

# Alternative crop factsheet: Fibre and energy crops

## OPPORTUNITIES FOR FIBRE AND ENERGY CROPS

Energy and fibre crops, such as hemp, miscanthus and reed canary grass, are seeing a resurgence around the UK, largely due to the growth in biomass plants and corresponding demand for fuel, but also in response to a return to natural and sustainable fibres as alternatives to synthetic materials.

Biomass is well-placed to help the UK meet its renewable energy targets, currently providing 5.3% of Britain's electricity, and estimated with the potential to provide 15% of the country's energy by 2050. A growing number of biomass plants and support from government indicates strong growth for biomass potential in Scotland.

Hemp is an annual plant and can be grown for oil, fibre or for energy production through incineration or anaerobic digestion to produce methane. Reed canary grass is well adapted to the soils and climate of the region and will grow well on a wide range of sites across southern Scotland on land with limited alternatives cropping potential. Miscanthus grows on favourable sites in south west Scotland and potentially in the Scottish

Borders but needs further investigation into commercial yield opportunity.

Unlike short rotation coppice, an area of hemp, reed canary grass and miscanthus will produce a crop every year, which is baled and used in biomass boilers or dedicated power stations across the country.

There may also be potential to utilise the straw from these crops for building materials such as particle boards or insulation products; as there is much suitable land on which to produce these crops there is justifiable scale develop dedicated manufacturing in the area. Likewise, there is interest in increasing the use of natural fibres, though commercial scale processing is very limited at present.

Furthermore, livestock bedding is a large market in the south of Scotland with the highest value being for poultry litter and equine bedding and cattle a lower value market. There may be opportunities for any grower of biomass crops to process this on farm and produce higher value bedding for the poultry and equine markets.

## PROCESSING AND SUPPLY CHAINS

- Dry storage is required for the harvested hemp crop. When grown for seed, due to its high value, the seed can be readily marketed and transported to end users across the UK or overseas. When grown for fibre the bulky and low value nature of the crop means that proximity of primary processing facilities becomes key to the viability of the crop. The Scottish Borders has a historic textile sector which continues to support the economy of the region despite the contraction of spinning and garment manufacturing in recent years. The region retains significant expertise in the design and marketing of textiles and with the growth in demand for sustainable textiles there could be opportunities to expand the supply of locally grown fibre.

## GROSS MARGINS

### Miscanthus

*Data source: Nix Pocketbook , 2019*

	/ha
Yield (t/ha)	£ 11
Price per tonne	£ 77
<b>Output</b>	<b>£ 847</b>
<i>Establishment</i>	£ 83
<i>Fertiliser/spray</i>	£ 22
<i>Harvest</i>	£ 81
<i>Bale</i>	£ 154
<i>Cart, stack</i>	£ 44
<i>Transport</i>	£ 182
<b>Variable costs</b>	<b>£ 566</b>
<b>Gross margin</b>	<b>£ 281</b>

### Hemp

*Data source: Agricultural Budget Costing Book, Nov 2019, and NNFC Hemp Factsheet, 2006*

	/ha
Yield (t/ha)	7.5
Price per tonne	£ 146
<b>Output</b>	<b>£ 1,095</b>
<i>Seed</i>	£ 137
<i>Fertiliser</i>	£ 186
<i>Crop protection</i>	£ 20
<i>Sundries</i>	£ 171
<b>Variable costs</b>	<b>£ 514</b>
<b>Gross margin</b>	<b>£ 581</b>

### Establishment costs:

- Hemp and reed canary grass are relatively cheap and easy to establish, and use existing farm equipment.
- Miscanthus is costly to establish, using rhizomes or plus, although there is suitable on-farm and contractor equipment for harvesting in the region.

- There is a strong demand for biomass for heating and CHP plants in the south of Scotland. However, relatively few boilers are designed for the use of straw and it has different properties from wood fuel including higher silica and chlorine content therefore it is likely to have limited market demand and may face a price discount as a result.
- Livestock bedding is another potential market for reed canary grass and miscanthus, and there is potential to develop processing of all of the above crops into building materials given regional investment in dedicating manufacturing facilities.

## CROP ESTABLISHMENT AND PRODUCTION

### YIELDS

Typical biomass yields from reed canary grass are 6 to 12 tonnes dry matter per hectare per annum. Typical biomass yields for established miscanthus crops range from 9 to 16 tonnes dry matter per hectare from trials, in commercial situations 7 to 12 tonnes is achievable south of the Wash in England with yield potential in south west Scotland at the lower end of this range. Productivity of fibre hemp can range from 12 to 16 tonnes dry matter per hectare per annum. In reality, commercial yields will typically be in the 6 to 8 tonnes dry matter per ha.

### CLIMATE

Both hemp and reed canary grass are temperate region species and grows throughout the United Kingdom, RCG being a naturally growing plant. Hemp has been grown successfully at small scale in both the Scottish Borders and Dumfries and Galloway.

Miscanthus is a C4 plant and so production is adversely affected by low temperature conditions and will not grow below 6 C. Varieties vary with regard to frost tolerance. The crop has similar heat requirements to forage maize which makes favourable sites in SW Scotland just in range.

### SOIL TYPE

Reed canary grass can withstand wet soil conditions and even flooding. However, its deep rooting means that it can also withstand drought conditions. It prefers soil pH greater than 5.0. Fertility requirements are relatively low as nutrient uptake appears to be particularly efficient.

Hemp likes good draining loam soil with high organic matter content, but has been grown successfully on a wide range of soil types. Research has shown that hemp can be very effective at improving soils, e.g. structure, water management, buffer strips, good break crop in arable rotations etc.

Miscanthus can grow on a wide range of soil types. The pH should be within the range 5.5 to 7.5. Fertility requirements are low as there is considerable recycling of nutrients from leaf fall in autumn.

### CROPPING SYSTEMS

Reed canary grass is a perennial plant which spreads by rhizomes. It is normally established by seed in spring and cropping can take place within the first year. It can be grown for animal forage, as silage, or as a biomass crop. Total annual yields can range from around 8 to 12 tonnes dry matter per hectare per annum. Optimal yield will be obtained for at least 8 years.

Miscanthus is a perennial plant. It is normally established using rhizome sections and is allowed to establish for one year, with cropping taking place after a second full year of growth. Harvesting normally takes place between February and May using forage and baling equipment. Optimal harvest yields are likely to be achieved in the third to tenth year after planting.

### MACHINERY AND EQUIPMENT

Both reed canary grass establishment and harvesting would normally be undertaken by standard agricultural grass sowing and harvesting equipment. The crop is harvested using a conventional combine harvester and the straw baled for fibre use. The fibrous nature of hemp can make harvesting for seed problematic as the fibre in the straw is extremely strong necessitating sharp cutting knives and advisability to cut the crop high and come back with a forage mower to cut the rest of the stems. Miscanthus rhizomes can be planted using a potato planter. Harvesting is undertaken using forage and baling equipment.

### TIMINGS

At least three cuts of RCG silage can be obtained per annum from June onwards. For biomass the crop would be normally harvested from late December to March when moisture content is at a minimum. Hemp is drilled in April or May, and mowed mid to late August then baled. Although harvesting of miscanthus takes place in February to March when soils are usually wet, the mat formed by the plant rhizomes forms a mat which can provide stability for machinery.

*Potential markets for fibre and energy crops include biomass energy generation, livestock bedding and building materials.*

### Further information

- Commercial viability of alternative non food crops and biomass on Scottish Farms. A report by SAC Consulting
- Domestic Energy Crops; Potential and Constraints Review; an NNFC report
- Agricultural Budgeting Costing Book
- SAC's Farm Management Handbook

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