

# Special Report: DIY Backyard Biodome Greenhouse



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### **“How To Build Your First Geodesic Greenhouse In A Weekend With Common Tools, No Construction Experience and Materials Available From Your Local Home Improvement Store.”**

#### **What is a Geodesic Greenhouse and How Does it Work?**



#### **Completed DIY Backyard Biodome**

Simply stated a geodesic greenhouse is a sphere or partial sphere made of intersecting triangles or other geometric shapes. Originally pioneered by Walther Bauersfeld, chief engineer of the Carl Zeiss optical company, for a planetarium in 1926 and later

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popularized by Buckminster Fuller. One can see examples of geodesic structures all over the world including Epcot Center at Disney World, the Eden Biodome in Wales, and various other amazing domes throughout the world. There is even a domed jungle in Vancouver BC.

Here's what I have learned in the last 4 years of researching and building geodesic greenhouses; when it comes to how a biodome greenhouses and keeps plants live for a longer growing season:

Plants germinate (sprout) from seeds and grow through their life cycle depending on light and soil temperature. Generally warmer is better and because you can't do much about how much the sun shines, you move “indoors” to your DIY biodome. So what does that do for your plants? The dome makes the air and soil in the dome warmer than outside the dome. It also makes it so you can control the humidity and even the light to stimulate maximum growth. However in my experience, it seems that growing season depends more on soil temperature than light, because some plants like cabbage and lettuce kept growing in your dome right through the winter. If you add LED grow lights then the growing season is essentially unlimited.

So does it get too hot inside? The short answer is: sometimes. However if you use an automatic passive venting system you can open a ventilation path even when you are not there and best of all it doesn't use any power! Even if you don't have an automatic vent simply keeping the door and vent open in summer during the day will moderate the temperature enough for most plants.

## How Does The Biodome Keep Plants Growing Longer?

Generally speaking there are two main ways your geodesic greenhouse dome will help the temperature stay warmer than the outside air.

1. The air inside the dome is separated from the air outside of the dome and the interior is protected against drying and cooling of wind.
2. The clear (or semi-clear) plastic skin lets light energy in, but traps heat energy and with some insulation on the north side and a few dark colored water containers you can store even more heat.

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Note: Some people even use chickens or rabbits to keep the chill off the inside of a greenhouse though care must be made to vent their droppings outside so the ammonia level doesn't get too high for the plants!

Even with a single layer of plastic (though double layer with an air gap is much better), the air inside the dome is prevented from mixing with the outside air when the wind blows, or a bus drives by. When the sun shines on the dome, lots of the high-energy light comes through the skin. Light goes through space in waves, and the light that helps us see can go right through clear objects, like glass or your dome skin. When the light bounces off the ground inside the dome and plants and the tools, it loses some of its energy.

## **Biodomes Keep Plants Warmer**

The heat waves that bounce off can't move as fast as the waves that came into the dome, and they get trapped inside the skin. So while the sun shines, the dome gets hotter and hotter as the energy from the sun gets trapped. And this hot air can't mix with all the other air outside, and level out. That's why it feels so different in the dome. You will feel it right away. It's like walking into your own private oasis! And if you add a grow light the “sun” even shines in the winter!

At night, when it is colder, the air in the dome is prevented from cooling off as fast as the outside air by the “solar mass” in the warmed water or the passive heating by keeping some live animals in the dome 24/7.

The warmer air in the dome also means that the air is more humid. Humidity means that there is more water in the air, and most plants love high humidity. That's why you need to treat the wood for your dome to prevent deterioration. In the warmer months when your vents the hot air rises out of the vents, and mixes with the outside air. The water in the air also leaves too, and though it might feel more comfortable to us humans don't let it get too cool or you risk slowing the growth on your plants!

## **What Can I Grow In My Groovy New Geodesic Greenhouse?**

food for planting in the cold season, plants that thrive in the summer months and plants that CAN (with some attention) grow all year round.

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If you decide to use your geodesic dome to grow food, I suggest giving some to people who can't always buy or grow healthy organic food on their own. The feeling you will get from sharing produce with friends, neighbours and those in need is a huge part of what makes greenhouse gardening so much fun and so rewarding. Once you have built your own backyard biodome you can help your friends, family and community build domes too. As you gain experience please share you biodome adventures with the growing greenhouse community on [FaceBook](#), [Google+](#) and the [www.GeodesicGreenhouse.org](http://www.GeodesicGreenhouse.org) blog.

## How To Actually Build Your DIY Backyard Biodome

### Materials Needed

#### Wood:

42 pieces of 1" x 2" x 8' wood  
1 gallon waterproof sealant

#### For connectors:

10 6' flat perforated metal straps  
25 coarse thread bolts 1/4" diameter x 3/4" length  
25 1/4" hex nuts

#### For putting everything together:

250 1-1/4" galvanized deck screws  
250 #8 washers  
roll of 10' x 100' 6 mil UV resistant vapor barrier plastic  
2000 5/16" staples that fit your staple gun

#### For rebar bender:

4' x 6" x 6" piece of wood  
4 spikes or large bolts  
4' piece of 3/4" plumbing pipe or conduit  
twenty 3' lengths of 1/2" rebar (have it cut at the lumber yard)  
1' chunk of 6x6" timber for bending rebar

### Tools:

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safety goggles  
work gloves  
hacksaw  
tape measure  
protractor  
shovel  
2"-3" general purpose paint brushes  
hand wood saw or skill saw (if you have one and know how to use it safely)  
bench vise (used to bend metal strapping)  
scissors  
staple gun  
8' step ladder  
9lb baby sledge hammer  
2 socket wrench sets  
cordless (preferably) or corded drill gun  
#6 Robertson screwdriver drill bit  
set of multi-sized drill bits

## Preparing the Ground

In the location in which you intend to place your dome, clear the ground by removing all grass from an area that is 12' in diameter. This is not absolutely necessary but will prevent weeds from continuing to grow in the comfortable conditions found in your biodome greenhouse! I like using crushed rock or sand as a base for my greenhouse. It helps keep weeds down and plus if you have [an LED grow light from Amazon](#) it feels like you are at the beach in January!

## Cutting the Wood

- 1) Start by measuring and cutting 30 pieces of wood that are 42" in length. These are your "A" pieces. It would be sure to mark them with the letter A.
- 2) Once you have those pieces cut, measure and cut 35 pieces of wood that are 48" in length. These are your "B" pieces. Mark these with the letter B.



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## Weatherproofing the Wood

After cutting the wood, coat all pieces (specifically the ends) with the waterproof sealant. Allow it to sit overnight or until dry.

## Making the Connectors

When you are finished, you will have 10 4-way connectors, 6 5-way connectors, and 9 6-way connectors. See example picture of a 5 way connector below.



## 4-Way Connectors

- 1) Begin by cutting ten strips that have ten holes each.

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- 2) Next cut twenty strips that have seven holes each.
- 3) Once you have all of your strips cut, you will use a vise to bend the pieces. Each bend should be approximately a 25 degree angle. On the strips that have ten holes, bend them twice, at the fourth hole from each end. Do this for all ten strips. For the seven-hole strips, bend them once, at the second hole from one end.
- 4) Once you have all of the pieces bent, you will assemble them. Attach two of the seven-hole strips to the middle (fifth hole from either side) of the ten-hole strips. Place the seven-hole strips on top of each other. Then, using a bolt and a nut, connect them together. You do not need to fully tighten the bolts at this time.
- 5) Repeat step four until you have a total of ten connectors.

## 5-Way Connectors

- 1) Begin by cutting thirty strips that have seven holes each.
- 2) Once you have all of these strips cut, use a vise to bend the pieces after the first hole from one end. Make 25 degree angles on all bends. You must do this for all thirty strips.
- 3) Once all of your strips have been bent, it is time to assemble them. Line up the first hole for five of the strips and connect them with a bolt and nut. For assistance on how they should be assembled, refer to the picture.
- 4) Repeat step three until you have a total of six connectors.

## 6-Way Connectors

- 1) For the 6-way connectors you will need to cut twenty-seven strips that have thirteen holes each.
- 2) Once you have all of the strips cut, you need to bend them using a 25 degree



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angle. Bend at the fourth hole from each end (leaves five holes in center space). You will bend each strip twice. Do this for all of the strips.

- 3) Assemble them by connecting them at the center hole (the seventh hole) with a nut and a bolt. Do this for all nine of the connectors. Once you have all of these steps completed, you are finished fabricating the connectors.

## Make the Pentagons

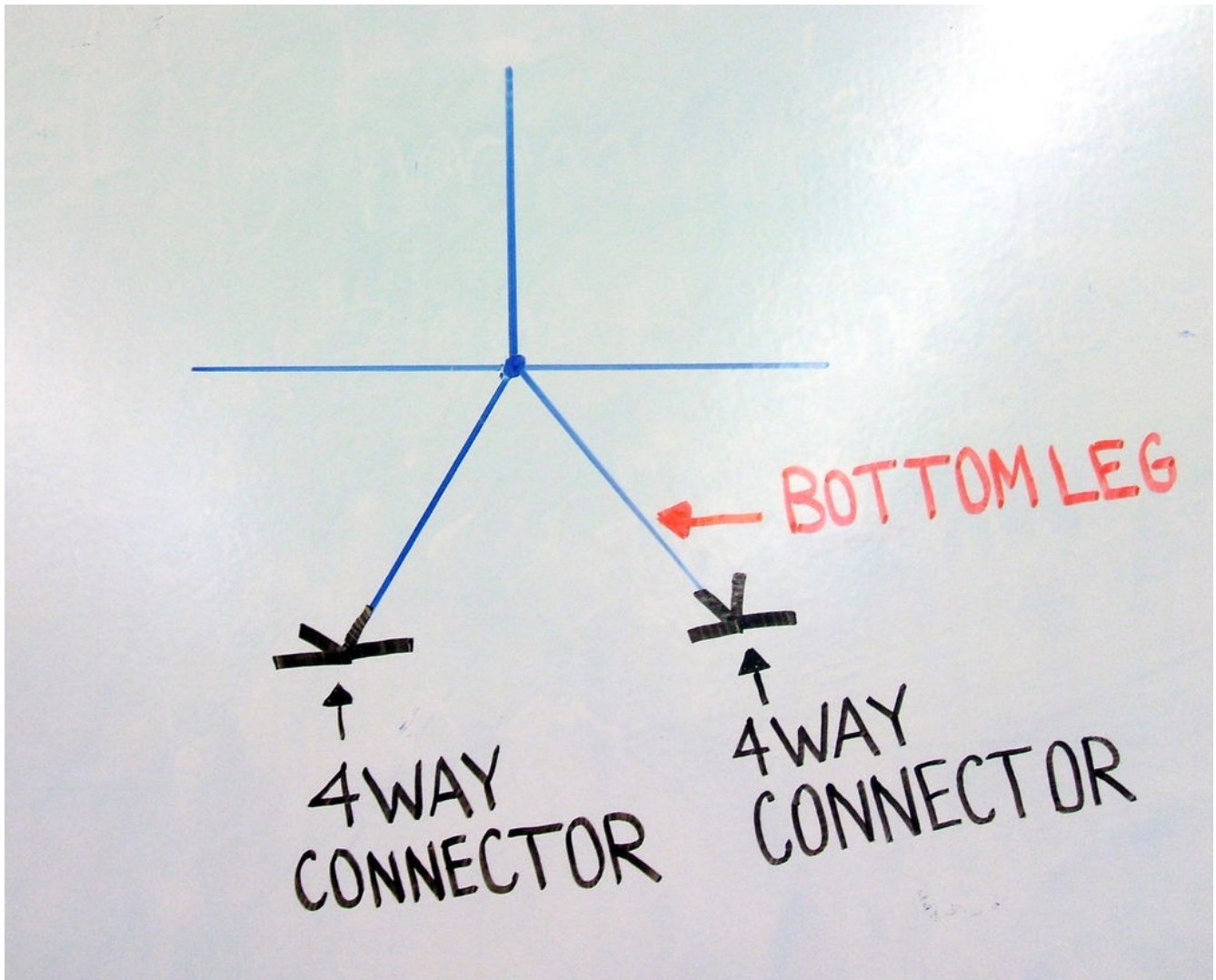


### 5-way connector

Using your drill with a screwdriver attachment, fasten one arm of a 5-way connector to a 42" (A) piece of wood using two screws (with the washer on each of the screws). Make

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sure that the connector is on the inside of the finished dome and that the screws are not coming out of the wood. Once you have your first "A" piece of wood attached, you will repeat this step for the remaining four arms of the 5-way connector. Repeat for all five 5-way connectors.



### Adding the 4-way connectors

Next you will attach two 4-way connectors to the assembled 5-way connectors and A pieces. Put a washer around the screw (two screws go in each leg), then attach one 4-way connector to one leg at the bottom of the pentagon and attach the other 4-way connector to the other leg at the bottom. For more help, look at the diagram below.



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## Attaching the "B" pieces

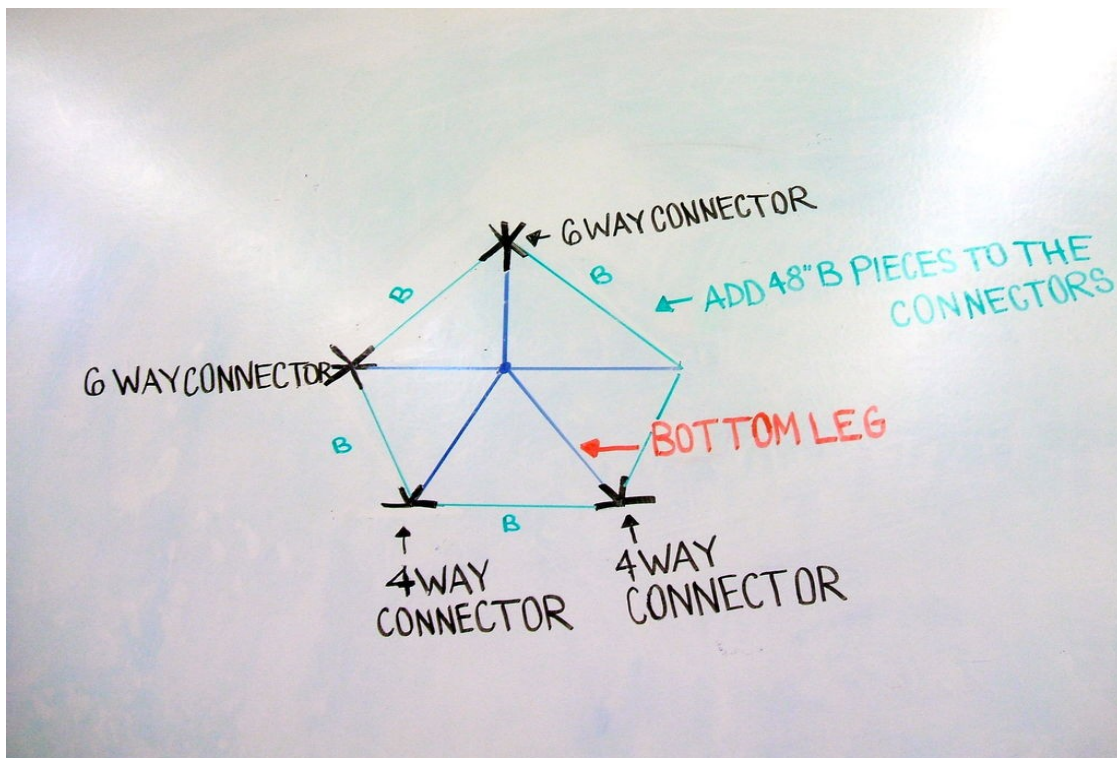
Attach one 48" "B" piece of wood between each outside connector. Be sure to install two screws and washers for each piece of wood. There will be no connector on one of the corners of the pentagon.

## Finish the pentagons

Repeat the previous few steps to complete the other four pentagons. You will have 5 pentagons when you are done.

## Connect the Pentagons

To connect the pentagons to each other, connect the 6-way connector on the left side of the pentagon to the right side of another pentagon without a 6-way connector. Repeat all the way around until each pentagon is connected. There will be ten "A" pieces connected around the middle of the pentagons.



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## **Connect The Bottom of the Pentagon**

Now attach "B" pieces between each pentagon at the bottom of the dome using the two 4-way connectors. Repeat until there are ten sides on the bottom of the dome.

## **Connect The Top of the Pentagon**

At the top of the pentagons, attach a "B" piece to the 6-way connectors between each pentagon. Repeat until the five "B" pieces connected at the top of each pentagon form a pentagon.

## **Preparing To Make the Roof**

First, pick a pentagon most convenient to where you want your door. Then disconnect the 5 internal legs ("A" pieces) with the 5-way connector from the external connectors (4- and 6-way) on each leg. The five legs that are disconnected will remain attached to a 5-way connector and make a star shape. This will be used to make the roof and the open pentagon will be used to make the door.

## **Attaching The Roof**

Connect the ends of the legs to the last available 6-way connectors at the top of the dome to form the roof.

## **Tighten all the Connectors**

Put one socket wrench on the nut side and one socket wrench on the bolt and tighten up all of the connectors on the dome.

## **Making the Door Frame**

Since there are variables that affect the exact dimensions of your completed dome, making the door is a field-engineering task. Measure a piece of wood that will be use to construct the side of the door. Start at the bottom corner of the open pentagon where the 4-way connector is and go straight up until you are touching the top leg of the open pentagon. Mark the wood where it touches the top leg of the pentagon . Repeat this step on the other side.



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## **Connect the door frame to the dome**

After you mark the piece of wood, cut it at an angle so that it fits the pentagon flush against the top piece of wood. Attach the cut piece to the 4-way connector at the bottom of the pentagon. Use a 3" screw to attach the piece of wood from the top of the pentagon where it fits against the wood. This will hold your door frame together. Repeat this step on the other side.

## **Adding the top of the door frame**

Next, measure another piece of wood to create the top part of the door. To do this, hold a piece of wood at right angles to the tops of your two parallel door pieces. Mark the spots that will allow you to connect it to the "B" pieces of wood at the top of the pentagon. From the outside of the pentagon, use 3" screws to attach this piece where it fits against the top of the pentagon and the other door pieces.

## **Adding the side supports**

Next, measure a piece of wood that goes from the 6-way connector at the side of the pentagon to the piece of wood that makes one side of the door (see photo below). Screw the piece of wood into the connector and into the piece of wood that it touches. This step adds support to the door. Repeat this step on the other side of door.

## **Adding the top support for the door**

The last step of constructing the door is to measure a piece of wood from the top 6-way connector to the top part of the door, cut it and attach the wood to the connector and the door.

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## Make a Rebar Bender



Now it time to anchor your dome to the 12' X 12' area where you have cleared the grass. You will use twenty pieces of bent rebar to anchor your dome into the ground.

## Anchor The Dome To The Ground

With your small sledge, hammer two pieces of rebar over each "B" piece into the ground. There are ten sides to the bottom of the dome, so you will use twenty pieces of rebar to hold it down.

## Cover the Dome with Plastic

Cut out a large sheet of plastic, about 6 to 7 feet long. Cover a section of the dome with the plastic. Start from the bottom and work your way up. Make sure the second layer overlaps the top edge of the lower layers to keep water flowing down to the ground.

## Staple Plastic and Cut off Extra Plastic

Pull the plastic tight over one triangular section of the dome. Staple just enough to attach the plastic to the wood on each leg of the triangle. Then go back and staple the plastic to each leg of the triangle, stapling about two inches apart. As you do this, continue to smooth the plastic to get the wrinkles out. It helps to fold the excess plastic on top of

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itself as you staple it onto the wood. Continue by covering as many triangles as you can until you have used up the plastic sheet. When your first section of plastic is securely attached, cut off any excess that does not completely cover a triangular section of the dome.

## Keep Adding Plastic Until Finished

Repeat the process until the dome is covered. You will need to put a ladder inside the dome to staple the plastic onto some of the top parts.

## Add the vent

You'll most likely need a ladder inside the dome for this step. Place the ladder on the ground under the top of the dome. Measure the outside dimensions of one of the upper triangles. Then create another triangle that fits on top the first one. Cover this new triangle with plastic leaving enough extra to overlap the top of the dome by 4" on each side. Screw the two hinges to both the new triangle and the existing triangle at the top of the dome. This will create a vent that will allow you to regulate the air to circulation and help regulate the temperature in your geodesic dome greenhouse. You can even add an [automatic greenhouse vent opener](#).

## Make the Plastic Door

To make the plastic door area for the dome, put a sheet of plastic on the door frame, cut it through the middle into two symmetrical halves, you can add a zipper or Velcro to the plastic to keep out the wind as well. After cutting the plastic, staple it onto the frame, then trim the excess plastic hanging from the frame.

## Other Dome Covering Ideas

Other ideas for covering your dome. I have had great success using industrial shrink wrap (like what you might see covering scaffolding or boats being shipped to a dealer). With this method you get a super tight, waterproof covering for your greenhouse that looks sexy and allows you to put another layer of plastic using staples on the inside to further increase your heat retention. This material needs specialized tools (heat gun) to apply but the end result is worth it in my opinion.

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## Insulation for the North Side

Fill in the triangles with (2-3") solid foam insulation (the type used under foundations) after you have put on the outside covering (either plastic or shrink wrap). Then once you have filled in half the triangles top to bottom on the north side then cover the insulation with your inside layer of plastic.

## Solar Mass for Heat Retention

What many folks do is use 45 gallon plastic tanks (ideally black) filled with water to capture solar heat and slowly release it overnight. The more hands on amongst you can also use small animals in cages to keep the night time temperature up too. Though as mentioned before you need to make sure there is a separate vent to the outside for their droppings, otherwise you end up with too much ammonia for plant growth. The added bonus with, say chickens, is besides the eggs, meat, fertilizer (compost it first!), and kitchen scrap recycling is that you get CO<sub>2</sub> released into your greenhouse which further increases plant growth.

## Aquaculture and Aeroponics (Advanced)

For the more adventurous amongst you or those already keeping fish as pets check out the amazing food production you get by using [aquaculture farming](#) using freshwater fish, in your water tanks to create nutrient rich "fertilizer water" that will skyrocket your food production while growing valuable protein for you, at the same time! Link to [\\$50,000.00 per acre farm on www.geodesicgreenhouse.org](#) blog.

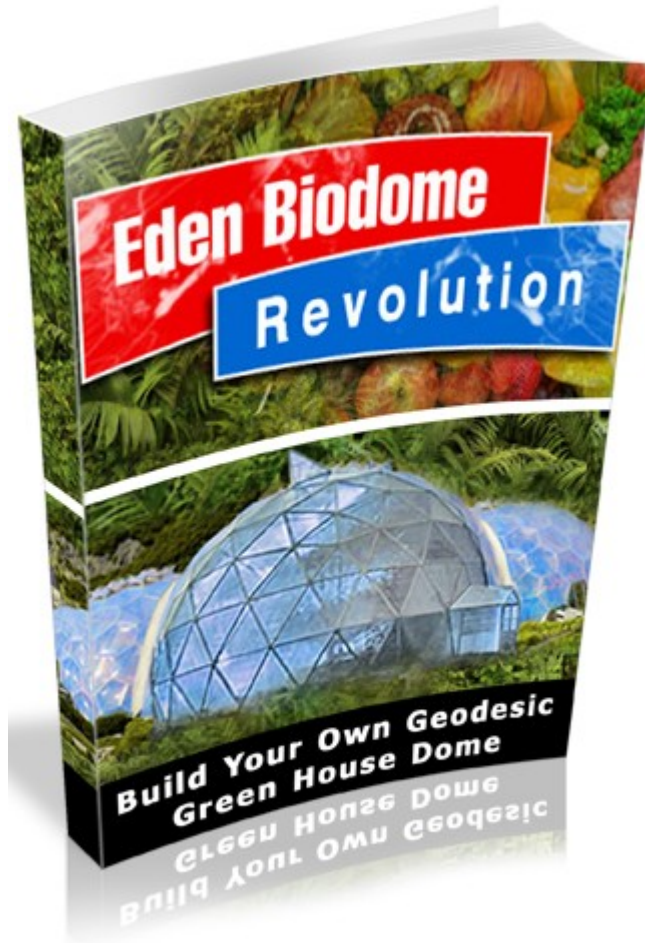
## Final Thoughts

So there you have it. A quick and dirty DIY back yard biodome! The above method is suitable for domes up to 12ft in diameter.



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When you are ready now to up your game download the complete Biodome Revolution eBook package [HERE](#) and learn how to create domes up to 30ft in diameter with very similar techniques to what you learned here but that will explode your food production and amaze your family and friends.



Thanks for reading and enjoy your DIY geodesic greenhouse tips arriving in your email inbox!

## Support

If you are running into challenges or just need moral support please post on [FaceBook](#), [Google+](#) or the [www.GeodesicGreenhouse.org](http://www.GeodesicGreenhouse.org) blog.

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**Good luck! And don't forget to post your pictures and comments to help out your fellow geodesic greenhouse enthusiasts!**

