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EPISODE NAME: Grass Biomass Research (Part 2 of 2)

Good afternoon and thanks for joining us; I'm Judy Simpson. Living in the Northeast requires some source of heat. The majority of Vermonters burn heating oil but some use gas or wood or a combination of two or more sources. But what if you could burn grass? A collaborative research project out of the University of Vermont is exploring the use of a variety of grasses as heating sources. Across the Fence’s Rebecca Gollin tells us more.

Roger Rainville is tending a fire that is heating one of the buildings on his farm. The pellets he is using are local – so local, in fact, that Rainville made them himself in the next room out of switchgrass that he grew. It’s nothing out of the ordinary for the farmer, who has spent most of the past decade trying to figure out how to grow his own energy.

Rainville – “with the switchgrass, there's no question it could be feasible, once we set up properly…”

Rainville is a longtime collaborator with the University of Vermont, and spends his time growing and experimenting with a variety of crops. His work gives researchers valuable information about how those crops react on a working farm.

Roger Rainville/Borderview Farm, Alburgh – “we've got like 3/4 of an acre of switchgrass we initially put in, Sid did, and then last year he put in an acre of switchgrass… and reeds canary - we grow that here anyway to feed the cows, heifers…

Rainville is working with Sid Bosworth, an agronomist with UVM Extension who is researching the potential for using grass as energy in Vermont.

Bosworth - “So this is research looking at perennial grasses not harvested for hay, but harvested for biomass, for energy,”

Bosworth has been testing various sites around the state to determine the ability of different grasses to grow in different environments.
Bosworth – “This is actually an eco-type from Pennsylvania - it’s performed very well in this site which is a well-drained, sandy soil. It has not performed well on our more poorly drained soils, so I'm not sure how much promise it has for Vermont”

The research is comparing a number of factors, from soil and land management practices to climate differences between the sites. The study will look at everything from what the best type or mix of grasses is for Vermont, to how much they will yield.

Bosworth – “You can see these grasses are very stemmy, which I think would be an advantage for biomass, usually the stemmier it is, the less ash there is, it's more like wood... “

The last part of the process is to turn the grass into pellets, and see how well they burn. That’s where Rainville comes in...

Rainville – “We were accustomed to pelletizing softer material, like sunflower meal, canola meal, we even tried pelletizing some manure and whatever - but switchgrass and reeds canary are a little trickier, so we're kind of learning as we're trialing”

A couple of years into the study and some of the grasses are reaching their full maturity, when they will give their maximum yield. Some have grown well, and some haven’t, and there are aspects of how and when to harvest that Bosworth thinks could have a significant impact on how well the grasses pelletize and burn.

Bosworth – “One of the challenges with the grasses is they accumulate a lot more minerals, so they have a higher ash content than wood does. So for a homeowner that means emptying the ash box a lot more often and there are some stoves that it probably is not suited for. But the industry is coming, I'm starting to see more boilers in stoves that can accommodate these... alternative biomass sources.”

There have been some challenges with the equipment. Some of the grass seems to bind together better during the pellet making process, and the pellet machine itself continues to need fine tuning.

Rainville – “We were able to get it to make pellets, so we know that it does work making pellets. I think things need to be addressed with that piece of equipment, I think once its addressed properly I think it'll work good.

Bosworth – (showing pellets) – “these would be similar in size and shape as wood pellets that you can buy for a wood stove however I do want to caution that many wood stoves cannot handle the grass pellets because of the ash content”

Some of the studies have indicated that harvesting some of the grass later in the season could help cut down on that ash content. For a farmer like Rainville, looking to grow his own energy, grass grown on unused or marginal land could be a cheaper alternative to the sunflower pellets he is currently heating with.

Rainville – “Sunflower meal is worth $500 a ton for feeding the cows, it’s real high protein, so if we have an alternative that works good to heat with, and we can do it with the switchgrass or the reeds canary, we'll definitely do that,”
Rainville will continue to grow, pelletize and burn the grasses, helping Bosworth find which ones grow best and the best way to manage them. It’s a long term process, as the grasses need to produce for at least 10 years to make the effort economically viable.

Nats, pelletizing –

For now, aside from the high ash content, the grass pellets themselves are proving that they can compete with established alternatives.

Rainville – “We fill the hopper up with 40 lbs. of switchgrass or 40 lbs. of wood pellets and it runs like 12 hours on that 40 lbs. both, so that we figured the consistency is quite the same, and we're keeping the building at roughly the same temp, so that tells me that without doing all the scientific aspect of it, it tells me that we're burning pretty consistent as far as temp-wise with the wood pellets.”

Although these are only the initial observations, and not a scientific study of the pellets, if Rainville’s results are typical, then growing grass for energy could make a lot of sense in Vermont.

Bosworth – “I think within the next year or two we're going to have a lot of good information as far as being able to provide it to farmers.”

In a few years, after a few more growing seasons, and more time to investigate, Bosworth will have the numbers and figures to go along with his work. For now, though, he and his partners will keep doing what they’ve been doing - growing, studying, and sharing information as it becomes available. In Alburgh, I’m Rebecca Gollin with Across the Fence.

Thanks Rebecca. With me now is the UVM Extension researcher featured in Rebecca’s story, it's a pleasure to welcome back Sid Bosworth. Thanks so much for being with us.

Sid.: Thank you.

Judy.: What is the potential of using grass for biomass energy in Vermont?

Sid.: Our crude estimate is there might be 2 to 300,000 acres of land that could potentially be used for growing grasses. And some of these are based on packed statistics that 20 years ago. In the last 20 years we've probably lost about 200,000 acres of cropland or at least that's no longer being used for crops. Some of that has gone into homes and other development but even some of those homes might be a home on a ten or 20 acre lot that nothing's being done around. Another simple scenario of interest is a buffer zone for corn land along waterways. Could those grow up biomass grass that could be harvested? So I think there is potential and the question is the economics of being able to accomplish that in a very local way because most of this is going to be local. It has to be locally grown. You cannot transport it very far because it's too expensive. It's bulky grass.

Judy.: And the whole point is to save money in another capacity by burning grass.
Sid.: Exactly.

Judy.: How does grass energy compare to wood or other sources of biomass energy?

Sid.: Grass is actually pretty close to wood. Most studies have shown that the energy content is about 95% of that of wood. The BTU value of wood. When you're burning it they're pretty comparable in energy content. Again the challenge is that these grasses have a higher ash content. There are more minerals in the grass so it takes a different kind of stove or boiler to handle these materials.

Judy.: What's the process of converting grasses into heat energy? I know we have some show and tell here.

Sid.: First and this is an advantage of these grasses is that they're grown like hay crops. Some grasses are the same grasses that we presently grow for hay. Many that I'm evaluating now are not that really different. So there is an investment that you're limited on how you'll be able to market that grass. They're grown for hay they're usually harvested once a year depending on the grass and might be midsummer or late in the fall. You want the harvest mature. The hay has to be run through a hammer mill to chop it up and then there's different ways of densifying the grass. Densifying is important for both transportation and handling and also even burning it helps with the burning process. I have some examples. Grass pellets is a term that's often used home and these are like quarter inch pellets just like wood pellets they run through the same type of mill for making. This happens to be switchgrass pellets here. We've made pellets of switchgrass and we've made them with wheat canary grass and we've made combinations of wood and grass together. That is the most energy intensive to make because you have to chop them very fine. A less intensive method is making these what's called briquettes. So the chop does not have to be as fine.

Judy.: It looks like grass actually.

Sid.: Yes it is grass but it's compressed into these briquettes. And then they get shipped into these pucks that are often called. They can vary in size this is obviously a 2 1/2 3 inch diameter and this is smaller about an inch to an 1½ inch diameter.

Judy.: Once again I guess you'd have to use a different stove then the one you could feed traditional pellets in?

Sid.: Correct. Some of the pellet stoves some companies are designing pellet stoves that can handle the higher ash content. Or if you're really careful some people are using these but you just have to clean your stove more often. These are definitely designed for a different type and probably more for industrial type boiler. One of our interests in small business or institutional type used for these grasses.

Judy.: How much land would you need to heat a typical Vermont home if you were to grow your own grass pellets?

Sid.: There was a study done and I think this was a study out in the Midwest that stated farmland I think it meant good farmland an acre could support a typical home for both space heating and water heating.
Judy.: That would be pretty nice.

Sid.: That would be nice but we're focusing on marginal land because we don't want to compete with good agricultural land. One I don't think you'll ever economically compete anyway we will always find other crops that will make you more money. It all depends on the yield I think if marginal and you're going to have less yield my estimates are at least for my home I've estimated it could be anywhere from 2 to 3 acres to heat the home.

Judy.: Is there potential for economic development around the use of this?

Sid.: I think there is certainly from the landowners perspective it might provide a little supplemental income. It's not going to be a big moneymaker but it could provide some supplemental income. There might be opportunities for small businesses that might act as brokers or contract with landowners to come in and harvest and then densifying the product you to provide that back to the homeowner for their own heating or sell it within the local grass basket we call it.

Judy.: What are some of the challenges for this technology?

Sid.: There's a few; one is the chicken egg or just getting the infrastructure going but there's some technical challenges. I mention the ash content and I'll show this. These grasses do take up a lot a minerals like a lot of plants do and unlike a wood where the bark is removed and pellets are made from the core this is the whole plant so you get all those minerals in there. If the stove or the boiler is not adjusted properly you can get these what we call clinkers. It's an amalgamation of the minerals that form.

Judy.: It looks like lava rock.

Sid.: It does look like lava rock. That can form on the grate of the stove. So if you do not have the right kind of stove that's removing these, that could be a problem. Or if the stove is not adjusted properly, that is an issue. So technically we need to have stoves and boilers that can handle a wide range of these kinds of grasses. One of the challenges if you think about these grasses for growing up in a wide range of conditions so their fuel quality characteristics mineral content ash content can vary quite a bit.

Judy.: How can people get more information on this research that you're doing?

Sid.: I have a website and they can go to that the URL is on the screen now it's pss.uvm.edu/vtcrops. I have some information on there and some links to other sites as well. There's work in this area are going on in Cornell, Maine, up in Quebec and also Vermont. My partners and collaborators with the Vermont Sustainable Jobs Fund.

Judy.: I want to thank you for joining us today and bringing in the show and tell.

Sid.: My pleasure.
Judy.: Interesting stuff, thanks a lot. That's our program for today I'm Judy Simpson will see you again next time on *Across the Fence*.

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