While many coffee plantations were swept away by Hurricane Mitch, this Honduran farmer’s erosion control practices saved his.
When Hurricane Mitch slammed into the north coast of Honduras on Oct. 29, 1998, and then stalled over the central part of the country dumping more than 20 inches of rain in 24 hours, the problem seemed meteorological. Too much rain, too fast. One geologist said there were one million landslides in Honduras during a little more than 48 hours. Though staggering, the figure may be misleading.

“Mitch really had more to do with poverty than meteorology,” says Bob O’Neil, Purdue entomologist and director of a collaborative project among Purdue, Cornell University and the Pan-American Agricultural School in Honduras, known as Zamorano. Purdue’s Office of International Programs in Agriculture is administering the two-year project. O’Neil, who spent a six-month sabbatical leave at Zamorano last year, feels Purdue, Cornell and Zamorano are well positioned to have a positive impact on the long-term reconstruction of the country.

“To appreciate the role our universities will play in the reconstruction effort, you first must step back and ask what these universities do well,” O’Neil says. “What we do well is serve as repositories of vast amounts of information. We provide a long-term focus on change. Providing education, outreach and information allows the engine of change to keep going, even within the short-term devastation.”

Rebuilding the basic structure—roads, bridges, water systems—has been the focus of last year’s reconstruction efforts, and that will remain a priority for some time. But what will happen next time? And surely, in a tropical country prone to heavy rain, there will be a next time. O’Neil says education will make the difference.

“Once they have the infrastructure, or parts of the infrastructure back in place, it’s the education process that will leave its mark over time,” he says. “And it’s education on two levels. It’s outreach education for community leaders, teachers, people that run the schools and local farming leaders. And it’s education for the undergraduate students at Zamorano, who are the next generation of leaders, utilizing new curricula, better teaching tools, new ways of teaching.”

Both Purdue and Cornell have significant histories of collaborative work with Zamorano. However, the U.S. Agency for International Development-funded project that O’Neil is directing is unique in that it creates relationships driven by the professional interests of the faculty involved while also focusing on the issues of international development. About 30 Purdue, Cornell and Zamorano faculty met at Zamorano in September 1998, (before Hurricane Mitch) to explore what they called “their own pathways of collaboration.” Out of this came 11 working groups, which cover the gamut from elementary education and health to agritourism and food science.

Some of the more critical working groups in the post-Mitch era will be those working on issues surrounding natural resource education. Many of the landslides—which in many cases destroyed not just the top soil but the sources of livelihood for many families—were caused as much by deforestation as the amount of rain that fell.

“We have a team from the Purdue School of Education that is working with local communities on the development of rural education, focusing on natural resource management. They will be working closely with the Purdue School of Nursing on health education issues,” says O’Neil. “And people from Purdue Agriculture and parts of Cornell are working with Zamorano faculty on curriculum development for environmental management. So we’re hitting different levels. We’re hitting local communities with elementary students in health and environmental education. We’re helping undergraduates at Zamorano through curriculum revisions. And we’re educating graduate students through advanced study in environmentally related fields at Purdue and Cornell.”

It’s the engine of change that O’Neil uses to make his point about what Purdue and Cornell can really accomplish in this environment of devastation. When asked what he sees for Honduras in five years, O’Neil is to the point. “Mitch did in two days what lack of education has been doing to this country for 20 years,” he says. “We must instill a concept of change. If you don’t have this framework of change, then it won’t happen. Institutions like Zamorano must take an active role for things to get better. To help foster this change, our universities can help people and communities recognize the relationship between environmental degradation, education and the costs to their own livelihood.”
New strategies, New skills,
The man in the front of the room knows his audience isn’t sure if it likes where he’s going. But as the farmers, agribusiness leaders, input dealers and lenders listen to the animated agricultural economist weave an almost irrefutable case of anecdotes and economics, most would concede that they don’t like the low-price spiral their industry seems trapped in today either. And they know that agriculture is changing, with or without them.

New agriculture

That’s one of the key concepts that Purdue University agricultural economist Mike Boehlje wants them to understand when he talks about new agriculture. This is farming in the future, part thesis with the extrapolation of promising new technologies, part real-world economic analysis where the global marketplace—not the participants—makes the rules.

Playing by new rules

The old way of farming was tough but, except for the weather, a fairly predictable way to make a living. Follow the rules and government supply control would make sure that there was money in the market. The American farmer worked hard, but advances in research and technology reduced the labor and eased the load. The horse, the supplanter of hand cultivation, gave way to the tractor. Less need for horse feed meant more acres for cash crops. The advent of synthetic fertilizers and chemical pesticides allowed farmers to grow the most-profitable crops continuously.

Corn and soybeans became commodities, and when everybody grows something, prices drop. Unable to raise prices, farmers concentrate on cutting costs to increase profit. Those who adopt the right innovations early reap temporary rewards, at least until everybody else does it, too. Then it’s back to the drawing board.

Some can’t, or won’t, keep up. Farming becomes more like factory work—what Boehlje calls “biological manufacturing,” where the farmer becomes more of a “general manager” rather than a “plant manager.”

“The new agriculture will require new skills,” Boehlje says. “The skills they’ll need will be more those of a general manager, with expertise in employee relations, marketing and strategic planning. That may not appeal to a guy who likes driving the tractor,” he says. “In the past, hard assets were prized—land, machinery and equipment. The new structure will value knowledge, information and relationships more.”

The picture he paints mixes a palette of economics, technology and culture, with a farmer more likely to push a pencil than pull a plow.

By Chris Sigurdson
Today’s farmer plants a few hundred acres in corn and soybeans. When crops emerge, he scouts his fields for signs of insect and weed infestation, hopes for timely rains and passively monitors plant development. Much of the summer is taken up with equipment maintenance and formulating marketing decisions. At harvest, the farmer either sells the crop outright or stores it until he deems it time to sell.

Contrast that with Boehlje’s vision of the “biological manufacturer” of the new millennium.

Tomorrow's farmer plants several thousand acres in a mix of crops—white corn, black beans, gourmet popcorn, ginseng—almost anything that he and his partners can secure a contract for. Many of these acres are two counties or more away, but satellite imagery allows him to track crop progress from his home office. Computerized monitors that measure relative humidity and temperature over time anticipate fungal infections. Infrared monitors can alert the farmer to changes in the levels of vegetative matter because a drop could signal leaf rolling or a plague of voracious Japanese beetles.

If insects or weeds are spotted by the electronic visioning systems, the irrigation system, which doubles as an intervention system, delivers a low toxicity spray only to the affected areas. If the insect infestation requires a pesticide restricted by the end-user because of consumer concerns or if it’s too close to harvest, the farmer will decline to control the pest.

Insurance puts a floor beneath how much the farmer can lose, but the contractor also bears some of the risk as long as the farmer faithfully follows the buyer’s production guidelines. At harvest, the farmer holds the grain in separate storage bins until the customer calls for it.

That customer relationship Boehlje is talking about will be contractual, a sticking point for many farmers. The chance that they would become employees on their own farms irks many of them, but Boehlje sees these contracts as a way to share the risk and add value at the farm level.

“A major snack manufacturer used to buy potatoes from about 800 growers, and quality was all over the place. Today, that list of growers is less than a tenth of the original, but they’re well-rewarded for meeting the needs of the consumer, as interpreted by the manufacturer,” he says.

These qualified suppliers will command premiums for their crops. They will be valued not only for their production skills, but also for their willingness to try new enterprises and adapt to consumer needs.

“Nothing’s going to be more information flowing back to the farm,” says Boehlje. “There’s going to be a greater connection between what people will pay for and how the plants and animals are raised.”

His conclusions come from decades of watching how agriculture has changed from when he was a boy on the family’s Iowa farmstead, to now, traveling the country speaking with agribusiness leaders, lenders and farm groups about farming in the new millennium.

**Specialty markets attractive**

Far-fetched? Hardly. It’s not too distant from what Don Villwock, a Knox County farmer, has done for the last few years. Villwock is living what Boehlje is talking about.

Villwock grows popcorn close to ISO 9000 standards, manufacturing-quality parameters that make products welcome in any country on the planet. “I have to document production,” he says. “They dictate when it’s planted, what pesticides are used and when, no glass in the field, and so forth. They even say that herbicides used on that field the year before must be within parameters.”

In exchange for following a strict regimen of production criteria, Villwock earns more than he would on common corn. However, he’s already starting to see some dilution—so many people want to grow popcorn that the premiums are coming down.

Boehlje calls it value decay or profit compression. “In a commodity market, all you can do is lower your cost, and you hammer on costs,” he says. “In specialty markets, crops with specific useful attributes have more value, less compres-
Farmers can add value in the field and get off the commodity treadmill.”

At least for a little while.

“When it’s safe, easy and doable, everybody will be doing it, and we’ll have to find the next crop, the next innovation,” Villwock says. But that will be another key characteristic of the new agriculture. Few farmers will be raising the same crops decade after decade.

Villwock’s also trying to become the middleman between buyers and farmers who are willing to grow to spec. So far, it’s been difficult.

“I think we’re ahead of our time. The end-users are not sophisticated about it, surprisingly enough,” he says. “They know they want the value-added materials. They want the relationship and they say ‘we should talk,’ but they’re not ready to put anything down on paper.”

Ironically, he says, the first contract that his group may broker will be one for commodity corn, if they can certify it contains no genetically modified organisms.

Technology pays off

The technology is already here. Hamilton County farmer Rodney Rulon has two degrees in agricultural systems management from Purdue, and he farms 5,000 acres with his uncle and two cousins. They began monitoring yields in 1993, shortly after the equipment was available. This year, they just completed the last soil sample on a one-acre grid, a massive undertaking, but one they felt was worth the investment. Matching soil characteristics with yield history and crop needs allows them to save money and resources.

Their planters can vary the rate of seeding as they move down the field, dropping more where the land can support higher populations. Their chemicals are scientifically administered with the aid of variable rate controllers and custom application prescriptions.

“We do our own variable-rate fertilizer, and we’ve been very pleased with the results,” says Rulon. “We’re managing the ground, getting fertilizer where we need it and not causing environmental problems by fertilizing where it’s not needed.”

Rulon calls the marriage of Global Positioning Systems and farm technology “a better form of record keeping” that pays off well enough for them to afford the acre-increment soil sampling and GPS land surveying cost. There’s even enough left over to provide their landlords with printouts to show how the family is farming the land.

“It gives us the ability to use management to the nth degree. It’s the best use of time and information, identifying areas that will pay back and those that won’t, and the yield monitors show better, more consistent yields,” Rulon says. “Because we’re in a county that surrounds Indianapolis, we’re real close to a lot of people who aren’t in agriculture. We want to show them that we’re doing a good job, and we have the records to back it up.”

“We’re not talking about an agriculture that’s incompatible with family farming or organic farming,” Boehlje says. “This is not a factory farming model—in fact, young entrepreneurs will do better than large bureaucratic organizations.”

“The new agriculture will require new skills. The skills they’ll need will be more those of a general manager, with expertise in employee relations, marketing and strategic planning. That may not appeal to a guy who likes driving the tractor. In the past, hard assets were prized—land, machinery and equipment. The new structure will value knowledge, information and relationships more.”

The Rulon farm is a family-operated enterprise. Rodney Rulon is just 27 years old, another important characteristic in the new agriculture that contradicts the current trend of aging operators, Boehlje says.

“In modest structural change, wisdom and experience count a lot, but in periods of rapid structural change, letting go, open-mindedness and no experience may be worth more,” Boehlje says. “You can’t be the second adopter, you’ll have to take risks, recognize when you’re wrong and make the corrections. Risks at 35—you can recover. Risks at 55, you can’t. The age dilemma—we’re old. Those willing and eager won’t have much competition.

“Economic forces are very powerful,” says Boehlje. “We need to acknowledge the pressures. And if we don’t like the projected outcomes, we have time to change them. At the same time, if we can see what’s coming and position ourselves for the change, more farmers will have a better chance to succeed.”
Lowell Hardin, professor emeritus of agricultural economics and associate director of International Agriculture at Purdue, was on the ground floor of what has become international agricultural development worldwide. He played a key role in the development of a network of 16 international agricultural research centers around the world, the first of which was the International Rice Research Institute in the Philippines.

These international centers, coordinated by the Consultative Group on International Agricultural Research (CGIAR), work to promote food security, alleviate poverty and manage natural resources in developing countries. These missions are accomplished through problem-solving research and training programs designed to improve local human capacity. Agricultures Magazine caught up with Hardin for an informal chat about the early days of international development, which ultimately led to the establishment of the CGIAR.
International Plant Genetic Resources Institute, Rome, Italy

The groundwork for the CGIAR was laid at this villa in Bellagio, Italy.

International Crops Research Institute for the Semi-Arid Tropics, Pantanacheru, India

Improved sorghum and millet varieties are products of this center, which deals with difficult environments found in Asia and Africa.

Centro Internacional de Mejoramiento de Maíz y Trigo, near Mexico City

This center developed the high-yielding wheat varieties that helped bring the Green Revolution to Asia.

International Rice Research Institute, Los Banos, Philippines

The first of the 16 centers, IRRI scientists developed the miracle high-yielding rice varieties.
How did this all start?

I think that the Rockefeller Foundation’s successful program in Mexico marked the turning point in development assistance. In 1943, the foundation sent a team of three scientists to Mexico. They went because Secretary of Agriculture Henry Wallace, having been to Mexico, said, “My gosh, aren’t there things that we could do to help improve the food situation of our next-door neighbor and the well-being of all those peasants?”

The team recommended a collaborative research and training effort. In response, Rockefeller dispatched a group of U.S.-trained scientists to live and work in Mexico. I’m convinced that many of the constructive things we’ve done to help improve food security for hungry people—even the reversal of near-famine position of India—can be traced back to what those agriculturists did in Mexico.

Why were they successful?

They practiced a different kind of development assistance. They started by training people to work beside them. They set a model that came from America’s farms. To them, it just came naturally to get out in the field and run their experiments with their own hands. They applied modern science and technology.

Many scientists in developing countries would send an assistant to take measurements and to see what the crops looked like. They seldom tended the crops themselves. If you’re going to be effective, you’ve got to see what’s going on with your own eyes, your own microscope. You’ve got to be there to do it.

Who were the players?

There were many, but one of the most memorable was a man named Frosty Hill, who was one of my major professors when I was working on my Ph.D. at Cornell. He had just come back from Washington where he helped Bill Myers set up the Farm Credit Administration. This was during the Roosevelt Administration. Frosty couldn’t tolerate Henry Wallace, who was vice president at the time, so he resigned.

The Ford Foundation picked Frosty to start its international division. Ford and Rockefeller, as well as others, feared what was happening in the poorer countries of the world. They were concerned that communism was taking over. If people didn’t get more to eat, communism was going to take them.

So politics played a role?

Well, altruism was involved, but it was really in our enlightened self-interest to have countries that were politically favorable to the United States rather than stand by and see them climb into bed with the Communists.

But, back to Frosty Hill; he and George Harrar, president of the Rockefeller Foundation, both lived in Scarsdale, outside of New York City. They commuted back and forth on the same train, and their offices were just a few blocks from each other. One morning on the train, George said, “You know where it’s most difficult to fill the food bowls for people? It’s the rice bowls in Asia.”

Frosty replied, “Why don’t we go to the Philippines and take a look?”

Well, in those days (late 1950s), we had propeller-driven aircraft, so it took a long time to fly all the way to Manila. They talked a lot about it and came up with the idea of establishing an international center in the midst of where the problem was. Employ a cadre of multinational scientists, they figured; then turn this small academy of able people loose, and see if they can’t do something about the food supply.

George and Rockefeller had the key scientists. Frosty and Ford didn’t have very many agricultural scientists on their team, but they had some flexible money. The upshot was that Rockefeller put in the staff and Ford built the facility. In 1960, they jointly started the International Rice Research Institute (IRRI) in the Philippines. IRRI, along with its sister corn and wheat center in Mexico, catalyzed the Green Revolution in Asia.

How did you get to the Ford Foundation?

When Frosty Hill retired in 1965, I went to Ford on a one-year leave from Purdue, where I was head of the ag economics department. Ford invited me to help develop an agricultural program in Latin America. I was involved in Purdue’s work with Brazil, so I knew what an institution like ours could do working with able colleagues in a sister country.

There was some question then, of course, as to whether it was a good
thing to do. Were we aiding and abetting the competitive enemies, so to speak, in the marketplace? What we have learned since then is that in nearly every country where agriculture has improved, our exports of ag products have risen. As a country develops and incomes rise, the people move up on the food ladder. They eat fewer starchy root crops and rice and more meat, milk and eggs. Domestic production can’t keep up with the growth in demand. This increases the market demand for grains for feed. If they can afford it, they buy the grain.

♥ So did you stay just that one year?

Well, I went to New York for that year. We had a great time. After all, I was on loan from Purdue; I could pretty much say what I wanted, do what I wished. About two-thirds of the way through the year, Ford said, “Why don’t you stay?” Well, I hadn’t thought about it. We’d been planning to come back to our home at Purdue, as we’d promised the kids. But my wife Mary said, “You know, Lowell, you’ve got a lot more to learn here.” And I thought, “She’s right.”

So, I sent a letter of resignation to Dean of Agriculture Earl Butz, and said that we’d decided to stay on. It was a good decision. It really did stretch us. We were there for 16 years. I went there in 1965 and came back in 1981, when I retired from Ford.

♥ What was the attraction?

McGeorge Bundy, who was president of the Ford Foundation during most of the time I was there, once wrote an essay on the international centers. He said the genius in international work is to retain scientific quality in the political world. You’ve got to have sufficient flexibility that each country can do what is necessary within its political constraints.

Our job as a foundation was to be catalytic. We started things. We helped them get to the place where we hoped they could go on, and the world would support them. In one of our programs, the foundation was instrumental in creating the profession of agricultural economics in Argentina. I’d like to think that’s one of the reasons that we have better relationships with Argentina today.

The foundation set up a competition and picked 50 people—top people—from all over the country and sent them to 12 different institutions in the United States to get their Ph.D. in agricultural economics. Then, we sent them back to Argentina to do their thesis work. Most of them got their doctorate. They were excellent.

♥ You started off addressing hunger concerns, right?

The root cause of hunger is poverty. The world hasn’t figured out how to alleviate poverty. We haven’t solved the poverty problem at home either, so who are we to tell somebody else how to deal with it. Hunger results from one’s inability to get access to food, not from the world’s inability to produce it. We will produce it as long as we keep our universities and research centers strong.

I think we are making progress. We get a lot of static from the media about how lousy a job we’ve done. They say supporting AID (U.S. Agency for International Development) is putting sand down a rat hole, and we’re not making much progress. So I looked up some of the numbers, and we’re really doing quite well.

You have only to examine the changes that are taking place in the well-being of people in poor countries

to see how much more progress these nations are really making. On average, over the last 35 years, the developing countries have doubled school enrollment. Especially significant is the rise in the number of girls who now receive schooling. Both adult illiteracy and infant mortality rates have been reduced by one-half. They have cut malnutrition by one-third and expanded life expectancy from birth by 20 years. Nothing happening in international development? All down a rat hole? Nonsense!

A graduate of Purdue and Cornell universities, Lowell Hardin joined the Purdue School of Agriculture faculty in 1943. He became head of the department of agricultural economics in 1953 and served in that capacity until 1965 when he went to the Ford Foundation as senior agriculturist. In 1981, he returned to Purdue as professor emeritus of agricultural economics and assistant director of International Programs in Agriculture, a position that he still holds. In 1998, he received the Nyle Brady Award in recognition of his lifelong contributions to the CGIAR.
To investors, three letters deliver heart palpitations: IPO, which stands for initial public offering. Everyone wants to invest in a hot company, but few people want to buy Amazon.com stock at $275 a share. The greatest rewards come to the earliest investors.

The trick, of course, is knowing which new ventures to invest in.

“The two hot high-tech industries of the moment are life sciences and information technology, and agriculture fits right into that,” says Vic Lechtenberg, dean of agriculture at Purdue. Lechtenberg says the researchers at Purdue foresee three high-areas with a large potential for economic development in agriculture. “First, there is the emerging new science of genomics, which will allow us to make great strides in improving the genetics of crops and food animals. This will be especially important as it relates to human and animal health and to the environment. Next is using technology to improve global competitiveness. Finally, there is the reality of greater environmental regulations and controls, and the economic opportunities these new rules create.”

Indiana is well poised to become a leader in this merging of agriculture, medical sciences and information technologies. It is home to three of the nation’s most well-known research universities, Purdue, Indiana and Notre Dame, as well as the nation’s fourth-largest medical school, the I.U. School of Medicine, and one of the nation’s preeminent agricultural schools. Add to that mix the industrial might of science-based companies such as Eli Lilly & Company, Boehringer Mannheim Corp., Great Lakes Chemical and Dow Agrosciences, and Indiana emerges as a potential leader in the next age of high-tech life sciences.

If an investment in high-tech life sciences is made, the payoff would be jobs. According to Purdue’s Office of Manpower Studies, across the nation, high-tech employment is expected to increase twice as fast as overall non-farm
Dennis Fry of Fry & Associates, Indianapolis, turned to Purdue’s Department of Food Science for technical assistance in developing a product for an overseas market. Purdue’s food science complex provides similar help to other food technology industries, especially new start-up companies that lack the resources of larger corporations.
employment for the next seven years, a 32 percent increase versus a 15 percent increase. Jobs in agricultural life sciences are expected to increase by 42 percent in that time period.

This would be good news for Indiana in many ways. Not only would new jobs be created, but it could also help reverse one of Indiana’s most intractable problems, which is college graduates leaving the state for better opportunities elsewhere, a problem known by colloquial shorthand as “the brain drain.” Indiana ranks 15th in the nation in producing college graduates, but only 48th in the nation in the percentage of the population with college degrees. According to the Indiana Fiscal Policy Institute, Indiana is dead last among the 50 states in the percentage of its labor force employed in professional specialty occupations.

It doesn’t take an agricultural scientist to tell you that if you want something to grow, you have to create a favorable environment. In his 1999 State of the State Address, Indiana Gov. Frank O’Bannon, proposed creating a $50 million 21st Century Growth Fund to pay for university research and business incentives to create and retain jobs in biotechnology, computer science and other high-tech fields. The Indiana General Assembly responded, creating a $50-million investment fund.

“We’ve seen this work in other states,” says Randy Woodson, director of Purdue’s Office of Agricultural Research Programs. “In California and Massachusetts, research was funded at Stanford and MIT, and the computer industry took off in those states because of that. North Carolina put money into the research triangle and launched a major pharmaceutical industry.” (The research triangle is the area between the University of North Carolina in Chapel Hill, North Carolina State University in Raleigh and Duke University in Durham.)

In 1990, Georgia created the Applied Genetic Technology Resource, an alliance of six research universities and high-tech industry. Their effort already has spawned seven new high-tech companies, with several more planned. The Georgia program would be a good model for Indiana, Woodson suggests. “The bottom line is this: Here at Purdue, we’re doing the type of research that will attract jobs—well-paying, high-tech jobs—to Indiana.”

Here are reports on these three emerging areas of high-tech agriculture.

**Biological manufacturing**

Just as the invention of the microprocessor eventually ignited the rocket-like ascent of the computer industry, many scientists believe recent insights into the genetic structures of organisms, a relatively new branch of biology called genomics, will spark enormous economic opportunities in the discovery of new genes. “There could be literally one or two companies that come out of the discovery of just one gene,” Woodson says. “When you multiply that by the hundreds of thousands of genes that are important to humans, animals and crops, you begin to realize the economic opportunities that exist today in life sciences.”

Lichtenberg says that a convergence of the applied biological sciences of medicine and agriculture are both inevitable and beneficial. “New advances in genomics, particularly plant genomics, will allow us to link agriculture and medicine. We will be breeding and producing new crops that lower cholesterol or block fat absorption, and consumers will soon see the benefits of this new emerging basic science.”

Purdue professors Avtar Handa and Suresh Mittal are looking at using genetically modified plants to deliver vaccines to animals and humans. By increasing the number of antibodies in the mouth and throat (antibodies are antiviral compounds in our bodies), the researchers theorize that diseases that typically enter the body through the mouth and nose will be less likely to cause respiratory and gastrointestinal diseases. By eating foods produced from plants genetically modified to produce the vaccines, humans and farm animals could have improved health at a very low cost.

Although the marriage of medicine and nutritious foods seems obvious, less apparent but equally promising are techniques that would ultimately convert farm fields into biological production facilities for important industrial chemicals and materials.

“For example, it is possible to modify genes of plants to produce materials that
Global competitiveness

It is of little surprise that globalization is an important factor in economic development—“If you go back a decade and compare, the globalization of agriculture is having a phenomenal effect on today’s economy,” Lechtenberg says—but that doesn’t discount the idea that globalization will continue to be a driver of Indiana’s future agricultural economy. A critical component in being able to compete globally is being able to create foods that people in other countries care to eat.

Mike Boehlje, professor of agricultural economics at Purdue, says “Most of the private-sector research and development activity has focused on the United States and Western Europe, but these are relatively mature markets. Today, the growth opportunities are greater outside these regions—such as Mexico, South America, Eastern Europe and Asia.”

Fry & Associates, a food technology company in Indianapolis, recently contracted to develop a Chinese-style chicken broth for a Taiwanese company. Fry turned to Purdue’s Food Science Department for technical assistance, and received advice on packaging, heat processing and production. During the first year, more than seven million cans of the broth were produced in the United States for export to Asia. “There were more than $500,000 worth of ingredients bought from Indiana producers for just this one product, with growth expected for the coming year,” says Dennis Fry, owner of Fry & Associates.

Fry says that over the past seven years, Purdue has assisted his company with international food and product development for markets in Argentina, Chile, China, England, France, Germany, Poland and Russia, as well as Taiwan.

“Purdue’s new food science complex gives us the opportunity to set up a technical assistance program to the food technology industry,” Lechtenberg says. “This is especially important for new start-up companies that lack the resources of larger corporations.”

Environmental research

Many business people view new environmental regulations as added burdens on the nation’s economy, but Ronald Turco, director of Purdue’s Environmental Sciences and Engineering Institute says that increased environmental concern also brings new business opportunities. “I’m an open-market advocate who thinks that the best way to implement the regulations is just to put them out there and let the marketplace come up with solutions and the people to deal with them,” Turco says. “The business community is quick to respond with innovative technology. If you put the regulations there and you enforce them, you will create jobs because of it. Look at all of the new companies that sprang up after the clean air regulations were put into place.”

In agriculture, the most pressing environmental problem involves disposing of animal waste. As food animal production moves away from a few animals on a family farm to large, efficient industrial production facilities, disposing the waste produced by those animals changes from a small barnyard chore to becoming a large environmental challenge. “This is a problem that has technological solutions,” Woodson says. “We just need to do the research and come up with those solutions. But this is a problem that we can solve.”

One of the problems with manure, according to Turco, is that it is an inexact material, which makes it difficult to use precisely. “But we can build computer-controlled bioreactors that can convert the waste into a standardized crop nutrient,” he says. “It’s going to take some brainpower to do that. But there will be economic opportunities in the development, testing and marketing of these new waste disposal methods.”

Taking a broader, long-term view of the economic potential in environmental regulations, Turco says that farmers may even find economic opportunities in new regulations enacted because of concerns of global warming.

If the United States signs the recent United Nations Kyoto Protocol, which calls for treaty nations to reduce their net carbon emissions to 1990 levels by 2008, Turco sees opportunities for farmers to be paid to adopt farming practices, such as no-till, that increase carbon sequestration so that the United States can achieve this goal.
The Land of One Million Landslides

Agri...
Information technology. When combined, these two words pack a lot of power in our lives today.

Information technology has found its way into our offices, our homes and our classrooms, opening the floodgates for a wave of new ideas as people look for innovative ways to make it work. College and universities discovered that the teaching barriers of time and distance could be eliminated by using multimedia like videoconferencing, the Internet and CD-ROM to develop distance learning programs. Land-grant universities, in particular, see information technology as a new way to fulfill their community outreach mission, which was established more than a century ago.

“There is a great need for continuing education in the agriculture, food and natural resources industries,” says Purdue Dean of Agriculture Vic Lechtenberg. “But these people aren’t all in the same place, nor do they all need the same information. Through distance learning, we now have the ability to reach audiences in ways that we couldn’t before. We can provide customized training, help people improve their job skills and even offer entire degree programs.”

But such talk doesn’t come without a price tag. Purdue Agriculture is investing more than $1 million for faculty and Extension educators to develop programs that respond to high-priority educational needs and incorporate distance learning as a method for delivering information.

Reaching out

The information age is creating a new population of information consumers. But while this new era is expanding the need for information, it also is fueling a demand for timely, convenient access.

Distance learning and Extension seem to be made for each other. But the challenge is to take the knowledge base that’s always been the hallmark of Extension and use technology to deliver programs that people want and need and at a time and place that is convenient for them.

Purdue Extension has been knocking at the distance learning door for some time. Last winter, more than 400 farmers around the state gathered at various county locations for a series of Extension videoconferences that addressed the crisis in the pork industry. Farmers questioned the panel of experts via telephone.

This is just one example of the videoconferences that are available to counties via satellite and closed-circuit television. Videos, CD-ROMs and Web sites round out Extension’s distance learning list. But these resources are only the beginning stages of what Purdue Extension hopes will grow into learning centers located throughout the state, serving up a full menu of programs.

“The needs of the public are changing, and we have to change, too,” says David Petritz, director of Purdue Extension. “People expect timely, relevant information from an expert.”

This timely, relevant expertise will come packaged in a format that Petritz describes as “high tech and high touch.”

“We have to find the right information for people—whether it’s a two-week learning module or a two-year degree program,” says Petritz, “then we need to determine who has the information that best fits their needs. We have to build the right package.” The right package may consist of information from Purdue.
Petritz also predicts that distance learning will bring about closer ties between credit courses and continuing education. “I think you’ll see a blurring of the lines between them,” he says. For example, a particular segment of an on-campus credit course may be repackaged as a learning module, which is broadcast to learning centers where county educators facilitate classes.

“The professor teaches his class as usual, but for that two-week period he’ll have a video camera in his classroom,” Petritz says. And credit courses, like a proposed two-year degree in agriculture, could be delivered around the state, much in the same way that previously was used only for Extension outreach.

Anytime, anyplace

Professionals who want to further their education while climbing the corporate ladder often face a difficult dilemma. Working on an advanced degree may mean long commutes to the nearest college or university or even abandoning the program because of a job change or transfer.

“Our philosophy is anytime, anyplace learning,” says Jay Akridge, who directs Purdue’s executive MBA in food and agribusiness, which enrolled its first students last fall. “We’re in four time zones with students in the United States and Mexico. Distance learning takes geography out of the picture.”

Like most classes, there are reading assignments, quizzes, class discussions and even group projects. The difference is the commute takes place on the information superhighway. The Internet becomes a virtual classroom, connecting students with their transcontinental classmates, as well as with faculty. Papers are handed in by e-mail. Lectures are delivered on CD-ROM. In one class, for example, a CD-ROM includes video that shows how to calculate a problem in quantitative methods. The video clip takes students through the steps the same way a professor might illustrate the problem in the classroom.

And remember time? This classroom is open seven days a week, 24 hours a day—an important selling point for students like Texas-based communications consultant Sarah Vacek. “Distance learning is especially appealing because of its flexibility,” says Vacek, who wanted to continue to work full time and attend a top-flight business school. “I don’t have to be present at a specific time for class. This means business trips won’t interfere. I’m still required to put in the
hours associated with any high-quality degree program, but I put those hours in when they best fit my schedule.”

This around-the-clock classroom also requires nearly around-the-clock support. Faculty have technical support staff to help develop Web-based courses, and online tech support is available for students, as well. “It takes a lot of development time,” Akridge concedes, “but it’s an investment with a great payback.”

And while faculty are adjusting to teaching in a virtual classroom, students are struggling with a learning curve of their own. “At the very beginning, I spent more time on the mechanics of the discussion group than actually participating and absorbing information,” Vacek says. “Now I can move more efficiently in the virtual classrooms and get more information out of the same amount of time devoted to the class.”

Expanding classroom walls

It was only a decade ago that a revolutionary box called the personal computer began to appear on faculty desks. It’s been a quantum leap from using a PC to create a course syllabus or record grades to turning it into a teaching tool. But distance learning is proving to be effective with resident students, supplementing what faculty teach in the classroom. It provides access to information that may not be covered in class and connects students and faculty when they’re outside the classroom.

Rod Allrich, associate professor of animal sciences, added virtual classes to his teaching repertoire during fall semester. Three days a week, some 90 students in Allrich’s Physiology of Domestic Animals course attended class in a lecture hall in Purdue’s Lilly Hall. The fourth day they went to class virtually.

While Allrich doesn’t believe virtual classes can replicate faculty-student interaction in the classroom, he says the Internet has some distinct advantages over the classroom—particularly when it comes to visuals. “Students can look at virtual images a hundred times instead of just once in the classroom,” he says. And a greater variety of digital images can be found on the Internet as opposed to those he might find on slides. He can also customize images by using a software program to add arrows and labels or even use a digital camera to create his own visuals.

His online lectures read a lot like you would expect him to sound in the classroom and are anything but canned. Past lectures stay online for the entire semester—ideal for test review. Web courseware—software used to develop virtual courses—grades online quizzes and tracks students’ progress throughout the course.

His course Web sites are warehouses of information, from housekeeping items—syllabus, reading assignments and daily announcements—to a reference bonanza—online dictionary, glossary of terms, and test and image archives. There’s also a chat room as well as e-mail links to Allrich and each student in the class.

Even though it’s less time in the classroom, the only thing virtual class saves him is washing the chalk off his hands one day a week. Allrich spends about six hours preparing for a virtual class, compared to about 50 minutes for a traditional classroom lecture. In addition to writing the text and creating the Web page, he uses an Internet search engine to help locate images and links. “I may look at 10 sites before I select one,” he says.

Then why do it? For Allrich, it’s all about learning. “If it expands what students are learning, it’s worth it.”