Dakota Lakes Interview

Of Dr. Dwayne Beck by Dr. Buz Kloot

Recorded at Dakota Lakes Research Farm, Pierre, SD

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Foreword

June 13, 2025

Not too long ago, I assumed the no-till debate was all but settled. I figured everyone had retreated to their respective corners—glowering, perhaps, but quiet. Then we posted a few short video clips from an old interview with Dr. Dwayne Beck of the Dakota Lakes Research Farm, and to my surprise, the conversation lit up again.

Much of the response was positive. But to give you a sense of the range, here are just a few of the comments:

- "Just use regenerative grazing, then we won't need tractors." And later from the same person: "Tell me why we need crops?"
- "With herbicide resistance on the rise every year, I don't know how we do it without tillage in the future."
- "False, false, false. Right off the bat—three wrong statements. You can't make claims of ecosystem health if you're totally dependent on herbicides and poisons."
- "Try no-tilling anything into bluegrass. Then you'll realize it's not the answer for everything."

These days, very few people will sit through a 20-minute video. When we post short clips, we do so to spark interest—but in a world of fragmented attention, framing matters, and context is often lost. That's why I believe it's time to release the full transcript of this conversation with Dwayne Beck—warts and all.

This interview took place on the morning of October 5, 2013, just as the Atlas blizzard was rolling into Pierre, South Dakota. And while more than a decade has passed, I don't think the content has aged. That's because Dwayne didn't speak in tactics or trends—he spoke in principles.

Our conversation begins with the founding of the Dakota Lakes Research Farm but quickly expands into a broad and thoughtful exploration of what it means to farm in harmony with nature.

When we discuss no-till, Dwayne is clear: no-till is not a destination, but a tool—one tool among many in a truly resilient system. He challenges us to move beyond yield-chasing and to begin mimicking the ecological functions of native prairie: cycling nutrients, harvesting sunlight, and building soil through diversity and deep-rooted perennials.

Key themes include:

- The limitations of annual-only cropping and the need to reintegrate perennials.

- Grazing systems, perennials, and cover crops are essential, not optional, for nutrient cycling and land stewardship.
- The importance of crop diversity, thoughtful rotation, and observation-based science.
- The long-term consequences of salinity, erosion, and drainage mismanagement.
- A critique of policy and programmatic barriers that discourage long-term soil health.

Throughout this interview, Dwayne ties modern innovation to ancestral knowledge. His message is as urgent now as it was then: farmers must move away from input-reliant systems and toward ecological designs that regenerate themselves.

In preparing this transcript, I've preserved our conversation as verbatim as possible. I've removed some repeated words that are natural in speech (e.g., "to, to"), corrected most machine transcription errors, and added section headings—though doing so was a challenge given Dwayne's stream-of-consciousness style. I've chosen to retain some of his more colorful (though not profane) language, because much of the joy in this exchange comes from his acerbic wit and biting clarity.

This conversation has shaped my thinking about agroecosystems. I hope that, through careful reading, it may shape yours as well.

I hope this conversation finds its way into the hands of those sincerely seeking answers.

—Buz Kloot

Dakota Lakes – Beginnings

Irrigation Focus

Buz: Dwayne. It's. It's really good. We're with, Dwayne back here from the Dakota Lakes Research Station, and, it's been great meeting with you. Very, very different conditions today. Compared to yesterday, you were out harvesting till, I don't know what time, but I've got some good footage of you.

Dwayne: Harvest in the dirt.

Buz: Yeah, well, Dwayne, before we start talking about some of your takes on the science of soil health, I'm really interested to know the story of Dakota Lakes Research Farm first, and then I want to sort of segue that into your story. But tell us the story of Dakota Lakes Research Farm. It really looks very, very unique.

Dwayne: So, well, the Dakota Research Farm is owned by and on or not for profit or 501 C3 Corporation that was put together by area farmers. And these guys at the time it started were actually irrigators. Yeah. And it was in early 1980s that the concept actually developed in it, and it had to do with the fact that they, had built a bunch in the, in the late 70s.

Dwayne: Is they "God's not making any more soil". Yeah. Rather, times which are maybe not dissimilar from now. And they'd put in a bunch of irrigation development along the Missouri River runs on loess soils, and loess soils tend to seal up when you hit them with rain. If they're bare, they tend to seal up in water runs.

Dwayne: And they'd put these irrigators up on the hills and pump water on them. And the water ran back to the river. And that wasn't working very well. Okay. And then the Arab oil embargo, type thing, worked its way into the system, and the energy costs went way up. And so now they wanted to go to low-pressure irrigation instead of high-pressure.

Dwayne: So now instead of putting an inch of water on and 30 or 40 minutes, they're going to put an inch of water on in six.

Buz: Minutes, okay.

Dwayne: And obviously, they're already having runoff issues. And that's kind of when I entered the picture, doing some research on irrigation as a graduate student, and noticed the runoff and started trying to address those issues for them. Yeah. And we had some stuff going on how to stop runoff under these sprinklers.

Farmer Intervention

Dwayne: Yeah. And after a field day, one night, some farmers said, Well, we need to have more of this type of research. And they said, well, you're not going to do that unless you

have a site somewhere out here because you can't come from the university this far and try to research. It's not efficient. Yeah. And it's not going to be comprehensive.

Dwayne: It's not going to be what you need. And and they said, well we'll just go to the legislature and get you, get you. Some land.

Buz: Yeah.

Dwayne: And I just said if you do that, you lose control of it immediately.

Buz: Okay.

Dwayne: I love the university and it's great. Whatever. But it, it it doesn't think like a farmer. Okay. And so you can have all the advisory committees you want, but unless they have, a dog in the fight or skin in the game, whatever you want to call it, unless they're intimately involved in the thing, they they, they don't get to listen to.

Buz: Yes.

Dwayne: So it took them a long time because this was in the 1980s when nobody wanted to talk about agriculture. Yeah. And it took them a long time to raise the money to get the place put together. But we bought this piece of property and started operations in 1990. Okay. So we've been here over 20 years, and it's always been no Till.

Dwayne: But the interesting thing was when we started, no till is not part of what we were doing. Okay. In terms of the 1980s, I mean, no till was part of what I was doing, but it wasn't anything the farmers were doing. It wasn't the reason for having Dakota Lakes. The reason for having Dakota Lakes was because of more efficient irrigation.

Dwayne: Yeah. If you look at our mission and goals, it says nothing about no till. It says, environmentally friendly and efficient, and whatever you aren't, unless you're doing no till but no till alone, without all the other things we do. Doesn't really make any sense either. Yeah, in a lot of ways, guys are doing quote unquote “no till” in in the US doesn't make much sense because there's no diversity and there's no attention to, water cycles and nutrient cycles and sunlight and whatever. They're just not doing tillage. But yeah, basically a conventional system with the tillage taken out?

Buz: I mean, is is your story tied very much to the development and the thought process at Dakota Lakes? Yeah.

Changing Perception of No-Till as the High Runoff Check

Dwayne: And it's been a building process like we were looking to how how do you more efficiently use water? Okay. And how you make water go in the soil and in those type of things. And when we started, if you read the literature, [at the time] everybody knew that no till had more runoff than conventional tillage.

Buz: Okay.

Dwayne: If you read the literature.

Buz: At that.

Dwayne: A at that time, and it had to do with the way they were doing how they defined no till as in how they were doing. The studies and whatever. But no, till at that time was they take a conventionally tilled field after harvest, they'd kill some of it, leave some of it until, and sprinkle it with water and get water in, ran off more in the no till.

Dwayne: Right. And so we actually included in no till type treatment in some of what we were doing as kind of a high runoff check. But after three years it wasn't to high runoff check anymore. Okay. But then to try to get people to move that way in the in the system took a while. I mean, we had to get Doctor [Chu?] who was a very well-respected soil physicist or ag. engineer type guy.

Dwayne: Yes. And we got him out and did some infiltration work on some of our land that we know tilled for a while. And all of a sudden, he's going, "Wow!".

Change of Mindset, Change of Name, Restoring Soils

Dwayne: And, and then kind of that started to change, change the mindset. But and then, you know, the evolution of what we were doing because I in the period between 1983 and 1990, I managed the research center at at Redfield, South Dakota, okay, because Dakota Lakes wasn't there yet, and I was done with my PhD.

Dwayne: So the university hired me to run this station in Redfield. And I recognized that, you know, it's important to make water go in under irrigation. It's more important to make water go in well and dry land, because under irrigation, if I run some water back to the river, I can pump more if I have enough time and enough money.

Buz: Yes.

Dwayne: In dry land, if I run water back to the river, I can't pump more. Right. And and so we kind of figured out maybe we should be looking at, the dry land aspects pretty hard as well. And, you know, and in reality, what the Dakota Lakes Research Farm was originally called Dakota Lakes Irrigation Research Farm.

Dwayne: And before we came here, it changed; we changed the corporate name to Dakota Lakes Research Farm because we started putting the emphasis on both dry land and irrigation. And most of the guys who were irrigators who started to Dakota Lakes no longer irrigate, but because it's too costly.

Buz: Yes.

Dwayne: And especially with the high lifts. Yeah. And even with all the efficiencies that we throw into the system with our low pressure and all this stuff we're doing, and we're about as efficient as you can get, we probably use two thirds of water that you use if you're doing

tillage, but, even at that, it you make more money per dollar invested right on dry land as compared to irrigation.

Dwayne: Okay. And, we irrigate, we call two quarters of land, but, you know, we irrigate about 35% of our property here. Yes. And it is a great tool, and the biology moves faster on the irrigation. Be more like the corn belt. It's kind of our simulation of the corn belt.

Dwayne: It'd be like if, if, if we always talked about native vegetation, if I just ran by irrigators and didn't put anything there, it'd be a tallgrass prairie, would be. And because of our, we just added a bunch of rainfall to what would be a tallgrass prairie ecosystem. And, so that would develop there, and the other thing it does is that the biology goes faster so we can develop, soil properties, these really wonderful soil properties, so much faster in high rainfall than we can in low rainfall.

Dwayne: It just takes a lot longer to heal the damage in the low rainfall areas. And, you know, our little rainfall stuff is, you know, probably it's we've been there 20 years and, and heard a little over 20 years and it's probably, we probably developed the same kind of structure in about 5 or 7 with, with the irrigation.

Dwayne: Okay. You have so much more biomass and potential for doing things well.

Lewis and Clark, Dakota Lakes, and Grazing Systems

Buz: Just give us a little bit of an idea of the conditions that your farm is that Dakota Lakes Research Farm has two basic soil types, and your climate is somewhat challenging.

Dwayne: Well, it's. We're in kind of a mixed grass prairie area, I'd say. That's hard to tell, actually. I mean, what we have here now is mixed grass prairie. Now, we've been growing tallgrass prairie here on some pretty marginal soils. And if you read the diaries of Lewis and Clark, who walked right along the south side of our property.

Dwayne: But 1804 and then coming up river, Lewis walked along, as near as I can tell, but by reading the original journals right across the south side of our property. Yeah. And he was finding tallgrass prairie stuff.

Buz: Yeah.

Dwayne: So that's that's the big stuff we've got down there and, you know, switchgrass and big bluestem and and, it's because it was developed with this, massive herds of bison coming through and and eating it once a year, maybe. Yeah. And then you still had the elk and the browsers and those kinds of guys, the pronghorn and those guys there.

Dwayne: But that massive impact of the device in herds, but they weren't grazing like we graze now. And so what's happened is we've grazed and probably degraded the soils from what they were when Lewis and Clark came through.

Buz: Yeah. So, with or with them might be more akin to mob grazing and not very much.

Dwayne: Yeah. It'd be a mob grazing type thing. And it has, you know, and some of those ideas are now coming back. So I don't know what it's going to look like. But we've had a tremendous success with what we've done with Harvest Bowl and the tallgrass prairie stuff. Yeah. And, and and you saw some of it yesterday.

Buz: Dancing with Wolves.

Dwayne: Where you were yesterday are these very shallow ocean bottom soils that were really considered marginal even for grazing.

Buz: And they've got 80% clay. Yeah. Wow. That's that's phenomenal. And you said something like four inches of water in the profile.

Dwayne: But but again that comes down to the yeah the question of what's available. See our measurement of what's available may not be what's really available. If you have a massive root system like the tallgrass prairie plants, they might be much better at extracting water than we can with the pressure plate.

Buz: You're right. Right. Okay.

Dwayne: So you got to be careful with. But according to the book, yes, they're there because they're really shallow. Where you were, that soil's probably only two to 2.5ft deep.

Buz: Or over shale. Yeah. And that's the shale that's here.

Dwayne: Shale fractures, shale stuff. And you know, that's called an Opal [Soil series]. Okay. That's an Opal soil. And the next one shallower would be a Sansarc [Soil series]. And the deeper one is a Promise up there but, you know, when I was young, I would read journals of explorers and early homesteaders and, you know, those are fascinating to me.

Dwayne: And, of course, the little House on the Prairie books were set in South Dakota, Oregon, and you, you you you read about these people coming in the, the grasses as high as the back of a horse. *And my only thoughts at that time is they had little tiny horses!* 😊

Buz: And ponies.

European Influence on Grazing Management

Dwayne: Yeah. I mean, just really little tiny horses because the stuff that was there now is this little stuff. But those are invasive species that that are the cool season species and what and and I think what really happened is, you know, that European in a different ecosystem. And they came here and they were used to being able to turn their livestock out early in the spring and just let them graze all summer.

Dwayne: And they would eat, you know, because it rained all summer and they eat those grasses and everybody is happy. But if you do that here, you just totally shift the ecosystem to these real crappy grasses. Yeah. That in in the, in the nice tallgrass prairie guys go away.

So I, you know, one of the most surprising things to me has been how well those tallgrass prairie species have done on, on really margin really marginal.

Buz: But really, I think from what I understand, you use a systems approach, so why would that be? Or tell us about how you approach the science of soils and soil health and growing things over here?

Dakota Lakes and Approach to Science

Funding

Dwayne: Well, there's there's several things involved. I think that, you know, I grew up on a farm with watching my grandfather and father, and actually a lot of the technique we use goes back to some of those techniques that they use. It probably had gone down through centuries of development, including some of the concepts, and I'm not sure they knew exactly why they were doing some things, but that's one input.

Dwayne: The other part of, of I think my experience that is important is my undergraduate training is as a chemist and a physicist. Well, most people don't know that.

Buz: I saw that. Well, you know, my my background is in chemical engineering. Okay. So, I used to love the stoichiometry because it was so tidy. So this sort of hearing about soil health and everything that goes on in that really, really blew my mind and changed my mindset.

Dwayne: Well, but yeah, she my daughters are becoming engineers and the training of an engineer is a little bit different. And a chemist, I mean, one of the things in that I and I taught chemistry for a while, one of the things that I always thought was fascinating in both chemistry and physics was to go back to how these historical, discoveries were made, how they discovered that, you know, Rutherford shooting things at this foil and thinking that would it's uniform.

Dwayne: And then some of them went through and some of them bounced this way, and some of them come bouncing back. Yeah. And which the only thing that could describe that is having little tiny areas of high density surrounded by areas with right, not high density. So, you know, looking at that whole system. And then the other thing, especially in physics, is, is, you know, trying to use fundamental principles to describe how things work in a, in a systems approach where actually what we're doing is we're looking we're using basic ecology principles to try to decide how things work.

Dwayne: And you look at, the top of the food chain and, you know, and how does that take what that tell you about everybody that's underneath that whole web, that's underneath, you know, it's a species at the top of the of the food chain and, and, You know, that's why there's so little we know about biology. We think we know a lot about biology, which is so little.

Dwayne: We know about biology that one of the things you have to do, and that's what we started with, is in, in, in no is one of the things you have to do is, is look at a model, something that's the same way. And so we use native vegetation. Like when I, when I took over the farm in Redfield, the first farm that I manage before Dakota Lakes became Dakota Lake.

Dwayne: Yeah. When, when I took over that farm was actually when funding for ag research started to decline in 1983. And we follow the history of of when the land grant University is a land grant, university system funding started to fall apart was in that exactly that period of time.

Buz: Great timing for you, wasn't it?

Dwayne: Yeah it was and and my boss, who's at that time was a guy named Ray Moore, who was a great, great guy. And, and he, he, he told me a couple things. Anyway, he, he really wanted me to work on organic and because that was hard at that period of time and, and organic slash sustainable. And I said, well, I, I agree with the sustainable part.

Dwayne: I just don't think organic is because of the tillage. Right. And and I said, and I think what we're doing is the real going to be the real answer. And he said, fine, you can work on that. You know, instead of saying, no, I'm the boss, you're going to work on organic. He said. You can work on that as long as it shows promise.

Dwayne: Yeah. You know, he gave me that leverage. And the other thing you said is he said the funding you have today would be the most you'll ever have. It's going to become less and less and less as you go forward, which it has. Yeah. And I said, can I keep the at that time, the money from the production side of the operation was sold and went back to state government.

Buz: Okay.

Dwayne: And I said, “Can I keep the production fund?”

Buz: Yes.

Dwayne: And he said, we'll see if they'll buy into that, which they did because it was $15,000 a year or something. And they got actually let him keep it right. And so we then started to focus even their very hard on, yeah, we're going to have a system that's environmentally friendly, but it's also going to make money because we need to make money to do.

Small Plot Research and Hunting Dogs?

Dwayne: And that's the way we run this operation that and that pervades what we find.

Buz: So you're you're not when you're doing research with a farmers mindset. Yes. Okay. So you're under real constraints of weather and soils and everything else but also economic constraints.

Dwayne: Yeah. And the you know and I'll use a southern since you're from South Carolina, I know I use a southern say you know *that's a pretty dog. But does a SOB hunt?*

Dwayne: It also be hunt if you take a look at a lot of what's done in terms of the research.

Buz: Yeah.

Dwayne: You know it's boy this is the greatest thing. And you know part of it's PR but this is the greatest. This is a wonderful crop. This is a wonderful thing boy. This is just the greatest thing. But boy this five years later, it's nowhere to be found because the thing doesn't hunt. So we have a nice combination here of, of, we do have at Tyco Lakes.

Dwayne: We have researchers from South Dakota State University come here.

Buz: And they have the guys who do the.

Dwayne: They do of small plot trials. And you can see them out there when you're out there last night.

Buz: Yeah, yeah.

Dwayne: And and in the past, probably not so much now is in the past because we just don't have as many of them as we used to. But in the past, you know, you can say, you know, here's a problem. We have. Could you give us some help with this in terms of let's do a little research or whatever?

Dwayne: Now we have to do more of that ourselves. But because they're just getting thinned out, and the guys that are left have to do this real short-term grant research stuff that may not fit what we need to have done, which is unfortunate. But yeah, hopefully, that will change. But if it doesn't, we can look at what the small plot guy is doing.

Dwayne: Yes. And and find something in there that we think fits part of what we need. And then we, we, we scale it up.

Buz: Okay.

Dwayne: And that's always, in my opinion, been the thing missing.

Buz: And that's where the you see if the dog hunts, you see.

Dwayne: If the dog hunt you take of the field and you see if it hunts and, and where are you going to hunt it? I mean, not all not all dogs hunt. Same kind of cover. Right? So, you know, maybe there's a fed here for it, but not someplace else. And so, you know, we we've brought in a lot of alternative crops and we've done a lot of work with engineering things in terms of eg engineering.

Dwayne: Yeah. Equipment design because, you know, if it doesn't fit Des Moines, Iowa, it's not really important to John Deere case or whatever. I mean, it's they're they're pretty focused on those major production areas. That's where the market is. Yeah.

Buz: Yeah. Oh well I saw one of your articles and we'll talk about that later. "No tilling in the mud". I also see that you have a fairly unique approach to cover cropping as well.

Mimicking Natural Systems

Dwayne: The thing is, no till is a tool. I mean, run. Yeah. And I you know, I don't want to get hung up on this, but yeah, I do I mean, the goal is the overall goal is to mimic natural ecosystems, okay. As closely as we can in terms of how we cycle the nutrients, how we harvest the sunlight.

Dwayne: You know, how we how we cycle the water. And that's totally, you know, if we do that, then we're probably going to do very little harm if we if we come in and, and, and, and just say, well, this is what I want to do and how can I change the ecosystem to make it do what I want it to do?

Dwayne: Most likely we're going to do we're going to have all these unintended repercussions that we we have no idea what they are.

Buz: Yeah, yeah.

Dwayne: And yeah. So when I look at no till, it's a tool that I have to use in order to not screw up the ecosystem because I need to make water go in the ground and I need to if I do tillage, water doesn't go in the ground. I mean, and we figured that out with irrigation, but I mean, that was just kind of okay.

Dwayne: But if, if, if I make water go in the ground, but I'm not doing other things right, my yields aren't going to be there. So now as part of that system, yes. Now that got the water going in the ground. That's good. But how do I keep from having all the diseases and insects and all the things that that everybody says it's associated with?

Dwayne: No till. And if you went back 25 years when we started that, and that comes down to the things I learned from my grandfather, my dad, who farmed when they didn't have all the, the pesticides and, and those kind of things. How do you how do you handle some of these things? And, and, and they did it with crop rotations.

Dwayne: And then one of the things they did because they did do tillage, albeit not like we do now.

Buz: Because they didn't have the big machines.

Dwayne: And yeah, I did, I did a lot of tillage with it, with, WD 45, Elmer's or you Minneapolis, Moline open station. And where you go, right. You're not going to do tillage like you can do it now, but how did they heal the soil after they'd tilled it for a number of years?

And the weeds would build up? Well, they put it back into perennials. But the other thing that did is it put a deep root down, it cycled the nutrients back to the surface.

Buz: So that's the perennial.

Dwayne: Yeah. Because it put the deep root system down. And then it caught the lime and stuff that was starting to go down and making the pH go down. They bring it back to the surface. I mean there's all these things that they did that made a lot of sense, but they didn't know exactly why they're doing it. But they were, you know, every so often you got to put in a perennial.

Dwayne: Yeah. And and part of the reason for doing that was to build the fertility by having legumes in that mix or whatever. And so. You know, I, the, the overall goal is to, to match the ecosystem. You can't do that if you do tillage. Right. You can't do that if you're using fire, you can't, you know, these these things.

Dwayne: And then and then, when you go beyond that, you know, cover crops and become a tool just like no till, right? That help you better match. There's, there's there's little periods in there when when you, you can't quite do it with, with, a crop to produce grain because a crop which grain takes a certain amount of time or a certain amount of moisture and you got periods in there when you need to do something but you don't have time to do, of, of full crops.

Dwayne: And to me, a forage crop is what, cover crops are really a forage crop, right? I mean, if you read a lot of my old stuff, I talked about forage crops. Okay. As doing that. Well, that's a cover crop is just not having anything. Eat it if you just leave it. But I think that eventually we're going to see that as a mistake.

Dwayne: We've got to get the cattle and stuff back in the system to mimic what the bison were doing. Right. But, you know, we do have little tiny guys eating it. You know, we have these little tiny microorganisms eating away at our cover crops. So, I mean, we're we are we are cycling it, but it's it's not, the mega herbivores wars that we've.

Buz: That we had in the past.

Dwayne: In the past. But, I mean, the idea is how close can we get to mimicking the natural ecosystem. And, you know, one we're doing right now that, you know, yesterday didn't have time. Maybe today we'll have time to go look at it because it's raining. But, we have alfalfa and corn growing in the same field at the same time.

Dwayne: You know, the first thing I always do when I travel. Yeah. And I've been lucky enough to do some traveling is I want to go see the natural, the native vegetation when I go somewhere. And, and then once I see the native vegetation or kind of get a feel for the native vegetation, then then you kind of, you know, what Mother Nature will allow you to do in an ecosystem.

Lessons from Western Australia

Dwayne: There, you know, this is what Mother Nature says you can do here and then and then how do you fit farming into that thing? That's the way. And one of the most challenging ones is, is probably the a Western Australia type or even eastern Australia. The Australian wheat belt type ecosystem, because it's a Mediterranean winter rainfall type climate.

Dwayne: In well in Perth in Western Australia, east of Perth. Okay. Got it in that area. And then, down around Adelaide and that type of area, and what, what's there when you see it is trees and what they call bushes. Trees. It's big trees because it's winter rainfall. And the first thing that I know when I see trees is that you have periods of time during the year when rainfall exceeds the ability of the soil to hold water.

Dwayne: Yeah. And the water will move beyond the depth where a grass-type crop can get it. Whereas here we have the grasslands because we have only very short periods of time when rainfall exceeds or precipitation exceeds the evapotranspiration. Yeah. And we have soils generally that will hold some water. So most of the action is occurring in the soil, where you know, the surface, four feet or a meter and a half or something like that, whereas you have water moving deep in, wherever you see trees at some period of time.

Dwayne: And so you have this water moving deep in the wintertime, and you have all this evapotranspiration in the summertime. And how do you throw a crop into that? In, in, in move that, you know, go down and get the nutrient that's leached during that wintertime and bring it back up. Because wheat's not use enough water and the canola is not use enough water.

Dwayne: And and I really can never wrap my mind around how you could do that other than we were. We were trying to talk and, and, and growing crops like sorghum this summer. Crops because it would be almost perennial like it is in Africa. It's a perennial.

Buz: Yeah.

Dwayne: And and would come back year after year. And, and so grow your craft in the winter and let the sorghum come back in the summer and just be a kind of your perennial cover crop. And we were trying to push toward that system. And then I ran into a guy by the name of Colin Size, at Dubbo, which is actually in the east, but it's a similar ecosystem.

Dwayne: And, and he was doing this thing he called pasture cropping or grain and graze or whatever. And he used these tall grass, what are very similar to ask for, tallgrass prairie crops, like they have a thing called kangaroo grass that looks like big blue steel and the same, same thing. And then that grows during the hot summers and, and takes the nutrients and brings them to the surface.

Dwayne: And and then when it goes dormant, he makes it go dormant in the wintertime at times and then grows a crop, a winter crop there. So he furnishes the cool season component of of of the mix species system. He says, okay, the cool season component is going to be going to be my my cereal crop and my canola.

Dwayne: And, the warm season will be a perennial right. And it makes a lot of sense, and I mean, and I still remember the day, and we're in a Ute pickup.

Buz: You can.

Dwayne: Yeah they call them. Yeah, yeah, yeah. And we're driving out moving sheep because these, these mob grazing or high intensity short duration grazing. The paddocks and then with the sheep, that's the other part of his system. And you know, I still remember I just went oh dang. He figured it out because I had been wrestling this this forever and I and he, he just figure out how to do that.

Dwayne: But if you for years I'd been asking the Australian, what's your mega herbivore? And because when you, when you see what they thought was their native vegetation is just really thick bush. Right. And and I kept saying, what's the mega herbivore? Because something had to have knocked down the trees. It's like in Africa, if you didn't have the elephant knocking down the tree, you wouldn't have the antelope.

Dwayne: And the things that run right, right. And the wildebeests and whatever the zebras, because you have to have something to knock down the tree. Yeah. And and they don't have that species there anymore. But it's a diet for non which I found out later. But people say well we never had one. And they said you wouldn't have kangaroos if you had bush like this, you would've never developed a kangaroo species that needs open areas.

Dwayne: You had at one time open areas. And this little fire did it all.

Buz: Yeah, yeah.

Dwayne: Well, no, I don't think so. And the Aborigines weren't there forever, so it wasn't them starting the fire. Now, they originally they think extinct the the disappeared on and then they started using fire to create the open spaces that the kangaroo needs. But I mean, you have to start trying to put those things together. Now, if you do like they're doing without having the deep rooted species, your goes down right, which is what's happening in the Corn Belt or places.

Leaky Systems

Buz: So you're, you're leaching all your calcium and magnesium into that profile and the hydrogens replacing them.

Dwayne: Right? I mean, you're taking them, take them out and they're going down. And it gets to the point where.

Buz: And they're going down with the nitrates as well.

Dwayne: Yeah. All this stuff and then and it's form and saline seeps, which is really just your fertilizer going someplace you don't want it.

Dwayne: And if you put in drain tiles it goes off the ocean and you sure as hell don't want it there. And so you've got the whole system leaking. And, you know, that's the first indication of a leaky system when you see these go down.

Buz: With the low.

Dwayne: Because of your calcium, they're moving in your lime, and that's one of the first ones to move. But in Australia, we actually saw a situation where. They tried to grow some sorghum in a paddock. And, the sorghum in the paddock looked incredibly stressed, other than right around the lone tree in the middle of that, you gotta look fine.

Buz: Yeah. Okay.

Dwayne: Well, everything I learned, they said, see, we told you we couldn't grow sorghum. And I said, well, everything I learned, you know, about, but water, you know, the tree. It should have been less healthy around the tree. And the tree was using water. And I said, well, why is the sorghum look better around the tree and not.

Dwayne: And then everybody's going, "Gee, we don't know". Well, the answer is the tree was cycling nutrients back to the star. And the drought symptom is actually a potassium deficiency symptom okay. So I knew that, and it had a leg up. But when we took a soil sample around the tree it was like 100 parts per million potassium.

Dwayne: And away from the tree it was five [parts per million potassium].

Dwayne: So it's not just the calcium that goes, you get the potassium to go in and all those other things, which your system is broken, and if you keep doing it and you keep leaking, you turn into a desert, right. And so that's, you know, the the Sahara Desert at one time was a grassland. And you can leak nutrients like calcium, magnesium, but you also like nutrients like carbon.

Dwayne: So when we start doing tillage and our organic matter goes away, that's leaking carbon. And it goes away. And then your soil productivity goes down. It's a spiral. I mean, Randy, Anderson has a really nice presentation that he makes on soil degradation. How it's, like a death spiral.

Dwayne: Going down. And then when you start to rebuild and people always expect, well, we come in, we start. No till and everything is great right way.

Buz: Right.

Dwayne: Well, no, you've got to rebuild that soil to the point where as close as you can get it to, to what it's intended to do. I mean, you're not going to necessarily get much better than what the native conditions are. If you can get that good.

Buz: Yeah.

Dwayne: And, and but you got to rebuild the soil, and depending on how degraded you are, it'll take you a while to rebuild it. And he talks about all these things combining to, to spiral back up. It's really kind of a nice, nice presentation. And when you when you talk soil health.

Defining "Soil Health" – Not So Easy

Dwayne: Not one of my favorite words.

Dwayne: But because it's not definable.

Buz: Okay.

Dwayne: You know, and, and but when you talk soil health, that's really what you're, you're really talking about is trying to rebuild this whole community that existed there as much as you can, where you have all these, these webs going on that we don't understand very well. And, and, and, you know, hopefully you can put it back a lot of the species and, and so that's why, you know, the diversity and stuff is important to try to put back as much of that, that that component as you would, you can, you know, soil health.

Dwayne: I mean, years ago, they had, I think they called even soil health years ago. And NRCs had a team in Akron, Colorado that was supposed to work on this. Right. And they came here one day and and, and I just I just got them off the field and they said to me, I want you guys to sit down and write a definition of a beautiful woman because they're all through you, man.

Dwayne: Because that's what everybody tries to do is, you know, and if, if or a handsome man or maybe in today's society, we could, we could do whatever.

Dwayne: But,

Dwayne: But you can't define them right. See, in the same way with soil health, you don't necessarily you can't necessarily define what it is. And, and so we, and the trouble is, is everybody is trying to define it from the standpoint of the input. If you do this and this and this, you have a healthy soil.

Buz: Yes.

Dwayne: Well that that's like saying, well they got to have brown eyes and yeah, you know, blue hair whatever. And that makes it, a beautiful woman. Well you can't do that. But what you have to do is on what is the thing at the end that you're, when the whole is put together? Is it is it is it is it working? It's kind of an output type thing. And and so that's what I look at is, you know, are we cycling the nutrients?

Buz: Okay.

Dwayne: In the same way, with *no till and whatever, these things are all components*, and then you've got no telling, you've got to do anything you've got to. But now you are, you,

cycling the nutrients. Are you harvesting the sunlight? Are you providing a home for wildlife? You know, I don't know if you took a picture of this. I.

Buz: I did.

Dwayne: Right. So, I mean, living soils is one of the things that's on the sign, right? Is the food healthy when it comes out. Because what we're in the business of doing is making food. You know, we're making food that's important. But it needs to be healthy food, you know, so the outcomes are what we're really looking for.

Dwayne: And so we can't we can't get to that outcome with no till we can't get to that outcome with cover crops alone. We can't get to that outcome, in my opinion, with rotations that aren't diverse, which everybody wants to do because, you know, I, I'm a corn grower. Well, I'm a corn grower too! And I grow wheat and I grow teff and I grow peas and I grow lentils and I grow flax, I grow soybeans and I grow sunflowers, right? We do all those things, and I have some perennials.

Perrennials

Dwayne: So in that ecosystem that we have out there, can I, in an irrigated ecosystem, can I cycle the nutrients without having a perennial? No, I don't think we can. I'm pretty dang sure we can't after 20 some years, have pretty good evidence we can't. I don't think anybody says we can without having a perennial, deep-rooted perennial in there to go down and do some things we can't do with annuals.

Dwayne: I mean, annuals have roots out there for very short period time. What percentage of the year do we have a root impacting that soil feeding the microorganisms that are there. We can't do it with annuals alone. So but our farm program developed by them, mental midgets in Washington, our farm, you know, with the help of a whole bunch of commodity groups and special interest groups, our farm programs tend to favor annual cropping.

Buz: Yeah.

Dwayne: And and so farmers do what their academics tell them they have to do to a certain extent. But if we put in perennials were punished, I mean, for life. Me, I can't understand why we pay one guy to put in CRP for ten years and we we take money away from another guy. We put in a perennial in a, in a rotational sequence.

Dwayne: I mean, it makes no sense. Take the money, you give him the guy to put it in CRP and spread it around everybody and say, y'all got to do a perennial sequence. It makes a hell of a lot more sense.

Buz: Yeah, yeah.

Dwayne: But why would they listen to me?

Buz: But now you're going to tell us about this alfalfa that you're growing.

Dwayne: But what the alfalfa is doing out there is it's the perennial right in that system. Well, I'm still growing corn, and that field happens to be something I don't like to do. But we do it because it says research on the gate. Yeah. It's been in and corn continuously since 1990. So, how do I add diversity of that system?

Dwayne: There's not time for the cover crop – we're not in South Carolina, right? You know, we're harvesting corn yesterday and there's going to be froze up and snowed. And I. You know, I mean, that's that's the way it is here. You don't really have that time. But if I have the alfalfa, the growing there, it grows in the period of time of the year when the corn isn't.

Dwayne: Corn is only occupying that space for a very short period of time, and the roots for a very short period of time. So we're putting that there. And it's feeding, feeding some biology we don't have, we think with mycorrhizae and whatever, it's going to feed the corn, a lot of it's nitrogen. We haven't documented that to this point, so I won't discuss that.

Dwayne: But, it should supply a good share of the nitrogen directly to the corn, like a poorly crop system. Now, how long can I keep the alfalfa alive? Well, more than two years.

Dwayne: We know this, you know, but can I do that for five years? And and and maybe that serves the function. Then instead of taking a a year with no crop.

Dwayne: That I can have a perennial. But I think in a longer rainfall area or longer growing season areas then, then something like what Colin Sies does with the "grain and graze", where he has a perennial during one season in an annual. It makes him money during another season, which makes some sense and I think some people are looking at that other than us now.

Buz: Yeah. Okay, so yeah, that sounds good. I mean, what you also talked about was in a sense, you're almost seeing the corn plant in the, in the summer enslaving some of the, some of the nitrogen producing it, ability. And that's probably a mycorrhizal. Well actually between the two.

Dwayne: Yeah. No, there's really good data that, that, that have. Okay. And, and we've got some good documentation of it happening with annual crops, and I, you know, there's this is where some of the. The real scientists come in, you know, the lab rats that do things, they call themselves lab rats. But they're, you know, they're in the laboratories looking at what's happening out there.

Dwayne: And that's fine. I think we need those. I love those people to tell me exactly what the heck's going on out here. Yeah. When we observe things. But, you know, one of the things that's happened in science and that.

Thoughts on Science and Practical Farming

Dwayne: In the old days, you know, 80 years ago, which is an old but I mean, 80 years ago, a lot of science was observation.

Buz: Yes.

Dwayne: And because you couldn't do all the statistics we do now. And so a lot of science was observation, a lot of plant breeding was observation. And, you know, all the stuff that Einstein and these people did in terms of of figuring out the. You know, the theory, relativity and those kind of stuff was, was basically thought process and observation.

Dwayne: And then playing these little games, what happens if I do this and stuff that they couldn't really do? I mean, we're now still proven somewhat that thought process led him to theorize. Yeah, basically a lot of what we've done is based on observation and then theorizing. What happens when we move that a bit. Yeah.

Dwayne: And you know, when you when you talk about cover crop, what iI'll give you this, this little [story] so you don't feel too good about it. My grandfather when he seeded oats, would see oats and sweet clover at the same time. And then when he would pull his horse-drawn binder through that field to bind the oats into bundles that they would shock and, and later thrash, he would have dwarf grape seed, a bucket, a dwarf grape seed set in by his seed.

Dwayne: And he would be throwing them out because the horses know where they were going. I mean, it's just a matter of sitting there and throwing the Dwarf Essex Rape. Yeah. And then when they got, the oats shot, they could turn the sheep out because the sheep would leave the, the shocks alone. They don't care. Yeah. They would eat the green stuff.

Dwayne: And so they eat the weeds and they eat the sweet clover. Yeah. And then they'd stomp on, on the Dwarf Essex Rapeseed and they got some rain. It would start to grow. And then, when they got time to haul the bundles into the buildings and thresh the oats, they could turn the cows out.

Buz: Yeah.

Dwayne: To eat the Dwarf Essex Rape, eating the sweet clover in the volunteer oats that was coming up out there.

Buz: Well, you know, I think that of speaks to a lot of the stuff we're doing now is almost rediscovering what we did in the past.

Dwayne: Yeah, I said that in, Yeah, I, got inducted into the South Dakota Hall of Fame in 2007, which is.

Dwayne: You know, I mean.

Dwayne: South Dakota Hall of Fame is not a big state. So anyway, if you're a baseball fan, Sparky Anderson went in the same time I did. So that's kind of a big deal. But basically that's what I said is I, you know, I'm getting inducted into the Hall of Fame for rediscovering things my grandfather and father did.

Buz: Yeah.

Dwayne: And, and and bringing them back in and, and putting a twist on that. We're going to do this now in a modern context with no tillage.

Crop Rotation, Diversity and Insecticides

Dwayne: But the whole idea of crop rotations and stuff is, is, and that's what the only thing we ever did is we just took these old principles or these old, old, old ecological principles of crop rotation and, and and predators and prey. And we may have used an insecticide on the farm here in about ten years.

Buz: So you're also using natural solutions to natural problems.

Dwayne: Well we're attempting to yeah. You know, and if we screw it up then. Yeah we have to come in and take a big bat and hit the reset button. Maybe. But we haven't had to do that now in quite a while. And, and our first instinct when we do see an insect or a weed or an insect or whatever, I mean, I get in trouble with my wife for saying this the way I normally say it, so I'll try not to, but.

Dwayne: Okay. *Mother nature's not a blank, blank, blank, she's an opportunist.* Okay, so when you have a problem out there, you've provided the opportunity somewhere, okay? I mean, it's it's, you know, we were talking, before we went on camera, about these bats and the moths, and there's a species of moth now that's developed a thorax that puts out this, this high frequency sound that confuses bats.

Dwayne: And they put them in these cages with these. And the bats just fly into the walls and whatever, they can't catch the moth.

Buz: Right.

Dwayne: Okay. I mean, that's the, you know, the rattlesnakes. It aren't rattling anymore because people kill ones that rattle. And they developed this, you know, they always had some rattlesnakes that didn't rattle because they couldn't rattle. They were deformed.

Buz: Yes.

Dwayne: But they're living and the other ones are dying, so they're becoming predominant. I mean, it's it's the same.

Buz: Same, same principle. So any time you open up a niche, Mother nature's going to move in and exploit that niche. Yeah.

Dwayne: And so how do we how do we come in and fill that niche so she doesn't fill in. And that's what a cover crop does. Instead of go out spraying weeds and spraying weeds and spraying weeds we say, okay, here is here's a niche that she's going to supply. If you don't supply something there she will.

Dwayne: And in May, you know, the way we do the insect thing is, is we're very, very cautious about, using insecticide because we learned early on. And as soon as we pull that trigger on an insecticide, then we we kill the predators. Our entomology friends tell us we have about *2 billion* predators per acre.

Dwayne: Okay.

Dwayne: Whether it be in some of them are ants. And and then, you know, one of the, the, you know, one of the main, causes of death of things like aphids is fungi, right? So if you have a very active fungi population there, I mean, they just give the heebie jeebies to the aphids when they come in.

Buz: Yeah.

Dwayne: But if you start throwing a bunch of fungicides out there.

Buz: That's the end of, you know, and then your effort population begins to blow up or. Yeah. Yeah.

Dwayne: And there's, and there's, and there's really good evidence of that. I mean, there's good numbers. Good real science people that have proven that. I mean, we we guess that.

Buz: Yeah.

Dwayne: That one time based on principle.

Context, Principles, and Practice

Buz: I'm going to be the devil's advocate over here. Okay. Dwayne, you know, you can do that out here, but you don't understand the kind of soils I have or you. We're in a different climate unit, so we can't do what you do.

Dwayne: Where you are you can't do what we're doing because we're in a different climate. But you can do the same principles. And that's, again, that comes down to why you look at the native vegetation first, and that tells you what you can do, where you're at. But to use Mother Nature's system cycles instead of, you know, it's just it's really an approach.

Dwayne: It's an approach of of. Trying to fit in with what the system is going to allow you to do, rather than trying to make the system do what you want it to do. Because, you know, you saw our corn, I don't think you saw our irrigated corn really yesterday. But I mean, we will harvest some 270 bushel irrigated corn this year.

Buz: And you will harvesting between 100 and 110 and 130 dryland corn on ten inches of rain.

Dwayne: Yeah, a little over ten inches of rain this summer. Yeah, yeah. And starting out dry. So it's kind of amazing to me. You know, the trial I had last night was the drought-tolerant versus non-drought-tolerant corn; there really was a difference, okay. Let's go. Yeah okay.

Dwayne: They're all good. But it. Yeah. You can make that work. I mean the thing is, is you, you can do all this very predictable stuff and keep throwing technology at it. And technology is good, but technology is there to augment good management and not to replace good management. And that's really the key in, I've often said to people that I shouldn't have said it to you, you know, somebody likes it.

Dwayne: A lot of people will say, well, I can't do that. I didn't go, well, you may not be able to, but but somebody that's a bit brighter might be able to. Yeah. You know, because the emphasis is on management.

Buz: Yeah. So in other words we, we don't want to take formulae all the time and say, well just apply this formula. You you've got to be you've got to be thinking about what you're doing. And that's part of this whole idea of watching nature and then adapt it, or figuring out what nature's doing and then working in that.

Reactive Farming vs Long-Term Strategy

Dwayne: And it's very hands-on, but it's not reactive. It's proactive. And so one of one of the comparisons, the way a lot of guys are farming now. And it drives me crazy to watch them is you know, they oh I gotta put on this and, and I gotta put on this and I gotta put on this is a cop says I gotta do this and I'm putting on this stuff and I'm putting it and I'm going, Jesus, you know, it's like driving down the road, having a camera pointed at the white line.

Dwayne: Yeah. Looking at a screen going, you know, and what we do is we try to develop and that's part of, you know, if you're going to use the term for health, that's part of the reason for having this soil health thing. If you have this system in place, then it's a little bit like looking down the highway and just laying back and just looking down the highway and where you going.

Dwayne: And if you kind of see a deer creeping up, right, you slow down or you do something to avoid that, but it's not like you're doing this herky jerky stuff, because what happens when you're looking at the white line *and the deer steps out? It's like, BOOM!, you know what the hell happened here?* You know?

Dwayne: Oh, you know, and then it's a wreck. And that's what's happening. The guys, I mean, I predicted in 1994, I got the tape, I predicted roundup resistance. Long before Monsanto said that was going to happen. They said it could never happen. Well, we had already had ALS resistance. That one I did before.

Dwayne: You're not coming to a farm and saying, you've got to do these five different, you know? And I like to approach of sort of looking down the highway. You've got a much wider view rather than looking at the, looking at the white line and making those, those little adjustments. Yeah. What what's your long term goal?

Dwayne: And I think in agriculture, I mean, it's, and heaven forbid, in the United States, we shouldn't be looking, say, where do we want the United States to be in six years? And where do we want agriculture to be? I mean, in 600 years, where do we want it? Where do we want our soil to look like in 600 years?

Dwayne: We keep doing this. I mean, we've been at it 100 years, right? A lot of South Dakota 100 years are places in the United States. But I mean, a lot of this area right here was homesteaded 100, 115 years ago. Right. And, you know, if we kept doing what we were doing and initially, what would it look like?

Dwayne: And now we're doing a little better, maybe. Okay, but what's it still going to look like? And what are the deer that are going to run out in front of us? I mean, one of the things that's going to run out in front of us is energy costs 80, 80% of the input costs in agriculture right now can be traced to fossil fuels.

Dwayne: Well, that's not a good long-term strategy. But, you know, I mean, the it's okay for this year, next year, but it's really dangerous. And so, you know, the board and I do colleagues, I mean, we've decided that we're going to see if we can become energy neutral by 2026. Fossil fuel neutral. So we're not dependent on, on fossil fuels.

Dwayne: Now we're going to have some things like my new John Deere tractor is going to have fossil fuel in its manufacture. So I have to offset that by producing energy of our own here. But, you know, the idea of trying to produce enough energy for everybody else doesn't make any sense either, right? But you know what? What are those things that are going to come and get us in terms a, a danger?

Weeds, Insects, and Resistance

Dwayne: I mean, well, I think you were talking about, Roundup Ready. Sorry, roundup resistant. We've got Palmer amaranth in the southeast. I'm thinking about, some of the borer beetles now becoming resistant to bt corn. So those are also Mother Nature's beginning to, find niches as well. But, you know, the thing is, is biotech.

Dwayne: And again, I mean, there's technology. I mean, I don't care if it's biotech or regular tech or insecticide. We've always had resistance developed to insecticides. I mean, DDT and whatever, you get resistance to that that, you know, and what what Mother Nature says when we throw technology at her, she just she just says, oh, you damn amateurs. That.

Dwayne: Is that all you got? You know, but, you know, it's kind of like the old movies, you know, the guy comes up and gives them this big guy [a punch] and he looks down and [he's like]"Yeah, okay". And that's kind of what's happening. You know, we're trying to do all this

stuff instead of saying, okay, she's got all these systems out there, and how does she handle this?

Dwayne: Because if you look at natural systems that are truly natural systems, they don't wobble. You know, they kind of they kind of, you know, they they do a little bit of this, so they sway rather than wobble. Yeah. They've got resilience is a word that I always like to use. And I you know, I've written, an article that in this the Howard Buffett Foundation sponsored series that been going on in the Farm Journal, you know, I wrote one on resilience, how important it was.

Dwayne: And that's maybe the term we should use instead of soil health, maybe soil resilience is more descriptive. So how well it is able to be buffered against shocks. Yeah I mean it and so that you know when, when we, when we look at what we're trying to do, it's okay. I mean, but you use it as part of a bigger scheme.

Dwayne: I'll use weeds as an example. Herbicides do not control leads. They're part of weed control. And one of my biggest pet peeves is when we hire, weed specialist at the university and he becomes an herbicides specialist. People call up and he gives them a chemical that kills that weed. Well, okay. But that's part of a whole system.

Dwayne: I mean, what kills weeds is competition is the number one thing. Sanitation, not letting the weeds get established. And then rotation is part of that. So we just say competition, sanitation, rotation, herbicides are part of sanitation and keeping weed seeds from forming somehow. Okay. And they're part of competition. What I look for in herbicide to do is if if I have to use it, is to keep that we down until I can get it covered up.

Dwayne: So I have narrow rows and fertilizer placement and all these things we do as part of our system or part of weed control. It's not the herbicide. Herbicide by itself doesn't have a chance if you if you depend on that herbicide alone and you put you put in, this is the real key factor. You put the same herbicide on the same weed at the same time every year. Like, duh, it's going to develop resistance. And and that's the most natural thing in the world for to do that. But that's what we're doing, and from an ecology standpoint, a weed is hardest to kill once it's established. Let's use humans as an example. Right. Okay. The best time to prevent a human being from being established is before it's born, you know, abstinence, birth control, whatever you want to do before it's born, once it's born, and kind of going early is easier to kill it than when it's 15, 18 years old.

Dwayne: It's harder to kill, much more difficult. But what we're doing with weeds is we let the damn things get up like this. Then we come in and spray and post-emerge. Yeah. And then we wonder why they develop resistance. And the big thing, like we do a thing on crop rotation where we talk about not being predictable in sequence or interval in terms of how the rotation goes.

Dwayne: So we got a whole thing on crop rotation. The, the corn rootworm the thing we're doing the BT for, right should never be a problem. It's only a problem in corn on corn. Okay.

So you you get rid of corn on corn. It's not a problem. Well okay. So people started doing corn soybean corn, soybean corn, soybean corn soybean corn soybean.

Dwayne: Now they're consistent in sequence and interval. Both. Right? Right. Corn always follows soybeans. And it's always a year. So in the western corn belt, we get extended droughts, corn rootworm, and beetles where the eggs don't hatch for two years. Well, that's the most natural thing in the world, right? Mother Nature always had a certain percentage of the eggs.

Dwayne: She's not that stupid. Her weed seeds don't all germinate the same year either. She's not that stupid. It's too easy to kill them. So she's going to have this diversity. So what we've done is in the Western corn Belt, we selected for extended diapause corn rootworm beetle because we did every other year, corn in the eastern Corn belt, they have the soybean variant, where the gravid female I call them the blond women.

Dwayne: The flew in the soybean field in lay their eggs and became the predominant species. It's like the bat or the moth. What's the thing that confuses the bat? It's the one that didn't get killed. And it's the one that got to have babies. That's the way Mother Nature works. And so it had the opportunity. So yeah, if I did, all my corn into wheat stubble every year, I would develop a corn rootworm beetle that later eggs or wheat stubble.

Can Humans be Smarter than Pests?

Dwayne: I mean, so you just you just got to be smarter. I mean, the real key. This is hard. It's a big leap. Is is to be smarter than a weed and an insect.

Dwayne: But this isn't for humans. This is. This is a stretch. Okay? To think and and and the advantage we have, the advantage they have is they go through lots of cycles so they can respond faster than we can. The advantage we have is we don't. We seed long periods of time so we can see these patterns. So one of the reasons we do a stack rotation for instance, where we do, two corns.

Dwayne: And then and we were talking about that yesterday. Well, and we can use the long residual herbicide the first year, use the short residual or the second year. So we're not using the same approach twice in a row. They can't figure that out even though we can say, okay, every six years you're doing boom boom, right. But by doing controlling that weed twice in a row and then we go away and then we go to a couple of years a week, which just by competition, if you have a, Palmer amaranth , shove some winter weed at that damn thing. It doesn't have a chance because it doesn't start growing to wheats this big, right? Okay. So it doesn't have a chance. So the competition just the non herbicide competition takes care of it. And so that's a big part of what we're doing is, is we can we can still keep high percentages that we think corn like under irrigation.

Dwayne: Corn is a good thing. We can keep a high percentage of corn in the rotation. But *we're throwing this other stuff in there just to mix it up, and it makes the corn better and much*

cheaper to grow. But yeah, unfortunately, economists don't necessarily look at systems. You know, they say, well, if you grow corn in this price, you make this much money breaker.

Dwayne: But if I do all my acres of corn, it's very risky, very expensive, got a lot of money in technology, and I got to have huge machinery to do small acres because I can't get it over at all, you know? I mean, why is McDonald's open for breakfast?

Dwayne: They make all their money. It three noon and and one in between 6 and 7. So why are they open for breakfast? Why are they open at midnight? The minute they thought like a farmer, they'd open noon to one and they'd open six, 5 to 6. You got many, You got a lot of people that run McDonald's are stupid.

Dwayne: That's the answer. Okay. Right, right. They're smart. They wouldn't do that. Okay. Now what? What the point is, is as farmers, we the diversity. Gives you lots of advantages, economic advantages that that you don't necessarily see unless you're doing it because they save you all this money. If you figure out how to take advantage of, of the system.

Dwayne: Right. And then you start throwing livestock in. But the reason a lot of farmers don't do it is because we have these farm programs and crop insurance, and these are things that tend to cloud the the true economy of what's going on out there. See?

Rotations and Managing Risk

Buz: You were talking about your rotations that you had and, I'm going to start managing my rotations more diversely, a lot of those things are going to develop, depend on my own risk aversion. And you, you made the illustration about someone going to Vegas. Would you be able to tell us a little bit more?

Dwayne: So you know, like crop choice, like there's a crop rotation and there's crop choices within rotation. Okay? Right. And and so the, the one I you do the Vegas thing on a lot is like chickpeas.

Dwayne: Yes. And if you're looking for a cool season in this area cool season component as a precursor to winter wheat. One of the things we use to transition to winter wheat is a cool season. Broadly. It it's kind of pronounced that way. We do that. And that can be flax. It could be canola, it could be, peas or lentils or chickpeas or there's a whole series of crops that you can grow to do that.

Dwayne: And guys always used to ask me, you know, well, what do you think of this and that? And it partially depends on personnel and that. And that's one of the things about crop rotation is different. Farmers have different personalities and in different risk inversion. So I always say if you go to Vegas and and you go to the $100 table, your chickpea grower, you have the personality to be a chickpea grower.

Dwayne: And and if you live in the right area and whatever, that's that's a fit. If if you go to the $5 table, you probably should be a pea grower or a lentil grower or maybe a flax grower or something like that. And if and if you eat at the smorgasbord and watch everybody else

gamble, that's when you start looking at a cover crop or what I call green fallow systems, where where you just put in a cover crop and that, and that's important.

Market Signals, Pressure and Nutrient Export

Dwayne: I mean, there's all kinds of things that get into how a guy chooses what he does with crop rotations and some I mean, we do different crop rotations on our north unit, which is the shallow two vertical West River ocean bottom, crappy soils. They have different personalities. And if a guy and we don't have any of those, but if a guy has a nice Highmore glacial or loess type soil with lots of water holding capacity, he does a whole different set of rules in terms of what he does for rotations.

Dwayne: So, you know, one of the things when you see. The whole corn belt growing corn and soybeans, corn and soybeans or corn on corn, there's there's some really strong economic pressures coming from outside the system, not from the natural system, from outside the system pushing guys into doing that. And those are real. But I think one of the things I hope that our policymakers look at is, are we putting in these outside pressures that are making guys do things that really aren't in the best interest of them, or ecosystem or agriculture as a whole?

Dwayne: And, and, you know, I think we can. Do a much better job of rationalizing how we're doing things. And so what you get into is you get kind of this pressure pushing guys to do that. And then it has these unintended consequences. And you get another agency kind of saying, well, no, you shouldn't be doing that.

Dwayne: And you know, if we all sat back, heaven forbid, and had an adult conversation without all the, the, the hype and, the passwords and the goofiness and the taglines and talking points and, and whatever. And you said, okay, what where do we really want to be in 600 years? And how are we going to get what how do we want our food produced?

Dwayne: You know, and, and what do we want from this whole situation? Because, you know, one of my big concerns and we talked about leaking before, but one of the big leaking things that's happening is, is a movement of grain from the farm somewhere else. And whether that be Taiwan or North Carolina, I mean, we've got corn comes from here to North Carolina and South Carolina to feed pigs.

Dwayne: And now you get all the phosphorus there that should be here. Right? And how do we get it back? As long as we can mine it, bring it back, we go okay. That's fine. But that's a leakage. And if we do that for a long enough period time, we got issues. And we're building these big circle tracks that we can load this stuff and out it goes.

Dwayne: And we're all going, wow, this is great. And the governor is going, we're exporting to China. That's great. But are they sending the fosters back? Governor and and I had a Taiwanese trade delegation here a couple falls ago at just about this time of year, just a little later, and the wheat's coming up and the cover crop is dying and and then explaining that how the cover crop is, it dies, is feeding the nutrients to the wheat.

Dwayne: And and the interpreter said, oh, that means you don't have to put fertilizer on your wheat crop. And I go, well, if I'm going to send my wheat to Taiwan. Then I have to replace the nutrients they sent to Taiwan, the ones other than nitrogen and carbon. I can catch those in the air, but phosphorus and magnesium and all these other things that we're sending has to come back.

Dwayne: Or I have to buy fertilizer. So I said, unless you're willing to take the poop from Taipei and put it in a container and ship it back to me, I have to use fertilizer.

Dwayne: And the guy got this real shocked look on his face, and I'm going, okay, I guess I just lost my chance at the diplomatic corps and and and then he kind of grinned in the interpreter and, and then everybody started to laugh, and they started doing these kind of movement like they're scooping [poop]. They're. Yeah. Yeah. And and I'm going, okay, we got past this.

Dwayne: But I mean, that's just looking at the system. You know exports are great right. So we can we can send them wheat and they can send us Toyotas from Japan. That's great. But there's no phosphorus in the Toyota. So how are you going to balance if I look at this native ecosystem that's behind me, when before we all showed up and started exporting, nothing ever left the the bison come through here and they ate the grass and they pooped and they got they died and the wolf ate them.

Dwayne: And and they pooped and not much left. And there's a little bit of it left in the river. And the sturgeon brought it back. Or in the west coast it left in the salmon, brought it back from the ocean, and the bear ate the salmon. And so the system became in equilibrium. And then if you're a chemist, what we've done is we've switched, shifted.

Dwayne: Take a look at Shatila, a principle. We come out and start doing all this stuff and we we shipping the nutrients out. And that's not going to be a permanent solution. It's going to degrade and we're going to become a desert. If you have a leaky system that continues to leak, it becomes a desert. Basic ecology 101.

Dwayne: Yeah. And I guess a basic ecology 1 to 1 always has to have a much longer time frame that makes. Yeah. So I like that idea of the 600-year plan. Well somebody has that. Somebody has to say okay we're going to look at where are we heading. Yeah. You know, I mean we're where are we heading. Yeah.

Dwayne: Yeah. And do we want to go there? You used to take road trips with my girls. We just every so often I'd say, okay, we're gonna take a road trip, and we would drive until we hit a stop sign, and then we would flip the coin. We went right or left? And sometimes you didn't get where you really could do much, but a lot of times it was really interesting.

Dwayne: It was just kind of a way to spend the day, you know? And they were really bored. Yeah, yeah. Well, that sounds like that sounds like fun.

Buz: Well I'm getting really cold Dwane but it's been really fascinating talking to you've given me a lot of editing work to do. But I really appreciate your perspective on on farming and farming management and this idea that, really of a long term view of farming. And, I thank you for your time. You wanted to show us something and then go show you some things, but you'll have to supply us with raincoats, and we'll go from there, okay?

Dwayne: All right. Thank you. Appreciate. Thank you.