Opportunities and Challenges with Aquaponics Systems

Tue, Jan 17, 2023 11:28AM 10:11

SUMMARY KEYWORDS

aquaponics, system, aquaponic system, fish, allen, plants, grow, aquaculture, iowa state university, leafy greens, hydroponic, water, produce, publication, types, unit, christa, small farms, ammonia, work

SPEAKERS

Christa Hartsook, Allen Pattillo

C Christa Hartsook 00:15

Hello, and welcome to the small farms podcast, a production of the small farms program at Iowa State University Extension and Outreach. Our podcast covers the opportunities and challenges associated with rural life. In this episode I visit with Allen Pattillo Fisheries and Aquaculture Extension Program Specialist at Iowa State University. Today we are talking about aquaponics. I'm Christa Hartsook, small farms program coordinator, and we hope you enjoy the show. Allen, welcome. Thanks for being on the show.

A Allen Pattillo 00:51

Thank you, Christa.

C Christa Hartsook 00:53

First off, Allen, can you explain for our listeners what an aquaponic system is?

A Allen Pattillo 00:59

Okay, so Aquaponics is it's a natural process that involves recycling of nutrients in a closed system, and being able to grow plants and fish. So what we're doing is a combination of aquaculture, which is growing the fish and in a controlled environment. We're doing some wastewater treatment from the fish effluent water. And we are doing a hydroponic growing of plants off of that nutrient rich effluent water.

C Christa Hartsook 01:31

Alan, this sounds a little complicated. Is this something that, you know, could be scalable for somebody on a small farm or acreage?

A Allen Pattillo 01:37

Yes, it is actually, I've been working with lots of different types of groups have done some workshops with some youth, where we've done benchtop systems. And we've actually scaled up to something that's more of a home garden scale. And but there are people that can do this as a single family for supplemental income on their farm, something like a high tunnel or a small greenhouse. And but it does have the potential to be scaled up to a commercial scale. So there's anything in between that you want to do

C Christa Hartsook 02:10

perfect. What are some advantages Allen to using a system like an aquaponic system.

A Allen Pattillo 02:16

Well the one thing that I really like about it is that you can grow fresh vegetables during the wintertime here in Iowa, which is, to me one of the best things about it. But it's a sort of a nice sustainable technology where we we can save water and land and energy, that we can have some cost savings there, but also be more efficient, we use a lot less water. So like 90% less water than you would use for some other forms of agriculture grow the same types of crops. The energy, we can combine our hydroponic and aquaculture units to get some combined efficiency there in the land space, it doesn't require you get a considerably smaller footprint for the amount of produce that you're getting out there. So other advantages would include because you can do this in a controlled environment, you can do agriculture near your city, which means you could be near your market and target local production of food.

C Christa Hartsook 03:24

So Allen, and in these types of systems, are you producing them for both the produce and the fish,

A Allen Pattillo 03:31

an aquaponic system, it can definitely produce both. However, about 75% of what you're producing is going to be the produce coming out of the system. So things like leafy greens work really well, these types of systems. But most of the income is going to come from the plant side.

C Christa Hartsook 03:51

Okay, perfect. I would imagine, Allen, that there's some challenges for a system like this, what

are some of the common problems people face?

A Allen Pattillo 03:59

Okay, we have because this is a complex system. And we're integrating different types of agricultural systems, you have to keep your fish plants and the beneficial bacteria all happy in the system at the same time. So you need to manage for each of those and keep them in balance. One of the major things that people have trouble with is maintaining good water chemistry. To start off with things like the nitrogen cycle, we're going to be producing ammonia, whatever the fish waste breaks down. And then you have to be able to have the proper bacteria in place to to transfer that ammonia into nitrite. And then the next bacteria to turn in nitrate, which is your plant food that tends to give people issues whenever they don't understand water chemistry very well.

C Christa Hartsook 04:49

Alan, you mentioned the leafy greens, you know, or things like that work particularly well in a system like this.

A Allen Pattillo 04:56

Yeah, so an aquaponic system because the fee the protein of the fish food breaks down and produces a lot of nitrogen, fertilizer plants that utilize the nitrogen, they use that to make the green shoots or the green leaf weight. That is, is going to be your main product coming out of there. And so leafy greens do very, very well for this. So lettuces are very common. And so things like basil and other herbs do very well in these systems. You can grow any sort of plant in these systems. But in terms of profitability, we look at leafy greens, and herbs and things like that to be particularly beneficial vegetables, if you're if you're on a larger scale, you can definitely do those. I've seen tomatoes and cucumbers and peppers do very well in aquaponics system. I've even seen eggplants and melons and things like that. But in terms of dollars per square foot per day production, you're really better off if you're producing for market to be able to do your lettuces and your herbs.

C Christa Hartsook 06:06

Allen similarly to you know, having specific plants that work well in a system like this. Are there fish that work better in a system like this?

A Allen Pattillo 06:15

Yes. So like you can do just about any plant you can do most any fish, some fish are a little more. They handle a controlled environment a little bit better. So one of the most common fish used in aquaponics is the tilapia, particularly Nile, tilapia is one that I've used a lot here, I've also worked with Barramundi. Now keep in mind, those are two tropical species of fish. They can be grown in fresh or saltwater, which is nice. On a smaller scale system, you might look at

something like ornamentals, goldfish, or potential or other types of fish that you can get from the pet store, you may want to consider looking at some fish that are native to the area, because they'll be able to handle the temperatures very well. But you want to make sure whatever the fishes that it will get on a pelleted diet because we're going to be feeding them pellet or flake feed into the system. And so they need to be able to eat that sort of food. If you want to go on a large commercial scale for something in the cold climate, you know, trout and salmon might be another option for you.

C Christa Hartsook 07:26

Allen what types of equipment am I going to need? What are my basic needs to get started with something like this?

A Allen Pattillo 07:32

Yes. So in just an overall system for aquaponics, you're going to need to supply these things fish tank, so where to culture the fish a solids filter, area, biological filter that's going to do the nitrogen cycling, you're gonna need a hydroponic unit or somewhere to grow the plants, there's going to be a sump, which is an air a low area to catch the water, and a pump to pump that water up to the highest point in the system. And you're going to need aeration to the system. Now, not all of these components have to be separate. You can combine a solid filter tank with a biological filter, I use in one of my research systems, I use the hydroponic unit also as the sump. But you're also going to want to have considerations for what your water source is going to be, what your electrical source is going to be what you're going to do for light for your plants. How are you going to control temperature? And how are you going to control insect predation and other disease issues?

C Christa Hartsook 08:38

Okay, Allen I'm assuming we've got some great information from Iowa State University Extension and Outreach that folks can look up and download.

A Allen Pattillo 08:45

Absolutely. So we have also the North Central Regional aquaculture center, I just developed a publication on hydroponic units for aquaculture aquaponics systems, developing one that's going to be aquaculture components, and there's a series coming out for aquaponics there. Also, there's there's publication from different institutions as well. So just give me a contact me, and I can get you to those different publications.

C Christa Hartsook 09:17

Perfect. Thank you, Allen, anything else we should cover for our listeners if they were interested at all in aquaponics?

A Allen Pattillo 09:24

Well, if you're interested in aquaponics, I do have I do have a Twitter. My handle is at ISU underscore aquaponics. And you can look that up and you can see what we're doing. That's where I put out any workshops that I'm doing any new publications or new developments on what we're doing here at Iowa State University. So again on Twitter that's at ISU underscore aquaponics. If you want to get ahold of me directly, my phone number is 515-294-8616 and you can email me at Pattillo pa t t l ll o at IA state.edu

C Christa Hartsook 10:06

Alan thanks so much great information today

A Allen Pattillo 10:08

Thank you Christa