Returns: Miscanthus, Barley, Wheat, SFI and CS

Summary

Farming is difficult and unpredictable by nature. So any certainty should be embraced with open arms, stabilising incomes and future-proofing family businesses. With this in mind, Terravesta has produced this study which looks at three crop scenarios - low, medium and high yield - for wheat, barley and Miscanthus, as well as the UK's agri-incentives as an alternative to active farming (SFI Sustainable Farming Incentive and CS Countryside Stewardship).

For the arable crops, we've taken the latest certified UK prices (2023) of £190 and £175 per tonne for wheat and barley respectively, plus an additional £55 per 2.5 tonnes of straw per hectare, assuming some residual straw is left in the field to maintain the organic content. These prices are very high compared to the average for the last ten years and create a very competitive field for Miscanthus to compete in, with the intention of analysing whether this perennial crop Miscanthus can compete in terms of agricultural returns even in good years.

Crop	This studies price (2023)	10 year average (2014-23)	10 year minimum
Winter feed wheat	£190	£142	£99 (2016)
Feed barley	£175	£139	£100 (2016)

Key Findings

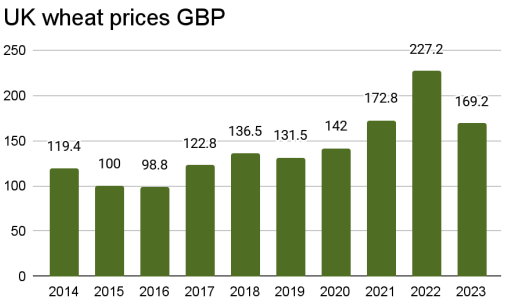
The financial mechanics of planting Miscanthus may appear unfavourable at first, due to high up-front establishment costs and delayed returns on investment. However, this analysis shows that stable and long-term returns ultimately compensate for these initial challenges.
The study considers a range of scenarios, including farming schemes in periods of very low crop market prices and years of higher prices. It also takes into account the opportunity cost of lost income in the early years when Miscanthus has not yet reached full yield.
Despite these considerations, the analysis shows that after 10 years farmers are better off with Miscanthus than with either of the two alternative crops, and this financial advantage becomes even more pronounced beyond year 10 as Miscanthus' low maintenance costs continue to generate consistent profits year after year.

- **Stable and Predictable Returns:** Miscanthus provides steady income with less vulnerability to price fluctuations compared to wheat and barley.
- **Resilient to Weather and Pests:** Unlike annual crops, Miscanthus withstands poor weather and is pest-resistant, offering dependable yields.
- **Consistent option in uncertain Markets:** With stable, inflation-linked pricing, Miscanthus delivers financial reliability.
- **SFI and CS fall short:** While SFI and CS options are appealing, growing perennial Miscanthus is typically more profitable long-term and less dependent on erratic government decisions.
- **Long term security**: Annual crops or farming schemes do not offer long term security over a period of 10 years.

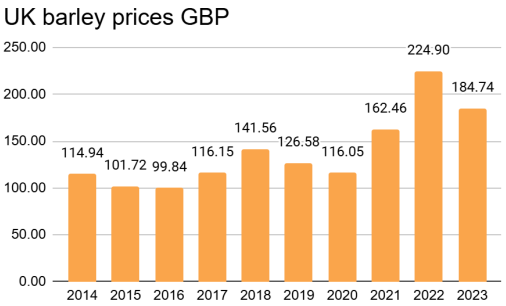
Arable crops: Miscanthus, Barley and Wheat

Unpredictable all round

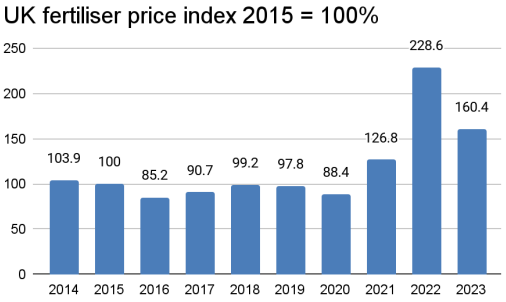
Taking the last decade as an example, data shows that there has been significant volatility in the prices of wheat and barley, as well as in the costs of essential agricultural inputs like fertilisers and pesticides. These fluctuations have posed considerable challenges to farmers, making financial planning and forecasting increasingly difficult.



For instance, wheat prices have shown dramatic shifts, increasing from £99 per ton in 2016 to £227 in 2022. Similarly, barley prices have followed a comparable pattern, fluctuating within the range of £100 to £225 per ton during the same period. These price variations are influenced by a complex interplay of factors, including global supply chain disruptions, geo-politics, climate change impacts, and shifts in market demand.



The cost of fertilisers has also risen sharply, often by more than 100%. This is due to things like changes in raw materials, geo-politics affecting production and distribution, and the rising cost of energy used in manufacturing these inputs. Farmers must manage risk and diversify to cope with these unpredictable changes. It is impossible to predict annual crop profits even 6 months into the future, let alone 10 years from now. Miscanthus doesn't need any input costs and its price increases with inflation (if long term offtake contracts are available).



▶️ **Miscanthus offers a notable advantage in terms of predictability in revenue.**

Net Margin: The Key to Accurate Farm Return Calculations

There are many ways to calculate farm returns. However, only one of these methods can provide a comprehensive representation of the underlying data, the *net margin*. This metric varies from farm to farm but is the only true measurement of a farm's financial performance.

Farmers usually don't include labour and machinery costs when calculating farming margins. The analysis usually stops at the *gross margin*, which is the difference between the crops' market value - *gross output* and the costs of seeds, fertilisers, and sprays, the *direct inputs*.

This gross margin approach is quick and easy, but it is not an accurate way of assessing individual farm performance and profitability. It is not uncommon to hear how much a farmer earns from a single crop, only to be told that there is no money in farming. Farmers growing the same crop will employ similar inputs. Other growers will probably get similar discounts on these inputs. Gross margin calculations don't show the full picture. They don't account for differences in farm efficiency, decision-making and resource management.

A more detailed calculation can be made by taking into account the additional costs of different farming systems. The main differences in costs between farms are in cropping methods, machinery used, labour, farm management, equipment maintenance and other operational factors. Farmers have different management styles which affect their indirect costs. It is only by taking all these into account that farmers can calculate whether a crop is really profitable or not.

Gross output
- Direct inputs
= Gross margin

Expenditure on fuel, maintenance, machinery replacement and labour can have a significant impact on a crop's net margin during periods of inflation. Long-term experience helps to better manage indirect input costs. Ignoring these costs may lead to poor decisions. It also makes it harder to compare different crops that may be less affected by indirect inputs, which could mean missing out on better or more profitable options.

Miscanthus offers significant operational benefits. Unlike annual crops, it only needs to be planted once and produces annual yields for a productive life of 15 to 20 years. Recurring costs are limited to contracting services for cutting - using a forage harvester (some larger farmers may even own these machines), baling and bale chasing. After these costs are deducted from the gross output, the resulting net margin helps to pay back the initial investment. Typically, the crop breaks even around the fifth year, marking the start of long-term profitability.

Gross output
- Direct inputs
= Gross margin
- Indirect inputs
= Net margin

In order to accurately assess the profitability of a perennial crop such as Miscanthus, it is essential to apply a *net margin* calculation. Only at this level of detail, the true cost associated with cultivating a field that is either unproductive, distant or exposed to extreme weather conditions becomes evident.

How we calculate gross and net margins (UK pounds £)

The calculation for wheat and barley are based on the John Nix Pocketbook figures 2024 edition.

Wheat (feed, winter)

	low	mid	high
Yield / ha (t)	7.25	8.60	10.00
Grain prices £190 /t	1,378	1,634	1,900
Straw in swath £55 /t	136	136	136
Gross output	**1,513**	**1,770**	**2,036**
Seed	81	81	81
Fertiliser	325	325	325
Sprays	292	292	292
Direct inputs	**698**	**698**	**698**
Gross margin	**815**	**1,072**	**1,338**
Labour	110	110	110
Machinery depreciation	130	130	130
Machinery running costs	115	115	115
Contractors	110	110	110
Indirect inputs	**465**	**465**	**465**
Net margin before overheads	**350**	**607**	**873**

Barley (feed)

	low	mid	high
Yield / ha (t)	6.25	7.30	8.50
Grain prices £175 /t	1,096	1,280	1,491
Straw in swath £55 /t	163	163	163
Gross output	**1,259**	**1,443**	**1,653**
Seed	110	110	110
Fertiliser	265	265	265
Sprays	221	221	221
Direct inputs	**596**	**596**	**596**
Gross margin	**663**	**847**	**1,058**
Labour	110	110	110
Machinery depreciation	130	130	130
Machinery running costs	115	115	115
Contractors	110	110	110
Indirect inputs	**465**	**465**	**465**
Net margin before overheads	**198**	**382**	**593**

Miscanthus

Miscanthus x giganteus

Newer, more vigorous hybrids are not considered, these may yield up to 50% more.

	low	mid	high
Yield / ha (t)	8.00	11.50	13.00
Miscanthus dry prices £/t	855	1,172	1,385
Gross output	**852**	**1,225**	**1,385**
Seed	0	0	0
Fertiliser	0	0	0
Sprays	0	0	0
Direct inputs	**0**	**0**	**0**
Gross margin	**852**	**1,225**	**1,385**
Labour	0	0	0
Establishment depreciation	179	179	179
Machinery running costs	0	0	0
Contractors	255	325	355
Indirect inputs	**434**	**504**	**534**
Net margin before overheads	**418**	**721**	**851**

The impact on margins of swings in direct and indirect inputs

	Wheat	Barley	Miscanthus
Gross output	100%	100%	100%
- Direct inputs	39%	41%	0%
= Gross margin	**61%**	**59%**	**100%**
- Indirect inputs	26%	32%	41%
= Net margin	**35%**	**27%**	**59%**

Crops with a higher percentage of direct inputs relative to gross output (shown in green and orange) are more vulnerable to market fluctuations in fertiliser and spray prices. With direct inputs accounting for around 40% of gross margins for both wheat and barley, a 10% increase in prices reduces net margins by 4%. A 50% swing, such as that observed in 2023, reduces net margins by 20% (we have excluded the 100% swing in 2023 in this reasoning as it represents the start of the war in Ukraine and is therefore a rather unique event).

Crops with a higher proportion of indirect inputs (shown in blue) relative to gross output are more vulnerable to market fluctuations in fuel, labour and machinery costs (typically reflected in contractor prices). With indirect inputs accounting for around 30% of gross margins for both wheat and barley, a 10% increase in indirect input prices reduces net margins by 3%.

For Miscanthus, the proportion of indirect inputs is much higher at 41%, meaning that increases in these costs will have a slightly more important impact. A 10% increase in costs (combined fuel, labour and machinery costs) would result in a 4% reduction in net margins.

And here is the important point:
For growers on a term contract with Terravesta there is no impact at all as the increase in these prices is fully absorbed by the index-linked increase in gross output.

The net margin of around 59% on gross output remains the same as the purchase prices for miscanthus increase at the same rate as the cost of indirect inputs. In fact, in 2022, at the peak of UK inflation, Terravesta's prices paid to UK farmers increased by 12%, fully absorbing the higher contract costs.

- ▶️ **Miscanthus is a net margin crop.**
- ▶️ **With Terravesta's term contracts Miscanthus becomes inflation proof.**

Weather & pests: the other big unknowns in farming

Weather is the other major variable in agricultural production. While extreme weather or pests can have a severe impact on wheat or barley crops, Miscanthus is highly resilient, has no known pests and can withstand severe conditions, including flooding, without long-term damage. If a Miscanthus crop is not harvested due to wet conditions, it will typically stand the following year, often with yields in excess of 160%, which is less than two full crops, but still better than a complete loss of one of the two harvests.

Costs associated with severe grass weed infestation such as Blackgrass or Sterile Brome can amount to up to £180 / hectare additional chemical costs . Yield losses as infestation raises ranges from 0.4 to 1.2 tons per hectare (source: *John Nix Pocketbook, 54th edition, 2024*).

Miscanthus is not susceptible to pests or blackgrass. In fact, Miscanthus is a cure for blackgrass, as it outgrows and overshadows it, leading to its complete elimination after a few years. Fields of Miscanthus are completely free of blackgrass at the end of their natural life.

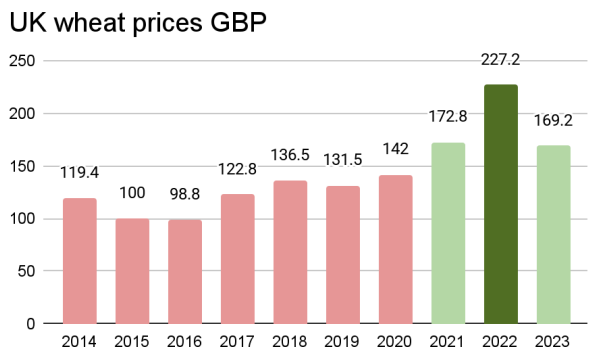
This is a very common issue, in fact a third of UK growers require additional seed treatments, particularly to suppress barley yellow dwarf virus (BYDV). This can add £160 / t of seed (£28 / ha), further eroding margins (source: John Nix Pocketbook, 54th edition, 2024).

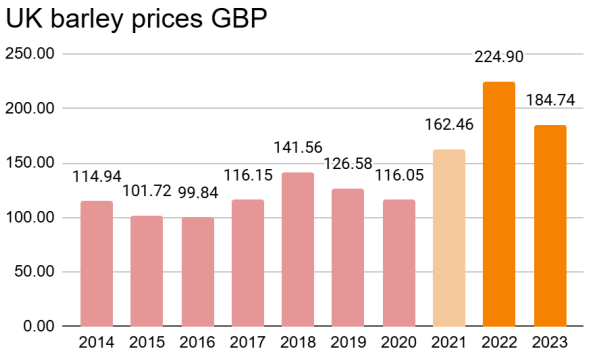
- ▶️ **Miscanthus is highly resilient to adverse weather conditions and pests.**

Price uncertainty

Fluctuations in market prices can also have a significant impact on the profitability of annual crops. A 10% fall in barley prices threatens the profitability of all but the most optimal fields (those yielding at least 8.5 tonnes per hectare). Wheat is slightly less exposed, but still vulnerable to price fluctuations, with a 25% fall leading to net losses on yields below 7.25 tonnes per hectare.

From 2014 to 2023, the picture for profits (net margin) for wheat/barley is rather bleak. In the graphs below, a red bar indicates years with net losses. Dark green/orange indicates years with profits, some of which are healthy, while light green/orange years show neutral situations, with net margins close to break-even.





Colour legend

Net margin negative = net loss

Break-even or small net profit

Net profit

And here is the important point:
At these prices, growers with low or average yielding fields will have made a net loss or no profit in 7 out of 10 years for wheat and barley.
Miscanthus prices are linked to inflation, growing year on year, and therefore exhibit no volatility.

▶ **Miscanthus is a reliable option especially in volatile markets.**

The comparison of net margins shows the impressive performance of Miscanthus even when compared to a situation of high market prices for wheat (£190 / t) and barley (£175 / t). Values in yellow show the best performing crop for each scenario - low, average and high yielding fields. None of the scenarios take into account pests or second dressings, which negatively distort the picture for what and barley.

	Low yielding / ha		**Average yielding / ha**		**High yielding / ha**	
	Yield t/ha	**Net margin £/ha**	*Yield t/ha*	**Net margin £/ha**	*Yield t/ha*	**Net margin £/ha**
Wheat	*7.25 t*	**£ 350**	*8.60 t*	**£ 607**	*10.00 t*	**£ 873**
Barley	*6.25 t*	**£ 198**	*7.30 t*	**£ 382**	*8.50 t*	**£ 593**
Miscanthus	*8.00 t*	**£ 418**	*10.00 t*	**£ 721**	*12.00 t*	**£ 851**

Wheat: average price for the years 2014-2020: £121.57 / t

	low	mid	high
Yield / ha (t)	7.25	8.60	10.00
Grain prices **£121.57 /t**	881	1,046	1,216
Straw in swath £55 /t	163	163	163
Tot output	**1,017**	**1,181**	**1,351**
Direct inputs	698	698	698
Gross margin	**319**	**483**	**654**
Indirect inputs	465	465	465
Net margin before overheads	**-146**	**18**	**189**

Barley: average price for for the years 2014-2020: £116.69 / t

	low	mid	high
Yield / ha (t)	6.25	7.30	8.50
Grain prices **£116.69 /t**	729	852	992
Straw in swath £55 /t	163	163	163
Tot output	**892**	**1,015**	**1,155**
Direct inputs	596	596	596
Gross margin	**297**	**419**	**559**
Indirect inputs	465	465	465
Net margin before overheads	**-168**	**-46**	**94**

The gross margin alone does not show the loss. In fact the margins look acceptable but they are not.

Miscanthus: margins remain unchanged over the same period

These compare to Miscanthus net margins over the same period which did not respond to market price fluctuations.

	low	mid	high
Net margin before overheads	**418**	**721**	**851**

▶️ **With Miscanthus you get what you had planned.**

Haulage costs

All crops require transport. Transport costs depend on region, distance and commercial arrangements, which can vary widely. For this reason, we do not calculate average transport costs for wheat or barley. The reader will know their own. We limit ourselves to quoting average UK transport costs per tonne for Miscanthus for 2023, which ranged from £15/t to £30/t for Miscanthus (50-150 miles).

Farming grants and incentives (CS and SFI)

For farmers seeking alternatives to traditional crop farming, the UK government offers several schemes designed to promote environmentally friendly practices and enhance land management. Two key initiatives are *Countryside Stewardship (CS)* and the *Sustainable Farming Incentive (SFI)*, both part of the *Environmental Land Management schemes (ELMs)*. These schemes provide financial support for farmers who adopt practices that benefit wildlife, improve soil health, and contribute to tackling climate change.

Comparison of net margins for CS and SFI actions

This study only presents the most profitable and popular measures for farmers. Action values for CS and SFI as of December 2024.

	CS				SFI		
Description	*Flower rich Margins*	*Winter Bird Food*	*Legume Fallow*	*Low Input Grass*	*Legume Fallows*	*Winter Cover*	*Summer Catch*
Action code	**AB8**	**AB9**	**AB15**	**GS2**	**CNUM3**	**SAM2**	**SOH3**
Payment / ha	**798**	**853**	**593**	**151**	**593**	**129**	**163**
Seed	51	48	24		50	30	30
Fertiliser		176					
Sprays		15					
Direct inputs	**51**	**239**	**24**	**-**	**50**	**30**	**30**
Labour	20	20	20		20	20	20
Machinery	50	50	110		100	50	50
Indirect inputs	**70**	**70**	**130**	**-**	**120**	**70**	**70**
Gross margin / ha	**677**	**544**	**439**	**151**	**423**	**29**	**63**

Miscanthus margins

After the first year of establishment no cultivation or maintenance work is required besides calling in the contractor. Miscanthus's net margins grow year to year indexed to inflation completely independent from policy actions and government budget constraints.

	low	mid	high
Net margin before overheads	**418**	**721**	**851**

▶️ **Miscanthus reduces reliance on short term government support.**

More details about UK farming schemes

Both schemes are intended to provide opportunities to support farm income while enhancing the environment.

Countryside Stewardship (CS)

Countryside Stewardship rewards farmers and land managers for implementing a variety of measures to improve biodiversity, preserve water quality, and protect natural habitats.

- Creating and maintaining wildflower meadows.
- Establishing hedgerows and buffer strips to support pollinators and wildlife.
- Enhancing woodlands and planting trees.
- Protecting watercourses from pollution through fencing and buffer zones.

Farmers can choose from a range of options suited to their land and environmental goals, with agreements lasting between 1 to 10 years. Payments vary depending on the actions taken, offering a tailored approach for farmers to balance profitability and sustainability.

Sustainable Farming Incentive (SFI)

The SFI focuses on improving soil health, water quality, and farm resilience by encouraging sustainable practices across arable, grassland, and mixed farming systems. Key priorities include:

- Soil Care: Actions like maintaining ground cover and reducing erosion.
- Nutrient Management: Efficient use of fertilisers to protect water and reduce emissions.
- Integrated Pest Management: Minimising chemical use by enhancing natural pest control.

The SFI is designed to be simple and flexible, with shorter agreements and annual payments based on land size and activities performed.

While attractive on paper, these do compare favourably only over a period of 3 years with the long-term net margins of Miscanthus.
The most profitable actions of both schemes have been blocked by the government 8 months after their introduction due to the huge uptake by UK farmers. Up to 266,000ha or 3% of UK farmland has been taken out of food production and put into flower, bird and bee mixes, certainly not what these schemes were intended to achieve.
Their true net environmental impact is also debated, but that is beyond the scope of this study.

▶️ **Relying on short-termist governments is not a good long-term farming strategy.**

Source: Defra Nov. 20th 2024 - Sustainable Farming Incentive action uptake data October 2024

A long term scenario

The compounding effect of small but cumulative inflation over time is often overlooked, as are the long-term benefits of a perennial, index-linked crop like Miscanthus.To provide an understanding of how these benefits play out, the case of a grower running two farms under different systems has been developed to highlight the contrast in results over time.

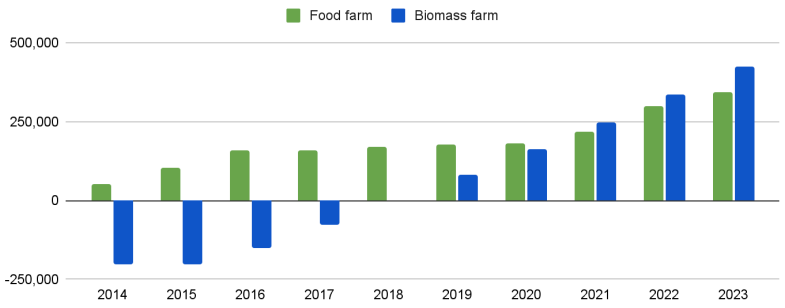
- The first farm, called the “Food Farm”, grows half winter wheat and half barley. The market prices for both crops are not particularly high at the start of this scenario, so the farmer chooses to put all his land into the highest-paying farming scheme with a duration of 3 years.
- The second farm, called the "Biomass farm", is dedicated entirely to Miscanthus. Miscanthus does not exist at the start and therefore has to be planted, which requires up-front investment and takes 2 years before the first harvest.

Summary of assumed conditions:

- 10 year scenario, 100 ha farms
- Average soil quality for both farms
- Prices for wheat, barley, miscanthus are those observed for real in the years 2014-2023
- Inflation is set at 3% per year (thus excluding the most recent unnatural extreme values)
- Results are evaluated at the end of 2023

Food farm	Biomass farm
• For the first 3 years, the farm is put into the scheme Flower Rich Margins - AB8 • In the years 4 to 10 50% of the land is planted with wheat and 50% with barley • The prices for straw are £55/t	• For the first 3 years SFI options SAM1 for the full farming area and IPM2 for 6 meters of field margins is applied • Year 1: planting, no harvest • Year 2: 80% yield after that full yield

Adjusted for inflation over 10 years, Food Farm generated a cumulative net margin of £342,920, driven by early income from arable schemes and two years of exceptionally high crop prices.



The Biomass farm initially lags due to the upfront costs of establishing Miscanthus. However, it breaks even by year 5, and with stable yields and inflation-proof (index-linked) prices, it eventually surpasses Food Farm, achieving a total profit margin of £424,663—approximately £80,000 more. The longer Miscanthus is cultivated, the greater its profitability compared to standard arable crops.

This report does not recommend dedicating an entire farm to miscanthus. However, it is a strong alternative for poor and mid quality soils or fields with difficult features to manage.

▶️ **The impact of stable returns is underestimated. It is only visible over the long term.**

Why Miscanthus is Different

Low Input Costs

Unlike wheat and barley, Miscanthus does not require fertiliser, sprays or replanting after initial establishment. This means lower annual costs, making it a cost-effective and inflation-proof option. It requires no special care after establishment, leaving the grower with valuable time to devote to more productive parts of the farm.

Long-Term Yield and Profit

Miscanthus only needs to be planted once, yet it produces a crop every year for 15-20 years. It typically breaks even by the fifth year, after which it becomes a long-term source of profit. Its cumulative yield achieves a great financial result and it compares favourably with any short-term farming scheme as well as exceptional years of high prices for conventional crops.

Resilience to Weather and Pests

Weather

Miscanthus can withstand extreme conditions, including flooding, without losing productivity. Even if harvesting is delayed, it often delivers higher yields the following year.

Pests

Miscanthus naturally suppresses weeds like blackgrass, eliminating infestations over time. Unlike wheat and barley, it does not require additional pest control.

Inflation-Proof Income

While wheat and barley profits can drop with falling prices or rising costs, Miscanthus offers stability. Its prices are linked to inflation, meaning farmers can rely on consistent returns.

Additional Benefits of Miscanthus

1. **Reduced Labour and Machinery Costs**: After planting, the main costs are harvesting and transport, work which can be completely outsourced to contractors.
2. **Pest Management**: Miscanthus not only resists pests but actively eliminates weeds like blackgrass, leaving fields weed-free after its productive life.
3. **Transport Costs**: While haulage costs for all crops vary, transporting Miscanthus typically costs £15–£30 per ton (50–150 miles).
4. **System services**: Throughout its long productive life, Miscanthus provides lasting benefits to fields and their environment, such as increased soil organic matter, increased soil life, reduced erosion and improved water quality.

Conclusion

In summary, miscanthus offers UK farmers a stable, high-yielding crop with minimal annual inputs. It thrives on poorer quality land, is resistant to pests and can withstand extreme weather conditions, making it an ideal choice for diversification.
While it cannot replace all other crops, adding Miscanthus to the farm can improve overall resilience and profitability, particularly in low or medium yielding areas.

Planting Miscanthus may initially appear financially challenging due to high establishment costs and delayed returns. However, this analysis shows that stable, long-term returns outweigh these initial hurdles.