

Harvesting operations in the management of even- and uneven aged Swedish forests

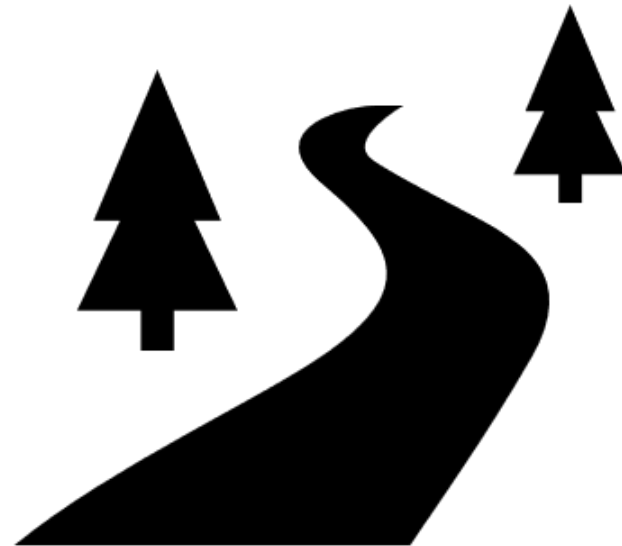
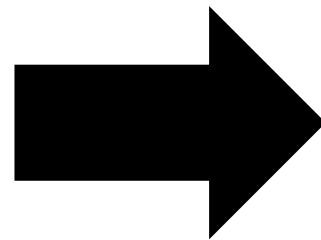
Simulating harvester forwarder logging operations: 1 operator, 2 machines



Anders Rowell

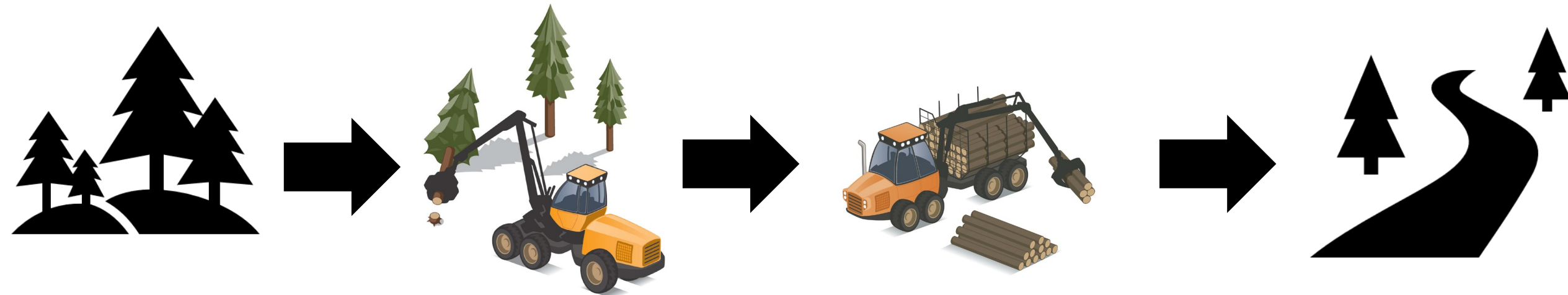
Harvesting operations

- Extracting trees



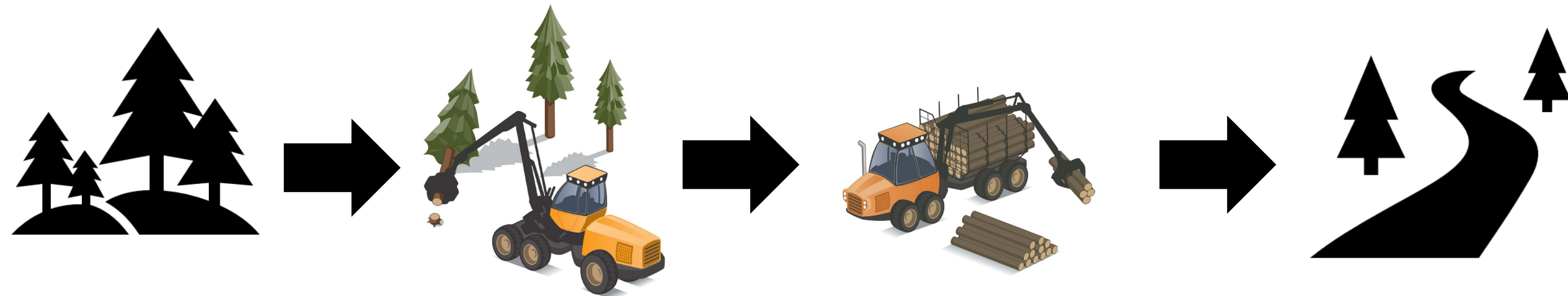
Swedish harvesting operations

- Cut-to-length using a harvester and forwarder



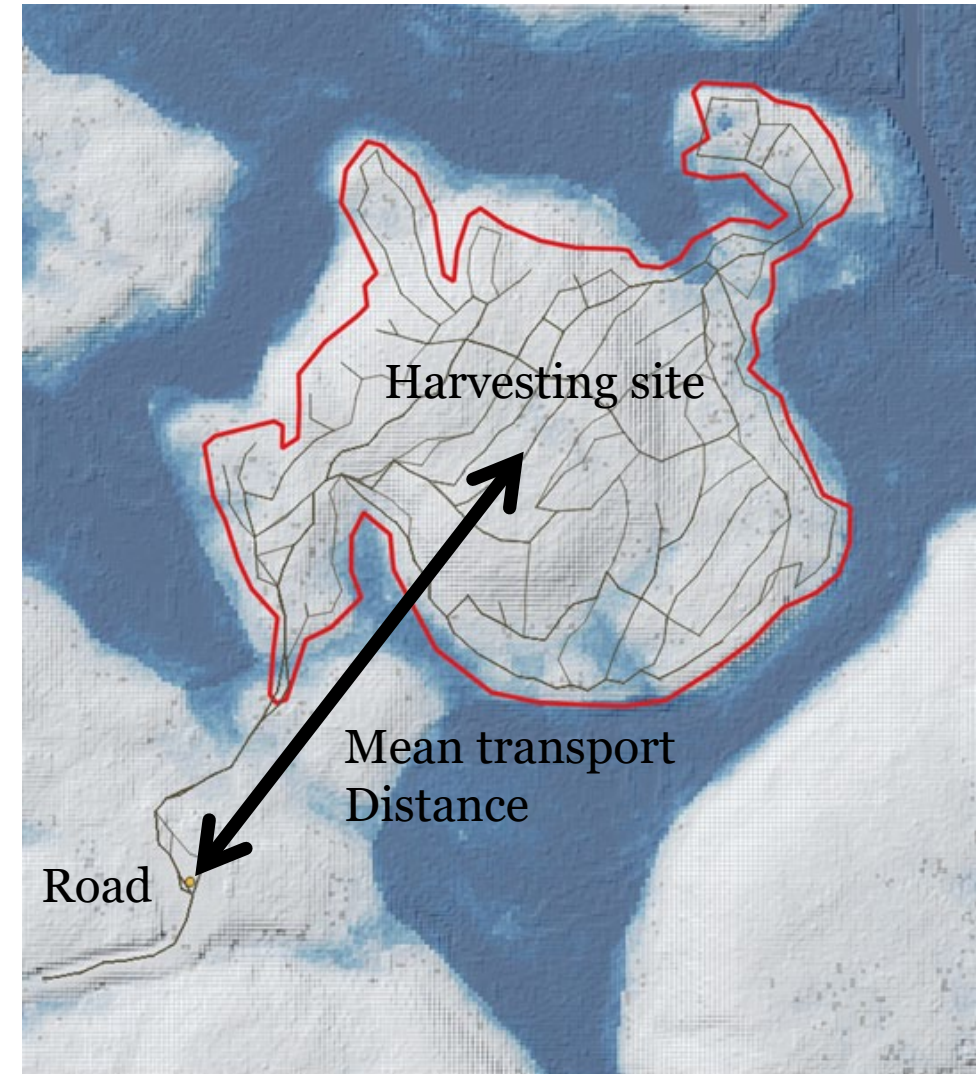
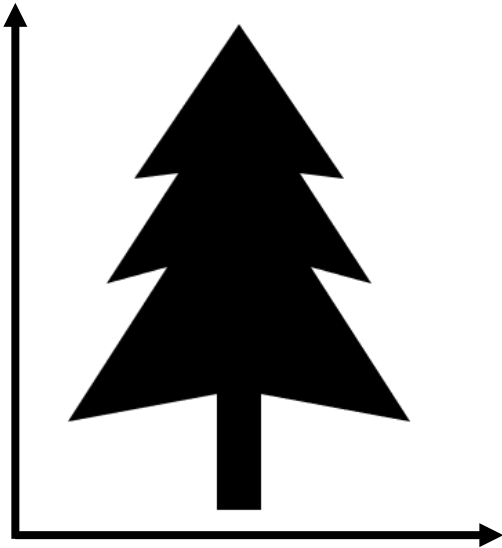
Simulating Swedish harvesting operations

- Estimating cost per m³ for alternative systems
 - Discrete event simulation



Harvesting site scenarios

- Mean stem size (m^3)
- Mean terrain transport distance



Harvester work elements

- Moving
- Positioning-to-cut
- Felling
- Processing
- Boom-in
- Clearing
- Moving logs, tops and branches



Forwarder work elements

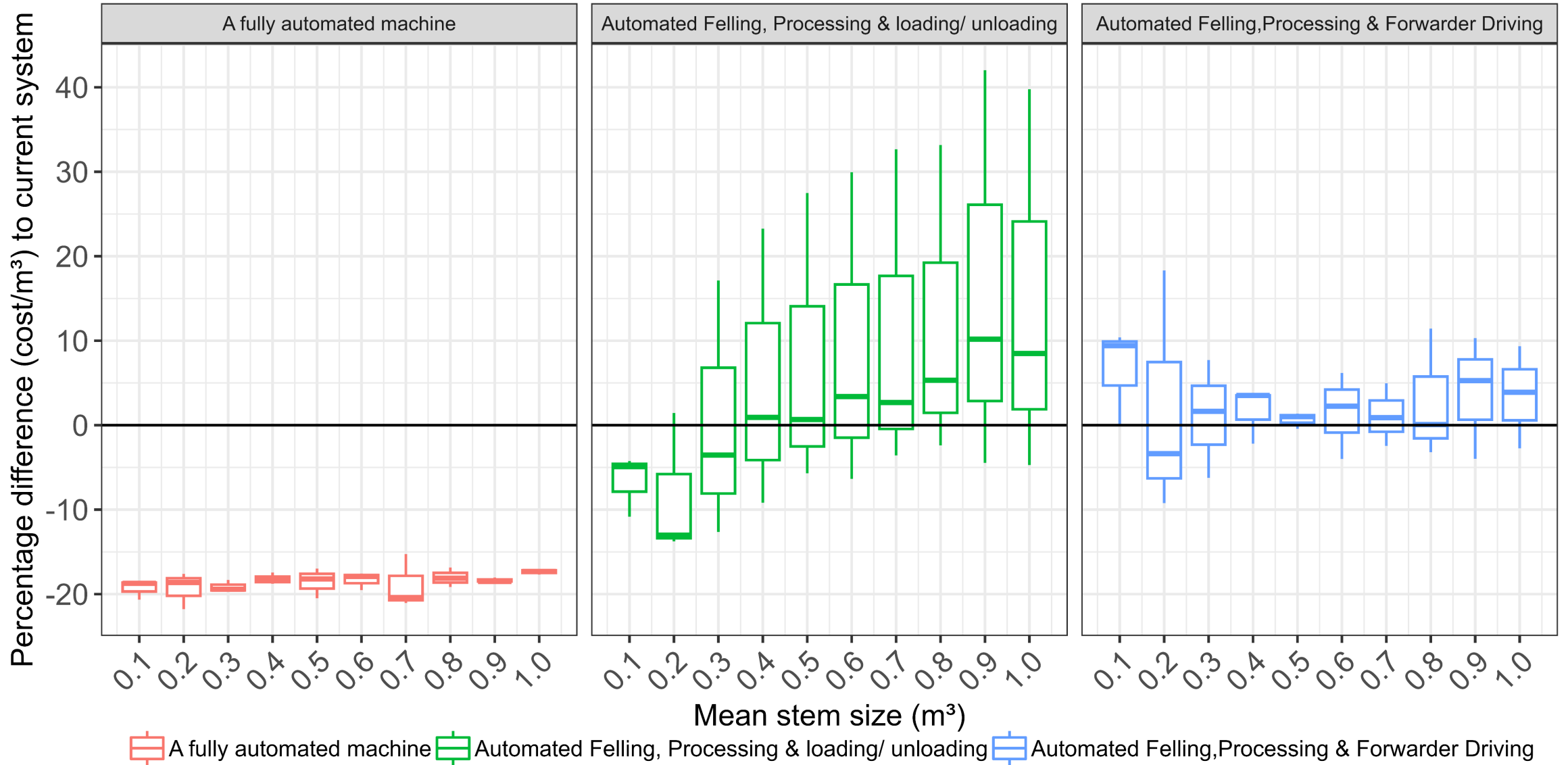
- **Driving empty** Won't wait for operator
- **Loading** Wait for operator
- **Driving while loading** Wait for operator
- **Driving loaded** Won't wait for operator
- **Unloading and driving while unloading** Wait for operator



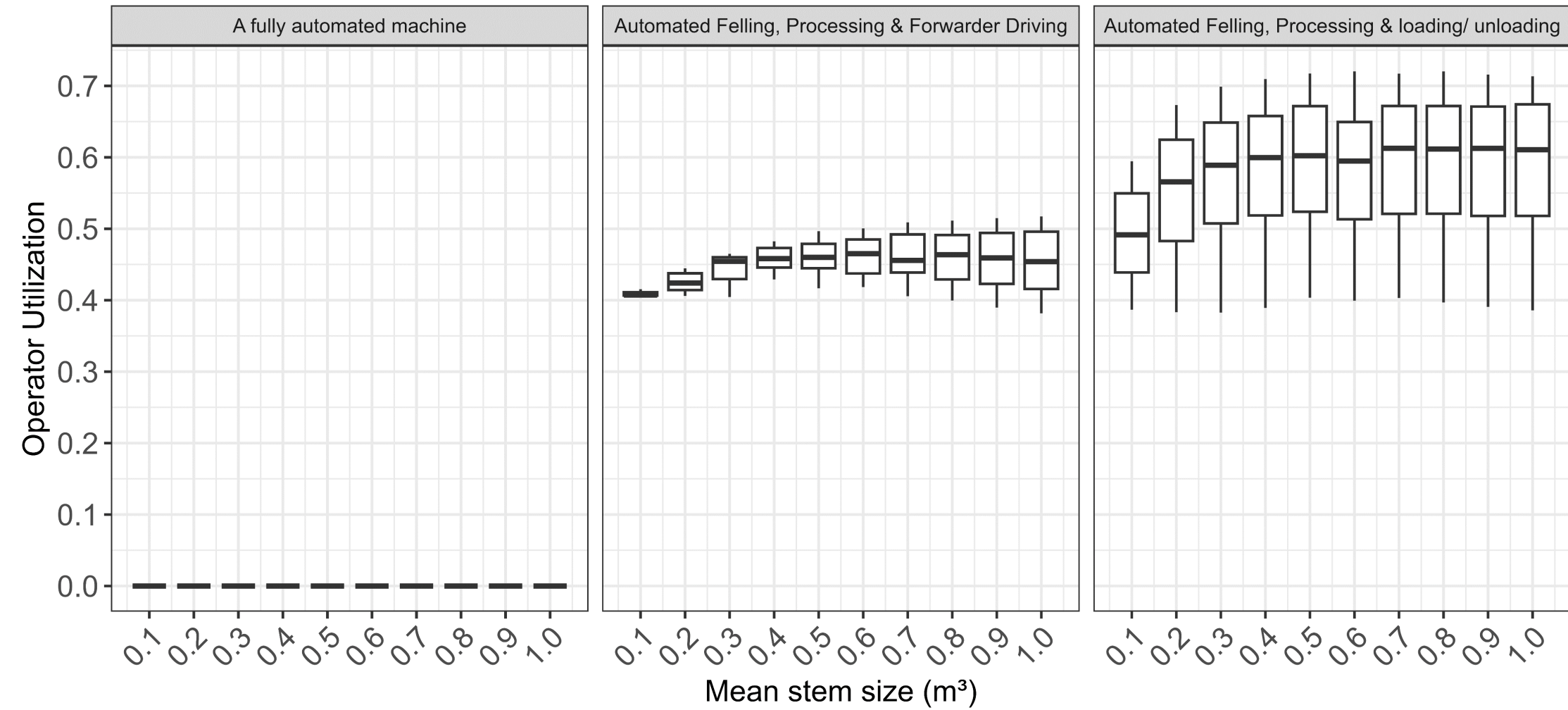
2 operators and 2 machines was compared with 1 operator and varying degrees of automation

- Preliminary results

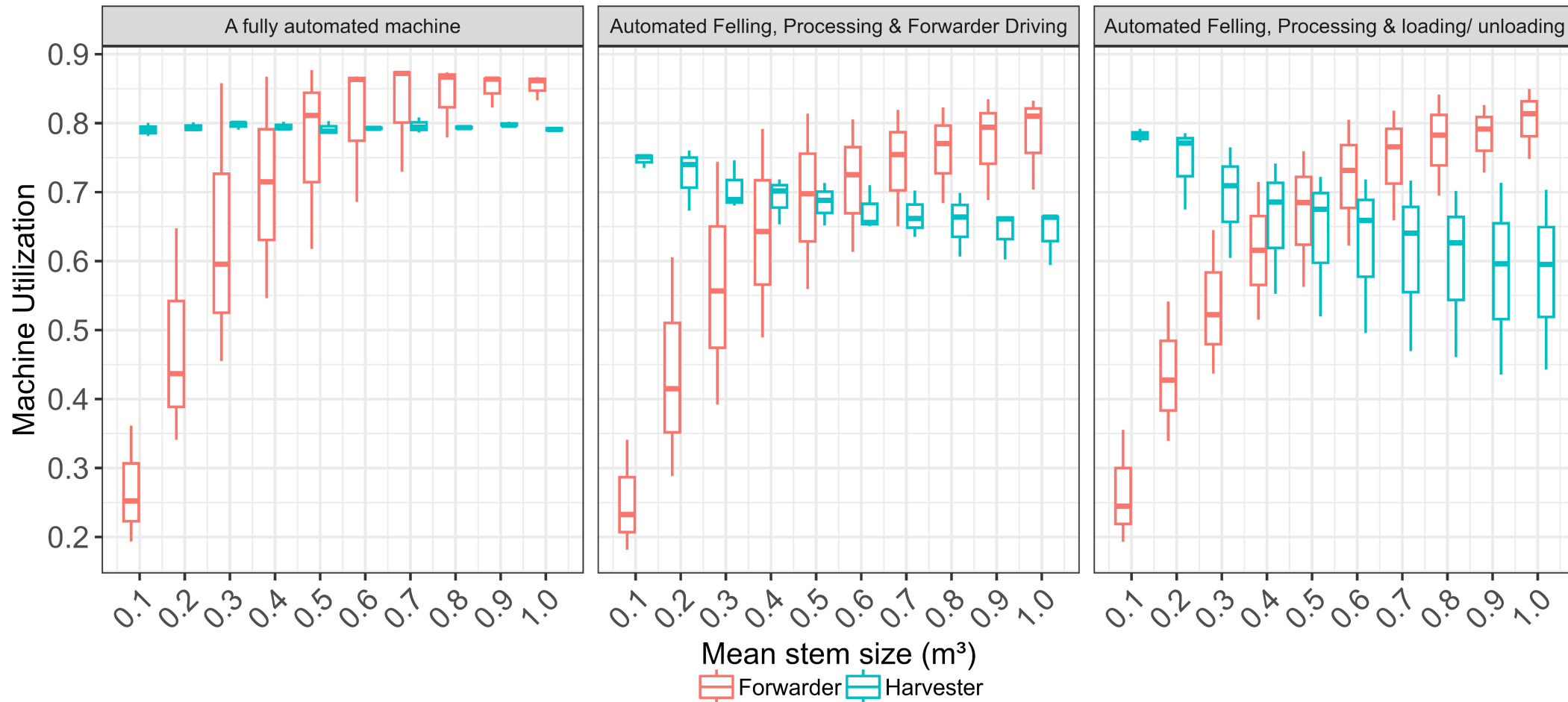




Operator utilization



Machine utilization



Questions?

