

INTRODUCTION

Miscanthus is a woody, perennial grass originating from Asia, commonly called Elephant Grass. Non-flowering forms of Miscanthus are of interest in agriculture because: they grow rapidly; have low nutrient requirements; produce high yields; suffer from few pests or diseases; and can be planted, maintained and harvested using conventional agricultural machinery.

These characteristics make Miscanthus an ideal energy crop for the production of heat and electricity. The crop increases the potential biomass feedstocks available to contribute to meeting the UK's renewable energy targets. Energy crops are defined as being carbon neutral as the plants absorb and store carbon dioxide whilst they are growing.



Fig 1. Miscanthus Rhizomes – used for propagation



Fig 2. Planting with modified potato planter



Fig 3. Early first year growth of Miscanthus

WHERE TO GROW MISCANTHUS

Most lowland agricultural sites are suitable with the highest yields produced on deep, moisture retentive soils. Good yields can be achieved on a wide range of soils but the key to high yield is moisture supply, therefore sandy or free draining soils should be avoided. It is important to consider landscape, ecology, archaeology and public access during site selection. Mature Miscanthus can reach over 2.5m in height so its visual impact must be considered especially if grown close to a footpath or local viewpoint.

CROP ESTABLISHMENT

- Thorough site preparation, particularly weed control, is essential to ensure good establishment – the crop could be in the ground for 15 years or more so efficient establishment helps avoid future problems.
- Miscanthus is propagated by rhizomes (see Fig. 1) planted in the spring at a density of 20,000/ha.
- Planting is best carried out using modified potato planters (see Fig. 2) that provide accurate rhizome placement into a good depth of soil and achieve establishment rates of over 70%. Manure spreaders can be used but this method is imprecise due to lack of control of spacing and depth. Consequently establishment rates tend to be low.
- Post-planting broad-spectrum herbicide is applied to ensure effective establishment.
- Shoots emerge in April (see Fig. 3) and by the end of the first growing season the erect, robust stems should be 1 to 2m tall with a diameter of 10mm.
- In late summer the lower leaves start to dry and by autumn leaf fall occurs leading to the development of a deep litter layer.
- During winter the freestanding, leafless stems continue to dry.
- The crop is harvested in late winter although yield from the first season's growth, 1 to 2 oven dry tonnes (odt)/ha/year, is not worth harvesting and the stems can be left uncut until the following year.
- From the second year onwards the crop is harvested annually with second year yields ranging from 4 to 10 odt/ha/yr and those in the following years 10 odt/ha/yr or more.
- There is no need to replant the crop – new shoots appear each spring after harvest.



Fig 4. Cutting with a mower conditioner

HARVESTING

After two to five years, yields will reach a plateau, generally at between 10 and 15 odt/ha/yr, although on some sites they may reach more than 20 odt/ha/year.

Methods of harvesting differ depending on whether the end-user needs baled or chipped material. Energy end-users generally need bales. The crop is first cut with a mower conditioner (see Fig. 4), which breaks up the stems and allows further drying prior to baling. The baler then used will

depend on the size and shape of bale required, for example large bales can weigh 250 to 600kg and have a dry matter density of between 120 and 160kg/m³.

WEED CONTROL, PESTS AND DISEASES

Due to the development of the litter layer and the density of the mature crop, natural weed control occurs.

Common cereal diseases known to affect *Miscanthus* include barley yellow dwarf virus, which may limit yield.

There are no insect pests that have significantly affected *Miscanthus* production although two 'ley pests', the common rustic moth and the ghost moth larvae, have been seen feeding on *Miscanthus* and might cause future problems.

FERTILISER REQUIREMENT

Fertiliser demands are low due to the plant's efficient nutrient use and ability to recycle nutrients to the rhizomes at the end of each growing season. Leaf litter decomposition, soil and rhizome nutrient reserves plus atmospheric deposition meet the crop's nutrient requirements. Mature rhizomes also store more nutrients than the crop needs so after the first two years only small quantities of micronutrients may be needed every two to four years to help maintain yields. For good yields a minimum phosphorus and potassium soil index of 1 is needed and soil nitrogen should exceed 150kg/ha for the first two years. Farmyard manure or treated sewage sludge could provide this.

ENVIRONMENT

Compared with cereals, *Miscanthus* provides a habitat that encourages a greater diversity of species. For example, one investigation found three times as many earthworms and spiders were found in *Miscanthus* plus a greater diversity of spider species. *Miscanthus* also had more mammal and bird species than wheat and also provides good nesting habitats for both ground nesting birds in the spring (e.g. skylarks) and reed nesting birds (e.g. reed warbler) in the summer.

ADVANTAGES

- Use of conventional farm machinery
- Rhizomes can be split and re-planted to increase the cropped area
- The plants are sterile so there is no spread onto neighbouring land
- Very low agrochemical inputs
- No significant pests or diseases
- Ease of storing and handling the baled product
- Ease of removal once the crop is no longer wanted
- Local fuel supply

DISADVANTAGES

- Long term contracts may tie up land for a number of years
- Large-scale planting may attract landscape or environmental criticism
- Consideration must be given to *Miscanthus*' high water uptake when planting large areas in single catchments