INTEGRATING NEW TECHNOLOGIES FROM NURSERY TO FIELD

A LOOK AT WHAT'S HAPPENING AROUND THE WORLD

October 2021

- Family owned business, founded in 1987 by owner Hans Björkemar
- Head office and production in Landskrona
- 48 employees
- Working through a network of dealers, agents and representatives
- References: projects in 65 countries, currently active in +/- 30 countries

Who is BCC

OUR BRANDS AND EQUIPMENT RANGE

- Forest Seed Centres
  - Cone and seed pod processing equipment
  - Drying chambers
  - Seed extraction, separation, cleaning and grading.
- Forest Nurseries
  - Growing trays (>40 tray models)
  - Growing tray cleaning and sterilising
  - Production equipment including stackers/destackers, media mixing and tray filling, seed sowing
  - Manual work stations for setting of cuttings, plant grading, plant packing
  - FiberCell (degradable paper growing system)
  - Conniflex treatment (pine weevil in Europe)
  - Semi-auto and fully automatic packing lines
  - Pallet handling systems
  - Travelling irrigation booms for greenhouses, shade areas and open grow-out areas
  - Black-out systems
  - Nursery-in-a-Box concept
- Planting systems
  - Pottiputki tubes and carrying equipment

FIBERCELL

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PROTECTED BY CONNIFLEX

POTTIPUTKI
Finnish Design Since 1970

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SWEDEN

SWEDEN



Conniflex and Automatic Packing Line

- Conniflex: combination of hydrofix (glue) and sand as a protection against European Pine Weevil
- Productivity of Packing line: 5 boxes per minute
- Capacity: 100 seedlings per box
- Features: box as a rip cord which allows the box to be used as a holder during planting

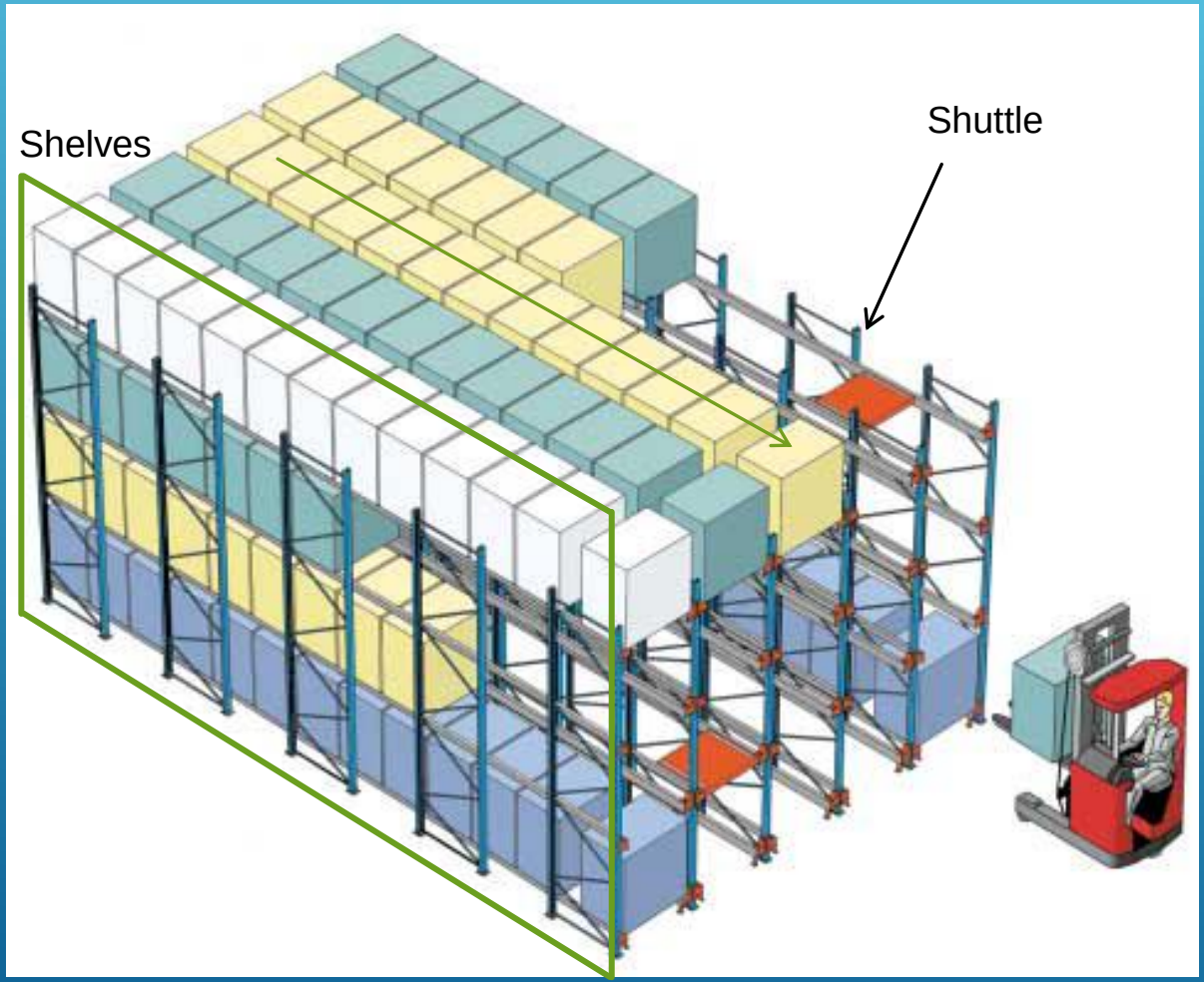
SWEDEN

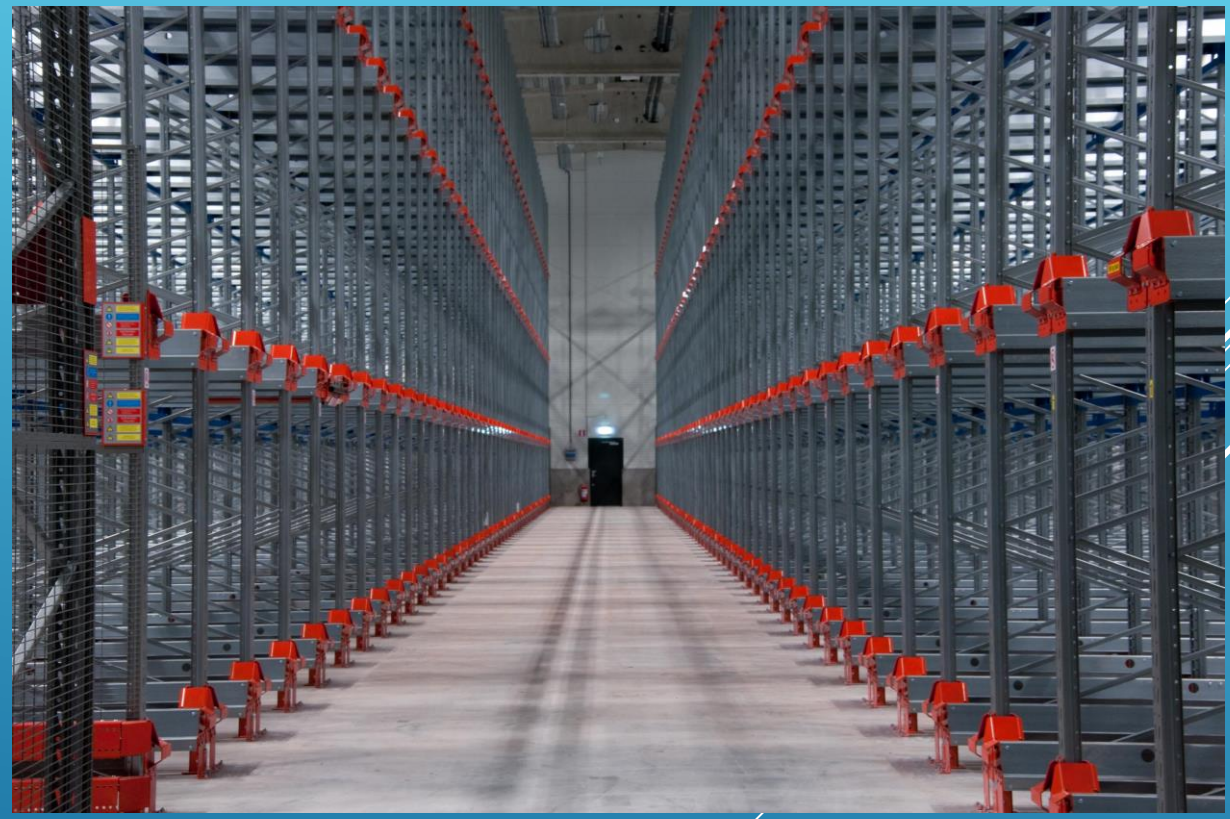
Foto: Henrik Lötstrand

SSP selling 145 million seedlings annually
Newest development:

- ❑ cold storage facility of 7200m2
- ❑ Capacity: 20.000 pallets – 42 million plants

SWEDEN





Cold storage warehouse

- Schematic image of deep stacking rack.
- Pallets shunted on shuttles.
- Forklift loading/unloading pallets.

SWEDEN

40 million seedlings stored at minus 4ºC

SWEDEN

- SSP uses a logistics company to manage cold storage facility including loading and transport to field.

- Each pallet has a unique barcode containing all information

SWEDEN

- Standard pallet on shuttle

- Shipping platform – standardised racks for ease, efficiency and reducing errors in supply. Transporting 20-25 loads per day in high season.

SWEDEN

Distribution of cold storage warehouses in Sweden

- ❑ trend is towards fewer but larger units.
- ❑ customer trend is towards having plants delivered by logistics company and not collecting by themselves.

SWEDEN

Transport

- ❑ Standardised and dedicated trucks with semi-trailers and piggy-back forklift.
- ❑ Semi-trailers allow for better flexibility – offloaded on site as per customer's confirmed GPS position.
- ❑ Feedback given to customers by sms when plants delivered.
- ❑ Optimising comms = time and money

SWEDEN

Transport and infield handling

- ❑ Easy to access sites and deliver plants.
- ❑ External factors to protect against: sun/heat – rain/snow/cold.
- ❑ Cover with protection cloth if needed.

SWEDEN

Infield handling and planting

- Box with ripcord – doubles as carrying unit in combo with Pottiputki box-carrier.
- Seedlings packed into kidney buckets for planting.

SWEDEN

Annual plantings - Sweden

- 400 million seedlings planted annually
- 97% of containerised seedlings in Sweden planted using Pottiputki planting system.
- 3% planted mechanically.
- Average productivity is 2000-2500 plants/person/day.

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FINLAND

FINLAND

Packing line (open crates)

- consists of manual selection and grading (manual workstation) and automated packing into open crates.

FINLAND

Packing line (open crates)

- Predetermined number of seedlings packed into each crate.
- Production capacity: 3-4 crates per minute
- Crates loaded into rack which fits delivery trucks.

FINLAND

BCC-StoraEnso fully auto packing line (2021)

- Productivity: 6-7 boxes per minute
- Technology: using wrap-around system (box folds around plants instead of plants packed into box)
- Capacity: fully adjustable depending on how many rows picked up from tray e.g. 50cc plugs fit 140 per box (30x40cm)

FINLAND

Annual plantings - Finland

- 160 million seedlings planted annually
- 96% of containerised seedlings in Finland planted using Pottiputki planting system.
- 4% planted mechanically.
- Average productivity is 2000-2500 plants/person/day.

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BRAZIL

BRAZIL

Packing in nursery

- Manual selection and grading in the nursery before packing into lugboxes.

BRAZIL

Transport and infield handling

- ❑ Logboxes stacked in trucks for delivery.
- ❑ Infield lugboxes are kept protected under shade next to compartments.
- ❑ Where plants are sent in trays, seedlings extracted from tubes on roadside for infield planting.
- ❑ Semi-mechanical and mechanical planting systems introduced

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CHILE

CHILE

Manual packing lines

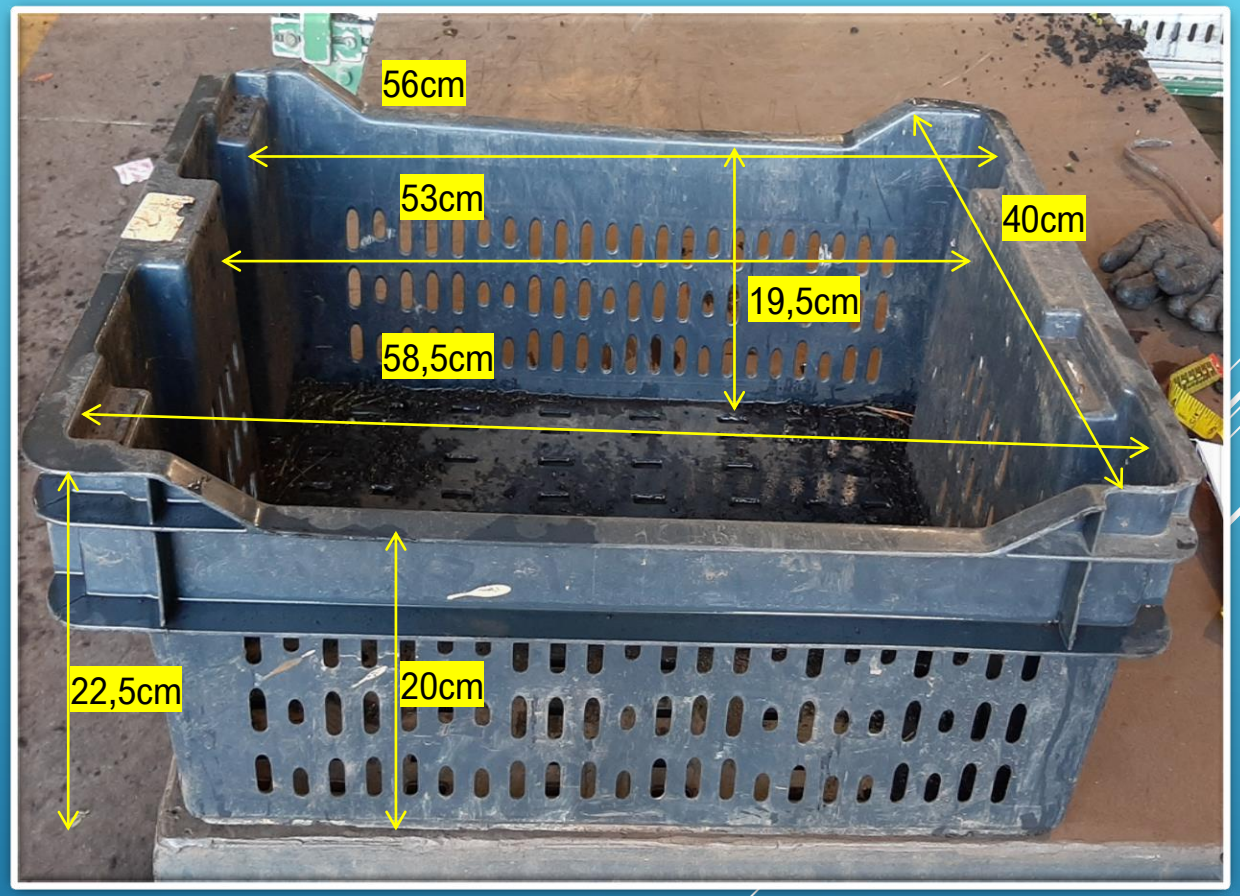
- Capacity: 24 workstations, three-level packing line
- Productivity: 9000 plants/person/day

CHILE

Manual packing lines

- ❑ Random quality checks done after packing
- ❑ All crates labelled with barcodes with detailed information of species, quality specs etc

CHILE



Manual packing lines

- 80-100 plants packed per crate
- Seedlings packed into plastic crates which are bulked up for despatch (500.000+ stocks at full capacity)
- All crates labelled with barcodes with detailed information of species, quality specs etc

CHILE

- Packing crates designed to stack on top of each other and by turning them the crates are nesting.

CHILE

Loading and transport

- ❑ Crates are palletised and loaded into delivery trucks
- ❑ More efficient than manual handling of individual crates.

CHILE

Infield handling

- ❑ Seedlings (60-80) loaded into buckets with shoulder straps for infield planting
- ❑ Majority of infield planting done manually

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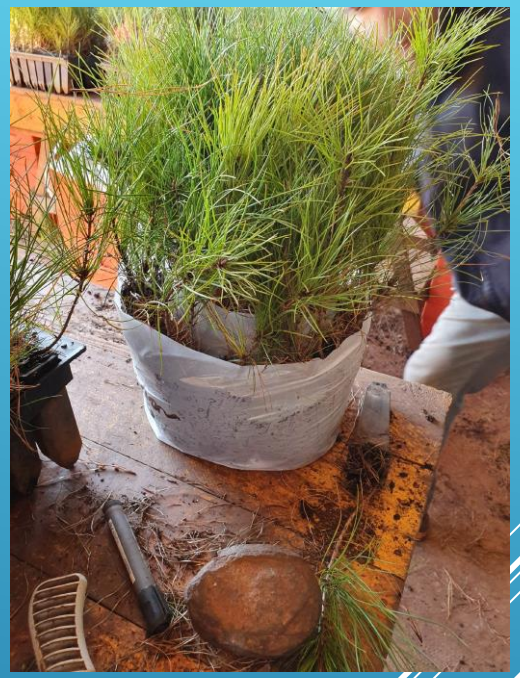
ARGENTINA

ARGENTINA



Manual packing

- ❑ Seedlings removed from tubes and placed on plastic sheet
- ❑ Quality check done simultaneously
- ❑ 54 seedlings per bundle
- ❑ 7000-8000 seedlings/person/day
- ❑ If roots not properly consolidated, rootplugs damage during transport

ARGENTINA

Loading and transport

- ❑ 128 bundles per trolley
- ❑ Trolleys loaded directly onto trucks (4 trolleys per truck); +/- 30.000 seedlings per truck
- ❑ Infield issues:
  - plastic waste;
  - limited time from delivery to planting (drying out, disease, root bridging),
  - need to repack into planting buckets (overall labour intensive packing system)

ARGENTINA

Manual planting

- Seedlings carried in planting crates
- Plant spades
- 1ha/person/day
- Pine: 1111spha, Euc: 1250spha
- Hilly terrain

Mechanical planting

- Tractor-drawn mechanical planter (1-2 persons)
- 5ha/unit/day
- Pine: 1111spha, Euc: 1250spha
- Flat terrain, well prepared sites

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USA

USA

Manual packing systems

- Tractor-drawn customised trailer for QC and packing in the nursery

Manual packing systems

- Packing stations in dedicated despatch house

USA

Packing boxes

- Plastic lined boxes used in many nurseries for packing conifer seedlings

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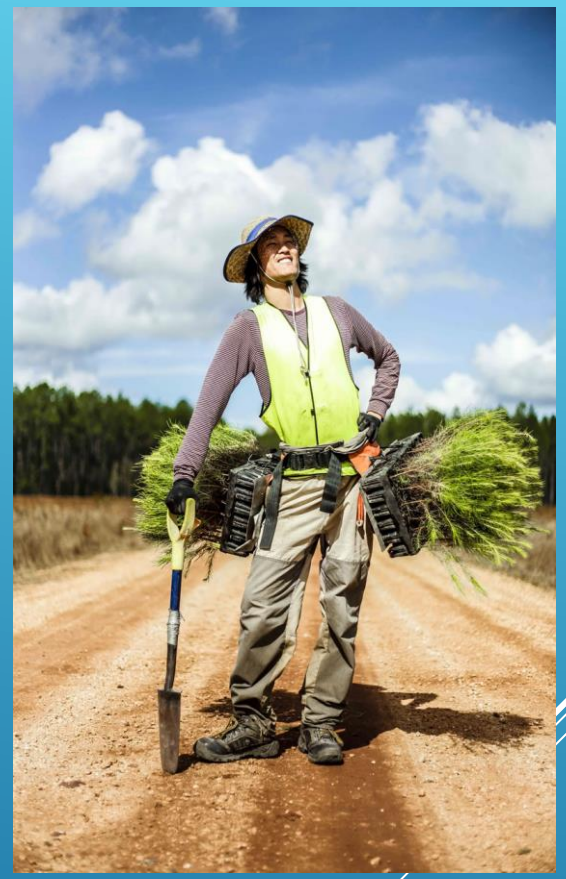
AUSTRALIA

AUSTRALIA



Transport and infield planting

- Seedlings packed and despatched both in boxes and in trays
- Seedlings treated at roadside and repacked into softbags (if transported in cardboard boxes)
- Infield planting done with planting shovel and Pottiputki tubes

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INDONESIA

INDONESIA

QC and Manual packing

- QC done at nursery on manual work stations
- Packed into crates or consolidating into trays for despatch

INDONESIA

Transport and infield handling

- ❑ Pre-treatment before loading and despatch
- ❑ Infield holding areas
- ❑ Removing plants from inserts to pack into buckets for infield planting

INDONESIA

Infield planting

- ❑ Treatment of seedlings for pests at roadside before packing plants in planting buckets
- ❑ Planting tubes becoming the standard in Indonesia for infield planting
- ❑ Productivity: 3 units/ha (this includes preparing two holes for ferts and one for the seedling)
- ❑ Spacing: 1111-1600 spha
- ❑ Mechanised planting trialled

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MALAYSIA

MALAYSIA

Transport and infield handling

- Smaller 4WD trucks used for deliveries – poor road conditions, smaller compartments distributed over a large area
- Make-shift holding areas infield on roadside

MALAYSIA

Infield planting

- Undulating topography in Sarawak
- Seedlings carried in soft bags
- Planting done with a planting spade (sandak) – planters carry measuring sticks for spacing
- Productivity: 2-5 units per ha (depends on skill, terrain and slash)
- Spacing: 1111-1600 spha

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CHINA

CHINA

Transport and infield planting

- ❑ Most seedlings packed and despatched in plastic crates
- ❑ Infield planting done with modified Pottiputki tubes equipped with gel dosing units

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RUSSIA

RUSSIA

Packing and despatch

- QC and packing done at manual multi-level packing stations
- Boxes are placed on Euro pallets (4 000 – 5 000 plants per pallet depending on plant size and box sizes)
- Pallets stored in cold storage from moment of packing until spring when planting.
- Pallets sent to terminals and distribution points where the boxes are loaded onto smaller vehicles, pick-ups and others for further transportation out to the actual planting sites.
- Plants planted by tubes or a kind of planting dibble.
- In flat terrain, tractor mounted planting machines are used sometimes.

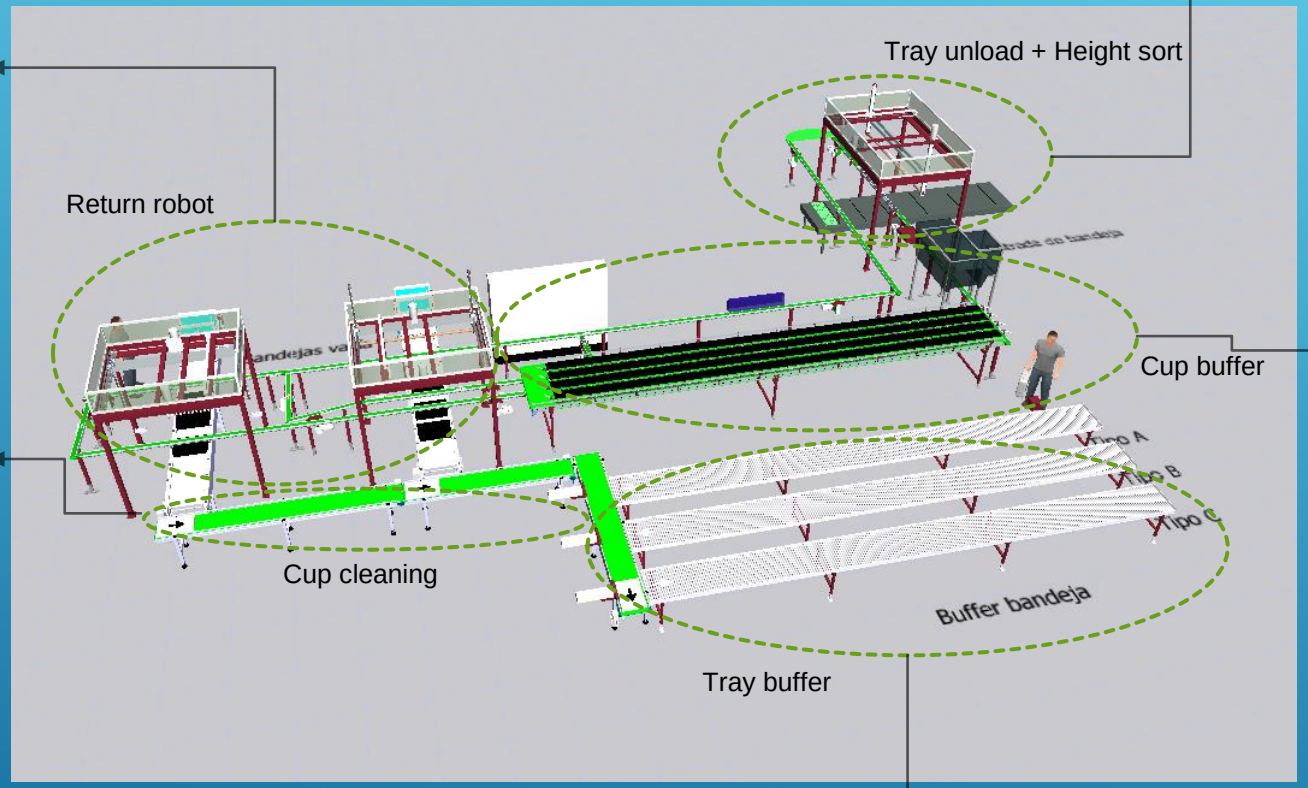
MECHANISATION: CURRENT AND FUTURE

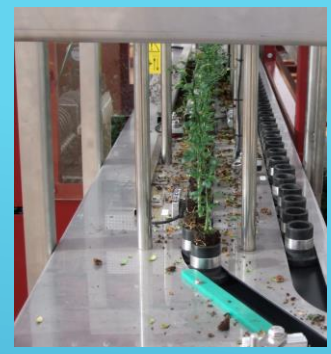
MULTI-CUP SORTING & GRADING LINE

- Each buffer fills one complete tray by robot arms

- Cups turned upside down and compressed air used to blow clean

- Trays accumulated on buffer conveyors





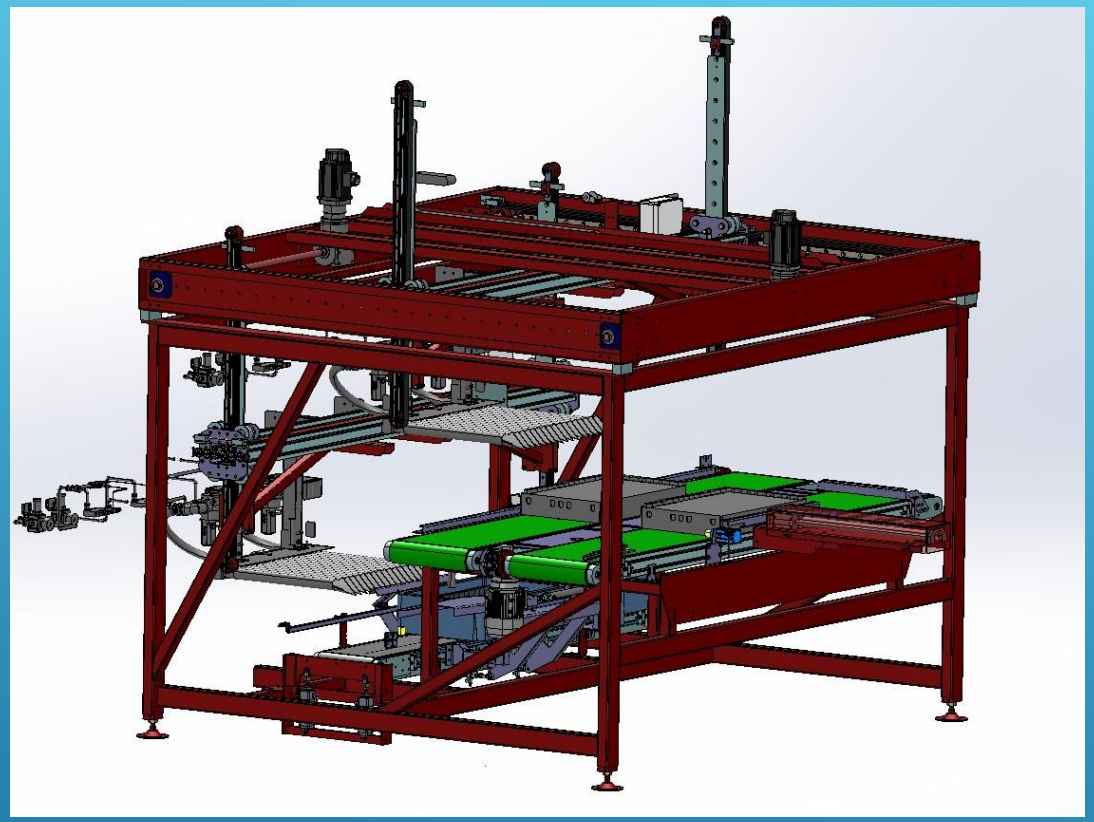
- Tray unload: gripper with deplugging to remove seedlings
- Height sensor sorting plants in three classes + waste

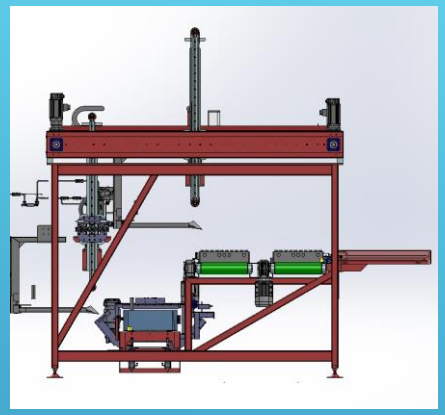
- Seedlings in cups moved into cup buffers
- Each buffer holds 88 seedlings

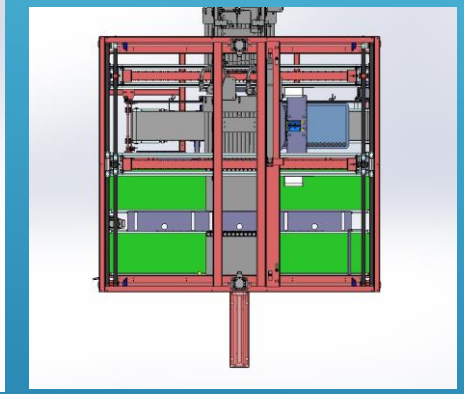
Production capacity:
- ❑ 7.200 plants per hour @ 8.5hrs workday
- ❑ 61.200 plants per day

Labour required:
- ❑ 4 people in the workstations.
- ❑ One person required to feed trays into the Grading line

AUTO PACKING INTO PLASTIC CRATES







Process:
- ❑ Specialised grippers (with inflatable cushions) remove seedlings from holder
- ❑ Currently set up for paper grown seedlings.
- ❑ Modifications needed for tube/insert grown seedlings.

Production capacity:
- ❑ 6 trays (88) per minute

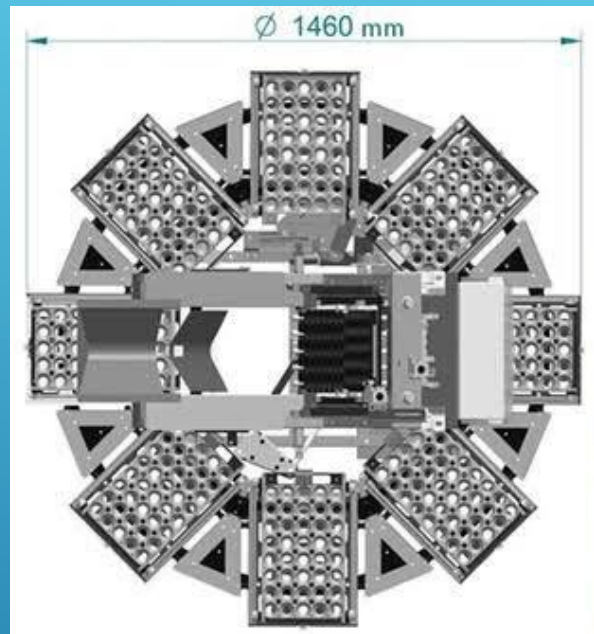
Labour required:
- ❑ 1-2 persons

MECHANISED PLANTING

Mechanised planting systems

- Introduced in various location including South Africa, South America and South East Asia.
- Indicative productivities ranging from 1.7ha/day per unit (South East Asia) to a claimed 900 seedlings/hr (Brazil, 3-head unit – refer Komatsu D61EM Planter article, Forsilvitech Jul/Aug2020).

MECHANISED PLANTING: FACTORS FOR CONSIDERATION



- Seedling count for size
- Seedling volumes for area
- Requires good seedling form (straightness)
- Logistics – how to get seedlings to machine/limited carrying capacities
- Replenishment time of carousels/pods, machine idle time – cassettes take time to change

MECHANISED PLANTING: FACTORS FOR CONSIDERATION

- Access to compartments
- Terrain
- Row alignment (up-down slope)
- In places like Indonesia labour still cheaper option
- Slash management – opening up planting point takes time

BRIDGING THE GAP BETWEEN NURSERIES AND MECHANISED PLANTING

Future development

- ❑ Dovetailing nurseries and infield planting especially mechanical planting, requires an efficient and effective solution getting the seedling from the nursery all the way to the planting hole.
- ❑ This involves the complete supply chain: packing, transport, infield handling and linking up with the mechanical planter.