

increase in the cost of CO₂. Therefore, the various embodiments of the present invention dynamically change the inputs to the environment based on the price of power and CO₂ to determine an optimal cost strategy.

5 In yet other embodiments, the present invention may include renewable energy as inputs. As the outputs of various types of renewable energy are variable, and hence, not predictable, the various embodiments of the present invention may be applied to adjust inputs to the controlled environments to address the change in these renewable energy sources.

10 The at least one memory and the computer program code may be further configured to, with the at least one processor, cause the apparatus to access third party input information via a bi-directional communication link to a third party website. For example, in response to rate information from a power company website, the apparatus, in the adjusting step, may send a signal to an electrical interface to schedule a light source to be inactive during certain times of the day as to take advantage of an incentive offered by
15 the power company or to only use electricity during lower rate time periods. Also, the apparatus may send a signal to a valve interface to schedule water usage for the controlled environment for certain times. The apparatus in this and other embodiments may comprise a controller or any other device capable of controlling one or more inputs in the controlled farming environment.

20 According to an aspect of the present invention, a system for optimizing plant growth in a controlled environment, said system comprising: a controller, wherein said controller has a bidirectional communication link to the internet; a water valve, wherein said water valve is remotely activated and coupled to a water source; a water valve interface providing a communication link between said water valve and said controller;
25 one or more light sources; and, an electrical interface operably linked between said one or more light sources and said controller; wherein said controller is configured to receive power rate information from a power company website via said bidirectional communication link.

30 According to another aspect of the present invention, a system for optimizing plant growth in a controlled environment, said system comprising: a controller, wherein said controller has a bidirectional communication link to the internet; a water valve, wherein said water valve is remotely activated and coupled to a water source; a water valve interface providing a communication link between said water valve and said controller;
one or more light sources; and, an electrical interface operably linked between said one or

more light sources and said controller; wherein said controller is configured to receive water rate information from a water company website via said bidirectional communication link.

5 According to another aspect of the present invention, a method of optimizing plant growth for a plurality of plants in a controlled environment, the method comprising: determining nutrition information for one or more plants; determining rate information for one or more inputs to the controlled environment; ascertaining current levels of inputs to the controlled environment; and, adjusting the inputs to the controlled environment based on the nutrition information and current levels of inputs.

10 According to another aspect of the present invention, an apparatus for optimizing plant growth in a controlled environment, the apparatus comprising: at least one processor; and at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: determine nutrition information for one or more plants from a
15 network location accessible via the Internet; ascertain current levels of inputs in the controlled environment; and, adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs.

According to another aspect of the present invention, an apparatus for optimizing plant growth in a controlled environment, the apparatus comprising: at least one processor;
20 and at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: determine nutrition information for one or more plants; ascertain current levels of inputs in the controlled environment; and, adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs;
25 wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus to access third party input information via a bi-directional communication link to a third party website.

According to another aspect of the present invention, an apparatus for optimizing plant growth in a controlled environment, the apparatus comprising: at least one processor;
30 and at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: determine nutrition information for one or more plants; ascertain current levels of inputs in the controlled environment; and, adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs;

wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus, to determine electrical rate information and to send a signal to an electrical interface to schedule a light source to be inactive during certain times of the day to take advantage of lower electrical rates or incentives from an electric power company.

According to another aspect of the present invention, an apparatus for optimizing plant growth in a controlled environment, the apparatus comprising: at least one processor; and at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to: determine nutrition information for one or more plants; ascertain current levels of inputs in the controlled environment; and, adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs; wherein current levels of inputs may comprise levels of one or more renewable energy sources.

According to another aspect of the present invention, a system for optimizing plant growth in a controlled environment, said system comprising: a controller, wherein said controller has a bidirectional communication link to the internet; a water valve, wherein said water valve is remotely activated and coupled to a water source; a water valve interface providing a communication link between said water valve and said controller; one or more light sources; and, an electrical interface operably linked between said one or more light sources and said controller; wherein said controller is configured to schedule operation of said one or more light sources based at least in part on a level of carbon dioxide present in the controlled environment.

According to another aspect of the present invention, a system for optimizing plant growth in a controlled environment, said system comprising: a controller, wherein said controller has a bidirectional communication link to the internet; a water valve, wherein said water valve is remotely activated and coupled to a water source; a water valve interface providing a communication link between said water valve and said controller; one or more light sources; and, an electrical interface operably linked between said one or more light sources and said controller; wherein said controller is configured to adjust inputs to the controlled environment based on the availability of energy from renewable energy sources.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Having thus described embodiments of the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

5 Figure 1 illustrates the system according to various embodiments of the present invention.

 Figure 2 further illustrates a system according to an embodiment of the present invention.

 Figure 3 illustrates the controller according to an embodiment of the present
10 invention.

 Figure 4 is a flow diagram illustrating the steps of a method in accordance with an embodiment of the present invention.

THAT WHICH IS CLAIMED:

1. ~~A system for optimizing plant growth in a controlled environment, the system comprising:~~
~~_____ a controller, wherein said controller has a bidirectional communication link to the internet;~~
~~_____ a valve, wherein said valve is remotely activated and coupled to a water source;~~
~~_____ a valve interface providing a communication link from the valve to a controller;~~
~~_____ an electrical source, wherein the electrical source is coupled to one or more light sources; and,~~
~~_____ an electrical interface providing a communication link from the electrical source and the controller.~~

21. ~~The system of Claim 1, A system for optimizing plant growth in a controlled environment, said system comprising:~~
~~_____ a controller, wherein said controller has a bidirectional communication link to the internet;~~
~~_____ a water valve, wherein said water valve is remotely activated and coupled to a water source;~~
~~_____ a water valve interface providing a communication link between said water valve and said controller;~~
~~_____ one or more light sources; and,~~
~~_____ an electrical interface operably linked between said one or more light sources and said controller;~~
~~wherein the said controller is configured to receive power rate information from a power company website via the said bidirectional communication link.~~

32. ~~The system of Claim 1, A system for optimizing plant growth in a controlled environment, said system comprising:~~
~~_____ a controller, wherein said controller has a bidirectional communication link to the internet;~~
~~_____ a water valve, wherein said water valve is remotely activated and coupled to a water source;~~
~~_____ a water valve interface providing a communication link between said water valve and said controller;~~
~~_____ one or more light sources; and,~~
~~_____ an electrical interface operably linked between said one or more light sources and said controller;~~
~~wherein the said controller is configured to receive water rate information from a water company website via the said bidirectional communication link.~~

4. ~~The system of Claim 1, wherein valve interface may comprise a wireless communication link from the valve to the controller.~~
5. ~~The system of Claim 1, wherein the controlled environment comprises a hydroponics farming system.~~

63. A method of optimizing plant growth for a plurality of plants in a controlled environment, the method comprising:
determining nutrition information for one or more plants;
determining rate information for one or more inputs ~~in~~to the controlled environment;
ascertaining current levels of inputs ~~in~~to the controlled environment; and
adjusting the inputs to the controlled environment based on the nutrition information and current levels of inputs.
74. The method of Claim 63, wherein the step of determining rate information further comprises accessing third party input information via a bi-directional communication link to a third party website.
85. The method of Claim 74, wherein the third party input information comprises electrical rate information.
96. The method of Claim 85, wherein the third party website comprises a power company website.
107. The method of Claim 63, wherein the step of determining nutrition information comprises accessing a nutrition information database via a communication link.
118. The method of Claim 63, wherein the step of determining a nutrition information comprises receiving a light requirement for the one or more plants.
129. The method of Claim 63, wherein the step of determining nutrition information comprises receiving a water requirement for the ~~plurality of one or more~~ plants.
1310. The method of Claim 63, wherein the step of adjusting comprises scheduling a light source to be inactive during certain times of the day.
1411. The method of Claim 63, wherein the step of adjusting comprises ~~varying opening or closing~~ a water valve to provide a predetermined amount of water to the ~~plurality of one or more~~ plants during a predetermined time.

~~1512.~~ An apparatus for optimizing plant growth in a controlled environment, the apparatus comprising:

at least one processor; and

at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to:

determine nutrition information for one or more plants from a network location accessible via the Internet;

ascertain current levels of inputs in the controlled environment; and,

adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs.

~~1613.~~ ~~The apparatus of Claim 15,~~ An apparatus for optimizing plant growth in a controlled environment, the apparatus comprising:

at least one processor; and

at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to:

determine nutrition information for one or more plants;

ascertain current levels of inputs in the controlled environment; and,

adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs;

wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus to access third party input information via a bi-directional communication link to a third party website.

~~1714.~~ ~~The apparatus of Claim 15,~~ An apparatus for optimizing plant growth in a controlled environment, the apparatus comprising:

at least one processor; and

at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to:

determine nutrition information for one or more plants;

ascertain current levels of inputs in the controlled environment; and,

adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs;

wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus, in the adjusting step, to determine electrical rate information and to send a signal to an electrical interface to schedule a light source to be inactive during certain times of the day to take advantage of lower electrical rates or incentives from an electric power company.

~~1815.~~ The apparatus of Claim ~~1512~~, wherein the at least one memory and the computer program code are further configured to, with the at least one processor, cause the apparatus, in

the adjusting step, to send a signal to an valve interface to schedule a water valve to be inactive during certain times of the day.

~~19. The apparatus of Claim 15, wherein the apparatus comprises a controller;~~

~~2016. The apparatus of Claim 15, An apparatus for optimizing plant growth in a controlled environment, the apparatus comprising:~~

~~_____ at least one processor; and~~

~~_____ at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus at least to:~~

~~_____ determine nutrition information for one or more plants;~~

~~_____ ascertain current levels of inputs in the controlled environment; and,~~

~~_____ adjust the inputs to the controlled environment based on the nutrition information and current levels of inputs;~~

~~_____ wherein current levels of inputs may comprise levels of one or more renewable energy sources.~~

~~17. A system for optimizing plant growth in a controlled environment, said system comprising:~~

~~_____ a controller, wherein said controller has a bidirectional communication link to the internet;~~

~~_____ a water valve, wherein said water valve is remotely activated and coupled to a water source;~~

~~_____ a water valve interface providing a communication link between said water valve and said controller;~~

~~_____ one or more light sources; and,~~

~~_____ an electrical interface operably linked between said one or more light sources and said controller;~~

~~_____ wherein said controller is configured to schedule operation of said one or more light sources based at least in part on a level of carbon dioxide present in the controlled environment.~~

~~18. A system for optimizing plant growth in a controlled environment, said system comprising:~~

~~_____ a controller, wherein said controller has a bidirectional communication link to the internet;~~

~~_____ a water valve, wherein said water valve is remotely activated and coupled to a water source;~~

~~_____ a water valve interface providing a communication link between said water valve and said controller;~~

~~_____ one or more light sources; and,~~

~~_____ an electrical interface operably linked between said one or more light sources and said controller;~~

~~_____ wherein said controller is configured to adjust inputs to the controlled environment based on the availability of energy from renewable energy sources.~~