

# Cutting Edge: In Search of New Crops For Wisconsin

Episode #4: Kernza with Guests Colin Cureton and Valentin Picasso

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## SPEAKERS

Speakers, Colin Cureton, Valentin Picasso, Carl Duley, JASON FISCHBACH

### **JASON FISCHBACH** 00:00

This is a podcast about new crops. You're gonna love it. Join us on the cutting edge, a podcast in search of new crops for Wisconsin.

### **Valentin Picasso** 00:09

(Background music) We're not trying to develop kernza as niche market crop we're trying to develop kernza as a major crop that in the future would, you know, substantially transform the landscapes.  
(Music playing)

### **JASON FISCHBACH** 00:44

Welcome, everyone to the cutting edge, a podcast in search of new crops for Wisconsin. I'm one of today's co hosts JASON FISCHBACH, the agriculture agent up in Ashland and in Bayfield County and joined today by Carl Dooley.

### **Carl Duley** 00:58

Yes, Carl Duley. I'm Ag-agent in Buffalo County, and it's great to be on once again, Jason, a little different topic today than what we've been on.

### **JASON FISCHBACH** 01:08

Yeah, I'm excited to talk about kernza. This is a crop long in the making, and it's something that really has potential to transform our agricultural landscape. And we've got two great guests today to talk about it, Colin Cureton at the University of Minnesota, in St. Paul, and Valentine Picasso, who's at the University of Wisconsin in Madison. Welcome, guys.

### **Speakers** 01:28

Thanks for having us. So let's just start with some introductions of who you are a little bit of background and how you're involved with kernza right now. Colin you wanna go first?

### **Colin Cureton** 01:37

My name is Collin Cureton, and I work as a supply chain development specialist with the University of Minnesota's forever green initiative as part of the commercialization team of that forever green, and I'm essentially the supply side guy of that equation. So I work on siting of new production, acreage, and supply chain development for the new crops and cropping systems we're developing. All of which are oriented toward perennials and winter annual crops that offer new economic opportunities and new environmental benefits.

**Valentin Picasso** 02:11

I'm Valentin Picasso. I'm an assistant professor in the agronomy department in college in the University of Wisconsin Madison. I work mainly with forages and perennials and perennial grain systems and adaptation to climate change and how we can make more resilient cropping systems. And I'm very happy to be here. Thank you for the invitation.

**JASON FISCHBACH** 02:36

Great, so let's just get right into it. The kernza name or kernza what what is it? It's you know, I know it's intermediate wheat grass but tell me the background of kerna, how it developed what's being done to develop it and and why kernza?

**Valentin Picasso** 02:53

Kernza is the first perennial grain crop in the world. It is perennial grass that can be harvested for for grain like wheat or barley. So with the with the with a grain of kernza you can make flour and bread and pasta and, and you can also ferment it and make beer. But at the same time it's a it's a forage crop so you can harvest forage at the same time as harvesting the grain and it's perennial that means it grows year after year and once you plant it, you can harvest it for many years without the need of replanting, and therefore has a lot of environmental benefits in terms of soil health, reduction of soil erosion and cleaning water in our landscapes.

**JASON FISCHBACH** 03:45

So is kernza, an actual strain of intermediate wheatgrass that's been with a plant patent or is that a more generic branding for? I don't know intermediate wheatgrass in general?

**Valentin Picasso** 03:56

So kernza is is actually the grain harvested from intermediate wheatgrass that has been improved and, and bred for increase seed size and grain size. So current sites at trade name of the grain of these improved intermediate wheatgrass, there's so in in a way we use the name kernza for, you know the harvest of the crop. Right now, there has been new varieties. I mean, the first variety of kernza that really released has been from the University of Minnesota, it's called Kernza Clear Water. That's the name of the variety, but currently it's a more general name for for the crop and for the grain harvested out of these crop.

**Colin Cureton** 04:44

And Jason, I'll try to follow up on that. kernza is a trademark name that's owned by the Land Institute which is based in Salina, Kansas. And that trademark name is also associated with an identity preserve program, which essentially ensures that grain that is grown handled and sold within that supply chain

meets those identity preserved standards. So that you you essentially know you're getting that high quality product that delivers those environmental services and growers can have some confidence in that chain. And so it's similar to other trademark name grains like kamut that maybe you've heard of. That's a niche or artisan grain that offers some distinct health or environmental benefits. So everyone that is growing kernza is licensed to do so by the Land Institute as the the owners of that trade name to ensure that they are aligned with you know, the vision for kernza and also the standards so that we don't have someone out there growing an intermediate wheatgrass, unimproved variety, selling it as kernza to try and get that premium that is really based around those ecosystem services right for a large part, as well as you As a new a new artisan grain, it has some value in the marketplace and we can get into that later but just just wanted to clarify that the green is associated with that that trademark name and that identity preserve program.

**Carl Duley** 06:15

Maybe just one more step in the in the in the current zone the development or where it's from where is the intermediate wheatgrass originally from Is it a native to the United States is it from the Fertile Crescent like it seems so many of our grains are or?

**Valentin Picasso** 06:31

Intermediate wheatgrass is a species that originated in the Balkan area in Eurasia. So and it was introduced from Europe to the US in early 1900s as as a forage grass for mainly for the West and for for rangelands, and so it's not a native grass from from here. It started being domesticated as a perennial grain crop. About I think it was like, in the early 1980s or so, by the Rodale Institute. And then they they did a first round of selection. Then they sent the material to the Land Institute and at the Land Institute in Salina, Kansas, they started a more intentional breeding program. And, and it's been already I mean, the kernza that that we're growing now it's been through five cycles of selection. And, and then it also the material went to other places like the University of Minnesota who started a big major program on on breeding of kernza too and now they've released a different variety.

**JASON FISCHBACH** 07:48

So how is the adoption shaking out across the states given that there's so many you know that Kansas isn't involved, Minnesota is involved, Wisconsin's involved. Sometimes I hear there are some frictions across state lines, is this developing cohesively is there? How is this playing out?

**Carl Duley** 08:06

Oh, it's a loaded question. Yeah. Oh, what kind of friction. People, people drive in there combines through state lines and going head to head or...

**JASON FISCHBACH** 08:16

Things I've heard...

**Colin Cureton** 08:18

Yeah. No, I would actually say a couple things. First of all, we're still very, very early in this whole kernza. And Valentin has been researching this a lot longer than I've been working on it. So I'd love his perspective on sort of arc of development. But we at the University of Minnesota released the very first

official kernza variety in August of 2019. Right, so imagine like the first soybean crop released variety right there. This is a long road we're going to walk. That being said, we're seeing a lot of interest, right. So whenever, especially in this climate, there's new, new new crop opportunities. That either real or perceived as attached to a new market opportunity. You have some people that want to be first to go, you have a lot of people that don't want to miss the boat. Right? So I think one of our main challenges is right sizing expectations among growers that many think this is this is ready to go. We have, you know, mass quantities of seed available. And we really don't we're we went through our first year of commercial seed increase, so we have more seed than we've ever had before. But we can get into that later. But the first year, we released about 5000 pounds of seed, you know, it was enough to add like 500 acres total. This year, we have enough seed to, you know, maybe add 1000 to 2000 acres total, a grand scheme of things that's pretty small. But in kernza world right now, there's only 2000 acres of currency worldwide. So we're at it, relatively speaking, we're in an inflection point where we may add 50 to 100% of commercially oriented acres. And that's the last thing I'll say is that a lot of acres up until now been the sort of either pure research or hybrid research/commercial. And now we're kind of transitioning to growers that really see this as a commercial production opportunity, and are really just in the early phases of that. Valentin, do you have anything you want to add about this kind of long arc that we're on?

**Valentin Picasso** 10:19

Yeah, well, as Colin was saying, this has to me it's very unique, not only the type of crop that that it is, because it's perennial and the grain crop, but, but really, because of the collaboration and the synergy between different universities and research institutes. I mean, we really work as a community together we meet every year, we discuss, you know, the challenges and the new research and and it's a really growing field of research both in the area of of production and agronomy and environmental services, but also in the area of, of marketing and supply chain. And farmer involvement. So it's been really motivating to me and we're really excited to be part of this community across states across and, and and also international there's there's a lot of interest in, in Europe, in South America in the development of kernza. Now, having said that, it's also unique, I think as a model in the sense that we're not trying to convince everybody to grow kernza right now. We're trying to grow at the same time, the knowledge and and the farmer base and the marketing and, and the and the demand. So we're trying to, to grow at the same time the supply and demand and that's that's what the role of of calling and, and all the other people involved. It's because we don't want a lot of farmers trying something that we really don't know very well how to manage and then get stuck with them with the market, that it's not worth working or we don't want like the companies is expecting a lot of grain when it doesn't come so we've been doing a very I think unique effort of growing these two sides together there's a lot of demand for kernza from the industry and and there's a lot of interest from the farmers and now our role is to try to make that process of growing across the states in a in a sustainable manner really.

**JASON FISCHBACH** 12:24

It seems to me this is you know, we've we've done one of our podcasts on hemp and it seems like that the contrast here is pretty stark right hemp was let's face it kind of a free for all. Versus it sounds like with kernza, it's much more intentional, much more strategic to build both the you know, to align the cart and the horse align the markets and align the the production and recognizing to the the strengths

and weaknesses of kernza and the the limitations still that are there. I think in terms of the economics and learning curve for growers, that kind of thing. But...

**Valentin Picasso** 12:56

and, and if you if you think about this, we are we're really having this strategy because we are here for the long term, we're not trying to develop kernza as a niche market crop we're trying to develop kernza as a major crop that in the future would, you know, substantially transform the landscapes. Okay, so we we want this to grow in a in a slow and sustainable manner. So, we're really hoping that you know, in 10 years, 15 years, I don't know 20 years it's difficult to say when that this would be another major crop like corn or soybeans or wheat or barley, okay, we're not going for for a small niche market. And that's why when we ask the farmers we did a little bit of research to ask why are farmers growing kernza. The few farmers who are growing kernza right now and we have a lot of farmers that the motivation is you know, environmental and and environmental consciousness and they want to protect their soil and they want to provide ecosystem services. And all that. But we also have a lot of farmers that are large farmers that are interested in the profit that are interested in the, in the economic opportunity of this and and and we really want this to be that to be a major crop that that it's both good for the environment and good for the farmers and for the economy.

**Colin Cureton** 14:19

I also wanted to just kind of contextualize here that this is what we think of is the leading edge of a portfolio of new crops, new perennials and winter annuals that as Valentine said, within forever green initiative, we are trying to move forward in the long history of the land grant university system of offering new crop opportunities that meet meet the, you know, the challenge for the day. And now we're stepping into the next century, really thinking about these environmental challenges and also the sort of economic hollowing out of rural America. How do we how do we address both of those at the same time, we have to offer new, new economic opportunities that are also in new crops that have these benefits for soil climate, water, etc.

**JASON FISCHBACH** 15:04

So to the point that the vision for this is not as a niche crop, right, volunteers you're talking about so you've got some pretty big commercial partners on board, Patagonia provisions, General Mills, can you talk more about that those partnerships and what their vision is for this crop and why they're involved,

**Colin Cureton** 15:25

Whether it's General Mills or anyone else? I think they have made, you know, public and strong commitments around sustainability and climate change, for example. And I think a lot of the industry partners, we talked to in our commercialization team we talk to regularly, they are looking for solutions that will help them meet those goals, right. And so when new crops emerge that have the potential to both deliver an economic return, but also advance that ecosystem service aspect, I think they're very excited to support. And also see a role in basic research development and contribution. So I know that our University of Minnesota would not be where it is, and probably at the Land Institute as well wouldn't be where it is without the commitments for General Mills.

**Valentin Picasso** 16:13

We we are extremely thankful and proud of the of the small businesses that are local and there are really trying and experimenting and selling kernza products. We also have here in Madison, you know, Madison Sourdough, as a bakery that has tried products with kernza and, and you can sometimes buy kernza bread there. We have Driftless Brewery in the in the driftless region in South West Wisconsin, producing kernza beer and there's a lot of smaller partners and we're very proud of them, and I'm very thankful of them. At the same time, we're very proud to be partnering with large companies like General Mills and Patagonia into developing this for for the for the long term. So...

**JASON FISCHBACH** 16:59

As we know in this specialty crop or alternative crops world, we have this funding dilemma where, you know, I refer to it as the flywheel of agriculture in that our our big main crops, corn, soybeans, cows, command, a lot of research dollars, the state legislature puts a lot of money into their publicly funded universities to support those crops and for good reason. Those are well established big crops that a lot of people depend on. And yet we have some challenges with those crops. And we also have other opportunities out there with different emerging crop species and things. And yet without an industry going to the legislature or to the university and saying, Hey, we want you to work on kernza, we want you to work on hemp hazelnuts, hops, whatever, then the public sector can't really respond and provide funding for that stuff. And so that flywheel it's so hard to siphon off even a little bit of resources to fund and do the development work on these new crops. So I'm fascinated how kernza because it seems like it's fairly well supported, well funded. Can you just talk briefly about how you did this? How? How kernza has been able to find the funding to get it as far as it has and what it sees going forward?

**Colin Cureton** 18:14

Yeah, well, what I'd say Jason is again to contextualize the currency for us here in Minnesota University of Minnesota, is on that leading edge of this larger portfolio of crops with under the umbrella of the forever green initiative that has been able to I think, so far fairly successfully put forward a new vision of agricultural diversification and delivery of new crop opportunities with, you know, those economic and environmental benefits and kernza is on the leading edge of that and that that program is based here at University of Minnesota, multi multi disciplinary approach that spans breeding, agronomy, environmental environmental sciences, food science and now commercialization and implementation. And so we've been able to go to the legislature, I think now for several rounds and been able to through a multi sector partnership that included growers that included industry, that included consumers that included environmental advocates, water quality advocates, and academics, all working on this together, have been able to go forward and make that ask. I also know that given the scale of what we're trying to do, like if you think about the development of other basic commodity crops over the years, it takes significant and Sustained funding. So I would say when we look at the investment has been fantastic, but we know it's going to take so much more. And last last comment is that we're starting to turn the corner on having some escalating funding from the state here in Minnesota has gotten some of these crops to the point where we've been able to garner significant federal investment just in the last year or so, through you know, multi state NIFA grants USDA investment. It's not just on. I'm thinking across the portfolio. So in hazelnuts with the screen program. And with winter annual oil seeds, pennycress, and winter camelia, also kind of turned a corner with getting their first major significant federal funding. And so that's really where we're headed is this diversified portfolio of private,

philanthropic, local, state and federal funding is going to need to be flowing in simultaneously in a sustained and increasing manner to really get the landscape scale impact we want to have.

**JASON FISCHBACH** 20:34

Colin, the Forever green initiative that's a grant program or not why you know initiatives bigger but the funding from the legislature that's a grant program that's only eligible to a certain suite of crops? Is that how it works?

**Colin Cureton** 20:48

Yeah, so So my understanding is as a very small part of forever green, There's 80 researchers at the University of Minnesota and beyond in these cross sector teams. Sorry cross departmental teams, and also cross sector that most of that funding historically, has been for the research side. So they've appropriated escalating certain number of millions. I could look up the figure...

**JASON FISCHBACH** 21:18

Potentially up to 10 million this fiscal year?

**Colin Cureton** 21:20

Yes, I think our asked the last few years has been in the 10 million range. I think last year was in the four or 5 million range. I should know that number. I'll look it up before this interview is over. But last year, the first allocation was made in the amount of half a million dollars to be spent over five years on implementation. And we're focusing that first round of implementation funding on the commercial scale up and success of MN Clearwater, our first kernza variety, but we're already seeing a need to come behind that with implementation resources for crops like winter camelina, which is a winter oil seed that can fit into our existing agricultural landscape and really enhance it through the addition of a winter oil seed. So So yeah, just just sharing that the state's appropriations have now been several legislative cycles running in escalating amounts and have started to bridge into the implementation space, which is quite exciting.

**JASON FISCHBACH** 22:12

Got it, Valentin anything like the Forever Green initiative in Wisconsin? What's the support, like for your work?

**Valentin Picasso** 22:18

So one thing I wanted to add to this story about the funding really is you were you were asking, you know, how was it possible to secure so much funding for kernza which we all know it's, it's not enough, of course. And and I think we have to have a historical perspective here. The Land Institute started 40 years ago with a with a clear vision of believing that we can have an agricultural system that doesn't destroy the environment or the economy and and realizing that you know, the current agricultural system has a lot of problems in terms of environmental degradation but also social and economic limitations for farmers and consumers. And they started with this this vision of how we can develop an alternative. And an alternative that has two features. One is we need more perennials, we need more perennial cover in order to give environmental services, but at the same time, we need diversification. We cannot have one or two crops dominating the landscape for economic and environmental reasons.

And so there were a lot of crops that were tested and there are a lot of crops that are being developed kernza is just one out of many. There's there's perennial flour, perennial sorghum, there's perennial rice, there's legumes that are also being considered. So there's a suite suite of different crops that have been tried over the past. Some of them didn't work, and were not included anymore in the research program and there are others that are earlier in the development and in the future we will be able to have other more perennial crops and and as part of that vision you know, there was the consistent talking to donors and funders and and trying to convince you know, to put money on this over 40 years really. And and that allowed for programs like the like the fellows program where graduate students from different universities, you were one of them I was one of them, were trained into these new alternative way of developing new crops and diversification of agriculture. And now all that people are in research positions, faculty positions, extension positions, and and trying to do develop this research and applying to grants in you know, I've been very fortunate to get get funding from MEFA from USDA from SARE. From really funding programs that are funding agriculture in general, really to to develop this Okay, and so I guess I wanted to point out here there's there's no magic bullet kernza is not the solution to all the problems it's just one piece of a much larger puzzle, not an a very long term puzzle that that really is trying to, you know, transform agriculture in a way that it's good for the environment, good for the people, good for the farmers, good for society. And, and, and, and really has been a long term investment. But also now, you know, as Colin was saying, you know, state agencies, federal agencies and that are really funding this which which is which is fantastic.

**JASON FISCHBACH** 25:53

Yeah, that helps just to push a little bit on the Wisconsin's contribution has the state taken an interest, you know, at the legislative level or legislature?

**Valentin Picasso** 26:03

So there has been interest, we haven't gotten to the point of like Minnesota in terms of actual, you know, commitment for the long term of funding. But there's being a lot of interest from the Department of Agriculture and trade and consumer protection, there's been a lot of interest from NRCS. And we're working closely with with NRCS to include the kernza as a as another crop that can be supported by some of NRCS programs like EQUIP so that there is interest and and and there is support. We haven't gotten to the point of like commitment of funding, but I think we're getting there. We're working towards that.

**JASON FISCHBACH** 26:49

Great, awesome, guys. So let's talk agromonics. Colin you mentioned this briefly. So and Karl jump in because I'm asking too many questions. But you mentioned this briefly. I'm a grower I'm interested. How do I get seed? How do I get started?

**Colin Cureton** 27:03

Yeah, yeah. So we have a system set up where there's a very simple online application 2020 Kernza growers application, where, you know, you share your basic information acreage you'd like to plant. And we've got a number of sort of checks in there, like, you know, do you have small grains planting and harvest equipment? Do you have post harvest storage? What's your experience selling into food grade markets, we we've set a certain range of priorities and requirements for kernza growers that we

in partnership Land Institute, go through each of those applications and usually call each grower directly and engage with them one on one talk about their interest in kernza of you know, this is a perennial grain crop. So we want to make sure that people are will be committed with this limited amount of seed to produce a stand for multiple years. Most are but also you know, like last year, for example, we had a lot of people come forward that said, Hey, I have you know, six permanant acres here and four there and 20 over there, I'll throw kernza in, it'll be a good option. Right, like and in our senses that that's probably not the best way to commercialize a brand new crop so we got to make sure that our first wave of growers are really going to maximize the likelihood of success in the new crop and that's the whole purpose of the fitting approach. Chances are though, when when growers have gone through that whole process, if they're really committed to this crop and they think they're a good fit, we are excited to see people you know, give it a try and to support them to do that. And so there there aren't many rejections coming out of that process but it's just a process so that we don't you know, not a knock to them by any means, but not sure we want to become the Wild West like hemp has in many ways. So you fill out the 2020 kernza grower application, chances are myself and or someone who plans to have conversation with you directly, then we would you know approve your request, you would get licensed concurrently pretty efficiently. You know, can do it online for the kernza trademark program and also for the kernza of the MN Clearwater variety through the University of Minnesota. And then we are now working with a contracted seed distribution partner that cleaned all of our seeds last year, Minnesota Native Landscapes they're based in Foley. And once once a sale is executed, we would, you know, send over a note to Minnesota Native Landscapes that, you know, they're set to pick up their certain quantity of seed. And then the last thing there to mention is that, you know, that conversation phase earlier is it's important to make sure, you know, growers we talked through with growers, that row spacing there, you know, things like that, that determine how much seed they're going to need to buy, what's their acreage, what's their row spacing, and also we were drawn from a number of different seed lots that have different germination rates, for example, all of which inform how much seed you're going to need to buy so we're not at a point yet where you just go online and order your seed, there's a bit of a process to it. But basically, it's apply, talk to us, get approved, get licensed, buy seed.

**Carl Duley** 30:10

So, is it the same process if I'm from Wisconsin, do I go through Valentine? Or do I just go to the kernza website or doesn't matter?

**Colin Cureton** 30:20

It doesn't matter at the moment. We do have, I should say it doesn't matter the application process, but we do for the University of Minnesota's variety. We have a preference to or essentially holding space for Minnesota growers based on you know, our state funding, for example, as you know, required that we deliver these new crop opportunities to Minnesota growers, first and foremost, that said, we don't want to hog all the seed and you know, we got to share the wealth, but we do want to make sure that we're not developing new crops and sending all the seeds elsewhere. So we sort of have a preference for Minnesota growers. But we'll take applications from from anywhere and that that has actually been one of the early sort of one of the things that might encourage us to say either no or just not yet is, you know, I think we're getting requests from Alberta from all over Europe, from the Dakotas from Montana, and we just don't have enough seed to supply the commercial acreage that some of those guys say I

want to play 500 acres of kernza. You know, right now, I think the largest commercial kernza field I know of is like 140 acres, and most are under 100. So this is not a crop at scale yet. It's not really. It's, yeah, we're at a much smaller scale. We also have a acreage minimum of 20 acres, we find that if you're growing less than 20 acres of row crop, like a grain crop, chances are it's not going to be necessarily a priority for you. It might kind of be a you know, might be at the bottom of the priorities list. And then also the costs tend to escalate as you try to you try to move a six acre plot of kernza, you got to ship it around three times and process it and the The processing and supply chain costs relative to the volume really makes it less of a economically viable opportunity. So that that gets into all the supply chain logistics and costs which which is all at play here. So,

**Carl Duley** 32:11

So is the market only organic or is the market both conventional and organic, or...?

**Colin Cureton** 32:18

Well, right now production wise, organic management practices are required not certified organic, it's just that we don't have any legal herbicides or pesticides yet those variety trials are underway. So right now certified organic is not required. We do see the market trending a bit organic but we also know there's people waiting in the wings to get in the game until they feel like there's a as they say more tools in their tool belt.

**JASON FISCHBACH** 32:44

So spring seeded, fall seeded, what's recommended for following crops Can you follow small grains in the fall Can you should you know, should you be following a legume to give it a nitrogen bond bump? What's recommended right now for the seeding?

**Valentin Picasso** 32:59

Think about kernza as a in terms of a grain, it's similar to winter wheat. So it has to go through a winter before it can flower and produce seed. And and therefore we recommend planting in the fall and and and let it go through the first winter and you'll get a better establishment and and then you can harvest the next summer. Ithe upper Midwest in terms of planting dates, we recommend you know, mid to end of August and early September at the latest. Okay. So it has to come after a crop that you can harvest before that. So you could you could plant kernza after small grain oats or barley or wheat or you can we could plant kernza after maybe an alfalfa field that's that's three four years old. Or I mean the the soybean or the, or the corn, usually, you know, you have to harvest much, much later. So you might have to go through a through a cover crop and then and then plant it the next year. You can plant kernza in the spring it is possible you can plant it. The thing is because it for the establishment during that first year, if you planted in the spring, it would be, you know, like a like a grass without producing any seed. And so it's not very competitive with the weeds in during that spring. And that's why when you planted in the fall, it would be much more competitive. The next spring with the with the wind, so we've had much more success with with fall establishment of kernza.

**JASON FISCHBACH** 34:49

Is winter hardiness an issue in the upper Midwest? Can I grow it up in northern Wisconsin?

**Valentin Picasso** 34:53

Yeah, it can grow in northern Wisconsin. It's winter hardiness has not been an issue so far. I mean, it's a cool season grass, tolerates very well to cold and also tolerate quite well the drought. It was one of the questions originally we had is like we knew intermediate wheatgrass did very well in the west where it's drier. And we didn't know how we would do in more humid climates like here, but it's, it's been working pretty well I mean, with both in Minnesota and Wisconsin, we've been growing this for you know, five or 10 years and we have good success in terms of the of the soils and the climate.

**Carl Duley** 35:36

So you mentioned maybe following small grains, oats or barley do we are we concerned about any of the same disease issues though with the with the small grain crops?

**Valentin Picasso** 35:47

Potentially, it could be but intermediate wheat grass and kernza are very diverse in terms of the of the genes and they have resistance to you know, All the diseases that we know. And actually intermediate wheatgrass has been used in the past as a source of resistant genes to other crops like wheat or and So, so far we haven't seen any disease problems with intermediate wheatgrass. That doesn't mean that in the future when the crop it's more expanded and there's more area there might come so far the only the only disease we've seen is ergot usually in the in the borders of the fields. But that it hasn't been a big issue. Of course, just like wheat is something that we need to measure and and and control for the marketing. But so far, it hasn't been a big, big issue. Colin, do you want to speak to that a little bit?

**Colin Cureton** 36:50

Yeah, yeah, I mean, I would say I would encourage everyone to not as Valentin said and not necessarily think of kernza as like a you know, a magic bullet or a superhero. We did see some issues with with aflatoxin last year that had several a couple lots kicked out of the year out of the food grade system or they essentially didn't meet spec, but I think that was not an uncommon occurrence for a lot of small grains. It was really really rough year on the whole you know, wheat crop as well. So it does involve some risks and and for kernza growers they'll like and like other small grains trying to reach food grade markets. That's That's why we have that requirements or strong preference for either on farm post harvest storage or local parcel post harbor storage solution, because you'll need to store that crop dry it down send in samples we are working to you know develop a good system to do that so they can test for toxin, aflatoxin, etc. And then hold that crop until it needs to move. So we saw a bit of a bit of an issue there last year but not unlike I think any other small grain.

**JASON FISCHBACH** 38:01

Okay, so we've got the crop established in the fall, what do we do about nitrogen fall application spring? Can we underseed it in the spring, like frost seeding with clover or something? what's recommended for,for feeding it?

**Valentin Picasso** 38:16

Absolutely,so, the first thing we have to consider is kernza is a dual use crop. Okay, you want to harvest the grain and you want to harvest and utilize the forage because it does produce a lot of forage. Okay, so, when you're thinking about how to manage this crop, you need to be thinking, How do I

maximize grain and at the same time forage and forage quality? Right. So the the research we've, we've done basically, that the management that we're recommending right now based on on the, again, only a few years of research on agronomic management, okay. We don't have like 20 years or 100 years of information like in other crops right. As you establish in the fall, we have been doing split applications of spring, nitrogen and fall nitrogen. We, again we don't know what's the optimal timing really in terms of whether split applications or just fall or just spring we are doing research on that but that so far we have good success with you know, applying like 40 pounds of nitrogen in the spring and another 40 in the in the fall more or less it doesn't require a lot of nitrogen compared to other to other crops and and of course, it depends on your soil type and location and what was the previous crop and all sorts of things but in general, it requires little amount of nitrogen. We would if we do this, the spring nitrogen application would be at green up in the spring. Then you let it grow during the spring. And summer, and by the end of July, or early August, you're harvesting the grain. for harvesting the grain you can either combine directly like you would do for for grass seed or for grain. It there's, there's a combine, you just need to, you know, tweak the settings of the combine to to to be able to harvest the seed it's it's a it's a lighter seed compared to other other grains but it's not very different from from grass seeds. So there's there's equipment to do that. And then we normally right after harvesting the grain which you know the crop gets like five feet tall, so when you harvest the grain to first to feed then you still have like, like three feet of forage available and so we normally bale that forage, which has that quality of a little bit better than wheat straw. I mean, it's still green, but it's very high fiber So you can we've done feeding trials we've done you can you can use it for bedding in dairy systems, you can you can feed it to cattle and and we've whether heifers or beef cows for instance, we have done trials where 50 50% of the diet is kernza straw and the other 50% is haylage and they gain weight and without a problem so it can be fed to to animals. And then after that in the fall it regrows. We do a fall nitrogen application and and let it go. We can either graze it in the fall or harvest, harvest another forage harvest at the end of the fall. And that's really high quality forage. And, and then the next year it continues again, I mean in spring, you can harvest forage in the spring early in the spring in the in the second year. And then let it go to seed and harvest of grain harvest forage. So when you think about which farmers are ideal for growing kernza, well you want somebody a farmer who knows how to grow grain and can utilize forage or can sell the forage to a neighbor. So because the forage it's an important part of this, of this crop

**Carl Duley** 42:26

Valentin, you said that it was still green, that bottom three feet, so the crop is still green when you're harvesting the grain. Is that correct?

**Valentin Picasso** 42:33

Yes. Yes.

**Carl Duley** 42:34

How do you tell when to harvest?

**Valentin Picasso** 42:36

Well, it's it's tricky because it's not only I mean part of it, it's green part of it, it's going to be really mature and part of it is already going to be shattering. Okay, so you have to find that that happy medium there.

The breeders, one of the main goals right now, other than increasing grain yield, it's also reducing shattering so that that you know, it's not such a such a problem, but Normally, I mean, you would want, you know, at least 50% of the of the seed heads, you know, turning brownish color and you can do the thumb test to see if the if the grain is full. But it's, it's, it's risky. And and it and we haven't figured out exactly, and we don't have the information exactly what's the optimal timing for harvesting. I mean, again, all these are research questions that that researchers are targeting and we're, we're looking into, but you know, that's why I'm saying I mean, usually end of July, early August, when you know, kind of half of the, of the field, it's turning brownish, that's when you would, you would harvest there would still be green leaves on the bottom. So you know, you have to be brave to run your combine onto that, but you know, it works. Yeah.

**JASON FISCHBACH** 44:01

The how perennial is it? Do we expect this to go two, three, four years is what about so two questions that and what happens with all of our other C-3 grasses does you know does brome and quack and everything Timothy start to move in is that what'll end it as the crop stand or is the crop just kind of burn itself out like alfalfa eventually.

**Valentin Picasso** 44:25

So, in terms of the intermediate wheatgrass as a as a as a grass and kernza is no different. It can survive for 20 years, 30 years, I mean, we've seen thick stands of intermediate wheatgrass that that don't thin out. Okay. So the crop itself, it's, it's very perennial. Okay, but but the plant itself, it's very perennial. Now the grain production of that stand. Our experience is that it goes down in the second and third and maybe fourth year. So So we've seen that the yield of grain really declines, you know, from the first year to the second to the second to the third. And and we think that that's not because the plants die, but actually because of overcrowding of plants. Okay, there's too many tillers too many plants. And so there's very little resources put into the reproduction and a lot into vegetative growth. So one of the main research questions we have right now is how to thin those stands and how to continue that, you know, the production over time of the grain. So right now, I mean, the information we have is while you can establish current set of harvest grain, two years, three years, and maybe after that, you can use it as a pasture, or you can turn it into your rotation and go back to some other crops. But again, we've only have long term information for only five years, really. And so you know, more research is needed to figure out whether there's some kind of rejuvenation that we can do and that, and we've thinking we've tried different things. We've tried burning the stands like prairie grasses or we've, we've tried tillage, or herbicide applications to thin the stand. And we're really looking into those experiments right now. I mean, we don't have a clear recommendation, but we think that that the stand can be rejuvenated and we can maintain yields in the future. But that's but that's why we still insist, this is a dual use crop. You want to use the grain and you want to use the forage because there might be years that you know, you just harvest only forage and that's fine. And you manage in a different way and other years that you harvest, mostly grain,

**JASON FISCHBACH** 46:52

Any progress on finding a companion crop for intercropping, like getting a legume in there or something?

**Valentin Picasso** 46:57

So yeah, you ask about the intercropping with legumes. We've tried the alfalfa, it works pretty well as a companion legume for for kernza. We've tried red clover, here in Wisconsin red clover, it's very competitive and at the rates that we've tried it, it ends up you know, dominating the stand in the in the third year, second, third year, kura clover, same thing. I mean, they're there. They're good legumes that can be mixed with with kernza. They all have some penalty on the on the grain yield about like 10-15-20% of reduction in grain yield, but certainly an increase in forage production and forage quality. So there's a trade off there. When when you have the occurrence of monoculture, you get like 20% more grain. When you have the kernza with the alfalfa or the kernza with the red clover, you have less grain but you have much more forage and much, much better forage quality.

**Carl Duley** 48:01

What kind of grain yields are we starting out at? Are you talking about a deduction by maybe 20%? If we put a companion crop with or it goes down over years, what is our optimum? And then what can we expect?

**Valentin Picasso** 48:13

Yeah. So in terms of research yields, the, the, what we've seen is like around, you know, 800 to 1000 pounds per acre in the experimental stations in the first year, and then going down, maybe half of that in the second year and maybe like 200 300 in the third year on farmer's fields, Colin maybe fill me in there, but I think it's around you know, between 300-500 pounds to the acre.

**Colin Cureton** 48:48

Yeah, I can, I can share some more numbers here. So in our 2019 harvest of this improved variety of Clearwater, we had an average yield of in production production. fields about 500 pounds per acre, we saw a range of anywhere from 350 to up toward 800. And that 800 pounds per acre was a certified organic field. So it wasn't, you know, due to any particular amendment or conventional treatment. And I wanted to chime in here on the economics of all this. So I'm an economist by training not agronomics. So you don't want your agronomic advice from me. But I've tried to develop some supply chain budgets and crop enterprise budgets to put put some numbers to all this and sort of the economic benefits of growing kernza. Because I'm sure if any listeners listening in here is something like a 500 pounds per acre or something. You kind of you know, your eyes glaze over or something like that. But I want to put in context, the value of this grain relative relative to other grains and how it's seen in the marketplace is a differentiated product offering these ecosystem services. So on the way at the end of the supply chain on the retail end, we've seen conventional grain sell for anywhere from three to five pounds dollars per pound. Right so when you think of like a bushel of wheat you know at the farm gate sells for like \$4 a bushel we're talking about this grain is you know \$4 a pound. So that just puts in context this trade off between like the value of the grain versus the yield is an important consideration. Certified Organic grain we've seen retail from anywhere from \$5 a pound to \$7 a pound. You can go now online to Sprout Labs or Perennial Pantry, Sprout Labs was selling wholesale for a while and you can look at the pricing on there for certified organic and non certified organic and you can also go on to Perennial Pantry and purchase advanced purchase there will be selling grain and flour and they're looking at 14 ounce bags for around \$9.50 a pound so kind of like you know like a Bob's Red Mill you know niche artisan grain You know, pretty comparable. Now on the grower economic side, okay, in looking at the production

costs, we usually see about a year one production costs of 300 to \$350 per acre in the crop enterprise budget. This being a perennial, those production costs usually dropped by about a third in years two and three. So you already have a pretty manageable production cost on a per acre basis that then, you know, declines by a third in years two and three. Valentin's comment about the importance of dual use is very much true. So we see growers that are you know, if you're just managing for grain only you, you have the potential to make a profit. There's also a lot of risk involved in relying the whole affair on just that grain harvest. So if you're growing for grain only and we think you can, you know, break even or better, but your revenue potential significantly improved if you're taking the forage, um, the research shows that there's just a lot of biomass out there of, you know, average or higher than average quality. So with I think I'm seeing here Valentin, correct me if I'm wrong about three tons of straw per acre per year, given your kind of standard forage prices, you have the potential to just, you know, cover your cost of production on forage alone. And then you get a grain crop on top of that, and it's gravy and it's a premium grain product, right? So we've seen people you know, breakeven or some people have, you know, their stands have failed, they haven't made it to market. We've also seen people who have, you know, netted \$1,000 an acre, you know, if they had that hot real high now, don't everybody go out and plant kernza, but that's for a high yielding certified organic grain crop with a good negotiated price. You know, I stood on the side of a certified organic grain truck last summer, that 13,000 pounds taken straight out of the field that was destined for a custom or sorry a specialty grain buyer that was, you know, willing to pay for it. And it was a high quality product that met spec and that grower negotiated good price. So there's a lot of components there other than just producing grain, you got to be marketing, your product has to be high quality, certified organic plot, but that's the range, right? So anybody who's interested in the economics of this, it's kind of hard to go through right now, remotely, but I have an integrated supply chain budget that lays out all the costs in the system, not just production costs, but all of those processing steps, the transportation with variable assumptions, variable assumptions for grain yields for forage yields, forage pricing, grain pricing, you can plug and play and look at what your revenue scenario might be.

**JASON FISCHBACH** 53:47

if at some point, right so you know, a couple dollars or \$4, \$5 a pound that's still pricing when it's a specialty niche crop, but if we're talking millions of acres of kernza, and we're supplying nationally branded food products through General Mills right now we're in the dollars per bushel range, I would assume something like that. Is there so I've read that the kernza has about a fifth the production of wheat, for example. Is there? Is there enough room within the intermediate wheatgrass genome to get yields higher? Or is this going to be a model that's always going to depend on the forage crop. Once you get to scale, to have a market for that crop.

**Valentin Picasso** 54:30

In terms of their of their breeding. We haven't seen any slowing down of their breeding progress over this over the time. And so when you compare with the first cycle of selection, the grain yield has gone, I think tripled already. And it's continued to grow. So we expect that in 10 years, maybe that the grain yields would be, you know, doubled what they are now or even higher. So it's it's hard to say but we we envision that in the long term, the yield of these perennial grain crop would be much higher compared to what it is right now. That's one thing. Now, I think that forage would still be an important part. And and and that's actually good. I think the the systems that integrate grain and livestock are, you know,

more sustainable in general. And so the ability to utilize the forage biomass, it's going to continue to be important, I think, not that maybe it won't be needed for the profitability, maybe I don't know. But but it would certainly be important for you know, also the ecosystem services and the environment and so on.

**Colin Cureton** 55:47

All add in that too, and that's to say, Jason, your question about kind of pricing over time, and I think as efficiencies and scale increase, it might be reasonable to see prices come down a bit but the idea is that also yields are gaining on that. But I want to go out on a limb here a little bit and say that we, I think we need to be careful about making this another race to the bottom commodity. And we're working with a lot of growers on what the best way to do that might be. It might be, you know, the economic model of, you know, a printer growers cooperatives that can really manage supply with demand. I think one of the challenges is even if you successfully commercialize a new crop, you know, the history of agriculture is such that we get on the supply treadmill, over produce, prices crash, and then growers are back in the same position. So what can we do to maintain value for the grower deliver, you know, economic sustainability, not just these ecosystem services that the public is going to benefit benefit from?

**Carl Duley** 56:53

A little bit of a step back though, let's let's talk about this seed itself, is first of all, there's only a lot of interest with gluten is kernza gluten free? Second of all does it have to be de-hulled before you can do anything with it or because there's a lot of interest I think in some of these new crops or regenerative crops however we want to state it in the in the small bakery the home bakery the specialty crop idea and does kernza fit into that or do you have to have lots of infrastructure a dehuller etc to to make this work on your in your in your system?

**Colin Cureton** 57:28

Yeah, so kernza is lower lower gluten, but not no gluten, higher protein grain, which is of interest to a lot of people. It does require at the time being requires dehulling, making rapid increase in free threshing, in the rate of free threshing grain. So I think right now or somewhere around like 50 to 60% free threshing with these varieties coming out and I think you know pretty rapidly progressing toward what we could all call a free threshing grain. There's also people working on malting kernza such that I think you might see breeding programs going in direction or, you know, for some niche uses, you might want to see that hull stay on. And in others, you know, you might want to see that hull, you know, come off in the in the harvest process. So it does require a bit of processing now, which is why we're trying to do that thoughtfully and carefully, you know, in this kind of cluster model, which I haven't talked much about at all. But there there are a lot of costs involved. And just to re emphasize very early days in this this whole affair, so...

**Valentin Picasso** 58:31

I would like to make a plug for a couple of resources that are online. One is the website kernza.org where you can learn more about the story of this crop but also connect with the kernza network. Which are the growers, where are they located? Which are the different partners, research and commercialization and industries that are working with kernza so for farmers and for consumers. For businesses who are interested, all there's a lot of information there. I also want to mention there's the

website of the Land Institute, you can access all the videos of the Kernza Conference 2020, which happened like a month ago. And so there's there's presentations on research and agronomics on breeding and commercialization, there's presentation from farmers who are growing kernza right now. So it's a really good resource to learn more for, for people interested in this topic.

**JASON FISCHBACH** 59:36

Is there a grower association or something forming or growers cooperative or whatever?

**Colin Cureton** 59:42

Yeah, so right now we're co facilitating with a couple grower leaders, the potential development of growers cooperative. There's also in development, more, I would say, based, are being driven by the Land Institute but also in partnership with all of us. A kernza business association. So we're starting to see the development of these, these sorts of entities that like for any other major crop will have a Growers Association, that there may be cooperatives within that are underneath that. So we actually have our next grower cooperatives and marketing call this this week. So we're having those regularly. And so I think we now have what you could start to call a critical mass of growers that recognize they need to have an organized marketing strategy to bring the grain to market and I wanted to also along Valentine's lines, plug a few resources here that we have access to that anybody who wants to get in touch with me, we have a a Google Drive folder with resources for growers, which includes the growers guide, includes the seeding rate table includes all of the notes and recorded calls we've had with growers up until now. There's probably 10 to 20 hours of grower calls on there with still notes and a number of other resources, recorded presentation, slide decks, agronomic best practices, things of that nature. Anybody who wants to get in touch with me can do so. at CURE0012@umn.edu.

**JASON FISCHBACH** 61:16

I just want to say to both you, congratulations, I know you're both kind of standing on and we all are shoulders of those who came before us on these projects. But, man, you guys are rocking, and you guys are doing such great work. And it's so fun to see. You know, to me the essence of public institutions and research being on pardon the pun here but the cutting edge, you know, and trying to develop new strategies and new crops and new options for growers. It's just awesome. So thanks so much for your time. Carl, any last questions?

**Carl Duley** 61:48

Well, once again, thank you. We look forward to seeing I know this year field days are probably not going to be happening but look forward to taking a look at the crops again. Look forward to more releases other. I know you have Clearwater. I'm assuming there's others in the pipeline, and be excited to put some of those in some of our plots and take a look at them.

**Colin Cureton** 62:10

Yeah, well, I wanted to thank you guys for covering this branching out beyond the H's to look at kernza , thanks for having us on. And there will actually be a it's up in the air, whether it will be a virtual or in person field day out in Madison, Minnesota, out in western western Minnesota at a frame farm in July. I don't have the date right in front of me. But I think that's being hosted in partnership with MOSES. So keep an eye out for that. And yeah, thanks again for for covering this today. And I feel like there's so

much more we can talk about. There's a whole cluster development strategy here in Minnesota, investing in three different regions, but maybe we can save that for the next conversation.

**Valentin Picasso** 62:51

Thank you very much. It was great to be here with you. And thank you for the invitation and looking forward to more more discussions on this and other topics.

**JASON FISCHBACH** 63:13

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