Mobile Trapezoidal Plant Trough

Mobile expandable trough greening

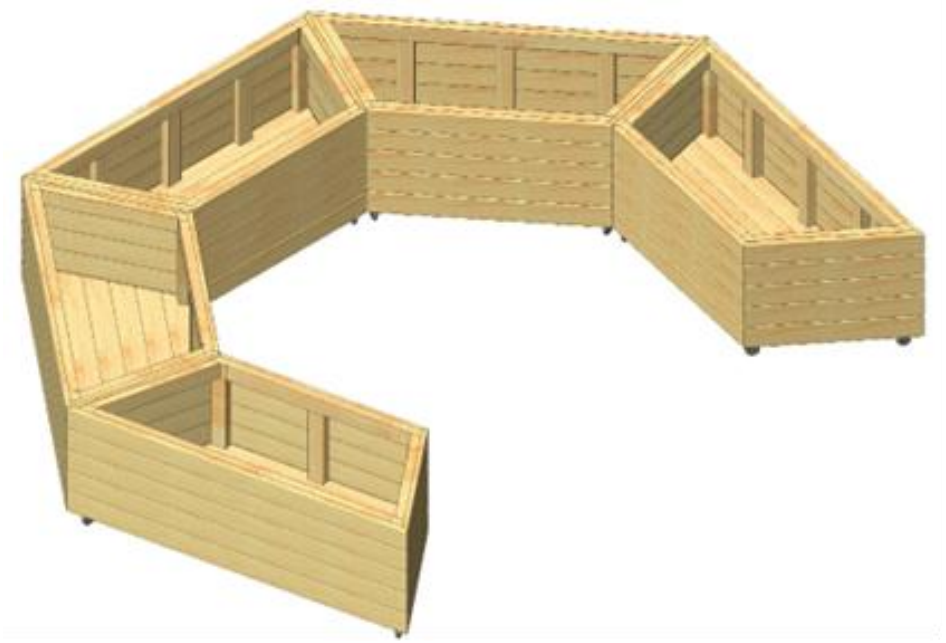

Figure 1: Ensemble of five mobile trapeze planters (Source: Dipl.-Ing. Ralf Dophiede e.U.)

Key Data

- LOCATION: Indoor, Outdoor, mobile
- TYPE OF GREENING: Plant trough
- VEGETATION: (Small-) shrubs, perennials, houseplants
- CONSTRUCTION: Plant troughs (wood) with castors
- IRRIGATION: Accumulation irrigation (manual) or drip line (automatic)

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Content

Key Data 1
Location Selection 3
Material 3
Wooden Plant Trough 3
Vegetation Support Layer 4
Automated Irrigation System 4
Plants 4
Tools 4
Step-by-Step 5
Step 1: Planning Sketch and Measurements 5
Step 2: Plant Trough Assembly 5
2.1 Cutting and Preparing the Wood 5
2.2 Screw Together 6
2.3 Sealing / Lining and Installing Drainage 6
Step 3: Filling / Layer Construction 7
Step 4: Planting 7
Plant Care and Maintenance 8

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Location Selection

- Define the installation area
  → **for determining the maximum dimensions and number of plant troughs**
- Check maximum dimensions (L/W/H) of the planned transport route (doors, elevators, etc.)
  - From assembly site → to installation site
  - For potential relocation

- Determine exposure and shading (from buildings) or lighting conditions (indoors)
  → **for selecting suitable plants**

- Irrigation:
  - Personnel for manual watering (also during holiday periods)
  - Water connection (for automated irrigation)
  - Power connection (for automated irrigation)
  - Drainage (for automated and outdoor irrigation)

Material

The following overview provides a summary of the required materials, including approximate dimensions and quantities, for a **trapezoidal plant trough of approx. 1.60 x 0.65 m**.

The exact lengths, quantities, and volumes must be determined based on a detailed plan adapted to the specific local conditions. The listed dimensions are intended as guidelines for material ordering and construction assistance. However, it is recommended to prepare a construction drawing or sketch based on the actual dimensions of available components or individual design preferences.

For the wooden components, it is generally advisable to select a local, easy-to-work-with, and durable type of wood. The surface should ideally be planed and untreated. For **outdoor use**, weather-resistant wood should be used-larch is a suitable option. For **indoor use**, spruce is recommended.

In general, the use of reclaimed or leftover wood is also possible. With appropriate surface treatment and positioning (e.g., best side facing outward), materials can be saved and reused effectively.

Wooden Plant Trough

Recommendation for outdoor installation – planed larch wood, untreated surface

- **Square timber ~ 50/80 mm ~ 12 m** – for frame structure
  - 4 pcs. ~ 50 cm each
  - 4 pcs. ~ 36 cm each
  - 7 pcs. ~ 52 cm each
  - 2 pcs. ~ 85 cm each
  - 2 pcs. ~ 114 cm
- **Wooden boards ~ 26/100 mm ~ 35 m** – for the exterior walls
  - 6 pcs. ~ 160 cm each (longitudinal boards + top cover)
  - 6 pcs. ~ 100 cm each (longitudinal boards + top cover)
  - 12 pcs. ~ 65 cm each (cross boards + top cover)
  - 6 pcs. ~ 160 cm each (bottom boards)

- **Castors or fixed supports** for ground contact

- 4 pcs. heavy-duty swivel castors with brakes (load capacity per wheel > 200 kg) Select castor type suitable for the flooring surface
- or fixed feet (metal or wood) – e.g., suitable for pallet jack access underneath

- **Screws**
  - Wood screws for all connections

Vegetation Support Layer

- **Waterproof plant trough**:
  - Plastic mortar tub (as a sealed catch basin at the bottom)
  - and/or dimpled membrane (available at construction supply stores)
  - or pond liner, e.g., made of EPDM (for partial or full inner lining)
- **Inspection pipe, diameter 5 cm, length approx. 50 cm**
  - e.g., drainage pipe (PP) DN 50 + cap
- Optional: **tank valve** for drainage
- **Drainage layer, height 5 cm, approx. 50 liters** – e.g., expanded clay, clay granules
- **Separation layer – fleece, approx. 2 x 1 m** – e.g., recycled fleece (200 g/m²)
- **Substrate, approx. 380 liters**
  - For indoor use: lightweight, purely mineral mix (e.g., volcanic rock, perlite, pumice, zeolite)
  - For outdoor use: lightweight intensive green roof substrate or planting substrate with mineral and organic components (peat-free)
- **Top layer / mulch material, 3 cm thick, approx. 30 liters**
  - Garden fiber / wood fiber (for outdoor use)
  - or coarse mineral material
    → Do not use bark mulch – it inhibits plant growth

Automated Irrigation System

- Water connection
- Supply pipe (e.g., PE pipe 25 mm or 16 mm)
- Drip line, approx. 12 linear meters (e.g., PE pipe 16 mm or micro-drip line with dripper spacing ~20 cm)
- Ground spikes for securing drip lines
- Irrigation controller
- Solenoid valve, if required (depending on the controller type)
- Connectors (T, L, straight)
- Automatic drain valve
- Optional: water meter
- Optional: frost sensor (for winter operation) + 2-core cable

Plants

- **Indoor:** Suitable houseplants → **Note their light requirements!!**
- **Outdoor:** Small shrubs, perennials, herbs
  → **Pay attention to site exposure and moisture requirements!**

Tools

- Tape measure, folding ruler
- Marking square
- Pencil

- Wood saw: circular saw or mitre saw
- Cordless drill/driver + bit set
- Wood drill bits (3 mm, 4 mm)
- Optional: wood planer
- Sandpaper
- Utility knife
- Staple gun + staples
- Scissors (for cutting fleece)
- Pruning shears
- Hand trowels

Step-by-Step

Once all materials have been procured, preparations and assembly can begin.

Step 1: Planning Sketch and Measurements

With the determined overall dimensions, a planning sketch can be created and the exact component lengths calculated. It is recommended to prepare a cutting list including all timber lengths and drill hole positions.

Step 2: Plant Trough Assembly

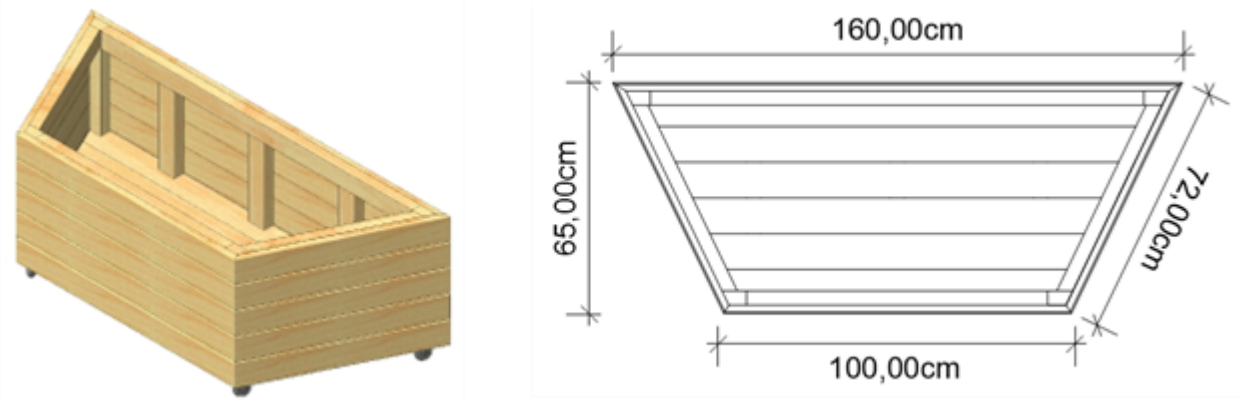

Figure 2: Plant trough visualisation and top view (Source: Dipl.-Ing. Ralf Dophiede e.U.)

First, all lengths are transferred onto the wood (marked out), then the wood is cut and processed. Afterwards, frames are assembled and screwed together with the boards to form the plant troughs.

2.1 Cutting and Preparing the Wood

1. Transfer length measurements and drilling positions onto the wood
2. Cut the wood to the exact lengths
3. Bevel or sand the edges
4. Pre-drill screw holes (keep a minimum distance of > 2 cm from end grain edges)

2.2 Screw Together

1. First, assemble the **frame** using the **square timbers** and screw the joints together (use 2 screws per connection, 5 mm diameter).
2. Screw the **wooden boards** onto the frame (2 screws per side of each board).
3. Insert the **bottom boards** and screw them in place (2 screws per side of each board).
4. Tilt the planter box and mount the **castors** at all four corners (e.g., 4 screws per castor).
   Tip: Position the castors slightly inward so that they can still be locked from the outside, but do not protrude beyond the planter edge.

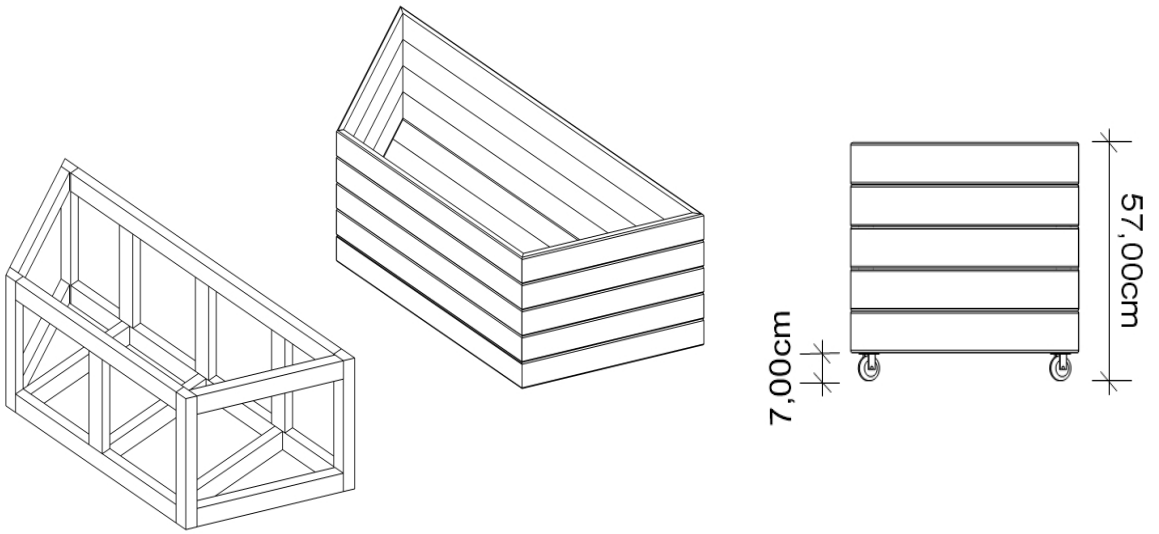

Figure 3: Plan trough frame construction, outer walls (panelling) and side view (Source: Dipl.-Ing. Ralf Dophiede e.U.)

2.3 Sealing / Lining and Installing Drainage

1. Insert a suitable plastic **mortar tub** (Alternatively, use only waterproof lining material)
2. For drainage (if needed), drill a hole for a **tank valve** - side-mounted, 3 cm above the bottom or bottom-mounted, extending 3 cm inside (to allow for water retention)
   Insert, tighten, and seal the valve securely
   → **Every outdoor planter box must have a drainage option**
3. Line the inside with **dimpled membrane** or **pond liner** (all the way to the top)
   Secure the liner to the upper inner edge of the frame using a staple gun every 20 cm
4. For the **inspection pipe**: Drill many small holes in the lower section of the pipe and wrap the perforated area with fleece to prevent substrate from entering

Step 3: Filling / Layer Construction

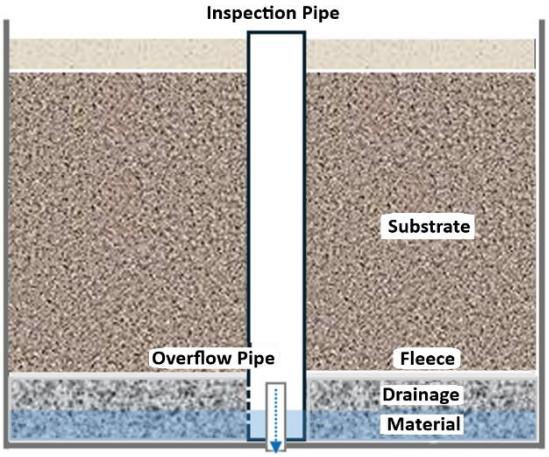

Figure 4: Layer construction of the plant trough (Source: Dipl.-Ing. Ralf Dophiede e.U.)

1. Place the **inspection pipe** upright onto the tank valves and keep it in a vertical position
2. Add approx. 5 cm of **drainage material**
3. Cut the **separation fleece** to size and make holes for the inspection pipes
4. Insert the **fleece** and pull it up along the inner sides of the planter box
5. Fill in the **substrate**
   → Leave enough space for large root balls where necessary

Step 4: Planting

5. Remove the **root ball** from its nursery pot and gently score the bottom of the roots (this promotes better rooting)
6. Place the plant and fill in with **substrate**
7. Press the substrate down all around by hand and continue filling until approx. 5 cm below the upper edge
8. Apply approx. 3 cm of **mulch material**
9. **Water** thoroughly – the substrate absorbs a lot of water initially

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Plant Care and Maintenance

- Daily visual check → are plants healthy and is the irrigation system working?
- Establishment care:
    - **Outdoor watering**: approx. 5x per week (initially more frequent with smaller amounts) → After rooting: reduce to 2–3x per week
    - **Indoor watering**: approx. 3x per week (initially more frequent with smaller amounts) → After rooting: reduce to 1x per week

    - Remove brown leaves as needed
    - Fertilize (spring/summer) with slow-release or solid fertilizer

- Water Accumulation and Drainage Check (~ once per week)
    - Water level in the inspection pipe should be max. ~6 cm
      → If higher: pump out using a hose or pump
    - If a drainage system is installed: check functionality

- Pruning and Replanting
    - Prune brown leaves or overly long shoots as needed
    - In case of plant failure: remove the entire root ball and replace

Figure 5: Plant care (Source: Dipl.-Ing. Ralf Dophiede e.U.)

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