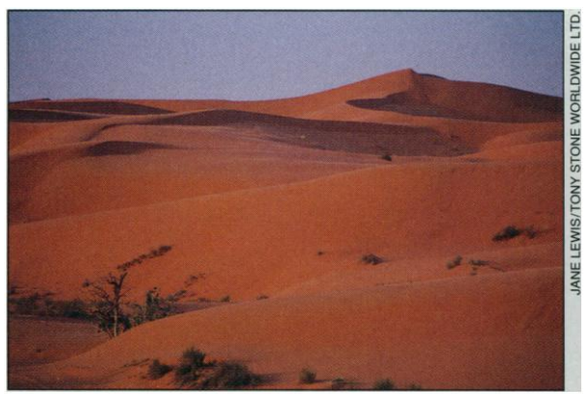
ENVIRONMENT

MITI Ecoprojects Target the Desert—And the Home Front

TOKYO—Why is Japan's Ministry of International Trade and Industry (MITI) spending $48 million over the next decade to find plants that can thrive in hot, arid regions, even though Japan has no deserts? The answer, in a word: oil. When your economy is dependent upon oil from the Middle East, it makes sense to work on scientific issues affecting that region. "Successful results might prove appealing to the Persian Gulf countries," says Jun-ichi Nakagawa, deputy director of MITI's biochemical industry division.

Oiling the gears of geopolitical relations is really secondary, Nakagawa says. MITI's prime objective is to develop technologies that will help the global environment. It sees the greening of the deserts as part of its larger effort to stem rising levels of atmospheric carbon dioxide (CO_2), a greenhouse gas believed to contribute to global warming. Conservation is one approach, but MITI believes such measures are not capable of solving the problem. That leaves technological fixes.



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Hot topic. MITI hopes Japanese researchers can turn parts of these Saudi deserts into green oases.

Toward that goal, one MITI project envisions bioreactors filled with micro-organisms that would suck CO_2 from power-plant exhaust streams. Another project is focused on biological means to produce hydrogen, which would then be used as a non–CO_2 producing fuel. Even more ambitious, however, is the desert project. "On a global scale, the biggest countermeasure is likely to be increasing greenery," Nakagawa says. Because plants absorb CO_2 during photosynthesis, goes the rationale, the more plants, the less CO_2. And the desert, with its dearth of vegetation, seems a logical place to begin.

In a certain appealing logic, funding for the desert project comes from gasoline taxes, which MITI distributes to the Petroleum Energy Center, a private foundation supported by 102 oil industry–related companies. The center gives out the money and administers the projects, and the effort is overseen by an advisory committee made up primarily of academics and a few industry representatives. The funding is currently being channeled to one group working at the MITI-affiliated Research Institute of Innovative Technology for the Earth (RITE), a few university researchers, and five companies, including Japan Tobacco and Mitsui Toatsu Chemicals, selected because they already have related research efforts. As for why the Petroleum Energy Center is involved, Chiyoshi Kamizawa, general manager of the center's international cooperation department, says, "This is a problem related to the desert areas where oil is found."

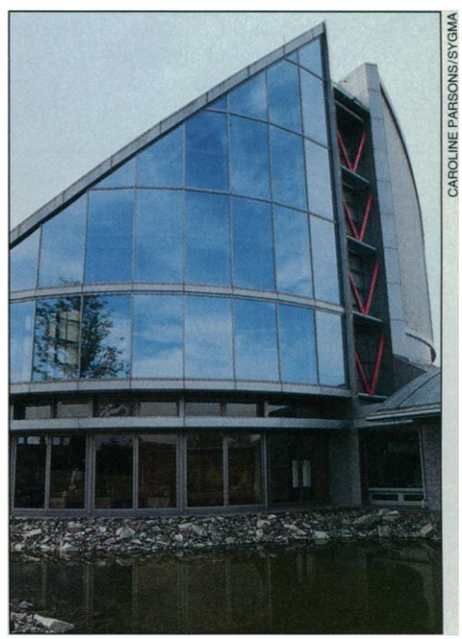
Not everyone buys the desert-greening scenario. "I'm very skeptical about the amount of CO_2 that can be stored [in plants] versus the cost of intervention," says ecologist Walter Oechel of San Diego State University, who recently published a 3-year study of Arctic grasses that questions whether plants will act as a long-range carbon sink in the presence of elevated CO_2 levels. "Improving a degraded ecosystem or restoring a forest would have a greater potential impact on atmospheric CO_2, I would think."

In addition, the climatic conditions of a desert are hardly conducive to large quantities of self-sustaining vegetation. "You can't grow a lot without a lot of water," points out ecologist Martin Caldwell of Utah State University. "And if you [irrigate] you have to face the problem of desalinization. Besides, it's such a small region that it's unlikely to affect global stocks of CO_2."

Observers within Japan point out that whether or not greening the deserts makes a dent in global CO_2 levels, MITI can justify its support because of the project's value to the domestic biotechnology industry. Participating scientists are probing such basic questions as the molecular mechanisms of drought resistance in plants and how to manipulate genes involved in the absorption of CO_2—knowledge of which might well apply closer to home. A second MITI project—a study of biodiversity in the tropical forests of Southeast Asia—is also driven by its potential value to Japan's logging industry.

"The major goal is to strengthen the technological capabilities of the companies doing [biotechnology] research," says Ko Shimamoto, professor of plant molecular genetics at the Japan Advanced Institute of Science and Technology, Nara. He says setting a goal, such as the development of new plants, provides a way for companies to measure their progress in acquiring and applying the latest biotechnology.

Shimamoto joined Nara from Plantech Research Institute, a plant biotech company and one of five companies receiving research funding under the MITI project. "That money can be used to strengthen basic research," he says, "so that aspect is really important for industry." Part of Plantech's funding from the project goes to study rice—not a crop particularly suited to arid climates, but one that ties in with the company's other rice projects.



CAROLINE PARSONS/SYGMA

RITE stuff. Plant researchers look for ways to increase uptake of carbon dioxide.

Despite the project's ulterior motives, Shimamoto believes it can generate good science, too. Citing the generous funding, the skills of those on the advisory committee, and the researchers doing the work, he says "the potential is there." He is particularly impressed with work done by Akiho Yokota, chief researcher in RITE's plant molecular physiology lab, to modify a key enzyme—ribulose-bisphosphate carboxylase/oxygenase, or RuBisCO—which regulates absorption of CO_2. A plant receiving a gene for super RuBisCO, he says, "would be very environmentally useful," even if it doesn't green the desert.

–Dennis Normile