GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

Team: 7

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Introduction:

Monique Manatch and her community are faced with the issue of having no access to essential groceries due to there remote location. With no set infrastructure of electricity and running water.

We have been tasked to design a greenhouse to structure to locally produce and harvest essential fauna. The community has several requirements for this project and there are basic requirements for a greenhouse as well that must be considered for the design. Based on her user specification and the budget we were given, we have come up with the following design criteria table to illustrate different part of the project in detail. Furthermore, we were able to gather data on other greenhouses currently on the market to study the functionality in order to aid our design.

1.

Design Criteria

Requirement	**Criteria**	**Justification**	**Rating**
Cost	- The cost should be not exceed $250	The cost needs to maintained under our budget of $250 given by the University of Ottawa. Additional fees will be covered by the group members if they feel more material is needed.	3
Function	- Sustains hydroponic systems throughout the year	Monique must be able to sustainable grow crops all year long in the greenhouse structure.	5
Material	- Cost effective and durable	The green house should be able to withstand all climate conditions of the area and facilitate crop growth.	2
User Centred	- Easily	The device has to be accessible to the client	2

	usable by the customer	and easy to operate.	
Reusability	- Easily reusable by refilling the liquid	Once the device is installed only exterior maintenance will be required.	2
Time Scale	- The project has to be finished by November 28th.	On top of final deadlines, weekly project deliverable are expected to stay on track of design schedule.	4
Requirements	-Grow vegetables	Grow vegetables to produce and harvest for the community.	5

2. Benchmarking

1) Hoop design:

The picture above illustrates a very simple hoop house greenhouse design. This is the easiest and basic version we have come across based on our research. The total cost to build this structure is around $50 making it one of the most economically affordable greenhouse on the market. If the user has a tight budget and short time deadline, this design will be a top choice. The greenhouse is made out of three quarter inch PVC plumbing pipe and fastened with pipe fitting to keep it together along with a wooden frame to maintain its structure. The structure dimension is 15 x 11 ft and 7.5 ft tall from the center. We liked this design due to its simplicity and the fact that the design incorporates the idea of a sloped roof to prevent the build up of snow and water.

2) Complex design

The greenhouse above features a 8ft wide by 10ft long that stands 8’ 6 high off the ground. Compared with the previous greenhouse, this is more of a complex frame construction that features a multi level sloped roof and an opening door on the side. It contains stakes hammered into the ground to keep it stabilized and has the option to permanently be held in place if needs to be. This greenhouse is ideal for harsher weather climates which we think will fit the description of the location of our client. We picked this design to benchmark because we find the construction of the design very aesthetically pleasing and contains multiple features we think we can incorporate into our own design. First, we favour the sloped roof feature that prevents build up of snow and rain water. Secondly, the multi level sloped roof creates a great location for the placement of solar panel. Finally, the windows screen separating the two levels of the roof makes a great place to put in a ventilation system to help air flow inside the greenhouse. I think with the adjustment of the material and altering the design, based on this existing greenhouse we can come up with a better design with our touch to it.

3. Engineering Design Specifications

	Design Specifications	Relations (=, < or >)	Value	Units	Verification Method
	Functional Requirements				
1	Vegetable require proper growing requirements	=	25-30	°C	Testing
2	Ease of assembly	=	yes	N/A	Analysis
3	Contain the internal hydroponic system	=	yes	N/A	Testing
4	Accessible and ease of operation	=	yes	N/A	Analysis

	Constraints				
1	Budget	<	250	$	Estimate, final check
2	Size (4x4x6)	<	4 x 4 x 6	ft	Analysis
3	Temperature	=	25-30	°C	Testing
4	Time	<	By Nov 28th	Days	Weekly progress check
	Non-Functional Requirements				
1	Aesthetics	=	yes	N/A	Analysis
2	Product life	>	1	year	Estimate, test
3	Security	=	yes	N/A	Analysis

Conclusion:
The requirements that were given by Monique Manatch as well as the requirements for greenhouses to function have been reviewed and ranked. Benchmarks of other greenhouses have been gathered to gain an understanding of how greenhouses function effectively. With a clear understanding of the project and needs defined, the design is now ready to move into its next phase.