As with any project created to fit a client’s specification there are some features or aspects of the system that were identified as potentially beneficial but were not implemented due to some extenuating circumstances.

Starting with the database a NoSQL solution could have been implemented instead of the current model which currently consists of a mix of Relational Database Scheme (RDS) and a NoSQL scheme. The reasoning for this was that the information stored currently would only consist of some basic user information, the sensor readings from the device(s) and nothing else. However, in the future it may be prudent to switch the storage method used for this data to a NoSQL solution as it would allow for the easy expansion of any of the data centric features. An example of this would be allowing multiple people to use the same account and therefore expanding the users table. This is really the only change, identified by the developer, that could be implemented with regards to the database.

As opposed to the database the physical device responsible for collecting readings on a plant’s surroundings could be improved in a multitude of ways. These are mainly quality of life changes and therefore were not implemented at this point in time. Beginning with the implementation of some sort of interface for the Arduino Collective so as to allow the user to perform a few actions that are currently unavailable or only available through the web application. As far as the developer can identify there are only 3 ways that an interface could be implemented to allow the user to control the device’s functionality. The first would be a custom-built application that would interface with the device once it is connected to the user’s personal computer. This version would allow the user to make changes to the device’s functions through the interface and then the appropriate instructions would be loaded onto the device. This iteration would be the simplest to implement as the Windows OS can already recognise when an Arduino device is connected. The second way to implement an interface would be to use a display and a number pad that operates in a similar fashion to the keys found on older mobile phone devices. This would allow the user to directly control the device without the need for an intermediate medium. Although a functional and novel idea for an IoT device, the implementation of this idea was deemed as too difficult to complete within the allotted time. Finally, another method that could be used to implement an interface would be to use the website to allow the user to set some options that would control the functionality of the device and then load those the appropriate device instructions onto the device. This is probably the hardest, of the three models described for device interfaces, to implement as it requires that two-way communication is possible between the device and the website. Additionally, it would require more storage for user preferences as well as more data to be collected on each individual user. Continuing with the device, another aspect that could be implemented in the future would be to allow the user to sustain or nourish the system through the device itself, mainly watering and providing light to the plant. This feature ties in with the previously mentioned future improvement of implementing a device interface as it would allow the user to not only monitor the devices status but to react by activating a watering or lighting mechanism to provide sustenance to the plant. The reason this was not implemented was that the developers felt that this would be fairly trivial to implement at a later time when some type of interface had been designed and attached to the device. Lastly and least importantly at this stage would be the design and construction of a plastic 3D printed case for the device to be housed. This was done due to the extremely limited access the developer had to such a printer.

The website is the final component which holds potential for future upgrades or modifications. Beginning with the addition of a feature that would allow the user to regain access to their account should they forget their password. There are plenty of methods that can be used to implement such a feature, including email reset links or other two factor authentication methods. This was, again, not implemented due to time constraints and not due to difficulties in implementation. Another security feature that will be implemented in the future will be the use of the HTTPS protocol to encrypt connections between the users and the website. This was not implemented because the web hosting used did not support the developers preferred method of adding the required certificate to the website and thus would require more work and time than available at that point in time.

Apart from security features there are some functional aspects that have not been implemented due to time constraints as well as the fact that they were deemed as small quality of life changes and therefore would not improve the functionality of the system by a significant amount. That being said, they will be discussed here as potential improvements for the system in the future. Starting with the implementation of a feature that would enable users to discuss plant care with plant experts or members of the user base who have proven to be extremely adept at plant care. This would allow for a kind of social network that would enable users to interact with other people who share the same passions as them. Another quality of life change that would improve the overall usability would be to add a feature that would allow users to upload a picture of their plant so that a trained AI model that would identify the species of the plant and suggest methods to improve the plants health. This feature could also be extended to utilise the portion of the website that asks the user to enter what they think are the ideal environmental conditions for their plant. While this is a novel and potentially useful idea, to build such an artificially intelligent model would require a large amount of development time as well as a huge dataset of pictures of all the most likely types of plants to be used with the system. Meaning that it was not be possible to implement at this time. Finally, another feature that could be implemented in the future would be to add a “wiki” type section of the website that would host all kinds of information about plant care. While very easy to implement this can be very time consuming as it would require the developer in charge of the task to do extensive research so as to ensure that the information hosted on the website is accurate. This is also the reason this feature has not been implemented as of yet.