CLAIMS

1. A control system for growing algae~~plant matter~~ having:

a controller for controlling a plurality of LED lights;~~,~~ and

one or more sensors to provide data on the growth of the algae in a liquid growing medium,

~~——~~wherein:

the controller is adapted to control the spectrum and intensity of the LED lights~~,~~; ~~and~~

~~wherein~~ the controller is adapted to control a flickering frequency of the LED lights in a range of 2ms to 5,000ms;

the controller includes a communication module adapted to communicate with a remote device;

the controller is adapted to send data on the flickering frequency of the LED lights to the remote device;

the controller is adapted to receive data from the one or more sensors and send the data from the one or more sensors to the remote device;

the one or more sensors includes a cell count sensor that measures the quantity of algae cells in a defined volume of the liquid growing medium;

the remote device correlates data from the one or more sensors with data on the spectrum, intensity and flickering frequency of the LED lights;

the remote device correlates desired traits of the algae being grown with the data on the spectrum, intensity and flickering frequency of the LED lights;

the remote device correlates desired traits of the algae being grown with the data from the one or more sensors;

the remote device is adapted to optimise the spectrum and intensity of the LED lights based on the data from the one or more sensors;

the remote device uses artificial intelligence to determine the spectrum, intensity and flickering frequency of the LED lights that correspond to desirable data from the one or more sensors;

the remote device will set the spectrum, intensity values and flickering frequency in the controller to the determined spectrum, intensity and flickering frequency of the LED lights; and

the remote device is adapted to communicate additional settings to the control system, the additional settings including one or more of flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added.

2. The control system of claim 1, wherein the control system includes the remote device.

3. The control system of claim 1 or claim 2, wherein the controller is adapted to control each of the plurality of LED lights individually.

4.

~~2.~~ ~~A~~The control system of any one of the preceding claims~~as claimed in claim 1,~~ wherein the controller is adapted to control the flickering frequency in a range of 10ms to 100ms.

~~3. A control system as claimed in any one of the preceding claims, wherein the controller includes a communication module adapted to communicate with a remote device.~~

~~4. A control system as claimed in claim 3, wherein the remote device is adapted to set the spectrum and intensity of the LED lights.~~

5. ~~A~~The control system of any one of the preceding claims~~as claimed in claim 4, further including one or more sensors to provide data on the growth of the plant matter~~, wherein the one or more sensors includes: a temperature sensor which senses a temperature of the liquid growing medium; a gas sensor adapted to sense dissolved gas in the growing medium; a sensor to determine algae growth; a pH sensor to measure the pH of the growing medium; a salinity sensor for measuring the salinity of the growing medium; a nitrate sensor for measuring the concentration of nitrates in the growing medium; and or a cell health sensor for providing data on the health of algae cells~~controller is adapted to receive data from the one or more sensors and send the data from the one or more sensors to the remote device, the remote device is adapted~~

~~to optimise the spectrum and intensity of the LED lights based on the data from the one or more sensors~~.

~~5.~~ 6. The control system of claim 5, wherein the one or more gas sensors is a carbon dioxide sensor and or an oxygen sensor.

~~6.~~ 7. The~~A~~ control system of any one of the preceding claims~~as claimed in claim 5 when dependent on claim 1~~, wherein the controller ~~is adapted to send data on the flickering frequency of the LED lights to the remote device, and the remote device determines the flickering frequency of the LED lights that corresponds to desirable data from the one or more sensors, and the remote device will set the flickering frequency of the LED lights to the determined flickering frequency of the LED lights~~ controls one or more pumps, valves, solenoids, heaters, or the like, to control the flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added, according to settings received from the remote device.

~~7. A control system as claimed in any one of the preceding claims, wherein the plant matter is algae.~~

~~8. An algae cultivation control system, the control system having~~

~~a controller for controlling a plurality of LED lights to provide the algae with light,~~

~~wherein the controller is adapted to control the spectrum and intensity of the LED lights, and~~

~~wherein the controller is adapted to control a flickering frequency of the LED lights in a range of 2ms to 5,000ms.~~

~~9. A control system for growing algae having~~

~~a controller for controlling a plurality of LED lights,~~

~~wherein the controller is adapted to control the spectrum and intensity of the LED lights, and~~

~~wherein the controller is adapted to control a flickering frequency of the LED lights in a range of 2ms to 5,000ms.~~

~~10. A control system for growing algae having~~

~~a plurality of LED lights to provide the algae with light; and~~

~~a controller for controlling the plurality of LED lights,~~

~~wherein the controller is adapted to control the spectrum and intensity of the LED lights, and~~

~~wherein the controller is adapted to control a flickering frequency of the LED lights in a range of 2ms to 5,000ms.~~

~~11. A control system as claimed in claim 9 or claim 10, further including one or more sensors to provide data on the growth of the algae, and further including a communication module adapted to communicate sensor data and spectrum and intensity settings of the LED lights to a remote device.~~

~~12. A control system as claimed in claim 11, wherein the remote device is adapted to communicate the settings for the spectrum and intensity of the LED lights which have resulted in desirable traits in the algae to one or more further control systems.~~

~~13. A control system as claimed in claim 11 or claim 12, wherein the remote device is adapted to communicate additional settings including one or more of flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added, to the control system and or the one or more further control systems, and~~

~~wherein the corresponding controller is adapted to control one or more pumps, valves, solenoids, heaters, or the like, to control the flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added.~~

~~14.~~ 8. A method of controlling the growing of algae, the method including the steps

of:

controlling with a ~~first~~ control system the spectrum and intensity of a plurality of LED lights for growing algae in a liquid growing medium;

controlling with the ~~first~~ control system a flickering frequency of the plurality of LED lights in a range of 2ms to 5,000ms;

controlling with the control system additional settings including one or more of flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added;

monitoring with one or more sensors traits of the algae;

transmitting from the control system to a remote device the spectrum and intensity settings of the plurality of LED lights and correlating sensor data for~~changing the spectrum, intensity and flickering frequency of the plurality of LED lights while continuing to monitor with the one or more sensors~~ the traits of the algae;

correlating on the remote device traits of the algae with the spectrum~~,~~ and intensity ~~and flickering frequency~~ of the plurality of LED lights, the flow rate of growing medium, temperature of growing medium, amount of CO2 added, amount of O2 added, and or the type and or amount of nutrients added;

using the remote device to change the spectrum and intensity of the plurality of LED lights while continuing to monitor with the one or more sensors traits of the algae; and

using the remote device to control the spectrum and intensity settings of the plurality of LED lights to correspond to a desired trait of the algae;

~~transmitting with a remote device the spectrum, intensity and flickering frequency settings of the plurality of LED lights for a desired trait of the algae to a second control system to grow algae with the desired traits using the second control system~~wherein artificial intelligence of the remote device is used to change one or more of the spectrum and or intensity settings of the plurality of LED lights, flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added to optimise the traits of the algae; and

wherein the one or more sensors includes a cell count sensor that measures the quantity of algae cells in a defined volume of the liquid growing medium, and the desired trait is increased cell count or increased cell density.

9. The method of claim 8, wherein the control system includes a controller and the controller is adapted to control each of the plurality of LED lights individually.

10. The method of claim 9, wherein the controller is adapted to control the flickering frequency in a range of 10ms to 100ms.

~~15.~~ 11. The~~A~~ method of any one of claims 8 to 10~~as claimed in claim 14~~, wherein the one or more sensors includes: a temperature sensor which senses a temperature of the liquid growing medium; a gas sensor adapted to sense dissolved gas in the growing medium; a sensor to determine algae growth, a pH sensor to measure the pH of the growing medium, a salinity sensor for measuring the salinity of the growing medium; a nitrate sensor for measuring the concentration of nitrates in the growing medium; and or a cell health sensor for providing data on the health of algae cellsfurther including the step of transmitting from the first control system to the remote device the spectrum, intensity and flickering frequency settings of the plurality of LED lights and the correlating sensor data for the traits of the algae, and wherein the step of correlating traits of the algae with the spectrum, intensity and flickering frequency of the plurality of LED lights is performed on the remote device.

12. The method of claim 11, wherein the one or more gas sensors is a carbon dioxide sensor and or an oxygen sensor.

~~16.~~ 13. The~~A~~ method of any one of claims 8 to 12~~as claimed in claim 14 or claim 15~~, wherein the controller controls one or more pumps, valves, solenoids, heaters, or the like, to control the~~further including the step of correlating traits of the algae with a~~ flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added, according to settings received from the remote device.

~~17. A method as claimed in claim 16 further including the step of transmitting with the remote device settings related to one or more of the flow rate of growing medium, temperature of growing medium, amount of CO_2 added, amount of O_2 added, and or the type and or amount of nutrients added to the second control system to grow algae with the desired traits using the second control system.~~

~~18. A method of controlling the growing of algae, the method including the steps of~~

~~controlling with a control system the spectrum and intensity of a plurality of LED lights for growing algae;~~

~~controlling with the control system a flickering frequency of the plurality of LED lights in a range of 2ms to 5,000ms;~~

~~monitoring with one or more sensors traits of the algae;~~

~~changing the spectrum, intensity and flickering frequency of the plurality of LED lights while continuing to monitor with the one or more sensors traits of the algae;~~

~~correlating traits of the algae with the spectrum. intensity and flickering frequency of the plurality of LED lights; and~~

~~controlling the spectrum, intensity and flickering frequency settings of the plurality of LED lights to correspond to a desired trait of the algae.~~