Aquaponics Project Proposal

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Project Background

- Aquaponics System
  - Client: Committed NAU Clubs
    - ASCE
    - Green Jacks
  - Educational Piece
    - Information boards show how components work and how system can be commercialized
    - Increase culture of sustainability
    - Increase amount of sustainable projects

Figure 1: Project Site [1]

Figure 2: Site Options [1]

Project Background

- Greenhouse
  - Client: CECMEE
    - Living laboratory/Classroom
  - Specs
    - Geodesic dome by *Growing Spaces*
    - 26’ diameter
    - Solar powered climate control system
    - Passive solar
    - Rigid frame

Figure 2: Growing Dome by Growing Spaces [2]

Technical Considerations

- Aquaponics Piping and Pumping
- Water Quality Monitoring
- Aquaculture and Plants

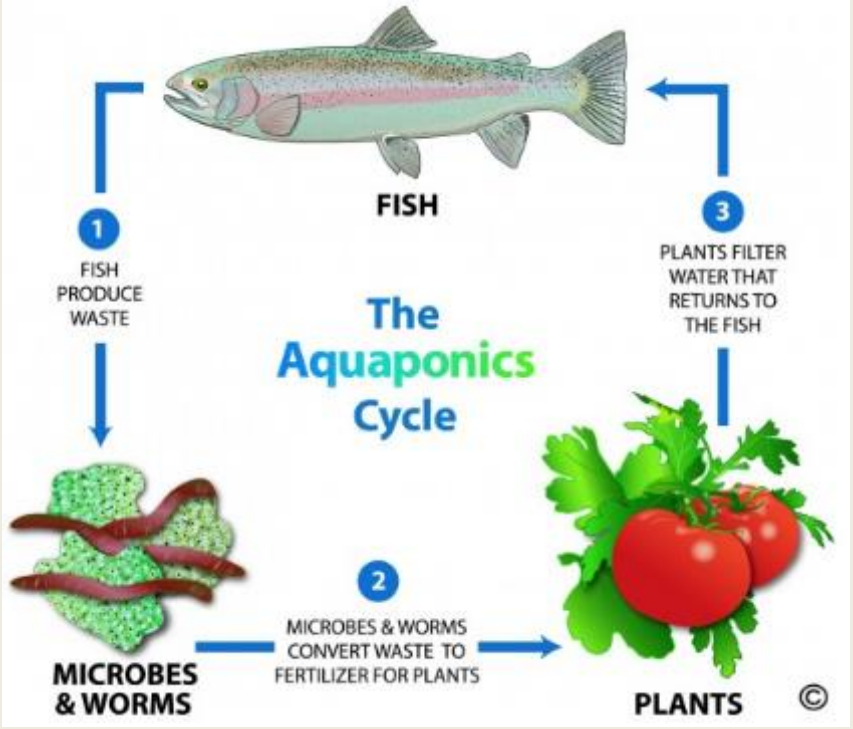


Figure 3: The Aquaponics Cycle [3]

Project Understanding

- Current Challenges
  - Site determination
    - Hours of daylight
- Potential Challenges
  - Fish and plant casualties
  - Aquaponics system leaks and clogs
  - What to do with the harvest?
- Stakeholders
  - CECMEE
  - NAU Volunteer Clubs
  - Viewers of aquaponics system
  - Recipients of compost
  - Engineering students and faculty
  - NAU community

Project Scope

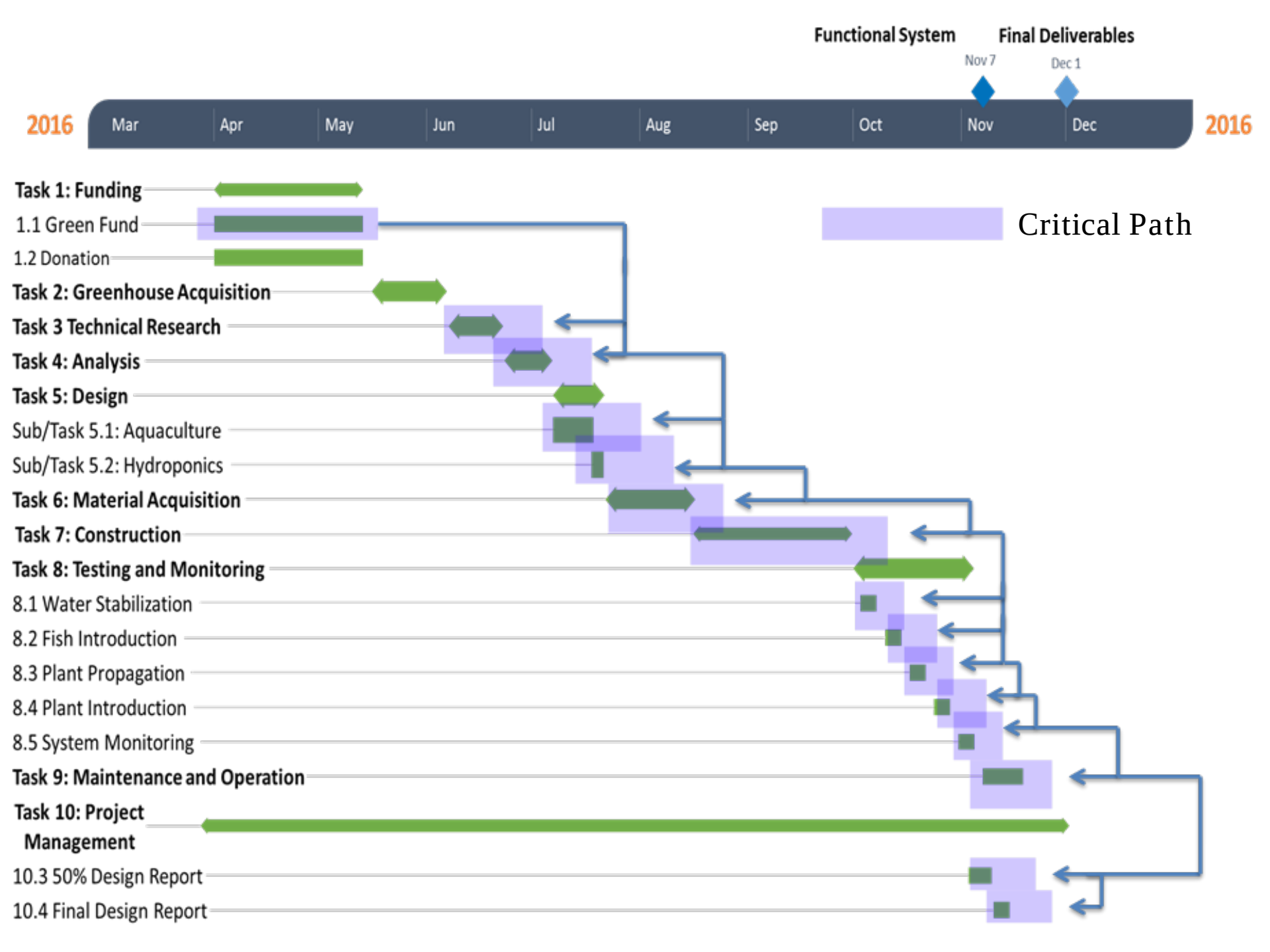
- Task 1: Funding
  - 1.1: Green Fund
  - 1.2: Donations
- Task 2: Greenhouse Acquisition
  - 2.1: Site and Size Determination
  - 2.2: Considerations for Renewable Energy
- Task 3: Technical Research
  - 3.1: Biofilter Design
  - 3.2: Clarifier Design
  - 3.3: Vegetation
  - 3.4: Aquaculture
- Task 4: Analysis
  - 4.1: Hydraulic Analysis
  - 4.2: Water Quality Analysis
  - 4.3: System Space Requirements
  - 4.4: Economic Analysis
  - 4.5: Environmental Sustainability Analysis
- Task 5: Design
  - 5.1: Aquaculture
    - 5.1.1: Aquaculture Selection
    - 5.1.2: Aquaculture Tank Design
    - 5.1.3: Clarifier Design
    - 5.1.4: Biofilter Design
  - 5.2: Hydroponics
    - 5.2.1: System(s) Selection
    - 5.2.2: Pump Selection
    - 5.2.3: System(s) Design

Project Scope

- Task 6: Material Acquisition
  - 6.1: Aquaponics System
  - 6.2: Greenhouse
- Task 7: Construction
  - 7.1: Aquaponics System
    - Informational Boards
  - 7.2: Greenhouse
- Task 8: Testing and Monitoring
  - 8.1: Water Stabilization
  - 8.2: Aquaculture Introduction
  - 8.3: Plant Propagation
  - 8.4: Plant Introduction
  - 8.5: System Monitoring
  - 8.6: System Alterations
- Task 9: Maintenance and Operations
  - Future Use Plan
  - Operations and Maintenance Manual
- Task 10: Project Management
  - 10.1: Meetings and General Management
  - 10.2: Project Schedule
  - 10.3: 50% Design Report
  - 10.4: Final Design Report
  - 10.5: Final Presentation
  - 10.6: Website

Exclusions

Exclusion	CECMEE	Volunteer Clubs
Additions made to aquaponics system after November 15, 2016		X
Projects added to greenhouse	X	
Repairing damages to greenhouse and aquaponics system	X	X
Operations and maintenance costs	X	
Items purchased outside of proposed materials list	X	X


Functional System
Final Deliverables
Nov 7
Dec 1
2016
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2016
Task 1: Funding
1.1 Green Fund
1.2 Donation
Task 2: Greenhouse Acquisition
Task 3 Technical Research
Task 4: Analysis
Task 5: Design
Sub/Task 5.1: Aquaculture
Sub/Task 5.2: Hydroponics
Task 6: Material Acquisition
Task 7: Construction
Task 8: Testing and Monitoring
8.1 Water Stabilization
8.2 Fish Introduction
8.3 Plant Propagation
8.4 Plant Introduction
8.5 System Monitoring
Task 9: Maintenance and Operation
Task 10: Project Management
10.3 50% Design Report
10.4 Final Design Report
Critical Path

Project Staffing

Table 1: Project Roles

Classification	Code
Senior Engineer	SE
Engineer	E
Administrative Assistant	AA
Engineering Intern	EI
Laborers	L

Table 2: Task Designation by Hour

Task	SE hrs.	E hrs.	AA hrs.	EI hrs.	L hrs.
1.0 Funding	10		25		
2.0 Greenhouse Acquisition	10	22			
3.0 Technical Research		40		40	
4.0 Analysis		65		65	
5.0 Design		70		70	
6.0 Material Acquisition				40	40
7.0 Construction					160
8.0 Testing and Monitoring		40		40	
9.0 Project Management	60	50	30	70	20
Subtotal	**80**	**297**	**55**	**315**	**220**
Total	**967**				

Project Cost Estimate

1.0 Personnel	Classification	Hours	Rate, $/hr	Cost
	SE	40	187.43	$14,955.00
	E	297	75.60	$22,455.00
	AA	55	59.06	$3,250.00
	EI	315	28.59	$9,005.00
	L	220	19.64	$4,320.00
Subtotal				**$54,025.00**
2.0 Materials	**Project**			**Cost**
	Aquaponics System			$1,555.00
	Greenhouse			$18,445.00
Subtotal				**$20,000.00**
Total				**$74,025.00**

Funding

- Approved for $8,647.00
- Conscious Cultivation will be submitting an addendum asking the Green Fund to approve the full materials cost of $20,000.00.

Figure 4: Green Fund Logo [4]

References

[1] Google Earth

[2] http://geodesic-greenhouse-kits.com/greenhouse_pictures/nggallery/page/1

[3] https://aquaponicgardening.wordpress.com/

[4] http://nau.edu/green-nau/nau-green-fund/

[2]