GROWERTALKS

Features

2/26/2016

A-Frame vs. Curved

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Greenhouse roofs come in two basic shapes: arch (or Gothic arch) and A-frame. But why? Have you ever given much thought to why you'd choose one over the other, beyond aesthetics, tradition or "that's what my builder recommended"?

So we asked greenhouse structure experts: What factors determine this decision? Here's what they had to say:

Arch

Why choose an arch-shaped greenhouse? First, they're generally less expensive to construct because there's less internal structure. Instead of welded or bolted trusses, the structure is made up of curved bows and simple purlins.

You can erect this style of structure with your existing crew, reducing the need for outside labor.

While an arch structure is often less complex than an A-frame, the arched roof does come with less structure available to hang and support baskets and other equipment, such as irrigation booms. Also, climate can play a factor, as an arched roof creates a potential flat spot on top where snow and ice can accumulate. A good compromise point is the Gothic arch, featuring curved bows that come to a point, which helps to shed snow and ice.

A-frame

An A-frame greenhouse is most often constructed using welded or bolted trusses, giving it strength to support automated basket systems, boom irrigation, monorails, curtain systems and other equipment.

While roof venting can be accomplished with either shape of structure, there's more flexibility with how you vent a peaked structure, from traditional Venlo style to multiple roof vents to a full, open-roof design.

An A-frame roof offers a good angle to capture winter light transmission—especially important in northern climates. An A-frame is also less likely to drip condensation compared to an arch house, especially when glazed with double poly.

Glazing choice

Speaking of glazing, it's usually the main factor growers and builders use when selecting the roof shape, as certain roof shapes better accommodate certain glazings.

So how do you choose a glazing? According to Tom Vezdos, VP of the Commercial Division of Rough Brothers, Inc. in Cincinnati, Ohio: "Crop is the number one thing. Number two is money (cost) up front. Number three is utilities and energy."

> **Glass**
> According to Tom, glass accounts for some 15% of commercial greenhouses (if you include vegetable greenhouses). Glass can be an ideal choice if you're growing a high-value crop or one that that needs high light levels, such as young plants or greenhouse vegetables. Characteristics of tempered glass glazing include high light transmission and long term durability. Many retail garden centers choose glass because of its aesthetic appeal—it has an open, modern look, offers lots of light for shoppers and has curb appeal.
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> Also, while glass has a high initial cost, it has a long lifespan compared to other glazing materials. A glass roof can last 20 to 25 years or more, with proper maintenance.
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> There are a few disadvantages to growing under glass. While improved methods of tempering have lessened breakage concerns, there's always a possibility of breaking in extreme weather. Glass greenhouses can have low-humidity problems in winter, higher energy loss than other materials and potential crop damage due to high light intensity during the summer, if not shaded. A glass greenhouse environment requires more attention and adjustments, while a poly house can be a bit more forgiving.
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> And of course, glass is heavy. And flat (unless you're building a curved glass greenhouse, which is a topic for another article), which is why glass is most often applied to A-frame and Venlo structures.
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> **Plastic**
> The two most common types of plastic glazing are panels (either polycarbonate or acrylic) and flexible film (polyethylene or "poly"). Growers choose to go with a plastic glazing instead of glass for many reasons, including lower cost, ease of installation, insulation value and lighter weight (meaning less structure required underneath). While plastic comes with benefits, it has a shorter lifespan than glass and needs to be replaced more frequently.
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> Rough Brothers estimates that about 25% of commercial greenhouses are covered in polycarbonate panels. Its flexibility allows it to be used on both arched and A-frame structures. Polycarbonate provides better insulation than glass, as well as more diffuse light. It's impact resistant and has a reduced risk of breakage. It can last up to 10 years before replacement; however, it gets more brittle and degrades over time. This causes a decrease of light transmission, so not all of those 10 years may be optimal ones.
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> For a more economical option, polyethylene film (most often applied in two layers or "double poly") is a good choice. It's much less expensive than other glazing options and requires less labor for installation. However, it will need to be replaced approximately every three or four years. Around 60% of commercial greenhouses use

> polyethylene.
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> As with polycarbonate, it retains heat better than glass and provides more diffuse light. However, it doesn't provide as much light transmission as other glazing types (which could be a good thing in southern climates). Polyethylene can be used with an arched or A-frame roof. However, with all structure types, the poly film can wrinkle, causing spots where condensation can drip on plants. Good installation is critical.

A grower's view

Bryce Johnson, GM of Red Oak Greenhouse in Red Oak, Iowa, grows in both poly and glass greenhouses. He agrees with Tom that glazing choice largely depends on price. Plastic is cheaper than glass and his team can construct a plastic greenhouse themselves.

Another factor that led him to choose poly is the ability to create three small peaks per bay. Combined with a narrow-width poly, it helps to withstand the high winds in Iowa. Also, the crops that Bryce grow in the poly house don't need the high light that glass provides. He likes double poly's energy efficiency.

With a double poly greenhouse, does Bryce prefer the A-frame or arched roof style? He says that he's tried both, but prefers the arched style. He tried an A-frame structure, hoping it would shed condensation better than an arch, but that experiment didn't turn out the way he'd hoped. Another disadvantage he found was that the A-frame structure stretched the poly and caused wrinkles.

"On a rounded roof, the poly sits well and has less wear and tear on the plastic," he added. **GT**