MULCH MATTERS EP. 22

Beyond Plastic: Dr. Shuresh Ghimire on Extension Partnerships, IPM, Hemp, and Smarter Mulching Solutions

[00:00:00] Nataliya Shcherbatyuk:

Hello and welcome to the *Mulch Matters Podcast* where we will explore the intriguing world of mulch and its impact on agriculture and the environment, as well as update you on the latest research about soil-biodegradable mulch and recycling options for plastic mulch. I am your host, Dr. Nataliya Shcherbatyuk, and I am a communications specialist for the project, *"Improving end-of-life management of plastic mulch in strawberry system"*. In each episode, we'll dive into the latest research, trends, news, and insights on why mulch matters and how we can improve plastic mulch end-of-life options. We'll also branch out and discuss other plastics as well as talk to researchers, experts, and practitioners in the field who will share their insights and experiences on how to use mulch effectively in different settings.

[00:01:15] Nataliya Shcherbatyuk:

Welcome back to our podcast and help me welcome our guest today, Shuresh Ghimire. Welcome, Shuresh. How are you?

[00:01:18] Shuresh Ghimire:

I am good. Thank you for having me, Nataliya.

[00:01:22] Nataliya Shcherbatyuk:

Oh, absolutely. Thank you so much for being here.

[00:01:25] Shuresh Ghimire:

Yeah. I'm excited about this.

[00:01:27] Nataliya Shcherbatyuk:

Well, let's then just jump in straight to the conversation. So, can we start with you telling us a little bit about yourself, who you are, also about your journey from Nepal to becoming an assistant extension educator at UConn. And how did you actually experience shaped your interest in vegetable and hemp production. So, take it away and talk about yourself.

[00:02:01] Shuresh Ghimire:

Yeah, this is a great opportunity for me to talk about myself. I love it. I love your first question.

[00:02:08] Nataliya Shcherbatyuk:

Fantastic. I love it.

[00:02:10] Shuresh Ghimire:

Yeah, I grew up in a rural farming family in Nepal, quite away, other side of the planet. We had a farm, um, small and diversified about 2.5 acres, and we occasionally lease an additional one to two acres. Leasing would mean giving half of the harvest to the landowner. So, from my childhood, I was involved in farming. I did most of the plowing, field plowing, using a tractor. a pair of oxen, which you might find interesting. I, by the middle school, I was the plow man. We grew lots of varieties of crops. Main crops were rice, corn, wheat, mustard, lentils, potatoes, and all kinds of vegetables. There was one incident that I can never forget, that was, about herbicide, the use of herbicide was not as common as the use of other insecticides and fungicides. But I was I, as I went to agriculture college, I learned more about herbicides. And one day I was using 2-4D, which is broadleaf weed killer, in my wheat field. And my neighbors saw me spraying in the middle of the field with something to kill broadleaf weeds. And they could not believe that I would not kill my wheat because, again, herbicide was not as common, but eventually I was able to kill all the weeds and our wheat that year was fantastic, much better than previous years because there were no weeds. What I want the point I want to make here is I, from my childhood, I was engaged in farming activities, and that sparked my interest to go for agriculture degree. I did my bachelor's and master's degree in agriculture from Nepal. And then I worked in the Department of Agriculture in Nepal, where I was exposed to other farmers, opportunities and challenges in farming. I was working with. various farmers groups and got to learn about their challenges. Um, mainly those challenges were like disease and pest management, lack of quality seeds, um, just being poor and not having sufficient capital and are on so unpredictable market prices. Those were major challenges of the farmers, how I got here, uh, that's interesting twist, I was working with farmers groups, um, for the department of agriculture, and the department was promoting organic farming, but farmers groups did not have all the effective tools needed. It was one incident where farmers were asking me about chemical alternatives, for late blight management in potato, um, that. You probably know about this disease. This is a devastating disease, can cause 100% of the crop loss, are good fungicides available, chemical, but at the time I was not aware of any non-chemical alternative to managing late blight. So, so that, um, Sparked. That was like a point. I came back and rethought about my own knowledge, need to advance my own knowledge, and I saw the gap between policy government had and then the practical solutions that farmers have need to have and I saw the gap and I started searching for higher education and I found Washington State University, that was focused on organic and sustainable agriculture. So I came to Washington and it opened the door to here I am today.

[00:07:02] Nataliya Shcherbatyuk:

Nice. So how many years have it passed since you graduated from Washington State University?

[00:07:12] Shuresh Ghimire:

Yeah, I graduated in 2018. I started in 2015, and I graduated with my PhD in three years. And I joined UConn in July of 2018. So I have been a little over six year into my current position.

[00:07:30] Nataliya Shcherbatyuk:

Oh, nice. So, it seems like we've been taking some classes together the same time when I was doing my PhD at WSU as well.

[00:07:38] Shuresh Ghimire:

Yeah. That's certainly possible.

[00:07:44 Nataliya Shcherbatyuk:

Absolutely. Oh, yeah it is possible. I mean, we are already two examples of it as possible. So, you know, I really liked that you brought, and you basically started the conversation with herbicides and weeds. And so, our project that we're working on is all about mulch, right? And we know that mulch is quite beneficial to fight, again, the weeds, to decrease weed growth and, and it's extremely needed in any crop production. And, uh, I know that you've been heavily involved in IPM for vegetables and vegetables and hemp crops and IPM is, you know, quite connected to the conversation about herbicides, weeds and mulch and all of that. So, could you please explain what exactly IPM is and why it's critical for sustainable agriculture?

[00:08:47] Shuresh Ghimire:

Yes, absolutely. And my official position title is IPM Specialist. I'm now Associate Extension Educator and Vegetable IPM Specialist. So, I love this question. So, IPM stands for Integrated Pest Management. It's a sustainable approach to managing pests, which could be insects, diseases, weeds, or any unwanted wildlife in agriculture, so it combines multiple strategies to control pest population with the focus on environmentally friendly, economically viable, and socially acceptable, socially acceptable ways. So, three important things while doing IPM. It's combination of various approaches, and then that all of it has to be environmentally friendly, economically viable, and socially acceptable. The goal of IPM is to minimize the use of chemical pesticides. We just gave examples of 2-4D. The goal of IPM We use a variety of tools so that the farmers don't have to go for chemical pesticides as much as possible, um, by integrating various control methods, and that would eventually reduce risks to human health, beneficial organisms and the environment. Our vegetable growers in Connecticut, they, most of the growers that I work with, utilize IPM principles, and various strategies to control, Insect pests and diseases, they use a biological control that would be like releasing natural predators, encouraging natural enemies, cultural practices from crop rotation to variety selection, mechanical methods, mulching would come under that plastic mulching or other types of natural material mulching, tarps, other barriers. And we still do not avoid that. We do not take away chemical options. We still keep that chemical option, as a last, last resort if other things do not work. If the pest population is extremely high, we still go to chemical options to save the crop because economically viable is also a principle of IPM. And so overall, it emphasizes long term prevention and proactive measures rather than reactive measures. So, before pests attack your crop, the goal of IPM is to be able to prevent that situation.

[00:11:51] Nataliya Shcherbatyuk:

That's great, that's really interesting. That's a good one, so you've done extensive research in biodegradable mulch or BDMs, what we say, for vegetable production. Could you share the benefits and challenges of using these mulches in modern farming?

[00:12:16] Shuresh Ghimire:

Yes, in the Northeast the share of BDM use is probably much higher than in the rest of the country, talking to the bulk suppliers in this region. We estimate that close to half of the mulch used is BDM, which isn't the case, nationally. It's like less than 10% on a national level, but in the Northeast, the BDM use is much higher.

[00:12:50] Nataliya Shcherbatyuk:

That's interesting.

[00:12:51] Shuresh Ghimire:

Yeah, and then the reasons, the benefits that growers tell us about the benefits because of these benefits, growers are continuing and expanding to use BDMs in their new fields. So, I will summarize some of what I frequently hear from growers in terms of benefits. When I ask growers about the mulch fragments, because we hear a lot about the concern of timely degradation from, from mostly those who have not used it, growers say, Okay. PE mulch leaves more fragment in the field than BDM because PE mulch is supposed to be removed at the end of the growing season, it leaves around 10%, or more in the field even after typical removal because it fragments, um, like, when you make the holes, you're not going to capture all those pieces.

[00:13:58 Nataliya Shcherbatyuk:

That's, you know, I never thought about that part. I always thought that the biggest reason why is because, you know, now they're making them thinner, so obviously they would rip off easier and leave the pieces behind. But holes, it's, it's just like millions of holes that there are tiny bits of mulch in the field.

[00:14:17] Shuresh Ghimire:

Exactly. So, you are kind of intentionally leaving them unintentionally, but because you don't have other ways to get them the pieces from holes out. So, you're digging the holes there. And then during the care with the use of different equipment there is more wear and tear. It, even the polyethylene molds, PE molds, does not remain. intact until the growing until the end of growing season. So, it fragments, uh, even besides those holes. And then the literature and even in field observation, we see that at least 10% of the PE fragments remain in the soil. So that piles up because PE does not degrade at least 300 years. So, it accumulates, and farmers are saying there would be more mulch pieces in the field where polyethylene mulch is used compared to where BDM is used, because BDMs are going to go away in, in a few years, if not like one or two years, depending on the climate. In Connecticut, it usually takes about 3-4 years to completely go away. And other benefits are even though the purchasing cost of BDM seems a little higher, but now they are pretty much comparable to PE mulch it used to be two to three times more expensive. BDM used to be two to three times more expensive, like three to five years ago, but now the prices are very comparable. And when you calculate the removal cost for PE mulch at the end of the season, this is the main reason our growers use it. It, overall BDMs, become cheaper after accounting for removal and disposal cost of PE mulch. That's the main reason that they are using it. And other, other reasons are at the end of the season it is the least favorite task for their farm crew to go and pick the PE mulch in wet and cold fall where, while they are. cleaning up the whole field and preparing for next season. So, and also, we cannot predict the weather usually in late fall in New England. It can be wet and cold, um, and if you have PE mulch you can't go and plant cover crop before you take it out of, from the field.

But when BDM is used, you can just go till it right in and then plant the cover crop. So timing for cover crops is another benefit for using BDM in our region.

[00:17:28] Nataliya Shcherbatyuk:

So, what you're saying, and taking you back to a few thoughts, what you just said before, so what you're saying that is on the big picture scale, on the long term, BDMs cost-wise might be even cheaper than PE. Is that correct?

[00:17:50] Shuresh Ghimire:

That is absolutely correct. That's the main reason growers in our reason are using BDM, again, there are many other benefits but that is economics is the main reason, that's what. The growers care most about, um, in my understanding, they care about environment, obviously, but that's added benefit. But the first thing is that farming needs to be viable, folks are doing it for a living. So, if it was not economical, if they would lose money, they wouldn't use it.

[00:18:30] Nataliya Shcherbatyuk:

Yea, that's definitely there. And also, so speaking about the challenge and you mentioned a few of the challenges overall PE and BDMs So speaking about challenge of one of the challenges of PE, it's the end of the season pulling it back out of field So it's not really favorite activity and the end of season to do, but also, you know, it made me think that it might be a great push to focus even more on recycling of the plastic mulch and figure out the process, how we can be taken out of the field with machine options and not with human labor, pulling it out. So, there is a great, you know, idea that's been working on, it's been worked on currently how to make the recycling of plastic mulch more doable in the near future. Because, I think, you know, if you have machinery that comes to the field and rolls in your mulch out of the field, the activity of the end of the fault is not going to be so unfavorable.

[00:19:43] Shuresh Ghimire:

Yes, that's right. There is work in progress regarding recycling technologies, but you probably know, even the other plastic that everything we put in the blue bin for recycling, you know, how much of that actually gets recycled. The number is very low. I read like 10 percent of what we put in the blue bin gets recycled. So, I am not very much hopeful that this PE mulch with lots of debris test, again, there could be technologies to knock off soil and debris right at the field, but it is still dirty and, and it carries on some, some really good top soil, again, it's great that they are resourcing and trying to, you know, figure it out. But I think BDM is another great option where you are reducing the passage of the equipment in the field. You don't have to go back and forth, remove and dispose. Somewhere and it, it has to travel there. There won't be recycling facilities in every county and even every state. So there, there will be a lot of fuel burning, um, in recycling. Other challenges associated with BDMs are the main one that I find challenging for growers is the confusion in marketplace. There are some products that are marketed as biodegradable and they're not truly biodegradable. There is like a list of things that is recommended or, suggested from anywhere right now, it does not exist. So, I hope in the near future universities, including us, who are working together on BDMs can come up with a list of suggested materials based on the research done. So, growers can use that as research to identify the potential materials that are

truly biodegradable. Right now there is not a real good market control anybody can sell anything and, and they are not well, accurately leveled some of the products. So, the lack of information is a biggest barrier in my mind.

[00:22:29] Nataliya Shcherbatyuk:

Yeah, that's really great. You bring it up because this is important point and sometimes it does seem quite confusion because degradation doesn't always mean biodegradation. Yeah, it can be, for example, oxidation or any other type of degradation, but it can be confusing. And if there is no like, um, you know, instructions in the back of the package were the ingredients. It's hard to make up the mind and you basically read, it's biodegradable. Great. Because producers say, so yeah, that's quite important to put the regulations on that too. Yeah. And, so switch it a little bit. You are widely working now with hemp. Is that correct?

[00:23:14] Shuresh Ghimire:

Yes, I am officially hemp extension specialist as well.

[00:23:19] Nataliya Shcherbatyuk:

Wow, that's new and it's also new. It's relatively new to Connecticut, isn't it?

[00:23:27] Shuresh Ghimire:

So, it's old but new crop. Hemp is not really new in U.S. Before it was stigmatized and criminalized in the 20th century, hemp and cannabis in general had a long history of growing and use for various purposes... One of the first colonies, Jamestown colonies, actually mandated growing hemp to all farmers and you look at the history, all farmers were mandated to grow, like must grow hemp in Massachusetts in 1631. And in Connecticut in 1632, all growers were mandated to grow hemp.

[00:24:28 Nataliya Shcherbatyuk:

Interesting.

[00:24:29] Shuresh Ghimire:

It is not new, but it had gone away. Again, it was stigmatized and criminalized, especially Marijuana Tax Act of 1937 that marked the beginning of its prohibition and then it was classified as Schedule I controlled substance in 1970s. So, that prohibited it's grown it's growing. So, it disappeared, and then it is now coming back. In 2019, it became a regulated crop in Connecticut. Most of the hemp grown were in Connecticut in 2019 and 20, uh, 21, where grown for CBD, which is cannabidiol is a volatile compound. It has thousands of uses but for those essential oils. But there is interest in other types of hemp, such as fiber and seeds, and farmers are investigating into that now.

[00:25:53] Nataliya Shcherbatyuk:

Interesting. Well, you're definitely staying busy. So, tell me are BDMs or any plastic mulches actually being used in hemp production?

[00:26:03] Shuresh Ghimire:

So, when so talking about CBD hemp, which is grown as more as a horticulture crops in rows, beds with mulching plastic or BDM it's spaced apart like a two or three feet apart, for CBD plastic mulch is used and I've seen a couple of farms where they used BDM for hemp but when it comes to growing hemp for fiber and seeds, it's like a field crop, not necessarily row crop, but just like with the seed drill, it's planted too close, like six to eight inches apart, and no mulch gets used in that it's just planted in the soil directly without using it, again, to summarize for CBD hemp, plastic mulch gets used, but for fiber and seed, which is more like a agronomic crop, um, plastic mulch is not used typically.

[00:27:21] Nataliya Shcherbatyuk:

Okay. Great. And so being an extension specialist, I'm sure that you're talking to growers. Basically, every day. Right? So obviously your work involves a lot of collaboration with, you know, not only one organization, but various organizations and agencies. So, what do you think? How important are these partnerships? And what's the benefits? of these partnerships in advancing agriculture practices?

[00:27:55] Shuresh Ghimire:

Yeah, that's a great question. We collaborate with many other agencies within the state, like Department of Agriculture, USDA, NRCS, Natural Resource Conservation Service, Connecticut Resource Conservation and Development, RC&D, and different Farmers Associations, so we all are here to serve farmers, we provide service to farmers. So, when we work together, we amplify the impact, UConn is here to provide educational resources and training. But when we go together with Connecticut Department of Agriculture, who also had some financial opportunities like grant programs when we go with NRCS, who has soils experts, they have, for example, rainfall simulation devices. When we do training, we don't have a rainfall simulation device at our extension office, but NRCS has. So just to amplify the impact, because our goal is common to help farmers to provide resources, educational and financial and everything in between to farmers, when they work together, we amplify that service and farmers get a service in packets, not just like I would go and say, like, use these tools to improve your crop production, but they have the financial resources to do it. But when we go together with the financial resources, they get the complete packet. So, it is really important to collaborate with other organizations with common goals.

[00:30:09] Nataliya Shcherbatyuk:

Yes. Well, I really like what you said that farmers use the service and package, and I think this is so important not to see the value only on one side. And I understand that every team has its own goal to succeed in but when you put all those heads together, it really becomes the package and that's the value the farmers are looking for. And looking forward, Shuresh, what do you think, what trends do you see as the, you know, will have the biggest impact? And if we're speaking about vegetable production and biodegradable mulches in the next decade or so?

[00:30:48] Shuresh Ghimire:

Yeah, that's an interesting question. I was playing with generative AI and the other day I put a two-page article that I drafted and then I asked AI to convert that into conversation. And I was blown away by the quality of the material it generated. So, AI is here, and it is going to be used. It's already been used, but it's more of it. It is

going to be used in agriculture, it will be incorporated with like advancements in sensors, drones, data analysis and then more towards precision agriculture. So, I see AI being incorporated into vegetable production, and because there is limited, growing space, especially in, states like ours, Connecticut densely populated. And when you think about even Boston or New York City, there's very limited space to grow, but a lot of mouth to feed vertical and urban farming. I see it being, like expanded in near future, like growing in shipping container. It is popular around here. It's getting popular and talking about biodegradable plastic molds I think there will be advancement in formulation that will enhance their degradation rates, making it even more predictable degradation in terms of the timeline and leading to better performance and environmental benefits. know, there is some research ongoing around developing spray materials like humic acid and different organic matters. on the plastic to expedite biodegradation. I hope some of that will take some shape and be meaningful. And then just combining BDMs with other sustainable practices such as precision irrigation, soil health management, that will improve overall crop management and sustainability.

[00:33:19] Nataliya Shcherbatyuk:

This is great. Well, thank you for that point. And outside of your professional work, which I hope you do have, what motivates you to continue pushing the boundaries in not only agricultural research, but also education?

[00:33:38] Shuresh Ghimire:

Yeah, I said in the beginning that I grew up in a farming family. It's not like just visiting a farm on a school trip. I lived there. I have seen it. I have witnessed the firsthand challenges as a farmer. Every time I eat my meal, I think about farmers. I think about who grew that food and what conditions they faced. So, I reflect on, on my own experience, and I want to help farmers in my profession or beyond, I don't think there is a clear line between my profession and outside. I want to help those who are trying to make a living. And there, and while, uh, ensuring that the consumers of farmers would be only people who eat. So, whoever eats those are all consumers, that is telling everybody to you to get nutritious and safe food. So, I don't find clear demarcation between my professional and nonprofessional work. I want to help farmers who are trying to make a living out of these farming practices.

[00:35:00] Nataliya Shcherbatyuk:

Wow, this is really great. I have one more question for you. So, you know, not too many years back, you and I have been graduate students, so it's not that far away. And if you talk today to current graduate students and they are thinking about and researching their future step of the career, you as extension specialist. What would you tell them?

[00:35:26] Shuresh Ghimire:

Yes, Extension is a career. I love my job, because I can do a variety of things. I can, obviously, I can shape my own program, but the tasks I would be doing, within the program, an extension position can vary a lot. One day I'd be working with farmers in their own field, making my hands dirty, trying to figure out the problem that they are facing. The other day, I may be giving training, you know, teaching a class, guest lecture at, at university. Next day, I may be providing input to legislators or speaking in front of the legislation sessions providing input or feedback on upcoming rules. So, I like the diversity of things I can do in my position. And most importantly, I get to help farmers. I work; I get to work with them who create knowledge with them and get to help with them

again who are trying to make a living off of a farm. So that is huge for me. and I encourage, students to look into extension as a career, it's great to work in extension. You can probably sense how happy I am working in extension from this conversation. So, consider extension as your future career.

[00:37:02] Nataliya Shcherbatyuk:

Yeah, this is great. And yes, you, you are very correct. You absolutely give a very passionate vibe. You can, I can hear you really like what you do and what can be more important when you do what you like and like what you do. Good job. Well, Shuresh, thank you so much for your time being with us here today. This is great.

[00:37:25] Shuresh Ghimire:

Yeah, thank you for having me. It was great speaking with you, Nataliya.

[00:37:40] Nataliya Shcherbatyuk:

That's it for today and until the next episode. You can find more information by following us on Instagram and LinkedIn by @mulch_matters and going to our websites www.smallfruits.wsu.edu and choose Mulch Technologies. This work is supported by Specialty Crops Research Initiative Award 2022-51181-38325 from the USDA National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed on this podcast are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

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