Oral History of Illinois Agriculture

Catalog Number:	ALPLM_10_RungeEd
Interviewee:	**Ed Runge**
Interviewer:	Mark DePue
Interview Date:	October 24, 2008
Interview Location:	IL Information Service Studio, Springfield, IL
Recording Format:	Digital Video Tape
Recording Length:	240 min
Recording Engineer:	Tony Bateman and Greg Lipe Il Information Services
Repositories:	Oral History Archive, Illinois State Museum, Springfield, Illinois; Oral History Archive, Abraham Lincoln Presidential Library, Springfield, Illinois
Transcript Length:	61 pages
Transcriber:	Tape Transcription Center, The Skill Bureau, Boston, Massachusetts
Editor:	Michael Maniscalco and
Indexer:	James S. Oliver

Abstract:

Ed Runge was born on August 4th, 1933 in St. Peter, Illinois, and was raised there on his family's farm. Ed discussed life on the farm, growing up in the Great Depression and during World War II. In high school, he was determined to get a college education, and once at the University of Illinois, he majored at Agricultural Education. He excelled in school and was encouraged to continue his education. He earned an M.S. Degree in Agronomy-Soils, with minors in Chemistry and Agricultural Economics in 1957. Runge earned a Ph.D. in Agronomy and Soil Science from Iowa State University in 1963. He married Patricia Rice in 1956. From there, Runge taught agronomy and soil science courses, while also conducting research, first at Iowa State University, then at the University of Illinois from 1966 through 1973. From 1973 to 1980 he was a professor and Chair of Agronomy at the University of Missouri-Columbia, and spent the rest of his career at Texas A & M University as the Head of the Soil and Crop Science Department and then the Billie B. Turner Chair in Production Agronomy. He is an Emeritus Professor and still works part-time at the Borlaug Institute for International Agriculture.

Runge discussed the evolutionary stages that occurred in American agriculture, from the impact of mechanization, then the introduction of hybrids, then the use of fertilizers, herbicides and pesticides, and finally the impact of genetics on agriculture. At Texas A&M he began a long-term friendship with Nobel laureate Norman Borlaug. Runge also traveled and worked extensively abroad, doing soil science research and performing extension services in places as diverse as New Zealand, Indonesia, Brazil, Africa, and Burma (Myanmar). Runge was an early advocate for alternative uses for corn – emphasizing demand enhancement, with ethanol production as one way to increase demand for corn. He also advocated the promise of using other biomass to produce fuel. During the course of the interview, he shared his views on many of the most important issues in agriculture today.

Keywords: St. Peter, Illinois; Rural Electrical Association (REA); farm life during WW II; Lutheran Churches in rural Illinois; University of Illinois College of Agriculture; Iowa State University College of Agriculture; work as a soil scientist/agronomist; University of Missouri-Columbia Department of Agronomy; Texas A & M University Department of Soil and Crop Science; Norman Borlaug; hybridization of corn; agriculture in New Zealand in 1970; evolutionary stages of American agriculture; agriculture in Brazil; agriculture in Burma (Myanmar); ethanol production and debate in America; bio-mass studies for fuel production; set-aside programs

Citation: Oral History Archives, Illinois State Museum and Abraham Lincoln Presidential Library and Museum, Springfield, Illinois

Interview with Ed Runge

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October 24, 2008

Interviewer: Mark DePue

Unknown: Okay, Mark. Tape is rolling, and just have your guest give us one clap to sync stuff.

DePue: Just clap your hands.

Runge: (claps)

Unknown: Whenever you're ready.

DePue: Good morning. Today is Friday, October 4, 2008 (corrected later in the transcript to October 24). My name is Mark DePue. I am the director of oral history at the Abraham Lincoln Presidential Library. And today, it's our distinct pleasure to talk to Dr. Edward Runge. Ed, welcome.

Runge: Thank you! Good to be here, Mark.

DePue: This is part of our "Agriculture in Illinois" project that we're doing with the Illinois State Museum as well, one of fifty video interviews we're doing. And unlike most of these, I thought it might be appropriate to kind of set the stage a little bit, or put this in some kind of a "time and place" if you will, with what's going on in the United States. Dr. Runge is a trained agronomist; have spent your entire life doing that. I know that your specialty area is soil science, and for a person on the outside, that says, "Oh my, this might be kind of boring." But I know this is going to be a fascinating discussion.

And you have been at the heart of a lot of the things that are in the news right now. Of course, at this point and time, we're about two weeks away from a presidential election; things like ethanol production are very much in the news and in the public dialogue right now, and you've been at the heart of that discussion for many, many years. So that's part of why we're fascinated to talk to you. Then you get into the subject of commodity prices and why corn goes from two dollars to seven dollars, back to four dollars, and you've been at the heart of a lot of that discussion as well. So I think this is about as relevant as you can get in terms of the subject that we're going to talk about.

We always like to start with your childhood and growing up, and I know that you grew up on a farm in Illinois, so let's start with this: when and where were you born?

Runge: I was born in St. Peter, Illinois, in Fayette County, on a little farm. I think we farmed about 160 acres, as I remember it. And we had everything: we had milk cows, we had pigs, we had chickens; we grew oats and wheat, and corn, and we made silage, and all those sorts of things. So we had a lot of work to do.

DePue: Describe the soil and the climatic conditions in that part of Illinois.

Runge: Well, Fayette County is what they call the "gray area," "gray soils [area]" of Illinois. So it's south of the Shelbyville moraine, and the Shelbyville moraine marks the terminus of the darker soils. And so here in Sangamon County, you have the deeper loess soils, and they're dark as

well. So this area [, Fayette County,] was lower in fertility than this particular area would be, or the more northern parts of Illinois.

DePue: And tell us a little bit about your parents.

Runge: Well, my parents were born in the late—1898 and 1899, so they've passed on. But they farmed all their life, and—

DePue: Their names?

Runge: Ed and Bertha Runge. And my mother was a Grandt. She had nine brothers and sisters besides herself, so it was a large family. And my father was sort of the youngest of his [family]. All of his—All my aunts and uncles on my father's side were like grandma and grandpa, because Dad was—his oldest sister was old enough to be his mother. So my cousins on my dad's side were more like uncles than they were like cousins, so... So we had a lot of cousins.

DePue: How far back can you trace your family and that piece of land?

Runge: I think it goes back to about 1870. I think it was purchased a little later than that. But we have a centennial farm, and we've had that for more than ten years. So we've probably had the farm in our name since about the 1880s, if I remember correctly, from the abstract. But I haven't looked at it in a long time.

DePue: Okay. And you say you were born in 1933, so a child of the Depression?

Runge: Yep. I was born in the bottom of it, I guess you would say. Actually, my father bought the farm that we were on probably in the later twenties, so I don't know whether he paid much for it, but any kind of money was scarce in my growing up periods, particularly through the end of World War II. Things perked up a little bit in World War II because there was more demand for agricultural commodities. But really, I think I remember four dollar-beans some time in the late forties, and that was a big change over what they had been. So that was, that was a thing I remember; I think it was in the late forties.

DePue: Do you recall much of—You know, those later years of the 1930s, it was still very hard times on the farm. Do you recall much about those years?

Runge: Well, you know, I guess everybody was poor. And we didn't know we were poor, but we never had a problem. I mean, essentially, we were self-sufficient. You know, we had to buy overalls and clothes, and salt and pepper and sugar, and things like this, but we canned everything we grew. We had big gardens. And so—

DePue: How big a garden do you think you had?

Runge: It probably was about a half-acre. So you know, one of our punishments if you didn't get along right with Mom and Dad and your siblings, well, you could always weed the strawberry patch. (laughter)

DePue: (laughter)

Runge: So weeding the strawberry patch was a place—was kind of like sitting in the corner. (laughter)

DePue: But with a very practical end in sight?

Runge: Yeah. We never were short of strawberries. (laughter)

DePue: Did you have chores every morning you were expected to do?

Runge: Oh yeah. Well, I don't know when we started with our chores, but essentially the routine started at five in the morning. We've got to milk cows. That usually took till about six. And then we had breakfast. And then we had to do the rest of the chores—the chickens and the pigs, and things like this.

And then we went off to school. And early, we walked to schools. We walked two miles. You know, we didn't walk every day, but we walked more than we rode. And there wasn't school buses. I went to a Lutheran school in the town of St. Peter, so there was some problem with public school buses picking up Lutheran school kids. That has since dissipated. But anyway, I had a good, a good education, in grade school in particular.

DePue: I know back in those days, there were lots of Lutheran churches that still spoke German or other languages.

Runge: Yeah. We had—When I was a kid, we had a German service and an English service every Sunday. Then it went to a German communion service every month. And then I think the pastor that we had changed, and the new one didn't speak German, so it really went out of [practice]...you know, we didn't have German church except on very rare occasions [later].

DePue: Did your family go to the German service?

Runge: I think we went to both. Mostly, we went to the English service, but I used to could pray in German. I can't anymore. (laughter)

DePue: Did you speak German at all at home?

Runge: A little. My two older brothers spoke more German than I did. Sort of, there was a feeling that the kids were in school—we're going to speak English. So... And then, see, World War II started, and German just kind of fell out of favor, so... So I remember taking German in grade school until the third grade, and the third grade must have been about when World War II was starting. And anyways, German was dropped.

DePue: I want you to tell us a little bit more about—well, first of all, did your father consider himself to be a subsistence farmer?

Runge: (laughter) No! No. He farmed like everybody else. No, basically we sold wheat, we sold some pigs, we sold, you know, eggs and milk on a regular basis. So if all else failed, we lived between egg check and milk check, and so...

DePue: How many milk cows did you have?

Runge: Well, early on, not very many. We probably had about sixteen or something like that. We all had to milk about three or four cows every morning. And later, after I left home, they went into the dairy business, and I think they might've got up to fifty, sixty cows. I don't remember the exact number. But when the kids all left, Dad decided he wasn't going to milk the cows, so the cows left in about '59, if I remember right.

DePue: Did either of your parents work off the farm?

Runge: No, no. They worked on the farm. Well, my dad did—you know, you have a barn somebody needs put up, why, everybody went and helped, and... And he was kind of a carpenter/electrician/plumber more so than most people, so he could do about anything.

DePue: How about the amount of mechanization that you had on the farm growing up?

Runge: Well, initially, we had horses. I think we had six horses. I remember when we had four. But Dad traded two horses in, Bert and Florrie on a 1937 Case-CC [tractor].

DePue: Bert and Florrie?

Runge: That was the name of the horses, yeah. There was a mare and a [female].... Anyway, there was a pair of horses there. And the other [two] were Dewey and Daisy. So Dewey and Daisy stayed around after we had tractors; Bert and Florrie were traded in on the tractor. (laughter) So...

DePue: And that was during the Second World War, you say?

Runge: That would've been probably about 1940, would be my guess—'39, maybe. I don't remember exactly the year. But I would say '39 to '40.

DePue: I would guess, then, that you were too young to be driving a team of horses in the field?

Runge: Yes, but I worked for my Uncle Sam, who was quite a bit older than my parents were. And he had britchin harnesses. We had the harnesses that went around the tail instead of—britchin harnesses were made to back up because they pushed on the—you had a—the back of the horse was—you know, it pushed on the back of the horse. So I can still harness horses.

DePue: "Britch?"

Runge: Britchin. I think they—b-r-i-t-c-h-i-n, I believe.

DePue: Britchin?

Runge: Britchin harnesses. They were essentially if you had hilly landscapes, you'd have brakes on your wagons. Well then, if you didn't have that kind of harness, why, the wagon essentially pushed the collar off the horse. And this way, there was a strap that went around their back hips, so to speak, and it kept that so they could break or hold [the wagon]. Now, where we were, it was flat, so we didn't have a problem with that.

DePue: Did you have electricity on the farm?

Runge: I think we got electricity—they strung the wires in '40-41, and they turned the electricity on, if I remember right, in early '42. Now, World War II started in December '41, but the wires were up, and then we got electricity, you know, at that point. Now, there was electricity along the highway in St. Peter, Farina, and places like this, but not in the rural countryside. So this was REA—Rural Electrification Association. And that—It was nice to not have to have the old Coleman lantern, which put out a lot of heat—a lot of light, but a lot of heat—or just the old wick lantern lights, which didn't make much light anyway.

DePue: Do you remember that first day you got electricity on the farm?

Runge: Not really. I must have been in about the...second, third grade. Third grade, maybe—something like that. And no, I don't remember the first day, but I'm sure that I did at one time.

DePue: What are some of the other—not just lights. Are there some other things that your family got that were powered by electricity right after that?

Runge: We got a refrigerator pretty quickly, but you couldn't get much of that stuff until the end of World War II. So you had to—most of those early buys on electrical appliances were delayed until the end of World War II. We had an electric stove and a refrigerator, and once we got a deep freeze—we had a big old International deep freeze—well, the canning process slowed

down considerably. But prior to that, everything was canned. You know, we canned meat, you canned all kinds of vegetables, you canned fruit. I told you I think last night, I don't ever remember us not having peaches or pears or plums, or something like that, for—you know, to finish our evening meal. And we often had pie and cake, and things of that nature. So Mom was—she was a busy lady.

DePue: Well, if you aren't careful, my stomach's going to start to grumble over here. (laughter)

Runge: (laughter) Well, we just had coffeecake this morning [at my sister-in-law's] from a—that was a Friday dish at our house.

DePue: Did your family do their own butchering?

Runge: Oh, yes. Yeah. And it was a—this was a—Everybody helped everybody. So butchering you started very early, because you had to heat the water. But we butchered hogs in particular, and then we'd butcher smaller beef calves. But that was—We didn't get into the sharing—the ring where you butcher a calf, and then you share it with your neighbors because you couldn't eat it fast enough. But we didn't get into that as I remember. When we did butcher, we often canned meat, and the meat was canned, and you could preserve it then a long time, so it was—

DePue: Well, the hogs were different at that time too, were they not?

Runge: Yeah. Well, we had salt-cured pork. You had all the—We had smokehouses where you smoked the meat and the ham. Now, it went to liquid smoke a little bit later, but on the butchering of the hogs, I remember it better than the butchering of the cattle. We didn't butcher that many cattle.

But basically, the hogs, you'd start the morning probably four o'clock, and you tended to want to be finished by mid-afternoon. And you'd try to pick a cold day if you could. But one of the things you did is you, you made lard. And so you heated up the, you know, the fatty part of the pig, and then you ran it through a press, and you squeezed the lard out, and we ended up with something we called—at the end, it was cracklings. It was everything—it was still like a deep-fried pork rind, I guess you would say, except that always tasted better because they were warm. And so you could eat those till you got sick almost. (laughter)

DePue: Was the lard, though, important in terms of a preservative as well?

Runge: No. We—Lard was our cooking oil. So no, we put lard in crock pots; they probably were from three to five gallon in size, most of them probably in the three-gallon size. And I don't remember it's exactly three gallon, but it wasn't as big as five gallon in general. But that was the way that you—I mean, instead of corn oil, soybean oil, things like this, you used lard.

DePue: Did you use all of the pig?

Runge: All of the pig. Yeah. Well, you'd make sausage: well, you cleaned the intestines, and you used those to stuff the sausage. And then, you know, we had what we called "summer sausage." We'd hang that up. It was, again, preserved, and we had summer sausage and—well, we made a lot of different kinds of things: liverwurst and blutwurst, and these kinds of things.

DePue: I'm jumping around here a little bit, but I'm curious: in those electrical appliances, do you recall when you got a radio?

Runge: We had a radio before we had a refrigerator. We had a battery-powered radio, but you know, the batteries didn't last very long till—

DePue: So that was before you even got electricity?

Runge: Yeah. And they were tube-powered. I mean, they weren't transistorized radios, so they took a lot of power. And so they'd drain the battery pretty fast. And then we had—The first radio was a Crosley radio; I think it was made in Cincinnati. And I distinctly remember listening to the St. Louis Cardinal baseball games. You know, they were, they were—we could be entertained. The announcers were very colorful. You felt you could see the picture while you were there.

And, actually the first ballgame I went to was the 1944 World Series, when the St. Louis Cardinals played the St. Louis Browns. And it was 1944. And I had an uncle that lived probably a mile and a half from the ballpark—it was Sportsman's Park. And so we walked to the ballpark from his place.

DePue: Well, you've got to tell us who won the Series that year.

Runge: That was the Cardinals, if I remember correctly. So anyway—

But see, this was the depth of World War II, so they were very stripped of—And the Browns had a one-armed outfielder; I believe his name was Ted Gray. And he also hit. So he'd catch the ball with one hand, then he'd have to tuck the glove under his stub arm, and then throw the ball in. And I don't remember which outfield he played, but he had something he called a "drag bunt." You know, everybody that was very able was in the Army, so it was either old people or people that had other problems and couldn't be in the Army.

DePue: Do you recall when you got a telephone on the farm?

Runge: Oh, we always had a telephone. Ours [ring] was two longs. So we had a little switchboard in St. Peter. And so I don't ever remember not having a telephone.

DePue: Ed, did your mother ever pick up the phone and listen to somebody else's conversation?

Runge: I'm sure she did, but she objected when people listened to hers. (laughter)

DePue: (laughter)

Runge: And I don't think she did it very much, because if everybody listened, then the quality of the transmission deteriorated very rapidly. So if everybody got on the line, you didn't hardly get any signal [and could not hear].

DePue: You would've been very young at this time, but I want to know if you remember when Pearl Harbor happened?

Runge: Oh, you bet.

DePue: What can you tell us about that?

Runge: Well, I guess one of kind of shock. We took the *Decatur Herald* paper—and we got that every day—and on the back page of the *Decatur Herald*, there were all these World War II scenes, and the Pearl Harbor scenes. And these were wire photos from the AP wire photo service, so that—so those pictures could be transmitted as early as that. And so the *Decatur Herald* was our newspaper, and the *Decatur Herald & Review* on Sunday, but it was the *Decatur Herald*, I think, during the week.

DePue: Did you have an appreciation of what you were looking at? You must have been about eight at the time.

Runge: Yeah. Again, I think that you picture these things probably somewhat differently than they are, but the *Decatur Herald* had enough photos that I think your picturing of things was reasonably accurate. So they had the whole back page, you would have, I'd say, four to eight photos on the back. And I don't know whether they did it on Sunday, but they certainly did it during the week. So every day there was, as I remember, there was photos like this. So I think we were reasonably well—you know, we had a reasonable picture of what was going on.

DePue: How did your life or the life on the farm change after that?

Runge: Oh, not a lot. You know, a lot of [, all] the young men left.

DePue: Anybody—relatives of yours that you—

Runge: Oh, yes. Yeah. Lots of cousins, and they... I was too young. Our whole family: my oldest brother was too young. He was born in '29, so he would have been twelve or so when World War II started. So none of us were in World War II, but all of us have probably been in the Army since. I was only in [the Army] for a brief period of time, and I'm not sure if my youngest brother was ever in.

DePue: But World War II is a time when there is obviously a severe labor shortage, and farming at that time was very labor-intensive.

Runge: Well, I guess that's why Dad had five boys.

DePue: (laughter)

Runge: So we had—we had probably a surplus of labor at our place, if you didn't count weeding the strawberry patch and a few things like this. But basically, you know, everything was done by hand. Now, we had a tractor that pulled the [plow and] disc [redacted information], and things like this. And we had a power takeoff [-powered] combine, and I don't remember when we bought that. But, initially we started—You know, everything was threshed. So you shocked wheat, you shocked redtop, you shocked oats. And then there was a threshing ring, and [all] your neighbors were in the threshing ring. So they went from farm to farm, and they—you know, everybody helped everybody else.

So I don't remember us really being labor short. I think that we were far enough from St. Louis and places like this where they were making airplanes and stuff of this nature that we didn't really participate in that. But you know, the Depression, so there was a lot of people looking for jobs in the thirties in particular.

DePue: But you finally got some money on the farm during the Second World War, I would think.

Runge: Well, I guess. I guess I didn't ever think we didn't have money. We just didn't have very much. And I think the thing that we limped through World War II on was inadequate automobile. We had—The first car I remember was a '28 Chevy (pronounced Shivvy), a four-cylinder.

DePue: When did they get that?

Runge: Oh, I think Dad bought it new, probably, in '28. Then we had a '36 Chevy, and then a '41 Chevy. And I think we ended World War II in that '41 Chevy. But you know, a trip to St. Louis was a trip! I mean, you'd planned that for weeks!

DePue: (laughter)

Runge: And it was ninety-five, 100 miles. So that was our place to go. You know, we went to a ballgame or two, and we went to see my uncle and aunt who lived in St. Louis. And Dad had some cousins there. And so we'd visit them once in a while.

DePue: Do you remember gasoline or tires being rationed during that time?

Runge: Yeah. Tires were a real problem in World War II. I remember boots in tires [to keep them going], because you had—you know, they all were tube types, but you had to put boots in them. They even had what they called "re-liners" that went all the way across the inside of the tire, which was sort of a woven piece of rubberized material. But I believe we went to the Gebhardt store in Vandalia, which was the county seat, and I believe we had enough either coupons or permits or whatever you needed to buy tires. So we got out of those re-lined, booted tires into something that was a little better. And I believe it was a Gebhardt store in Vandalia that we were able to get those.

DePue: Would it have been easier to get tires for the tractor and to get fuel for the tractor?

Runge: Well, originally, a lot of the tractors were on steel wheels. So they didn't come out with rubberized tractor tires—I think Allis-Chalmers was among the first [with rubber tires]. Now, that would've been probably in the late thirties. But our old CC-Case was on steel wheels. And we put it on rubberized—I mean, we cut it down, put rims on it, and made it a rubberized version, and I don't remember when we did that. My uncle Sam who I mentioned earlier had an M Farmall that I think he bought in 1940, '40 or '41. So he had a pretty new tractor all through World War II.

But our tractor was an adequate tractor. It just—you know, once you had—you couldn't get a new one. I mean, they weren't made, so.... Well, maybe they were made a little, but you had to be pretty high on the list to get anything like that. Cars weren't made, so you couldn't buy a new car. So...

DePue: But there was enough gas at least to keep the farm equipment running?

Runge: Yeah. Well, we didn't use much. I mean, you know, five gallon of gas was quite a bit of gas. You know, you didn't—Well, we had gas in barrels, 40-gallon barrels. And our gas man was Jimmy Irvin, and he delivered it in five-gallon cans and filled the barrels. So it was a different scene. Now, later, he went to a pump on the truck, and he could pump it. But initially it was done in, I think, five-gallon cans.

DePue: Okay. Did you have plumbing growing up? Indoor plumbing?

Runge: No, no. It was all outdoor. We didn't have indoor plumbing until probably the mid-to-late forties. I don't remember the year, but my guess: '47, plus or minus a year.

DePue: Well, after the Second World War?

Runge: After the Second World War.

DePue: And it's hard for any of us today to look back, especially if you haven't experienced that directly. Say, They lived without electricity? They had no indoor plumbing?

Runge: Yeah. That's right. And you took a bath on Saturday night whether you needed it or not. (laughter)

DePue: Because otherwise—

Runge: We must've all smelled the same, because nobody'd know we— (laughter)

DePue: And you went to those one- or two-room schoolhouses like that?

Runge: Yeah, yeah, yeah. And most kids wore overalls. And oh, some would wear a belted pants, but not that many. Most wore overalls.

DePue: You mentioned redtop quite a bit earlier, and I'm not familiar with that.

Runge: Well, redtop was, in our area was a fairly low-input crop. In other words, whatever grew is what you got. But we had forty acres of redtop, and the elevator in St. Peter, which was the Schnaky—Borchelt & Schnaky elevator, had a big redtop reprocessing plant—I mean, big for at that time. And so redtop was a—I don't know what they used it all for. I mean, it was a grass seed. It was kind of like browntop, and not that different from bluegrass. But basically, it produced a seed which was very small, and I don't know where it all went. I can't tell you that.

DePue: It wasn't used for your own use? It was—

Runge: No, no.

DePue: —a cash crop?

Runge: [Yes, the seed was. But,] No. No. We didn't use it. We used the hay, you know, if you threshed it. You had to thresh it with the threshing machine, and then you used the hay. And there, you see, instead of—you bagged it [, the seed] in a nice, heavy—I think they were called denim bags at that point. And so they were not the woven—normal woven bags—they were much heavier.

DePue: You had draft horses on the farm, at least, in the earlier stages of your life. Does that mean you grew your own oats as well?

Runge: Oh, yeah. Yeah. Oats was grown for horses in particular. And, we'd, you know, oats was always a—You know, it got too warm too quick for oats to be a good crop, but wheat was a substantial crop, and oats was probably lower acreage than wheat. And again, you know, 160 acres, we probably had forty acres of pasture and forty acres of redtop, so you end up with eighty acres of corn and wheat and oats [and clover].

DePue: Not, no soybeans, though?

Runge: Not then, not early. Soybeans, the first soybeans I remember were used for hay. And that would've probably been—I don't think we grew many soybeans until about the end of World War II, maybe a little earlier. Because you couldn't really process them. You know, [once] we got combines in, and so you needed a combine to process [then for seed].

DePue: Can you tell me a little bit about the crop rotation that your father would've had?

Runge: Well, I'm not sure I remember it real distinctly, but the crop rotation was as much to control weeds as it was to be a fertility consideration. We put all the manure on the cornfield, and I believe we always put some fertilizer on wheat. I know our drill had a fertilizer box on it in addition to a seed box, and we'd—if you'd sell a, say, a cow, or some pigs, they went to East St. Louis, and the truck taking them to East St. Louis would bring fertilizer back. And usually this was a mixed blend fertilizer, and we used that particularly on wheat.

DePue: "Mixed blend" meaning what?

Runge: Well, it was NPK—the nitrogen was the first number, phosphorous second number, and K the third number—oh, probably [redacted material] 12-12-12, or 10-10-10. But mainly—

DePue: But manufactured fertilizer?

Runge: It was manufactured, right. And it was—So we used fertilizer on wheat ever since I could remember. On corn, I don't think we used much fertilizer except for manure. And we had enough cows, so hauling manure was a wintertime job, and an all-time job, basically. And so that was—and, so you ended up plowing—you know, hauling manure, plowing, and then planting corn. So you know, there'd be times— Now again, you didn't have a large acreage, so—but to be timely, you still had to do all those things before you could plant your corn. And I think all the people had two-row planters—you know, two horses pulled the two-row planter.

DePue: Was the corn the most labor-intensive crop you had?

Runge: Oh, I think maybe if you look at it from the total tillage operation through shucking by hand, probably so, because we didn't have corn pickers. We had our first corn picker was mounted on an M Farmall. It was called the 2ME, International 2ME, which was a nice picker. Now, there were some earlier ones, and there were some pull types. But ours was always mounted. Now, there was a new idea of pull types in our area, and John Deere had a pull type.

But you know, shucking corn, you know, we used to say if you got through by Thanksgiving, that was a pretty good year. And we stored it all as ear corn, and [it could be harvested as] [redacted information] fairly high-moisture corn because it had air space, and the cribs were fairly narrow, so they didn't have a problem—you didn't have to dry it. We had no way to dry it anyway. So I would think that you could probably start shucking corn when it was 20-25 percent moisture, and it would keep it, no problem.

DePue: You didn't use any silage then?

Runge: Oh, yeah—we used silage. We always had our silo. It wasn't very big, but the silo, oh, I'd say that we—you know, you'd cut the corn green, and we used machetes, I guess we—we called them "corn knives," but people in the Central Americas call them "machetes." But basically—

DePue: You're just walking down the field with your...?

Runge: Yeah, and you'd cut it off, and you'd lay across the rows, and they'd come pick it up. Then [later,] we had something we called "sleds," which went between two rows, and it had an angle blade on both sides, and it would eventually cut the corn off, and one horse pulled it. And so it would take two rows; you know, one row kept it from going one way or the other. And so that was much faster than—but you had to stop the horse, you know, because you had, you could—after you had an armful of corn you had to lay it down, and at least I remember stopping and then [later]we had corn binders. I don't think we ever had a corn binder. [We borrowed one from uncle Sam.] But anyway, they came along, and things of that nature. So yeah, silage was a big deal.

DePue: During the harvest season and during the planting season, did you have to take some time off from school?

Runge: No. No, school was always pretty important with my parents. The parochial, the, yeah, the uh, the uh—the public school, which was a half-mile from our farm, started later and got out a month earlier than we did on the Lutheran school. So if I remember right, they got out in April,

where we got out the end of May/first part of June. And they got out at least a month earlier than we did. Now, we might've started roughly the same time, but they got out a little earlier.

DePue: So here you are. When you come home from school, you probably go to the fields and do some serious chores. Or if you're walking, and you're working up a sweat, and you're taking a shower one day, er, a bath one day a week?

Runge: Well, generally the routine was, not to—If you went to school, you generally didn't have to do field work. So, generally, we milked cows in the morning, and we milked cows at night. Now, you had to do chickens and pigs and all that stuff, and sometimes twice a day, but often it was just once a day. And so anyway—But the night chore was always milking the cows, and everybody seemed to come home at a delayed rate. So if you got home early, you might milk more cows than if you got home late. (laughter)

DePue: (laughter) I don't really imagine that's something that the siblings would argue about, was it?

Runge: Well, you know, we could argue about anything. My mother always said it was a wonder we all were alive. (laughter)

DePue: (laughter) Can you tell me a little bit about what holidays were like in the Runge household?

Runge: Well, I'm sure the biggest holiday was always Christmas, but—And Christmas, you know, this is something we take for granted, but I remember in early years of grade school, we always—at New Years'—at Christmas Eve we had a program, and we presented it to the congregation in our church. And at the end of the program, you got a sack, and in the sack there would be peanuts and English walnuts and pecans, and an orange, and some candy, and things like this. But I would say that the orange that we got at Christmas was almost the only orange we saw [during the year] in many of those early days. So again, bananas? Ehh, there was some bananas. But again, I don't remember them early on. I remember them a little later.

Now, we didn't have a problem with what we ate. I mean, we had plenty to eat. But the diet was different than it is today. And the other thing is that in the summertime, if you worked, let's say, you know, you baled hay, you could—when I worked, often we had breakfast, and usually breakfast around six o'clock. Then you might have a morning lunch nine, 9:30. Then you'd have a noon meal, and that was twelve to one. And then you'd have an afternoon lunch; it was three o'clock. And then you had dinner, which was somewhere around 6:30. And so how many calories did we eat? I don't know. But we burnt them all! I mean, we were skinny! Not "skinny" in the sense of being too thin, but we didn't gain weight. We grew normally, but we didn't gain weight because we were eating too much—we gained weight because we were going to burn it up, you know, doing something else.

DePue: I suspect there was plenty of muscle and gristle on those bones.

Runge: I guess so. And you know, I think we had our, our share of that.

DePue: For the Thanksgiving and the Christmastime, was the big event then the meals?

Runge: Yeah, but we did a lot of things. We celebrated birthdays, anniversaries, and things like this. We played card. You know, we'd go and we'd have progressive pinochle, where we'd go—

DePue: I've played some pinochle.

Runge: We'd go play something they called "Sheep's Head," which generally we had ten kernels of corn, and it was a very rapid-paced game. You had a very small deck of cards, and five could

play. You could actually play with six, but four was the minimum, and we played that. Another game we played was something called "Solo," and I remember a game but I don't re—haven't played it in years and years—called "Rook." R-o-o-k.

But we did this, and we made homemade ice cream. You know, we got ice at the ice, well, you know, somebody had ice in town, so we could make homemade ice cream and things like that. I mean, we enjoyed those things. And everybody made a cake or pies or something. So we had—we had fun! We really did.

DePue: Were these events extended family events?

Runge: Yes. See, my mother's brothers and sisters lived nearby; my dad's sister and brother in particular, two of them, lived very close, and then he had a bunch of cousins which were like my uncles, and we went to their houses as well. So I would say that we had something to do in terms of a birthday or an anniversary or some kind of reason for getting together fairly frequently. So it was—well, that's how we enjoyed ourselves together. And really, by kid's standards today, they would probably—well, if they were in our shoes, they'd have done it the same way. But [today,] they have a different set of things to do.

DePue: Let's get you into your high school years, and I want to know what, during those years, your career aspirations were.

Runge: Well, high school in contrast to grade school was [different]—again, see, I was going through high school in '47-51. I'm a Depression era baby, so there weren't many in my high school class. I think it might have started with about thirty, and it wasn't unusual for kids to drop out of school after a couple of years. So in my high school graduating class, there was twenty-four or twenty-five. We were not the smallest class in the high school, but very close. We didn't have enough kids to—You know, baseball and basketball in particular, in particular basketball was the big sport we went to in the wintertime; we didn't have enough kids for football, and probably we didn't have enough money for the uniforms and things like that. But they dropped band when I was in high school because they didn't have enough kids [or enough money]. They didn't have—They didn't offer physics when I was in high school because there weren't enough kids, and they didn't have enough—I think if they'd had enough kids, they would've had the teacher that could've done it.

So high school was I guess the teen years where you're kind of figuring out who you are and what you're going to become. So I always had the idea [that I would go to college]—I had four brothers, so there wasn't enough room for everybody to stay home. So my—

DePue: "Room" in terms of staying on that farm?

Runge: [Or income,] on the farm. So the next-youngest brother, Robert, [and his son Matt] is the one that farms the farm that we've had for a long—he farms the land that I've got. And anyway, my oldest brother became an insurance agent. My next oldest brother [and his wife], they ran a restaurant, and he also drove school buses and things like that. Well, I always was determined I was going to go on to college. And so there were never any doubt in my mind that I was going to go on. And I wrote on the county scholarship exam for Fayette County—and happened to get the Fayette County scholarship to go to the University of Illinois. And so I went there and started in September of '51. And I think tuition was—see, I had a scholarship so I didn't have to pay tuition, but I think the most I ever paid was like, eighty dollars per semester to—and they might have been fees or something. You know, you had to pay a number of these things.

But I had a meal job, and Dad gave me his checkbook and said, "Now, I don't expect you to write many checks."

DePue: (laughter)

Runge: "But if you have to write a check, you've got to write a check." And so I had a meal job, and so basically I didn't have any particular problems making ends meet. And so Illinois, I graduated there [from Illinois] in '55, but I remember distinctly going to Huff Gym as a freshman, and all the freshmen were there. And, I remember the person up in front either said it or intimated that—you know, Look around you—in a couple of years only half of you will be here. And I was pretty sure I was going to be in the half that I was going to be there. (laughter) And so it worked out very well.

DePue: But those last couple years in high school, you didn't know exactly what you wanted to do other than to get to college?

Runge: No. My chemistry teacher [, Miss Maladra], I enjoyed my chemistry teacher and I do well in chemistry, and I sort of thought I wanted to be a chemist till I took quantitative analysis. And then I said, Hey, if I've got to pipette this smelly stuff and have these smoky labs to go through, there is surely something I'd rather do better. So that's really when I got into soil science, because you can apply a lot of chemistry in soil science, and you could be outdoors, or at least you didn't have to stick your nose in a laboratory all the time. So that's how I got into soil science, was to—

DePue: What was your major in college?

Runge: I actually got my Bachelor's in ag education, and I did my practice teaching at Altamont. And from there, I was offered a [teaching] job a couple of places, and I decided I wanted to go on to graduate school pretty much about my junior year. And so I went [back] to the University of Illinois and got a Master's degree. And then I went back and picked up, oh, physical chemistry, physics, math through calculus, and all these sorts of things which I hadn't taken after I went into the ag education curriculum [during my MS degree].

DePue: Were there some professors who were steering you in that direction?

Runge: Yeah. I had mentioned my high school chemistry teacher; I think her name was Mrs. Maladra. I had a person in soils whose name was Weimer, Dr. Weimer. And he was a very strict disciplinarian, but I think one of the more effective teachers in the College of Agriculture. And so I decided, Hey, I believe this is something that I can do, and it's sort of tied to my chemistry leanings. And so I took that "Beginning Soils," and pretty much decided at that point that's the direction I would probably go. And then I had, oh, some mentors, like Dr. Russ Odell, and John Alexander and people like this who were on the faculty in the Agronomy department, Ann B. Russell a little later, Walt Jacobs, Marlowe Thorn. All these guys were—you know, we all have our mentors. I mean, without them, we don't get there.

DePue: I wanted to go back just a couple years, though. You graduated from high school you said in the spring of 1951.

Runge: Right.

DePue: Were you accepted into the University of Illinois already at that time?

Runge: I had the county scholarship, so I was either going to go to Southern or Eastern if I didn't get the county scholarship.

DePue: Okay. My question is, June of 1951, the Korean War starts. And I would think people of your age and your brothers' age, that has a certain relevance for you.

Runge: Well, I had a Korean War deferment. And I did have a friend who went to school with me for two years, went into the Korean War. And then I ended up going all the way. So you could go through your Bachelor's degree on a Korean War deferment. Somehow or 'nother, the Korean War—I forget when it ended—

DePue: July 1953.

Runge: So anyway, and once it ended, there was a relaxation of the people that had deferments. So I ended up getting my Master's degree, and then I went to Michigan State to work on a Ph. D., and I was immediately classified 1A, and [that meant] I was going to be drafted. And that would have been, uh, January of '58. So I enlisted in the Army, the Reserves, and went to Fort Leonard Wood [, Missouri]. So I did my military service mostly at Fort Leonard Wood, and then in the Reserves after that. And then I actually taught high school in Indianapolis [in 1958-59]. I taught chemistry and physical science at Broad Ripple High School for a year when my wife was finishing her nursing degree at DePauw, and they did their nursing work at Methodist Hospital, Indianapolis. So that's how I got to Indianapolis.

DePue: Well, I need to correct the record, because I made a grave error myself. The Korean War started in June of 1950. Well, you would've still been in high school then.

Runge: Okay.

DePue: Okay. Let's talk a little bit more about meeting your wife.

Runge: Well, she had a grandmother that lived in Vandalia, and so I met her at the "Toot and Tell [-um]" (laughter) in Vandalia.

DePue: "The Toot and Tell?"

Runge: Yeah. It was a drive-in [restaurant]. I mean, you could honk your horn, and then somebody would come out and take your order, and—Or you could go inside. But that was the name of the place. So that's how I met my wife.

DePue: Were you working there?

Runge: Actually, I had done my [summer] practice teaching in Altamont, and somehow we found ourselves in Vandalia one night. And so we met there. That would've been the summer of '54.

DePue: Were you both customers there?

Runge: I guess so. I guess that's why we were there. I mean, I don't remember that. I know that you could dance inside. I mean, you know, it was a very different kind of an atmosphere than probably today, but... But anyway, that's where we met.

DePue: What was her name?

Runge: Her maiden name was Rice, and her grandmother's name in Vandalia was Ray. In fact, she has an aunt who is 104 years old this past September who is still living in Vandalia, and her name is Helen Ray. Her—She had an uncle Bill Ray, and another uncle Leland Ray. And Bill Ray

lived to be 100-plus, and Leland I think was ninety-six. And now Leland's wife is Helen, and she's 104. (laughter) But her mother died early. She had a cancer that she died early [January, 1973], so we miss her.

DePue: What was her first name?

Runge: Nellie Ray. Nellie Ray was her—

DePue: Your wife's first name?

Runge: Oh! Patricia [, Pat].

DePue: Okay. And was she a student at the same time? At that time?

Runge: She was a couple of years younger than me, and so she would've been...she might have just completed her first year at DePauw, I believe. She went to DePauw [University] at Greencastle, Indiana. And I think she had just completed her first year, because I know driving back and forth to Greencastle was something; I used to know the road pretty well. (laughter)

DePue: (laughter) I suspect so. What was she majoring in?

Runge: She always wanted to be a nurse. And so she was in her nursing class [curriculum]. And they changed. So anyway, that was her desire. So her aunt was a nurse in World War II, her aunt from—her mother's sister. And so somehow or another, I think that [nursing] always was in her background.

DePue: Was she a farm girl herself?

Runge: Oh, yes. Yeah. Yeah. They had a big farm: they had 240 acres. (laughter)

DePue: Oh my!

Runge: So it was a bigger farm than ours.

DePue: And you were married in—when?

Runge: In 1956.

DePue: So you were in the middle of graduate school at that time?

Runge: Yeah. I had been one year in Master's degree, and one year to go, so...

DePue: Your major, then, once you got to graduate school was agronomy, as I understand?

Runge: Well, actually, I did [major in] a soil science, but I actually did an agronomy degree. My, uh,—I've always been interested in—you know, if you walk around on a farm, you see that corn grows better in one place than another, or wheat grows better in one place than another [due to soil differences]. And so we were interested in the impact that weather has on crop yield. So I started using—This is where I got into my "weather by crop" [research] stuff. And we used a computer [, ILLIAC] that was produced [redacting information] [for] the Department of Defense at the University of Illinois, and their payoff for making this computer was they got a copy of their own. So it was called the "ILLIAC," and the ILLIAC was a tube-type computer. [It was before the transistor.] So it wasn't transistor, so it filled a room as big as this easy. And they had modules, so if I remember the modules, they were about two foot square, and they must have been standardized in some way. And so they would check those modules on a frequent basis.

So anyway, I did my analysis [of weather cards – one per day] on an IBM accounting machine. We converted the results to paper tape, and the paper tape went through the ILLIAC, and it inverted the matrix and did the multiple correlations, which no one had done before that as near as I know.

DePue: I was going to say, this is very cutting edge stuff at that time.

Runge: That was [true]. (laughter) No one had ever done it. And so these were things that not many places could do.

DePue: You mentioned "weather by crop." I'm not sure I understand what that means.

Runge: Well, you know, we've had a lot of years where the weather has not been very good: [the 1930's,] 1954, 1980, 1988....

DePue: Well, much of very young—earliest years were some very bad years.

Runge: Yeah. Well, again, I don't remember them very well, but if you look at the Dust Bowl era, which started in the early thirties and really didn't end till almost the forties, if you go to the Western Corn Belt, there were twelve years in a row of below average trending [line yields]—I mean, below trend line yields—for that part of the world. And Illinois didn't have that many in a row, but we had a good share. But I distinctly remember bad years: '54 was the very first one; 1980 was a very hot year; 1988 was a bad year... And so all those years show up as a weather problem, basically [, and yields are below trend].

DePue: And that was something that you always found interesting in terms of—

Runge: Well, it was something that I've been able to analyze the records, and to find out that most of the repression in corn yields in particular, which is what I studied, was due to bad weather. So it either rained too much or too little, mostly too little, and it was too hot. So...

DePue: I know you grew up on a farm where you had a little bit of everything. Did you also have an interest in the animal science side of things?

Runge: To a very large degree. I guess, probably the dairy cattle, there was a time when I was probably more interested in cows than all of this [soils and crops]. Dad had registered cattle, and we had Milking Shorthorn, and we eventually went to all Holsteins. And so we found out that Holsteins produce a lot more milk than the Milking Shorthorn, but if you wanted—Milking Shorthorn was called a "dual-purpose breed." They were good for milking as well as for beef, and for eating. And, so—But we went to Milking Shorthorn Association meetings in Illinois at different places, so... So there was a time when animals were pretty high on my list.

DePue: At the end of the Master's degree—and you got that in 1957, I understand—

Runge: Yeah.

DePue: —then you had the time in the military?

Runge: Well, I actually went to Michigan State in July of '57. And I worked on a soil survey in the lower peninsula, and Everett was the county seat, [redacted information] Osceola County. And then I went to Michigan [State]. They were on a quarter system, and school didn't start there until—they had one quarter before Christmas, so school started essentially the first of October. And I was immediately classified 1A when I went to Michigan State. I went to school in the fall [quarter and] went home for Christmas and checked with the Draft Board, and they

basically said, You will be drafted in January or February, depending on how many they had to send. So I enlisted in the National Guard, and went to Fort Leonard Wood in late January of ’58. So I never did go back to Michigan State.

DePue: Was this in the Illinois National Guard?

Runge: Yes, it would have been a unit out of Vandalia as I’d I enlisted there.

DePue: What was the unit?

Runge: I don’t remember.

DePue: Was it an infantry unit at that time?

Runge: Probably. Probably. It might have been a motorized infantry unit or something like that. But I just don’t remember. So...

DePue: Okay. It doesn’t sound like you spent too much time in the National Guard, then?

Runge: No. I actually see that I was able to go for six months, and then I was in the active reserves for a while after that. And then *Sputnik* flew over in 1957, if you remember correctly, and it would have been the fall of ’57. And so all of a sudden, science was very critical in the US’s thinking. And if you were a scientist, you had different priorities than if you weren’t a scientist. And so basically the Sputnik era started in—I don’t know—it was October or something like that in ’57 when it went over. And you know, we heard these “beep-beeps” and “beep-beeps” or whatever it was when it went over. And the government valued science, and so the National Science Foundation was formed. And there was money for scientists to get additional training and things like this. So things changed quite a bit.

DePue: In other words, you were more valuable sitting in a classroom and working in a science lab than you were in the uniform?

Runge: Evidently that was the decision, so... So let’s see. Let’s say I finished one year at Broad Ripple High School, my wife finished her nurse’s training. Then I moved to Iowa State in ’59, and so I was on the faculty at Iowa State while I got my degree [there]. It was a very good decision. I had some excellent people [to work with] there.

DePue: Does that mean that you were wanting to stay in education, you wanted to teach, but you wanted to teach at the college level and...?

Runge: Yeah. I guess I always had pretty well decided that I was probably going to go into the professorial ranks, probably by my Master’s degree. But you know, Michigan was having problems with funding. I would’ve gone back to Michigan State, except I found out that their support was two hundred dollars a month, and you had to pay tuition. And in Illinois, if you had a graduate assistantship, you didn’t have to pay tuition; at Iowa State, you didn’t [either]. So [, at Michigan,] you ended up with paying three months of tuition because you had three quarters, and then you had two hundred dollars a month. You couldn’t live on two hundred dollars a month when you had to pay [back] three of those months for tuition. And so it was hard to make a go.

DePue: So that’s why you didn’t select Michigan State?

Runge: That’s why I didn’t go back. I went back to Iowa State. So, and...

DePue: But I'm curious to understand why an Illinois farm boy goes to Iowa State instead of University of Illinois.

Runge: Well, there is really a kind of an understanding that unless there are unusual circumstances, it's not professionally correct to get all your degrees at one school. You need to experience different thought patterns, different scientific philosophies to the degree that you can in your graduate program. So that's why I didn't go on at Illinois. I could've, but I was discouraged from doing that because I already knew all the people [there that were] in my Bachelor's and Master's degrees.

DePue: So some of your mentors, your college professors, were saying, You need to go someplace else to get your [PhD]—

Runge: That's right. They were actively pushing me somewhere else. So I actually interviewed at Iowa State, Wisconsin, Michigan State... I don't think I went to Purdue, because I considered Purdue to be too close to Illinois. But anyway, those were the three places that I looked at.

DePue: And what little I know about agricultural schools in the United States, the University of Illinois has an outstanding reputation, but Iowa State does as well.

Runge: There's a lot of good schools. I'd put Michigan, Wisconsin, Iowa State, Illinois, Missouri, Kansas State... You know, they're not necessarily the best in everything, but they're the best in a lot of areas. And so you can get a good education at many different schools. The east coast, Cornell was looked at, UC Davis, Texas A&M where I am now, etc.. So...

DePue: But most of these schools that you've mentioned in terms of agriculture are the old land grant colleges, too.

Runge: Yeah. They're all land grant colleges. That's right. They're all land grant colleges.

DePue: Okay. Tell us a little bit about that time, then, when you are at Iowa State University. And you mentioned already that you were on the faculty as well as being a student there.

Runge: Yeah. The head of the department was a guy named Dr. [William] Pierre, and he was insistent that I come there the first time, but I didn't want to work with the person he wanted me to work with [and so I went to Michigan State]. And so when I contacted him again later, about two years later, he had a faculty position which he said, "I'll just make that a research associate position till you get your degree, and then we'll have you on the faculty." Well, in those days, the department heads probably had more leeway than they maybe do now, but the guy [, Dr. Pierre] was—I mean, he believed in me, and obviously I had to produce! And then I had another professor: Professor Frank Reicken was my graduate school advisor, and he was an excellent person.

And so it was well for me to go to another school. I mean, it was borne out. It wasn't that the people at Illinois weren't, say, equally good, or etc., or Michigan State, or any other place. It's just that you need to experience a different set of people. You've got to prove to them you can do it, so to speak.

DePue: What was your PhD dissertation on?

Runge: Well, actually, I compared a bunch of soils in southwest and southeast Iowa. And we were particularly interested in the phosphorous weathering regimes in those soils. And so Dr. Reicken was my advisor, and I would say he kind of pointed the direction, and then it was your

baby, you know? And that's what you expect. In the graduate game, in the professorial game, you really have to set your own agenda, because nobody's going to tell you what you have to do. They might tell you you've got to teach this class, but then what are you going to do? So I've been lucky to have people that believed I could do it and hired me, and said, "Hey, here's your job—go to it." And it worked very well.

DePue: You got your Ph. D. in what year, then?

Runge: Sixty-three.

DePue: And at the time you got your Ph. D., what were your career intentions?

Runge: I planned to stay at Iowa State. And shortly after I got my degree—it probably would have been early July—Dr. Pierre came to me and said, "Illinois wants to talk to you about going back to Illinois." And so anyway, I went for an interview, and our kids were—what?—[one,] [redacted information] and four. Well, one was, I guess, almost four, and the other one would have been six months. And we decided that, Hey, Grandpa and Grandma are thirty-five, forty-five miles away or 100 miles away, and here we're 400 or 500 miles away. And so... And I liked Illinois, and I thought I could do the job, and they offered me the job, and that's where I went. So I was doing my time there.

DePue: Was Patricia nursing at that time?

Runge: Yes. She worked at McFarland Clinic in [Ames,] Iowa. And we also had our kids at that point, so both of our kids were born in Ames. And then she worked in Urbana. She didn't work full-time because the kids were pretty small, but she worked at the university hospital in particular, not on a full-time basis, but on a part-time basis. So, and she did that when we moved to Missouri as well.

DePue: I know that being a college professor is kind of a mixture of being a teacher, but also of doing research, and especially in a field like you were in. How did those things sort themselves out in your life?

Runge: Well, the standard appointment in the College of Agriculture is to have a teaching appointment and a research appointment. And the research—And the teaching appointment can be more than half or less than half. In my case, my first job at Illinois was a research and extension appointment. The research appointment was, I think, 30 percent, and the extension appointment was 70 percent. After I think I'd been in that job two years, another position came available which was more research and teaching. So I really kind of wanted to get back into formal classroom teaching, and so I went into about a third teaching appointment and two-thirds research appointment. And so anyway, and I liked that, and it worked very well for me. But I still like the extension role. The extension role basically is to convey the information people can use to them in such a way that they can understand it and apply it.

DePue: So you're working with the larger community at that point?

Runge: Yes. So you essentially had all these county agents in Illinois at that point. You know, Sangamon County was Denver Corn, and Logan County was a guy named Harold Brinkmeyer, and Macoupin County was Orville Mowry, and, you know, I could list them all basically. Most of them are, you know, not living any longer. But they were your clientele, because they convened the meetings of the farmers and the people that they wanted you to meet and visit

with. And so it was, it was, it was a good experience. You had to learn how to sell—learn basically how to sell yourself.

DePue: What essentially were you talking to them about then?

Runge: Oh, it was often about productivity issues. Why does this soil produce less than that one? What can you do about it? And things of this nature. I actually taught, I think I mentioned to you, I taught an extramural course here in Springfield; it probably would have been about ’64 or ’65, and (clears throat) my students were basically the county agents. Now, they had ag. teachers, they had the Soil Conservation Service; I had rural appraisers, things like this, farm managers, rural appraisers [, ag advisors]. We had, I think, twenty-one people in that course. There was some assistant county agents. Year, basically, it was a whale of a good experience. That’s where I really learned how the county programs work, was in that particular program. And it enhanced my reputation with these people, so I was a pretty busy guy after that.

DePue: What was the nature of your research at that time?

Runge: I was still in the soil phosphorous game. We were, you know, this whole idea of environmental concerns, one of the big problems is phosphorous. And phosphorous is in our soaps, it’s in our—lots of things we use. So it’s a ubiquitous kind of a phenomena. And in soils, the soils, we have to put phosphorous on soils to get them to produce adequate crop growth. It’s not the only thing we have to put on them, but it has to be there in adequate supply.

DePue: Does that strengthen the root system, or...?

Runge: Oh, it just, I would—People ask me, What do you do in the soil and crop sciences agronomy? And I just give them a short answer: We make plants grow better, is basically. We do the genetics, we do the fertility, we do the water, etc.. And so the whole thing blends together in such a way that you, you know, don’t necessarily have the problem, but the county agent might take you to a farmer and say, “You know, this farmer is concerned. What’s he doing wrong on this piece of land? It doesn’t produce the way it should.” Well, sometimes the answer was pretty obvious, and sometimes it was not too obvious. But basically you found out that you could help these people quite a bit. So it was a good experience.

And once I went into the teaching/research appointment, I then had more graduate students, and I taught undergraduates and graduate students [in my course]. And I taught a soils course that I called “The Dynamics of Soils” rather than “The Statics of Soils.” So how does it [, the soil] scrub the phosphorous out of these systems, you see.

DePue: How sophisticated or how well could you analyze soil samples during that timeframe?

Runge: Ah, pretty well. The big thing that’s happened is that we’ve mechanized it, and we’ve streamlined the equipment. So we used to use flame photometers and spectrophotometers, and things of this nature. And we had probably pH meters. Now, they still have all those things, but they have them much more computer-driven, so they can do things in sequence, or there’s a robot that runs the samples through the system, etc. So I would say that the analysis—well, let me tell you, we used to be what I call “idea rich” and “data poor.” Now we’re “data rich” and, I think sometimes, “idea poor.” Because you can generate data so much more readily today than you ever could when I was a graduate student or an early—you know, younger in my professorial days. So just like the farm has gone from manual labor to everything mechanized, the laboratory has gone from a lot of manual labor to pretty much being mechanized. So you can now get data much, much more readily.

DePue: This is probably a good time—I always love to hear this discussion myself, and hope whoever's listening to this will appreciate it as well, but—but, the role of nitrogen, potassium, and a phosphorous, and what it takes to be a good, healthy soil?

Runge: Well, the nitrogen is not held in the soil. It's usually put on as ammonia, which is then converted to nitrate, or we can put it on as urea, which is converted to nitrate. Or we might even put it on as ammonium nitrate, which is partially nitrate and partially ammonia. But the nitrate moves with the water, and so you can't put it on a long time before it's to be used. We basically say if you could spoon-feed the plant with this nitrogen, you'd be in the ideal situation. Well, you have to compromise. And some people still put, you know, fertilizer on in the fall after it's cold with a nitrogen inhibitor or nitrate inhibitor in the ammonia or whatever they're using. And—

DePue: So when it's released into the soil, it's—

Runge: So it's released later, and... But I'd say there's more and more people putting it [, nitrogen,] on in the spring after it's planted or before it's planted than they used to. And that's [for] nitrogen in particular. So, the third—If you put it on when the plant needs it, that's ideal. But you have to compromise.

Phosphorous and potassium. The phosphorous generally can be put on [and not worry about loss]. It doesn't move very far. The big problem with phosphorous is that it goes from a more use, usable state or more of a state in which plants can pick it up more readily to a state in which it is more fixed. It combines with calcium, say, and it becomes less available. So phosphorous is again not nearly as time-critical [as nitrogen], and it tends to be—once it's in the soil, it releases over a long period of time. And so phosphorous is an, is an expensive nutrient at this point in time, and again, placing it into the root zone, if you can put it under the hill of the corn plant, it's better than putting it between the rows, for example, because—

DePue: And how does the plant use that?

Runge: Oh, all these energy compounds in a plant are phosphate-type compounds. So the energy transfer mechanisms in plants—and we can go into it, but I'm not an expert in the area. But, you know, we have—A phosphate [compound] is a very important energy [redacted information] [transfer agent] in our metabolism as well. So the plants need to have the phosphate in it because it takes the sunshine into—and the water and the CO_2, and it essentially then runs it through the green leaf, and the green leaf stores it then basically into the plant as a starch, or things of this nature. So [phosphorous,] it's involved in the energy pathways in particular.

Potassium, again, is very critical. We used to have corn that would fall over. You know, where I grew up Fayette County if you didn't put enough potash on, essentially, the plants would be—you know, they'd fall over, so they'd be hard to pick. Or in the early days when you would pick them by hand, you don't want to stoop over all the time. So, potassium is utilized by the plant in a little different way, but it's a little bit—you know, I have ways of thinking about it which are not necessarily all that analytical. But I think it's like a good tonic in some ways for the, for the plant. And that's kind of a poor way of saying it, but that plants grow better if it's got an adequate supply of [redacted information] [potassium]. Somehow, the vascular systems seem to operate better with potassium in the system at an adequate level than if they aren't. And so you end up with stronger plants, and things of this nature.

So, and there's a lot of other nutrients that are used. But basically, [nitrogen, phosphorous and potassium,] those three are the ones we put on—what we call "macronutrients."

DePue: And can you talk us through the same kind of discussion on alkaline versus acidic soils?

Runge: Well, alkaline soils generally in Illinois are high in—they usually have a pH, say, of around 8.0 to 8.2. And they're usually saturated with calcium carbonate - limestone. So these soils then will fix phosphorous more readily because there's excess calcium. And so they're primarily the less favorable calcium phosphates. In other words, they're less soluble as calcium phosphates than they are as ammonium phosphates, or however you put them on. And, so these are—That's the big criterion that affects the plant growth on alkaline soils, probably. Now, there's other things that probably come in. On acidic soils, if you have them real acid like they used to be—let's say a pH of 5.0 or even less—number one, the hydrogen ion concentration is pretty high, and then the aluminum becomes soluble. And then aluminum becomes soluble at these lower pHs, and that essentially restricts plant growth because the aluminum them is really sort of toxic to the plant. The roots don't grow very well; they become gnarly; I mean, they'll be brown instead of white, and things of this nature.

So the big thing that we used to have something—a guy named Pat Johnson who was a regional agronomist and he lived in Newton, Illinois but he ran the Newtown/Brownstown/Oblong/Ewing experiment fields—and there's probably more that I'm not mentioning. And Pat had something called "the ABC[D]s of soil fertility." Number A: lime it. B: put on phosphate. C: put on potash. D is nitrogen. But if you don't put on the A, B, C, the nitrogen is not going to do any good.

The soils that I grew up on were not very productive early because they were acidic, and they needed supplies [- lime], they need to have their pH changed, and they also didn't have the abundant supply of other nutrients, in particular potassium, than these soils up here [in Sangamon County] would have. And so today, there are still, you know, many things that are better about these darker soils in Sangamon County and northern Illinois than we would see in the grayer soils in Fayette County.

But the Fayette County soils are head and shoulders [more productive] above what they used to be. We expect 150 [to 170] bushel of corn now, and hopefully we'll get more, and sometimes we get less. But I would say the norm—and probably here [in Sangamon County], they're expecting maybe another thirty [redacted information] bushel above that.

DePue: So upwards of 200 bushels?

Runge: Yeah. It—They don't often—The only county that [has had a 200 bushel county average,] it might have changed since I've looked at the data, but Morgan County, and Jacksonville's the county seat, in 2004 had a county average of 200, more than 200 bushels of corn. Now, that was a record year. I think Fayette County might have had 175-180 [bushels]. But the whole—and it might not have been that high. I think Illinois had 182 or 183 bushel average yield that year. But Morgan County [was the only county that] had above 200 bushels [average].

DePue: What's the difference, then, between those dark, loamy soils that we have around here versus the soils that you had in Fayette County? What makes it darker?

Runge: Oh, it's organic matter. It—Again, the native grasses grew better in these darker soils. [The soils, they had more fertility. So there was more grass, so there was more organic matter being produced each year. In Fayette County, the vegetation wasn't nearly as dense as it was here

because they just didn't have enough [fertility]. You know, fertility empowers the plant, and the power of the plant was much better here than it was there [in Fayette County].

DePue: Well now, after that basic lesson in agronomy, I guess, and soil science—which was very important for me for the rest of this—can you talk about that critical time when you were doing a lot of extension work? What was the state of farming in the United States and in Illinois at that time?

Runge: Well, I used to talk about the eras of crop improvement. And I'd start with probably the 1930s, with hybrid corn. And hybrid corn came in [very quickly]—you know, we used to have [varieties of corn like] Reed's Yellow Dent and all these inbred - or not inbreds, but what we called "varieties" of corn [that are not hybrids]. [People saved their own seed.] And so the hybrids came in. Henry Wallace formed Pioneer in Des Moines. There was a lot of these smaller seed companies [- DeKalb, and Funk's, etc. formed] here, but the hybrids came in in the late—depending on where you were, in the thirties to the early forties.

DePue: Was that the Henry Wallace who became the Secretary of Agriculture during the—

Runge: The same one.

DePue: —Roosevelt administration?

Runge: He was also vice president.

DePue: Right.

Runge: So he was one of the mavericks, I would say, of [the] hybrid corn [era]. But again, my dad sold Pioneer corn, and we had a guy, George E. Ebee who used to live in Morrisonville, Illinois, and was our regional person. And he came down, and I think 1948 was the first time we had more than 100 bushel of corn per acre, and it was a good year. And we didn't have it [- 100 bushel yields], I'm sure, for a long time after that because the state average yields were probably running in the sixty-bushel range, in that range. Maybe a little higher. I could actually look it up. But anyway. So it was starting to take off at that point. [Hybrid corn was everywhere by 1940-1950.]

Well then, the next era was the fertility era, particularly nitrogen. The munitions plants that were used to make explosives were all of a sudden available for other activities, and most of them were nitrogen manufacturing plants. You can make ammonia, and it'll explode, and you can make ammonium nitrate, and that's how some of these terrorists have been [blowing up buildings]—so it's a real high energy compound, in the sense that it [, the energy,] can be released all at once. So ammonium nitrate became available. And then we had ammonia gas as ammonia, and we injected it into the soil. So I'd say the fertility era started at particularly the nitrogen side, which is what is deficient in growing corn. Say legumes, alfalfa, soybeans [and clover] fix their own nitrogen, but corn, wheat had to have nitrogen to produce maximum good yields.

So the nitrogen era started at the end of World War II, and we pretty well had that pretty well along by the sixties, I would say—early sixties in particular. Well then, the [next] big thing happened: 2,4-D, DDT came along, and all of a sudden you could spray those broadleaf weeds—the cockleburs and the jimson weeds and the buttonweeds and the pigweeds—that we had to pull by hand when we didn't have anything else to do in our cornfields, you could spray them, and they'd die! I mean, it's magic! The big—We then went to a couple of pre-plant

incorporated [herbicides like] - Atrazine and Treflan. Atrazine for corn and treflan for soybean. Now you could put this on— Treflan's called a "yellow herbicide," and there's quite a few of those kinds [of herbicides]. And the Atrazine's still used today. The corn has a way of—It's not toxic to corn. And so you can [redacted information] [incorporate it]., and all of a sudden you can control weeds.

So all of a sudden, we now have a plant that's got decent [high yielding] hybrids, a plant that's powered with some fertility, and we don't have to go out there and pluck weeds or kill a crop of weeds before we can plant corn. And so we then move, I'd say, into that era. Then we moved into the biotech era.

DePue: How about the pests?

Runge: Well, the pests really came along at the same time as the [2,4 D, atrazine, etc. beginning with] DDTs were—the insecticides. And so that whole spectrum of things went into the plant pathology in terms of fungicides. We don't use a lot of fungicides, but also corn borer was a problem. So if you really didn't plant—If you had a corn borer—If you planted early, you tended not to have a big borer problem; if you planted late, you had a second, third, fourth crop of the corn borers, so you could have a lot of them. And so you'd have to treat for those.

So you really then had the hybrid technology, which raised [corn] yields substantially. The fertility which then powered those hybrids' genetics that were incorporated, then you don't have to control weeds which are competing for nutrients and water and all these kind of things, because you can now control those [weeds, even without cultivation] .

And then we went into the biotech era, in which—and particularly in cotton. See, we had the boll weevil and the boll worm, and a lot of the southeast [USA] quit cotton production because of the boll weevil, and the boll worm was always a problem. It's the same thing that's—you know, it's the *Lepidoptera*, which are in the corn borer area. [Treatment for boll weevil and boll worm in cotton was expensive and compounds used were toxic.] So these things would ruin a cotton crop.

The first thing [- biotech plant -] that came out was Bt cotton. It was a particular bacillus that was incorporated into the cotton's genetics, and if the boll worm would eat this [Bt cotton plant], he would have indigestion and die. There was a protein in it which upset his gut, and he would die. So we now have Bt corn, Bt cotton, and these sorts of things [and don't have to apply toxic insecticides].

But I think the thing that probably came along from a farming perspective was, say, the whole idea that you can now spray over the top with Roundup-resistant soybean. So if you have a Roundup-resistant soybean, you can wait until the weeds grow a little bit, and spray the soybeans [with Roundup] and the weeds and the whole bit, and the weeds die and the soybean lives. So you see clean [weed-free soybean] fields out here [without cultivaton].

So those are what I call bi—you know, they're a change because we've been able to introduce some genetic information into the genome of the soybean or the cotton or the corn plant, and we can do things we couldn't do before.

DePue: Can you walk through that progression again, and put a rough timeframe when each one of these really started to change?

Runge: Well, okay. Hybrid corn started I'd say in the thirties, early thirties, and was pretty well adopted by the beginning of World War II, particularly, [and completely adopted by] the middle of World War II. The fertility era: we had some fertilizer, particularly phosphorous fertilizer, but limited nitrogen fertilizer, until the end of World War II. [At the end of the war, munitions nitrogen plants—] And so that came on-stream in the late forties, later forties, mid-forties to the early fifties. So nitrogen became fairly abundant—at least, you could buy it at a reasonable price. And so then you had that particular [fertility] era [underway].

Then we entered up into what I'd call the weed control, the insect control [era, using chemicals that started in the fifties]. We have insecticides, herbicides, fungicides. The first [compounds] that I remember were DDT and 2,4-D. And 2,4-D is still available. I mean, we use that, lots of it. DDT has been taken off the market because of its perception of being a problem with egg-laying birds in particular. But in the malaria world, taking DDT off the market was not a very wise decision because people die from malaria at a rather alarming rate, and you could control malaria [with DDT].

So anyway, then we have that. So I would say this—

DePue: And the timeframe for that?

Runge: That would've been, I would say it must have started in the late fifties, and then really progresses to today. But glyphosate was not released—glyphosate is Roundup—was not released until, it must have been after '75 [about 1974]. You know, you might use it in your garden or things like this to control weeds. So it was, I'd say, '75, plus or minus a year. But I'd say '75-77 would be my guess of when it was available. And it was magic. You could spray anything and it would—you know, it would almost control them [and they died] without any problem.

So that era, I would say the glyphosate was a big change over the others [- herbicides], but there's many ways to control weeds, and farmers can use them now, and some require more sophistication than others, and glyphosate is probably the most foolproof. But we're now getting weeds that are resistant to glyphosate, and farmers are going to have to rotate [with other herbicides].

And then the biotech really started, I would say, about 1980. And we didn't sell commercial biotech materials until—I think 1995 was when Bt cottons became available, Bt-resistant cottons, so they controlled the boll worm. And I think that started in '95, '95 or '96. And then we've had all that [other development] since then.

DePue: Would you describe all these changes as "evolutionary" or "revolutionary" in terms of their impact on agriculture?

Runge: Well, a combination of both, I think. You see, we used to have to plow [and disc] the ground and we had to kill a crop of weeds. We were concerned about the weed control, so it really governed everything you did. You had [crop] rotations because a wheat crop would destroy weeds that a corn or soybean crop wouldn't. And so you had some of those things. Or you put it in hay, and you mowed them off three or four times, and you'd control a different set of weeds. So these things were just part and parcel of early agriculture in my life.

Now, you don't have those restrictions at all. You can go no-till. You can let a crop of weeds grow and you can spray them with Roundup [and any of other available herbicides], and you don't have moisture problems. And you can plant right into the material. So now we're looking

at some of these weed control techniques as something we favor because they allow us to [reduce tillage and in the process reduce and] control erosion differently than we did before.

DePue: Is that the advantage of going low-till or no-till, then?

Runge: Yes. That's the big advantage. Plus it saves energy. It saves money. And not all soils are equally easy to do no-till in. If you've got a highly different texture [soils], water status, on one end of the field versus the other end, then it might be too wet to no-till one side, and too dry almost on the other side. And some farmers still feel like a little tillage will allow them to comp—you know, if you don't get a good stand, you compromise your yield to start with. So you've got to do what you need to do to get a good stand. And in some cases, it's a little harder to get a good [uniform] stand with no tillage than it is if you've had some tillage.

DePue: I thought the purpose of the plowing and the tilling is to loosen up the soil so that you can get better oxygen intake and better moisture as well.

Runge: I think we used to think that way, and that's still true of some soils, particularly those that are real high in clay, but, particularly if the clay is not what I would call "expanding/contracting types." And so you can get crusts and things like this. But for the most part, probably we don't factor up the infiltration rate [changes with tillage]. Actually, we think the infiltration is better under no-tillage than it is under clean tillage, because [with] the clean tillage, you can tend to seal over [the soil surface], and you get more erosion because there's more runoff. But the—I've been to Brazil quite a few times, and again, an awful lot of those hillier soils—you go to western Iowa or even western Illinois, and some of those [hilly] areas with reduced tillage or no tillage can be farmed much more intensively than if they were tilled and still have an acceptable [erosion with more intensive farming]—you know, in conservation ranking.

DePue: Take a different course here just a little bit. Much of what you've been talking about, this is all very innovative stuff, and I'm sure you're learning about it, you're doing research on it, you're engaging your other colleagues in the university environment, and right at the cutting edge of this. And then you're on the other side: you take this out in your extension work. How receptive or how resistant were the farmers that you were working with on some of these new ideas?

Runge: Well, I think originally—Just take no-till. There was a guy in Kentucky, a guy named Shirley Phillips, who I think is credited with starting no-tillage in those rolling soils of western Kentucky and western Tennessee, which had a high erosion rate. And he went to the idea that, Hey, if we till those [soils] less, and if we can control weeds and we can, you know, plant into this material [without so much tillage and reduce erosion], maybe we can do something differently about it. And we had a person that worked at Dixon Springs in Illinois; his name was [Professor] George McKibben. George McKibben was a fan of Shirley Phillips' idea of no-till. And we had these fescue pastures, grass pastures in Dixon Springs on rolling land, and George said, "Hey, if we can burn those [grass and weed] things down with chemicals we should plant without tillage] [redacted information]"— if I remember right, Imperial Chemical Industries in Britain had a herbicide which is a burndown, and I forget the name of it, [paraquat,] and I think they use that to burn these things down.

Anyway, they were then starting to plant [into the soil without tillage], and I think Shirley Phillips and George McKibben were looked upon by the average agronomist in the Midwest as being, "Hey, I wonder if those guys really know what they're doing?" They were sort of

looked upon as being somewhat far out, I think. Well, they persisted, and once Roundup [herbicide] became available in the late seventies, early seven—well, it wouldn't be early, but I'd say '77, something like that—once that became available and you could burn those [grass and] weeds down with a very environmentally-friendly chemical—glyphosate is detoxified very, very quickly [into the soil], and plants [absorb the chemical,] get sick from it and die very, very uniformly—all of a sudden we have now a compound which is reasonably inexpensive, cheaper than tilling, and we can control that [erosion], and on sloping soils [with increase crop intensity,] we can do this.

So the sloping soils that have reasonably [high] infiltration rates that [formerly] had too high of an erosion rate to be intensively farmed can now be farmed rather intensively [with tillage]. And this is true of much of our rolling soils in Illinois, western Kentucky, western Tennessee, and you know, I can go on. But it's also very important in southern Brazil [and other parts of the world], where without no-till, they just have unacceptable erosion rates.

DePue: Well, we want to talk quite a bit more about some of the work you've done in a lot of different countries throughout the world. I'd like to go back and ask you to reflect on what agriculture was like in the late sixties and through most of the seventies in terms of the economy as well.

Runge: Well, I'm not sure. You might have to ask me another question. But we had dollar corn for a long time, and then we sort of went to two-dollar corn, We had through essentially 2006, and even into 2007. And two-dollar corn, you know, you really have trouble making it on two-dollar corn. Now, with expensive energy [, seed and fertilizer] and things you have now, I think the break-even price on growing corn is much closer to four dollars than it was. So we're close to a break-even point on corn production probably as we speak because the price of corn has tumbled dramatically since early September. And, same way [is true] with soybeans. So basically the whole system of—The thing that many people do not understand is that if you take the country as a whole, agriculture produces somewhat of a stable crop [that is consistent year after year]. It may be better yields in Indiana than Iowa or wherever, you know. But overall [total crop production,]it doesn't go up and down a lot. Now, we have exceptions to that: '54, '80, ['88,] back in the thirties, etc.

So the big thing, though, that a farmer has is unless he has something to sell, he has no way of getting an income. And so an individual farmer is just part of the puzzle. And he's, you know, he's exposed on risk, on weather in particular. You know, this year [2008] planting was a big problem. It was too wet for too long for many people, and so we got high-moisture corn that's still sitting in the field when a lot of people wished they were finished [harvesting]. So you end up then with all kinds of weather risk. And it can be too dry. And if it's too dry: [in] 1980, I went back from St. Louis to Columbia, Missouri, I think the temperature got to 113 degrees Fahrenheit? Well, I saw those records in 1936 where it got 114 in Illinois, but I didn't think I'd ever see those kind of temperatures. Well, when you have that kind of [high] temperature and the corn doesn't have enough water, it essentially doesn't do anything. So you end up with very poor yields.

So basically, as I look at this whole business of agriculture, the person that's running General Motors or Microsoft or somebody like this has an entirely different production [process]. If people don't buy the product in adequate amounts, they can produce less; if people buy more, they can produce more. A farmer? Remember, he's got a fixed acreage, and he's just one of many out there. And, he doesn't, you know—I guess, my dad used to say, "The price is always

high when I don't have [much of] anything to sell, and it's always low when I've got a lot to sell." So sometimes in, we used to say that in a dry year, wheat tended to do better in Illinois than corn. So if you had wheat, you could kind of hedge against a dry year a little bit better than if you didn't have wheat. Well, not much wheat's grown in Illinois now. There is still a fair amount of acreage, but not like it probably was. And it tends to be growing on soils that are moisture deficit in the summer, the area around particularly Greenville and south, where we have a lot of "slick spots" that we call it [, grows more wheat than other areas].

So having said that, the ag programs have to look at this whole [farming] spectrum differently than you look at the manufacturing sector because we're relying on rainfall, and sunshine, [CO_2] and seed, and things like this [to produce something that did not exist before]. And I'm going to have to buy fertilizer, and I'm going to have to buy my seed, and I'm going to have to pay for my diesel. And if I don't get much yield, then I don't have much to sell.

DePue: Well, you're describing a group of people, it sounds like riverboat gamblers to a certain extent.

Runge: Well, I suspect that a farmer really has to gamble much, much more [that people realize]. Now, he's learned through time that generally speaking, he'll come out all right most years. But I think he expects one year in ten, maybe two years in ten, where gosh, it's not as good as I hoped it would be. And once in a while he gets a 2004, when everybody set a [yield and production] record.

DePue: Well, let's talk about the thing that has bedeviled American agriculture for I would suspect a century or more, and that's the problems of overproduction. So could you talk us through that dynamic of overproduction and how that factors into a farmer's decision?

Runge: Well, first of all, overproduction is always better than underproduction [(everyone has enough to eat at reasonable prices)] because you have some things to do. The other thing is that you have to have overproduction to make the secondary industries work—the chicken feeder, the Kellogg's Corn Flakes guy, the ADMs, the Cargills, the [grains and] things that people that ship things overseas.

So the problem with agriculture is you can't predict at the beginning of the year what you're going to have at the end. And so I would say that [it seems] government policy is always to produce enough. Now, what's "enough?" Well, "enough" usually is price-depressing. And if you go back to prior to 2006, we had a lot of price-depressing years. And we had something called—what is it?—LDPs? Deficiency payments, loan deficiency payments. Where if the price of corn got less than say, two dollars, and it was selling for $1.30, you got a loan deficiency payment of say, sixty, seventy cents to make up [to stay in farming].

DePue: From the federal government?

Runge: From the federal government. And a lot of people said, Well, that's just baloney, and we shouldn't have anything like that. Well, the real question is that you can't afford to not pay somebody for their risk. If you don't pay them for their risk [and to make a profit], then what happens? Well, they either seek something else to do, or they somehow try and compensate. [So, why do we have government programs in agriculture?] Well, let's say I've got a farm of any acreage you want to tell me, and I decide that, Hey, if we produce 20 percent less, the price will go up. So I produce 20 percent less. Well, everybody else produced the same amount, so I just got 20 percent less to sell.

And so the government payments are essentially to impose on the whole [farming] community something that is perceived to be more fair than that. So when we [, the US,] limited production [by having] acreage reserves -and we still have the conservation reserve program, the acreage reserve programs where everybody had to take out 10 percent, 20 percent, something like this to kind of get production in sync.

DePue: But was the government paying them to take that acreage out?

Runge: In some cases, they probably had some payment on those [set-aside areas], but it wasn't a loan deficiency payment at that time—it was a set aside payment.

DePue: Okay.

Runge: Now, what has really happened in the ethanol [era] area—and I wrote a paper on demand enhancement instead of supply control way back in the—we did that study in the early eighties, er, late eighties—and what's really happened is the farmers in I'd say western Iowa, southwest Minnesota, eastern South Dakota, Nebraska, particularly eastern Nebraska, and more than that, say, Hey, the basis that we have between the Chicago price and the price we can get locally is fifteen, twenty cents a bushel different than it is for somebody that can put water, you know, put corn on a boat in Havana, Illinois or some place like this where maybe the basis is [lower, and maybe] five cents or ten cents. Now, it's more than that today, but at that time, they might have five cents basis, and the guy in western Iowa has got a 25-30 percent basis. [The basis in western Iowa was always more than in Illinois.] That's the difference; that's the local price versus the Chicago price.

Well, [the western grower,] [redacted information] [always had] feeding cattle, because they could ship the cattle cheaper than they could ship all the corn, and they've historically done that. And [, in the last several years,] they have basically said, Hey, we can make ethanol, and that's going to increase the demand, and maybe we can demand-enhance this [corn] crop instead of supply-control it. And so the ethanol industry really had its foundations in, oh, it started in probably the early eighties. ADM was a big player. [Much later,] we built these local co-op type arrangements where farmers took equity stakes in the plant, and promised to deliver a certain quantity of corn in the process, or you could have a guaranteed amount that they could deliver.

And so the demand-enhancing of corn then took place, and the energy price took off, and all of a sudden those ethanol plants were very, very profitable. Now, that's changed: the energy price has gone down, particularly in the last couple of months, and the ethanol price has gone down, the corn price has gone down, and things like this. So now it's harder to make money on an ethanol plant that it was earlier. But anyway, this whole idea of balancing supply and demand [with ethanol was the thing to do] when you have to pre-plan on nature and [variable] rainfall and things like this—you don't have an irrigated crop; you have a dry-land crop or a naturally-watered crop—they go up and down depending on whether it's a favorable year or an unfavorable [corn production] year.

DePue: We're going to spend a lot more time this afternoon. I think it's about time for us to take a break for lunch here.

Runge: Okay! I'm ready for that.

DePue: I want to spend a lot more time talking about ethanol, because I think that's fascinating, and that you can't get more topical than the kind of discussion that we've just been beginning to [discuss]—

Runge: Well, I'm not the total expert in ethanol, but I certainly have opinions. (laughter)

DePue: But as an old history teacher sitting here remembering the days when I would be teaching my students about the whiskey tax back in the late 1700s, and why was the government taxing whiskey, and why were people - the Whiskey Rebellion, why were they so upset that the government was taxing whiskey? Well, they had grain in western Pennsylvania, and they were trying to get it to markets in the east, and the best way to get it there was to distill it into whiskey.

Runge: Yep. It's a lot less freight!

DePue: And it's the same discussion as our discussion you just had about ethanol.

Runge: Yeah. Well, you see, in Brazil, one of the big problems Brazil has is hauling all that tonnage of soybean or corn to the port, or to—you know, most of Brazil ['s population] is in Sao Paulo and Rio, and along that coastline that goes all the way up to Recife and places like this. But they don't have the railroads or the roads that we're blessed with, and it's not unusual for a farmer to spend at least one-third of the total value of the crop getting it to the market. So they're starting to build chicken plants and these kinds of things which can eat the corn in place, [close to where it is grown,] and they can ship a smaller amount. And so it repeats itself.

DePue: Well, again, we have plenty more to talk about, Ed, this afternoon, but let's you and I get some lunch first.

Runge: Sounds good!

DePue: Thank you. (Sound stops at 1:47:19; silent to end, which is 2:00:35)

(End of Tape 1; Tape 2 begins)

DePue: I did say the right date this morning, didn't I?

Runge: I think you said October fourth .

De Pue: The day? What is it? The twenty-fourth?

Runge: Twenty-fourth. I think you said October fourth to start with, but that's all right—you'll figure it out.

DePue: (laughter) Well, nothing like starting with a mistake. (laughter)

(30-second pause in recording)

Unknown: (claps)

DePue: Good afternoon, Ed.

Runge: Good afternoon, Mark.

DePue: Today is October twenty-fourth. I think I might have said October fourth this morning, so contrary to what I said previously, it's actually October 24, 2008. So, we're here for part two of our interview with Ed Runge, who is an agronomist. And we had a fascinating discussion this morning. I warned you that I'm going to throw a curveball at you.

Runge: Okay.

DePue: We have been doing this in somewhat chronologic order, but I am going to take a little bit of a step back in time. I want you to talk a little bit about how the soils here in Illinois, especially central Illinois, got to be the way they are.

Runge: Well, the central Illinois soils generally are what we call "dark-colored soils." They're either thick loess soils, much as Sangamon and Morgan County, or they're thin loess over a—Illinois, er —Wisconsin glacial till. That Wisconsin glacial till moved as far [south] as Shelbyville, Illinois. And there's a big moraine at Shelbyville, and so if you go south of Shelbyville, you have the gray soils, and north, you have the dark-colored soils. The loess cap—the silting material on both—is roughly the same depth—say, about four feet. And the soils to the south [redacted information] [have loess over] a very weathered pre-Wisconsin surface that was depleted of nutrients and had been highly weathered, and the soils to the north were on the calcareous, brand new, 20 percent calcium carbonate till or loess. And so the soil's [loess cover] then weathered much more rapidly where they were on an acid substrate than they did where they were on an alkaline substrate - the Wisconsin glaciation. And so their [soil's] fertility, from the silting material put on top, was depleted much more rapidly in those that had an acid substrate versus those that had a basic substrate. And so roughly, that is the big chronologic change. Now, time-wise, that is, oh, 20,000, plus or minus, years ago [that the loess was deposited].

DePue: Can you explain in a little bit more detail exactly what the action of the glacier had, the impact that that had?

Runge: Well, the glacier essentially moved like a giant bulldozer—the Great Lakes are assumed to have been gouged out by the glacier in many cases. And while they went across Illinois, for the most part they were depositing material that was in the ice as the ice retreated. And, so the glacier—I mentioned I've been at the Wedron Silica pit [in LaSalle County], and where you've seen that the glacier overrode a spruce forest, and that was [when] a Wisconsin sheet [of the glacier rode over] on top of another Wisconsin sheet, of [previously deposited] glacial material. So this [glacial] action is like a volcanic action: it's brand new material; it's the [glacier-deposited] bedrock ground up. In this case, it's basic material, which runs 20-25 percent limestone, and these [alkaline] soils then keep their nutrients much longer because the limestone has to weather before many of the other minerals will weather. And this is a little bit why the soils south of Shelbyville were depleted of their nutrients earlier because there was sort of a sponge below that would absorb anything that would come down. Well, here, [north of Shelbyville,] it didn't do that [, lose nutrients nearly so rapidly,] as much up here.

Now, that's kind of a crude explanation of that, but anything else I need to explain? I'm not sure I've done as good a job as I should've.

DePue: No, that was great. Let's take a short step forward then—maybe only 20,000 years or so?

Runge: (laughter) Okay.

DePue: And get you back up to what we had talked about earlier. And we had you at the University of Illinois, up to 1973. But you had one year where you weren't in Illinois.

Runge: No. [As professor] we have something you can do, is [to option to] take a sabbatic leave or a study leave. And I had been working on these [loess] soils that have 20 percent calcium

carbonate in them, and the loess soils. The loess is a uniformly silty material; runs around 20 percent calcium carbonate, and maybe 15-16 [-20] percent clay, depending on a little bit—

DePue: And how much organic material?

Runge: In the original loess, very little—it's just, it's the flour that came out of the glacier that was re-deposited by the wind. So really very little [organic matter]. But since it was calcareous, and since it had new nutrients [released over a long time interval], the bluestem grasses, which were - we call them the "big bluestems" and "little bluestems" - these grasses grew very well. And they [, their abundant growth in the top part of the soil,] then caused the dark organic matter to be put on top [and take root]. And where in south of Shelbyville, those soils were less fertile, and so the grassland was also there, but it grew much less vigorously, and so the soils weathered [more rapidly] because there was more water percolating through those soils and less evapotranspiration because the plants weren't growing nearly as vigorously.

DePue: What was that word again?

Runge: Evapotranspiration. It's the use of water either from evaporating from a surface or going through a plant and evaporating from a leaf.

DePue: Okay.

Runge: So I spent my study year in New Zealand, and I wanted to study silty soils that had no calcium carbonate in them. And the only place I could find them in the world—I couldn't go to China because that didn't work, and they didn't have—they have similar soils to what we have. So I went to New Zealand because the soils, the silty soil there is made from a neutral bedrock material—"greywacke" generally they call it. And so the silty loess that came from their glaciers was free of calcium carbonate. So in my scheme of things, the phosphate weathering took place immediately upon deposition, where in Illinois the phosphate weathering really didn't advance very much until you got rid of the calcium carbonate. And so that was sort of the reason I went to New Zealand. And it was a great year, Great country.

DePue: Any observations about the people and the culture you met in New Zealand?

Runge: Well, New Zealand is settled by English, Scottish, some Irish, and there are a few others, but mostly English and Scottish people. And some of them—I lived in Christchurch, which is on the South Island, and people said, You'll find it more English than in England. And that's partially true. They're delightful people, so to me it's the England without having, what? 2,000-4,000 years of history behind it. It's brand new country for them, like the US, so if you'd go to Australia and New Zealand, it's sort of the western country of the US with an English background.

DePue: I assume you took the family with you, as always?

Runge: Oh, yes. Yeah. Yeah, they went to school. So everything worked well.

DePue: And from an agronomist's point of view, what was the most rewarding part about being there that year? What was the thing that you learned?

Runge: Well, I guess the thing that I learned is that first of all, the research project that I wanted to work on worked very well. Secondly, the kids were exposed to an entirely different culture, and they found out that people do things in that country like they do things here. And so that type of thing probably took place. But I guess if you really go back to it, in the professionalal

business that I'm in, is I gained a whole new circle of professional people [, colleabaues and friends,] that I can interact with. And probably that's the most rewarding over a career.

DePue: Okay. What happened to your career after 1973?

Runge: Well, I took a bit of a turn and went to the University of Missouri to be chairman of the Agronomy department. And I kept my research going that I was doing in Illinois until about 1978, and at that point I had more money. I had enough money to hire someone else, and I'd had a post-doc who turned out less successful than the previous post-doc, at least in my terminology, and I was ready to—and the people were expected me to be more involved in administrative issues than just [my own] research issues. So 1978, I really dropped my research that I had been doing, hired another professor to do it, and then I left Missouri, and two years later in 1980 [for Texas A&M University].

DePue: But you mentioned that you continued your research, but you were doing it now in Missouri instead of Illinois?

Runge: Right. But I was carrying the research program that I had done in Illinois and applying it across the Midwest while I was in Missouri.

DePue: Okay. Here's another challenging question, perhaps, for somebody who has been in academia: did you find being the chair of the department rewarding? Or distracting?

Runge: That's pretty easy to answer. I think that most successful administrators find out that the game has changed. It's no longer you in the front—it's who you can put together and how can you get a team to work more effectively. So you have to enjoy seeing the people you hire and work with succeed, and you need to lubricate the mechanisms so they can be more successful. And so you really chalk your success up in a little different way. But I feel like my role as an administrator was [more successful] because I had done extension, because I had done teaching, because I had done research. I knew the game; I knew how people were evaluated. And I think that, you know, it's a little bit you can praise in public, but you criticize in private. And it works. You can get your rewards out of administering something and seeing other people grow; [I've found it] equally rewarding as seeing things you do yourself.

DePue: Did you find that to be an important skill to kind of add to your quiver, so to speak?

Runge: Yeah. I guess when you first take a job like that, you kind of wonder whether you are prepared for it, or whether or not you can do it. And I had [good] role models. I had Bill Pierre at Iowa State; I had Marlow Thorne at Illinois, M. B. Russell at Illinois—people that I respected, and I observed how they did their business. And the thing is that you can be—you can steer the ship, and you don't necessarily do all the things on the ship. But if you praise your faculty—and first of all, you have to have good faculty. But if you have good faculty, it's pretty easy to, I think, create what I call an environment where the whole ship is lifted. In other words—and not everyone is successful at doing that, but I think you have to have an alter ego. I think you have to be able to say, "Hey, my success is your success," because as a department head you no longer get success for what you do—you only get success for your unit if it's successful. And so I think you have to look at it somewhat differently.

DePue: Well, professors don't necessarily have the reputation for being the most team-spirited and cooperative group of people.

Runge: Well, we're as variable as any other group of people in society, and some professors are much more fun for me to be around than others. Some have an ego which you can't accommodate, and some have such an alter ego you have to build them up. And so basically, as I look at it, you have to—what I say I learned in Indonesia in spades—you have to be able to put on the other person's shoes, and what would you expect your boss to do if you were in the other person's shoes. And I think if you can wear the other person's shoes and relate to it—and also, you have to be enough interested that you can ask the right questions, you can set the right expectations, and these kinds of things. And if you do that, you can be equally successful as an administrator.

DePue: I think you might have just alluded to it—did you have a sabbatical during those years?

Runge: No. The only sabbatical I had was at Illinois in 1970-1971. And then when I stepped down as being department head at Texas A&M, I went back to Illinois for the year 2000 on a [year's] study leave. So I've had two study leaves.

DePue: Did you have the opportunity to go overseas while you were in Missouri?

Runge: Oh, I have had a lot of opportunities to go overseas. I first made my first trip overseas in 1968, and then I followed that trip when I took my family [to New Zealand] in 1970, and I am not sure that I'd a had the confidence to take a wife and two little kids that far away without having made that 1968 trip. But anyway, I have had the good fortune—now, I think I've probably [visited or] worked in some sixty, seventy different countries in my career.

DePue: Did you go to Indonesia while you were at the University in Missouri?

Runge: I went to Indonesia once when I was at University of Illinois, in 1972, and then they asked me to go back, and I went back in 1976. In 1976, I took my wife and kids with me, and they were—what?—they were thirteen, twelve? I forget what their ages were, but anyway, one was born in '59, so one was sixteen, I guess, and the other one was—they were in high school, junior high school. You know, we took their books with them, but their education really was learning batik, learning about Indonesia... We had another family that we shared—had kids like our age, and so they learned from each other. But as far as them poring over their books and doing study assignments, I am not sure we were very successful with that. But their education came from a different perspective [of living in a different culture].

DePue: Well, that's an incredible opportunity, because as much as New Zealand is different from the center of the United States, I would think Indonesia is different in a much, much bigger way.

Runge: Yeah. New Zealand is kind of like here; Indonesia is not like here. And there is Java: where we were on the island of Java is among the most densely-populated pieces of real estate in the world, Bangladesh and maybe the Netherlands being more or less the same. But anyway, you had to learn to do many different things, and their culture is entirely different. You know, the Buddhists were there, the Hindus were there, the Muslims were there, and Christianity was a very small segment of the total population. Now, the Hindus were pushed mostly to Bali, and so Bali is an island of very high Hindu population, but Java was mostly Muslim and some Buddhists left, and some Hindus left, and some Christians there. But a different kind of mix. And the Muslim religion was interpreted, in my perspective, quite differently than the Middle East. So a much more, much more pragmatic, I think would be the way to say it.

DePue: More inclusive as well?

Runge: More inclusive, and I felt less restrictive on women in particular.

DePue: Okay. What was the nature of your work?

Runge: Well, both of my—In Indonesia, we were trying to help them with their soil development [and settlements] on outer other islands: Borneo, [or] Kalimantan in the big island, and also on Sumatra. And they were trying to—Since the population was so dense on Java [in Indonesia], they were trying to translocate entire groups of people to underpopulated islands, which they had a large number of. And we were looking at the soil resources on some of those areas where they were hoping to move people to [to see what was limiting their use].

DePue: I'm going to take a guess at this: I'm assuming that these places you were moving to were basically rainforest?

Runge: Not always, but generally they were not dry. Generally, there is a wet season and a dry season, but when you're very close to the equator you can have two wet seasons and two dry seasons. Java's wet season, it was far enough south that they had a wet season that essentially was our winter, and their dry season would be our summer. And western Java was much wetter than eastern Java, for example.

DePue: What were the challenges from the soil scientist's point of view?

Runge: Well, again, those soils in many cases have been there a long time [and were highly weathered]. Now, a lot of Java and Bali are volcanic, so those soils are fairly recent, and they're quite fertile—very high in potash, for example, compared to the more weathered soils. So you go to Borneo and Sumatra, those are very old landscapes, no volcanic activity of any real major significance, particularly Borneo. And so the soils there were much more [weathered]—you've got to [increasingly] bring the fertility to the soil and things like this.

DePue: Were you wearing your researcher's hat or your extension officer hat?

Runge: I kind of couldn't tell which one I was wearing—both of them, I would say. But we were looking to apply technology more so than to discover technology.

DePue: Did you work quite a bit, then, with the local population?

Runge: Mostly with other people that were involved in the transmigration schemes, and this would be university professors and then local politicians more so than individual farmers. But we did visit with individual farmers.

DePue: Were they generally receptive to what you were telling them?

Runge: I think so. Yeah, yeah. Again, you don't necessarily know all the answers. You can ask the questions more sometimes better than you can give them the answers, so...

DePue: So an exchange of information in both directions?

Runge: That's right.

DePue: This takes you up, I believe, to 1980, and then where did you move from there?

Runge: Well, in 1980 I had the opportunity to go to Texas A&M, where I still am, and was able to—well, they hired me to be head of the Soil and Crop Sciences department. We would call that "agronomy" in Illinois, and as I told you earlier, our job as agronomists is to make plants grow better. So it was probably one of the largest soil and crop science/agronomy departments in the

world, and so I went there. They wanted me to come, and I administered that [department] for nineteen years before I decided I ought to do something else. So I was an administrator for twenty-six years if you count the seven [years] at Missouri.

DePue: This is the opportunity to bring up a subject I know you will enjoy talking about, because you've had a long relationship with Norman Borlaug, and a little bit with Henry Beachell as well. So tell us a little bit about Norman Borlaug, and let's start with how you met him in the first place.

Runge: Well, I first met Norman—Norman got the Nobel Peace Prize in 1970 for the green revolution in wheat. If you would look back in the sixties, we were shipping as much wheat as we could to India and Pakistan. You know, India and Pakistan used to be always—a part of India, but then it split, mostly on religious lines. So they had East Pakistan and West Pakistan, which then East Pakistan became Bangladesh. So Dr. Borlaug was commissioned and hired by the Rockefeller Foundation to keep Mexico supplied with [redacted information] [wheat] rather than importing [redacted information] [wheat].

DePue: And this would've been at what timeframe?

Runge: He went to Mexico in 1944, after he was released from the War Manpower Commission, where he had worked with Dupont in World War II. And so he spent the next sixty-two years mostly in Mexico, and developed these short-statured, high disease-resistant, widely-adapted, day length-independent [, high-yielding] wheat varieties. These were "spring wheats," we would call them, so you can't grow them here in Illinois because winterkill would set in. So they are planted in the [fall in Mexico and in the] spring [in North USA and Canada], and he actually would do two crops [per year]: one in the mountains in the summertime, and one in the fall in Sonora in northern Mexico. And [he] developed these wheats, and found through interns that worked with him that these wheats were adapted [redacted information] [to] many other parts of the world.

Paul Ehrlich, who is probably known by many of the people that might listen to this, predicted that famine, [and concluded that] there was no way to prevent famine from decimating India. Well, Dr. Borlaug's wheats went into India [and Pakistan] in about the mid-sixties, plus or minus a year or two, and by nineteen—I might have these dates a little wrong, but I think Pakistan was self-sufficient in wheat before 1970, and India after 1970. So what really happened is that the wheat production in India has gone up fourfold since 19—Borlaug's wheats were introduced. They had to be fueled with fertilizer, so he was insistent that they'd have the fertilizer to power these wheat genetics [' yield potential], and he also was insistent that they [- Pakistan and India -] had to essentially establish floor prices, uniform prices, because farmers had to take risks, they had to borrow money to buy fertilizer, and they had to then be able to sell their wheat at some kind of an incentive price. And so India became self-sufficient in wheat in the early seventies, and it produces at least four [or five] times as much wheat now as it did before 1960 on 10 percent more land. So essentially, the total production has gone up at least threefold in that period of time. So India to this day—

Now, Hank Beachell was involved in the [green revolution in] rice story, and that's the other principle carbohydrate crop that India would use, and the Philippines, and Indonesia, and all these [Asian] rice-consuming nations, particularly the tropical ones, and China as well. And so that [green revolution in] rice story and the wheat story essentially rewrote history.

DePue: Was Henry Beachell, was he working in the same place that Borlaug was?

Runge: No. Henry Beachell was first at Beaumont, Texas, at our Texas A&M rice center, working for the US Department of Agriculture. He went to IRRI—the International Rice Research Institute—in 1963.

DePue: Which is where?

Runge: That's in Los Baños, the Philippines—near Manila, in the Philippines. And he went there in '63. They [- the IRRI -] released IR8—International Rice number eight—in about '66. And I first met Hank Beachell in 1968 when I came back to the Philippines on my first trip abroad. And, then, since 1980—then he went to Indonesia, and I met him again in Indonesia when I was there in Bogor in '72. I don't think I saw him in '74, er, 76. And then he came back to Texas in '80. His wife was ill, and she passed away I think in '81. That was his first wife. And then he was involved in rice work in Texas. He was very much interested in hybrid rice, and he worked for a place called RiceTec. Hank Beachell turned 100 in September of 2007, I believe, and he passed away in December of 2007. So he lived to be 100, and Norm Borlaug is presently ninety-four. He'll be ninety-five in March.

DePue: The way you've described both Borlaug's work and Beachell's work, this is essentially hybridization of a particular crop.

Runge: Well, actually, they make the hybrid by crossing two parents. And then this becomes a variety because they don't change those genetics anymore. So it's then a fixed variety, and so we would not call that a hybrid. A hybrid is a new combination every year, so when we produce hybrid corn, we have to buy new seed each year because the hybrid vigor goes away. So they make the cross—which would be a hybridization—between two lines. It produces what we call an F1 hybrid. And then they keep growing [and selecting plants]. They may grow six, seven generations, and they say, Hey, this is a better variety now, because they [have selected plants during each generation and] haven't changed the genetics after the first crop. Now, they might introduce other things along the way, but basically it's just a plain crossbreeding experiment. [They have selected the best progeny and replanted it and then released it as a new variety.]

DePue: It takes some time...

Runge: It takes lots of time. And the more crosses you make, the more children you have to look at. And so what Dr. Borlaug was able to do was to grow two crops in one year of wheat—a winter crop in Sonora in northern Mexico, and a summer crop in the high altitudes near Mexico City. And so he was able to get two generations per year. So that speeded it up, doubled the speed in which he could do it. And he had Mexico self-sufficient in wheat production—he went there in '44—in about 1956, it was self-sufficient in wheat production. And then Mexico became the big [seed] exporter of these varieties that Norman, Dr. Borlaug, developed to India and Pakistan. So they moved shiploads of [seed] wheat to India and Pakistan for them to plant these new varieties. And so within a matter of three years, essentially everybody was growing the new material [, which was the wheat varieties from Mexico].

DePue: Well, and some of this is my curiosity about the creative process. You talked earlier about hybridization of corn, and how that was something that was going on late thirties, into the 1940s?

Runge: It started in the twenties, but it was really going on in the thirties.

DePue: And you didn't mention any names when we talked about that hybridization process, but now you've got Norman Borlaug, who wins the Nobel Peace Prize, who—but I've got to believe that it wasn't just Norman Borlaug; that it was very much a collaborative process as well.

Runge: Well, there was many other people involved in his team, but he certainly set the pace and set the expectation. And Beachell did the same thing with rice.

DePue: Was Borlaug something of a promoter of his ideas as well?

Runge: Borlaug was a salesman as well as a very good scientist. He's in the National Academy of Sciences; he's a member of that. He's gotten fifty-two or fifty-three [or fifty-five] honorary doctorates; that I believe is right. He's won the Congressional Gold Medal, the Presidential Medal of Freedom, the Nobel Peace Prize...I mean, you name it, he's won it.

DePue: I read also he's in the Wrestling Hall of Fame.

Runge: He's in the Wrestling Hall of Fame. He was a wrestler at Cresco High School, and he was a wrestler at the University of Minnesota. And, so I've been fortunate. I brought Dr. Borlaug to Texas A&M, along with Perry Adkisson, and a President [Frank Vandivar] that we had who wanted to have a Nobel laureate on campus. So Perry Adkisson was chancellor of the university, and I knew Perry—he's an entomologist. And he suggested that, Hey, let's go after Borlaug. Vandivar, our president, wanted to have a Nobel laureate, and he said he had the money to hire one.

So I approached Dr. Borlaug at a meeting I was at at Iowa State—he had been there. And then Dr. Adkisson went to a talk that he [, Dr. Borlaug,] was giving at Texas Tech in Lubbock, and through that we got him to come to Texas A&M. So he came for one semester [beginning in 1984]—he still comes one semester a year. And so my wife and I have been fortunate that we are almost part of the Borlaug family at this point.

DePue: Well, I was going to ask: what's the nature of the relationship the two of you have?

Runge: Well, I was his boss, he'd say, for nineteen years. And I would say that he was my friend [and colleague] very quickly on. We have had many similar experiences. He is nineteen years older than I am, and so basically he lived a generation before I did, so he experienced the Depression for real at the University of Minnesota when he was a student there. He was there in the thirties. And so that was people standing in lines, and no jobs, and people were trying to unionize, and trying to enforce union [rules], and he said he never saw such a mess, you know? He lived in rural Iowa. They had the garden like we did, you know? They basically were almost self-sufficient. So he goes to the big city in Minneapolis and St. Paul, and he says, "My gosh—things are bad!" (laughter)

DePue: During the time that he was at Texas A&M, was he teaching or doing research?

Runge: He did mostly teaching, yeah. He was—See, he would have been seventy years old the first year he was there. And so twenty-four years later, why, we still have him as one of our professors. He got an honorary doctorate from Texas A&M last December. That's the last one he's gotten. But I think Senator McGovern's—I forget which school it is—it's Wesleyan University in South Dakota is giving him an honorary doctorate, I think in the next couple of weeks. But he won't be able to go. He's too frail at this point.

DePue: It's sad, I think, that not more people know about the story of people like Norman Borlaug.

Runge: It really is.

DePue: Or Beachell.

Runge: There is a book being written. There's one written now by a guy named Leon Hesser about Borlaug, and I just got another one in the car that just came out this past two weeks ago. It's Borlaug by a guy named Noel Vietmeyer, and there are going to be four in that series. So this first book goes from Borlaug's birth until 1944. The next book goes from Borlaug's going to Mexico to the Nobel Prize. And so there's going to be four in this series. So Noel Vietmeyer is a tremendous writer, so I'd recommend that people see if they can't find the books, and if they need help I'll try and help them.

DePue: (laughter) Would you agree with those who say that because of the work of people like Borlaug and Beachell that a billion or more people are alive today?

Runge: Well, the Atlantic Monthly about 15 years ago wrote an article on Borlaug, and said they credit him with saving more lives than any man that ever lived. And they estimated that the people that were—this whole green revolution thing, he probably saved somewhere around a billion lives in India, Pakistan, and China through those [Mexican] wheats that were released and the rices that were released [in addition to that]. Now, I think in fairness to many other people, Borlaug and Beachell get a lot of credit, but there were many, many soldiers in this effort.

DePue: But you would be one of those.

Runge: Well, yeah. But I'm a little bit younger than some of the other soldiers. But we had Henry Wallace, hybrid corn—he didn't get credit. You know, but you look at what has happened to corn, and there is an army of people that have been involved. And on rice and wheat, there are many more people than just Borlaug and Beachell that made this thing go. But I think that individually, they did have sort of what I call the "leading edge role," particularly with wheat and rice. And, sort of—If you go back, and if you could compress Henry Wallace's hybridization ideas of the last twenties and squeeze that late twenties to 1940-44, that compression of time that these things took place in wheat and rice was so short. I mean, it was five years! You know, you go from starving people to feeding people—surplus!

DePue: And to put that all into context, this is the years, those crucial years after the Second World War, India was hardly a stable society. They were, as you mentioned already, they were torn apart by civil war, and with all of the displacement and the agricultural disruption that goes along with that. So I can see now, as you describe it, how they're that close to mass starvation.

Runge: Well, the ship that was hauling the [seed] wheat was supposed to offload in Pakistan and offload in India—the Seven-Day War took place before the ship got to either place! (laughter) You know, the India-Pakistani war. So, there's a lot to what I call—The Watts Riot in Los Angeles was involved because the trucks from Mexico couldn't get to the port. So read the books—it's all there.

DePue: Well, that makes a fascinating adventure story.

Runge: It is. It's an adventure. It really is. And I guess if you look at people like Borlaug—and maybe Beachell, too—it's almost like a priest taking a vow, you know? Their vow was to help people get enough to eat. And that's all they did their whole life. So it's really kind of an interesting story. So, you know, this newer, this younger—I mean, history's got to help us know what really went on, and I think the Vietmeyer books are going to be a bit more comprehensive than

Leon Hesser's book because they're going to be much more stories that I'm telling you about here involved in those. So it's just, read the books. It's a fascinating story. Google Borlaug, you know? We can say you can google him. But you'll get lots of information. You'll get his Nobel laureate speech; you'll get lots of things.

DePue: Do you, off the top of your head, do you recall the names of any of these books? The titles?

Runge: Well, the first one is *Norman Borlaug: The Man Who Saved a Billion Lives*, I believe. And that's by Leon Hesser. And then this other one is *Borlaug: The Maverick of the Green Revolution*, I believe is by Noel Vietmeyer.

DePue: Well, we're in the season of mavericks right now.

Runge: (laughter) Yeah. Yeah, we are. But this one is a real maverick. (laughter)

DePue: Let's go back to your own career again, and I'm fascinated, all the different places that you've been. And I'm sure a lot of these are during your tenure—your long tenure—at Texas A&M. So we've talked about Indonesia already; we've talked New Zealand. You've mentioned Brazil a little bit, but I'd like to have you go into more detail about that.

Runge: Well, I have taken study abroad classes to Brazil three different times, and we generally go for about three weeks. And we try to do it between the Christmas and New Year's break between semesters. So it's a little compressed, but that's summer in the south, instead of winter here.

And so I have been fortunate to have people - again, connections made through various ways - but Fernando Cardoso, the person who formed MANAH fertilizer. M-a-n-a-h, MANAH, or "mah-nah"' they say in Brazil. He formed the fertilizers that were needed to power the green revolution crops in Brazil [' "cerrado"]. And I mentioned to you these soils are very highly weathered, so they needed micronutrients, they needed magnesium. They needed a whole bunch of things that we don't necessarily have to apply to our soils here. Zinc, for example. And so he blended all these things together, and was involved in this [development of Brazil's agriculture].

So he was always the speaker, the end speaker. He usually met us in Piracicaba, and then he met us at the end of trip in São Paulo, Brazil, and he was sort of what I call: What did you kids learn? Where is Brazil in this whole [agriculture] scheme of things? And I would say that Brazil has the land available to increase production very dramatically. The big problem they have is the infrastructure is so incomplete that it's hard to move bulky commodities long distances with the present infrastructure.

DePue: I think we should mention my misconception, and I would imagine a lot of people's misconception, that the lands you are now talking about are all rainforest, and that we'd be slashing and burning and cutting down the rainforest in the process of getting these into productive stage.

Runge: Actually, the area is north, er, south of the rainforest. The rainforest is—This land is called the cerrado, that's c-e-r-r-a-d-o, and this land was [formerly] used almost entirely for what I call "Wild West grazing." People would turn their cows out, and every year they'd round them up and see if there was a few fat enough to take to market. And so the [cattle] production [growth] was very low, and the palatability of the grasses was very low. So it took at least [about] four years for a steer or a heifer to get to marketable size, because they just had a poor diet. Now, most of that land is a bit of a savannah. It has scrubby tree growth on it, and then it has some

grass, but it's not forested in a rainforest sense [at all – mostly low growth brush and poor grass].

Now, if you go further north to Mato Grosso state and go north of Cuiabá, which is the capital, a couple hundred miles, then you will find there is more dense forest. But again, it's not rainforest: it's sort of the margins, I guess you would say, of the rainforest. But for the most part, Brazil really is not expecting to change the rainforests very much. So Mato Grosso do Sul, Goiás, Bahia, Minas Gerais—I'm missing some—Mato Grosso do Sul, these are states that are all south of the rainforest, and Brazil has fairly adequate rainfall in most of this area. So it certainly can increase its production tremendously [by developing additional cerrado areas]. Now, there is another Brazil, the northeast corner, which is drier, smaller farms, and a poorer aspect of Brazil from a plant-growing point of view. But it has its sugarcane under irrigation and things of that nature [- such as dryland crops like sorghum and cotton].

So there's a bit of a—what should I say?—south of the rainforest, they put Brasília in the middle of the cerrado, the capital, because they wanted to develop this vast territory. And the people who won the World Food Prize two years ago were two Brazilians and an American who essentially established that you could grow good crops on these very, very infertile soils if you took care of the fertility. And the other thing is they are very nice texturally. You'd love them for a garden, because they are friable, they're easy to dig, they're low-bulk density, have high infiltration rates... So they have some things going for them. But acidity [and low fertility] was a big problem.

DePue: What then did the farmers have to do to the soils to condition them to the point where they could be productive?

Runge: Well, they used to start by saying, Maybe the first crop we ought to grow is rice. We'll put a dike around the place, and we'll maybe add some water to it. Because when you reduce the soil under flooded conditions, then you allow the iron phosphates to become available, and so you don't have to put as much [redacted information] [fertilizer] on. But they don't necessarily do that as much as maybe they did ten, fifteen years ago. So now it's much more, we know what the fertility package has to be, we know we've got to correct the acidity, we know we've got to add magnesium, we know we've got to add zinc, we know we're going to have to place this fertilizer close to the seeds so the plants get it as quick as they can rather than spread it all the way across.

DePue: So is it a massive application of lime to start with?

Runge: Oh, I wouldn't say "massive," but we used to say in southern Illinois you had to put on four tons initially, and then four tons five years later. I don't think they had to put on that much because something we call the "base exchange capacity" is lower for those soils, so you can do it with less. But it does take lime, and it takes what we call "dolomitic limestone," which has got magnesium in it as well as calcium.

DePue: I've heard it explained also that because this has developed rather late that these tend to be huge farm businesses.

Runge: I would say that if you go to Paraná, São Paulo, south, the farms tend to be kind of like we know farms here. They might be a couple hundred acres, and they might be bigger than that. But I was on one farm in—and in fact, the governor of Mato Grosso, the state of Mato Grosso, owned this farm. Maggi was his last name. He's the largest soybean grower in the world. And

on this one farm, he had forty-nine combines. It was about 100,000 acres. So, but I would say that's the extreme. But a lot of those farms will be a couple thousand acres in size.

DePue: And you had talked about this a little bit before, but I think it's worth dwelling on again: the infrastructure challenges they currently have.

Runge: Well, the big problem is that Mato Grosso [redacted information] or Cuiabá is, my guess, 600-700 miles, maybe more than that, from a port. And the highways are kind of like your county roads here. In other words, they're just not adequate [for large trucks]. Some will. In São Paulo state, you have pretty good roads; in part of Paraná state, you have pretty good roads. But for the most part, in Mato Grosso do Sul, Rio Grande do Sul and Santa Catarina—I've only been in Santa—haven't been in Rio Grande do Sul—but generally speaking there, I think the infrastructure is pretty good [in south Brazil]. But when you get to Mato Grosso do Sul, Mato Grosso, Goiás, Minas Gerais, those states, the roads are just inadequate. Now, they did have, as I understand it, a railroad now to Rondonópolis in Mato Grosso state, and that's a recent phenomena. So there is at least one railroad going up there.

DePue: But why has it been so long for Brazil to develop its rail infrastructure?

Runge: Well, I'm not sure I can give you the answer to that. Basically, there was no reason to develop it earlier because there was no production [and no economic activity to pay for it], or you'd harvest a few cows or calves or whatever per year, but you didn't really have any real [substantial] economic activity going. So there wasn't enough economic activity to support the development of the infrastructure.

DePue: Was that land that they had even less productive than the classic rangeland of the American Southwest that led to those cattle drives up to the railroads coming through Kansas?

Runge: A different story, but yes, a lot [of similarity]. In this case, it wasn't dry—it was adequate moisture. But the soils were so poor they didn't grow anything that was palatable. Now, it's kind of like the spring of the year, if the cow can eat the grass just as it comes upso they can eat it, it's much more palatable than it's going to be six weeks later or six months later. So the big problem you have in there is not that the cows starve—it's that what they eat is kind of like a monotonous diet that doesn't have any energy in it. And so they really don't grow very well.

And so it's not the Southwest story in the sense that it [, production,] was controlled by moisture [not fertility]. It was a different control. This was terribly infertile soils. And so really, until 25 years ago, that area was written off. See, Brasília was established as the capital of Brazil, my guess, in the late fifties, early sixties, and that whole city now has developed in the cerrado. These are [mostly] very red soils. They're very highly weathered, and they will erode pretty—you know, if you get a water channel. But no-till agriculture we talked a little bit about earlier is practiced in a lot of that area. And a lot of it's very, very flat, so the water doesn't run off very fast anyway [if vegetation covers the surface].

DePue: Well, let's jump ahead a few years and make some predictions. Once the infrastructure is there, and with the technology and the knowledge we know about today with soil conditioning, what's the potential?

Runge: Oh, I think the potential of Brazil is what I say: it's the potential of the US a hundred years ago. And that is that I think they can [double to] quadruple production over what they're doing now by applying known technology to areas that still haven't been developed.

Now, this has to be done in some sort of what I call a "sustainable" manner. You can't do it all at one time. So it's a bit more like the US when we moved from the East Coast to the West Coast, you know? Some people went all the way across, but most people only went 100 miles, 200 miles til they found some land that they thought would work. And yes, we had transcontinental railroads that came through and things of that nature, but that's a later phenomenon. I think Brazil, with adequate roads and railroads and the economic activity per unit area now that's possible, they have a very big [and bright] development future.

DePue: Well, where should we turn to next in terms of the world map? Africa?

Runge: Well, Africa is—you know, I've been to Africa many times, and more in west Africa than east Africa. And Africa is a Brazil that still hasn't gotten started in many ways, in my opinion. Now, much of Africa is dry, but there is a large part of Africa that's not that dry that produces [much] less than it should or could.

And, the big problems with Africa? One or—There are several problems with Africa. One is education has never been as available to the people [or a high priority] there way I think it could be or should be. And so you end up with people who are less educated. You know, you go with the major cities [which are the most developed]. The major cities are the demand areas, the education areas, etc. And there are places where healthcare is more adequate, things like this. So you get out into the rural, the rural infrastructure is completely lacking when you get many miles off the road. [The goal is to have enough to eat.] It's not unusual for people to—basically, their staple crops are millet or sorghum, or maybe corn, and they eat that most of the time. Maybe they get a chicken once in a while. I'd think a rather monotonous diet [at best]. But people I think should aspire to more than that, and I think it's very [difficult, but possible] possible for them to do much more than that.

The small size of many of those African countries—Togo, Benin, Ghana, Ivory Coast as you go across from Nigeria and then Sierra Leone and Liberia, and then you have Guinea, Guinea-Bissau, many cases, if you have a duty between each country, it'd be like a duty between Rhode Island and Connecticut, or Rhode Island and Massachusetts or New York City. So you have all of these things which people used to increase their income, but which then stymies the economy. And so the ports—There's land-locked countries, just like Illinois is landlocked and things like this. Well, we have a river [, we have highways,] and we have railroads which keep us from being landlocked, but in many of those cases[in African counties,] they have one main road or maybe two main roads, and it may not be that good. But the economic development [is difficult and] just hasn't occurred, so—And good governance is always a problem.

DePue: Well, I was going to ask how much does the political turmoil that that had continent has had for the last—

Runge: Well, you know, I just spent the past week with a lady from—she grew up in Liberia. And she's raising I think seven grandkids because the mother and father were murdered by the last army group [ruling the country] that was there, which was her daughter and her husband. And so she's raising her grandkids. And now she lives in Madison, Wisconsin; the kids are in the US now. But I mean, we just can't imagine some of these awful things that take place. And [in] Sierra Leone, I have a student from Sierra Leone that I've been trying to get a hold of since '98-99. The mail doesn't come back; I never hear from him. I don't know whether he's dead or alive. And I've asked people to help me try and find out whether there's any way for me to get a hold of him. And again, Njala University—the University of Illinois spent a lot of time

getting up to speed—and Sierra Leone was completely ransacked and burned, and the books thrown out and everything else in the last war that they had in Sierra Leone, which is only the last four or five years ago.

DePue: How much time have you spent in Africa?

Runge: Oh, I have spent probably up to two weeks many times.

DePue: No extended stays?

Runge: No, it's nothing like Indonesia or New Zealand. I generally worked in an administrative capacity. I'd either have faculty members there, or we have projects there, and things that I review or had reviewed. And so Africa has been [a big disappointment]—I've worked in Burma, where I have a project—Myanmar now. And I find that the speed with which people adopt practices that are proven to be beneficial were much more rapid in Burma than they were in Africa. And I can't give you all the reasons for that. I think I've mentioned some, such as infrastructure and good governance, [the value and importance of education,] and ability to be able to have some credit. And banks don't work, and no electricity—no nothing, you know? [It's a tough place to make changes.]

DePue: The lack of a good educational system?

Runge: Yeah, a lack of education. And in Burma, we went with a crop improvement project. It was corn. We provided seed, the fertilizer, the herbicides - a bit of herbicide, not much, and we showed them how to do it, and we showed them how to plant corn in such a way that you shade the ground early. And when you shade the ground, then weeds don't get the energy from the sun and they don't grow very well. And so you get [some] weed control because it's dark in a dense cornfield, and things like this. And that has an effect on weed control.

So we found that we used to give them a practice—two years. We'd give them the package [of the seed, fertilizer and herbicides] for two years. We soon found out that hey, we can give it to them in one year, and then we can move twice as fast to new areas. The last year, we've had a bit over 5,000 farmers we worked with. They probably average about two and a half acres apiece in terms of size, but they've been exporting and they are fortunate they live close to China. So they've been exporting over a million dollars' worth of corn to China [redacted information] [in the last several years]. Well, that's about 200 dollars per farm. Well, 200 dollars in that part of that world is a lot of money.

DePue: This has been very recent that you've been doing this work in Myanmar?

Runge: Yeah. I started in '96, and we're still going today.

DePue: Well, the military junta was already in power in '96, were they not?

Runge: Oh, yeah. Yeah. And they've gotten more paranoid since. They used to allow us to go to the project area; but in about the last time I was in Burma proper was 2000, and our project leader, our president who was a World War II veteran, the last time he was there was 2001. So now what we do is the project people come to China, we fly to southwest China - Kunming is the capital of Yunnan province, and we fly to a small place which is about 50 miles from Burma, and they [, the project people,] come to Burma—they come from China from Burma, and we do our project review and planning, and size up what has to be done and not have to be done. Now, we're hoping to go again, but the project might be ending. We aren't sure.

DePue: Because of the lack of cooperation with the government?

Runge: Yeah. We haven't been able to get funding for the last year and a half, so that's part of our problem.

DePue: I'd like to have you put your soil scientist hat on again and talk to me about the challenges in Burma, what you encountered there.

Runge: The Burma—see, this is off the Tibetan plateau, and so downwearing was a very big part of the land development process. So the soils are more fertile than, say, Brazil, which was very flat and weathered [in most places] for eons of time. So [Burma,] it's a bit more like Java and Bali in that sense. So if you apply the nitrogen and the phosphorous fertilizers in particular, then the plants grow quite well. So you don't need to do the limestone, you don't need to do the minor elements and all that stuff. And so with sort of what we call a "cookbook approach" to fertility [, we've been pretty successful], and we import the seed, which is—we're trying to produce it in-country, and I just have a whole bunch of pictures of them producing hybrids. But anyway, we have a ways to go.

So the big thing they have to do is they have to supply the fertility, particularly the nitrogen and phosphorous. Once they do that, then they need some seed that's got some yield potential. And sill, one of their big problems is weed control. In spite of what we tell them, their weed control is still, still not up to where I think it should be. But it's much better than it was.

DePue: So much of Burma, I thought, was rainforest. I assume you're talking about the coastal plains?

Runge: [No.] We're way up in the hills. You see, we're in the Kachin state, which is northern Burma. And we're northern Shan state, and southern Kachin state. And the Kachins and the Shans go over across into China.

DePue: Those are ethnic groups?

Runge: They're ethnic groups. And so there's a lot of ethnic groups in that aspect of China. So Yunnan province in China has more ethnic groups than any other province in China, and these go across the borders, and so it's not unusual [for them] to have relatives in China or in Burma, or vice-versa, and things like that. But it's been a real fun project. It really has.

DePue: What's made it so much fun for you?

Runge: Well, I guess just seeing the success. The last time I was there, I went as a Baptist preacher because that way I could get a business permit to go to where I wanted to go.

DePue: I thought you said you were a good Lutheran boy.

Runge: (laughter) Well, they happen to be Baptists there, so...

DePue: (laughter)

Runge: The guy that helped me get a business visa was Saboy Juna, was the head of the Baptist convention in that part of the world. And so anyway, I went, and I came back and I said, "Dr. Borlaug, I now know why you travel so much." Because every village we went, there would be a pile of corn, probably fifteen, twenty bushel; the ladies all came in their best outfit, the men came too, and they all wanted their picture taken with this tall guy. And I told Borlaug you almost felt like they think you're a deity in the aspect of some of these [successful changes

and] things. So I think just seeing other people succeed beyond their expectation is the payout so, and they're much better off as a result of us being there.

DePue: It sounds like they were very receptive to the things that you were telling them as well.

Runge: Yeah. The first time I went over in '97 to help plant the first plots that we were putting out, and there was this lady who probably was in her sixties. She wasn't about—We told them how we wanted to plant, so we're going to plant rows so they can get through, let's say twenty, thirty inches apart.

DePue: Rows of?

Runge: Corn. And we wanted to put the seed about eight inches apart so it would shade the ground as quickly as it could. And she insisted that she was going to plant every blasted seed. She wouldn't let anybody else plant that seed. Well, we figured that we almost quadrupled yield on that field over what they had done previously, so that's four times as much corn—and actually, I think that was conservative. Now, the problem they have many times is fencing, so the pigs get out and the cows get in it, and things like that. So they have some production problems just because of that. But I would say conservatively, we increased yields three times, and on the optimistic side, five times.

DePue: I would think that presents a couple new problems, though. One would be storage, and the other one you talked a lot about in terms of Brazil, is transporting it to a market.

Runge: Well, they have a couple things going for them. We're along the Burma Road. The Burma Road was a World War II road from Mandalay to Kunming, China. And so they're reasonably close to China, and there's a lot of truck traffic that goes from China to Mandalay on this particular road. Now, the road was very bad when we first went; it's much better now. But—and that's a separate story. But basically they are fortunate in that they're on a reasonable road that can get produce in and out.

And we [also] developed co-ops. The co-op buys the [input] materials and breaks the bulk commodities down into sizes that individual farmers need for one or two acres.

DePue: "Bulk commodities" being things like fertilizers?

Runge: The fertilizer, and the seed corn, and herbicides in particular. We'd buy backpack sprayers so they'd have a way of using [the herbicides and] these things. And so it's broken down, and the farmers essentially pay for it. We give it to them the first year, and after that they have to pay for it.

Then at harvest-time, let's say that we've increased yield three or four times. Well, if they were subsisting before, let's say that they use one and a half times as much corn as they did the first time before we came; well, that means they still have got [redacted information] corn that they don't need. So it might be fifty bushel, and it might be twenty bushel, but you can't bring a truck to an individual farm for twenty bushel or fifty bushel, so they have to get it to a town center. And then the co-op arranges—hey, we've got a truckload here. Usually these things are bagged, and we have a truckload here, so send the truck in, and we can load the truck on, and generally it goes over to China and brings some money back. And so it's what I call both a "buying co-op" and a "selling co-op," because you have to aggregate it to get into what I call "marketable quantities." Now, they do a lot of farmer market kind of stuff. They barter back

and forth and things of this nature [for the things they need or can sell]. And we also did vegetable production and wheat production, and things like this.

DePue: What was the reason they couldn't have done co-ops before? Was there some cultural reason, or just because they had never produced enough to get to that level in the first place?

Runge: Oh, I think it might be cultural. I think it's political to a large part. They've sort of been manhandled by the military. I think they live in fear of the military to a very large degree. And so I think that's one of the big problems.

One of the things that I'd like to talk a little bit about which I think is making a difference around the world is the convergence of agriculture and energy. Up until 2006, essentially the farm price of corn was determined by its food value and its use as feed, and things like that. Since 2006 in particular, the ethanol demand is such that we've raised the demand, so now it's much more that the price of corn is based on its energy value in addition to its food value. So I'd look at this as the Brazil sugar mill: [in Brazil, the sugar,] it either goes to the sugar shed, or it goes to the ethanol plant. It's strictly an economic decision. If I can make more money putting it into the sugar shed, it goes to the sugar shed; if I can make more money by converting it into ethanol, it goes to the ethanol plant.

DePue: When you say "putting it into the sugar shed," you mean...sugarcane?

Runge: Well, it starts as sugarcane, and they grind it up, and they leech the sugar out of the cane, and they end up with what they call the "residue," the bagasse, which is then burned to power the plant. It makes the high pressure steam, the low pressure steam, things like that [to cause evaporation], and so that you get the sugar juice. It's kind of like a molasses mill: you get the sugar juice, and you either have to concentrate the sugar through evaporators and things like this, or you take the sugar juice and you put it into the fermentation tank, and you make ethanol out of it. And which way the sugar juice goes is a function of economics. Now, I think the Brazilian government requires a certain percentage be made into sugar, so I think each area [or mill] has a sugar quota they have to meet before they can do the ethanol. The ethanol quota is not restricted.

But anyway, I think that now more and more, we're going to see the price of foodstuff [based more and more or its energy value], if the energy value is more than the foodstuff, the food value is going to rise to the energy value. [And vice versa.] If the energy value is lower, the food value is. So I think we're close to having a situation where basically we have a pricing mechanism which is independent of government policy and more or less worldwide. So if the infrastructure doesn't exist to create an ethanol or a biofuel of whatever version we're talking about—and we'll get out of corn-based ethanol here in ten years, I presume, so we're using much more cellulosic [energy and] things. But in the process, I think that the world has received a stabilizing influence on its agricultural commodities. And that's a first in my book.

DePue: I think I am wrapping my brain around what you are talking about here. This is incredibly important in terms of what we are going through right now with the energy crunch. You're suggesting that in the old days in American agriculture where you always could count on overproduction and that always drove prices down, now you've got this scenario where a lot of that food production is going towards energy. And so now you've got this interesting balance between the cost of oil and other classical kinds of energy and ethanol and biodiesel, and those

are going to have to find some equilibrium, but it's probably going to be more money for farmers?

Runge: Well, I think that the whole idea of demand-enhancing is to essentially give you a price in which you can stay in business at least, and—

DePue: In other words, that old supply and demand equation—

Runge: That's right.

DePue: —it's increasing demand?

Runge: So you're trying to increase the demand. And I think the ability to do this is a different game than it used to be, because now we have this sort of total energy need which is beyond the bio-energy to provide; at least at this point, in such a way that we can essentially, what I call in my old publication of eighteen years ago, a "sink" for the excess production at an acceptable price. So the farmers that took this on as their own demand-enhancing—and I'd say I'd particularly say ADM was certainly involved in this [early on], but you take these little co-op ethanol plants in western Iowa, [redacted information], southwest Minnesota, eastern South Dakota and Nebraska, they saw this as an opportunity to essentially increase demand, and also allow them to produce something that was [needed and] useful, and [in the process] increase the income of the rural economy in the process. So I think that's a very big one.

Another thing that I have been on is, you know, I have lived my whole life virtually with what we call "cheap energy." You know, I remember—I don't know whether I ever bought gasoline for less than nineteen cents a gallon, but that's the least I can remember.

DePue: There's people who are going to watch this and say, "Nineteen cents a gallon?"

Runge: Yeah, but I wasn't making anything then, either. (laughter) I was making 150-200 dollars a month, so... But you know, you could fill your car up for less than 5 dollars. And then all of a sudden in the seventies, it took 20 dollars, 30 dollars, 40 dollars to fill your car, and a couple six months ago it took 60-70 dollars depending on the size of the tank of your car to fill it up.

So these are the things—So I guess I posed to one of the boards that I'm on, is "if cheap energy, inexpensive energy, led to centralization and globalization, where does expensive energy lead us to? Does it lead to localization or less globalization?" Well, I don't want to go back to having one orange per year in my Christmas sack.

DePue: (laughter)

Runge: And nobody wants to go back to those "good old days." But I do think that we can put the world together a little differently and still have most of the things we value in life. And so I think this globalization/localization is a phenomena that's going to [be a function to] have to listen to the economic pluses and minuses, and I think the scenario is going to be a little different than what we've had in the past, so...

DePue: Would it be fair to say that you were one of the early advocates of ethanol production for fuel?

Runge: I wasn't necessarily an advocate of ethanol production. But when we did an economic study in '86—we started in '86—and essentially when we were exporting a bushel of corn in '87, we were adding about a dollar in each bushel. That's what we had to [do to] subsidize that export for. And we calculated that if we'd have taken that same production and converted it to ethanol, even if we had to buy the ethanol plant as a government entity, we could've done it for

twenty-five cents [a bushel]. So that was my first demand-enhancement instead of supply-control, and that was the nature of—and [in the process] I got to be known a bit as a pro-ethanol person, but I was really looking at this from an alternative rather than necessarily [an energy source]—and ethanol was a place that you could, so to speak, dispose of excess commodities in large quantities and still be plenty to eat for everybody else. Well, now it's a little big different story, and there [have been] [redacted information] some disruptions. And we've had food riots here and there. I think, I think we're in a phase where it's going to come together a little different in the future than it has in the past in terms—

DePue: Okay.

Runge: So that's kind of the game that I've been trying to work on a little bit.

DePue: There's a lot of different directions I think we can go here, but I want to stay with this discussion about ethanol for a bit more, because it certainly is part of our national debate, if you will. And there's a lot of discussion about ethanol and how that is not an efficient way to develop fuel, because you have to use a lot of gallons of gasoline to produce just a few more gallons of ethanol. Can you discuss that?

Runge: Well, there's the people that have biases. One is, I don't like the ethanol business, and others, they'll say it's the best thing since anything's gone on. I think if you look at these studies that have taken place, the ones who are biased against it tend to use old studies in which the efficiencies in producing the ethanol are different. So now we get, say, 2.8 gallons of ethanol per bushel of corn. Previously, it was less than 2.5. So we end up with more ethanol per bushel of corn. Previously, they were using different distillation techniques and things like this, and so you end up with more energy being used in drying the material. You put a feed lot at the end of the ethanol plant, you don't have to dry what we call the distiller's "dried grains," or the material that's left after the corn's been digested. So the, the—I think there is a reasonable consensus that the new efficient ethanol plants are much more positive in terms of the energy balance than many of the older studies would indicate.

DePue: Can you put any ratios to that? One gallon of fuel, whether it's in the tractor or in fertilizers or other applications, equals how many gallons of ethanol?

Runge: Well, I think the efficiencies are running about 30 percent on the positive side. So in other words, you get about 30 percent more energy out than you put in. Now, there's some who will claim more than that [and some less], but I would say I'd balance it between the forties [% positive] that I've seen and the twenties [%] that I've seen. And these are pro-ethanol people. But I believe that that is justifiable, as much as I can determine.

Now, I look at the use of corn grain for ethanol as an interim process. We need to get to the cellulosis side. So the reason the Brazilian sugarcane mill is more efficient on the energy balance than the corn plants that we've got in this country—particularly dry milled and wet milled—are basically they haul the whole crop to the sugar mill. So they take the leaves off, and everything else is taken to the plant. So they grind up the sugarcane, they leach it of its sugar, and they have all this residue left. And so the way they use the residue is they burn it. They burn it in just a plain old burner/boiler, and that boiler produces the high-pressure steam to run the generator that powers the plant, and the low-pressure steam that runs the distillation units that dry the sugar or centrifuge the sugar, or whatever else. [redacted information] So the

low-pressure steam [also] is used. So you end up with efficiencies that are really quite different [from the present corn plants].

DePue: And the nature of one gallon of input will equal two gallons of output, or...? Can you put a figure to that?

Runge: I don't know the numbers, but the Brazilian one will probably be positive in the 65 percent range, something like this. And, don't quote me on those numbers because I am not the person that carries those numbers around in my head.

Now, if we get to the cellulosis side, we have a couple of problems. One is it's very bulky. You know, just like sugarcane, it is very bulky. It's not unusual to have little railroads laid out so they can load them onto little railroad cars, and it goes to the sugar mill. So you don't haul this [sugarcane] stuff hundreds of miles. You maybe haul it twenty, twenty-five miles, [forty miles,] but you don't haul it hundreds of miles. So the cellulosis plant has localization problems. You have to make the plant close to where you're going to grow the materials.

DePue: Let's be a little bit more explicit in what you mean by the cellulosis.

Runge: Well, cellulosis taking the cornstalk, the wheat straw, the hay that is high in cellulose, which you then have to—and cellulose is a very complex sugar. It's a very long-chain sugar [that needs to be digested].

DePue: Or switchgrass?

Runge: Switchgrass. Or wood. And you then take an enzyme which breaks this cellulose down to a sugar, a simpler sugar which is then fermentable. And you can get your ethanol then from what [is often unharvested bioimass - that] we call "waste material." So there's a lot of energy that's lost out at what we call the city dump or the landfill. Why do we continue to haul all of that high energy material and bury it, and then it gives off methanol or methane for years on end. And you know, we're capturing that [methane] now and people are using it. So there's lots of things that can be done.

So I think the biofuels are only beginning, and I think ethanol from corn is probably going to stay with us to some degree, but I think we're going to graduate to using what we call "low value," "lower end use" kinds of materials, like wood or hay, cornstalks, things like this.

DePue: And many of those things you are mentioning, it would strike me, takes a lot less input in terms of the fuel that's needed.

Runge: Well, and basically, number one - Number one is you can burn it, [and] so you don't have to power the ethanol plant with natural gas or coal, so you could provide the heat source that the present ethanol plants would need. And then you would get these ethanol plants on a par to the Brazilian plant. So that would be the simple way to do it, is just to burn it at the ethanol plant to produce the steam you need [or to produce electricity].

The other thing is that I mentioned to several people that we used to have to something we called "city gas." When I went to New Zealand, in Christchurch in 1970, they were still [making city gas]—if you turned on your gas stove, it was powered by city gas. What they did is they burnt coal incompletely, with incomplete combustion, and they produced carbon monoxide and methane, and the CO2 as well, and they stuck it in a [gas] line, and they called that "city gas." Well, the heat value was much less than [if] it was pure methane [redacted information], for example. But it was adequate enough that you could boil your water or you

could heat your stove, and things like this. So we have the thermochemical processes which have not been looked at very completely—at least I don't think they have. South Africa during apartheid essentially produced a large part of their liquid fuels from this thermochemical processes. [We can also produce electricity.]

DePue: Basically converting coal?

Runge: Basically converting coal. But you can do it with wood, you can do it with anything that will burn. And obviously, the Nazis in World War II essentially powered the German war machine by burning coal the same way to make liquid fuels. Now, how we go about all these things, and how the politicians and policymakers get this all put together, remains to be seen. But we have many alternatives as I see besides just using corn grain for ethanol.

DePue: Another thing that has changed dramatically, I would think, in the last twenty, forty, fifty years is the myriad of other ways that corn and soybeans both are now being used. Can you talk about that evolution a little bit?

Runge: Well, I'm not an expert at all in this area, but we were talking—you know, the person, whose father-in-law worked for a corn products company in Chicago—and if you look at any of these integrated mills—take the ADM plant in Decatur. We use Karo syrup. You know, Karo syrup is made from corn. You can get dark, or you can get white. I don't know what the how the difference is [in processing], but I think people would be amazed at how much corn is used for things that they have no idea there's corn there. I don't have a list of these things, but obviously we're all familiar with Fritos and Cheetos, and corn curls and corn chips, and corn tortillas if you're from Texas, and things like this. But that's just a little bit of the wagon that is there. [Also most of meat is produced by animals that eat corm.]

So I look at it this way: for a manufacturing company to invest the research that it needs to create a useful product, it has to be assured of a stable supply at a reasonable price so that if they build a plant, they have a reasonable chance of making a profit for their investors. And I think that that's what's happened with corn. We've had, you know, we've had corn at a dollar and two dollars for forty years or more. Now it's up, a little more expensive, but with the price of oil falling to about half of what it was earlier this summer, corn prices seem to be following along with it. You'll end up somewhere where I would—If we want the investment community to develop alternatives, they have to have a stable supply at a reasonable price so if they make the investment, they can probably pay back the money they borrowed, or they can pay their investors for giving their capital to invest, and things like this. And I think that we have lots of opportunity in this area.

DePue: One of the things we've heard a little bit lately—and people start to realize exactly how much corn has permeated our diet—if you talk about dairy milk or dairy foods, well, that's all based on cows processing that corn—and other feeds, but primarily corn. Any kind of meat product, it comes from corn or soybeans, and some grass. Corn oil is what we fry our french fries in and everything else, and you went through the whole litany of other products that obviously involve corn. You go and get that can of soda off the shelf, and that's sweetened by corn syrup. It just has an incredible penetration in terms of what we eat.

And you and I were talking yesterday about these two young college kids who on a lark decided to drive across the country and realized, Man, everything we're eating is coming from corn! And then they put together this documentary called *King Corn*, and the message of that

was this isn't necessarily always a good thing that corn dominates our food chain so much; although it's led to cheap prices, it's also led to the obesity. What's your reaction to that challenge?

Runge: Well, I think that obesity is obviously a problem for us. When I was a kid, we didn't have to worry about obesity because we could probably eat 4,000 calories a day and not gain a pound, because we burned it all up because we were physically involved in baling hay, milking cows, walking to school, whatever. But as we become much more—what should I say?—sedate in our practices, things are taken care of for us. We don't have to do all those things. And I'm not advocating everybody should do this, but it's hard to eat less when there's so much variety and it tastes as good as it does, and things of this nature.

So obesity is a bad problem, but it's a much better problem than famine. And so I think that I'd like to weigh about fifteen pounds less than I do. I find that to be a challenge, and I don't think I'm necessarily very much out of control of where my weight should be, but if I weighed 175 pounds instead of 190 pounds, I'd probably be just as well off or better than I am now. So I think that people who are obese, yes, that's a problem. [People don't want to be obese.] But remember, it's a better problem than a famine, so that's number one.

And the other thing is when we don't have to expend all this physical labor that we used to have to do, we have to learn to eat less, or we have to exercise more. And I find running, well, I think you'd burn your knees out on running if you aren't careful, but I find that to be a little boring. So anyway, I think a lot of other people do, too.

DePue: But I'm not hearing you say that it's because corn so dominates the diet.

Runge: Well, I think it's corn, wheat, soybeans - the whole business. Basically, we have adequate food supply. We have more than enough. And I guess that I am still a little bit perturbed when you go to a restaurant and they give you on a plate [with] twice as much as you hoped that you'd got. You know, I go to some restaurants, smorgasbords, and I can say, "Will the percentage of obesity be higher or lower for this kind of a restaurant versus that kind of a restaurant?" And you can make your own judgments, but you've done it all the same way that many of us have [- if you eat more than needed you gain weight].

And on the other hand, the variety that's available is tremendous! I mean, you go to a grocery store, and the choice that people have just overwhelms you. Again, when I was a kid, we got three dips of ice cream for ten cents. Well, you couldn't get it for a dollar and a half now, maybe two dollars. (laughter) Well, that was probably more than you need, but we had to go home and milk the cows, and then we had to go haul hay and haul manure and all these kind of things, so we could burn it up in a hurry. I think I told you earlier we often had morning lunch as well as an afternoon lunch because we were *physically* involved in burning those calories up.

DePue: Are you proud of your involvement in American agriculture getting to the point where we have this incredible abundance that surrounds us without any tinge of guilt involved with the overproduction?

Runge: Well, I think what we tried to do—I think I have lived in the best of times. I think I've experienced things as a kid which people would now say was almost subsistence living, to a point where, you know, if you want grapes from Chile, you can get them any day of the week;

if you want to eat blueberries, you can get blueberries even though they have to come from various long distances and things like that. So I think we've lived in the best of times.

No, I don't have any guilt about increasing food production. Now, how I should associate myself with obesity, oh, I guess I look at this as much more a personal choice rather than a choice that anyone makes for you.

DePue: This might be something a bit away from your area of expertise, but I am sure you have opinions about the issue of the trend away from family farms towards corporate farms, towards agriculture as a business.

Runge: Well, I'm no sure. Economics eventually dictates, and I don't think you can rewrite the books unless you have policy people that rewrite the economic books and how they apply. I mentioned to you earlier when you had set aside programs, you couldn't have farmer A setting aside 20 percent with farmer B, C, D and E doing 100 percent. So the government had to put in policies so everybody had to participate in the set aside. Else if I got 20 percent less to sell because I set aside and you got your 100 percent, that's not a fair procedure. So I think that you end up with various kinds of political instruments that are going to have to be made to get us to where it is you want to go.

Now, there are some people that say that the free market can do everything, and there are others that say we've got to modify it. I think that Ghandi's comment is "There is plenty for everybody's human needs, but there is not enough for everybody's human greed." And I think that somewhere between "need" and "greed" you've got to have some policy [to help produce a better result]. The other thing is not everybody is created with the same level of intelligence and the same opportunity. I guess I'm glad my parents were— I was born in St. Peter, Illinois instead of the middle of the middle of Niger, for example. And how do we then take our gift of birth to make it a fair place for the rest of the world?

So I think this motivates you in various kinds of ways, but I think it motivates Dr. Borlaug and people like this [to help feed the world]. You know, I'm concerned about people not having enough to eat. Well, if you've got enough to eat and somebody else doesn't and that's a concern, it becomes a very big driving force. And I think that a lot of people in agriculture still have those basic kinds of feelings. So how we put it all together in the future I'm not sure, but I think we'll get there.

DePue: Um-hum. So there's no nostalgia in your respect in terms of seeing the family farms kind of slip away year by year?

Runge: I don't know how to keep it from happening. I guess that—You see, we started with 160 acres, of which about half of it was in redtop and pasture. So we really farmed eighty acres. My brother [and his son] who still farms that land [now] farms about—what?—almost 1,000 acres? And he's a small farmer by today's standards. But he's got enough to own his own combine and things of this nature. But—

DePue: And does he own all of that land?

Runge: No. He owns—He and I together own about half of what he farms. And then he [rents and] farms the rest. He farms my uncle's land, he farms a neighbor's land—two neighbors' land. So about half of it is owned by the family, and about half of it, you know, is either a cousin or somebody like this.

And how do you recreate the 160-acre farm? I don't think you can. In other words, the only way to do it is you can't mechanize it, because you can't pay for the mechanization. You have to spread that out over more [acres]. I don't think we want to go back to the little square baler and five cows, ten cows, and thirty hogs and 300 chickens and this kind of stuff. Now, do we want all the chickens to be in one place? Do we want all the beef cattle to be in one place? There's one thing [in a cow calf operation] that hasn't been able to be mechanized and scaled up as much as the beef cattle business. We still have the Mom & Pops that run twenty [to forty] cows here and a couple bulls, and they sell a few calves, and things like that, because it requires area. So you have some of this that doesn't scale the same way as corn and bean production scales.

DePue: But this trend towards larger operations, towards much more business-oriented operations, not necessarily a bad thing?

Runge: Well, I don't see an alternative to moving in this direction [with present policies].

DePue: But I also don't hear any great regret in terms of how you're discussing it.

Runge: Well, I guess I drive through small town US, and I am kind of sorry to see that most of them are either antique malls or [small] stores, or the storefronts are closed, and things like this. So I do have some regrets in those areas. But I don't know how to play it differently, because if I am going to open a restaurant in St. Peter, I can't count on 10,000 people going through town—there won't be that many going through town. So I've either got to figure out how many people have to eat here every day for me to succeed, and then [determine] how big an area do I have to draw that number of people from, and will they eat [here] once a week, once a month, or how often will they eat?

So I think you have to be more than nostalgic. I think you have to be what I call kind of "brutally frank" with what the possibilities are. And I am not completely satisfied with all the things we've done, but economics [dictate], if you can't make a living doing what you're doing, then you're pretty much required to change your attitudes or your procedures, or your investment base, or some such thing to get to an acceptable standard [of living].

DePue: Well, if I can sum it up in a different way perhaps, and you can tell me when I'm way off base. But we're not talking about sixty bushels an acre farming anymore: we're talking about 150-200 bushel/acres, and that requires these larger farms, but that increased production overall is a good thing?

Runge: I think so. I guess I would hate to have to cover, to shuck by hand, 200 bushel[/acre] corn. You would *never* get done! (laughter) Now, my brother has a reasonable-size combine, and it takes eight rows going through the field, but his big problem is hauling it away from the combine. I mean, you just don't have enough wagons and trucks and things like this to keep [up with the combine]—yeah, you can have everything emptied at night and things like this, [and it's hard to keep up,] but we're fairly fortunate that we have a large grain terminal that's less than ten miles away, so... And they can dump very fast. They've got at least three dumps, and so generally speaking [they can process a lot of grain per day;], you can—or you put it in your own bin, and so... But I think that shucking 200 bushel corn by hand would have to be (laughter) a long, long [and tedious] time process.

DePue: As they would say, "Been there, done that."

Runge: (laughter) Yeah.

DePue: You don't need to go back, huh?

Runge: No, I don't need to go back to shucking corn by hand.

DePue: What do you think, and you've talked about a lot of very significant changes that have happened in agriculture over the last fifty, sixty years,what would you say is the most significant or transformative change?

Runge: Well, you know we've talked about hybridization and fertilization, and weed control and insect control, and... But I think when you really get down to things that most people see is that the total mechanization of the old processes. You know, you don't use a scoop shovel now, except to clean up the mess that you made when you didn't get the dump on the right place or some such thing as this. I mean, everything is done by a machine. The tractors are air-conditioned, the combines are air-conditioned, the bin handling equipment is all done by electricity or some sort of mechanized auguring system, or something of that nature.

So, one of the things when we handled a fair amount of dairy cattle in the fifties, sixties: every Saturday, we had to grind feed. I never hated anything worse than grinding feed, I believe, because you had to grind with the rain or not, because [on] Saturday, you had to grind feed, because the cows are going to eat on Sunday! And you didn't have enough storage capacity to not do it that way. Well, now, we a lot of times we just contract [the work]. So my brother will contract somebody to spray his crop for herbicide because the guy has got a sprayer that's 100 feet wide or seventy feet wide or whatever it is, and he's all prepared to do it, and can get it done in hours, and maybe it's not worth me investing in a sprayer to do it myself. So we have a lot of these kinds of things which have developed because there is an economic incentive for somebody to own that equipment and let people rent it from him or do it themselves, they provide the service.

So it's just put together different than it used to be. I guess there's lots of things, but I think if you really get down to it, you know, the automobiles, we used to say, "They don't make automobiles as good as they used to." No, they make 'em better. You can run a car now a couple of hundred thousand miles, and if you've had to overhaul the engine, you've had a lemon. You go back to the old six-cylinder Chevy and the old flathead V8 Fords, if you got 60,000 miles out of those cars before you had to overhaul them, you were doing pretty well. And we used to get 20,000-25,000 miles out of a set of tires; now [if] you don't get 50,000, you think there's something wrong, and you might get a lot more than that. So I think that yes, there's a lot you could say is not like it used to be, but for the most part, I think it's much, much better.

So I look at, there's sort of three legs of sustainability: one is the economic leg; another is the environmental leg; and the other is the social structure leg. And one of the things that is very strong in Africa is that social leg. They still have what we call the "extended family." Grandpa and Grandma get taken care of by siblings. The grandchildren get mentored by Grandpa. They live—So I think that one of the things the African population and many other populations in the world do better than we do is what I call the social leg of sustainability, where when I was a kid, my grandfather and grandmother on my mother's side—now, I never knew my grandparents on my father's side—they lived with my uncle Art and aunt Alma. They had their own little house, but aunt Alma and uncle Art were sort of their first line of mentoring and keeping make sure they were okay, and the rest of the kids came, too. I guess one of the [newer] institutions that I find my least favorite are what I call "senior homes" or places where

people go to die. I think they're [necessary], you know, they're not - they're not very attractive to me.

DePue: Well, let's talk a little bit about the future, then. What do you see in the future of farming, especially in this region of the country, sitting on top of some of the best farmland in the world?

Runge: I don't think farming is—You know, we still have to trap sunlight, and take the water we get through the rain, and run it through a green leaf to get something for nothing. Essentially, if we can produce 200 bushel corn or 150 bushel corn that's worth three dollars a bushel or six dollars a bushel—well, let's say it's somewhere in that category—we're producing 450-900 dollars or [nearly] 1,000 dollars of something that didn't exist before. And that 900 dollars is then distributable to people in the area in some form. Now, the landowner obviously is going to be involved, but there is going to be other [in the] supply infrastructures [- and the local schools, etc., benefit]. But if you produce only sixty dollars—you know, you have sixty bushel corn, and it's worth a dollar a bushel, that's sixty dollar.

Well, so I think that the future for the agricultural community is pretty substantial, and it's—I mean, we're going to have to eat. And I don't see us living off algae that grows someplace else, or we don't have enough petroleum to convert that to something we want to eat. So basically, I think that this part of the world is very fortunate to have the well-endowed soil resource, the excellent climate. Yeah, it's maybe not what you want every year, but for the most part it rains when it's supposed to. And you're able then to take a good set of agronomic practices and produce something that didn't exist before. And I think as long as the world's going to need something to eat, we really don't have much to worry about. It might—The game might change, the way we get there [may change], but I think overall it's not going to change very much.

DePue: You're bullish for the future, then?

Runge: Oh, no other way. I think agriculture is more bullish now than it's been in a long, long time.

DePue: These really are some of the best times—economically, at least—for the farmers of this region.

Runge: Yeah. And we've got this financial meltdown at the present time which is having some adverse effects, and we don't know where it's all going to end. And agriculture is certainly adversely affected right now. So the people that make poor decisions are still going to have to pay the piper, and not everything is going to come out exactly the way you want, but that's what risk is all about. If we had everything exactly guaranteed, how boring would it be?

DePue: (laughter)

Runge: (laughter) It wouldn't be any fun at all.

DePue: Well, I suspect you have grandsons and granddaughters?

Runge: Oh, yeah. Yeah. I've got two grandsons and three granddaughters.

DePue: And maybe some nieces and nephews or grandnieces and nephews. What happens if one of those was to come up to you and say, "What do you think? I'm really thinking about going into agriculture. I'm just about ready to graduate from high school. What do you think I should do?"

Runge: Well, I've got a grandson that's taking over from my brother—or not a grandson; it'd be my nephew—is taking over for my brother at the present time. So there is a generational shift taking place. My brother is younger than I am, but not a lot. And so this past year, [my nephew,] he bought the combine from my brother, and he's bought a tractor [and a planter]. And so he's in a transition stage. I guess what I'm saying is to just start from "I want to do it [-farm]" and not having any history of being involved is a pretty tough go. It takes a lot of money. If you're going to buy land these days [it's a big expense], I don't know what land sells for here in Springfield, but I doubt if you can buy much for 5,000 dollars an acre. [Machinery also is expensive.]

DePue: Well, I was on a combine harvesting soybeans just south of Bloomington; a gentleman said it was about 7,500 per acre.

Runge: Yeah. Well, land has always been priced so you can barely afford it. And you probably never get more than about 4 or 5 percent on your money [when you buy land] under the best of conditions in terms of the particular time. And over time, a land purchased five years ago looks better than a land purchase today, and one purchased ten years ago looks better still. So basically, there are people that can buy pieces of land because they can spread the cost over some other land that they own, and things like this. And so they [, people who own land,] are in a more favorable position.

So I think if the high school student wants to go into agriculture and wants to go into farming, I think he needs to have a father or an uncle, a brother, a mentor, a neighbor, or somebody that he can sort of use as a way to [help him] get started. And I think that my brother and his son who is trying to transition from one generation to the next, he started by buying tractor, and he bought a planter this year. He said he wanted a sixteen-row planter instead of an eight-row, and he ended up buying the combine. Well, he's still got a lot of things he's got to do, but he hasn't bought any land. So the land cost, cash rents—you know, a lot of people want tp cash rent. If you cash rent three years ago and you've got a five-year cash rent agreement, it looks pretty good in the third and fourth year now. But if you've got a cash rent that's [expecting 7 dollar corn, you might be in trouble]—you know, I heard somebody saying they had to pay 325 dollars [and more] an acre for a cash rent. Well, going forward, that may not look as good unless prices recover. So farming is not for the faint-hearted, in my opinion.

DePue: Would you tell that seventeen-year old to—or what would you tell him about going to school?

Runge: Oh, go to school. There's no reason he should not go to school.

DePue: Are there reasons he *needs* to go to school?

Runge: Oh, you bet. Number one is he can learn some [agronomics and] economics, and he'll find out that there's more than just what I think—there are actually things that he can quantify in the process and things of this nature [and make better decisions]. But no, better decisions are made from people that are educated than from people that aren't educated [or less educated]. And everybody makes the best decision they know how [to make], but if you have a better background, a better understanding, you can make a better decision than someone that isn't that way. And sometimes you bet it on the wrong side of the wagon. Look at Bear Stearns—they're out of business because they bet the wagon on the other side of the fence [and lost].

DePue: What's the visceral reaction that you have when you hear people who suggest that aw, he's just a dumb farmer, or he's just an unsophisticated hick, he doesn't know what's going on?

Runge: That kind of makes me cringe. Basically, farming is a tough business. And I don't mean that in the sense that it's necessarily hard work at this point. It used to be really hard work.

DePue: Physically?

Runge: Physically. Now it's less physically hard work, but I think you have to be an economist, you have to be a futures person, you have to be an agronomist, you have to be a machinery expert, you have to be a welder; I mean, you can't run a farm and every time you've got a nickel's worth of problem you've got to call somebody to fix it. You've got to do it yourself. Or else you lose too much time, [it costs too much] or things of this nature. So I think most farmers are welders, they're economists, they're agronomists. It's not that they necessarily know all that stuff, but they know enough about it to know that they need to know more, or [often] they've got to rely on somebody else to help them with that decision. Many of them hire consultants to help them with some of these kinds of decisions. [Some] people have marketing people help them with marketing. Well, marketers in a stable environment are one thing, but marketers in an up environment, they tell you to sell before you wish you had. In a down environment, they sold too late.

So all these kind of things kind of balance out over a period of time, but farmers have to know an awful lot, in my opinion, and I think they're essentially a small business where they have to make all the decisions that a small business person does [and more]. So I put the farmer and a small businessman pretty much in the same bandwagon. [The farmers,] they handle a lot of money these days.

DePue: Well, we've covered an awful lot of bases. This has been an important discussion we've been having, and as we mentioned before, so much of it is extremely timely. But I suspect there's a couple things that you'd like to talk about a little bit more than I haven't touched base on yet.

Runge: Gosh, I'm not sure what that would be. Well, I'm just pleased—I'd say number one is I'm pleased that you persisted in getting me here.

DePue: (laughter)

Runge: You know, the first time I said, Well, why me? (laughter) You know? And then, you know, I said, well, and then the last time I responded, I said, You know, I'll go through Springfield and see who those guys are. And anyway, I'm glad I did. You know, Illinois is still home for me. I don't think it'll ever change. Now, for my kids, it's not home anymore. It's either Texas or Missouri. My son is Texas, and my daughter is Missouri. That's where they went to high school.

So basically, I think Illinois sits in a very favored [farming] position; the Midwest, the Corn Belt sits in a very favored position. Yes, there will be bumps along the road, no question about it. But more people die of boredom than anything I know of, but I don't think most farmers that are active farmers are very bored for very long, so...

DePue: Well, Ed, you've had a very full and productive life. You've been all over the world and back a few times. What do you look back at and say, "I'm proudest about" in terms of your accomplishments?

Runge: Oh, I never really dwelled on that very much. I think I've been lucky. Now, luck is having a plan that somebody thinks, this has (laughter) had a lot of prior thought, but I think you can plan [or make most of] your own luck, to some degree. I could've easily not gone to New

Zealand, because the kids were in school, and it cost a lot of money, and things like this. But gee, the world [for me] would be different if I hadn't done that. I could have stayed in Illinois and not gone to Missouri, or not gone to Texas. And the world would be different. And I'm not sure it'd be any worse or maybe any better [for me].

And when I used to teach, I used to tell kids that if you say no to every time you get asked to do something, before long nobody's going to ask you to do anything. Now, if you say yes and you found out that when you went through that door on the other side, [your response] was, Gosh, why did I do this?, you've already learned something, and secondly, you learned that you maybe won't do that again. But if you—I think the thing that you've got to do is continually try and find out a new opportunity. You've got to say yes. You've got to be an optimist. I mean, pessimists are no fun.

And now, you've got to have optimism founded in some kind of an educational[-relevant] framework. But I think you can put a lot of these kind of things together, and I guess if you look at education, I was the first in my family to go to college. Well, where would I be if I hadn't gone to college? [My] Uncle Sam wanted me to farm his farm. I think he'd have given it to me. Well, life would've been very different. And maybe I'd have been just as [successful and as] happy as I am now, but... Anyway, I think you make [most of] your luck [by saying yes to opportunity].

DePue: And it strikes me you are very happy with the life you've led.

Runge: (laughter) Well, most days.

DePue: (laughter) Well, you've got a lot to be proud of.

Runge: Well, thank you.

DePue: This has been a wonderful interview. It's been very educational and informative for me, and I certainly think it will be for anybody who takes the time and the effort to listen to it as well. So thank you very much, Ed, for this opportunity.

Runge: Thank you, Mark, for the opportunity.

DePue: Okay.

Runge: Thank you. [You've been an excellent interviewer and I enjoyed your questions.]

(end of interview at 1:58:00; two minutes of silence to end.)