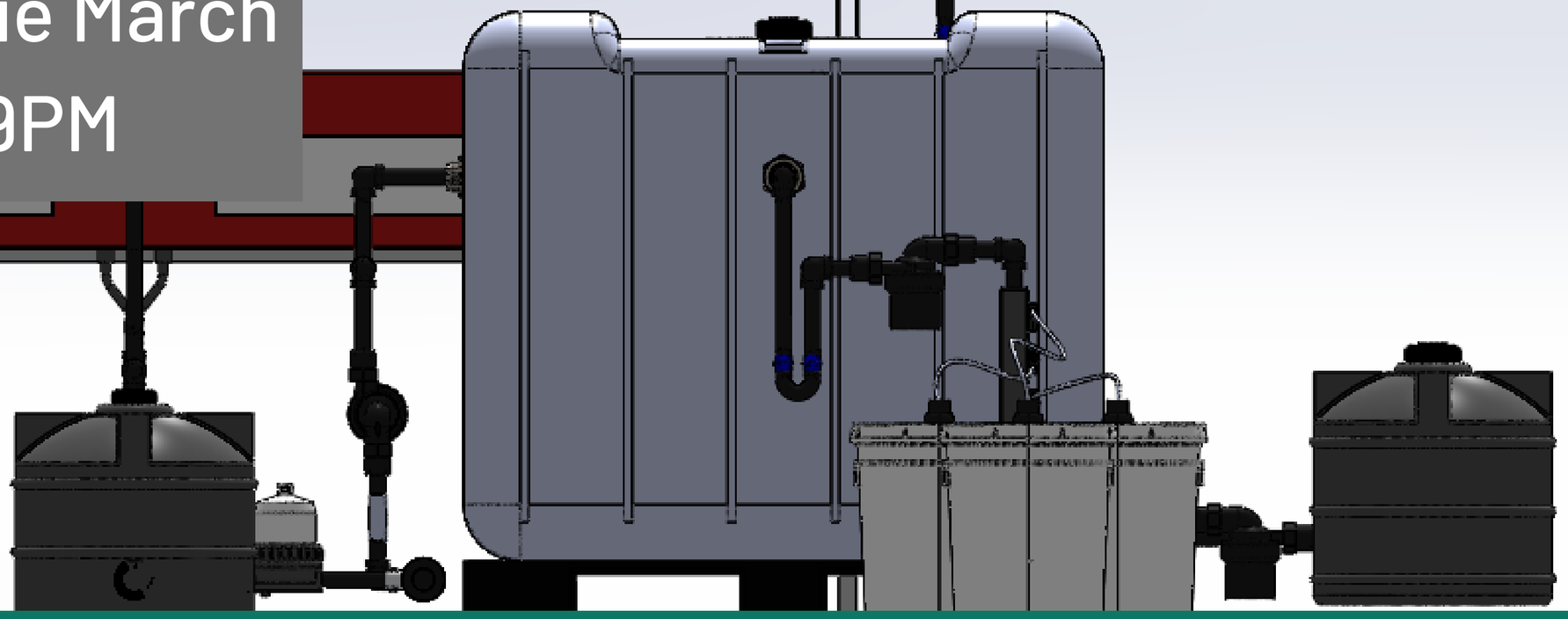
HIRING PACKAGE

Applications due March 5th at 11:59PM

QVFT

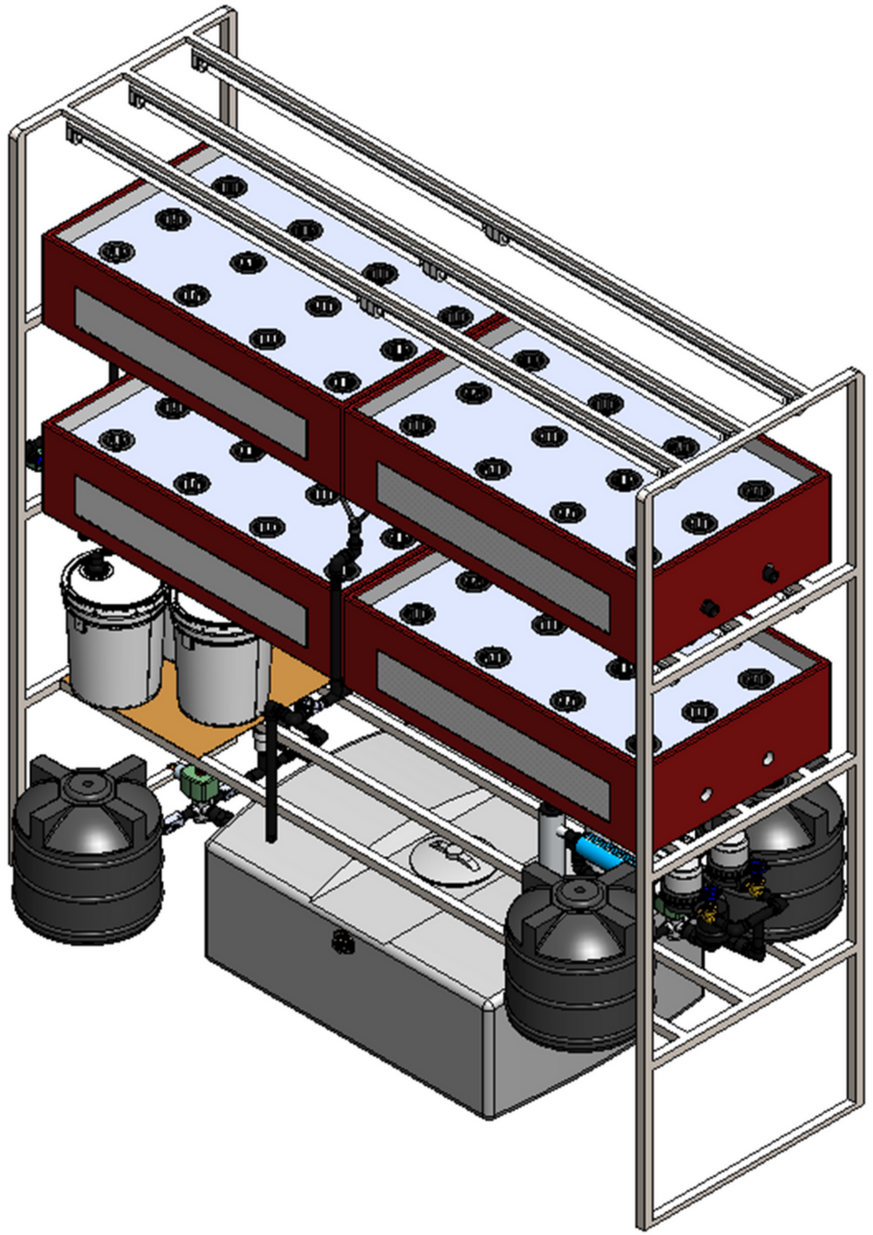


Queen's Vertical Farming Team | qvft.ca | director.qvft@engsoc.queensu.ca

ABOUT US

OUR MISSION

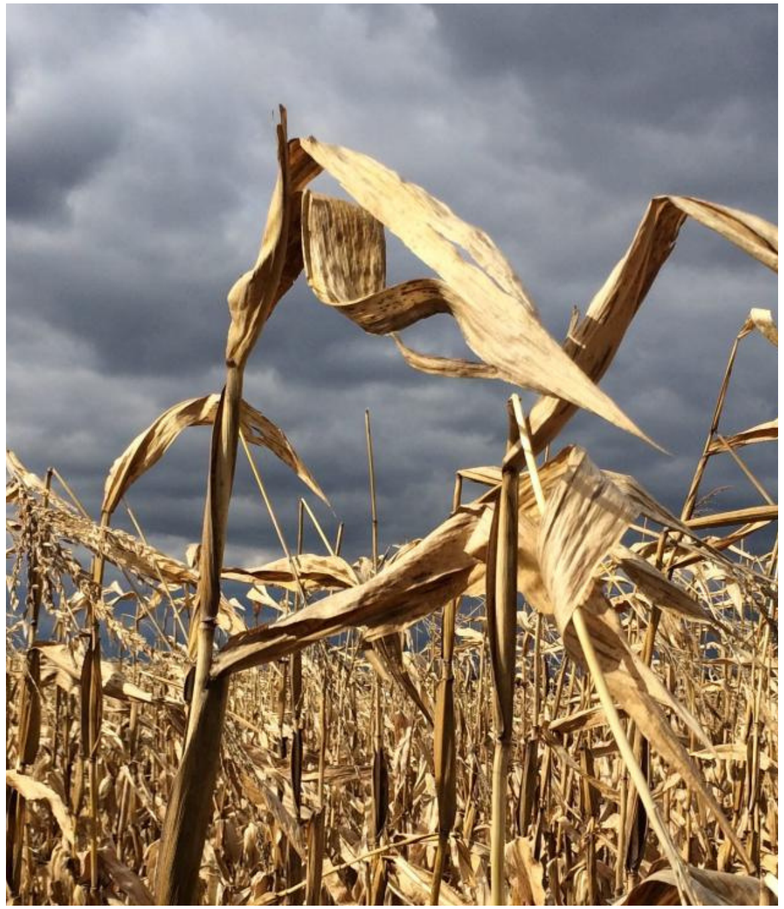
- Founded in Sep. 2019, QVFT is Canada's first student-led undergraduate vertical farming design team
- We are designing and building a functional, software-automated aeroponic vertical farm
- The majority of existing research in this field is conducted by private companies and is thus inaccessible to the public; through its open-source approach, QVFT aims to democratize vertical farming knowledge and research

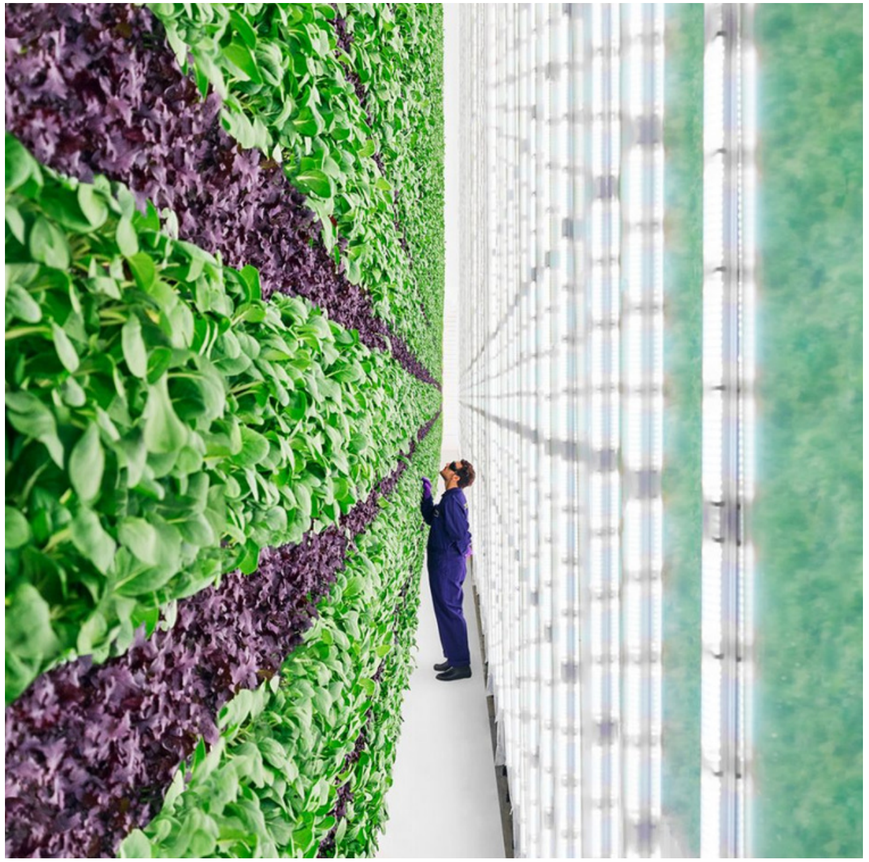


WHY VERTICAL FARMING?

THE PROBLEM

- A global trend of increasing concern is the diminishing supply of arable land per capita
- Due to trends such as climate change, freshwater depletion, and soil degradation, arable land per capita will fall to one-third of the amount available in 1970 by 2050
- The unsustainable practices of conventional agriculture exacerbate the problem
- The world population is also expected to increase from 7.7 billion (2019) to 9.7 billion (2050)
- The intersection of these climate and population challenges means that global food security depends on our ability to adapt to increased demand and develop better farming techniques





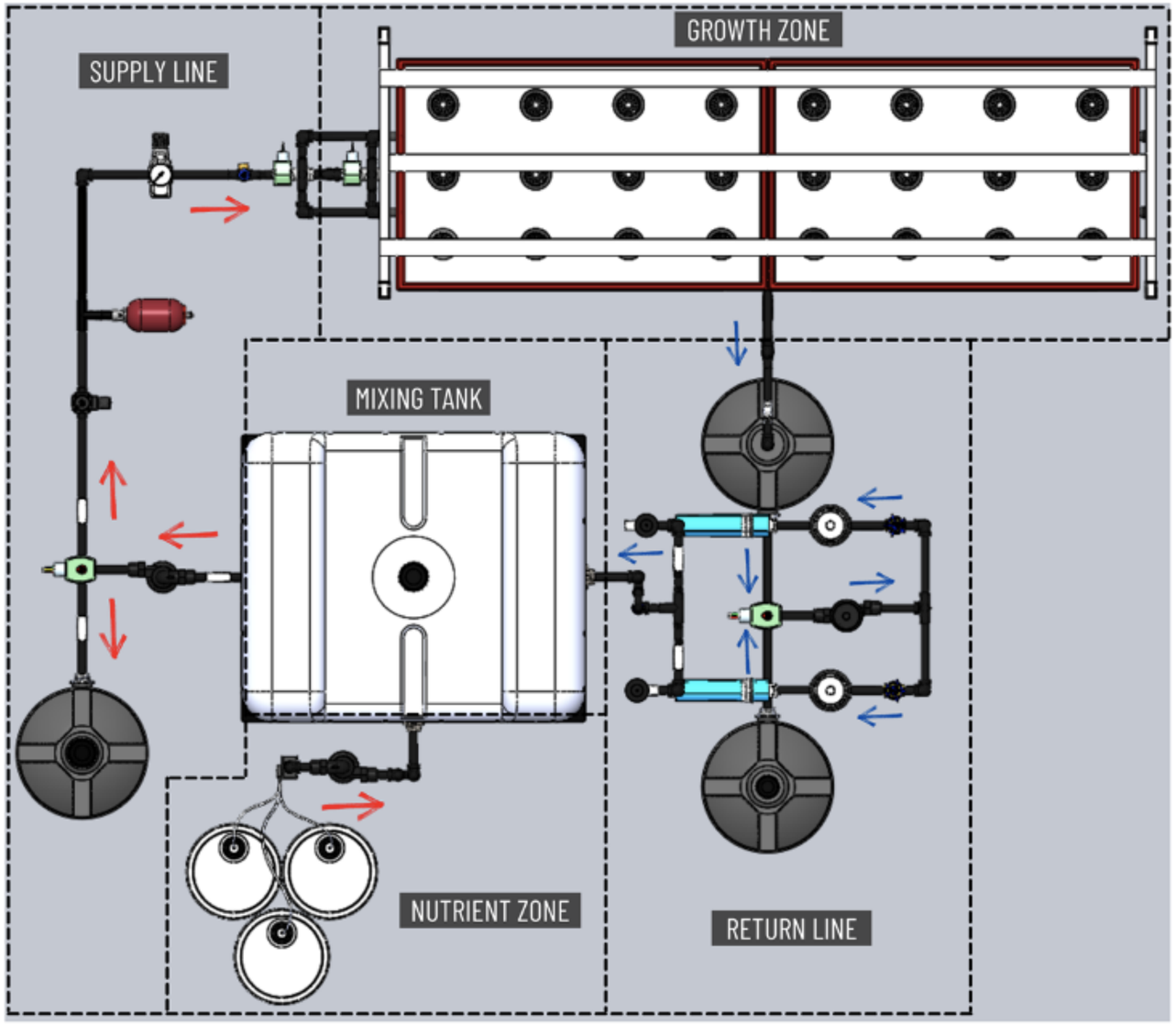
THE SOLUTION

- Vertical farming is a cultivation practice in which crops are grown in an indoor, climate-controlled facility
- This approach is associated with dramatically reduced water consumption (~95%), minimal transportation costs, and massive improvements in per-acre land productivity
- Vertical farming can grow nutritious, organic produce in any location, at any time of year
- Given these advantages, this technology is projected to become a major contributor to global food production in the coming decades
- The vertical farming industry's global market value is projected to grow from $2.23 billion in 2018 to $12.77 billion by 2026, representing a compounded annual growth rate of 24.6%

WHAT WE DO

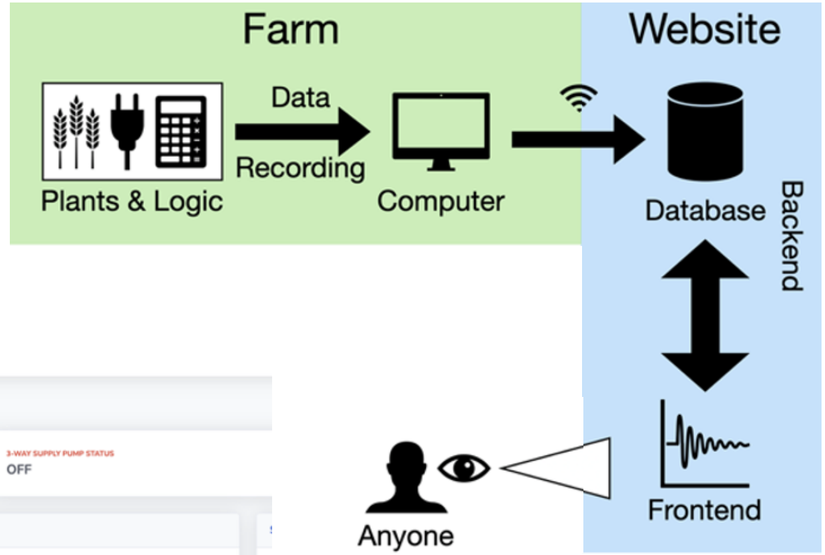
AEROPONIC SYSTEM

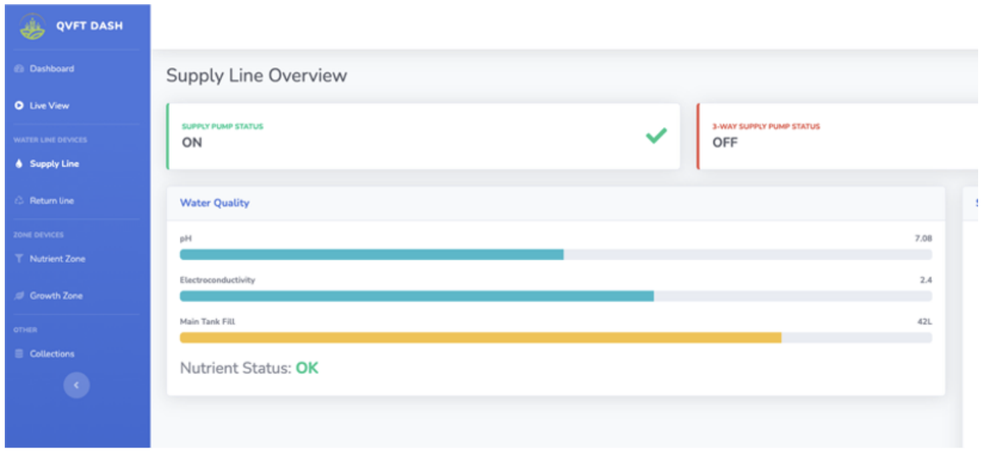
- QVFT employs an aeroponic cultivation method, in which plants grow without soil and are fed by a nutrient-enriched mist
- Crops rest in thin, slotted plastic root cups, through which their roots hang into a basin below
- Aeroponics lend well to automation and can allow for near-complete control over the plant growth environment
- The system is broadly divided into five zones: mixing tank, nutrient zone, supply line, growth zone, and return line

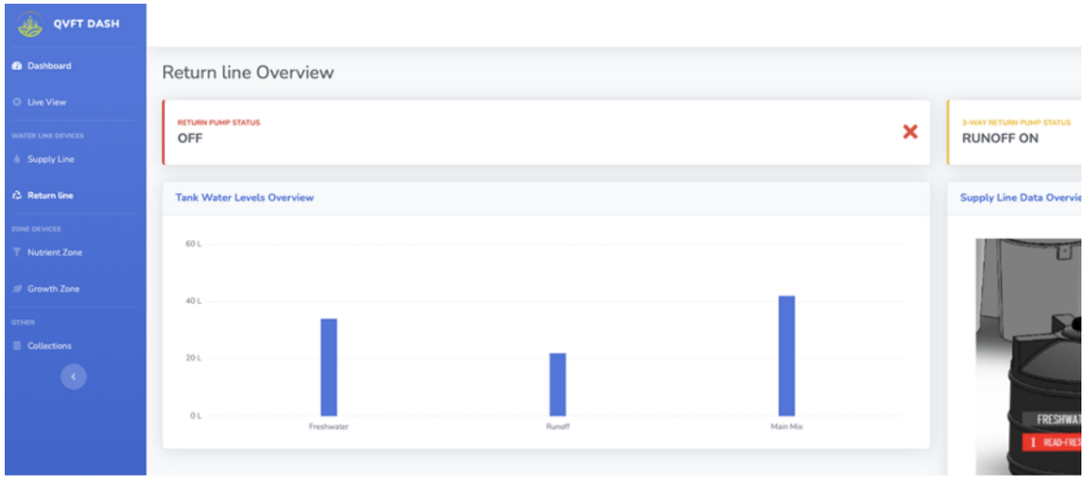


SOFTWARE STACK

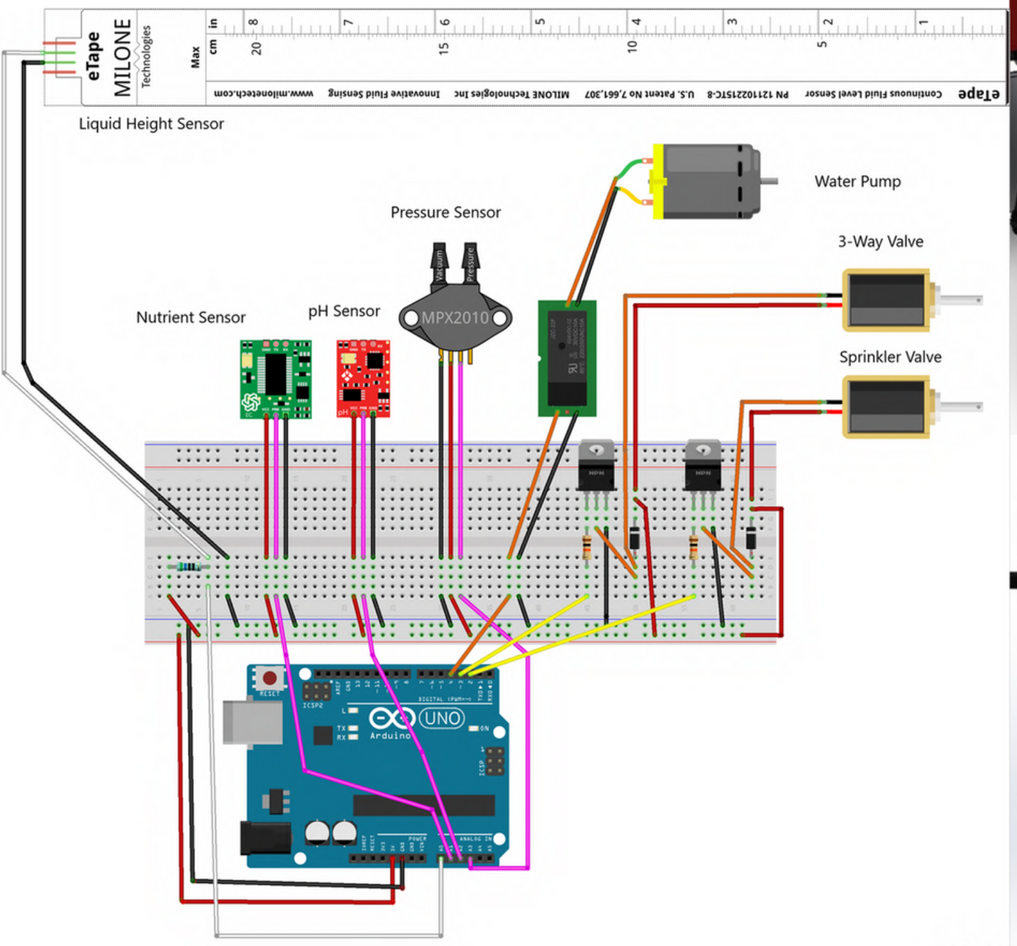
- Entails the database, back-end, and front-end and ultimately aims to provide a publicly accessible repository of real-time vertical farming data
- An electromechanical feedback control system that automatically maintains optimal growth conditions using interconnected sensors and actuators, which interact through a logical framework programmed into their Arduino micro-controllers
    - Allows technicians to remotely monitor farm equipment, Provides a record for future tuning and improvement of the farm by comparing data to commercial vertical farms and conventional producers

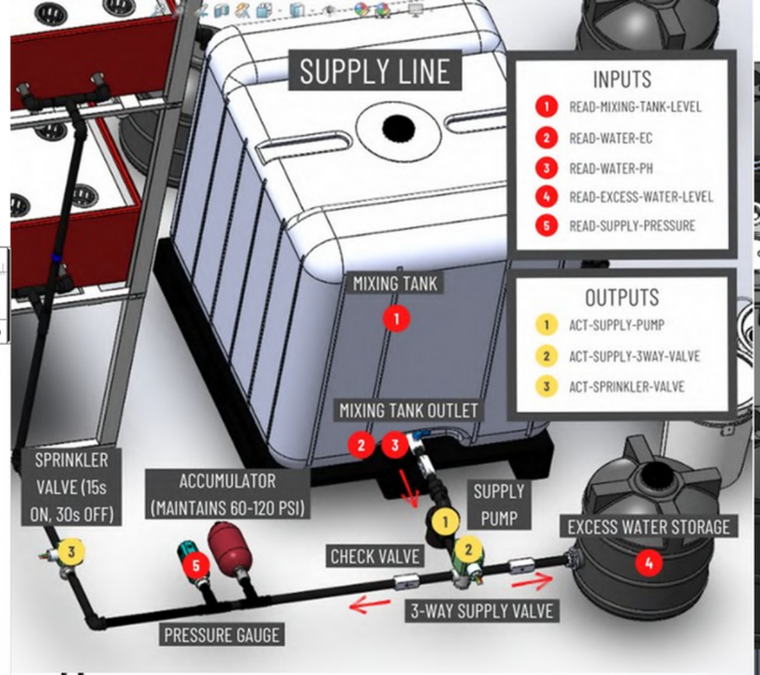


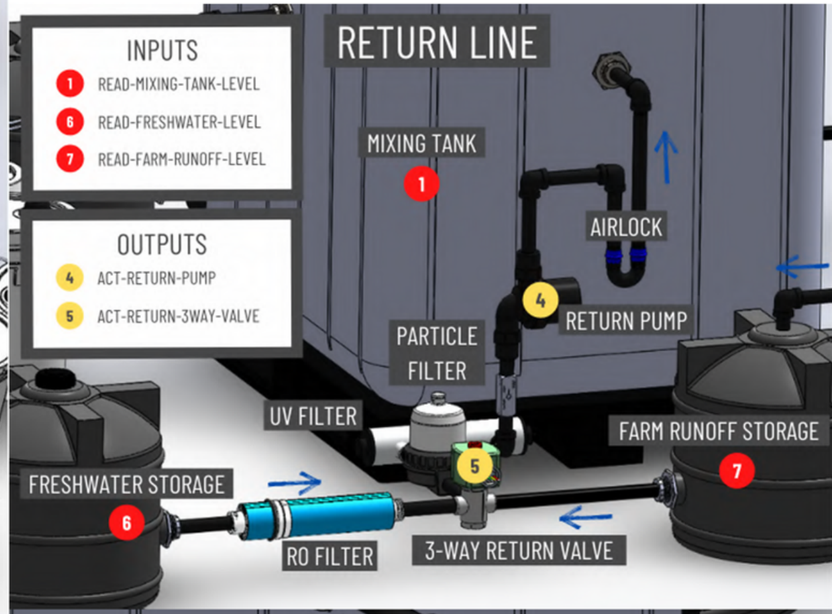


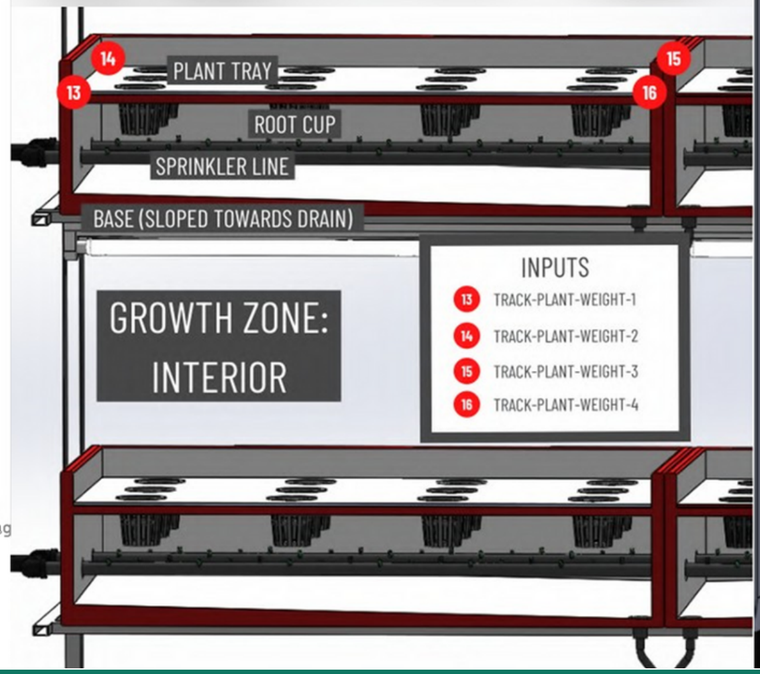


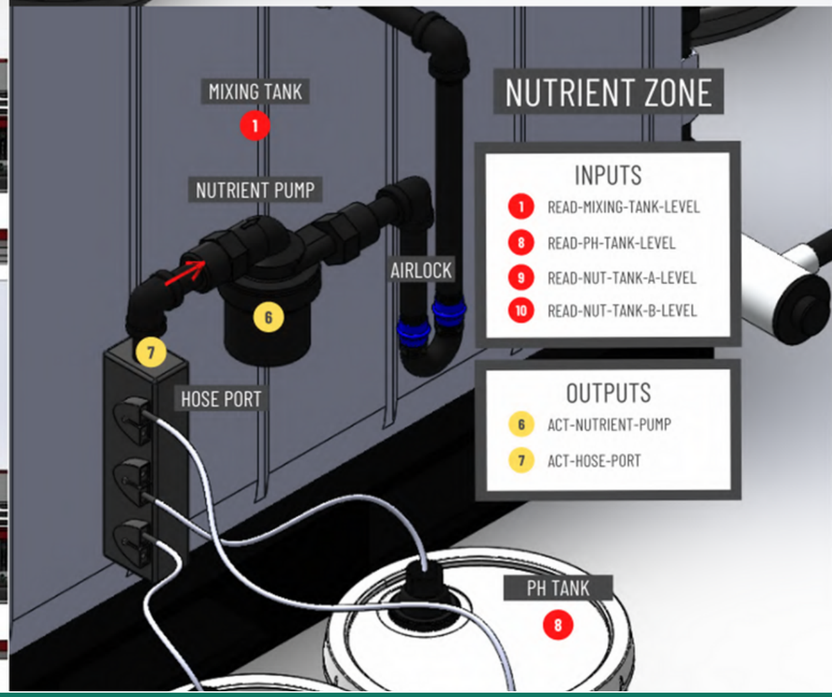
Farm Brain: Sensors and Controls











HIRING INFORMATION

MECHANICAL DESIGNER

KEY ROLES AND RESPONSIBILITES

- Computer-aided design (CAD):
  - Strategically place pipe fittings in order to:
    - Maintain water tightness
    - Ensure 'safe' failure modes
    - Prevent leakage, back-flow, cavitation and excess pressure build up.
  - Design new system components that meet provided design constraints.
  - Competently manage large CAD assemblies and read drawings.
- Quantitative analysis:
  - Use fluid mechanics to determine pumping requirements and optimize physical system parameters.
  - Model and iterate calculations with MATLAB, python or equivalent tool.
  - Interpret product data-sheets and select practical components that best meet your calculated 'ideal' values.
- Manufacturing
  - 3D printing and small0scale manufacturing using available facilities on Queen's Campus

WHAT WE LOOK FOR

REQUIRED KNOWLEDGE:

- CAD (SolidWorks preferred)
- Fluid mechanics and other core mechanical engineering subjects.
- Computational tools such as MATLAB or python.

PREFERRED KNOWLEDGE:

- Mechatronics
- Arduino
- Control systems design
- Machine shop experience

PERSONALITY TRAITS:

- Hard-workings, meticulous, and driven
- Able to balance a healthy school and team project balance
- Are you good at what you do, and are you able to figure out when you don't know how to do something?

Note: past experience in vertical farming is not required

Queen's Vertical Farming Team | qvft.ca I director.qvft@engsoc.queensu.ca

STACK DEVELOPER

KEY ROLES AND RESPONSIBILITIES

GENERAL

- Improve the existing software-based automation system in close collaboration with the other sub-teams

FRONT-END/BACK-END (WEBSITE) SPECIALIZATION

- Use web technologies (Amazon Web Services) to build an online user interface for visualizing farm data in real-time

DATABASE/DATA SCIENCE SPECIALIZATION

- Work with PostgreSQL and ElephantSQL to store and update incoming readings from the I/O sub-system
- Use these readings to update the website in real time in collaboration with the front-end / back-end sub-system

WHAT WE LOOK FOR

REQUIRED KNOWLEDGE

- GitHub
- *Front-end:* HTML, CSS, JavaScript
- *Back-end:* AWS, Flask
- *Database:* AWS, PostgreSQL, ElephantSQL

PREFERRED KNOWLEDGE

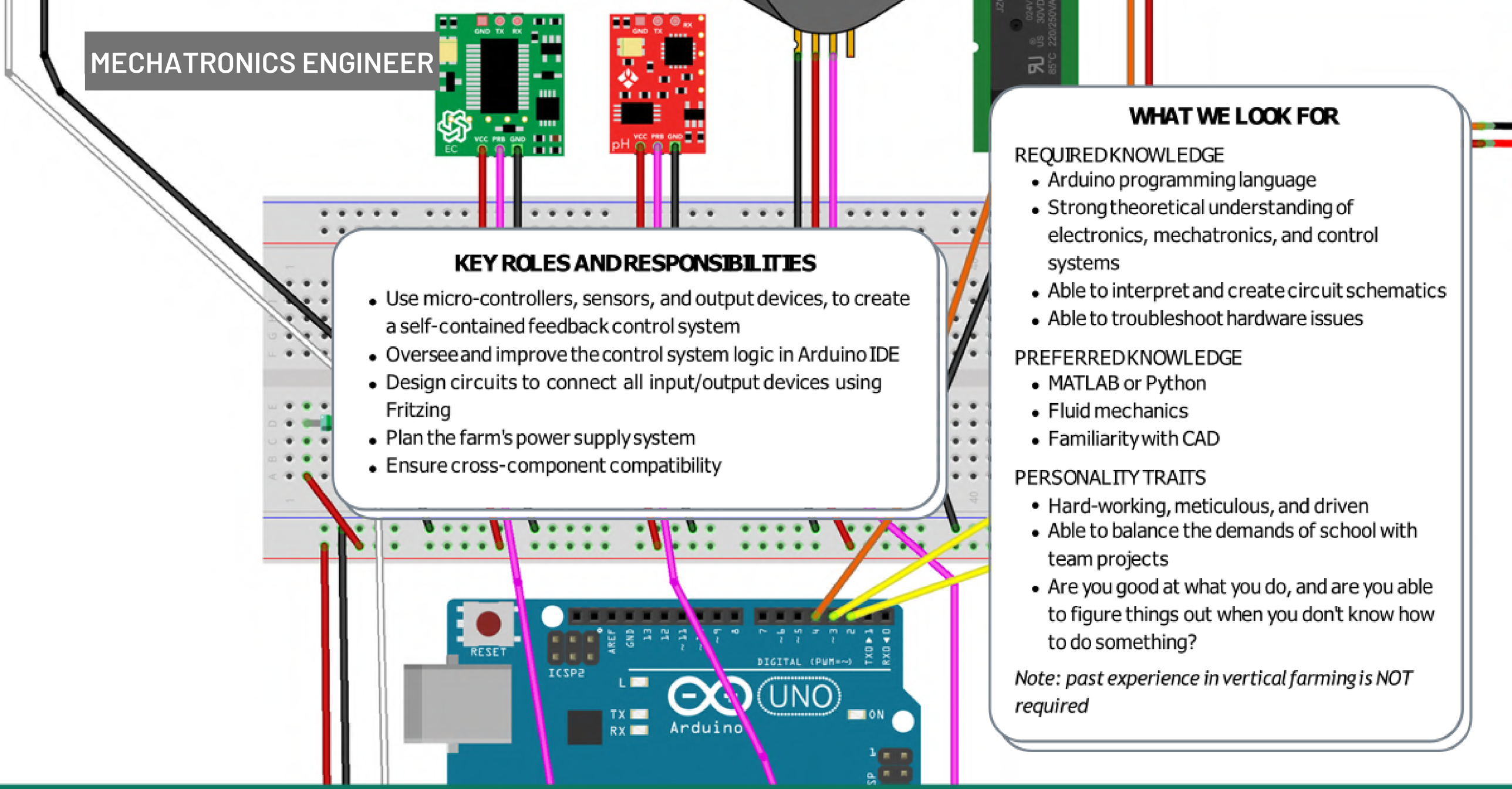
- Awareness of the tools used by the other software specializations
- Arduino IDE
- Micro-controllers, circuits, and hardware

PERSONALITY TRAITS

- Hard-working, meticulous, and driven
- Able to balance the demands of school with team projects
- Are you good at what you do, and are you able to figure things out when you don't know how to do something?

Note: past experience in vertical farming is NOT required

MECHATRONICS ENGINEER



KEY ROLES AND RESPONSIBILITIES

- Use micro-controllers, sensors, and output devices, to create a self-contained feedback control system
- Oversee and improve the control system logic in Arduino IDE
- Design circuits to connect all input/output devices using Fritzing
- Plan the farm's power supply system
- Ensure cross-component compatibility

WHAT WE LOOK FOR

REQUIRED KNOWLEDGE

- Arduino programming language
- Strong theoretical understanding of electronics, mechatronics, and control systems
- Able to interpret and create circuit schematics
- Able to troubleshoot hardware issues

PREFERRED KNOWLEDGE

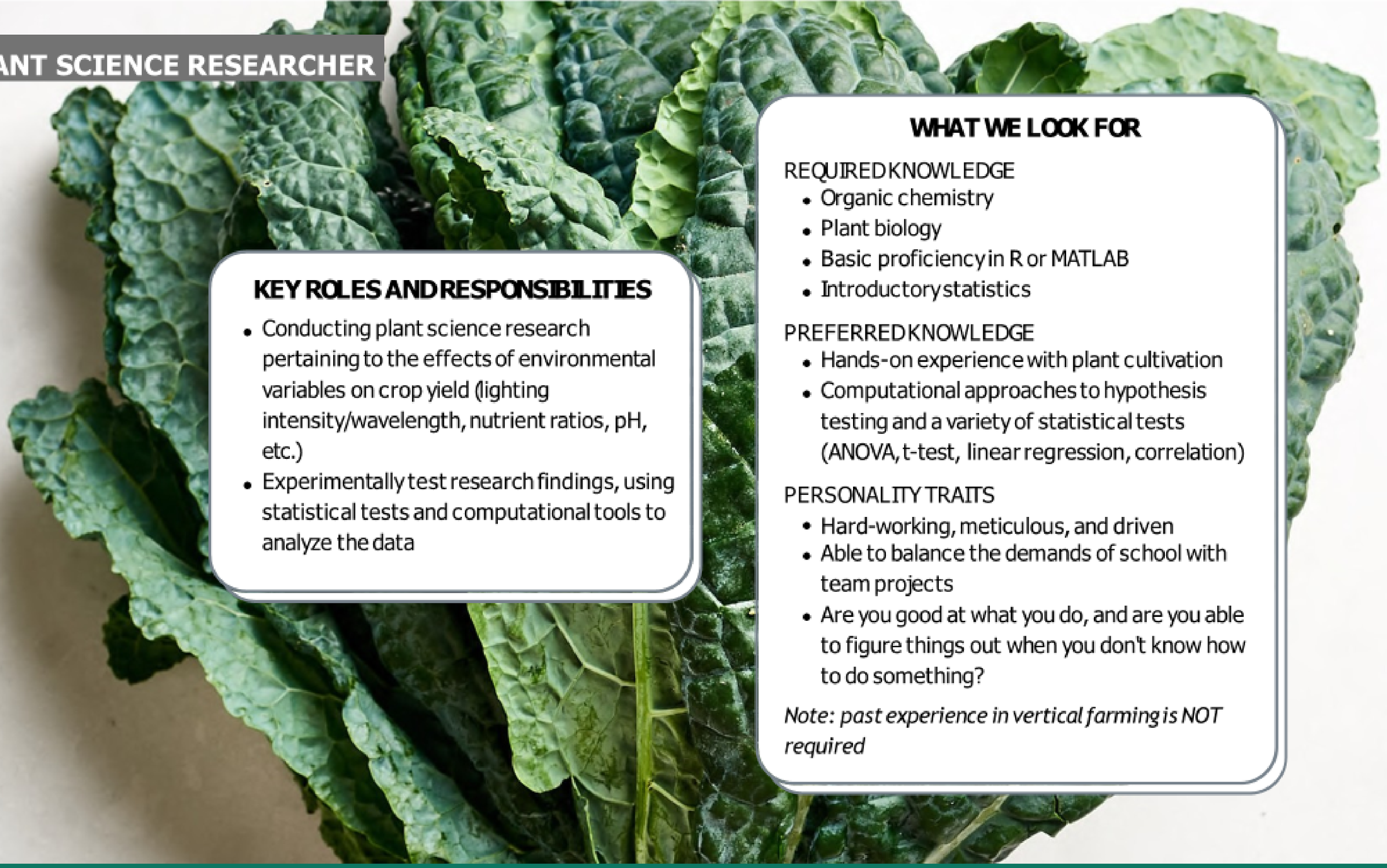
- MATLAB or Python
- Fluid mechanics
- Familiarity with CAD

PERSONALITY TRAITS

- Hard-working, meticulous, and driven
- Able to balance the demands of school with team projects
- Are you good at what you do, and are you able to figure things out when you don't know how to do something?

Note: past experience in vertical farming is NOT required

PLANT SCIENCE RESEARCHER



KEY ROLES AND RESPONSIBILITIES

- Conducting plant science research pertaining to the effects of environmental variables on crop yield (lighting intensity/wavelength, nutrient ratios, pH, etc.)
- Experimentally test research findings, using statistical tests and computational tools to analyze the data

WHAT WE LOOK FOR

REQUIRED KNOWLEDGE

- Organic chemistry
- Plant biology
- Basic proficiency in R or MATLAB
- Introductory statistics

PREFERRED KNOWLEDGE

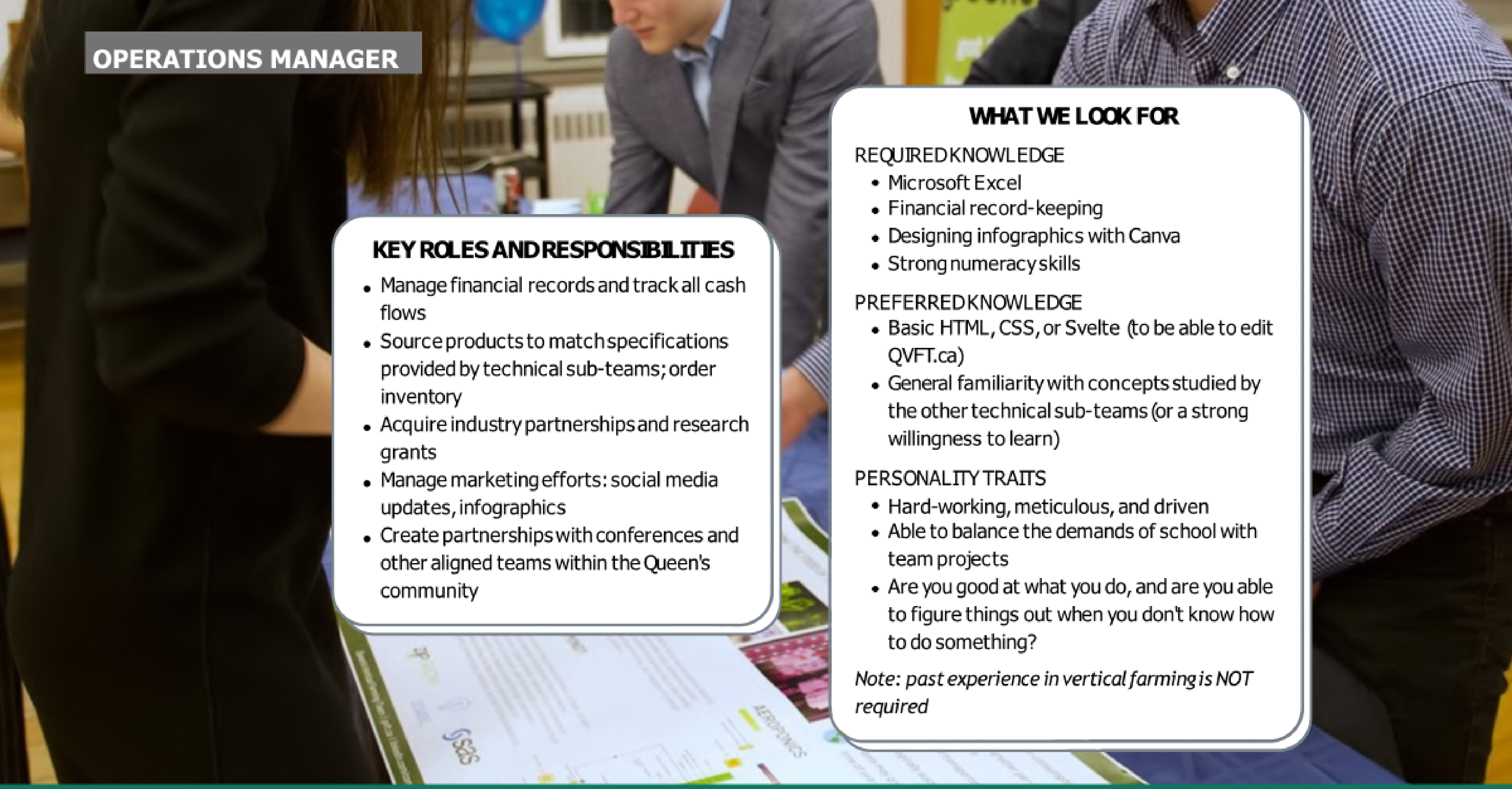
- Hands-on experience with plant cultivation
- Computational approaches to hypothesis testing and a variety of statistical tests (ANOVA, t-test, linear regression, correlation)

PERSONALITY TRAITS

- Hard-working, meticulous, and driven
- Able to balance the demands of school with team projects
- Are you good at what you do, and are you able to figure things out when you don't know how to do something?

Note: past experience in vertical farming is NOT required

OPERATIONS MANAGER



KEY ROLES AND RESPONSIBILITIES

- Manage financial records and track all cash flows
- Source products to match specifications provided by technical sub-teams; order inventory
- Acquire industry partnerships and research grants
- Manage marketing efforts: social media updates, infographics
- Create partnerships with conferences and other aligned teams within the Queen's community

WHAT WE LOOK FOR

REQUIRED KNOWLEDGE

- Microsoft Excel
- Financial record-keeping
- Designing infographics with Canva
- Strong numeracy skills

PREFERRED KNOWLEDGE

- Basic HTML, CSS, or Svelte (to be able to edit QVFT.ca)
- General familiarity with concepts studied by the other technical sub-teams (or a strong willingness to learn)

PERSONALITY TRAITS

- Hard-working, meticulous, and driven
- Able to balance the demands of school with team projects
- Are you good at what you do, and are you able to figure things out when you don't know how to do something?

Note: past experience in vertical farming is NOT required

Contact Us

Joshua Sass-Gregoire:
director.qvft@engsoc.queensu.ca



Dunin-Deshpande Queen's Innovation Centre

VERTICO FARMS

ZIPGROW™

SIMBL

iGrow

Ministry of Agriculture, Food & Rural Affairs

The Engineering Society of Queen's University