

# GROWROOM STRUCTURE DESIGN

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## PROJECT GOAL:

“TO DESIGN AND CONSTRUCT A GROW ROOM STRUCTURE THAT CAN SUPPORT AND HOUSE A VERTICAL AND ROTARY BASED CNC MACHINE.”

## BACKGROUND MATERIAL

### Autonomous Urban Agriculture

Ever-increasing accessibility and capability of new-age technology in the agricultural industry are making smaller, more urban projects more economical and possible. The integration of smart devices with traditional practices within agriculture makes them:

- More reliable;
- More efficient;
- Require less maintenance, and
- More economically viable.

Inner-city hydroponic labs adopt a vertical shelving system to maximize the usable operating area for in a compact footprint. They are quickly becoming a new approach to urban agriculture due to their:

- Efficient use of horizontal and vertical space;
- Usage of smart technology to monitor and maintain environment;
- Ability to operate without sunlight;
- Incredibly low maintenance, and
- Higher yield than typical rectangular garden beds.

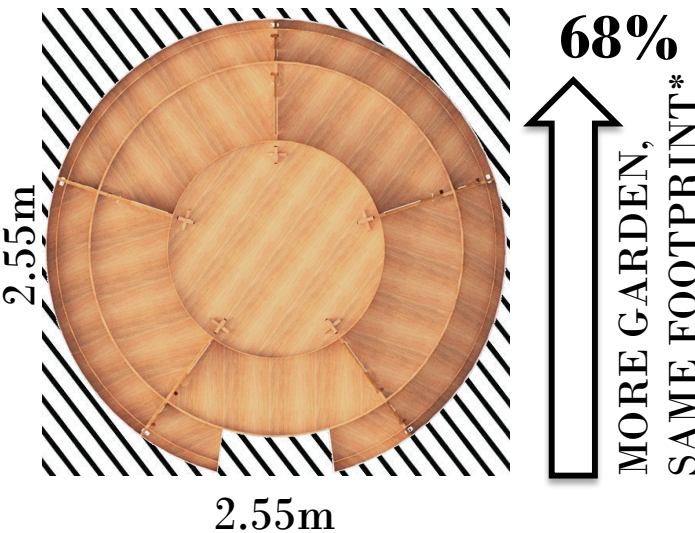
## PROJECT DETAILS

### Growroom Design Process

- Analyse existing designs (SPACE10)
- Develop preliminary concept at smaller scale.
- Develop and construct functional small- and full-scale structure to house CNC machine.

### The Designs

- Made entire from plywood
- Completely flat pack design
- Simple and (almost) toolless assembly
- Applications for small, medium and large scale uses
- All models offer more usable garden area than single level rectangular beds with same footprint.

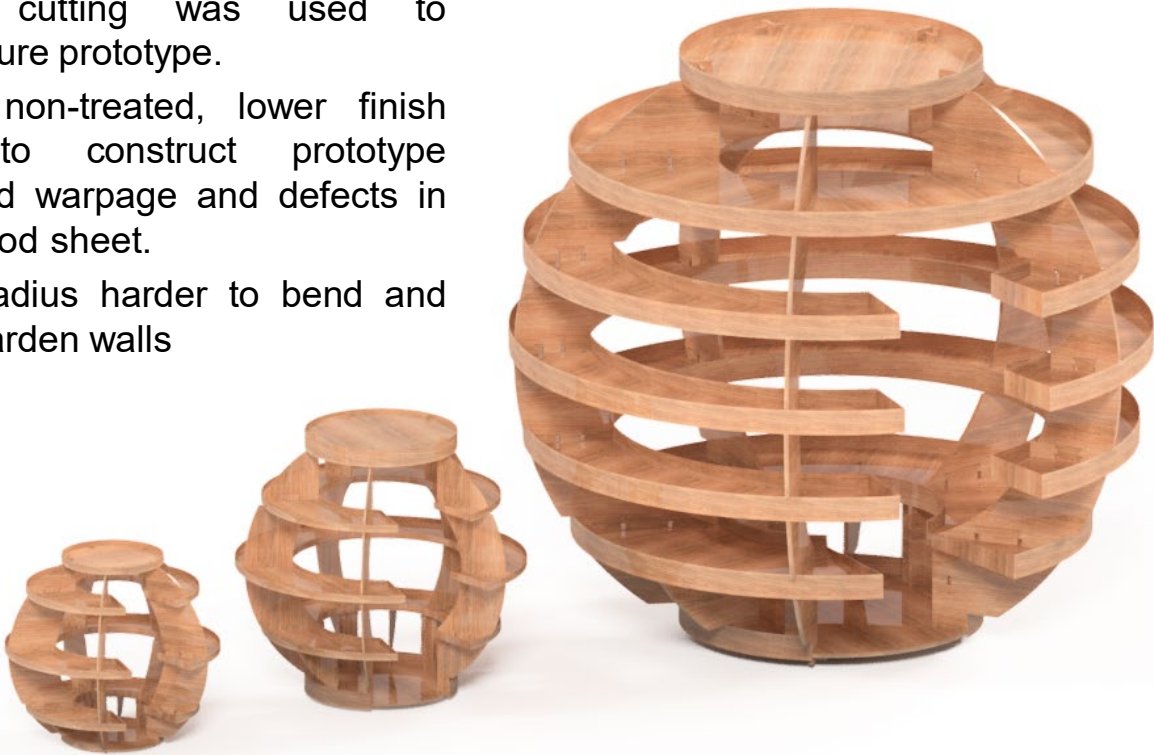


### Challenges and difficulties

- Downscaling structure while maintaining FarmBot UTM (minimum clearance same for all models ~ 200mm)
- Unavailability of smaller CNC bits at the UQ Makerspace meant that waterjet cutting was used to manufacture prototype.
- Use of non-treated, lower finish timber to construct prototype introduced warpage and defects in the plywood sheet.
- Tighter radius harder to bend and secure garden walls

### Design improvements

- Investigate cylindrical designs
- Minimizing the profile of the supports
- Potential solar energy integration
- Water storage solutions.



Small D:0.80m x H:0.75m	Medium D:1.16m x H:1.10m	Large D:2.55m x H:2.40m
<u>Materials</u> 6mm, 4mm Plywood	<u>Materials</u> 7mm, 4mm Plywood	<u>Materials</u> 18mm, 4mm Plywood
<u>Garden Area</u> 0.86m <sup>2</sup> (15% larger*)	<u>Garden Area</u> 1.43m <sup>2</sup> (8% larger*)	<u>Garden Area</u> 10.94m <sup>2</sup> (68% larger*)
<u>Garden Volume:</u> 86L	<u>Garden Volume:</u> 143L	<u>Garden Volume:</u> 500L
<u>Weight</u> 10kg (wood) + 20kg (soil)	<u>Weight</u> 15kg (wood) + 30kg (soil)	<u>Weight</u> 200kg (wood) + 200kg (soil)

\*versus a single level, square garden bed of equal footprint



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# INNOVATION EXPO