opting for pesticides. IPM strategy for rice boils down to a simple axiom: Pesticides usually do more harm than good because they kill beneficial insects.

This kind of training isn't particularly expensive by the standards of international aid. The Indonesian government pays for the program's annual cost—$6 million—half of which comes from aid provided to Indonesia by the U.S. Agency for International Development. The World Bank will start footing part of the tab on 1 June. Agricultural experts hope that this kind of international funding will provide a lever for getting Indonesian-style programs adopted elsewhere. "We're trying to get IPM as a basic condition for World Bank loans," says Peter Weber, an agricultural analyst at the Worldwatch Institute, a Washington, D.C., environmental think tank.

The numbers depicting increased food production and decreased chemical use aren't the only measures of the Indonesian program's success. In addition, there's the fact that it has already survived one potential major calamity. In 1990, a sporadic rice pest in Southeast Asia—the white rice stemborer—began infesting paddies in West Java. Despite desperate calls from the villages for a massive distribution of pesticides, local governments stuck by IPM. According to the FAO, field trainers that summer rallied 300,000 people to pick the stemborer's pinhead-sized white eggs off the rice plants. Last year, stemborers infested only a handful of hectares of rice paddies, says Kenmore. Furthermore, FAO scientists maintain that the rice paddies most damaged by the stemborers were in areas treated heavily with carbofuran, one of the few rice insecticides currently allowed on the Indonesian market.

Kenmore argues that the commitment of local officials, who stood firm and rallied the villagers on behalf of IPM, indicates that the Indonesian program has long-term sustainability. That's great for Indonesia, but for the rest of Asia it simply poses the key question of whether the preconditions of the program's success can be duplicated elsewhere. Some analysts think, somewhat gloomily, that it will take the same kind of threatened catastrophe in other rice-growing Asian nations that it took in Indonesia to launch the program. "Unfortunately, too often it happens that only when systems break down do people do sensible things," says Andrew Gutierrez, an entomologist at the University of California at Berkeley.

It may or may not take catastrophes in other countries in Asia for them to get IPM under way, but, in the opinion of many agricultural experts, it will require that the governments of those countries follow Suharto's lead and steer farmers away from pesticides. "The reason farmers use more chemicals is because that's what the paradigm is," says Weber. "And you need to change the paradigm from the top."

To some observers, awareness at the top of the dangers of commonly used pesticides is long overdue—and sorely lacking in Asia. "There's an intimate interface between agriculture and people" in Asia, says Richard Harwood, an agronomist at Michigan State University and former director of the Asian division at the Winrock International Institute for Agricultural Development, based in Morrilton, Arkansas. "The rice paddies surround the villages...there's no way of isolating the rice paddy from village water supplies," he says. A review of health studies compiled by IRRI researchers and sponsored by the Rockefeller Foundation in 1990 found that prolonged exposure to pesticides in Asia can lead to maladies ranging from skin disorders to heart problems. "We need to paint the current scenario," says K.L. Heong, an entomologist at IRRI, meaning that the other countries must be shown that IPM can work as well as, or better than, pesticides.

Kenmore, meanwhile, hasn't altered his IPM strategy—in fact, the Indonesian program is serving as a prototype, he says, for revamping programs supported by the Dutch and Australian governments in Bangladesh, China, India, Korea, Malaysia, the Philippines, Vietnam, Sri Lanka, and Thailand. And they have had some successes. Farmers in Bangladesh who received IPM training spent 75% less money on pesticides in 1991 than did their untrained counterparts—and produced 13.5% more rice. And in the Philippines, where environmental organizations and farmers' cooperatives are campaigning against pesticides, the agriculture secretary last month banned four pesticides. Those are encouraging signs, but it will take much more time to tell whether the hopeful results from Indonesia can, like a hardy hybrid strain of rice, thrive in foreign soil.

–Richard Stone

GENE PATENTS

Scientists Voice Their Opposition

An interagency working group set up to resolve the sticky questions surrounding the patenting of gene sequences held a town meeting at the National Academy of Sciences last week, where the public was invited to speak its mind. The committee got an earful as representatives of 16 or so different scientific and biotech groups took to the podium, largely to denounce or question efforts by the National Institutes of Health (NIH) to patent gene fragments of unknown function (*Science*, 11 October 1991, p. 184). If nothing else, the group established by the White House Office of Science and Technology Policy (OSTP) and chaired by Mary Clutter of the National Science Foundation,* got a strong message that the U.S. and international genetics community is still vehemently opposed to NIH's moves. Industry, too, is leery, said Richard Godown of the Industrial Biotechnology Associations, though it believes that NIH had no choice but to file the applications.

NIH Director Bernadine Healy, a member of the working group, showed no signs of backing off yet, however. She said the agency's goal in filing for patents on thousands of gene fragments identified by NIH researcher Craig Venter is not to get rich but simply to ensure, as is required by law, that its discoveries are translated into new therapies and drugs. She reiterated that NIH staked its claim "to protect its options—and those of the taxpayer," while the issue of whether gene fragments could—or should—be patented is sorted out. And, contrary to widespread opinion, she said NIH is not committed to patenting: "If, after thorough evaluation, it is decided that these cDNA [complementary DNA] sequences should not be patented, NIH could withdraw its patents or dedicate them to the public."

That didn't wash with most of the researchers who testified, however. One by one, representatives from the American Society of Human Genetics (ASHG), the American Institute of Biological Sciences, INSERM in Paris, the European Community, and others argued that if NIH is allowed to go ahead, it will start a patent stampede that will destroy international collaboration and hinder product development. "This sort of approach does not build a road to further advances, it just builds a toll booth along the way," said Michael Roth, a patent attorney at Pioneer Hybrid. Even Venter told *Science* that patenting thousands upon thousands of gene fragments simply won't work. "The patent system wasn't designed to give me and a small group of people ownership of half the genome," he added.

What's more, warned David Galas, another working group member who also oversees the Department of Energy's genome project as head of health and environmental research, the NIH claim could be just the "tip of the iceberg." He noted that if that approach holds sway, patent claims might be filed on all sorts of mapping data such as the giant YAC (yeast artificial chromosome) clones being used to piece together the chromosomes. Walton Nance of ASHG, agreed, saying it raised the specter of unending litigation over competing claims, say, from one group that patented a YAC and another that patented a gene fragment within that YAC.

Galas urged the government to give careful consideration to a policy that would allow the

* Genome Patent Working Group of the Committee on Life Sciences and Health, under the Federal Coordinating Council for Science, Engineering, and Technology.

patenting of DNA sequence information only when it is intended for a specific use, adding that a shift to such "use" patents, as opposed to "structure of matter" patents, could render the current controversy moot. Use patents may need to be strengthened, he said, since they offer limited protection and some countries don't honor them. But even so, consensus seems to be converging around that approach.

Just one week earlier, a group of 250 scientists meeting in Brazil for the First South-North Human Genome Conference passed a unanimous resolution saying that "intellectual property should be based on the uses of sequences rather than the sequences themselves." Several European representatives at the academy meeting, including David Owen from the Medical Research Council in England, also pushed for an international treaty by which countries would agree not to seek patents on these fragments until their uses are clearly demonstrated.

The sentiment among the working group members was clearly in favor of putting the U.S. house in order before venturing into international negotiations. And that will take some time. The OSTP working group will pass along its policy options to White House science adviser D. Allan Bromley in July, and legislative action may ultimately be needed. Meanwhile, the Patent and Trademark Office has promised to expedite review of the NIH patent application, which could settle at least part of the controversy, but there is no sign yet as to when the office will rule.

–Leslie Roberts

FETAL TISSUE

Banking for Transplantation Research

In an effort to head off a rare political defeat in Congress last week, President Bush touched off a debate that is likely to reverberate around the scientific community for some time. The issue: Just how much fetal tissue might be obtained for research from sources other than induced abortions?

The question was raised when Bush proposed establishing government-funded banks for fetal tissue derived from spontaneous abortions and ectopic pregnancies. Bush said this plan—which he proposed on the eve of a congressional vote that would end a 4-year moratorium on federal funding for transplantation research that uses fetal tissue from induced abortion—would allow such research to proceed without encouraging women to have abortions.

Under Bush's plan, five to 10 tissue banks would be established at an estimated cost of $3 million in the first year. They would supply fetal tissue to research projects and maintain human fetal cell lines. According to the Administration's point man on the plan, Assistant Secretary of Health James O. Mason, "conservative" estimates suggest that approximately 2000 tissue samples acceptable for transplantation would be obtained each year. That would be more than enough to meet current demand for about 200 tissue samples each year, Mason claimed.

Mason's figures, prepared by the National Institutes of Health (NIH), were quickly challenged by researchers, however. They are based on a reanalysis of a 10-year-old study conducted by Julianne Byrne, an epidemiologist now at the National Cancer Institute. In the late 1970s, Byrne examined spontaneous abortions that occurred at three large hospitals in New York City. She evaluated 3518 tissue samples over a period of 4-and-a-half years and determined that 241 samples appeared to be acceptable for transplantation. (The rest had genetic or other structural defects.) But Eugene Redmond, who heads a Yale University team that is using fetal tissue transplants for Parkinsonism—a program funded by private donations because of the federal funding ban—says only about eight samples per year would be available based on Byrne's data. The reason: His project requires tissue between 7 and 12 weeks gestational age. Moreover, Byrne admits she made no attempt to determine whether viral or bacterial infection might make tissue that she classified as acceptable unsuitable for transplantation.

Alan Fantel, a teratologist at the University of Washington in Seattle, is also skeptical about the Administration's plan. The National Institute of Child Health and Human Development has funded Fantel's lab for 27 years as a center for collection and dissemination of fetal tissue from both induced and spontaneous abortions for research that does not involve transplantation, and is therefore not covered by the federal funding ban. The problem with tissue from spontaneous abortions, says Fantel, is that it degenerates because it remains in the womb for days or weeks after the fetus has died, but before it is expelled. "In 20 years, I don't think I could count on the fingers of one hand the number of samples from spontaneous abortion that would be suitable for transplantation purposes," he says.

Mason insists that the Administration's plan is not intended to discourage fetal tissue research, but to "eliminate the medico-ethical tangle and make human fetal tissue from noncontroversial sources more available." So far, however, Congress doesn't appear to be buying that argument. Language overturning the funding ban is contained in the NIH reauthorization bill, which has now passed both houses of Congress (*Science*, 10 April, p. 172). The Administration's proposal for a fetal tissue bank is essentially the same as one proposed by Senator Orrin Hatch (R–UT) when the Senate was considering the NIH reauthorization, but it was soundly defeated 77-23. The Senate then went on to approve the bill by a margin that would override a threatened presidential veto, with several prominent, conservative Republicans not only voting in favor of it, but actively lobbying on behalf of the bill.

A House-Senate conference on the legislation has now produced a final version of the bill and both the House and Senate are expected to vote on the measure in the next few days.

–Joseph Palca

PORK BARREL FUNDING

Congress Sends a Message

Congress last week told the Bush Administration in no uncertain terms that pork-barrel funding of research and science facilities is here to stay. Both the House and Senate passed a bill that rejects the Administration's efforts to cut several science projects that Congress had added to the 1992 budget, mostly without peer review (*Science*, 27 March, p. 1635). And, to drive home the message that Congress reserves the right to determine what research should be funded, the legislation strongly recommends that 31 peer-reviewed social science projects in the president's 1992 budget for the National Science Foundation (NSF) be axed. The reason? The Senate Appropriations Committee, in what a staff aide acknowledged was a "tit-for-tat" move, claimed the projects cannot be justified for their contributions to economic competitiveness or fundamental knowledge (*Science*, 15 May, p. 959).

The bill passed last week simply docks $2 million from NSF's budget. But the accompanying report urges that the reductions be applied to the 31 projects singled out by the Senate Appropriations Committee. NSF officials are now trying to decide whether they must cut these specific projects or whether they can apply the reduction across the agency's $1.8 billion research budget.

Picking on specific items in the Administration's bugdet "is something we don't necessarily intend to do in the future," says the Senate aide—if the Administration gets the message.

–J.P.