

as a luxury.

The engineering challenge comes in designing effective and inexpensive systems. Local materials must be used and social constraints taken into consideration. Some toilet construction schemes have failed because, for example, the walls did not extend to the ground: Women hesitated to use them because men could recognize their shoes. A problem of a different sort arose in Nairobi. When the city ruled that all housing must offer toilet facilities, low-income housing that owners deemed not worth the expense of improving was closed down by the government.

The design of water supply systems will vary according to local conditions. For instance, large drill rigs are not only expensive to buy and operate but difficult to transport over poor roads. More adaptable are small, jeep-mounted rigs capable of drilling to a depth of a hundred feet. Where there are high water tables, hand-dug wells can be sunk into soft soils at very low cost; the only materials required are concrete, reinforcing bars, and wood for a cover and pump or windlass. Simple wells will work as long as groundwater is uncontaminated by human or animal feces and if the well-head is designed to prevent contamination. For example, a child with guinea worm can easily infect the well by stepping in the water, for the female worms lay eggs under the skin, where they form blisters that burst when immersed. Even bucket wells are subject to contamination by careless handling. Placing the bucket on the ground or handling it with dirty hands will contaminate the water and infect the well's other users. This may account for the failure of wells to reduce diarrhea in some communities.

Driven wells—pipes hammered into the ground by someone using a sledgehammer, can be sunk up to forty-five feet. The system requires a pump and must be inexpensive, reliable, and easy to repair locally. Spring or gravity-fed systems work well, but only when the water supply is elevated above potential human or animal contamination. Springs in particular require covers to prevent contamination at the point of collection. In Malawi, a highly successful gravity-fed system distributes water over ninety miles without a single moving part.

Much of the poor hygiene in the Third World is due to the sheer difficulty of moving water, which weighs about eight pounds per gallon, not counting the container. For adequate hygiene, an individual needs about four or five gallons of water each day—forty pounds of it. If the burden of supplying water to a family of seven falls to the mother and daughters, as usually happens, they share the back-breaking job of carrying over three hundred pounds of water per day. Then follows the hard work of bathing children, cooking, and cleaning. Thus they fall behind in the fight against the pathogens in their environment.

Easing this burden will require sizable capital investment. The World Bank estimates that village water-supply systems—assuming the installation of public standpipes to be shared among approximately 140 persons—would cost \$20-\$40 per capita, depending on the size of the village. Surface water, even if turbid or contaminated, can be treated, made potable, and delivered through public standpipes for as little as \$40 per capita. The cost includes sand filters to remove amoeba cysts that cause dysentery and chlorine to kill any bacterial contamination.

According to a World Bank estimate, indoor water and sanitation for the Third World would cost \$800 billion to

construct and \$10 billion per year to operate and maintain. Thus, as with water supply, only inexpensive excrement disposal systems will be practical in the developing countries. Fortunately, several appropriate and affordable technologies are available.

Expertise is needed to install these systems, whether from government agencies, health workers, or private entrepreneurs; but projects seem to work best when citizens help to construct their own systems and are taught to operate them. Primary health care workers can make sure the facilities are used properly. A problem may arise when, as is usually the case, sanitation projects are administered by a government agency other than the ministry of health. Still, if the two efforts are coordinated, separate responsibility for sanitation need not be counterproductive. In fact, coordination between sanitary engineering and health maintenance makes sense, because sanitation not only reduces the cost of health care but promotes economic efficiency as well.

Demonstration programs offer a cost-effective way to promote sanitary methods. The model of large-scale public education created by the Tennessee Valley Authority (TVA) is instructive, though TVA promoted agriculture and not sanitation. TVA selected locally respected farmers willing to try a new idea—fertilizer use—and provided free fertilizer to those who agreed to use it for five years and to publicize their experiences in local seminars. Water and sanitary methods can be demonstrated in the same way, whether involving a single family, a neighborhood, or an entire village.

Nonetheless, the importance of support from government leaders is not to be underestimated. In India, Indira Gandhi's backing for aqua privies was merely symbolic, but it was her endorsement that brought down many of the barriers, both psychological and bureaucratic. And because sanitary efforts are expensive, leaders will be called upon to make available greater resources than ever before. Such investments seem an acceptable cost for making such a vast improvement in human health and resources.

*William U. Chandler is a Senior Researcher at Worldwatch Institute in Washington, D.C. This article is excerpted from a Worldwatch Paper, "Least-Cost Health Strategies."*

## EXCURSUS 3

### Thomas Land on TOBACCO & DEVELOPMENT

A controversy over investment in tobacco cultivation in the hungry belt of the globe has exploded into a heated and embarrassing conflict involving several United Nations agencies that wield vast influence over public health and agricultural planning. In the process, it is the tobacco companies that seem to be gaining ground.

The original parties to the dispute are the Geneva-based World Health Organization (WHO), which is concerned with the medical and social costs of smoking, and the Rome-based Food and Agriculture Organization (FAO), which is

reluctant to advise Third World farmers to forgo the short-term profits they can earn from cultivating tobacco. A new entrant is the U.N. Industrial Development Organization (UNIDO), a much smaller although widely influential global agency based in Vienna, which recently adopted the FAO's pragmatic, short-term approach to tobacco profits in an Asian project.

UNIDO was one of ten U.N. agencies participating in secret discussions back in 1981 seeking to resolve the conflict through compromise. The FAO and the World Bank grudgingly agreed then to reduce their considerable financial and other support to Third World tobacco-growing projects. But as a WHO participant disclosed afterward, the "frank discussions" at the meeting "revealed that there were considerable differences of approach to the problem of different organizations reflecting often very different constituencies, although it was recognized that smoking-related diseases cause major economic losses." Attempts at disguising the split are now being abandoned.

Of the approximately 120 countries in which tobacco is cultivated, many are in the developing regions, which have recently overtaken the rich world in the production of cigarettes. Over the last decade or two these countries have entered the tobacco business in a big way, seeking to raise foreign exchange income to finance economic development. But with increased production has come increased consumption, so that today the bulk of the cigarettes produced in the Third World are consumed by an expanding local market. It is WHO's contention that the control and reversal of this "smoking epidemic" in the developing countries "could do more to improve health and prolong life . . . than any other single action in the whole field of preventative medicine."

Other major issues in the controversy concern the global environment and long-term economic prospects. According to an authoritative recent estimate, one out of every eight trees cut down is used as fuel for curing tobacco—a situation that contributes to the deforestation of the planet and, in the long-term, could lead to shifting rainfall patterns and permanent drought in the great breadbasket regions of the Northern Hemisphere.

A study published by War on Want in London concludes that developing countries have been unable to resist the spread of the tobacco business "because the companies offer a package deal which operates on every level—from teaching the farmer how to grow the crop to capitalizing the processing plants, guaranteeing the market through brand names and advertising and offering profit opportunities to the ruling families." An analysis issued by the U.N. Conference on Trade and Development observes that "at all stages of the production and marketing chain, a handful of giant companies, whose epicenters of power remain the United States, South Africa and Britain, exercises decisive control."

FAO offers a very different assessment. In a recent closely argued study, the organization asserts that the tobacco industry creates many immediate and tangible social and economic benefits—especially in the poor countries—and concludes:

Tobacco growing generates large-scale rural employment in over-populated areas and provides a ready source of cash for smallholders who would otherwise be dependent on less remunerative crops or on subsistence farming. In nearly every producing country, tobacco is one of the most

valuable crops grown, and its contribution to the total agricultural income is almost invariably significant, reaching 25 per cent in the case of Zimbabwe. Tobacco is also one of the most remunerative cash crops, yielding net returns per unit of land which may be several times higher than those obtained from industrial crops or staple foodstuffs. In addition, tobacco leaf is an important source of foreign exchange for exporting countries, making a substantial contribution to the agricultural export earnings of many countries, especially in Africa and Asia.

Tobacco manufacturing also creates extensive opportunities for employment, particularly in developing countries where manual methods of production are still the rule. The wages and salaries paid by tobacco factories compare favourably with those paid by other industries. . . . World exports of tobacco products were valued at \$3,500 million annually in 1978-81 and, although only 6 per cent of this total accrued to developing countries, some of them earned sizeable amounts of foreign exchange from this trade.

Finally, tobacco products are a very important and easily tapped source of tax revenue for governments in both developing and developed countries. . . . In view of these factors, farmers continue to have strong incentives to produce tobacco and governments to encourage its cultivation and manufacture.

In a controversy in which the opponents have carefully refrained from answering each other's arguments, governments and financial and political pressure groups in the hungry world feel free to take sides according to their perception of their immediate interests or, more likely, to suit a leader's personal preference. Partly because short-term considerations tend to favor tobacco cultivation and partly because personal preferences may well have been influenced by the cigarette companies' recently intensified and vigorous advertising campaigns in the Third World, the tobacco lobby seems to have gained the upper hand. Among influential health professionals in the developing regions, the climate of preference is well illustrated by statistics published by the Royal College of Physicians in London: While most British doctors have given up smoking, 72 per cent of Nigeria's medical students smoke, and so do 39 per cent of doctors in Bangladesh.

The global trend may well be accelerated by UNIDO's decision to promote the use of solar energy for tobacco curing in Asia. The project envisages the application of an "appropriate" technology for the exploitation of a renewable source of energy with the aim of raising rural incomes and thus improving the quality of life in the villages. It is a very modest project in terms of effort, capital investment, energy generation, and, indeed, woodlands potentially saved; and its peripheral aspects seem to satisfy the general objectives of those concerned with health and environment. But it may do wide damage to WHO's campaign to curb tobacco cultivation in the poor countries.

At best, the conflict of priorities between such widely trusted specialist agencies as WHO and FAO will cause confusion in the many government departments that have come to rely on their advice—as well as on the multilateral aid funds they dispense. At worst, it will lead to conflicting policies and a huge waste of resources in the area of development planning, where routine decisions frequently affect the health and livelihood of large populations.

*Thomas Land writes from Europe on global affairs.*