Bill McDorman: Bill Tracy, who's a professor at University of Wisconsin, Madison, summed it up I thought rather nicely when he said, "While the first 9,850 years of breeding might not have been efficient in modern terms, it was highly effective." Why? Because we had millions of farmers. Everybody that farmed and gardened saved their own seeds. And what that was doing is adapting those crops to where they lived and for their own cultural needs. We had millions and millions of people involved in this process for resilience and adaptability and resistance to diseases.

Cooley Ludtke: That is Bill McDorman, who's been a lifelong champion of community-based seed saving.

We had a very informative conversation with Bill about how commercial seed production has changed our relationship with seeds, farmers and gardeners alike, and why it's never been more important for everyone to participate in saving seeds.

We hope you enjoy it as much as we did. Thank you for listening to the Farms for Tomorrow podcast. I'm Cooley Ludtke.

John Swain: And I'm John Swain.

Cooley Ludtke: Let's get into it.

Part 1: Who Owns Our Seeds | Length: 2:48

John Swain: So Bill, what is happening in commercial seed production these days, seed production and distribution?

Bill McDorman: Fortunately, it has gotten so centralized that that's relatively easy to explain. But how well you explain it probably needs a little bit of historical perspective.

There's a poster that was done by Phil Howard. He's a professor at Michigan State University. And what he tried to do was represent visually

what has happened to the seed industry since 1996 and continues to happen today. And he did that by drawing little blue circles that represented all of the individual seed companies that were around in 1996. Had them represented by size. The size of the circle is the size of the company and then showing the 5 or 6 new red circles, which are chemical companies primarily, or pharmaceutical companies that now own all of those companies. We've seen such an extreme centralization of the seed industry, especially in the 90s and the 2000s. And it's ended up with, there are estimates and nobody knows exactly because they're private companies, but maybe at 60 to 70% of the world's seeds are owned by five companies or controlled by it. So that's the state of the commercial seed industry. There's a graph that shows you the top ten seed companies and just how big and centralized they're getting. Monsanto Bayer is at the top. Many people still point at Monsanto as being one of the most destructive, but they no longer exist. They merged with Bayer, that’s Bayer aspirin, a pharmaceutical company. And Bayer immediately dissolved the name. They don't use it anymore. I think Forbes magazine at one point said that Monsanto was the most hated corporation in human history. And that was a business organization magazine headline. These weren't the foes or the people that were the millions that marched against Monsanto. This was business just looking at what was going on and the amount of lawsuits and so forth. Top three the next one is DuPont Pioneer Dow Agroscience when they merged. And the third largest is Syngenta and ChemChina. And those three own the vast majority of the commercial seeds that are being used worldwide. Of interest may be is Syngenta/ChemChina, ChemChina basically is bigger than Syngenta. Syngenta represented at the time about 80% of the vegetable seeds being used in America. Now they're basically Chinese controlled.

Part 2: The Consequences of Seed Centralization | Length: 2:03

When you try to figure out what the results of that centralization have meant, it means that fewer kinds of things, less diversity, is being planted in fields worldwide. And Colin Khoury, who worked at the National Seed

Storage Laboratory in Fort Collins, Colorado, told me something very wise, “You can't count what you've lost.” In the industry you see all sorts of percentages. We've lost 78% of the vegetable variety. They've gone extinct. And those are inaccurate, probably, and unreliable at best to say things like that. So how can you summarize what's going on? Well, the United Nations sent people all over the world with their far reach, and the FAO, the Food and Agriculture Organization, to try to just get a general sense. And what they came back with is what they thought was a fairly accurate number. And that is 90% of the crop varieties that were being planted a generation ago are no longer being planted in fields. And this includes gardeners and farms worldwide, hundreds of millions of farmers. They've all been affected by this centralization. They're only getting access to the varieties that are being offered by this handful of companies, basically. I'm generalizing there and there's lots of exceptions. But when you stop planting 90% what's going on? Now, is it fair to say they're extinct? Probably not. We've been finding thousands of heirlooms, even in the United States, through the Seed Savers Exchange that were in cans and in envelopes in people's garages or whatever. We don't know what's out there totally. But what we do know, is that unless there's an active system involving the planting, the growing and the saving of seeds from this 90%, they will be extinct.

And that seems to be the path that we're on.

Part 3: 10,000 Years of Seed Selection | Length: 3:01

So, let's clear the palate a little bit and let me set the stage for what's going on. If you think about it, all of the food that we eat that's based on plants came from wild plants. Wild plants. Carrots came from daucus carota, a roadside weed that if you pulled one up today, same genus and species, it would be inedible. It's just bitter and it’s little white roots. And it took about 600 years in the Middle Ages, largely Franciscan monks that were sequestered, to do the breeding and selecting. All they did was select out the ones they wanted. And they selected for orange, it turns out, because probably they needed carotene, they were drawn to that to

create the modern carrot. And we have timelines for how that took place. And that took place with all of our major food crops. It's taken we generalize 10,000 years of somebody somewhere saving the seeds to a wild plant and starting what we now know as plant breeding. And plant breeding can be summarized really simply. It's not a mystery. We breed for more sugar. We breed for more yield, larger, and we breed for disease and pest resistance, and we breed for easiness to harvest.

We've taken almost all of the wild plants that we have and bred them in those directions. And we've got to remember that all of that work was done before the modern era, before modern technology, before Gregor Mendel and we knew what genetics were. Before all the techniques that happened. That's how we got all of this food that we have today. Bill Tracy, who's a professor at University of Wisconsin, Madison, summed it up I thought rather nicely when he said, “While the first 9,850 years of breeding might not have been efficient in modern terms, it was highly effective.” Why? Because we had millions of farmers. Everybody that farmed and gardened saved their own seeds. And what that was doing is adapting those crops to where they lived and for their own cultural needs. We had millions and millions of people involved in this process for resilience and adaptability and resistance to diseases. Now we've got a handful of corporations breeding for profit; and that profit means yield. And so, we've just at one time or another, just shelved off all the other aims that we've had for breeding.

Cooley Ludtke: And that historical breeding process you’re talking about must have been based on really close observation.

Bill McDorman: Observation may be the most important craft that we can relearn. We've lost it. We measure, we've got soil tests, and we do all this, you know. I met somebody who's a master observer, and he's the best plant breeder I've met.

Part 4: From Farmers’ Rights to Corporate Control | Length: 04:17

John Swain: So how did we get from millions of farmers worldwide over thousands of years saving their own seeds to where we are today? What happened?

Bill McDorman: In the great corporate centralization that was going on in every industry, farming was starting to happen also in the last couple of generations. And John Deere is a really great example of a guy building tractors who ended up with a multi-billion-dollar multinational corporation. And that's because basically they could patent their new inventions and then make sure that they were protected in selling them to people all over the world. Well, when you got to seeds in the 40s, the 50s, the 60s, basically you couldn't do that with seeds. It was the one product in the whole farm system that somebody could buy a bucket of and they never had to buy them again, right? They could plant and save their own seeds. There were no rules. There was an attempt in the 30s to patent seeds and US Congress, basically, it was almost unanimous, said, “No, we are not going to allow the patenting of seeds. That’s what got us here with agriculture. All these people everywhere growing and saving their own seeds. That's a right that farmers have. They did pass an act that allowed the patenting of plants for the first time, however, and I think that was in 1938 or something if I remember correctly, but it was only cloned ornamentals.

Stay out of the food system with these ideas and stay away from farmers who need to save their own seeds. Well, pressure was kept up to do this, to patent things, so that they could lock up this last part of the farm industry and really make some money on it. And in the 1970s, Congress reached sort of a compromise, and they passed what is known as the Plant Variety Protection Act. And this was done by the United States Department of Agriculture. Again, they would not allow the patenting of seeds. That wasn't even part of the discussion at the time, but they wanted to come up with a system that would protect plant breeders. What we now call the PVPA, The Plant Variety Protection Act. It's still on the books. It's still being run by the Department of Agriculture. And basically, I'll just summarize. It gives a breeder about a 20-year head start. In other

words, if they create a new variety, and farmers buy those seeds, they are prevented from growing and producing and selling seeds from that variety. However, they allowed the farmers to be able to grow them and to save their own seeds. They did not want to cross that sacred line of farmers being able to save their own seeds. And so, they found a compromise.

You could grow them, and you could save your own; you just couldn't sell them. Or if you did, you had to work out some sort of licensing agreement with the owner of the PVP we call it, the Plant Variety Protection. And so, in the 70s, all of the sudden, there started to be huge investment in the seed industry because for the first time you could protect your profits. If somebody came up with a new variety, at least they knew those varieties would be protected for 20 years. And that started this landslide of mergers.

And that started to gain steam until the early 80s when there was a court case that made it to the US Supreme Court, and it involved Chakrabarty. He was a breeder. Actually, he was a scientist. And he came up with a new variety of bacteria. And if you remember back, he wanted to patent this bacteria, and then they were going to release it into the ocean because it ate oil. And the idea was that they would have a really cheap and easy way to clean up oil spills. Well, they did some research, and they realized that was not a good idea because the bacteria could come up into the ships and start eating the oil in the engine crank cases of the motors that were in the ships. And so it was never really even released.

Part 5: How Patents Changed Agriculture | Length: 9:29

But in 1980, the Supreme Court ruled in Diamond v. Chakrabarty that living things were indeed patentable for the first time and the fact that organisms are alive is without legal significance. And one of the final quotes, and this is written in the final ruling by the Supreme Court, “Anything under the sun made by man can be patented.” And that opened the floodgates. Thousands and now hundreds of thousands of patents

have been filed for individual varieties of seeds and plants and all sorts of parts of seeds and plants and that is why we saw this huge centralization in the seed industry. There are people on the ground that kind of lived through that era that estimated at the time, there were probably about 20,000 small family ma-and-pa or regional co-op seed entities worldwide at the time this patenting started. And then, as I said, we ended up with three companies owning about 60% of the world's seeds and the top ten owning a huge and vast majority of it.

So it worked. I mean, if you're a big company, you can protect your profits. For the first time then seed companies had stuff on their balance sheet, right? All of a sudden, all their varieties become part of the balance sheet because you can file for patents and protect what was there. Companies could borrow money against the assets in the companies. And that was the financial mechanism that allowed this to happen.

So today if you open up seed catalogs, I was thinking about one of the largest organic seed companies in the United States, they have their own definition of what a utility patent is. And these are the patents that people file under the original 1950s Patent Act. You can patent a seed the same way you can a wrench or a bolt or a piece of software. And basically, the translation for us seed people was, “Seeds can only be used for crop production. They cannot be used for seed saving, replanting, resale, giving away or use in a breeding program.” Okay? So that ends the 10,000-year sacred right of farmers to save seeds. And what's really interesting, I think, is that there are many countries in the world that just don't recognize this. We are the largest country in the world as far as exporting agriculture. Many of the large companies are either from the United States or are part of the new European pharmaceutical companies that do it. We have tremendous influence. So, these laws are now being exported as sort of well, and this is matter of fact. This is the way we do things. Of special note for me, and this gets into what I've been doing my whole life, is that we're waking up to the fact that many of the new patents that are being applied for are for organic, certified organic, seeds. And in the nation's three biggest organic seed catalogs, there are now large

percentages in some of their vegetable areas of seeds that are patented. And I don't know, when I was growing up, organic meant you wanted to be more conscious. You didn't want the chemicals; you wanted to look longer term at your soil and build fertility and that implies sustainability and resilience and all of those sorts of things. Well, you take away the right for a farmer to save their own seeds, and you've undermined any sense of the future for resilience or sustainability. In a sense, you're not buying seeds anymore. You're renting them, right? You can rent them for the season, grow out one crop, but then you're done.

If you go to the company that is selling the most organic seed in the United States, that's patented, it's a company called Vitalis. It's from Europe. It's a branch of Enza Zaden, which is a German chemical company. If you go to their conditions of sale for their seeds, it says "Under no circumstances shall purchaser use of the products and/or its components and/or its harvestable material in any way for multiple action and/or reproduction of any kind of material." In other words, they're trying to broaden even the definition of what seed saving is.

Genesis is a company from Europe. It came out of Israel I think originally for organic seed. They're the same way, "And the buyer shall refrain from using the product for multiplication and/or reproduction purposes." That's all their seeds. And then if you get to one of the spin offs of one of those companies, you get some other language and it says, "Violation of our supplier's intellectual property rights may constitute a serious offense. For further info, see…" And there's a website there www.aib-seeds.com. I went to the website, "Welcome to the AIB, the Anti-Infringement Bureau for Intellectual Property Rights on Plant Material." It turns out that the eight or ten largest companies, including these organic seed companies, have bonded together and started their own agency to make sure nobody in the world is saving seeds from their varieties.

Further on the AIB website, it says, "Production, use and trading of illegal products is an important source for financing organized crime." So that's the first time I heard seed savers lumped into the category of organized

crime. And upon further exploration, I found that there's a new United States version of this. SIPA, S-I-P-A, the Seed Innovation and Protection Alliance. And basically, it does the same thing. It's a consortium of companies. They have an 800 tattletale line you can call. They offer rewards. They don't want any farmer or gardener anywhere saving their own seeds from their patented material. They've got a code of ethics up on their site and it mentions nothing about all of the work that was done for all of those thousands of years by all those people to even get these varieties in shape to be patented. There's no mention at all. “It's like having a stack of quarters six feet high,” I think as Jack Kloppenburg who's a professor at the University of Wisconsin, said, “it's like having a stack of quarters six feet high and you put a put a quarter on top of it and claim that you own the whole stack.” And so, this is serious business for these people. And it's to be understood that way.

Cooley Ludtke: There must be some pushback. What are you seeing?

Bill McDorman: So, is there any organized thing going on against it? No, not really, not in the United States. In Europe there is. There is a group called No Patents on Seeds. Eighty organizations in Europe came together, gathered over 25,000 signatures for the EU and have successfully at this point challenged the patenting of seeds in this utility patent way in the European Union. But to say that it's going to stay that way is to be a bit naive. They are being hammered and hammered. And my guess is, as we see a right wing turn for these governments, deals will be made. So, it leaves us in a really ironic place. And this is something I've been trying to educate and argue with gardeners and farmers in the United States. They go, “Well, well, who cares about patents? These people are trying to make a living too and I'll just buy my seeds.” And what's interesting is that Enza Zaden can't patent the varieties that they patent in the United States, same varieties being sold in both places. They’re a successful company in both places. And yet in the United States, their varieties are patented, all of them almost. And it just shows that more than thinking about the welfare of the company, it's pointing the finger at the naive American gardeners and farmers who, if they banded

together and wouldn't stand for it, they wouldn't have to put up with that. And they could then start to relearn and reunderstand just how important and necessary seed saving is.

Part 6: Patents on Organic Seeds | Length: 7:41

John Swain: I was surprised when you mentioned that organic seeds are now being patented. What's going on?

Bill McDorman: You know, at one point, over 40% of the lettuce varieties, organic lettuce varieties sold in Johnny's Selected Seeds, for example, were patented. When this first started happening four or five years ago, it was hard to find even if they were patented because you can get all the variety names out of the catalog. And if you go to the Patent and Trade office, which is where they'll tell you to find patents, the variety names don't come up. What they do is they patent sometimes expressions of genes within the varieties that only those varieties have. But it's a really dark and kind of scary world. We can't even find out really what's patented in some cases. That's where my alarm bells were set off. I mean, if they're going to patent things for large million-acre farms and it's industrial agriculture and they're GMO, they've genetically modified them, which makes them easier to patent because they're more distinct, they've got markers in them that they can prove that they're distinct. That's really hard to do with organic varieties that have not been genetically modified but that's another court case to come, probably. It really wasn't hair raising for those of us in the seed saving movement.

But when they moved into organic seed and now almost all the market gardeners in the United States are growing patented varieties, and they don't even know it. They don't even know it's an issue. They just buy their seeds every year. And some of these small farms now that's up to $30,000 a year in seeds. And what that's done is made Johnny's a $60 million a year company.

Everybody's riding the gravy train. And the word is, and again we can't find out for sure because no one will tell us. A dear friend of mine was one of the breeders at Johnny's who was speculating with me. They think maybe up to 40 to 60, somebody said even 80% of the organic seeds being sold through Johnny's Selected Seeds catalog are being contract grown now in China. And I asked Tom Stearns about this. He owns High Mowing Seeds in Maine, which is another source for patented organic seed now, and I said, “Tom, what's the deal?” And he goes, “Well, Bill, they're just better farmers. And they're really good people in China. I've been over there a few times.” And I said, “Well, I'm sure they are.” He goes, “It's just a better product, better price.” But you think about this idea of Americans being self-reliant in their own backyards.

We can't save the seeds anymore. Oops. They're coming from China. Oops. They're on the container that got sideways in the Suez Canal on their way over. I mean, it's really interesting. And again, where it all falls out. The position I've taken as an activist is like, I don't want to start wars I can't win. So I'm not going up against the big companies. Look at how well financed they are. They know what they're doing. They're really smart about all of this. That's not going to work. But I do want to educate. I want to shine the light on it. I want everybody to know what they're doing. I don't want you to have this smug, “I'm better than all the other farmers in my farmers market because I'm growing organically,” and you're growing patented seeds that are contract grown in China. I mean, that sort of burst the bubble there a little bit. And I hope that bubble burst. And I try to do that because, it's actually better if you take back your own seed saving.

Cooley Ludtke: And if you’re growing patented seeds that were contract-grown in China, for example a lettuce crop, and you let it go to seed, those seeds can’t be used legally?

Bill McDorman: No. And they're tremendously expensive. Lettuce is an open pollinated seed. It's not even a hybrid. There are no hoops to jump through to save your own seeds. I walk through gardens of my market

farmer friends and I see them growing these patented lettuce varieties, and you've heard me say this before, how much do you get for a head of lettuce at the farmer's market? Five bucks. And what's the average shelf life? Well, maybe a week if you put it in ice cold water when you pull it out of the field. If you let that lettuce go to seed, it will produce true seed, really great seed if you just let that go to seed. And it's easy to do, just ignore it. Just don't harvest it and ignore it. Go back with a paper sack and when it all puffs out and dries out, you've got enough seed there for your own operation.

John Swain: However…if those are patented seeds you can't use them.

Bill McDorman: Well, there therein lies the rub. You can't even save it according to the utility patent rules. You're not even allowed to let that plant go to seed legally now, okay? But if you did, and nobody knew about it, who's going to know? I'm saying that because I think that's largely the reason why there has been no organized movement in the United States against plant patenting. I tried to start it. I got grant money, No Patents on Seeds campaign in the United States. I had buttons done up. I think as farmers and as seed citizens, I call us, we need to know what's going on in the world and be responsible and act honestly. I really think that's important. But I know this is going on in other countries all over the world. People, they're not going to fight a government or fight these well-heeled corporations in courts. They're just going to do what they can do. And I got to thinking about it a bit, these corporations in the end, have the responsibility. So, what happens if you break the law, so to speak, of utility patents? What happens if you just blatantly save your own seeds or even sell them? What happens? Well, the enforcement of the Utility Patent Act, is borne by the company or the owner of the patent.

They're the ones that have to enforce it. And if they just allow it to happen willy nilly without ever enforcing it, I think there's a statute of limitation for six years or so, the patent is null and void anyway. So, in order for them to keep their patents, they need to enforce them. They need to do it consistently. They can't let some people go and then crack down on other

people. So that's where this enforcement bureau idea comes in. They want to know, and they want to stay on top of it. But what happens if thirty or forty or fifty thousand small farmers all of a sudden start saving their patented lettuce seeds in their own gardens and using them? There is no enforcement mechanism at Bayer, in Germany to do that or at Enza Zaden. There just isn't. Maybe this is the dynamic. You want to know the state of play? That's the state of play. Huge financial reward for the small market farmers to ignore plant patenting laws. And at some point, Americans are going to say, “I got a lot of questions about this organization the Supreme Court that allowed this in the first place, because to this day, there has never been legislation in the United States allowing the patenting of plants. It would never pass. This has all been done with smoke and mirrors using other channels. And I'll just tell you from the students that have come through our courses, the thousands of students that have come through our courses, all are reaching their own decisions about how to act around these things. And growing and saving and sharing seeds is the best thing they can do as farmers for their economics and for their communities. And they're relearning and getting very good at how to do that. And I don't think there's any force that will stop that once it gets going. And it will take a long time, but that will finally someday, I'm making a prediction here, result in a change in our political consciousness nationwide. And maybe it's not a change. We're just getting back to the practices that built this great country.

Part 7: Fewer Seeds, Bigger Risks | Length: 4:32

Cooley Ludtke: Let’s hope so. Maybe a little summary would be good here.

You’re saying commercial seed producers are eliminating many varieties of seeds and patenting others which is reducing our options and impacting biodiversity.

In turn, farmers and gardeners are forced to buy their seeds every year which is expensive.

So we need farmers and gardeners to at least grow and save some of their own seeds. And by doing so, #1 you can keep old heirloom varieties from extinction and #2 you're adapting those seeds to local conditions which makes them more resilient.

And the economic incentives may be significant for farmers. People just need to relearn the skill of seed saving.

Bill McDorman: What is going to happen at the intersection of the crash between climate change and industrial agriculture? It's getting more extreme. Wants to own and control more, more centralized. I mean, that's what corporations do. We shouldn't be surprised if you want to make more profit sell fewer products that you don't make as much money on. Get rid of all those old varieties, just dump everything off. Let's only keep the handful that make the most money. That's how we do this.

You're having trouble with your competitors because they have lower prices. Buy them. Merge with them. All of this industrial agriculture is tending toward one big company in each area. And then pretty soon they'll start merging. So that's getting more extreme. And now, on the other hand, we know what's happening with climate. And so yeah, it's a huge crash. And where all of that falls out, I have no idea. What I do know is that I'm going to feel more safe if I'm in a community of people that, if needed, know how to grow and save some of their own food and especially their own seeds, because I think seeds offer the real hope for the future. That way they don't have to depend on anybody. And I have friends that say, "Oh, it's oh, you're just upset. And there'll always be food through these industrial systems." And they're probably right. They'll be food kitchens or whatever. I mean, people are going to get fed no matter what happens. Chef Andre goes in. The problem is the food's not going to be very good. It's not going to be fresh local and organic which is what I found is absolutely necessary for my health care plan. Whenever I stray away from that, I start getting sick and I can't afford to get sick.

Cooley Ludtke: I've heard that without nutritious food humans may not have the capacity to adapt and evolve as a species. I see you're nodding, Bill.

Bill McDorman: I'm not sure we're going to make it as a species. At these points in time, when I think of Bill Mollison, who co-founded permaculture, the whole permaculture movement worldwide, 30 years ago. And in his permaculture manual which he wrote as a college course textbook in Australia he's reflecting on the state of things. This collision that's so clear to us now between climate change and population growth and the centralization of our interface with the natural world. And at one point, he goes, "You know, if mankind goes down, if we lose it, there's no guarantees humans are going to survive on this planet. But if we go down because of things beyond our control, at least we tried. If a comet hits us, whatever it is, there's those of us that tried. We really tried," he said. "But if we go down because we knew what to do and we didn't do it, that makes a mockery of every philosophy, every religion, every industrial system we ever created. It didn't work, people. It doesn't matter how sacred it is or how good you feel about it, or how deeply you believe it. If we don't make it, we don't make it." And that's why they came up with permaculture which is a philosophy for living in the world for us to make it. That was what he was trying to do. I keep waiting for that part in the movie where the tension is building, and you don't know if the hero's going to make it or not. And then all of a sudden there's redemption or you know who's going to make it. And I keep thinking we're going to get to that point in the movie and we never do.

Part 8: How Communities Can Take Back Agriculture | Length: 5:26

John Swain: So Bill, this sounds pretty grim. Is there a way forward?

Bill McDorman: With the resources we have, how can we realistically go into communities and change them, wake them up, so to speak? We're not trying to build anything new. We're trying to reawaken something that was so much a part and parcel of the roots of why this country became so

great, with small local communities and food systems. And it translates to this day, data that came out of 2008 showed that those counties in the United States that had the most local food being grown were the ones that recovered first from the recession. And it's because of the creation and the acceleration of dollars in their economies. Because if you got a farmer and he's making he's selling those dollars go throughout their whole communities. And we know that. And so how do we reengage with that whole thing.

We need to start with each individual community. I can just tell you what I've learned is that you've got to ignite a passion in that community and enough people to carry through and to keep doing it. They've got to be excited about it. It's got to change their lives. They've got to see the light. And I know I'm sounding evangelical about it, but that's really what happens. And the only thing that I've found that will do that across the board in a whole community and everybody there that is demonstratable in a short period of time, it started with our five-day seed schools, went to one-day seed schools. Now I try to do it in single lecture. I even tried it in a seven-minute Ted Talk. You got to find something that captures their imagination, that blows their mind to potentials. And those are seeds. Those are the only things that we have. They are so unbelievably powerful. When you get down to that there's a million seeds packed inside each seed, that it is a truly self-replicating technology beyond all the technologies that we have.

It can grow out into a plant and take input from its immediate environment and change its own DNA, right? Form itself back up into a little hard shell that can last for hundreds of years as a living, breathing embryo and then come back out again when the conditions are right. With seeds as a technology, you can take a pocket full of seeds anywhere on the planet and start a whole new agriculture that will end up being adapted and resilient to that area. And all you all you have to do as you were saying is observe and save the seeds from those things that work for you and replant them. Real simple system. And when people start doing that, people that are interested, if we could just get them excited enough to do

it once, if they could make that cycle once, grow and save and then replant their own seeds, a whole bunch of switches come on. I think it's primordial almost in humans now. Ten-thousand years, that's created all the wealth and all the civilizations that have been based on that ritual I call it, that process of seed saving.

And so, if you look into the history of things, you look at how easy it is. You hear something about the miracles that have happened because of people saving seeds in their own backyards. Waltham butternut squash was seed saved in the backyard of an insurance salesman in Pennsylvania. It was a cross between things. He didn't know even what they were. It was a genetic mistake. And it grew up in his garden. And he walked out and he saw these things, and he saved them. And he goes, “Wow, these are pretty good.” Took them down to the Waltham experiment stations. We used to have land grant experiment stations all over the country. Those are all most all gone. And they were a way for locals to engage in breeding with their own university, to bring the science out of them. They grew it out for a few years in straight rows and said, “Wow, this is great.” Waltham Butternut Squash is now the largest distributed seed for winter squash worldwide. Still is. Never been changed, never been patented, never been messed with. It just came out of some guy's backyard. That's what we're talking about. The miracles.

The economic miracles, the cultural miracles that come out of saving seeds for people. That's the way I've learned to do it. If I had the money, I would put a centralized seed school in every state, and then I would break it down so that every little community had a chance to pull in the resources. And I think within a year or two we could change the whole country. I've just seen it happen. We're up over 600 seed libraries now. I don't know how many seed exchanges. A lot of those came out of our students, people that start the ritual. They have too many seeds. Now, what do we do? We got to share them. Let's start a seed library. Let's start a local seed exchange. So, once a year, we can all get together and talk and share each other's seeds. And we don't have to buy them anymore. And they're all locally adapted varieties. And we get the stories.

And it's just a great thing that's spontaneously starting to come out. We don't have to guess that that will happen now; It's happening. And so, I'm more hopeful than I've ever been as I stand and watch the intersection and the crash.

Part 9: Seed Saving – Where to Begin? | Length: 4:32

Cooley Ludtke: When a farmer or gardener decides to start saving seeds but doesn't know where to begin, what do you say to them?

Bill McDorman: One of the greatest opportunities in my life was to spend some time with, W.S. Merwin. William Merwin. He's a great poet. He won the Pulitzer Prize twice for poetry. And I was at a gathering one time, a writer's conference, and somebody asked him, they said, "I'm an English professor, and you're one of the canons of modern poetry." He was recognized worldwide. And he goes, "What would you say to me William Merwin as a professor of English on how to teach William Merwin as a poet." And Merwin said something that still stuck to me to this day. He really was a poet. He looked at the guy and he says, "Well, I would hope that you would start with a poem you love." And that's what I would say, "Start with a crop that you love, something that means something to me, something that blows your mind. There are a lot of people that don't know what crop they love. And we introduced glass gem corn, which had mind blowing colors. And that became the favorite. And the reason why people are gardening all over the world. So, whatever it takes, if you've got your crop, your food from grandma. It's a cultural thing. Whatever it is, take the thing you love most, that's most important to you, learn how to grow it and learn how to save the seeds and adapt it to you and where you are. That's the best way to do it. And if people aren't doing that, I would say they're not really gardening or farming. You're just making money in another way. You're just part of the industrial grind to try to bring dollars into your farm.

John Swain: That reminds me of a story you once shared with us about Nash's carrots.

Bill McDorman: Yeah, you can ask any market farmer, if you want an entry point into a conversation, ask them about the varieties they used to grow that they loved that are no longer available in seed catalogs. This centralization has had that practical effect. From the late 50s on, hundreds, if not thousands, of regionally adapted varieties or culturally specific varieties have disappeared from the nation's catalogs. Seed catalogs costs money to print them, and they're not selling that many of them, right? There's a reason for it. But ask them about that. And that's what happened to Nash. His favorite carrot disappeared, and he learned how to grow and save it, using help from John Navazio, a great plant breeder who recently passed away. And together they just saved seeds, adapted a carrot -- a commercial carrot that was no longer available -- to Nash's field and after several years renamed it Nash's Carrots. And so now he's at the farmers market and he's not selling carrots anymore. People don't line up to buy carrots from him. They line up to buy Nash's carrots, and he's the only one who sells them. And he's famous for them. That's agricultural economics. If you want to make money, do not grow and sell things that they can bring into your region on boxcars. A Gila River Indian farmer Terry Ring said that once in one of my classes and that stuck.

You cannot win against industrial ag. Even if you're big enough to survive with them, they'll eventually bleed it out of you to the point where now it's illegal to work on your own John Deere tractor. They're all software. They'll send out a software engineer to help you, but farmers can't work on their own equipment anymore. It's all patented and proprietary. They've got to hire somebody to come and work on it. And they're bleeding, and the seed prices go up and the fertilizer and their part of it just keeps getting squeezed out. There is no future. And the smart farmers I know have seen that. They want to start small again. And it's pretty practical. You don't have to start big. Don't stress yourself out. Just go back to the beginning. Grow and save some seeds from something you love. Get your daughter to do it. Go down to the local food co-op and find other kids in your neighborhood that want to do it. Make a deal with

them. Give them some land to do it on and you guys split the crops. I mean, there's all sorts of deals that could happen, but get involved because nobody's coming to help us. That's my doom and gloom. People are going to wake up some day. They're going to have their seed sources disrupted, and there's going to be nowhere to go and nobody to call. We just won't have enough unless we've got these active and vibrant seed exchanges and libraries in each community. And that's why they're so important to be working on.

Part 10: Debunking the Myths of Modern Seeds | Length: 5:15

Cooley Ludtke: So it sounds like locally grown seeds are a big part of the solution.

Bill McDorman: It is the solution. The modern seed industry, there's a bunch of myths that they've perpetuated. You can't save your own seeds, is number one. If you go, well, I can. I see them there. And they go, well, you can't save seeds from hybrids. If you save the seeds, you're getting the kids, but you don't know what the grandparents looked like. And so, if you save your own seeds and plant them, you may get traits that were in the grandparents that are unpredictable. So, if you save seeds from hybrids, it's unpredictable. And as you get larger in agriculture, especially in industrial agriculture, you can't afford that. So, there's this myth that you can't save seeds from hybrids. Actually, you can and there's a lot of great diversity in it. And if you're on a small scale, it doesn't matter. You still get to eat. It doesn't matter what comes out. You usually get enough to eat, right? And then you can save out seeds from the new adventurous things that happen in your backyard, maybe a new butternut squash or something like that.

And so, along with those myths is that, our industrial system for breeding seeds is better. We're going to have better seeds with better yields. And if you follow our practices, you give them just the right amount of water, you change your environment to fit the parameters of our varieties, you'll get more yield, and you'll make more money. That's basically what they're

saying. And so, that one-size-fits-all philosophy just doesn't work. Remember back when they had Flavr Savr tomatoes? That was the first genetically modified tomato. And what they did was modify a gene in it to give it more flavor. And this is the future, right? Wow. We've conquered science. We can change things. We'll go in and we'll have this tomato, and it will taste better and it'll be a commercial success. And there were billions of dollars put into the project. It took about 15 years to develop. They released it. And guess what? They put the gene in a tomato that was adapted to Florida, and it didn't work anywhere else. Oops. We forgot rule number one of agriculture is that you take something away from the conditions where it's really optimized, and it just doesn't work very well. And it took farmers in the northern tiers, they got it first. But even over in California and other parts of the country stopped buying the seeds because it wasn't a great variety for where they were. Didn't work really well.

Even in industrial agriculture, they're making mistakes missing the regionality. Companies want to think big and want to think one size fits all because one product is the same, you can sell it everywhere. But agriculture doesn't work that way and seeds specifically. And now that we're learning more about epigenetics, we're seeing results within three years, dramatic results in crops that have been brought, grown, seed saved for three years. Those varieties are different. They look different. They act differently in different parts of the country. And that's what we're talking about. That's that active adaptation system that's built in that has to be there. Otherwise, we wouldn't have so many varieties of wheat. That all came out of one wild plant. It's really interesting how we've lost that and we've just tunnel visioned and all the advertising around seeds. “No, you can't save your seeds. No, don't save seeds from hybrids. You're going to have to buy them every year, right. They're going to go bad.” You know, we routinely got 90% germination on tomato seeds that were ten years old. They don't go bad. But all these things help the seed industry make a profit. And so, we just have to find our way back down. And once you do, wow, it's easy to become an evangelist for the other side.

John Swain: So if you're a farmer, or a gardener like us, what seeds would you recommend we start saving first?

Bill McDorman: It's a simple question. Multiple answers. Depends on what it is. What I did was group the easiest ones together first. If you look through the list of the really easy ones to save, really, really easy, and you love something on that list. And tomatoes and peppers are on there and lettuce and peas and beans as well as all the grains. And that's einkorn included. Then it's easy to get people started. And once they're used to that, almost all the seed savers I know, the really great ones, their curiosity gets the best of them, they start to branch out and they start to look for other things, and then they start looking at specific characteristics that they want to breed for. As I like to point out, we have registered kennel clubs for dogs in the United States, which are specific licensed breeds with very strict rules about how to breed them. Just genetics class 101, right. You got to know some Mendel to do that. Well, where did that come from? That was all spontaneous grassroots movements throughout the United States, different groups of people getting together.

And that's what's starting to happen with seed savers. It's inevitable. That's just how we are.

Part 11: Rediscovering Einkorn Wheat – Why It Matters | Length: 3:04

Cooley Ludtke: And that is very encouraging. Bill, one last question. We've been talking with Walter Goldstein a scientist who I think you know. And he's focused his career on breeding corn. He shared a beautiful story about the origins of corn and the role of native Americans domesticating it. It made me wonder, has any single plant captured your imagination in that same way?

Bill McDorman: Bless you, Dr. Goldstein, for the work you've done. Corn is really important because the Western Hemisphere is based on it. All the major civilizations that came out of the Western Hemisphere came out of corn. They actually physically gave it the calories to grow into the Inca,

the Maya and the Aztec empires. And even after the Spanish conquest and the United States of America grew up, Michael Pollan calls us the United States of Corn because corn or corn products are in 80% of the processed foods in the United States. And so, we should always talk about corn, and we can go back to it being a wild plant, 8 to 10,000 years ago in a field outside Oaxaca, that's where we think it came from. And it was taken both south and north. And it's a beautiful story. Everything we base our civilizations on came from wild plants like that.

So, einkorn is a wild grass, grows in eastern Turkey. It still grows there in fields. You can find the original wild grass growing there. It's genetically identical to the varieties of einkorn that have been cultivated and the seed saved from and made larger and easier to harvest all over the world. There's hundreds of varieties, maybe thousands of varieties of einkorn.

It was just taken everywhere and adapted to wherever it was to cultural needs and climatic needs that people needed. That's why we have so many different kinds. I've got a black and tan einkorn. There's blue ones. There's white ones. There's tall ones, short. It's just unbelievable, the diversity now that we're growing. And right now, that's really one of the more fascinating crops for me. Einkorn, 40% protein, a real simple genetic structure. Hugely adaptable, has to be. And seems to have way less effect on human gut biomes than the modern varieties of wheat. So people that have gotten sick or are gluten intolerant have found that they can eat einkorn and reintroduce bread into their lives. And what's more fundamental than the staff of life itself? So, einkorn is really one of the great stories and how it came to be and passed around and how it's now being rediscovered and regrown. It's become a superfood. It's got so many more vitamins and minerals, especially if it's grown organically and as I said is even eaten by the gluten intolerant. And again, we don't know what the difference is in it specifically yet. The smoking gun that causes people to be gluten intolerant around modern varieties. But we do know that a lot of people are starting to eat einkorn.

Cooley Ludtke: We'll have to give it a try.

John Swain: Hey Bill, thanks for spending time with us.

Cooley Ludtke: That was Bill McDorman. To hear more content like this from farmers and others, check out the Farms for Tomorrow website at FarmsForTomorrow.org. And also, please follow us on Instagram.

END OF TRANSCRIPT