ABSTRACT

A shell with a controllable indoor climate. The shell may house plants, such as produce, for farming purposes. The shell may be made of scalable structurally insulated panels. Within the shell may be trays for facilitating the growth of the plants. Lighting, climate, and nutrients may be controlled for the proper growth of the plants.
INDOOR FARMING DEVICE AND METHOD

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an indoor farming device and method and, more particularly, to an indoor farming device that may include a shell for facilitating plant growth within.

[0002] Nutrient rich farms are becoming scarce, are contaminated by chemicals, and are plagued with environmental issues. Meanwhile, the demand for food is becoming greater every year. In addition, genetically modified organisms (GMO) are becoming more and more common and the organic farmers will soon be forced to change their growing techniques to avoid cross contamination and thereby maintain their organic certifications.

[0003] Current practices include produce traveling on an average of 2,000 miles before reaching a grocery store. Further, the produce may be days to weeks old by then, and may lose most of its nutritional value. This may greatly increase the risk of disease, contamination and making the use of preservatives mandatory to extend shelf life. Today’s food shortages, droughts, water shortages and global climate change, along with world population growth, have compromised our food production supply. Experts are actively concerned as organizations are struggling to find alternative ways to produce local food, which would eliminate major travel time, save fuel, and eliminate high water crop consumption.

[0004] A majority of hydroponics farming systems use green house environments and control systems. Although those systems are effective they take up a lot of land, are not insulated to be used in extreme hot or cold climates, and are difficult to control the environment.

[0005] As can be seen, there is a need for a plant facilitation device that allows users to grow plants in a controlled environment.

SUMMARY OF THE INVENTION

[0006] In one aspect of the present invention, a housing for the facilitation of plant growth comprises: a shell comprising a plurality of walls comprising a front, a back, a top, a bottom, a first side and a second side, wherein the plurality of walls comprises a plurality of structural insulated panels; at least one tray within the shell, wherein the tray is configured to contain plants; at least one lighting fixture within the shell oriented to project light onto the at least one tray; and at least one door attached to at least one of the plurality of walls to facilitate entry to an inside of the shell.

[0007] In another aspect of the present invention, a method of using a housing for the facilitation of plant growth comprises: placing at least one plant, nutrients and water into the at least one tray; placing the at least one tray onto at least one cart; inserting the at least one cart into the shell through the at least one door; and situating the light fixture over the plant.

[0008] These and other features, aspects and advantages of the present invention will become better understood with reference to the following drawings, description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a perspective overview of an embodiment of the present invention;
[0010] FIG. 2 is a perspective view of a cartridge illustrated with trays;
[0011] FIG. 3 is a perspective view of the cartridge of FIG. 2 illustrated without the trays for illustrative clarity;
[0012] FIG. 4 is a perspective view of the tray of FIG. 2;
[0013] FIG. 5 is a sectional detail view of the present invention along line 5-5 in FIG. 1; and
[0014] FIG. 6 is an exploded view of the shell of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0015] The following detailed description is of the best currently contemplated modes of carrying out exemplary embodiments of the invention. The description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating the general principles of the invention, since the scope of the invention is best defined by the appended claims.

[0016] Broadly, an embodiment of the present invention provides a shell with a controllable indoor climate. The shell may house plants, such as produce, for farming purposes. The shell may be made of structurally insulated panels. Within the shell may be trays for facilitating the growth of the plants. Lighting, climate, and nutrients may be controlled for the proper growth of the plants.

[0017] The present invention may include a scalable farming solution, which may include a structurally insulated controlled growing environment with digitally controlled hydroponics vertical cartridge system. The present invention provides a turn key vertical farming solution that may help provide produce commercially and independently in food deserts. The present invention may use 85% less water, 95% less fossil fuels, and does not need pesticides or fertilizers.

[0018] In certain embodiments, the present invention may implement structurally insulated panels (SIP) to accurately control the farming environment. Additionally, combining vertical farming systems and a scalable farming approach, the present invention may be customized for farmers needs. The present invention may produce crops all year around, cut harvest times in half and provide 20 to 30 times more than traditional green house farming methods.

[0019] Referring to FIGS. 1 through 6, the present invention may include a shell 10. The shell 10 may include multiple walls including a front, a back, a top, a bottom, a first side and a second side. The walls may be supported by a frame 20. The walls may be made of panels 14, such as structural insulated panels (SIPs). Integrated within the panels 14 may include electrical outlets and conduits.

[0020] The SIPs may be made of building material and may consist of an insulating layer of polymer foam sandwiched between two layers of structural board. The board may be made of thermostatic substrate laminate, sheet metal, cement, oriented strand board or the like. The thermostatic substrate laminate may be made from continuous by-directional fiberglass reinforced polypropylene resin. The foam may include expanded polystyrene foam, extruded polystyrene foam, polyisocyanurate foam, polyurethane foam or the like. As illustrated in FIG. 6, each wall may include one panel 14. However, as illustrated in FIG. 1, each wall may be constructed of a plurality of panels 14.

[0021] In certain embodiments, the shell 10 of the present invention may include at least one door that may be opened and closed to gain access to the inside of the shell 10. For example, the shell 10 may include a door 18 on the first side, second side, front and/or back. In certain embodiments, the shell 10 may include a roll-up door 20 on the front or back. The roll-up door 20 may be used to easily insert and remove equipment from the inside of the shell 10.
The shell 10 may contain the equipment of the present invention in a temperature controlled environment. The equipment may include, but is not limited to, trays 22, cartridges 12, light fixtures 26, and the like. The trays 22, may be containers that contain and facilitate the growth of plants. In certain embodiments, the cartridges 12 may be used to support the trays 22, as illustrated in FIG. 2. The cartridges 12 may be made of stainless steel and a water proof powder coating.

The cartridges 12 may include at least one rack 24. The cartridges 12 may be customized to size and consist of a series of levels of racks 24. In certain embodiments, each level may be adjusted vertically depending on plant height. In certain embodiments of the invention, the bottom of each level of racks 24 may support a lighting fixture 26. In certain embodiments, at the bottom of the cartridges 12 may be tracks 28 designed for forklifts and thereby may be easily removed from the shell 10 for planting, harvesting and maintenance purposes.

As mentioned above, the present invention may include lighting fixtures 26. The lighting fixtures 26 may be directed to supply light to the plants that are contained within the trays 22. For example, the lighting fixtures may hang over the trays 22. As illustrated in FIG. 5, the lighting fixture 26 may hang from an above rack 24 within the cartridges 12. The lighting fixture 26 may also hang from the top of the shell 10.

In certain embodiments, the lighting fixture 26 may include a combination of light emitting diodes (LED) and fluorescent lights mounted above the trays. The light fixtures may be turned on and off based on a preset time schedule. The LED lights may consist of blue and red spectrum. The fluorescent lights may be high intensity high output lights. The lights 26 may be interchangeable within a reflective hood system. The reflective hood may be attached above the lights to disburse light to cover a greater surface area. The hoods may be attached and detached from the cartridge system.

The shell 10 of the present invention may further include mechanisms for heating, cooling and ventilation (HVAC). The shell 10 may further include mechanisms that control humidity, pH levels, EC levels, CO2 levels, nutrient levels and water input. In certain embodiments, all of the mechanisms listed above and including the light fixtures 26 may be controlled by a digital central control system. Using the control system, the conditions within the shell 10 may be monitored from remote locations with the appropriate software. The control systems may further collect data to help improve and monitor farming practices.

Although the illustrations provide a vertical farming system, the present invention may also provide a shell and selected equipment for a single level growing system where efficiency of space is not a priority. Solar power, wind power and other forms of alternative energy may be added to run climate controlled mechanisms. Additional, aquaponic solutions may be integrated into our hydroponics systems to provide nutrients.

The following provides a method of making the device. First, the shell may be made by constructing a facility using SIP’s panels and a medium weight steel frame. Then, the HVAC, electrical, ventilation, drainage and point of entry components made be installed. In addition, the hydroponics vertical cartridges may be made and inserted into the shell. When complete the correct sensors and other control systems and mechanisms may be installed to finalize the turn key environment.

The following provides a method of using the device: placing at least one plant, nutrients and water into the at least one tray; placing the at least one tray onto the at least one cartridge; inserting the at least one cartridge into the shell through the at least one door; situating the light fixture over the plant; and controlling the climate within the shell.

The present invention may be used in food deserts. A food desert can be defined as an area that does not have farmland to produce crops or adverse temperatures that do not allow crop production. An example may include a highly populated city environment, a desert in Africa or on a ship. The present invention may provide a sustainable local food solution into communities in need. Consumers may use the farming facilities of the present invention in food deserts.

It should be understood, of course, that the foregoing relates to exemplary embodiments of the invention and that modifications may be made without departing from the spirit and scope of the invention as set forth in the following claims.

What is claimed is:
1. A housing for the facilitation of plant growth comprising:
   - a shell comprising a plurality of walls comprising a front, a back, a top, a bottom, a first side and a second side, wherein the plurality of walls comprises a plurality of structural insulated panels;
   - at least one tray within the shell, wherein said tray is configured to contain plants;
   - at least one lighting fixture within the shell oriented to project light onto the at least one tray; and
   - at least one door attached to at least one of the plurality of walls to facilitate entry to an inside of the shell.

2. The housing of claim 1, further comprising at least one cartridge within the shell, wherein the cartridge is configured to support the at least one tray.

3. The housing of claim 2, wherein the at least one cartridge comprises a plurality of racks.

4. The housing of claim 3, wherein the plurality of racks is adjustable vertically within the cartridge.

5. The housing of claim 3, wherein the at least one lighting fixture comprises a plurality of lighting fixtures, wherein the plurality of lighting fixtures are supported on a bottom of the plurality of racks and from the top of the shell.

6. The housing of claim 2, wherein the at least one cartridge comprises a track on a bottom of the at least one cartridge.

7. The housing of claim 1, wherein the at least one door comprises a plurality of doors.

8. The housing of claim 7, wherein the plurality of doors comprises a first door located on the first side and a second door located on the front.

9. The housing of claim 8, wherein the second door is a roll-up door.

10. The housing of claim 1, further comprising a heating, ventilations and air conditioning system.

11. The housing of claim 10 further comprising a digital control device that controls at least one of lighting, heating, ventilation, air conditioning, humidity, pH levels, EC levels, CO2 levels, nutrient levels, and water input.

12. The housing of claim 1, further comprising a canopy covering a plurality of shells.

13. The housing of claim 1, wherein each wall comprises one panel.

14. The housing of claim 1, wherein each wall comprises a plurality of panels.
15. The housing of claim 1, wherein the structural insulated panels comprises an outer layer of thermoplastic substrate laminate and a foam inner layer.

16. The housing of claim 15, wherein the foam inner layer is polyurethane foam.

17. A method of using the device of claim 2 comprising:
   placing at least one plant, nutrients and water into the at least one tray;
   placing the at least one tray onto the at least one cartridge;
   inserting the at least one cartridge into the shell through the at least one door; and
   situating the light fixture over the plant.

18. The method of claim 17, further comprising controlling the climate within the shell.

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