Interview with Peter Goldsmith

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DePue: Today is Tuesday, the 16 of September, 2008. My name is Mark DePue; I'm the director of oral history at the Abraham Lincoln Presidential Library. And today it's my honor to have a conversation with Peter Goldsmith about your work at the Soybean Research—I should say the National Soybean Research Center here in Champaign—or is Urbana?

Goldsmith: We are physically in Urbana.

DePue: Okay. Peter, why don't you tell me just a little bit about yourself, and start with when and where you were born.

Goldsmith: I was born in Stamford, Connecticut, in 1959, and I'm probably one of the last people you'd expect to be executive director of the National Soybean Research Laboratory, having grown up about thirty—well, in Westchester County, New York, right outside New York City. My mother worked in New York City, and my father ran a manufacturing facility outside of New York City. And I knew nothing about agriculture growing up until my father retired and moved to a farm.

DePue: And how old were you when that happened?

Goldsmith: I was seventeen. So I had never thought about agriculture. I liked being outdoors, of course, and that sort of thing—camping and that sort of thing—but I had no idea. And they'd bought a farm, which they still live on, in western New Jersey, and I said, "Well, gosh, I kind of like this." So I started farming for people. And certainly didn't think about academics because I didn't start that until I was in my thirties.

DePue: What was your father's name?

Goldsmith: Benioff. This is my stepfather that I grew up with.

DePue: Benioff?

Goldsmith: Benioff, yep.

DePue: How would you spell that?

Goldsmith: B-e-n-i-o-f-f.

DePue: Okay. What nationality would that be?

Goldsmith: Lithuanian.

DePue: Okay.

Goldsmith: Yeah.

DePue: Why did your father go to the farm?

Goldsmith: Well, my grandfather grew up in a farm in Delaware. There's a plaque on his farm because they were a group of émigrés from New York City in the early 1900s when the ghettos—the Jewish ghettos of New York—were so teeming with people, and then they had this program of low-interest loans, and they moved people off to the farm. And so my grandfather's family was one of those, and they started farming in Delaware. And I don't know, maybe my father just got bitten by the farming but like all of us do and said when he retired—and he retired a fairly young man—and said, "I'm going to buy a farm."

DePue: Okay, you were a seventeen-year-old. Had you graduated from high school yet?

Goldsmith: It was right then. I had just graduated. They waited 'til I graduated from high school.

DePue: What was your reaction when they moved to the farm? What are you thinking?

Goldsmith: "Oh, this is great." I was like a pig in manure. This was really good.

DePue: So you didn't miss all your friends or all of the…?

Goldsmith: No, no, no, no. No, no, no. I thought, you know, we had a farm, and it was in not very good shape, so we had a lot of work to do. And it's a hobby farm; it wasn't very big. Very beautiful place. And it was great. I spent that first summer helping them get it together—all the outside work, all the ground work, then started looking into programs and work, looking for neighbors where I could farm, where I could work, and just started farming for people.

Film crew: I need to pause for just a second. Microphone's rubbing while you move your arm. I'm just going to (inadiable speech). It's nothing for you to worry about.

DePue: Did we miss some of it?

Film crew: No.

DePue: Okay.

Film crew: We didn't miss any of it, but I don't want the rubbing to get distracting. (pause)

DePue: And I'll start talking the second time around here again. (pause)

Film Crew: Three, two, one.

DePue: Peter, can you describe the farm that your father purchased?

Goldsmith: Yeah, it was a fifty-acre farm in Mercer County, right on the border of Mercer and Hunterdon County, New Jersey. It had been a dairy, but the main barn had burned down in I think 1958. There was a couple-acre pond, rolling ground—you know, in the East, not very good ground. Small. I don't know how many different fields. Half a dozen small fields, corn, beans, hay. And…is that good? And there was three tractors, one barn still standing, an employee's house, and then my folks' house.

DePue: Coming out of high school at the age of seventeen, what are your plans—your immediate plans?

Goldsmith: I had thought I was going to be a lawyer, but while I was good in school; I was not very bookish. I liked working. That's what I always liked to do was work. And so I went to a school out in Ohio, and that certainly helped. I went to a school called Kenyon College in Gambier—a rural area. And I just liked being out of the East Coast, in rural area. And they had a library—this was before computers—and had a guest farmer program in Norway, and you could go and work all summer for a farm. And so I thought, "Well, that's great. What do I need to do to do that?" And so I just signed away and then signed up and started milking cows about 300 kilometers north of the Arctic Circle. I farmed there and made very good friends there and said, Yeah, dairying is really what I want to do. There was more to it than that, but that was right out of high school.

DePue: What was your major in college?

Goldsmith: I majored in political science. And Kenyon's a liberal arts college, and so I just took liberal arts and farmed during the summers and then on vacations. The second year, I worked for a New Jersey farmer—large cash grain and beef operation, and just driving tractors, plowing, all that sort of stuff, for him. And third summer during college I went back to the same farm. They liked me so much the first time, I went back there, up in northern Norway, and farmed for them. And they were expanding their farm, and so that was good. And then when I graduated, I went back to Norway again—this time, I'm fluent in Norwegian, and it's not very difficult for me—and this time was a herdsman for a cooperative. They had a law in Norway that all farmers had to take off two

weeks a year. They had to physically leave the farm. And so then they needed guest herdsmen. So then I was a herdsman.

DePue: Did you graduate from college with a political science major?

Goldsmith: Yep.

DePue: And yet you kept getting drawn back to the farm, sounds like.

Goldsmith: Yep, yep, yep, yep.

DePue: Anywhere in that process you says, "You know, I got the wrong major"?

Goldsmith: Well, not the wrong major, because I certainly—I don't know, political philosophy has always been something of interest, but I didn't really want to—I knew nothing about graduate school. You know, I wasn't thinking anything like that. But I did realize that I needed a dairy science degree, so then when I came back from working as a herdsman, I enrolled at the Ohio State University, got a dairy science degree part time. I was a herdsman for a farm in Ohio. So I started working for a farm in Ohio, and then during the middle of the day and winter, I'd take classes. So I do have a dairy science degree. So I came back and got that.

DePue: What year did you graduate from college?

Goldsmith: Nineteen eighty-one.

DePue: And from Ohio State? From Ohio State?

Goldsmith: Yeah, Ohio State was 1983, maybe, with the dairy science degree.

DePue: Very briefly, then, if you could talk us through from 1983 until the time you came to join this institution.

Goldsmith: Well, I wanted to farm, so I graduated, farmed for a bit. I worked for this registered—it was a ninety-cow registered Holstein herd in central Ohio—and then I decided to join the Peace Corps. And they had a large animal husbandry program in Ecuador. And there aren't many Aggies who know about cattle, so I was drawn to that, and they certainly selected me, and that was a great experience, going down there. And there, I worked for two and a half years in Ecuador, in the coastal region. It was a colonial region. It was an area that was being cleared. And taught artificial insemination, did a lot of country vet work—castrated every species. Lots of horses, lots of pigs. And we set up an artificial insemination co op, because artificial insemination wasn't known at the time in Ecuador, especially in the coastal region. So we set up a co op. I managed a large herd there and taught artificial insemination, reproductive management, and spent two and a half years.

I came back and got a job with Dairy Herd Improvement, which is a dairy records company which does dairy records, and then rose up, became the assistant general manager of that coop. And got an MBA—thought that might be helpful—in finance. And then something happened. And then I was in my thirties and something happened, and I realized I was really curious about co ops. And I met a guy, an ag economist—and I had no idea what an ag economist was—I'd never taken any economics—and I saw what he did, and people seemed very interested in what he did. Not so much in dairy management—what I did—but more in the money. So then I decided to leave Dairy Herd Improvement and became a graduate student—was offered an assistantship with a very nice gentleman professor, and I started a new phase of my life as an economist. And I'd never taken economics before, and go right into a Ph.D. class in economics.

DePue: Where was this program?

Goldsmith: At Ohio State. And so then I became a graduate student. And upon graduating, I was a professor at McGill University in Montreal and then came here in the summer—the academic year 1999-2000.

DePue: Okay. I got to back up a little bit. You spent a lot of time overseas, in Norway and Ecuador. First of all, what was the reason you joined the Peace Corps?

Goldsmith: That was something I always wanted to do, and certainly influenced by my mother. She was very passionate in terms of activism and social responsibility, and I felt it was important to give back to society and so forth. And I had done a lot of volunteer work in social organizations as a kid, and I always wanted to do the Peace Corps. And I do like to travel, and did like to travel, and thought it was the right thing to do.

DePue: What did you learn from all of these overseas experiences?

Goldsmith: I don't know so much on Norway, any life lessons, other than that I certainly enjoyed it and so forth. But Ecuador was an important lesson, not only just in how the world works and our responsibility kind of to the greater good and importance of that. And that every day, a life is going on in so many other places of the world, and I was just very, very lucky to be plunked down in Westchester County, New York, and not in country X and time Y. You know, it's just by chance, and not through good looks or anything else; it was just by chance. And that we really have—I felt, and still do—a great passion and responsibility for trying to do good and trying to improve lives of others who are less fortunate.

DePue: Okay. Linda has told us quite a bit about this institution. What is your specific title here?

Goldsmith: I'm the executive director of the National Soybean Research Laboratory.

DePue: Okay. And as the executive director, you're the chief full-time operating officer?

Goldsmith: Right, but I'm a faculty member, so I—often faculty will have a small appointment, so there is an associate director whose the day-to-day—she's the real worker. I'm just kind of hovering around, causing trouble and…

DePue: (laughs) And "she" would be…?

Goldsmith: Bridget Owen.

DePue: Okay, very good. A board of directors, then, as well?

Goldsmith: No, we don't have a board of directors. We work for the college. I work for the dean. And so Bob Easter is the gentleman who I report to, and we take our cues and direction from the college and the university.

DePue: Can you tell us a little more about your specific duties here, then?

Goldsmith: The National Soybean Research Laboratory is an organization that is geographically at the edge of the campus, and figuratively, we are at the edge of the campus as well, and bridging relationships with industry and with faculty in terms of joint research and outreach in soybeans. And so for industry that seeks and looks to do soybean research on campus, we try to facilitate that, and we help anyone—any researcher—who's looking to access grants, work with industry, help them in any way. We help them get their work out, we develop software to support their program—anything that supports research and outreach related to soybeans, from production (inaudible speech) all the way through utilization and consumption.

DePue: Was there something specific about soybeans and soybean production that drew you to this particular institution?

Goldsmith: In some sense no, in some sense yes. My area of research is in industrial marketing and global changes in grain and livestock markets—the agribusiness scene, globally. One of the greatest phenomena in kind of post-modern agriculture is the rise of soybean production, not only throughout the world, but now most recently in South America. And so soy—it's as a supply of protein. It's a supply of protein in low-latitude regions, in the equatorial region, which is very unique because there's not a lot of protein in the low-latitude regions. Made it a very, very important subject to conduct research on.

DePue: I think you might have already gotten into it. I have been told you are the person to ask this question to. Why soybeans versus corn? Since we're right in the heart of the corn belt.

Goldsmith: That is a good question. Well, they're both good, and as an economist, we think of them as complements. Increasingly, though—and maybe with the tone of the question—they may be what are called substitutes, meaning we might only need one crop—corn—or we might only need in certain regions, one crop—soybeans. But I think that they do make them for very good complements,

meaning that soybean spits nitrogen, break up the disease cycle; corn breaks up the disease cycle for soybeans. So the soybean crop does very, very well following corn. So it makes for a very, very good rotation.

Also, in terms of the industrial complex here in the United States, the meal is the finest protein source for livestock, and so we have a large poultry, swine, and a dairy and cattle-feeding complex in the country. And the oil, which is a byproduct, which is seventeen percent of the bean, makes for a very good food ingredient. So it's in almost every processed food that we eat. So that complementarily has really been the backbone behind the livestock and food industry in the United States. So it's essentially been a perfect crop.

DePue: In the future, if you look forward in the future, do you see soybeans increasing the market share, or do you think it's pretty well—in terms of soybean versus corn, that that's the leveling off point?

Goldsmith: Right. I don't think it will be increasing all that much. There is a stable, strong food industry and livestock industry in the U.S. Both are not going to grow very much; we're a very mature country in terms of development. And most of the growth in soybean demand will be overseas, and most of the supply will be produced overseas. But we will see increases in yield, maybe not so much in acreage, in the U.S.

DePue: Talk a little bit about what's going on in Brazil, then, because I know you are very knowledgeable about that.

Goldsmith: Yeah. Brazil is interesting for a number of reasons. First is certainly its expanse in terms of arable or productive farm ground. There is a lot of ground available. Much of the ground that we farm—and actually, in the U.S., we're farming fewer acres than we did right after the war—so the new lands are really what are quite interesting, and a lot of those are in Brazil. That's certainly interesting. They also farm—especially in the center-west, where most of my research is, in the state of Mato Grosso and in the center-west region—is a region almost without history. So there isn't a history of farming there, a history of land tenure, there isn't any sort of settlement for the government establishing farms there. So they don't have the history of small farms—relatively small farms—that we do here or in Europe that were settled before mechanization. So these farms are all virgin farms, new farms, being settled under a world of very sophisticated mechanization. So farms can be any size, and that's very interesting.

DePue: What's the land ownership pattern then?

Goldsmith: So these are individual family farms. These are individuals. One of our newest freshmen in the Department of Ag in consumer economics, his father is a farmer. He owns 20,000 hectares in one state and another 20,000 hectares in another state. I mean, this is a very large landowner, but he's a single

businessman. His father, who is now older, is part of the business, but the meaning of a family farm is so much different now, when you can purchase land, and they're able to purchase it very cheaply. They're able to manage this farm—much larger farms that we're used to seeing here in the Midwest U.S. So it's a very interesting area; it's a very interesting phenomena—the farming model in the center-west of Brazil.

DePue: Was this formerly rainforest?

Goldsmith: No. And this is a complicated situation for us, for people who don't live in the region, to understand. But in some sense, I explain it as, if you move in from Ohio—if you're driving from Ohio to Illinois, in eastern Ohio, it will be rolling, and everything will have—the original biome would have been forested, but as you move west, you'll find patches of prairie. Of course, as you continue to move west, you find greater percentage of prairie and less and less forested ground. And so here, we would see forested ground in the riverbeds and low-lying areas. Well, the center-west is much that way. There is a rainforest in the Amazon state and in the state of Mato Grosso, in the northwest, and that's mostly rainforest. And that, by its name, it rains a lot, so it's not very good for crop agriculture. But the borderline or the division of what is a rainforest and what is not is not clear, just like what is a prairie and what is not is not clear. There are patches.

There is a biome called a dry-land forest, and so there are trees, much like we have in the east that we cleared for agriculture in the eastern U.S. So there's dry-land forest, and people confuse that with the rainforest. And then there's another biome—the largest one—it's called a Cerrado, and this is a low brush—not a prairie, not a grass—but a very low brush that has very small trees and bushes and things like that, which makes up the majority of the land there. And so it's complicated because it's not like there's a rainforest and there's not a rainforest, and farmers are farming the rainforest. The rainforest is being cleared for timber, it's being cleared for livestock, because they can survive in a rainforest environment, much like where I worked in Ecuador. But cropping and soybeans need a dry period, and that's what the Cerrado region provides them—a long, dry period, where a rainforest can't grow.

DePue: Can you compare the soil in that Cerrado region with what we know here? Is that rich, loam soil?

Goldsmith: It's very, very poor soil. It's much poorer. It's acidic soil, high in aluminum. It needs a lot of fertilizer, and so it's very expensive to manage. Lots of lime, and these are products, inputs, that have to be brought into the region, with no manufacturer in the region, so it's very expensive but very necessary.

DePue: Is that why it had never been farmed previously?

Goldsmith: No. I've been reading a lot of Brazilian history lately, and it was an area that had no infrastructure. Up until the fifties, there were not roads. Still today, the state of Mato Grosso is a third bigger than the state of Texas. There is no barge traffic, there is only fifty miles of railroad, and there is no four-lane highway. There is only a regular—you know, a two-lane state route—for the whole state. So all the soybeans, all the truck traffic—all the traffic—has to be trucked, and it has to go on these very small roads. So it's still a very difficult area to get around in.

DePue: I would think, though, that infrastructure is going to follow, because the soybean fields are proving to be quite lucrative, right?

Goldsmith: And people over the years have asked about a particular highway that's supposed to—again, it would only be two lanes, but it would be paved—that would go from the state of Mato Grosso, which is in the interior of the country, to the ocean in the north, in a city called Santarem, where Cargill has a loading facility. But it hasn't been built yet. The federal government needs to set aside the funds to build the infrastructure. There is not mining activity going on there. There isn't enough wealth creation going on there to justify, for example, outside investment. There's been a lot of infrastructure investment, for example, by China in southern Africa because of the wealth that's sitting there. It's agriculturally very rich, but there's not been the commitment like we had with our federal highway system to link our rural communities—or link their rural communities. That has not happened yet. And so you'll see in Brazil there's excellent, excellent infrastructure in the east, in the coastal states—have wonderful highways, lots of highways, lots of traffic, and then it'd be like at the Appalachians, they decide, No more highways; the states have to fend for themselves. And it just has not been (inaudible speech). So farmers build a lot of roads, but these are the private township roads. So it's infrastructure-starved.

DePue: Do they have the kind of crop rotation that we would be familiar with here between corn and soybeans?

Goldsmith: Well, it's a little bit different because they can farm year-round. It's not a rotation but a succession, meaning that they'll plant soybeans around October first, you know, start planting, and then they will harvest their soybeans in February, March, and come back and plant corn right away. And they'll till corn right in and get a corn crop, and then they might have a green cover until after the corn is harvested. They have to keep a cover on because the soils are highly erodible. They're not pancake flat like ours are here; there is some slope to them. So they have to keep cover on them, so no-till is something that they've embraced quite aggressively. Their corn yields are about half—less than half—of our corn yield; their bean yields are equal.

DePue: Again, we talked to Linda about how the practice of growing soybeans throughout the world has evolved over the last few decades. I want you to tell us

a little bit about the condition of the global market, currently, for soybeans, and what are some of the dynamics that underlie that?

Goldsmith: The market is, like for all commodities, hard and soft, meaning grains as well as nettles and petroleum, quite good. And as we are sitting here in September, commodity markets have started to soften a little bit as demand from the world economy has started to abate a bit. But the demand for soy is great because as incomes have risen in the developing countries, consumers have shifted from grain diets to meat diets and from fresh food diets to processed food diets, and that involves soy oil and soy meal for livestock feed.

Poultry consumption is rising dramatically, pork consumption is rising dramatically, and fish and seafood—which are increasingly fed soy meal—has risen dramatically. So these are all very, very good omens for the industry. The demand for oil as well—there has been an increase in the demand for biofuels, and soy oil, under certain conditions, is a fine biofuel, but it has probably better use as a food oil. But oil has been taken up in the marketplace for biodiesel, and so the value of oil has risen dramatically, both because of fuel and food demand reasons. And so now the oil is very, very viable, not just the meal. So it's a very good time.

DePue: Gosh, there's about a million different directions I'd like to go on here, but let's develop this issue of biodiesel a little bit more. When you're making biodiesel, you also have the other byproduct.

Goldsmith: Glycerin, yes.

DePue: And that, from what we've heard already, that's an excellent source of livestock feed. Is that correct?

Goldsmith: Well, maybe you're confusing it with ethanol and DDGs?

DePue: Well, I know there's a difference between biodiesel and ethanol; that was certainly one of the things I wanted to pursue.

Goldsmith: So the byproduct issue with biodiesel is less of an issue—not really an issue—than it is with ethanol, where a third of the product is the ethanol and two-thirds—you wouldn't call them byproducts—are co-products, which is livestock feed—DDGs—and CO_2. In biodiesel, most of what we are able to produce is diesel fuel. The issue with using soybean oil or food oil for biodiesel is that it's expensive. And with soybeans, soy is not an oil crop, it's a protein crop, so there isn't a lot of oil in a soybean relative to sun or canola, detropa. I mean, there are a lot of other oils out there—crops out there that produce higher levels of oil that could be used. But there are also great opportunities to produce biodiesel from waste oil as well as animal fat and waste grease and things like that, so that biodiesel can use a variety of feed stocks and not just soybean oil. So if you were to start a biodiesel—if you wanted to produce biodiesel just from some feed stock, you wouldn't necessarily choose a soybean, because you better have

a place for the meal. Because really what you're producing is a lot of meal and a little bit of oil.

DePue: Well, talking about the two basic products we get when you process the soybean, you get the meal, which is excellent livestock feed, and you get the oil.

Goldsmith: Right.

DePue: So is that the benefit, then, of why soybean oil is so much a factor of the overall biodiesel market?

Goldsmith: Well, it came about because there was a lot of oil on the market, relatively, in the U.S., because we produce a lot of soybeans and we have a large livestock industry. But increasingly, the demand for biodiesel rose, especially in Europe, and so all oils started to be used. And so the price of oil has tripled in a very short time, making it very hard on the food industry because there was such a shortage. Again, the soybean oil is a fine feed stock and can be turned into biodiesel, but you have to have a market for your soybean meal, and so you need that complementarity, you need to have both a biodiesel plant or biodiesel use and the livestock market. In the U.S., we also have the whole food industry that buys soybean oil. So now the biodiesel industry was competing with the food industry for oil, and the food industry generally can pay more than for energy, so it made it difficult for the biodiesel industry to have just soybean oil. So now we see most plants being built not necessarily being in the Midwest, near the soybean processing, being in other locations where they can access other feed stocks as well as soybean oil.

(End of Audio File One; File 2 begins—files overlapped for about two minutes)

DePue: Which one of the two products, then, was in the lead as far as the market was concerned, as far as demand for that product? Was it the meal or the oil?

Goldsmith: Oh, absolutely the meal. I mean, that's why it's a brilliant crop, in terms of the high-quality protein and amino acid that it provides swine and poultry. And it was the rise of the poultry industry that really brought along the demand for soy protein and really expanded its use. And then we had this oil sitting there, and it was great, and it was a great ingredient in the growing food industry in the U.S., and so it was a perfect situation. Countries like Brazil and Argentina have much smaller livestock industries, and they don't have large—significant at all—food industries. So they have to export their meal, export their oil. Now, for example, Argentina takes that oil and produced biodiesel and exports that oil—that biodiesel—to Europe.

DePue: What would you say is the more efficient way to produce energy from the farm? Is it through ethanol products, or is it through biodiesel?

Goldsmith: That's a very good question. I wouldn't know which might be better, because certainly on the farm, we see methane production from livestock waste being a

very good use, very efficient. We see wind generation occurring, and that's got exciting potential, I'm sure, and in certain locals, especially in the Southwest, solar is going to have increasing potential. So we see a lot of different models out there. Certainly the Brazilian model for ethanol involves sugar cane, which has very high yields per hectare in terms of energy. And so we're still young in this bio-energy game, and we're seeing all sorts of different models emerge for how to produce bio-energy from farm products.

DePue: Well, that takes us right into the pricing of these products, and I've long been fascinated about the price of corn versus the price of soybeans again. And certainly recently, we've seen an incredible spike in the price of both of those products. So first of all, can you walk us through an acre of corn versus an acre of soybean, the price of a bushel of each of those, and then we can get into some of the other aspects of the price increase.

Goldsmith: Right, right. And you asked earlier about corn versus soy, and so these prices and values and the cost have to all kind of stay in balance; otherwise, farmers would go to one or the other. So a typical farm, historically—you know, I'll use kind of old prices—on one acre might produce in Illinois 200 bushels of corn, and each bushel might be worth two dollars. Okay? And so that would be 200 bushels times two dollars or four hundred dollars. The soybean farmer might produce forty bushels, and each bushel might be worth six dollars—five dollars, six dollars—which would be two hundred and forty dollars. So in that sense, you'd say there's more revenue on the corn side, but the cost of inputs is higher in corn. So generally, the net margin—the profit that a farmer would make—would be equal, hence the benefit of rotating or the lack of consequence in rotating.

Recently, though, especially with ethanol, the relative prices has improved for corn and the yields—the relative yield increases—have improved for corn, so that farmers have stopped rotating as much every year and having fifty percent of their acres in corn and fifty percent in soybeans. And so as long as there is more profit to be gained from corn, you'll see more continuous corn. But now—it's a dynamic, as you said, and it was a very good word to use—the cost of inputs has risen. So the cost of nitrogen fertilizer, which corn uses and soybeans don't, makes it very expensive, and the cost of other inputs related to corn—other fertilizers and seed and so forth—have risen. And so now soybeans are doing better, relative to corn. And we have seen not a reverse, but that the trend has moved back, where we saw an increase in soybean acres and not such an increase in corn acres.

DePue: You mentioned that the inputs for corn were higher, and that's why that balance could occur.

Goldsmith: Right.

DePue: Inputs included, I guess—you mentioned fertilizer. Are there other inputs?

Goldsmith: Yeah, fertilizer. I'm trying to think if… The corn seed has had a number of genetically modified traits to fight insects and to fight weeds so that you don't have to apply chemicals, and so the seed price, relatively, has gotten more expensive. So fertilizer and seed are really basically the two that are the largest cost items that differentiate a soybean from corn.

DePue: Okay, Peter. Now, take us through that process of going from two-dollar corn and six-dollar beans to where we are at today, because we're a long way from that.

Goldsmith: We're a long way from that. And you know, we also need to move from twenty- and thirty-dollar oil to a-hundred-and-forty-dollar oil, and we also need to go from an exchange rate with the Euro of being 1.25 Euros to the dollar to being $1.40 to the Euro. So the U.S. currency is weakened, which makes oil, of course, more expensive, and imports more expensive. The demand for commodities has risen dramatically as incomes have increased. So not just for petroleum, but also for food—for corn, for wheat, for rice, for meat—because incomes have risen dramatically, as workers became more productive and urbanized in Asia and in South America, they have shifted how they consume and the quantity of what they consume. I was recently in Vietnam, and you would have seen out on any street, you know, thousands and thousands of bicycles, and now essentially overnight, you now see thousands and thousands of scooters and motorcycles—no bicycles. That's metal, that's fossil fuels, that's rubber, that's copper—all the things that you need to put together a motorcycle. That transformation has occurred in very short order as these incomes have risen—tremendous transformation. So that demand has caused the demand for all commodities to rise.

DePue: So walk us through the links, then. If this grain, if the soybeans are being grown in massive quantities in the United States, and increasingly in Brazil and other countries, the markets we're now talking about, it seems like the demand is over in places like China, India, the developing world. What are the products that we're shipping overseas now?

Goldsmith: Yeah, the locale is not as critical as just the size of the growth. In just taking it down to this butterfly effect of a small change in behavior, you see people in China, mass migration to the cities and are now much more productive than they used to be. They're taking urban jobs, and now they have an urban lifestyle; they have some leisure. So they might have two pairs of shoes; they might have three pairs of shoes. They start eating out; they don't eat at home as much. They start eating meat. They start doing things on Sundays. This is a phenomenon that's happened millions and millions of times. That increase in demand for meat products, for example, means that there are as more demand for poultry. We need to raise more poultry. That poultry eat a lot of corn, and they eat a lot of soybean meal. And that soybean meal and corn come from the Western Hemisphere—they come from Brazil, Argentina, and the U.S.

DePue: So does this mean soybean meal is being shipped out from the United States and Brazil to these markets, or does it mean our meat products are being shipped out, or both?

Goldsmith: We just had meat moving to China recently, which is very exciting, but generally—it depends on the country and depends on the market—generally in the U.S., we export beans, and we process our meal and use our meal domestically, and we produce our oil, and we use it domestically. In Brazil, they will export a lot of beans, and some meal and oil, whereas Argentina will export meal and oil. They have a large processing industry in Argentina. China has invested a tremendous amount in soybean processing. So they import soybeans there, they process them, and then they feed their livestock in Asia. And so they're supplying their own. But look at—I mean, especially with the weak dollar—our poultry exports are very strong, pork exports are very, very strong, so that's a very, very good thing. So we're exporting a lot of everything. When you have a weak currency, you export a lot, and so that's been very exciting for the export markets.

DePue: What do you think has really driven the increase, then? Is it that growth in the demand?

Goldsmith: Yeah. You know, certainly in politics, you want something that's very small and very precise—exactly what it is. It's been the increase in demand; it's been the weakening currency. At the same time, we've obviously shifted a lot of supply over to bio-fuels, and so that has created a new customer for our product. So all of those things have contributed to a spike in commodity prices. And then, probably added into that, of course, is that commodity markets have been a great investment. The stock market has not been such a good investment. So a lot of capital, and people moved a lot of money over into commodities—I mean, the land—inflating all of what we do in ag —which has been a great thing – because for a long time, they wouldn't take our phone calls; they didn't know us. But now they love us, and it's great. So all those factors contribute to the rise, but now we see, here in September '08, as the global economy slows, that prices are coming back.

DePue: Well, you haven't mentioned specific prices, and I think to put it into context… We started at two dollar corn. Where did we peak at, and where are we at right now?

Goldsmith: Gosh, I…

DePue: Probably an unfair question to a soybean guy.

Goldsmith: You know, fifteen or sixteen dollars. You know, we used to say "beans in the teens," and we've definitely done that this year. And now they've pulled back and—that would be soybeans. And corn has been eight, ten dollars, and that's been very, very exciting for corn producers as well. But rice, wheat—wheat's

pulled back now considerably. And I should point out that the high prices, obviously, are very, very good for farmers, and that's a very, very good thing for the world's farmers. But there's also a lot of consumers out there at the margin who struggle to deal with high food prices. So that's another very, very important issue I think that many of us are very concerned about, trying to improve the purchasing power and the productivity of those at the margin who really suffer when grain and food prices rise.

DePue: Well, having watched the markets here, and just as a casual observer of them in the last couple of years, and I understood the incredible drive for a lot of farmers in the United States to go from soybeans to plant a few more acres of corn, because ethanol production was exploding, and it was pushing the price of corn way up, and so I understood why the price of soybeans might go up, because you have a lesser supply and still a same or growing demand. I had a harder time understanding why wheat prices went up like they did and especially rice commodity prices zoomed up here in the last couple years.

Goldsmith: Right. Wheat was affected by some crop failures and a drought in Australia, and some supply issues around the world, but at the same time, independent of that, the demand for all commodities has just been voracious during this expansion in the developing economies, whether it be fuel, whether it be food, whether it be grain, whether it be meat. The demand for any product, the amount of trade, the amount of global trade, the amount of product moving in Asia, the amount of product moving into the cities in South America—in Sao Paulo and so forth—has driven up the demand for rice, because yeah, there's been a shift over to meat, but at the same time, the demand for rice has increased. You also have urbanization, which is taking cropland out, and yields have not kept up with demand. And I think people realize that we have not had a lot of investment, relatively, in agriculture over the last fifteen, twenty years, because we had excess supply, and so that we had lots of grain on the market, lots of products on the market. Now demand has outstripped supply; research is needed to increase yields and increase the efficiency, reduce inputs and reduce the impact on the environment. And we see that and the markets are working—except they work slowly. It takes a while.

DePue: Well, that brings us right back to why this institution is so important, right?

Goldsmith: That's what we're about. I think our number one goal is yield, on the production side of our business. We're really focused on how we could the industry and researchers work together to increase yield. Yield in soybeans in the U.S. have been flat, have not really increased much at all, and we don't want to put more land into production, and we need to become more efficient. And yield research is something that the researchers here (inaudible speech) are very, very focused on. It's a very, very important issue. And if we look historically—we look at corn, we look at other crops, and we look at soybeans—it's an amazing phenomenon how we've been able to increase our productivity and production of soybeans or corn while at the same time reducing, for example, our land

inputs, our energy inputs. And that's going to be an important task for us as researchers: how to produce more from less. And that's where technology comes in, precision agriculture, biotechnology, nanotechnology, and University of Illinois, the National Lab, other land grant universities, are really focused on meeting those challenges and meeting this tremendous demand for agricultural products.

DePue: Are you optimistic about the future as far as increasing yields?

Goldsmith: Yeah, I am. I am. I think there are some great technologies out there, especially in advancements in plant breeding and so forth. I think we've seen in other crops great strides being made. Our understanding of the soybean genome is increasing dramatically, and our ability to manage agronomics—meaning the inputs, and fertilizer, and soil quality, and water management, and so forth—are very exciting, and so I'm very optimistic that we're going to start to see significant improvements in yield.

DePue: Well, maybe twenty, thirty, forty years ago, we had a Green Revolution. Would you be willing to bet on an evolution of increased productivity or a revolutionary step?

Goldsmith: Well, that's a good question. I would say it's going to be a revolution. I'll be more bold and say that it will be comparable. And what will be different about this one is that we will manage our input use better so that we don't have as adverse an effect on the environment as we may have had on the first green revolution. We learned about using, and it was it a great opportunity—using fertilizers, using chemicals, and we addressed a very severe famine. Now we have tremendous demand as well, tremendous need for expanding production, but we have to reduce our environmental footprint. And that's what's very exciting about these technologies that are coming out now. It's really a green revolution too, where this one reduces our inputs and reduces our impact on the environment. So it's a very exciting time to be involved in soybean, but in agriculture in general.

DePue: What do you see is the future, looking into your crystal ball, ten or twenty years from now in terms of this current debate about food versus fuel?

Goldsmith: I think we're going to learn a lot about fuel from bio-products and what they can do and what they can't do. And as we do that, we're going to learn, and the markets are going to help us move to more efficient sources. And I think that's been part of what this process is about, is learning. And people certainly criticized the corn ethanol business, but we've learned a lot and we learn a lot from it without a relatively significant amount of investment. We've been able to use essentially the same farms and the same system to produce corn ethanol, and that's allowed us to understand liquid fuels better, understand the challenge of using liquid fuels, and so that learning process is very helpful. And so as we move into more advanced fuels like butanol or cellulosic ethanol or maybe other

sources. Maybe we'll shift totally from the use of agricultural products except when they're in a byproduct form, like wood waste or straw waste or something like that. But we're still very young in this in terms of really focusing our attention on bio-fuels and their efficiency and their appropriateness, and these are good questions to ask as we have tremendous demand for energy, at the same time, we have tremendous demand for food.

And what it's causing us to do is to invest, and so for those of us in the research business, we'd say that's a very good idea. So I think there's a lot we don't know yet, and a lot we're learning, and I think certainly here at the University of Illinois, it's been great to be in the center of a lot of people thinking quite a bit about the bio-energy question, and so the future is going to be very exciting.

DePue: So optimistic that there is going to be a long-term future in the use of bio-fuels?

Goldsmith: Yeah. I think that there is going to be a long-term future, but there's probably also going to be some other fuels that come along, whether they be hydrogen or whether they be other alternatives—solar or wind. It will probably be a portfolio of fuels as we learn to move it, store it. Those are some big challenges. And that's where this search process that we're in the middle of is all about, is trying to understand each one of them, and see where do they go and what do they mean, and our focused attention on the research side, and investors focusing their investment dollars is great. So it's an exciting time. We obviously need a more rational energy policy, we need a rational polity on climate change and our impact on the environment, and that's what we're working on, and that's what we're right in the center of.

DePue: Yeah, right in the middle of a presidential campaign, where all of these things are being discussed on a daily basis, so…

Goldsmith: Yeah, exactly. Exactly.

DePue: To kind of change gears just a little bit, the soy meal, especially, is it more applicable, more conducive, for certain kind of livestock than others?

Goldsmith: Well, generally, it's whether livestock require higher levels of protein or not, and so poultry and swine do quite well on it. The ruminants, like beef cattle and dairy cattle, require less protein—they're able to get protein from other sources—from forages—but they do well on it as well. The interesting new area relates to aquaculture, where there are a variety of species out there—and fish, just in general, are carnivores—you know, from the old story of big fish eat little fish—so they eat fish, and transforming them over to vegetarian diets is a large undertaking, and a lot of research is going into that. And we find that inclusion of soy in a lot of fish diets has worked very, very well. And this has significant environmental benefits, and so that's kind of the new frontier.

DePue: We're getting towards the end here, and I wanted to close with a couple more broad questions for you. Let's start off with this one: What do you think is the

most significant or transformative change that you've seen in agriculture, and in soybean production in particular, in the last two or three decades?

Goldsmith: The low-latitude soybean. The soybeans produced by the Brazilians. To bring soybeans to areas that heretofore had not had broad-acre agriculture in the lower latitudes—the equatorial band. Now there can be soybean production in the equatorial band all around the world.

DePue: What do you see as the future of family farm in the United States? There's an emotional question.

Goldsmith: Nah, I think it's very, very bright. I mean, I think we see very, very successful in fishing farms, and U.S. agriculture would be very competitive, use of technology… I see only great things. It's exciting to be here in Illinois, in a great state that has some just tremendous farmers and who do a superlative job, whether they were here, whether they were—no matter where they were. This is where farming is going to be—it's going to be here in the future, and they're going to do it. And it may look different, because there's going to be all this technology involved—lots of opportunities are out there—but we're definitely going to be in the center of things like we are now in the future.

DePue: So you had one of your students—bright young man or woman who walks into your classroom—and they come up to you after class, and they say, "Professor, I'm really concerned about the future, if I've got a viable future going into agriculture. How do I increase my chance of being successful?" What would you tell them?

Goldsmith: If you're a young person coming out today, it's a great time. I mean, it is absolutely the greatest time in agriculture. The demand for what we do couldn't be greater. So in any direction they were to turn, whether they went into industry, whether they went into farming, whether they went into niche products, or they went into livestock, or they went overseas, it's great. There's just a lot going on there. The skills that they need—being alert, understanding how the business operates, just traditional good business sense and business training—I'd say is very, very good. And probably my colleagues over in agronomy and crop science and animal science would say good training in the technical aspects, very, very important always. And so the training is out there, and the opportunities are just fabulous. It makes me happy every day to come to work and see all that's going on, and it's a great time to be an aggie.

DePue: Any final words of wisdom for us? Maybe something that you can distill in about thirty seconds?

Goldsmith: Uh-oh. Uh…no, no, don't have anything. I think your last question just kind of captured it, that the university is sitting right at the center of things and provides a lot of the research and groundwork for anyone who has ambition and really

wants to get into agriculture at its production level, all the way through food and bio-energy, and graduate work. It's right here, so it's a good place to be.

DePue: Well, thank you very much, Peter. It's been a fascinating interview. It's kind of the confluence of science, and agriculture, and marketing, and the mysterious world of those things and how they mix together.

Goldsmith: Well, my pleasure. Thank you very much for your interest.

DePue: Thank you.

(end of interview)