

Introduction:

Short rotation coppice (SRC) willow is a multipurpose biomass crop producing high yields of small diameter stems that can be cut and stored as rods, billets or chips. Once established, willow can be harvested every 2-4 years and used for heat and power generation (commercially or domestically), or for a diverse range of non-bioenergy uses (e.g. [fodder](#), bedding, bio-packaging, pulp, phytochemicals etc).

In addition to providing biomass, willow has a number of co-benefits, including:

- the protection of watercourses from runoff when grown as a [riparian buffer](#),
- the ability to play a part in [flood prevention measures](#) by offering hydraulic roughness which reduces the velocity of water flowing downstream (by acting as a green leaky dam),
- [biodiversity benefits](#) through providing habitats and food for invertebrates, feeding opportunities and roosting sites for birds and pollinator services,
- the potential to remediate polluted land by removing harmful heavy metals and other chemicals.

Site suitability

- Willow SRC grows best on heavier soils with a high clay content, but varieties can be matched to a wider range of soil types.
- pH range 5.5-8.0.
- Annual rainfall of between 600-1000 mm



(willows can tolerate much higher rainfall but this can impact on the ability to harvest the crop).

- Suited to relatively flat sites with a slope of no more than 7%.

Establishment

Commercial scale (above 5 hectares). This requires mechanised harvesting, with planting at a stocking density of ~15,000 per hectare (~6,070 acre), with planting typically 0.6 m apart in twin rows with 0.75 m between rows and a 1.5 metre alley between each twin-row.

In the past commercial plots were cut back after the establishment year in order to promote coppicing. This is rarely done these days. Instead, the establishing crop is left to grow for 3 years before the first harvest. By this time the roots will have established well and following the harvest young shoots will coppice from a stool. From this point, harvests take place at 3-4-year intervals.

A typical SRC harvest of a three-year-old crop is :

- 55 green tonnes, with rods reaching up to 8 metres in height. This is equivalent to 10 oven dry tonnes per hectare per year.

Higher yields are possible on good sites, using the best varieties with good husbandry techniques and suitable growing conditions. Upper and lower yield estimates are 8-15 odt/ha/yr.

Smaller-scale planting for harvesting manually is also feasible. Stocking densities of ~6,600 stems per hectare (2,671/acre) based on planting single rows at 0.5 m spacing, leaving 3 m between rows is recommended to allow for better access. High yields are achievable at small scale.

Smaller-scale planting (less than 5 ha) can afford greater flexibility. Staggered planting and harvesting can be performed to provide continuous self-supply or be adapted to suit farmland available to fit around core farm business and provide other benefits, such as:

- shelter-belts, buffer strips and sight screens,
- agroforestry options enabling:

- pollination services (willows produce nectar and pollen rich catkins in spring which are a good source of food for pollinators needed for other crops)
- habitat for predatory arthropods which can prey on undesirable pests in food crops
- cover for poultry and game,
- flood mitigation and wastewater management.

Management, pests and diseases

[Planting several genetically diverse varieties within a single plantation is recommended to protect against pests and diseases.](#)

Young growth is attractive to deer, hare and rabbits so fencing may be required in areas where these animals are prevalent. However, this tends to be very expensive, and few commercial growers do this.

Other major pests include the willow beetle (*Chrysomelidae*). Perennial weeds may require chemical control during establishment. In small scale situations the use of geotextile membranes can remove/reduce the need for herbicides. No other inputs are required once established.

Willow is a very thirsty crop, and droughts can seriously affect establishment. A minimum annual rainfall of 600 mm is required for the crop to perform well.

Harvesting

[Ideally willow should be harvested during the winter dormancy period.](#) Unfortunately, in the UK this is usually not possible due to wet soils. As a result, most willow is cut during the spring to autumn window as long as ground conditions are suitable for trafficking of heavy machinery.

Willow plantations will remain productive for over 20 years.

When willow is established on a **commercial scale** modified forage harvesters are used to cut and chip straight to a trailer. Availability of specialised harvesters and contractors varies by



region with greater availability in the north of England. If not removed straight from the farm, large areas can be required for the storage of chip.

Smaller-scale harvesting can be performed using a chainsaw or brush cutter. Biomass can be stored and seasoned as whole rods in stacks/bundles or cut down to billets (15-30 cm logs) and stored for on-farm or domestic use.

If intended for small-scale self-supply, manual harvesting can be the most flexible and cost-effective option.

Harvest time, storage conditions and moisture content of wood chip needs careful consideration. Higher moisture content can lead to increased fungal growth (composting) in chip stacks and under some conditions can also present a fire risk, which needs to be accounted for in the management of the chip.

Harvested SRC willow biomass has a calorific value of 18.4 MJ/kg on a dry matter basis, equivalent to 5.1 MWh/oven dry tonne. [A typical farmhouse and associated buildings requiring 10,000 litres of oil per annum for heating purposes would need around 2.5 hectares of SRC willow.](#)

Further information

www.biomassconnect.org