Hemp_Brym_FINAL

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Ricky Telg 00:04

This is science by the slice, a podcast from the University of Florida's Institute of Food and Agricultural Sciences Center for Public Issues Education. In this podcast, experts discuss the science of issues affecting our daily lives reveal the motivations behind the decisions people make, and ultimately provide insight to solutions for our lives.

Phillip Stokes 00:29
Hello, and welcome to Science by the Slice. I'm Phillip Stokes, host of this podcast and education coordinator at the PIE Center. This episode is part one of our two part series on industrial hemp. And one of the reasons we're talking about hemp is because the University of Florida Institute of Food and Agricultural Sciences began an industrial hemp pilot project back around 2018. The project aims to support the future viability and sustainability of the hemp industry through assessment of the crop cropping systems and their ecological and economic impacts. And in this episode, I'm joined by the person leading this project.

Zack Brym 01:08
My name is Zack Brym. I'm an assistant professor in the Department of Agronomy. I work from the tropical Research and Education Center down in Miami Dade County.

Phillip Stokes 01:09
and Dr. brim is an agro ecologist. And as you may gather agro ecology marries the interests of Agronomy and ecology. Much of his research explores how production systems can remain profitable, while conserving natural resources and protecting the environment. And that's exactly the approach

he's taking with the UF/IFAS industrial hemp pilot project. Here's Dr. Brym discussing that agro ecology approach as it relates to industrial hemp research.

Zack Brym 01:48
When I was hired at UF/IFAS, I was a new member of a new discipline to the university, that is agro ecology. And so that approach fragger ecology one where you try to understand both the production and environmental impacts of agriculture in the surrounding area, on the farm in our communities. And so bringing a new crop into the state is one interesting way to add plant diversity into our farming systems. With that plant diversity comes sort of an interruption to our farming system, it could be a positive interruption, one that allows farmers to have a new crop choice, it could also be one with environmental impacts that we need to be mindful of. And so that agro ecology approach is one that I bring to the hemp Research at the University of Florida. And what lays out our primary objectives for the fist industrial hemp pilot project.

Phillip Stokes 02:55
I want to pause here and reiterate a point that Dr. Brym made that bringing in hemp is a way to add plant diversity into our farming system. He also mentions that it brings an interruption so to speak, but potentially an interruption that the state of Florida is primed to receive. Here's Dr. Rob Gilbert Dean for Research with you UF/IFAS discussing why he thinks the time is right to explore alternative crops such as hemp.

Zack Brym 03:24
And I think that the industrial hemp this brings together issues both basic and applied that we need to work on. And the time is right to look at alternative crops around the state. We've had a number of different issues in terms of tropical storms, Michael and Irma going across the state diseases that are growers are facing different invasive pests and diseases that we face trade agreements which are causing economic stress, and so we need to investigate alternative crops. industrial hemp is a great example of a promising alternative crop for Florida.

Phillip Stokes 03:59
So if you're listening and you're still wondering why hemp it's a pretty simple explanation, it's another crop option for farmers with potential to bring economic and ecological sustainability. Of course we have so much more to cover in this episode, starting with the next question. What is hemp and how you define him is pretty different from practically any other plant.

Zack Brym 04:23
The definition of hemp is a very interesting one to grapple with, because it some ways depends on what you're interested in. So as a plant guy, botanically hemp is cannabis sativa. botanically exactly the same as marijuana, they are the same plant. They are cannabis sativa folks, call them cousins folks call them you know what whatever to in terms of how to distinguish them. But from a biological level, they are the same plant. Now, this plant, which brings on so much excitement has a great deal of diversity in its genetics. And so one of those ways that the plant can be distinguished is by the metabolism of secondary compounds, which we define as cannabinoids and terpenes. That chemical structure within the plant is how we are able to distinguish hemp and marijuana. that distinction then becomes a legal

one. So 0.3%, total Delta nine THC tetrahydrocannabinol is this legal distinction between hemp and marijuana? So the total THC, below 0.3% is legally defined as hemp above that threshold is defined as marijuana.

Phillip Stokes 06:05
So to the human eye, if I'm walking out there, or maybe even you're walking out there, I don't know. You see the plant, there's no way to distinguish any cannabis sativa plant from one from the other unless you actually test for these chemicals. And I'm not going to try to repeat the name of it but the THC Right.

Zack Brym 06:31
So that's exactly correct in terms of the ability for someone to distinguish, looking at a cannabis sativa plant, whether it is hemp, or marijuana is not a sure thing. There are signals, particularly with the grain and fiber varieties that we are looking at as well. Those are the tall spindly ones, there's a million of them an acre, maybe. And, and you can get an idea that that's probably industrial, in terms of the use, or the purpose that it's being grown. The way that it's been bred is that emphasis on stem production for fiber or seed production for grain. And so, over 1000s of years, there's been an emphasis on those parts of the plants instead of the cannabinoids. Of course, over the last several decades, we've also made different choices. And that is the selection of cannabinoid production, whether you're in a medical marijuana industry, or you're in the hemp industry looking to extract essential oils, the cannabinoid of interest for essential oils and hemp is CBD or cannabidiol. And so those plants look a lot like the marijuana plants that we see in the medical marijuana industry. So those fields of hemp can very much look like field of marijuana. Also to point out, I mentioned visually you can distinguish between grain and fiber and essential oil, hemp. But we've also seen the grain and fiber hemp that has exceeded the THC threshold or gone hot. And so again, not a sure thing, and not something that someone should attempt to convince somebody that they can do. An interesting point is that the challenge of extracting those oils that you need in order to do this test, separating the different cannabinoids from that oil, and then getting a value for how much THC or CBD or whichever cannabinoid you are interested in is one that requires a laboratory with some really high-tech stuff. And so there are some field tests that are coming along. But if you think about the conundrum in law enforcement, one where a law enforcement officer approaches a hemp field not really sure it's supposed to be they're not really sure if it is hemp or marijuana, is a challenging thing. And so that's where we see a lot of these regulations come both at the federal and the state level in order to try to alleviate this challenge where we're pretty sure it's hemp. But we have no way of knowing other than tracking where the material came from. I'm in order to be farmed and where it's going and how it came out of the field. So important things to be thinking about as a farmer, if you're getting interested, certainly important things to have prepared as you enter planting of hemp.

Phillip Stokes 10:17
So I think you're just you're talking about so many things that make the production of hemp and growing of hemp a challenge. I mean, it sounds like on one hand, it's an extremely versatile crop. But also, I mean, from a regulation standpoint, and just being able to keep your crop at that appropriate level, there's going to be challenges with that. Just one quick question I want to ask. So if a farmer is growing hemp for, I don't know, they're trying to keep those levels, those cannabinoid levels at an acceptable

range? If they do kind of break that threshold? Does it matter? If it's going to be used for something that is not? That is not the purpose of, I don't know, an oil or something like that? Help me out, help me understand, I mean, from or is it really just matter from a regulatory standpoint?

Zack Brym 11:14
Well, that is an important question. It's also one that I will do my best to answer without sort of objectifying the situation, right. Which is that the federal government has defined hemp as an agricultural commodity, marijuana remains a controlled substance. And so, 0.3% THC, unless you got an agricultural commodity, something that you can sell on the market. Of course, with all the licensing and, and things that are that required. If you exceed the 0.3%, then you have marijuana in your field, mostly, so there is an allowance for exceeding the threshold, because it's kind of easy to do. Or you can do it on accident. And so the USDA just put out their final rules for regulating hemp across the country. And one of the things they did was describe an allowance of 0.3% to 1%. For sort of mitigating circumstances, you can get a strike on your license, but you won't be held accountable for criminality, or as they define it negligence. If you have hemp, that's better than 1%, you probably had either no idea what you were doing or getting yourself into, or you did it intentionally. And so that's kind of the idea behind the negligence. The definition of him still remains that 0.3% THC and farmers are going to want to avoid that if they're going if they expect to sell their crop.

Phillip Stokes 13:23
Sure. Now I think I'm probably getting ahead of myself because I still want to learn a little bit more about what hemp we talked about what hemp is, yeah, what is hemp used for, and historically speaking, what hasn't been used for currently and then in the future. So you have this raw plant material then what?

Zack Brym 13:45
So I'm actually going to take it a step farther back, which is in describing the different cropping systems for hemp. That's one of the exciting things about this crop is that you have options. You have a diversity of outlets for your raw materials. You have a diversity of choices to make as a farmer, and that comes down ultimately to what you're trying to produce the historical hemp cultivation going back, all the way to the beginning of agriculture, really, is the grain production. These plants were found and happened to grow nice, edible seeds for use as grain. If you brought the seeds along and happen to drop them in your mittens. They were performed very well. It's kind of understood to be camp follower, so that grain production requires pollination of the female plant in order to produce seeds. So we talked about grain, male, female pollinates, the grain most folks are familiar with, or can at least imagine what that would look like. If you are then moving into more of the industrial times, colonial times, so colonial to industrial, I suppose, then you're starting to emphasize the fiber production. These are the systems that were brought over to the Americas, in order to make rope in order to make sale in order to make the materials that were necessary, basically, to colonize these areas. And so, historically, at the United States, we see hemp cultivated in those early colonies, the eastern seaboard. And then as we move west into what's now the Midwest and the Great Lakes states, we sort of populate the farms with those plants at that period of time. Again, fast forward to the modern day. And we've added this new cropping system. So recall that there's males and females, the female flower producers are also the ones that produce the cannabinoids, sort of those essential oils that are extracted from on pollinated flowers are

then processed or used in whatever sort of products so we have the grain system requires the males and females and the pollination, we have the fiber system. The best fiber comes from plants just before they flower. And then we have the flower production, which is all females in the field, and cannot have any pollen. So there's the conundrum. Let's have all of these things produced for hemp. But we need pollen on one thing and not pollen on another thing. So lots of choices. The three systems one of the things we do know is that by pollinating a flower, you draw down the cannabinoid production. And so perhaps that's a mitigating factor for the risk of going hot in your crop, your crops probably not going to go hot if it gets pollinated. But then again, you're not going to have the material that your processing facility is going to be asking from you.

Phillip Stokes 17:44
So I want to back up and add a little more historical context to what Dr. Brown was just explaining regarding the use of hemp throughout the world and how it traveled to the US. First off, hemp goes back maybe 10,000 years. The first record we have of cannabis associated with humans is about 6000 years ago in Central Asia. It made its way to Europe around 1500 BCE, and eventually production for fiber held more value than any other use and was used by maritime countries for Canvas and cordage. In fact, the word Canvas was derived from cannabis. Around 1645 hip became a very important crop in colonial America, presidents Washington and Jefferson both grew hemp on their land. So now we catch up to the early part of the 20th century. That's when hemp production declined. That was due to competition from other fibers, such as cotton and jute. sailing ships were replaced by steam and fossil fuel powered vessels. And later on, there were concerns for hemps hallucinogenic properties, and Congress passed the marijuana Tax Act in 1937, which placed cultivation of all cannabis under control of the US Treasury Department and required growers to be registered and licensed with the federal government. In principle, this act aimed to restrict the use of the plant as a recreational drug. However, in practice, it effectively ended hemp production in the United States until the US entered World War Two in 1941. And imports of industrial fibers were cut off so several 1000 farmers were recruited to grow what was called

hemp or victory. In 1942, patriotic farmers have the government's request rather than 36,000 acres of seed hemp, an increase of several 1,000% the goal for 1943 years 50,000 acres of seed hemp, this is hemp seed. Be careful how you use it. For to grow hemp legally, you must have a federal registration and tax stamp. This is provided or in your contract. Ask your triple A comma demand for your accounting agent have Don't forget…

Phillip Stokes 20:03
you may have noticed the narrator's reference to extension when he says to ask your county agent about it. Always nice to hear a historical reference to extension. Now fast forward to 1970 the Controlled Substances Act is passed. And once again, the emphasis of this act is on the cannabis sativa plants that are being cultivated as marijuana. However with this passing all cannabis sativa is classified as a schedule one drug, making it legally one of the most dangerous substances carrying the highest penalties. So given all that historical context, I asked Dr. Brym to explain how we got to the point we're at now, where the University of Florida has established an industrial hemp pilot project.

Zack Brym 20:47
It starts in 2014 with the federal agricultural act, that's also known as the Farm Bill. That was the first time that hemp was distinguished from marijuana in our federal legal structure. And that was the pilot projects phase of this reestablishment of hemp cultivation. So several states jumped out right in 2014, to administer those pilot projects as offered by the federal government. Florida got to its pilot project law in 2017, gave the land grant universities in Florida, University of Florida and Florida A&M University, the opportunity to establish pilot projects. And that's when we got to work at UF.

Phillip Stokes 21:51
I assume there are some partner farmers that you've been working with during this pilot project. Is that correct?

Zack Brym 21:59
Yes, the I said in stages and phases. Another advancement for 2020 is that we were able to move our research off University of Florida facilities, right that first year, if someone else outside of UF was found to have hemp, it probably came from the University of Florida, or at least, there was enough fingers pointing in our direction, we wanted to be very cautious. 2020 with the commercial licenses available, we moved our research out to farmers. And I would say that was my favorite part about 2020 in terms of hemp that was a really important milestone that we could learn together, as opposed to just doing it behind our fence at the University of Florida. So the permit, and the work that we're doing has really expanded from the first couple years just building the infrastructure. Taking our first attempt at accessing the material and growing the crop 2020 really expanded the program not just to include farmers in the community by other researchers at the University of Florida. And, and really helped develop the team, which I really want to emphasize sort of as much as I can, that this really was a team effort at UF/IFAS really committed to getting that information out to folks. And it's taken some time to get our feet under us to be available in support of the industry. And it's exciting to be sitting here feeling like 2021 kind of represents that transition from just trying to race to catch up to having some information that we can share and sort of engage in a dialogue that really looks to establish some solutions around this new cropping system.

Phillip Stokes 24:17
So what is some of that information that you've learned over over the past few years?

Zack Brym 24:23
Absolutely, So can hemp grow in Florida, we've shown from several locations, that if you put hemp in the ground from seed or from a transplant, that we can keep these plants alive, and they can aim at a productivity that we would be expected from commercial farmers. Now we've also seen a lot of other things. Interestingly, for Hemp flowering is triggered by day length and this day length is probably cued by the origin of those genetics. So wherever this plant has historically been adapted, most of the genetics that are available are from northern latitudes. So you think about those hemp regions in the north, we're talking about Canada, we're talking about Europe, certainly farther north than Florida. So what happens when you take those genetics that are available commercially, and you bring them into Florida? Well, in some cases, we put them in the ground, and within two or three weeks, they're already flowering. So that's not good for anything sort of production. And one that is sort of an interesting piece

of the research that I'd like to do. Can we access genetics from a region that would match our latitudes? Can we use genetics that may be neutral to de length? Can we craft our cropping systems where flowering might occur a little bit earlier. And so this year, we're looking at genetics from Southern Italy, we're looking at genetics from Australia, sort of areas that may be at least closer than the northern latitudes of Canada, and Europe. The other one is the fertilizer. So fertilizer requirements for hemp. expectations from hemp doesn't need any fertilizer to hemp needs as much fertilizer as some of our most fertilizer dependent crops. It's probably somewhere in the middle. But if we don't have some guidelines or information available to farmers, then they're just kind of making their best guess or their philosophy on what a plant needs. Let me just dump the whole bucket on it. Please don't, please don't dump the whole bucket on it. You probably have to give it something, whether that's organic manure, what composition of nitrogen, phosphorus, potassium, micronutrients, those are things that we have a lot more information available in the greenhouse in the controlled environments than we do out in the farm. But not only is Florida going at this, but there I have collaborators across the country that are going at this as well, other scientists that that we're talking to are sort of narrowing in on that window. So I've talked a bit about the critical questions we have for agriculture, and agronomy, that production of hemp, those cropping systems that we have to design, those genetics or varieties that we're chasing, to bring to Florida. That's very much top of our list for the pilot project research that we conducted. There's also this other piece that is critical, the environmental and ecological impacts the understanding of fertilizer applications in terms of leaching. Also, another one that's unique to the program at UF is this investigation into invasion risk. So you bring a new plant into the state of Florida that doesn't have any records of having been here commercially. The assessment of that introduction comes along with this invasion risk assessment. And for Florida, that comes out as high invasion risk. Let me just say it plainly as a new crop for Florida, cannabis sativa, is assessed to be of high invasion risk. And so that's something that's critical to our research program at UF. It's something that's unique to our program, and nationally, one that we're interested in as a critical component equally to the agronomy. So at the same time that we're working together information for farmers, we're also working to understand what kind of impacts that this crop might have environmentally, for instance, leaching of nutrients or use of water, and ecologically, for instance, the escape from cultivation.

Phillip Stokes 29:42
I do want to ask a little bit about the future outlook of hemp production in Florida, and kind of maybe coming back to how successful it has been and then wrapping in some of the challenges, just sort of bringing all those together into what you see as the outlook going forward.

Zack Brym 30:02
My outlook is still cautious optimism that hemp grows in Florida. Something that we've seen something that we've demonstrated, we've put together crops in our research that would be commercially viable. We haven't done that at scale yet. And that's a big question. Can we do it at scale? Do we have access to the genetics that we need? Do we have the markets, I think that's probably the biggest one, right now, if you're going to grow hemp, make sure that you have someone to sell it to. Because it's expensive to get the genetics, whether you're paying for plants, whether you're paying for seeds, that sort of access to the hemp that you need, in order to put it on your farm is still being developed. I think that was one of the things that I had to one of the things that I had to really grapple with in the early days was the lack of available genetics or lack of available information, and the need for all of that right

away. So it was very much a part of the conversation, what sort of reasonable timeline it would take to get this information out, we got our first report on fertilizer last year, we're probably going to take another two to three years to really put together that science that that supports fertilizer guidelines, it could take a decade or more to put together genetics that really match. I really like using the example of blueberries in Florida. It's almost been 100 years since we started blueberries in Florida. And maybe the first 10 to 20 years was like, okay, we found a blueberry that'll do. And it's taken like 100 years to get to this is a really great blueberry, blueberry for Florida. And so those reasonable expectations, I think, are helpful to explain. But also now that farmers have had a chance to do it. It's it's sort of more of that reality, where am I going to get my material? Who am I going to sell it to? How do I grow this crop successfully? All of those things are exactly what we want to be able to share in terms of insight and sort of support for the the industry and all of those things that that take time.

Phillip Stokes 32:48
So if if you can look in your crystal ball, do you think there there will be a market for for hemp whether it's the flowering plants for the oil or for the fibers? I don't know. Do you think there's a market for for moving in the future?

Zack Brym 33:05
Sure, well, we'll declare this crystal ball scenario. So I'm not on the hook for my projection. Right now, the emphasis from the industry is on essential oil production on CBD oil. That is how the pilot projects across the country shook out. As time went on, more folks, were producing the flower for essential oil. We've seen a deep decline in the value of that crop, sort of the processing, and marketing of the CBD oil has not yet outpaced the farming. Of course, that was the opposite of the very beginning. All of the processors are like I want more plant material, I want more plant material. Well now we're right on the other side of the equation. So my target as a researcher is more of the long term for it's going to take a while for these questions to shake out in the industry. And a lot of that is going to guide the research that's happening at the University of Florida. A lot of what I've talked about is the lowest common denominator for all of these things. If we need to know how hemp grows or can it grow or what kind of water or fertilizer does it needs. I'm okay with taking the approach that by and large cannabis sativa requires a similar environment. We know and I've described that to not be exactly true. But at least as far as research approach, we can sort of go after that and learn something about the crop we have. And we're working on sharing that information making that information available for folks. So they can understand their system, in terms of this information making choices make decisions, with the best available information that we're able to provide. My long term outlook is a rebalance of the grain and fiber. So I represent the Department of Agronomy, the grain in fiber is something that would match the equipment. And the systems that I'm familiar with and working with, I also see the grain and fiber as having an edge in terms of the sustainability conversation. So it's the grain and fiber crop that is going to provide carbon to the soil, maybe even used as a cover crop, in some instances, may be used for phytoremediation pulling up heavy metals. Of course, the heavy metals and those sorts of things wouldn't be a consumer product. And so we have to figure all those things out. But as a long term industry, I'm sort of moving at least my personal research interest towards that, because as an agro ecologist, I can explore this space of sustainability in a system that we can probably draw down inputs farther, whereas the plants for flower production, we're cranking them. So that being said, there's this interesting compliment. In asking this question, can the industry be sustainable, where we can sort of

have one system, the grain and fiber that can probably work with limited inputs, will perform better with more with, you know, the sort of ideal or optimal amount of inputs, and the flower system sort of on the opposite side of that equation, where you have to have enough inputs in order to have good production, and you might add a little bit extra in order to do better.

Phillip Stokes 37:35
One of the things I was very impressed with while speaking with Dr. Brym, is his attention to detail throughout this exploratory phase of hemp cultivation in Florida, the experimental designs are in place to lay the groundwork. So current and future growers have evidence based research backing up the decisions they make in their fields. And all of this work is being done with input from growers with a sincere and honest approach. As he explains here,

Zack Brym 38:02
our approach from the beginning has been to be transparent and open as a resource for farmers in Florida. I know you want all of the answers now. And I sympathize with that. In some ways, that gives me job security. And I'm also mindful of that, saying I don't know or having sort of a drool of non answer, for some of these very direct questions is something that I've had to work on over the last couple of years, something that I've had to grapple with. But it's the reality, and I'd much rather folks understand where we're coming from at UF/IFAS, and the stage that we are with our research and our education. And what's cool about 2021 is now that we can do it together, that there are farmers with commercial licenses that are doing this that are taking a shot at it. Hopefully they're doing some homework before they jump in and have answers to those critical questions. Do my genetics match our light environment? Do I have an idea what a balance of fertilizer and irrigation is going to be for this crop for my soil for my farm? Making sure that there's an environmental containment plan and a commitment to keeping hemp from escaping cultivation and that we're sort of having a productive dialogue. It may not happen at a rapid pace or as quickly as as Everyone would want needing answers in the industry. But just to emphasize that our goal is to be here in support of the industry, provide this information accurately, with support from the science. And one of those ways that we're doing that, as a program, we're doing this actively, it's not like I'm just saying, I want to be engaged. We're doing stuff about it, right? We had workshops and field days when we could in person, we're doing the virtual thing this year. But also, I'm working with folks at the PIE Center, to do the social science to gather the information from the public, to survey commercial farmers, to work with our partner farmers to gather this information from their perspective, so that it's not just my perception of what people need or what they think about hemp what they know about him, but that it's really coming from that place of good science as well.

Phillip Stokes 41:20
I want to thank Dr. Zack Brym for being a guest on science by the slice. In the podcast description. I've included links to a couple resources developed by Dr. Brym, other researchers at UF. One is a fact sheet document on hemp fertilization, and the other is a virtual workshop on industrial hemp. I've also included a link to the UF/IFAS hemp program website, which is programs.ifas.ufl.edu/hemp. Once again, you can find those in the description of this episode. And Dr. Bryms last statement, he mentioned that he partnered with the PIE Center to conduct social science research. And that's exactly what you're going to hear about in part two of our hemp series, how the public views this topic. So be

sure to listen to that episode available now. As always, I want to thank my coworkers in the PIE Center for working on Science by the Slice. Michaela Kandzer, Sydney Honeycutt, Ashley McLeod-Morin, Alena Poulin and Valentina Castano. Be sure to subscribe to this podcast. I'm Phillip Stokes. Thanks for listening to Science by the Slice.