provide people with the health care and education previously denied them. It has also begun to plan the development of the economy in accordance with the nation's needs and resources, instead of leaving it solely to the profit motives of foreign corporations.

Such policies have met with opposition from foreign investors, the United States government, and some Nicaraguan capitalists and professionals. Some professionals and capitalists, unhappy with the loss of their privileges, have fled the country. Foreign banks have refused to extend loans,[4] some companies have refused to sell to the Nicaraguans, and others have been unable to obtain export permits from the U.S. government. Medical supplies and machine parts are suddenly unobtainable. Such things are not made in Nicaragua. The

Peter Downs lives in St. Louis and is a long standing Science for the People member. He recently returned from a trip to Nicaragua where he was investigating issues of science and technology in the "New Nicaragua."

Nicaraguan economy was developed under Somoza as an appendage of the North American economy and it lacks the technological and scientific infrastructure necessary to maintain itself.

The Innovators Movement

The Nicaraguans are finding a way out of the impasse: their own creativity. Workers, faced with the prospect of widespread unemployment, have responded by developing their own machines and industrial processes. Such activity, which expresses the hope of science by the people, has spawned the Movement of Innovators.

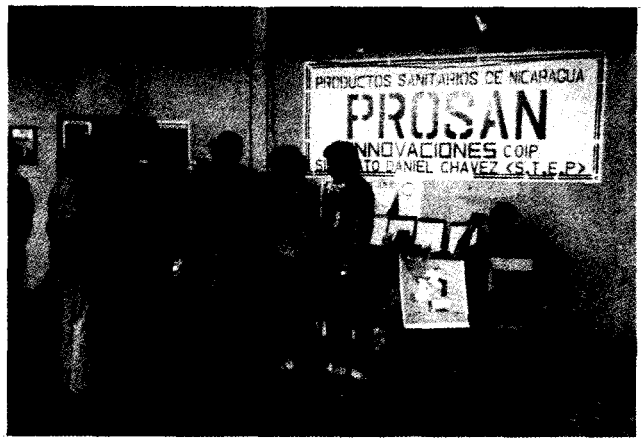
Innovators are workers who develop new tools, develop new production processes, or solve other technical problems and thereby allow industrial production to continue or cut costs. According to José Lopez, of the Office of External Relations of the CST, which is the largest union federation in Nicaragua:

> The Innovators' Movement is an answer to the problems we're facing. By changing the line of production to necessities and to products that use Nicaraguan materials, or by inventing small machines that permit production to go forward, we can avoid unemployment and reopen factories. In practice, this means that we must push forward the revolution, the same revolution that we workers are making.

The strongest branch of the Innovators Movement is rooted in the state-owned enterprises. After the Sandinist triumph in July, 1979, a large number of enterprises were nationalized. In 1981, nationalized enterprises accounted for 41% of the gross domestic product.[5] Workers in those enterprises were given a greater voice in the administration of production. During the last three years, there has been a general trend toward increasing the level of workers' participation in the administration of those firms. In the Nicaragua Cigar factory in Estelí, for example, a council elected directly by the workers directs the factory's operations and oversees the activities of the manager.

In privately owned companies, workers also have expanded their roles. In struggling to halt the flight of capital, unions have begun to routinely examine company records to ensure that production is not being sabotaged and that businesses stay open. In some cases, workers have even begun to regulate the speed of production in order to maintain employment. Unions have argued that such control is necessary not just to protect their own members' jobs, but also to meet the needs of the rest of the population via the maintenance of production.

Those goals are threatened by the economic crisis which grips all of the underdeveloped world. Nicaragua's foreign debt, largely inherited from Somoza, now



stands at $4.2 billion,[6] or approximately twice the nation's gross domestic product.[7] The government's commitment to pay this debt forces it to maintain, or even increase, production of export crops. Nicaragua continues to import oil, machinery, and raw materials to keep its economy functioning. The debt keep growing. The size of the debt, coupled with the political opposition of the United States government, makes banks and business increasingly reluctant to grant further loans or to sell the country spare parts or raw materials. The lack of raw materials and replacement parts is now forcing many factories to close and others to reduce production. The Coca-Cola bottling plant, for instance, one of the country's largest factories, had to cut production in half due to a lack of imported materials. The owners there tried to lay off workers, but the workers overrode the owners' wishes and instead slowed the pace of work in order to keep the same number of fulltime employees. That, however, is only a temporary solution. According to CST's Mr. Lopez, innovators might find a better solution in that they "might develop a way of bottling fruit and vegetable drinks, or sauces, which would guarantee full employment and save foreign exchange." Indeed, a newspaper has reported that the Coca-Cola bottling company of Nicaragua will soon begin marketing fruit-flavored soft drinks made from concentrates produced in Nicaragua from such native fruits as pineapples and oranges.[8] The owner of the bottling plant recently became a leader of the contras in Honduras and the plant has been nationalized by the Nicaraguan government.

Achievements of the Innovators

The CST attributes many successes to the innovators. The most common type of achievement is in the manufacture of machine parts and tools that were previously imported. At the Agrarian Reform Repairshops, for example, workers have reconstructed two lathes that were abandoned since 1933 and they have used them to make replacement parts for over 600 tractors as well as for other agroindustrial equipment.[9] At the German Pomares Engineering Works, José del Carmen Filetes used pieces of scrap to make a sheet metal bender, which is a tool that was normally imported for a cost of 90,000 cordobas.[10] (The government-set exchange rate is 10 cordobas per dollar, but the practical rate is approximately 40 cordobas per dollar).

At the MACEN factory, workers were confronted with a need to find new products that could be made with the materials on hand. MACEN makes woven bags for storing such farm products as beans, rice and corn. Since the floods in late May destroyed much of those crops, the demand for storage bags decreased significantly and the factory, which is state-owned, began to operate at a loss. In an effort to boost sales, the workers had a contest to develop new products from the same materials that they use to make bags. Over 50 of the 380 workers participated in the contest, making purses, lamps, hammocks, clothing, curtains, and upholstery fabric.

In the same factory technicians have also been looking for substitutes for the imported Spanish cord used in the bag-making process. (The factory normally uses over 200 tons of cord per month). After testing cords made from different Nicaraguan fibers, technicians believe they have found a substitute called "junco." The replacement of the more expensive Spanish cord with "junco" will increase the profitability of MACEN and create new jobs in the manufacturing of cord.[11]

Even more impressive is the invention of a cacao stripping machine. Previously in Nicaragua, cacao nuts were stripped by hand. The new machine will greatly improve productivity and make possible the development of a chocolate industry. This will help save foreign exchange, since all chocolate currently consumed is imported; and it will also encourage the fledgling dairy and tool-making industries.[12]

Another important invention is the development of a process for fabricating plastic airplane cabins. Three workers at the Plastic Record Company decided to apply their experience from making plastic lamps and table decorations to the problem of making aircraft cabins. They made molds, prepared materials, and tested their prototypes until they developed a successful cabin. They say that with their process the cost for each cabin is 32,000 cordobas ($3,200 at the official Nicaraguan rate of exchange, $720 at the black market rate), compared to the import cost of $9,000 each. And they claim that they can modify their process to make cheap automobile windshields.[13]

Workers who develop new products receive full support from the government. They receive access to machine shops in order that they may work on their ideas, they meet with other innovators to compare and coordinate research, and they get preference for admission to technical education courses offered by SINAFORP (Sistema Nacional para la Formacion de Profesionales). For a worker to be eligible for such government support, s/he need only be recognized as an in-

PROJECTS FOR NORTEAMERICANOS

There are many types of projects that progressive Americans could be involved with to aid the development of science in Nicaragua. In the January/February 1983 *SftP*, Uriel Kitron and Brian Schultz briefly described some of the work of the New World Agriculture Group in Nicaragua. That work includes research, training Nicaraguans in research methods, and literature searches in the United States.

Another type of project involves the raising of funds to support the work of innovators. In the summer of 1982, the St. Louis Latin America Solidarity Committee raised money for the municipal government of Estelí to buy a portable blockmaking machine. The government wanted a portable machine to help with the construction of better housing in the countryside. It had a stationary machine, but the cost of transporting blocks out into the countryside was prohibitive. One of the city workers studied the problem and designed such a portable machine, but the city lacked the money to have a machine built. The St. Louis committee answered the city government's request for help and raised the $200 it needed. Such a project is ideal for supporting the work of innovators and contributing to a people's ability to be independent and provide for themselves.

A third type of project is suggested by the CST's critique of EDUCREDITO: teaching short courses in Nicaragua. A physics teacher from St. Louis will be doing that this summer and there are probably many radical scientists who have the capability to develop short courses with the Nicaraguan government and make arrangements for people to travel to Nicaragua for a few weeks to teach them.

Projects such as the above can be pursued in addition to politically opposing the U.S. government's policy on Central America. *SftP* has been committed to the development of a people's science, and Nicaragua is displaying the beginnings of such a science. It is our responsibility to nurture those beginnings.

novator by her/his co-workers who inform the central office of the CST of their decision.

Each aspect of the Innovators' Movement exhibits the same spirit of democracy, from the government's opening of resources to the Innovators, to the election of Innovators by their co-workers, to the expectation that Innovators will share their knowledge and skill with their co-workers.

That spirit of democracy has even invaded such traditionally conservative fields as medicine. A series of health-related technical seminars open to all health workers (lab techs, nurses, doctors, etc.) took place in Managua in September of 1982. The director of the Medical School, Dr. Oscar Flores, stated that such meetings used to be for doctors only. Alberto Sequeira, a delegate of the health workers' union FETSALUD declared that the opening of such seminars to include health workers other than doctors is important because it helps "to break the doctors' monopolization of scientific knowledge."[14] Such efforts to broaden the accessibility of knowledge are common throughout Nicaragua.

Attack From the Right

Just as the armed Somosistas have made teachers and technicians prime targets for assassinations, so, the CST claims, has the counter-revolution taken aim at the Innovators' Movement. The CST made that announcement in August 1982, charging that a private educational firm called EDUCREDITO was trying to deprive the Revolution of its best workers. EDUCREDITO has ties to the Nicaraguan association of capitalists (COSEP) and the United States Agency for International Development.[15,16]

In December 1981, EDUCREDITO decided to begin a program to send exceptional workers to Houston, Texas, for technical training. In the summer of 1982 it awarded the first of such scholarships. According to a statement by EDUCREDITO, the program was established to contribute to the national reconstruction and its "only objective is to strengthen national production through the technical training of Nicaraguans."[17] The CST, however, contends that the aim of the program was to take innovators and technicians out of the country, where they can't serve their people, and where they will also be taught that they are superior to other workers and have the right to exploit them.[18] CST leaders pointed out that EDUCREDITO solicited donations solely from private entrepreneurs and that its campaign was coordinated by COSEP. Unions were never informed of the planning, much less involved in it, and factory unions were given little time to nominate workers for scholarships. (At the Tona brewery, for example, the union was given just one half-hour in which to consider the program and nominate workers.) The final decisions as to who would be offered scholarships were made by a North American on the basis of private interviews in which he questioned workers about their political beliefs.

Whether or not EDUCREDITO actually intended its program as an act of economic sabotage, it would have had that effect by removing skilled workers from the country at a crucial time. A program for aiding rather than sabotaging reconstruction would involve workers from the very beginning. It would make all the course materials available to the unions for their comments and entrust them with the final selection of students. It would also bring the instructors and materials to Nicaragua to give the courses. This would permit closer coordination with actual problems and a wider dissemination of knowledge.

The Innovators Movement and a New Science

The CST and the Sandinist Front have stressed that the importance of Innovators goes well beyond their role in overcoming current economic difficulties. The Innovators' Movement, they argued, is different from previous occurrences of worker-inventors because, in post-revolutionary Nicaragua, such people are no

longer dependent upon a capitalist owner. As expressed in an editorial in *La Barricada*:

> The capitalist system is based on the separation of manual labor from mental labor. As ownership of the means of production is reserved in that system to the capitalist, so too do they seize scientific knowledge and technology.
>
> Around this, they install an aura of mystery, a barrier, in order to maintain the worker in ignorance. And this is not only in the technology of production, but they also extend it to *administration*. . . . The worker innovator, when he is not subject to dependence on the capitalist, who is going to take advantage of his ingenuity and skill in order to extract more surplus value, begins to travel the road which will eliminate the separation of manual labor from intellectual labor. . . . The construction of socialism happens, among other reasons, because workers reach a higher level of technical ability; because, by dominating technology—and science with it—the worker is able to give work its true creative character, is able for the first time to dominate and transform nature and its products and put the fruit of that work to the service of human development.[19]

What *SftP* has long called the "demystification of science and technology" can happen only after the capitalists' monopoly on political and economic power has been broken. It is not certain, however, that that has happened in Nicaragua.

On the one hand are those who argue that the nationalizations that have taken place, the system of people's power, the dominance of socialists in the government and the popular militias all indicate that the capitalists' power has been decisively broken. Nicaragua, they say, has begun to develop a socialist democracy, which is threatened and may be defeated by the economic and military intervention of the United States.

On the other hand are those who claim that what we see in Nicaragua is the development of a modern nationalistic capitalism, the development of the petty-bourgeoisie into a capitalist class or a new bureaucratic class. They point out that the backbone of the revolution consists of peasants, part-time farmworkers, and artisans, who seek, not socialism, but to become property-holders in their own right. They point to Nicaragua's lack of industrial development and a proletariat and they point to the sizeable financial support the Nicaraguan government gives to private agriculture, commerce, and industry. They can even point to statements by FSLN cadre, such as Abdul Sirker, editor of *Barricada,* who stated that the party's position is that Nicaragua needs capitalism now and for the next several decades in order to develop. After that, he said, they can begin to worry about the transition to socialism.[20]

The question of the character of the revolution is germane, for it is that which will ultimately decide the fate of science by the people. But it is not the most important question. Every revolution consists of different currents and coalitions vying for power, but successful intervention by the United States could make them moot.

In Nicaragua today there are two approaches to science education and development. One consists of the creation of experts, the sending of small numbers of people abroad to study for advanced degrees. This approach easily lends itself to the creation and maintenance of a privileged stratum in Nicaraguan society. The other approach is the Movement of Innovators, with its emphasis on popular education and inventiveness. It will act as a counterweight to dependence on experts and to the experts' tendency to monopolize knowledge. The hope for a science by the people in Nicaragua rests on the Movement of Innovators. □

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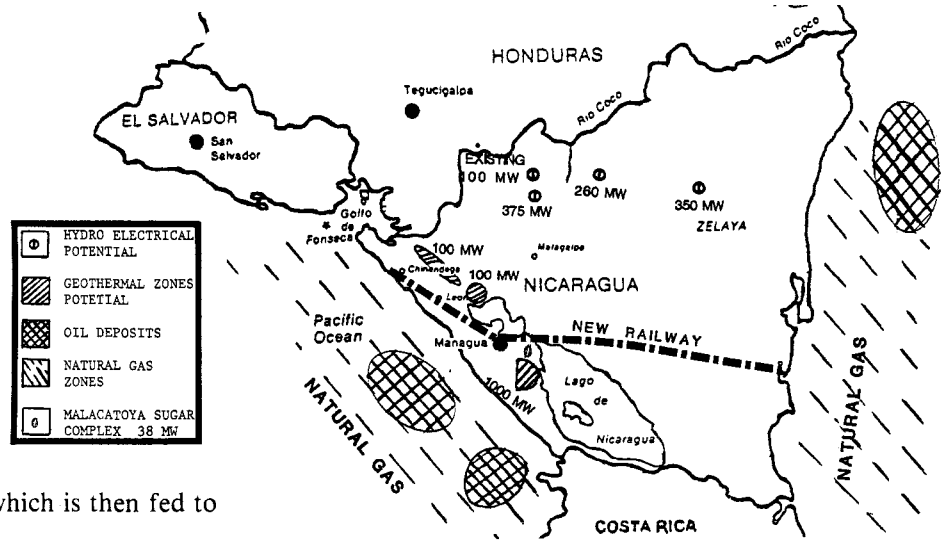
ON THE ROAD TO ENERGY SELF SUFFICIENCY

by Tim Kuhn



Nicaragua's first step on the road to energy self-sufficiency became a reality in early August, 1983, when a huge single turbine of the new 35MW (mega-watt) Momotombo geothermal energy plant turned for the first time under the force of naturally generated steam. The steam is produced from underground water which comes into contact with high-temperature rock. Wells drilled into the rock tap the steam which is then fed to the electricity generating plant.

The country's geothermal program began under the former Somoza regime. However, Somoza owned the company which contracted for the drilling project, and amassed large sums of money by drilling a prolific number of holes which produced little or no steam. Since the revolution the new government has urgently pursued its energy development program. In just two years, the entire generating and cooling plant, all the wellheads, and kilometers of piping have been constructed at the base of the picturesque Momotombo volcano.

The Momotombo project is the first of a series of geothermal energy projects planned in Nicaragua. A second 35MW plant is to be installed near it over the next two years. Further along the Cordillera Los Maribios, a chain of volcanos which dominate the entire Pacific coast of the country, there is a further generating potential of 100MW, and to the south of Managua a large but deeper field has a generating capacity estimated at 1000MW. This latter field would be considerably more expensive to develop, however, due to the deep drilling depths.

The present electricity generating capacity in Nicaragua is only around 300MW. Industrial use is still relatively low, but development plans based on linking industrial growth to agricultural growth will necessitate a rapid expansion in electricity supply. Plans to irrigate large areas of the Pacific coast for increased basic grains production, in order to achieve food self-sufficiency, will require greatly increased water-pumping capacity.

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The target is to develop over 1,000MW of generating capacity from renewable resources by the end of the century. The combined agricultural and industrial development program will help the government reduce the $400 million balance of payments deficit. Presently, Nicaragua must borrow money from foreign sources to meet its payments, a practice which increases the country's debt burden.

Nicaragua's short-term goal is to phase out the present oil-fired electricity generating plants by the end of the decade and to replace them with geothermal plants. At present, one million barrels of oil are imported every year for electricity generation at a cost of over $25 million. Once fully operational, the geothermal plants will release foreign exchange to be used in other sectors of the economy, such as for machinery, spare parts and raw materials exports.

Nicaragua imports 3.5-4 million barrels of oil a year and several other projects are underway to make further cuts in this figure. The Malacatoya sugar complex, one of the biggest in Central America, which will start production in 1984/85, is designed to provide electricity for the national grid system during the 105 day non-milling season. The 15,000 hectares of sugarcane being planted at the site are to be grown in circular, 80 hectare fields. The spaces between adjacent fields, totalling 4,000 hectares in all, are being planted with fast-growing eucalyptus and leucace trees which will be harvested on a four-year cycle and burnt in the mill's boilers during the off-season, producing 38MW of power. The mill will also produce 70,000 tons of mol-

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MEDICINE BEHIND THE LINES

Health Care in Guazapa, El Salvador

by Dr. Charlie Clements

The Guazapa Front in El Salvador is 25 miles north of San Salvador. It is an area 15 miles by 15 miles, or 8 hours a side if you are walking. And in that 225 square miles there are 10,000 civilians, 40% of whom are under age 12. Guazapa, we have been told by a recent congressional delegation that spoke to Air Force officers, is a free fire zone. Any of the Salvadorans living there could have told you that, because there isn't a day since July that the Front hasn't been bombed by American-supplied A-37's, or strafed by American-supplied Huey helicopters, or rocketed by American-supplied Cessna Skymasters, with complete disregard for civilian or military targets. And so health care, education, food production is made much more difficult there. And despite that, almost 1,000 people have chosen to come and live in Guazapa this year. There were about 9,000 when I arrived, and when I left there were about 10,000. That's a very profound statement.They have come to live with that fear of daily air attacks rather than live with the terrorism that exists in the other parts of El Salvador.

President Reagan speaks about leftist terrorists in El Salvador. It is a phrase he chooses very carefully. It discredits the people that are fighting there. Terrorists are people who inflict random acts of violence against the civilian population to keep them off balance and in fear. And that is what the *rightist* death squads do that haul people off in the middle of the night and throw headless bodies around the streets of San Salvador.

That doesn't happen in the control zones. Americans, in describing the situation, sometimes fumble with phraseology. They say rebels or insurgents or freedom fighters, but don't hesitate to use the word guerrillas, used there with pride. It means people who are fighting to win the confidence of those they hope to govern. And they don't commit atrocities, nor do they make war against the civilian population. On the contrary, they fight with a very strict code of conduct. There are civilians killed in civil war. But in and around Guazapa, every time there has been a death of a civilian during the year I have been there, there has been a *balance*, an investigation to see if there was poor planning, or poor execution, or acts of indiscipline. And acts of indiscipline have been severly punished. The guerrillas can't afford to lose the confidence of the people they're struggling for. I contrast that with the other part of El Salvador where there have been 40,000 deaths in almost 40 months, none of which have ever been brought to trial.

The society that's unfolding in Guazapa is doing so under a great deal of stress, but despite that it is a very positive place to work because it reflects the hopes that they have for all of El Salvador. Health care is characterized by the equitable distribution of services that are free for everyone. And for many of the campesinos, it is the first time they have ever seen a physician or a nurse or a medic.

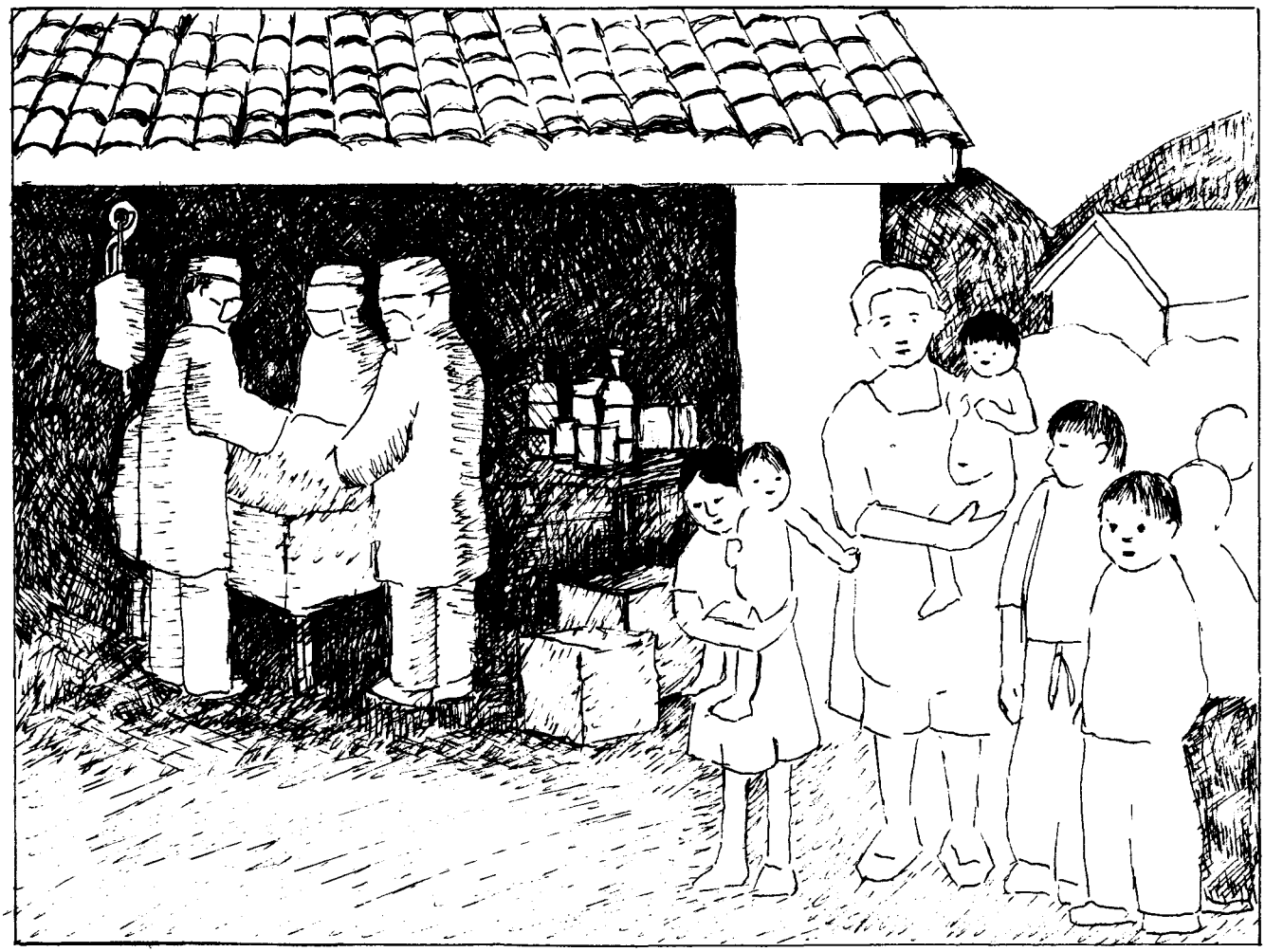
Medicine is contraband in El Salvador, and so we have very few medicines in the Front. They all have to be smuggled into the Front at great risk to those who bring them in. To compensate, we use a lot of natural medicines when we can't bring in, can't infiltrate other medicines. We make an aspirin out of willow bark or willow leaves, having people boil that and make a tea for people with chronic arthritis. We boil the bark of the quikona tree to make a chloroquin to fight malaria much as the Indians and Spaniards did hundreds of years ago. People who are anemic and can't take iron tablets because there are none, or vitamins, soak large

Charlie Clements was a U.S. Air Force pilot in Vietnam until the late 1960s, when he came to oppose the war. Rather than fly more combat missions, Clements accepted a psychiatric discharge. After Vietnam he became a Quaker and completed his M.D. He entered the controlled zones of Guazapa in 1982, after negotiations with the Democratic Revolutionary Front (FDR) about his participation as a health care volunteer. This article is excerpted from an extemporaneous speech he gave in Boston, May 24, 1983.

nails in glasses of water and clean them every 24 hours with a piece of lemon to have a little bit of vitamin C to help absorb the iron, and drink that Nail Cocktail. They make faces, but they know it's supplementing their otherwise meager iron intake. There's a great emphasis on public health, on patient education, on training Salvadoran health workers, many of whom were students in the medical school and had to quit school when it closed down, but wanted to continue to serve their people. Diarrhea is the leading cause of morbidity and mortality in most developing countries. There has been a latrine campaign to build latrines at 95% of the homes. There's been a campaign in the more than 30 elementary schools to teach children about the necessity of washing fruit because the soil is full of parasite eggs. And a campaign to teach mothers to make a rehydration solution because of lack of fluids which kill children with diarrhea. Mothers know to boil a liter of water and add 8 teaspoons of honey or sugar or molasses and a teaspoon of salt and make a solution that can prevent dehydration when their children have fevers like malaria or when they have diarrhea. And so very few children have died of diarrhea in the last six months.

We have very few malnourished children in the Front despite it being an endemic condition in all of El Salvador. The most malnourished children I see are the ones that come from the outside as refugees. But in Guazapa they're targeted by the agricultural collectives as people who need special supplements. So the dairy collective that keeps its cows down by the lake under tree cover (because helicopters like to strafe the cows), distributes the milk to the most malnourished children. And the fish cooperative that catches about 150 pounds of fish a day distributes that so the malnourished pregnant women, or those with wounds, who have higher protein needs, receive the fish.

And that is one of the key issues in this revolution in El Salvador: hunger. And it relates to the use of the land. I knew a lot of statistics when I went there. I knew that 1% of the population owned 20% of the arable land in 1960, and by 1980, 2% owned 60% of the arable land. As a result of years of—decades of—land appropriation, El Salvador has come to be the hungriest land in Central America. Not because of lack of arable land, but because of who owns it and how it is used.



Keith McHenry/Brushfire Graphics

But that is very different now. What we call revolutionary cooperatives today were called campesino cooperatives or Catholic cooperatives not too long ago. They were the inspiration of the base Christian communities. Groups that would read passages from the Bible would ask each other their interpretation of them, ask each other what they meant in terms of their surroundings, and ask each other what they might do to change their lives, to be more in congruence with that spirit of social justice that runs throughout the New Testament. People that had always looked at the ground began to look at each other, and they organized cooperatives, the Federation of Christian Campesino Unions.

But by that time the priests were dead; Rutilio Grande was machine gunned by government soldiers with five catechists in a retreat one Sunday. It was his death that would spark Archbishop Romero to speak out. They had killed other priests before, but they were called Marxist priests. And he knew that Rutilio Grande knew nothing about Marxism. Jose Alas was beaten and left for dead; another two or three priests in Guazapa were killed.

The next targets were the leaders of the cooperatives. In December I operated on a man who came to me and said he had an abcess on his neck and wished I would look at it. I examined him and I said I thought there was a foreign body in there, because there was a lot of scar tissue and tracks where it had been draining. He said, in a typical campesino way, "Yes, you might find some bullets in there." I operated on him. He had only local anesthesia so he was awake the whole time and explained as I removed the bullets that were sitting just above his vertebrae that he had been a secretary of one of the local cooperatives, and the death squads had come by and picked up the three leaders of the cooperative and driven them down the road and shot them all twice in the head and rolled them out of the car. He had been lucky to be shot with a 22 pistol, and he was nursed back to health when he was found 24 hours later. And that wasn't uncharacteristic of what was happening in all of El Salvador, what was happening in the rural areas, what was happening in the cities.

But the momentum was moving by then, and the sons and daughters of the campesinos began to defend themselves and ambush the right wing death squads, and did so fairly successfully because they knew every rock and tree in all of Guazapa. And the right wing death squads began to call in the military to help them, and truckloads of soldiers would come.

In April I examined a woman in a prenatal clinic and I asked how many pregnancies she had had. She said seven. I asked how many children she had living, and she said one, and I asked how many abortions or miscarriages, and she said one. When I asked what happened to the others, to find out if there had been birth defects or perinatal problems, she said, after she had recomposed herself, "They were burned in the house in Palo Grande along with 36 other women and children." And I naively asked why didn't they run like we do now when the soldiers come. She responded, "That was before, before we knew we were the enemy. Because we didn't belong to any organizations. We'd never been to a demonstration." And the people in Guazapa were soon to learn, because the next massacre was 136 civilians who were dumped in a well in Sacamiel.

The sons and daughters armed themselves and learned military tactics and grew better at defense measures, and learned what a hammer and anvil tactic was. And there has been a spiral of escalation that has led to the revolution we know today. Guazapa has become a control zone where the peasants live in some security from the right wing death squads and some security from intrusions of small numbers of soldiers. They don't come by truckloads anymore, because the guerrillas have defense perimeters and local defense garrisons and they've armed themselves better. And they've grown to be very sophisticated because they know if they make mistakes it will cost them the lives of their families. So they fight with a real determination. Well disciplined, not well trained or well equipped as Reagan would have you believe.

I don't find that the people have embraced violence willingly. My first week there I was sent with a column to establish a field hospital. Even though I felt that I wanted to work with civilians, that was their need at the time. It was a column of 75 combatants, and they called me grandfather because I was the only one over 30. And so when I heard about a man named Magdalena, soon after that, a man who was 62 years old who was a combatant, I asked to meet him. Maybe he used royal jelly on his tortillas or something. And I met Magdelena, who was very gentle, a very strong campesino, amazing in a country where the average life span is only 47 years old. I asked, as I asked almost everybody there, how he came to incorporate. That means why and how did he come to join actively in the struggle. Magdalena said with a twinkle in his eye that he went to a meeting of the Federation of Christian Campesinos, and he was picked up afterwards and tortured by the police. They wanted to know who were the other 40 people in the meeting. And he said, "I didn't know much about the Federation of Christian Campesinos, but I knew they were very important if the police wanted to know who was at that meeting." And he said, "It gave me the courage to withstand three days of torture." Magdalena never told me; I found out later from his wife that he had had to be medically castrated when he left that jail because they had hung heavier and heavier weights from his testicles. And still he didn't resort to violence willingly. He moved his family to a control zone. He want to San Salvador and he asked the Archbishop if as Christians they could resort to violence to defend themselves. And the Archbishop answered him very reluctantly that perhaps there was no other way, perhaps they had no choice. By

that time Magdalena had tears in his eyes because he said the Archbishop would die soon thereafter from an assassin's bullet. Their dilemma reminds me of something that Martin Luther King said before they assassinated him. He said,"The choice today is not a choice between violence and nonviolence; it is between nonviolence and survival." And that's what the Salvadorans have been faced with.

I'm going to close with a short vignette about life in a village that's overrun so you can understand a little concretely how the Salvadorans live. In the fall I was in a village which I visit every two weeks to visit chronic cases and teach the health workers. It was cut off as the Ramon Belloso batallion [one of the three batallions trained in the U.S.] invaded the Front. We knew that the Front had been invaded that morning because we heard 90 millimeter recoilless cannons, and mortars and machine guns. The village found out very quickly that they had been cut off from receiving reinforcements from the usual regular forces of the guerrillas. So they sent out their defense force of 50 young people to meet Belloso, and their job was to hold Belloso off till nightfall, because when civilians evacuate in the daytime the spotter planes circle and fire their white phosphorous rockets or call in the fighter bombers. And the young people did that very successfully throughout the day. The men hid their livestock in the hills and buried their seed stock so they might have something for the next planting. The teenagers hid whatever possessions they wanted to save. The teacher was packing up the school. The health worker was packing up the clinics into backpacks, making bandages. My jobs, amongst others, were to see to the evacuation of those who couldn't walk. There were two women 9 months pregnant who had to be carried on hammocks slung on bamboo poles, and a boy of 10 who had malaria, and a patient well known to me named Miguel, a 76-year-old man who had bad arthritis in his knees and ankles and couldn't walk very well. And that day as I discussed his evacuation he looked up at me and he said, somewhat defiantly, "I'm tired of running. And what would they do to an old man?" And we left it at that.

At five, the government soldiers got close enough to start mortaring. Mortaring is a word for most of us. But a mortar is a real terror. They take an untoward toll of young and old people because the young many times have ear infections and can't hear so well, and some of the elderly people can't hear so well either. From the time you hear the mortar's whistle you have about two or three seconds to hit the dirt. And then there's a jarring concussion, and a terrible sound. And everyone hid in trenches beside their houses and beside the clinic and beside the school and the children were screaming by then. And we started to give them the tranquilizing cocktail that I had been mixing in the afternoon.

About two hours after, when it was dark, everyone evacuated, single file, beneath the very hill the enemy was mortaring, men in front, with some water, maybe a machete, a few possessions, women carrying great sacks of tortillas, the older children carrying the young children who were well drugged by that time. It's something I always do with fear because if you give them too much they can suffocate, and if you don't give them enough they can scream and give away everybody's position, or maybe force a mother who is scared for everyone to suffocate them in her own fear. That day, that night, we marched for 8 hours, and stopped at daylight and hid under cover of trees high in the mountains and hoped that government forces wouldn't come after us. And we were fortunate; they didn't. We saw the smoke from the village and heard the gunfire for two days.

When it was silent we reentered the village and weren't surprised by the utter destruction there. They've lived through 12 invasions before. About the only surprising thing was that Belloso hadn't burned all of the houses, only some of them, perhaps because they were so busy looting and digging up everything, and destroying what they couldn't carry off. It takes a lot of work to set the adobe houses on fire. You have to burn the wood roof beams. And every spoon was broken in half, every fork had its tines broken, every cup and saucer had a bullet hole through the bottom of it. The sacred hearts and blessed virgins that were on the wall of every house had been desecrated, as their churches have been, and now this kind of final straw.

In the midst of bloating and stinking livestock, the cows and dogs and pigs and chickens, I found Miguel. Miguel had gone to hide because he didn't want to be a burden to anyone. And they had almost twisted his arms off before they shot him. Shot him in the stomach to make sure he died nice and slow. And that's not uncharacteristic of the civilians I find there that are caught by government forces. I'm pleased that the American public gets alarmed when I talk about the use of napalm, but the truth is that I think most people there would rather die from napalm than get caught by the soldiers, especially those trained in the United States.□

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transferal of North American technology. In addition, the structure of Nicaraguan society insured that only the upper classes, with their class biases, have access to this education, thus making even less likely the possibility that trained technicians would direct their work towards the problems of Nicaragua's *campesinos*, the poor farmers.

The classic example of agricultural technology penetration in Nicaragua, with the resulting creation of dependency, is in the cultivation of cotton (see Sweezy and Daxl article in this issue).

The "Threat of Revolution"

The success of the Cuban revolution sent shock waves through the leadership of North American capitalist interests because it proved that the influence of the United States could be defeated in the underdeveloped countries of America by armed struggle. The Kennedy Administration responded to the threat of further revolutions by instituting the Alliance for Progress, a massive reform program geared towards ameliorating the discontent of the rural population of Latin America. Johnson C. Elmer, a Rockefeller Foundation geneticist succinctly expressed the concern of large capital interests involved in these countries, "Before anything, a man has to eat. If there is hunger, a risk is run that political and economic disturbances will occur, because he will go in search of food, and conflictive situations are often produced during this process."[14]

The Alliance for Progress program, hatched in the offices of the Rockefeller Foundation, incorporated as one of its spearheads another Foundation creation, the Green Revolution. Touted as a program intending to develop an agricultural technology that would ease world hunger, it was a thinly veiled scheme to develop technological packets demanding massive agrochemical usage that could be exported throughout the world. Linked with a tepid agrarian reform program in the Alliance for Progress, the Green Revolution attempted to raise food production in Latin America, but always with the intent to create markets (=dependencies) for agrochemicals produced by U.S. businesses.

Kennedy inaugurated the Alliance for Progress in 1961, the same year that the Sandinista National Liberation Front (FSLN) was founded in Nicaragua. The agricultural wing of the United Nations, FAO, fell in line with the Alliance with its World Hunger Program, and brought to Nicaragua in 1962 a research program designed to study fertilizer responses of new Green Revolution crop varieties.[15] An FAO functionary would later comment, "The FAO intends to increase the consumption of fertilizers in the Third World . . . always with the aid of the fertilizer industry."[16]

In spite of Alliance reforms, the FSLN steadily grew in strength in the Nicaraguan countryside. The dictator Somoza, advised by USAID and threatened by tactical gains by the Sandinistas, began in 1975 a technical assistance and training program called INVIERNO that mainly reached small coffee producers in the northern mountain strongholds of FSLN guerrillas.[17] In 1977, the Nicaraguan Institute of Agricultural Technology was formed as a unification of agricultural research, education and extension, whose first major program was a CATIE-directed soil fertility project that introduced the methodology of research promoted for tropical countries by North Carolina State University.[18] Another reform program mounted by the Somoza-USAID team was the Research Program Adopted to the Small Producer (PIAPA), begun in 1978 with the participation of CATIE, CIMMYT, and CIAT.[19,20] This program recommended pesticides as safe for the environment, and was structured with the following research priorities:

- Variety evaluation.
- Systems of production and levels of technology.
- Chemical control of insects and diseases.
- Soil fertility and fertilization.
- Vegetable production.

After Somoza's Overthrow

With the FSLN-led overthrow of the Somoza regime in July of 1979, Nicaragua began a process of social change that has resulted in a reorganization of all governmental ministries and administrative bodies. The agricultural sector was consolidated in the Ministry of Agricultural Development/Nicaraguan Institute of Agrarian Reform (MIDINRA). The joining of agrarian reform and agricultural technology in one organization reflects the priority of the Sandinista government: to raise agricultural production within the emphasized philosophy of collectivization.

While the agrarian reform has effected fundamental change in land distribution and management, the technical sector of MIDINRA maintains the same technological prejudices that characterized Nicaraguan agriculture before the triumph of 1979. Production continues with an absolute dependence on imported agrochemicals, and there is little awareness of the dangers inherent in this addiction. Agricultural research, administered by the Division of Agricultural Technology (DGTA), is directed largely by technicians who hold the same jobs they had during the Somoza years. In addition, many current research programs are based on the plans of foreign institutions like CATIE, which contain very specific goals and biases equivalent to pre-1979 programs like PIAPA.

More significantly, there continues an educational dependency towards the ideology and technical ideas of the capitalist world. Many technicians have been sent to study at CATIE, CIMMYT, CIAT and other institutions, producing the danger that if they do not have a clear political analysis, they will mechanically adopt the technology of these centers with its well-defined capitalist interests. Even within Nicaragua the influence of capitalist ideology is strong, as evidenced by the effectiveness of the Furadan conference held last June. Agro-

chemical companies have very refined propaganda, and with their financial resources they can significantly influence technicians by giving them lavish entertainment or gifts. At the very least, this treatment of technicians must psychologically influence their acceptance of the product, and may in many instances create unpaid salespeople who will promote the product through their work or simply by displaying advertising material. The Furadan conference *did* concretely influence research in one region of Nicaragua: an experiment was immediately designed and implemented by enthusiastic MIDINRA technicians to test Furadan against several other nematicides on a coffee plantation.

Towards an Independent Technology

Clearly the technical sector of MIDINRA has not changed greatly to conform with the demands placed on it by the goals of the Sandinista Revolution. While political, cultural and economic independence are being created as this society advances on its unique path, an agricultural technological dependency is passively maintained. Without a clearly defined, independent policy of agricultural research, it is likely that agricultural technology in Nicaragua will maintain its ties to capitalism. Any new policy will have to be based on the problems and realities of the revolution: it will need to apply itself to the needs of production and the demands of the agrarian reform. And it will need to confront each of the three faces of dependency: the world market, imported agricultural products, and the capitalist technological ideology.

Nicaragua has learned well the lesson of dependence on foreign markets for the sale of a few crops. United States interests have twice used this dependency to strike economic blows at the Sandinista government; Standard Fruit Company closed its banana operations without advance notice in October 1982, while the Reagan government drastically reduced the Nicaraguan sugar import quota last May. In addition, for the past few years the nation's economy has been plagued by falling coffee prices, which comprise 30% of total export earnings. The way to escape this dependency is obvious: diversify export crop production. It will be the responsibility of agricultural research to determine which crops are suitable for Nicaragua's environment, and then to develop technologies of cultivation that assure good production without the need for massive agrochemical imports.

If it is accepted that Nicaragua's current agricultural technology developed to satisfy transnational capital interests, the task of a revamped research program is to completely change its focus towards a technology truly appropriate to Nicaragua's socioeconomic needs. The basis of this research will need to be a reintegration of ecological principles into agricultural practices. This analysis does not deny that there is the need, at least in the short term, to continue relying on the use of technologies such as imported pesticides or fertilizers; but it does suggest that these technologies need to be evaluated for their economic feasibility and ecological efficiency.

An important aspect of the reintegration of ecology into agriculture should be a careful survey and documentation of the traditional practices of Nicaraguan *campesinos*. Presumably centuries of cultivating experience (really trial-and-error experiments!) have selected for successful, ecologically sound practices, and there is no doubt that it is the *campesino* who will have the best perspective on the problems facing agricultural production. Therefore what is needed in the search for an appropriate technology is a fusion of the ecological principles of modern science with the knowledge generated by *campesino* experience, always within the social and economic framework defined by the revolutionary process.

Nicaragua's ideological dependency will be the most difficult challenge to the development of technological integrity. The first step in this process should be the recovery and experimental validation of traditional agricultural practices. Another should be an educational program that teaches the concepts discovered by a refocused agricultural research, but allows for the modification of these ideas by the realities of their implementation in the field. An effective beginning to this education may be to locate experiments on cooperatives, with the intention of training *campesinos* and facilitating the interchange of ideas. Another measure that would help link the research process with the realities of agricultural production would be to locate agronomy students on cooperatives for a year of practical field work as part of their studies.

It will be necessary, in order to overcome the legacy of ideological domination, to structure an efficient system of information distribution that insures that the innovations of independent research reach the many sections of Nicaragua's agricultural infrastructure. This process undoubtedly will lead to confrontations with capitalist propaganda that travels through the country with gifts and "scientific information" for technicians. It is advisable to institute in the agricultural research and education system a political education program that will give technicians the tools necessary to understand the interests embodied by the propaganda efforts of multinational agroindustrial corporations.

Research is the foundation of any developed technology, and it is only through an independent agricultural research program that Nicaragua will be able to shake its technological dependency on the capitalist world. The key to such a program will be the reincorporation of ecological principles and traditional *campesino* techniques into agricultural practices. This process will need to overcome a crippling ideological dependency on the developed world, a feat that can only be accomplished with an innovative and politicized education system. Radical technical reform is needed to serve the agrarian reform and all of the other advances of the Sandinista revolution.

Note: Due to current conditions in Central America and the Caribbean, we are forced to delay publication of the references which accompany this article until the next issue of the magazine. The Editorial Committee.

book review

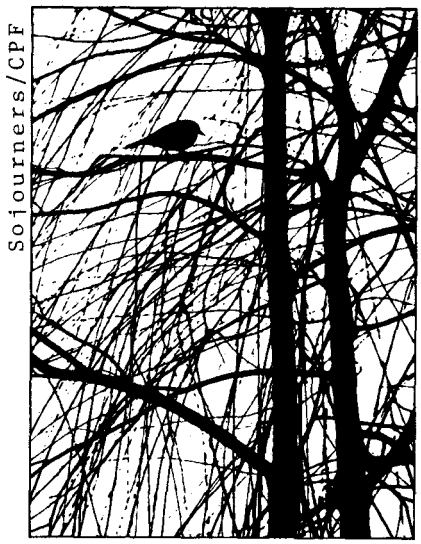
by Sue Tafler

A Bitter Fog
By Carol Van Strum, Sierra Club Books, CA 1983.

People leave the stresses of urban life for small farms in Oregon, only to be sprayed by powerful herbicides from forestry helicopters. This striking irony is only one element of *A Bitter Fog*, but it left me with the profound impression that one can never escape pollution and leave it behind.

A Bitter Fog is the chronicle of what ordinary people, living in areas bordering the Siuslaw National Forest of western Oregon, did from 1975 onward, when they were exposed to the phenoxy acid herbicides — 2, 4, 5-T (possibly contaminated with TCDD or dioxin), 2,4-D, and picloram. These herbicides are the ingredients of Agent Orange of Vietnam fame and also have been a regular feature of domestic forestry management. While the symptoms suffered by the exposed victims — miscarriages, birth defects, neurological and behavioral problems, skin disorders, uterine bleeding, nausea and vomiting — proved to be both depressing and frightening reading, the growing struggle of people, their activism and organizing, was exciting and inspiring.

The major impact of *A Bitter Fog* comes from the pages upon pages of interviews with housewives, forestry workers, farmers — people with a love of the land and an appreciation of the delicate balance of their farms and the forest. Author Carol Van Strum herself first became involved when her own children were accidentally hosed during roadside weed control in 1975, and a strength of the book is her personal passion and committment. All the interviews showed a common progression: from innocence and trust, faith in government, to pain and amazement at the physical affront to their children and themselves, through frustration, suspicion and anger at official denials and bureaucratic bungling, to cynicism and shattered illusions as governmental agencies dismissed their concerns and local communities ostracized them for stirring up trouble. The politicization and radicalization of the people grows naturally as they educate themselves in toxicology, federal laws and regulations, and the ties between the EPA and the chemical industry, and they come to the realization that they must fight to gain control of their own lives.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Though many of the stories in *A Bitter Fog* are of failure and frustration, the story of eight women from Alsea and Five Rivers, Oregon shows that it is possible to get the EPA bureaucracy moving. The women wrote to the EPA in 1978 and carefully correlated the timing of their miscarriages with spring herbicide spraying. Their letter attracted media attention and elicited an EPA study. Finally the EPA issued an emergency suspension order on forestry and many other uses of 2,4,5-T. The story of the Alsea women also includes two of the most outrageous incidents reported in the book. In one, the EPA asked a pregnant woman who had already suffered several miscarriages if they could have her fetus if she miscarried again, and when she finally gave birth, they came to take samples of her milk. In the other, a representative of Weyerhauser (the timber company) suggested to these women at a public meeting that even though there was no danger to them from spraying, they should time their next pregnancies to avoid spring spraying.

Van Strum is very upfront from the start that hers is a "people" book, not an academic treatise (though she does a thorough job of referencing legal and scientific issues in an extensive bibliography). The anecdotal style of much of the book clearly reflects the difficulties of citizens who have mainly circumstantial evidence to give an EPA bureacracy which insists on "proof" of toxic effects on humans. The evidence presented in *A Bitter Fog* is so compelling in total, that its lack of scientific rigor becomes irrelevant by the end. Indeed a major issue of the book is how ordinary people can demystify expertise, particularly when experts insist the spray is safe and the people *know* it is not. In *A Bitter Fog*, scientific impartiality is often shown up as simply failing to deal with serious reality. Traces of my scientific training kept me wishing, hopelessly I suppose, that a scientific hero could come along and turn the sets of anecdotes into such compelling proof, that no one, not even Dow (manufacturers of 2,4,5-T), could argue against it.

Van Strum tries to put herbicides in the context of larger issues. She makes important connections between domestic forestry use of 2,4-D and 2,4,5-T, and Agent Orange. She discusses the inadequate and degrading treatment of Vietnam veterans by the Veterans Administration (VA) and the VA's insistence that veterans document in detail the "proof" of their exposure. Indeed, that connection has been made in her private life, since she is now married to Paul Merrel,

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a veteran disabled by Agent Orange and an activist in his own right.

Van Strum also draws parallels between Dow's campaign to convince the public of the safety of its products, such as 2,4,5-T, and other incidents of industry cover-up attempts (such as toxic shock syndrome and thalidomide). And since the herbicides which have today replaced 2,4,5-T in Oregon's forests were registered with the EPA based on fraudulent data from the scandal-ridden Industrial Bio-Test Laboratories, Van Strum goes into the far-reaching problem of the EPA (as well as the FDA) preventing public access to information, protecting trade secrets, and conditionally registering chemicals whose safety has not been proven.

Van Strum understands that the issue is one of public empowerment, not simply herbicide toxicity. In light of the failure of the regulatory process to protect people, she sees the need for people to take back the control left in the hands of bureaucracies such as the EPA. To this end she proposes a constitutional amendment for informed consent. By this she means both people's right to know the risks to which they are subjected as well as their right to withhold their consent to being exposed to toxic chemicals. And armed with full disclosure of information, people could hold federal agencies accountable for failing to act in the public interest. Van Strum admits that a constitutional amendment would not be an instant solution to pesticides. She makes some good points, however, regarding the relevance of the Equal Rights Amendment (ERA) to her proposed amendment. Although the ERA is not yet ratified, the campaign for the ERA was successful in providing a focus for diverse citizen groups, in public education, and in getting women to insist on their rights.

A Bitter Fog suffers from a disrupted flow as its focus kept changing, and its organization could have been improved. It was sometimes disconcerting to jump back and forth between a conversational style (with lots of human detail) and the more historical presentation of court cases, letters to and from the EPA or VA, conclusions of health studies and surveys. While there is a powerful emotional effect as Van Strum keeps returning to letting people tell their own stories, some of the repetitiveness could have been edited.

These criticisms aside, I can recommend *A Bitter Fog* as both a testament to citizen activism and an education for those who have been naively confident in the EPA's role as public protector. Van Strum has lessons, also, for those who set too much store in technical expertise. Perhaps the book is most useful as part of an effort to make ties between diverse movements for progressive change. After reading *A Bitter Fog*, the struggles, failures and victories of the people living in and near the forests of the Northwest seemed very close to my life as an Eastern urbanite. □

Continued from pg. 25

asses as a by-product to the sugar production, and an alcohol-from-molasses plant is under consideration as an addition to the refinery project. The alcohol would be used as a gasoline substitute and would replace about 35% of the gasoline consumption in the country.

Meanwhile, a project to cut diesel consumption by half (presently 1.2 million barrels per year) has also begun this year. A new railway is now being built to link the Pacific port of Corinto with the capital Managua and with a new deepwater port being built on the Atlantic Coast at El Bluff. At present, 50% of the country's diesel consumption is expended on transporting the one million tons of cargo that pass through Corinto each year by truck, mostly along the Corinto-Managua route. Transferring this cargo from road to rail will save an estimated $15 - 20 million per year in oil imports, while electrification of the route will make even further savings. Extension of the route to El Bluff, besides opening up the neglected Atlantic Coast region for development and bringing urgently needed employment to the area, will also save $70 million per year in shipping costs on freight that presently has to pass through the Panama Canal.

All the above projects are aimed at saving on foreign exchange, and reducing the need for oil imports. The major expansion of electricity supply, however, over the next 15 years will come from hydro-electricity development. The first project will optimize output from two 50MW turbines already installed at Apenas (see map). A new dam will be built nearby, which will "top-up" the existing artifical lake and thereby increase the output of the existing turbines. The planned installation of two more turbines downstream from the project will increase generating capacity by an additional 70MW. There are also major plans to build two new dams in Zelaya, one of 350MW capacity, the other of 260MW. Assistance is being provided by the Soviet Union and studies are now underway with a goal to have the two dams completed by the mid-1990s.

In the longer term, Nicaragua has a considerable hydrocarbon capacity of its own (all its oil is presently imported). The lack of finances to develop its resources is the major drawback. Studies carried out by multinational companies before the revolution indicated that a large oilfield (approximately 500 million barrels) lies off Nicaragua's Pacific coast. At present consumption rates in the country, this is enough to last several hundred years. However, the cost to develop the field is estimated at over one billion dollars.

The country's natural gas potential is even greater. One test well drilled before the revolution showed a potential output of 40 million cubic feet per day. According to the head of a Venezuelan team that recently visited Nicaragua to assess its hydrocarbon potential, "Nicaragua could have the possibility of providing all of Central America's needs in natural gas." Test drilling is expected to begin within the next 18 to 24 months. If Nicaragua is able to slip the financial noose that is presently being tightened around it by the Reagan administration, it could, in four to five years, become one of the fastest growing economies in the region as a result of its energy development program. □

resources

CENTRAL AMERICA

What Difference Could a Revolution Make? Food and Farming in the New Nicaragua, Joseph Collins with Frances Moore Lappe and Nick Allen. $4.95. Available from: Institute for Food and Development Policy, 1885 Mission St., San Francisco, CA 94103. (415) 864-8555.

The Triple Struggle — Latin American Peasant Women, Audrey Bronstein, (Boston: South End Press, 1982), 268 pp., $7.50. Latin American peasant women speak about issues affecting their lives, including the areas of health, birth control, and women organizing.

"Health and Human Rights in El Salvador" — a report of the Second Public Health Commission to El Salvador. July 1983. Available from: Committee for Health Rights in El Salvador, 66 West 87th St., New York, NY (212) 799-0530. $3.00 plus $1.50 postage per order.

El Salvador: Background to the Crisis, Central American Information Office (CAMISO), 1982, 148 pages, $5.95 plus $1.00 postage. Available from: RECON Publications, PO Box 14602, Phila., PA 19134.

Sandino's Daughters: Testimonies of Nicaraguan Women in Struggle, Margaret Randall, New Star, 1981, 220 pages, $7.95 plus $1.00 postage. Available from: RECON Publications, PO Box 14602, Phila., PA 19134.

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"Central American Women Speak for Themselves" — a collection of articles, documents, testimonies and photographs of Central American women's experiences in their own words about women and their struggles in Guatemala, El Salvador and Nicaragua. $7.00 plus 20% postage and handling. Also available:
"Wherever a Woman is She Should Make Revolution" — a translation of AMNLAE's (the Nicaraguan women's association) magazine explaining the rights of women in the New Nicaragua. Special sections include: Women and Health, Education, Defense, and Laws. $3.00 plus 20% postage and handling. Both publications available from: LAWG, PO Box 2207, Station P, Toronto, Ontario, M5S 2T2 Canada. (416) 533-4221.

Nicaraguan Perpectives, a journal of the Nicaraguan Information Center, with articles written by people who have lived and/or worked in Nicaragua. Subscription price: $10 per year for 4 issues. Available from Nicaragua Information Center, PO Box 1004, Berkeley, CA 94701.

CHEMICAL WARFARE

A Higher Form of Killing: The Secret Story of Chemical and Biological Warfare, Robert Harris and Jeremy Paxman, Hill and Wang, 1982, 274 pages, $7.95 plus $1.00 postage. Available from: RECON Publications, PO Box 14602, Phila., PA 19134.

G.I. Guinea Pigs: How the Pentagon Exposed Our Troops to Dangers More Deadly Than War — Agent Orange and Atomic Radiation, Michael Uhl and Tod Ensign, Wideview Books, 1980, 256 pages, $6.95 plus $1.00 postage. Available from: RECON Publications, PO Box 14602, Phila., PA 19134.

AUDIOVISUALS

"Health Care in Nicaragua: 'Revolucion es Salud'" — a 23 min. slide-tape program which presents a brief historical background to current events in Nicaragua, sketches the public health conditions facing the Sandinista government on assuming power, and traces the plans, accomplishments, and problems facing the Nicaraguan Revolution in the field of health." Available from: Medical Aid to Nicaragua, PO Box 796, Astor Station, Boston, MA 02123. (617) 492-0520, 484-5335.

"Dawn of the People: Nicaragua's Literacy Crusade" — a 26 min. film which "portrays the efforts to spread grassroots democracy by empowering people through literacy." Available from: Green Valley Films, 300 Maple St., Burlington, VT 05401 (802) 862-4929.

"The Hopeful Revolution: Nicaragua" — 16 minute slideshow with script and cassette. Commissioned by Oxfam-America, it deals with the struggle of the Nicaraguan people and analyzes the principles, problems and needs of the new government. Available from: Packard Manse Media Project, PO Box 450, Stoughton, MA 02072.

POSTERS

"In Solidarity with the People of El Salvador" poster available for $5.00 from: Boston Committee for Medical Aid to El Salvador, PO Box 796, Astor Station, Boston, MA 02123. (617) 492-0520, 484-5335.

* * * *

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University Science Teachers Needed in Nicaragua

The School of Agricultural Science of the University of Nicaragua in Managua is currently in need of teachers in the following fields: agronomy, animal science, plant protection, forestry. This includes *all* traditional subdisciplines (e.g. biological control, animal nutrition, forest entomology, soils, etc.) **Spanish Essential**. Salary commensurate with experience. Send Vitae to: John Vandermeer, Division of Biological Science, University of Michigan, Ann Arbor, Michigan 48109, U.S.A.

DEFENSE WORK OR PEACE WORK? For scientists and engineers concerned about how their work may be applied, High Technology Professionals for Peace has formed a nonprofit employment agency to place workers in non-defense related industries. Openings are presently available in software and hardware engineering, medical instrumentation, mechanical engineering, nonprofit work, and other fields. Please send resumes to: H.T.P.F.P. Employment Agency, 639 Massachusetts Avenue, Room 316, Cambridge, MA 02139 or call (617) 497-0605.

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