

CLAIMS

1. A method for cultivating plants (43) in a building (1) including a greenhouse (2), comprising ~~including~~ the steps of,

sowing seeds in a growing medium in sterilised pots (17) using a sowing device (7), wherein the sowing device (7) also provides water, nutrient and/or fertilizers to the growing medium,

allowing the seeds in the pots (17) to germinate in a germination device (8),

controlling whether the seeds in the pots (17) have germinated,

placing only pots (17) with germinated seeds into trays (9) with length axis (16) using a device for movement of pots (25),

automatically moving the pots through the greenhouse (2) to allow the germinated seeds to grow into plants (43), wherein the greenhouse comprises at least two parallel tracks (3, 3') for moving trays (9) from a starting position at the top of the building (1) to an end position at the bottom of said building, wherein said tracks are divided in a number of horizontal track portions (14) connected by track connecting means (18),

moving the trays (9) to a tracks portion (14) of one of said plurality of ~~parallel tracks (3, 3')~~ using an elevator (4), wherein the trays (9) are moved from the

bottom of the building to a start position of the track portion (14) at the top of the building (1),

~~automatically moving the pots through the greenhouse (2) to allow the germinated seeds to grow into plants (43), wherein the greenhouse comprises at least two parallel tracks 3, 3' for moving trays (9) from a starting position at the top of the building (1) to an end position,~~

~~moving trays (9), supported by a first beam (51) and a second beam (52), through the greenhouse (2) by conveying means, characterized by a conveying device (53) with a tray moving unit (55) which travels along the first beam (51) and moves a tray (9) one step along the track portion (14) after passing the tray (9), the conveying device (53) thus moving trays (9) stepwise along the track portion (14) during the travel along the track (14),~~

~~sliding down trays with their length axis (16) parallel to their direction of transportation from one track portion (14) to another track portion (14) below by using said track connecting means (18), said track connecting means being arranged as diagonally-inclining paths with length axis (19), wherein said track connecting means (18) connects the end section of an upper track portion (14) to the beginning section of a track portion (14) below,~~

harvesting the grown plants (43) using a harvester (5), and

sterilising the pots with the growing medium, in a sterilisation device (6) after harvest in order to provide sterilised pots (17) with a growing medium.

5 2. The method according to claim 1, wherein the trays (9)
 are moved through the greenhouse (2) by conveying means
 comprising a track portion (14) comprising a first beam
 (51) and a second beam (52), wherein the trays (9) are
 supported by the beams, and a conveying device (53) ar-
10 anged to travel along the first beam (51) and comprising
 tray moving unit (55), which after passing one of the
 trays (9) moves the tray (9) one step along the track
 portion (14), the conveying device (53) thus moving trays
 (9) stepwise along the track portion (14) during the
15 travel along the track (14).

~~2.~~3. The method according to any one of the preceding
 claims, comprising the steps of sowing seeds in medium in
 pots (17) which have at least two opposite walls that are
20 slightly inclining, placing said pots (17) in trays (9)
 which have a decreasing width towards the bottom, and
 wherein the trays allow a single row of pots (17) to be
 placed in the tray (9) along the length axis (16), and
 placing said trays (9) on the track (14) with their
25 length axes (16) perpendicular to the beams (51, 52) of
 the track (14).

~~3.~~4. The method according to any one of the preceding
 claims, comprising the step of intermittently watering
 the plants (43) by intermittently providing water to the
30 trays (9), and further comprising the step of using trays
 (9) with a bottom that is inclined at an angle of 0,5-2

degrees to the horizontal direction, wherein the remaining water flows out of the tray through an opening provided at the lower end of the tray.

5 4.5._____The method according to claim 4, comprising steps
for continuously purifying and recycling excess water
that flows out from the openings in the trays, wherein
the excess water passes through (i) a mechanical filter
for separating plant parts and growing medium from the
10 water, (ii) a biological filter comprising zeolite and
pumice for purifying the water from pathogens and metabolites,
(iii) a second mechanical filter for separating
zeolite and growing medium particles from the water purified
by the biological filter, and/or (iv) a UV filter,
15 and wherein the excess water which has passed through the
various filters is collected and thereafter mixed with
nutrient, fertilizer and/or fresh water, and then pumped
back to the arrangement (1) for watering and providing
plants with nutrient and fertilizer.

20 5.6._____The method according to anyone of the preceding
claims, wherein the step of controlling~~inspecting~~ that
the seeds in the pots (17) have germinated including using
an automated means for inspection (24) utilizing a
25 digital camera (23) connected to a computer.

30 6.7._____The method according to anyone the preceding
claims, comprising the step of harvesting the grown
plants (43) using harvester (5) with a harvesting unit
(46), wherein three parallel first conveyor belts (47)
move trays (9) with plants (43) into harvesting unit (46)
where the empty trays are moved out of the harvester on
second conveyor belts (48), and the harvested plants are
transported on third conveyor belts (49) where a camera

(50) connected to a computer is provided to inspect the harvested plants to determine the size and colour of the plants.

5 ~~7-8.~~_____The method according to anyone of the preceding claims, wherein organic wastes from the harvest inspection comprising plants that do not fulfill predetermined requirements, are sent to a biogas production plant (28) wherein bionutrients from the biogas production ~~are~~is transported to the sowing device (7).

15 ~~8-9.~~_____The method according to anyone of the preceding claims, comprising the step of sterilising the pots with the growing medium (17) using a sterilisation device (6) in which the trays and pots are subjected to steam, and the trays (9) are thereafter moved through a cooling device (30) in which the trays (9), the pots (17) and the growing medium are allowed to cool off and are transported to ~~a~~the separating device (40), in which the pots (17) are removed from the trays (9) and moved into the sowing device (7).

25 ~~9-10.~~_____The method according to anyone of the preceding claims, wherein the sterilisation is performed using microwave radiation to heat residual water in the pots, to thereby heat the growing medium and the pots.

30 11. The method according to anyone of claims 1-10, further comprising scanning unique identification tags of said trays such as Radio Frequency Identification (RFID) tags or barcodes in order to monitor and control movement of the trays.

35 ~~10-12.~~_____Arrangement (1) for cultivating plants (43) in a building (1) with a greenhouse (2), characterized by,

a sowing device (7) for sowing seeds in a growing medium arranged in pots (17), wherein the sowing device (7) also is arranged for providing water, nutrient and/or fertilizers to the growing medium,

a germination device (8) for allowing the seeds to germinate in the pots (17),

means for inspection (24) for determining whether the seeds have germinated,

a device for movement of pots (25), for placement of pots (17) into trays (9) with length axis (16),

a greenhouse (2) for allowing the germinated seeds to grow to plants (43), wherein the greenhouse comprises two parallel tracks (3, 3') for moving trays (9) from a the start position at the top of the building to an end position at the bottom of the building, wherein said tracks are divided in a number of horizontal track portions (14) connected by track connecting means (18),

an elevator (4) for moving trays (9) to a track portion (14) of parallel tracks 3, 3', wherein the elevator (4) moves trays (9) from the bottom of the building to a start position of the track portion (14) at the top of the building (1),

~~a greenhouse (2) for allowing the germinated seeds to grow to plants (43), wherein the greenhouse comprises two parallel tracks 3, 3' for moving trays (9) from the start position to an end position,~~

conveying means for moving the trays (9) through the greenhouse (2), ~~wherein the means for moving the trays (9) through the greenhouse (2) comprises a track portion (14) comprising a first beam (51) and a second beam (52), wherein a tray (9) is supported by said beams, and a conveying device (53) arranged to travel along the first beam (51) and comprising tray moving unit (55), which after passing tray (9) moves a tray (9) one step along the track portion (14), the conveying device (53) thus moving trays (9) stepwise along the track portion (14) during the travel along the track portion (14),~~

wherein said track connecting means (18) are arranged as inclining paths with length axis (19), wherein the paths are arranged for transportation of trays (9) with their length axis (16) parallel to their direction of transportation, wherein said track connection means (18) are arranged for the trays to slide down diagonally from one track portion (14) to another track portion (14) below, and wherein said track connecting means (18) connects the end section of an upper track portion (14) to the beginning section of a track portion (14) below,

a harvester (5) for harvesting the grown plants (43), and,

a sterilisation device (6) for sterilising the pots (17) with the growing medium after harvest in order to provide sterilised pots (17) with a growing medium.

13. The arrangement according to claim 12, wherein the conveying means for moving the trays (9) through the greenhouse (2) comprises a track portion (14) comprising a first beam (51) and a second beam (52), wherein the trays

(9) are supported by said beams, and a conveying device (53) arranged to travel along the first beam (51) and comprising tray moving unit (55), which after passing one of the trays (9) moves the tray (9) one step along the track portion (14), the conveying device (53) thus moving trays (9) stepwise along the track portion (14) during the travel along the track portion (14).

~~11, 14.~~ The arrangement according to any one of the preceding claims 12 and 13, wherein the pots (17) have at least two opposite walls that are slightly inclining so that the cross-sectional area of the pots (17) decreases towards the bottom of the pots (17), and wherein the trays (9) have a decreasing width towards the bottom, which corresponds to the width of the pots (17), and wherein the trays (9) are elongated to allow a single row of pots (17) to be placed in the tray (9) along the length axis (16), and wherein the track portion (14) is arranged for arrangement of the trays (9) on the track portion (14) with their length axes (16) perpendicular to the beams (51, 52) of the track portion (14).

~~12, 15.~~ The arrangement (1) according to anyone of claims 12-14, wherein watering means are arranged for intermittently providing water to the trays (9) at the highest side, and wherein the track portion (14) is arranged at inclined at an angle of 0,5-2 degrees to the horizontal direction, which hinders water from remaining on the bottom of the trays (9), and wherein the remaining water flows out of the tray through an opening provided at the lower end of the tray.

~~13, 16.~~ The arrangement according to claim 15 as dependent on claim 14, wherein the watering means comprises pipes

(10) situated at distances corresponding to the length of the steps of the stepwise movement of the trays (9).

~~14.~~17. The arrangement to claim 15, comprising means for continuously purifying and recycling excess water that flows out from the openings in the trays, wherein the excess water passes through mechanical filters, biological filters and/or UV filters, and wherein the excess water which has passed through the filters is collected and thereafter mixed with nutrient, fertilizer and/or fresh water, and then pumped back to the arrangement (1) for watering and providing plants with nutrient and fertilizer.

~~15.~~18. The arrangement according to anyone of claims 12-17, wherein the means for inspection (24) that the seeds in the pots (17) have germinated includes an automated system utilizing a digital camera (23) connect to a computer.

~~16.~~19. The arrangement according to anyone of claims 12-18, wherein the harvester (5) comprises a harvesting unit (46) for harvesting the grown plants (43) wherein three parallel first conveyor belts (47) move trays (9) with plants (43) into harvesting unit (46), where the empty trays are moved out of the harvester on second conveyor belts (48), and the harvested plants are transported on third conveyor belts (49) where a camera (50) is provided to inspect the harvested plants to determine the size and colour of the plants of the harvested plants.

~~17.~~20. The arrangement according to anyone of claims 12-19, wherein organic wastes from the harvest inspection comprising plants that do not fulfil the predetermined

requirements, are sent to a biogas production plant (28) integrated or connected to arrangement (1), wherein bio-nutrients from the biogas production ~~are~~^{is} transported to a sowing device (7) for sowing seeds.

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~~18-21.~~ 21. The arrangement according to anyone of claims 12-20, comprising a sterilisation device (6) in which the trays and pots are subjected to steam, a cooling device (30) in which the sterilized trays (9), pots (17) and growing medium are allowed to cool off, a separation device (40) by which the pots (17) are removed from the trays (9) and moved into the sowing device (7).

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22. The arrangement according to anyone of the preceding claims 12-~~21~~²², wherein the sterilisation device comprises a microwave radiation source in order to employ microwave radiation to heat residual water in the pots, to thereby heat the growing medium and the pots.

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~~19-23.~~ 23. The arrangement according to anyone of claims 12-22, wherein said trays comprise unique identification tags such as Radio Frequency Identification (RFID) tags or barcodes, and wherein said arrangement further comprises scanning devices, such that movement of the trays can be monitored and controlled.

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