Net Zero Willow

Upscaling UK SRC Willow Planting and Harvesting Capacity

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Instigator of Net Zero Willow project

Willow Energy is based in Cumbria
10 years experience as an SRC willow contractor: Planting and harvesting
Planted 780 ha and harvested 225,000 ton’s
Involved in multiplication of varieties

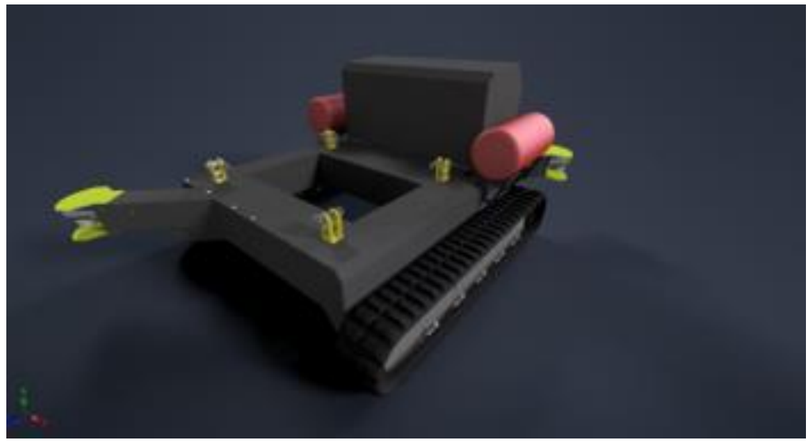
Short Rotational Coppice Willow
What is it?

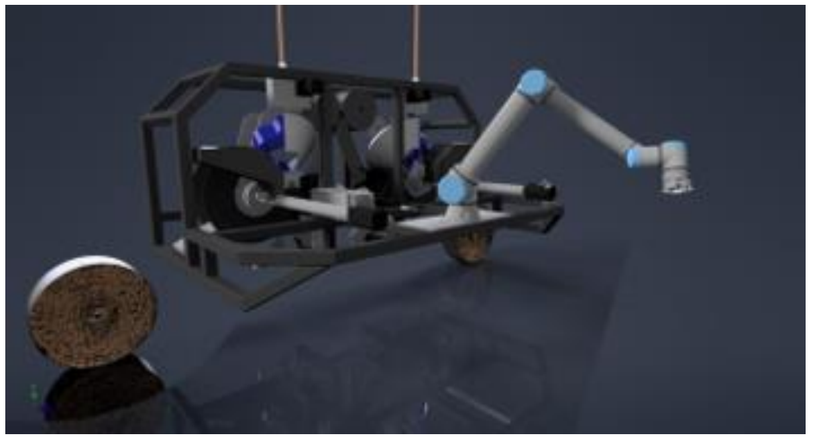
- Woody Biomass crop
- Willow rods are harvested in Jan/Feb
- Plant 20cm rods between March-July
- Planting rate is 15,000 rods per hectare
- First year as establishment year
- No longer carry out first year cut back
- Weed control very important
- 3 year harvest cycle after that for bio-mass production
- Harvesting Oct-March
- Could have shorter harvest cycles for other uses

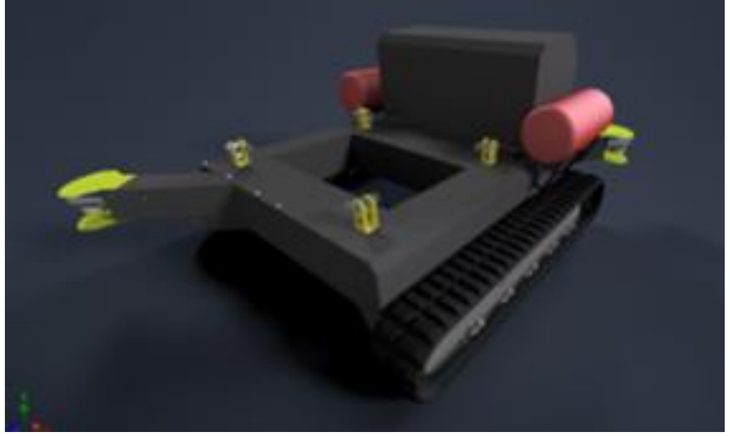
Current SRC practice

The bot concept

- Idea started from a Brussel sprout and a nail gun
- All Terrain Robotic Base vehicle
- Two changeable units
  -The Rod Harvesting Attachment (RHA)
  -Rod Planting Attachment (RPA)
- One skilled operative to manage several bots at once.

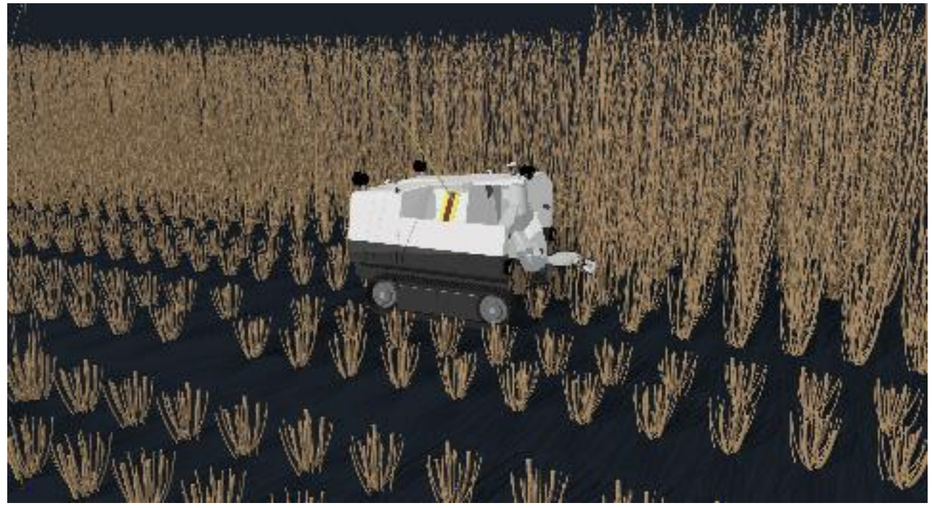


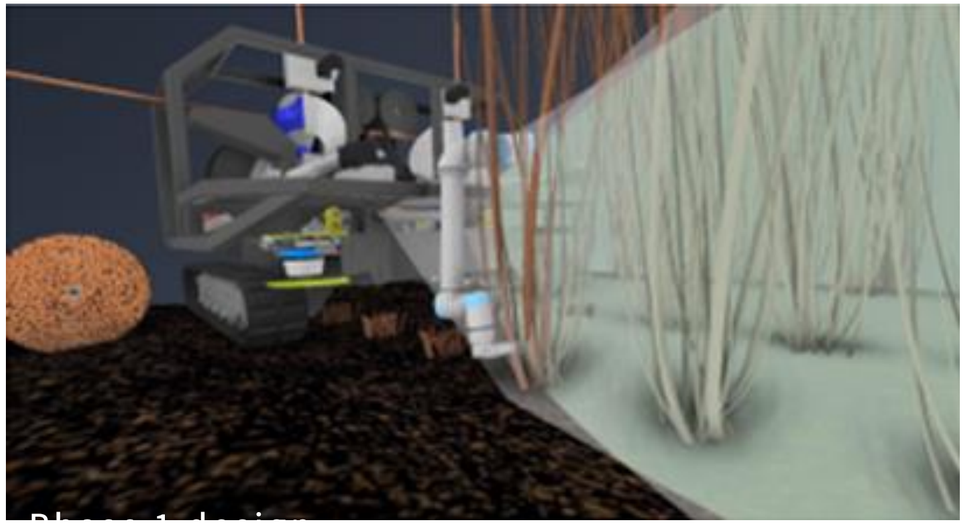




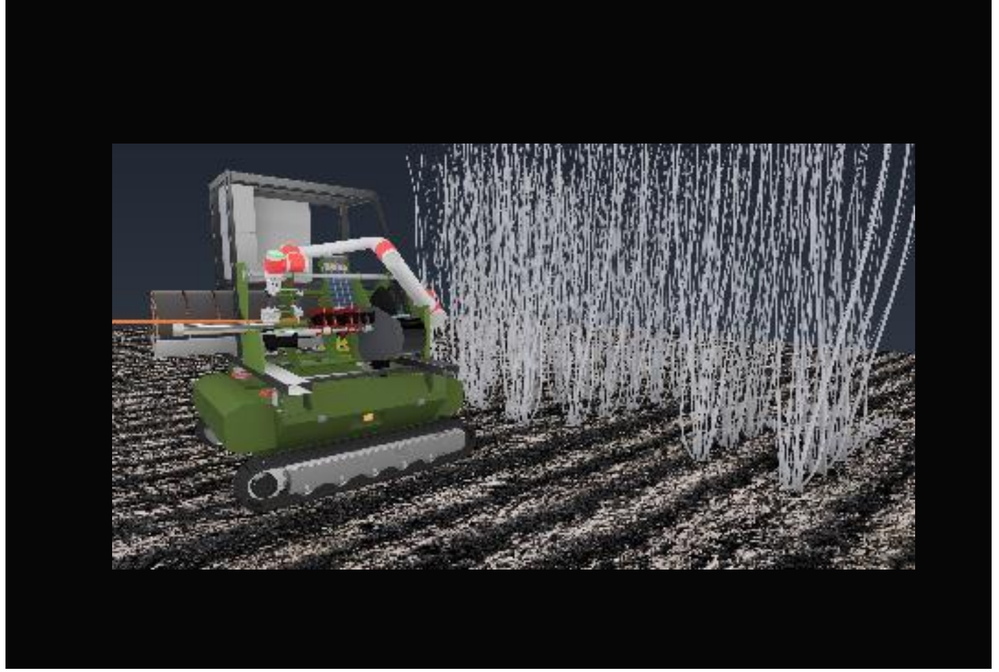
All Terrain Robotic Base vehicle

Rod Harvesting Attachment



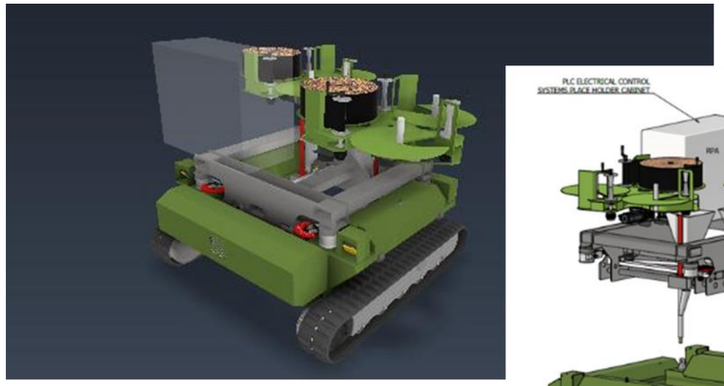


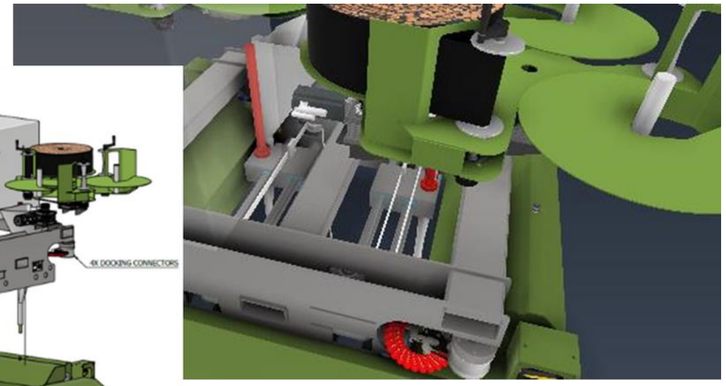
RHA- Marginal gains

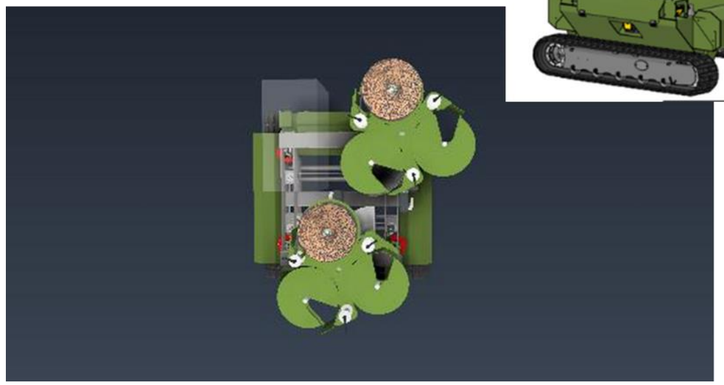


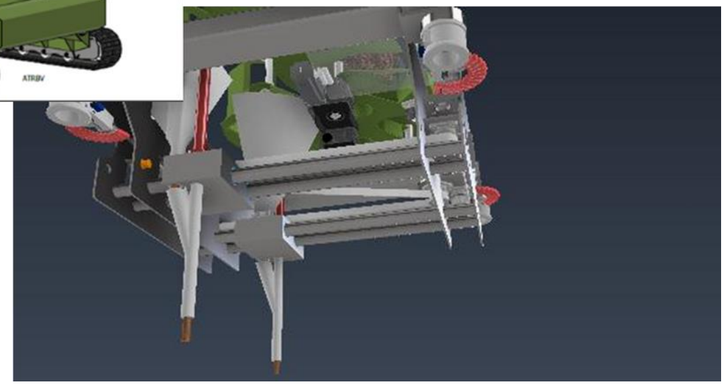
- Higher work rate by at least 200%.
- Yield Increase by up to 25%
- Reduced labour by up to 90%
- Reduced contracting cost and plant material cost to grower by up to 25%
- Reduced harvesting costs due to more consistent growth in a plantation by 15%
- Increased rod production season by up 50%
- Increased productivity from a multiplication bed 33% (1:28ha to 1:37ha)
- Increased bulk density of plant material and storage capacity by 15%
- Reduced material waste used in packing and distribution by 50%

Rod Planting Attachment initial concept







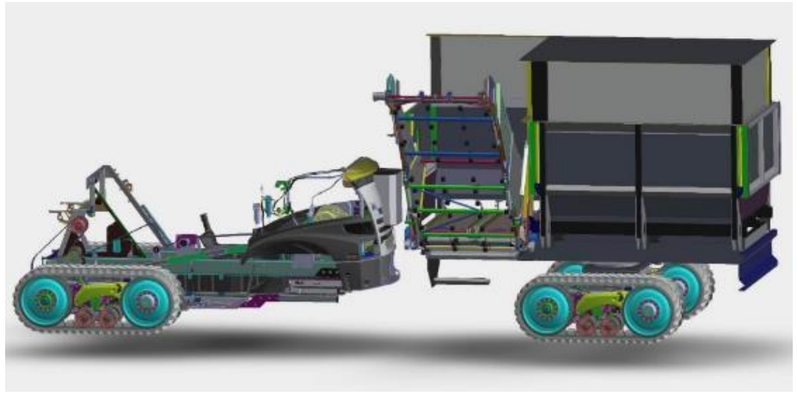


RPA – Marginal gains

- Higher work rate - 25% per machine and increased area planted per day - 50%.
- Increased stocking efficiency - 98%.
- Rate of refilling machine with planting material - 50%.
- Increased yield (because of more consistent planting) - 10%.
- Reduced labour - 85%.
- Reduced maintenance - 60%.
- Lower weight machine - 70%.
- Reduced noise - 40%.
- Reduced LCA GHG emissions by 21%

- Reduced fuel requirements
  - Diesel used in actual planting - 80%.
  - Diesel used to move planter from one job to another - 80%.
- Reduced contracting cost to grower - 30%.
- Reduced harvesting costs due to more consistent growth in a plantation - 5%.
- Increased planting season - 50%.
- Increased bulk density of plant material and storage capacity - 20%.

Tracked Harvester Bunker Concept



- Higher work rate
  - Dry conditions 10% increase
  - Average conditions 25% increase
  - Wet conditions 75% increase
- Reduced labour 50%
- Reduced maintenance
- Lower impact on soil structure
- Reduced fuel requirements 40%
- Reduced noise
- Reduced contracting cost to grower
- Increased harvesting season by >100%

2023 Biomass Strategy, what the industry needs now

These innovations need an industry:

- Clear long term policy framework
- Time scale
- Investment in supple chain and more end user's for the material
- Recognition of willow's environmental credentials
- Levelling up with woodland schemes
- Planted area ambition

Watering down of ambition of annual planted area of perennial crops.

- 2021 Net Zero Strategy
  2025 7500 ha - 2030 21,750 ha - 2035 26,350
- 2023 March Carbon Budget Delivery plan
  2025 0 ha - 2030 9600 ha - 2035 15,000 ha
- 2023 August Biomass Strategy
  2025 0 ha - 2030 0ha - 2038 17,000

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