

Creating a market for miscanthus



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The growth of miscanthus in Ireland has really taken off in recent years. This high uptake is a direct result of the bioenergy scheme, which provided 50% funding towards miscanthus establishment.

The bioenergy scheme was launched in 2007, and now many of those crops are mature. While a lot has been done to encourage the planting, very little has been done to help create the markets.

Since 2007, a total of 2,475 hectares (6,115 acres) of miscanthus has been planted with the help of the Department of Agriculture bioenergy scheme. Prior to the bioenergy scheme, approximately 240 hectares was planted with the help of local LEADER-type funding.

Allowing for crops which failed for different reasons, such as poorly selected sites, poor weed control, varying quality of rhizomes (planting material) and poor initial soil cultivation, the amount of miscanthus currently growing should provide about 445,424 Giga Joules (GJ) of energy — enough to heat on average over 6,000 homes (see *Table 1*).

ENERGY HARVESTED

The first crop of miscanthus is harvested two years after planting, with a small yield of approximately seven tonnes at 20% moisture content per hectare, rising to maximum yields of nine to 15 tonnes per hectare at 20% depending on soil type, field slope, topography, soil nutrient status and pH.

The vibrancy of the planted rhizome, together with crop management, including weed control, is critical to successful miscanthus establishment.

If we assume an interim yield figure of harvested miscanthus at 12 tonnes per hectare at 20% moisture, and the energy per tonne at 13.7GJ, one hectare will produce approximately 164GJ at this yield level.

One thousand litres of oil contains 36.68GJ of energy. One litre of home heating oil contains approximately 10.5 kiloWatt hours (kWh) of energy. *Table 2* shows that the value of home heating oil at €0.90 per litre is €23.61 per GJ of energy. To calculate the value per GJ, multiply the cent per kWh by 277.78.

MARKET RETURNS

Based on the best available data to date, miscanthus in its second year should yield six or seven tonnes of dry matter per hectare per year.

This is expected to increase to 10 tonnes dry matter per hectare from year three onwards.

This will yield approximately 12 tonnes per hectare at 20% moisture content. The only price currently available

from the market is €60 per tonne at 20% moisture content. The harvesting costs are approximately €270/ha, between cutting and baling.

The cost of the rhizomes at 20,000 a hectare is €1,925 (plus 13.5% VAT if not registered) and planting costs an additional €485 per hectare (plus 13.5% VAT).

Cultivation costs (soil preparation) including ploughing, power-harrowing, grubbing, spraying and rolling costs approximately €185 per hectare.

As the land is tied up for 20 years, we have included an opportunity cost of €200/hectare to cover the potential other income lost and some farm fixed costs (this may be substantially higher depending on the land quality and potential alternative uses).

Based on calculations by Teagasc financial specialist Fintan Phelan, miscanthus over a 20-year period could provide an average annual net cash flow before tax of €342 per hectare, working at a price of €60 per tonne, and €320 per hectare at a price of €65 per tonne — remember that you also have the €200 cash per hectare set aside to cover opportunity and some fixed costs (see *Table 3*).

This is based on a bank interest rate of 6% and an annual average inflation rate of 3%.

The above calculation also assumes an energy inflation rate of 3%.

The cashflow will not be positive until year three. Do remember that the return is very sensitive to:

- Site selection



Table 3: The value of miscanthus

Fuel – 20% MC	kWh/tonne	Price /tonne	Cent per kWh	Value per GJ
Miscanthus Chips	3,805	€60	€0.016	€4.36*

*€4.36 per Giga Joule is equivalent to 16 cent per litre of home heating oil

- Soil fertility and crop establishment
- Crop yield
- Price per tonne of harvested miscanthus

MAIN MARKETS

• **Animal bedding:** One of the main markets used for miscanthus in the past was horse and small animal bedding. However, one of the terms of the bioenergy scheme is that miscanthus must have an energy end-use destination.

• **Pellets:** It is possible to convert miscanthus into pellets for use in suitable domestic or commercial stoves and boilers. However, miscanthus had different chemical properties to that of ordinary wood pellets, and requires specific boiler technologies to handle its alternative burning nature.

It's also expensive to convert from miscanthus chip to pellets at approximately €60 per tonne, depending on economies of scale. If this cost can be avoided, all the better.

• **Chip:** Miscanthus can be harvested by cutting with a conditioner mower and baling in large Heston bales or round bales, and then chipped out of the bales. It can also be chipped by a maize Kemper header on harvest. However, the pro-

blem with this type of harvest is the crops' low bulk density of approximately 50kg to 80kg/m³. The crop is very bulky, and will take up a lot of storage space on harvest.

It needs to be less than 20% moisture content for small chip harvesting, as the small chips will heat, based on Teagasc Oak Park research. The other potential problem with the miscanthus is due to its fluffy nature. In chip form,

it can potentially bridge or get blocked while feeding into the boiler combustion zone. However, a suitable auger feed-in mechanism will overcome this issue.

• **Power stations:** Edenderry power station has already conducted trials on burning miscanthus. The biggest problem was a technical issue of getting the chip down to a suitable size of less than 40mm to pass through the power station's



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Miscanthus is currently being sold in shops and garages across the country in the form of densified briquettes.