



terravestaTM

Energy, naturally.



THE MISCANTHUS GROWERS GUIDE



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NOTE FROM THE CHAIRMAN

As a Miscanthus grower myself, I have experienced the day-to-day processes of planting, establishing, baling and selling the crop first-hand. Today, Miscanthus is a highly profitable crop to grow commercially, and there is no doubt that, with very little input, it can deliver a lifetime of returns.

Developed from a pool of collective experiences from long-standing growers, Terravesta is able to recommend simple steps to ensure that for today's grower, it only takes a small amount of effort to safeguard a premium quality crop.

Lending its expertise in everything from propagation, planting, growing, harvesting, and plant breeding, at the heart of Terravesta's mission is continued investment into crop research and development, to meet a rising UK and international demand for Miscanthus and grow ever-increasing markets for it.

With a global directive to reduce carbon emissions and the UK government aiming for 20% renewable energy capacity by 2020, coupled with a UK Government target of 1.4M hectares of energy crops by 2050, there is increased interest in renewable energy sources both in the UK and internationally. The demand for biomass sector growth plays a critical part in reaching government targets.

The Miscanthus Growers Guide has been created to share the vital knowledge developed from years of experience to both new and existing growers, to help secure the highest quality of Miscanthus supply for the UK. For the new grower, by embarking on your first season, you are joining a network of hundreds of other farmers (myself included) who are already reaping the benefits of this miracle energy crop. Sharing information and making the most of others' experience means the whole Miscanthus market will grow stronger, better and together.

William Cracroft-Eley
Chairman, Terravesta



WHO IS TERRAVESTA?



THE WORLD LEADING
MISCANTHUS SPECIALIST



OUR MISSION IS TO REPLACE THE
GLOBAL DEPENDENCE ON FOSSIL FUELS
WITH MISCANTHUS - THE SUSTAINABLE
SOLUTION TO OUR PLANET'S
ENVIRONMENTAL NEEDS

Terravesta manages all aspects of Miscanthus supply, working with over 300 UK growers, to service several markets, and develops future markets for the crop.

By securing a sustainable source of annually harvested crop from growers, Terravesta supplies whole bale power stations with Miscanthus and facilitates small scale heat and power projects, providing a reliable, home grown biomass fuel source for energy providers on a long-term contract basis.

The company supplies Miscanthus rhizomes for planting, provides agronomic knowledge, secures lucrative markets and offers long-term, index-linked contracts to growers.

WHAT IS MISCANTHUS?

Miscanthus is a truly sustainable renewable energy crop that's seeing rising demand for UK heat and power generation, due to its rapid growth, low mineral content and high biomass yield. This along with its remarkable environmental credentials make it the number one biomass fuel.

Planted once, harvested annually, and with a lifespan of over 20 years, Miscanthus is a long term, environmentally friendly, low maintenance investment that provides an assured income well into the future.

It's a perennial crop that's harvested during January to May, with the potential to yield 12 – 17 tonnes per hectare, and thrives on poorer-grade, marginal farm land. It's not grown on vast areas of productive land, meaning it doesn't compete with vital food production.

Limited inputs and no fertilisers are required, because the rhizome recycles nutrients back into the soil, and over the winter period the leaves fall off the crop and there is a significant return of plant nutrients through leaf litter.

CROP CHARACTERISTICS



- Low maintenance
- Low input costs after establishment
- No known diseases and minimal pests
- High resistance to fluctuating environments
- Low moisture content during harvest <14% when baled

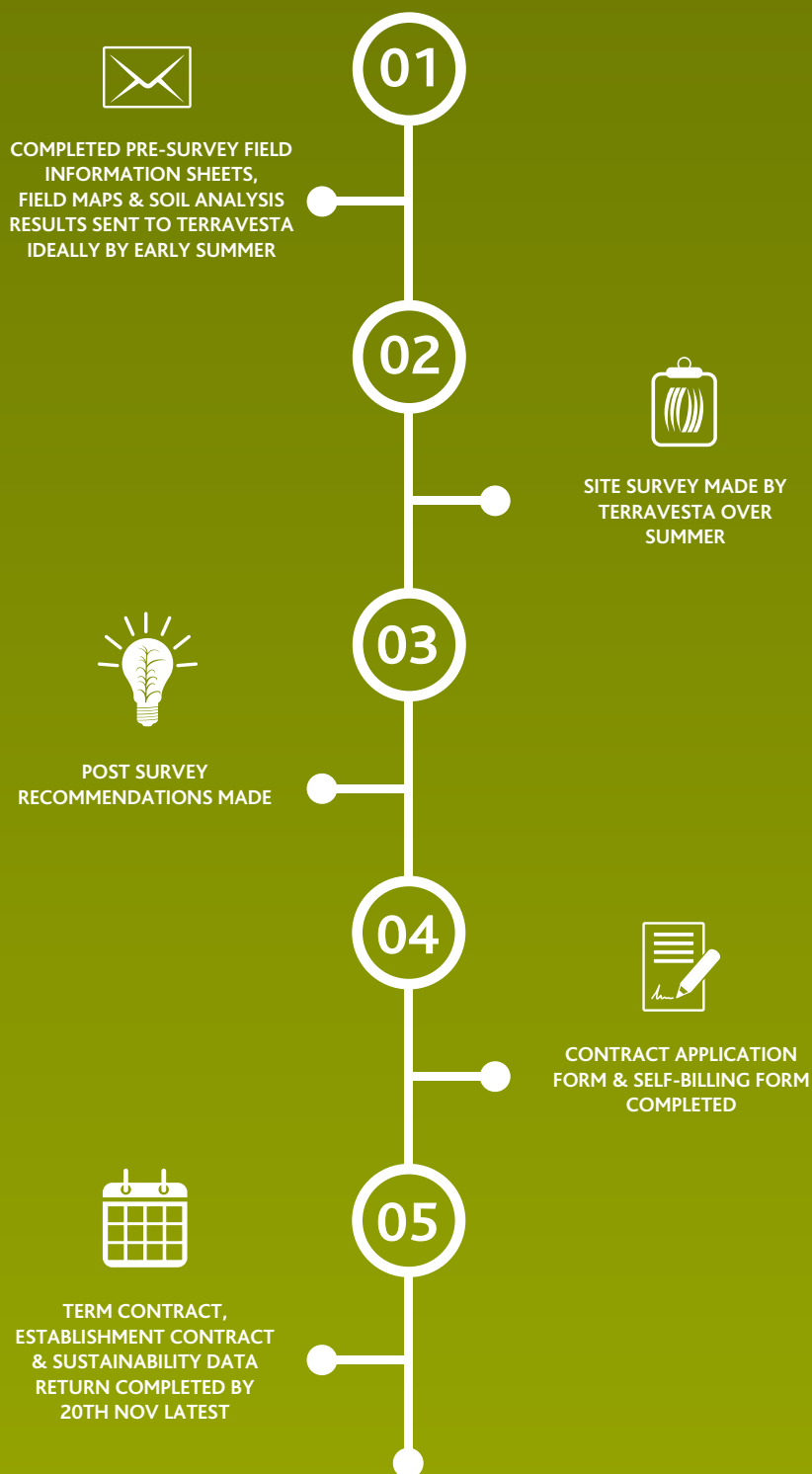
SOIL



- Miscanthus will grow on all land types
- Strongest yields achieved on wet sandy soils
- Soil pH ideally needs to be in the region of 6-7.5
- Year one growth rates can be more dynamic in lighter soils
- Best establishments if planted in a fine 6" tilth in April/May
- Takes longer to establish in heavier clay soils but yields are more consistent

KEY STEPS TO GROWING MISCANTHUS

The steps to getting started with a Miscanthus crop are better planned well in advance of planting. Ideally, if the paperwork is completed in summer, you can get on and prepare the land in the autumn months, before planting the following spring, for the best chance of a high yielding crop.



GROUND PREPARATION

With Miscanthus, there's a strong correlation between good planning and a healthy, high yielding crop.

SOIL PREPARATION

Soil needs to be ploughed and/or subsoiled well in the autumn to allow weathering over the winter months. This helps to achieve a fine tilth the following spring, ahead of planting.

WEED & PEST CONTROL

It's vital that fields should be cleared of weeds before any planting takes place.

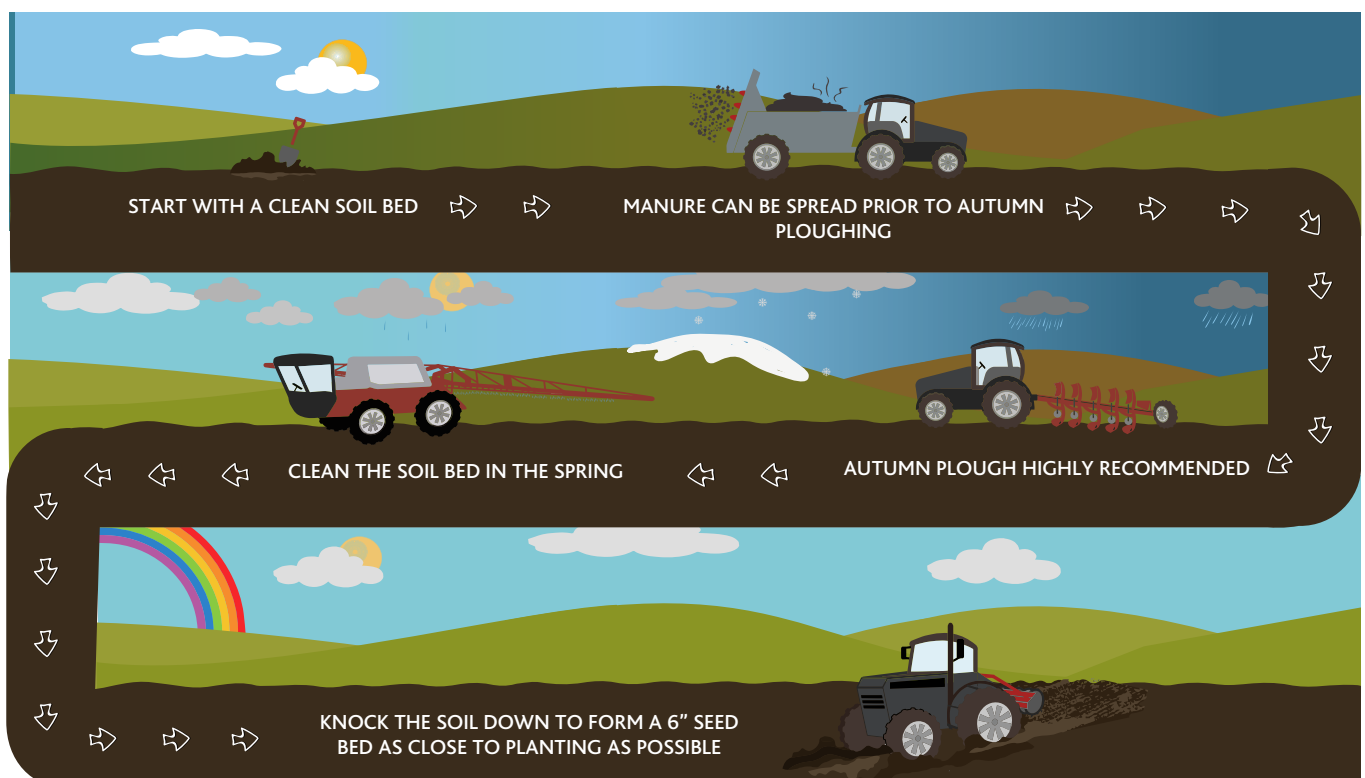
Weed control in the establishment phase of Miscanthus is essential so that the crop can develop successfully.

It's also crucial to avoid planting in areas where there is a wireworm issue.

INPUTS & SOIL SAMPLES

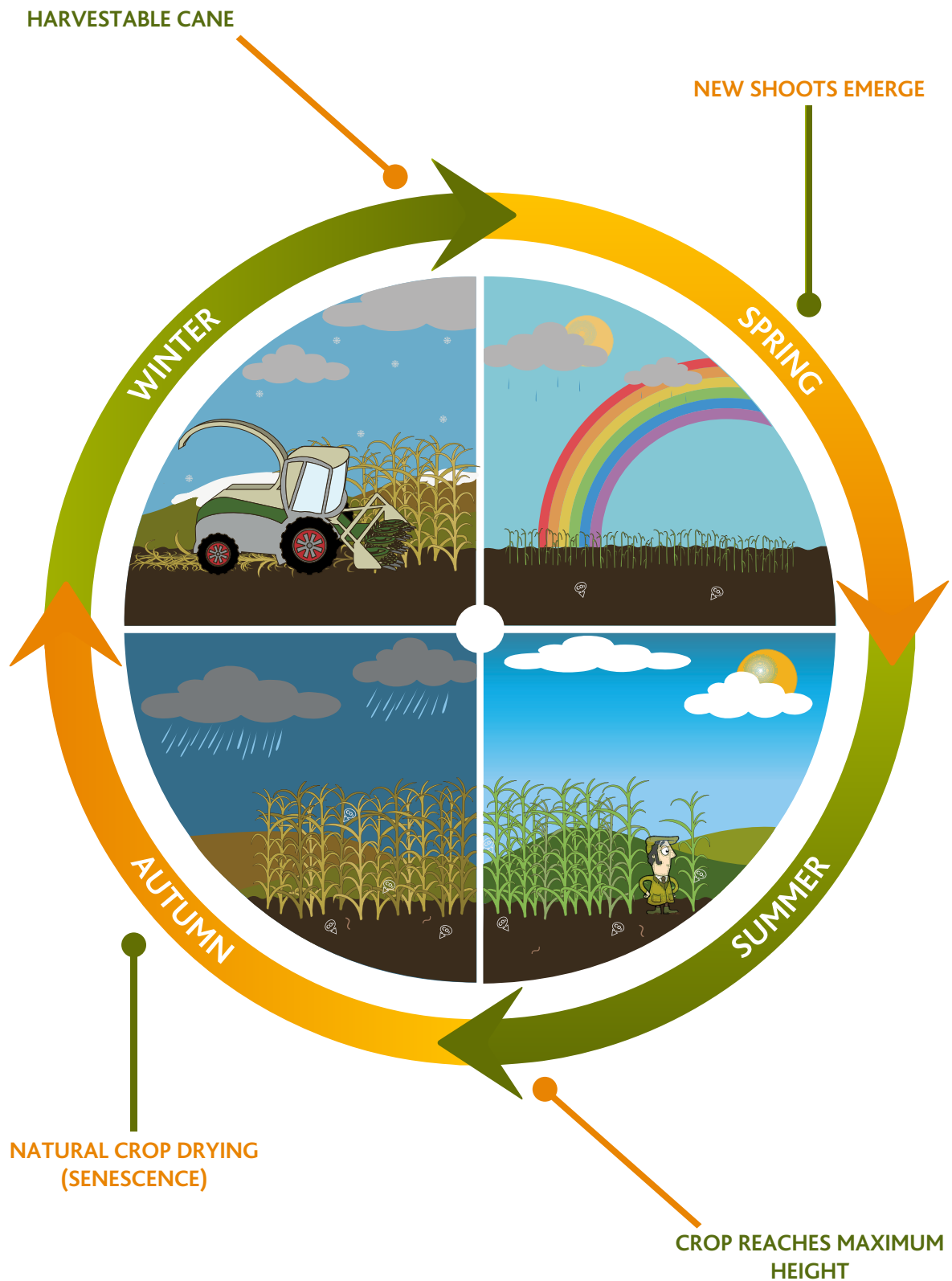
Miscanthus has little or no need for applied fertiliser, and this can be confirmed by a basic soil test.

If a soil sample is taken during the summer, nine times out of ten, no additional nutrients such as phosphate, potash or nitrogen need to be applied.



MISCANTHUS GROWTH CYCLE

PERENNIAL CROP PLANTED ONCE, WITH A 20+ YEAR LIFE SPAN



CULTIVATION & RHIZOME HANDLING

Miscanthus is grown from rhizomes which are planted using a semi-automatic, specifically developed Miscanthus planter.

Terravesta's rhizomes are lifted from our nurseries and are never more than three years old in their propagation cycle. The resulting vigour of these rhizomes is what produces the high growth yields of 12-17 tonnes per hectare.

CULTIVATION SPECIFICATION



- The soil should be worked down as close to planting as possible
- Manure can be spread prior to ploughing but no later
- The seed bed should be as clean as possible
- A fine tilth of no less than 6" is required
- Clods should be less than 10mm in size

RHIZOME STORAGE & HANDLING



- Rhizomes are delivered direct from cold storage and need to be stored in cool, dark conditions
- It's crucial that rhizomes are watered daily to prevent dehydration
- They must not be heavily stacked when in storage
- When handling, try to prevent unnecessary damage, as this can impair the buds and potentially reduce yields
- When loading rhizomes onto the planter, do so in the field boundary, off the crop area, to reduce unwanted compaction from machinery
- Once the rhizomes are on the planter, keep them watered, especially in hot and dry weather conditions





PLANTING

TERRAVESTA RECOMMENDATIONS

AVERAGE PLANTING RATE

17,000
RHIZOMES PER HECTARE

1.2 RHIZOMES
PER M²

ENOUGH ROOM FOR CROP EXPANSION &
GROWTH WITHOUT INDUCING INTER-SPECIES
COMPETITION

 **19,000**
RHIZOMES PER HECTARE
FOR STRONGER SOIL

TERRAVESTA SEMI-AUTOMATIC MKII PLANTER

WIDELY USED
ACROSS THE UK &
EUROPE TO PLANT
RHIZOMES IN A
PRECISE MANNER



 INCREASED YIELD POTENTIAL
THROUGH SAFE & CAREFUL
HANDLING OF RHIZOMES

PLANTS IN ROWS
OF 4 AT 75 CM
SPACING



DROPS A RHIZOME EVERY

78CM

AFTER IT OPENS THE FURROW. THIS CAN BE
ALTERED FOR DIFFERENT PLANTING DENSITIES

CUTTING, DRYING & BALING

01



THE CROP IS CUT WITH A SELF-PROPELLED FORAGE HARVESTER AND LEFT IN THE SWATH

02



THE CUT CANE IS LEFT IN THE SWATH FOR 1-6 WEEKS UNTIL IT'S DRY

03



BALES MUST BE 4X4 OR 4X3, WEIGHING A MINIMUM OF 575KG & 425KG RESPECTIVELY & BELOW 14% AVERAGE MOISTURE CONTENT FOR THE BEST PRICE PER TONNE



When it comes to achieving a dry and commercially viable crop, timing is the essence. Growers investing time and effort into this crucial stage will quickly reap the rewards. It means a price difference of up to £15 per tonne, faster processing and collection, earlier payment, no return charges, cheaper haulage and less waste.

Harvesting is a contractor job, and Terravesta works with regional contractors, who are experts in handling Miscanthus. Please visit www.terravesta.com for the most up to date national list of Terravesta approved contractors.

TIPS ON TIMING

THE BEST TIME TO CUT

The key is to cut as early as you can. The determining factor is likely to be ground conditions and whether the machinery can travel without creating damaging ruts. It's best to wait until after Christmas before cutting.

Providing the forage harvester is correctly set to leave the cane rods unsplit, the crop will withstand rain or snow, drying quickly in prevailing winds.

Cutting late limits the opportunity to control senescence and moisture in the crop. Cut early and do not rush to bale.

CROP SENESCENCE

When it comes to cutting, ideally, the cane will have as little green on the stem as possible, but in a mild winter, the crop may not have achieved the right level of senescence, and will have more green than 1ft up from the ground.

The standing crop is unlikely to senesce any more beyond the end of January. It is essential that the cut crop is left in the swath for long enough to enable the sap to dry out. The greener the crop at cutting, the longer this will take. Cutting early will induce the senescence process by exposing the stems, which are then left in the field to dry.

THE CUTTING PROCESS

Always cut to a cane length of 300 – 450mm using a self-propelled forage harvester. The machine needs to be set up so that it doesn't split the canes length-ways. Splitting the cane exposes the absorbent inner pith, which will soak up rain and external moisture. Unsplit cane won't absorb external moisture and can sit for long periods in the swath without any detriment to quality.

Longer canes are not feasible in any market and will lead to bales being rejected.

DRYING & TURNING MISCANTHUS



IN A REASONABLY DRY SPRING, MISCANTHUS WILL DRY NATURALLY WITHOUT NEEDING TO BE TURNED



THE MOST IMPORTANT THING IS TO ENSURE THE SAP HAS DRIED FROM INSIDE THE CANE, INDICATED BY A CHANGE IN COLOUR FROM GREEN TO BROWN



EXTERNAL MOISTURE WILL GENERALLY DRY OUT WITH A FEW DAYS OF BREEZE THROUGH THE SWATH



IN A WET SPRING, TURNING THE CROP, BUT NEVER RAKING IT, CAN HELP DRY IT

TIPS FOR TURNING - NOT RAKING

- Always consult your baling contractor for turning advice
- Turning can jeopardise the quality of the crop if not done correctly
- The aim of turning is to invert and raise the swath to enable air to get to the damp underside, and this can be done with a ROC Merger or similar
- Turning will also fluff up the swath to allow air through and enable final drying

WHEN TO TURN

- Turn with a fine forecast within a day or two of baling. The operation adds cost, so aim to do it once only
- In wet ground conditions following a wet spring, where the bottom of the swath is lying damp
- Where the swath has been cut green and has sat for a long time, turning will promote airflow through the swath to reduce drying time
- Where headlands may have received heavy traffic and lie wet during the winter

DO NOT RAKE GROUND LITTER INTO THE SWATH

- Ground litter is wet and can contain stones and grit, all of which may lead to bale rejections
- Ground litter acts as a mulch, suppressing weeds and preserving soil moisture in times of drought
- Ground litter decomposes to form an organic mulch which over time, leaches nutrients through and into the soil horizons

BALING

When to bale Miscanthus isn't set in stone.

Terravesta advises that you should only bale a crop that meets moisture specifications, or you will ultimately lose out when it comes to sale.

Leave the widest possible window after cutting to ensure that the crop is fully senesced and completely dry. Once its packed into bales there will not be enough ventilation to dry it out further.

It's important to line up your baling contractor early. A meeting in the autumn prior to harvest will give the contractor a good indication of expected yield and what time of the harvest season they expect to be baling at your farm.

Before calling the baling contractor at harvest time, it's advisable to inspect the swath for any green stems and ensure the crop meets the moisture specification. It's also advisable to be present at the time of baling.

For a list of contractors in your area, visit www.terravesta.com

CHECKING MOISTURE



CHECK FOR MOISTURE WITH A MOISTURE PROBE. TEST THE FIRST FOUR OR FIVE BALES IN SEVERAL PLACES WHEN THE CONTRACTOR STARTS AND WORK TO THE WETTEST READING, NOT THE AVERAGE.

≤14%

AIM FOR AN OVERALL AVERAGE MOISTURE CONTENT OF 14% OR LESS. YOUR CONTRACTOR SHOULD TEST THE MOISTURE OF THE BALES AND BE AWARE OF THE SPECIFICATIONS.



IF YOUR BALES DO NOT MEET THIS SPECIFICATION, THE CROP MAY BE REJECTED.

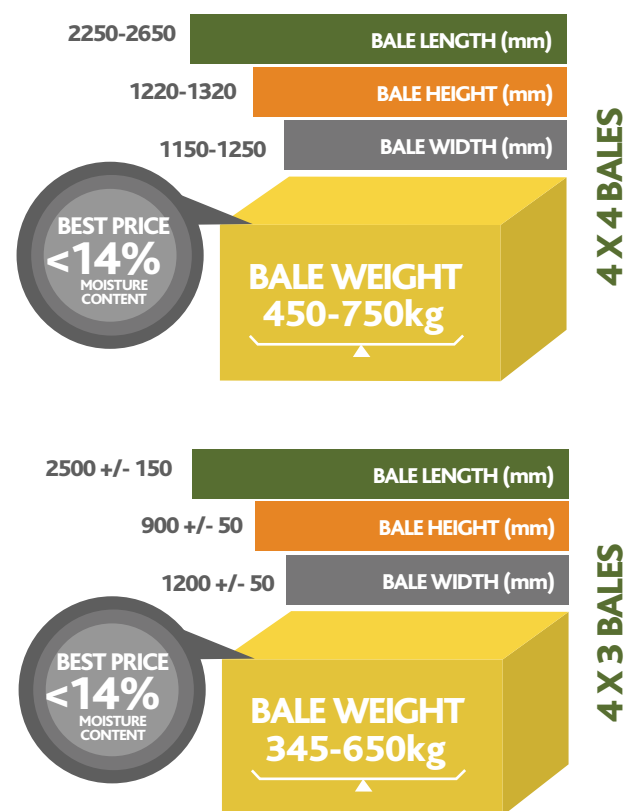


BALING SPECIFICATION

Bales should be tightly packed for stability and economical haulage and must meet specifications, for the best return.

Correct bale structure, shape and size is crucial due to the handling process at the whole-bale power plants. Growers should ensure that any broken strings are replaced before collection.

TERRAVESTA BALE SPECIFICATIONS



* Bales with less than 14% moisture content get the best price. Terravesta does accept bales up to 23% moisture content. However there are price penalties for anything over 14% Moisture content.

CHASING

Some contractors offer a chasing service, which has been praised by those who use it. It reduces the risk of compaction which is a long-term yield inhibitor.

STACKING & STORING MISCANTHUS

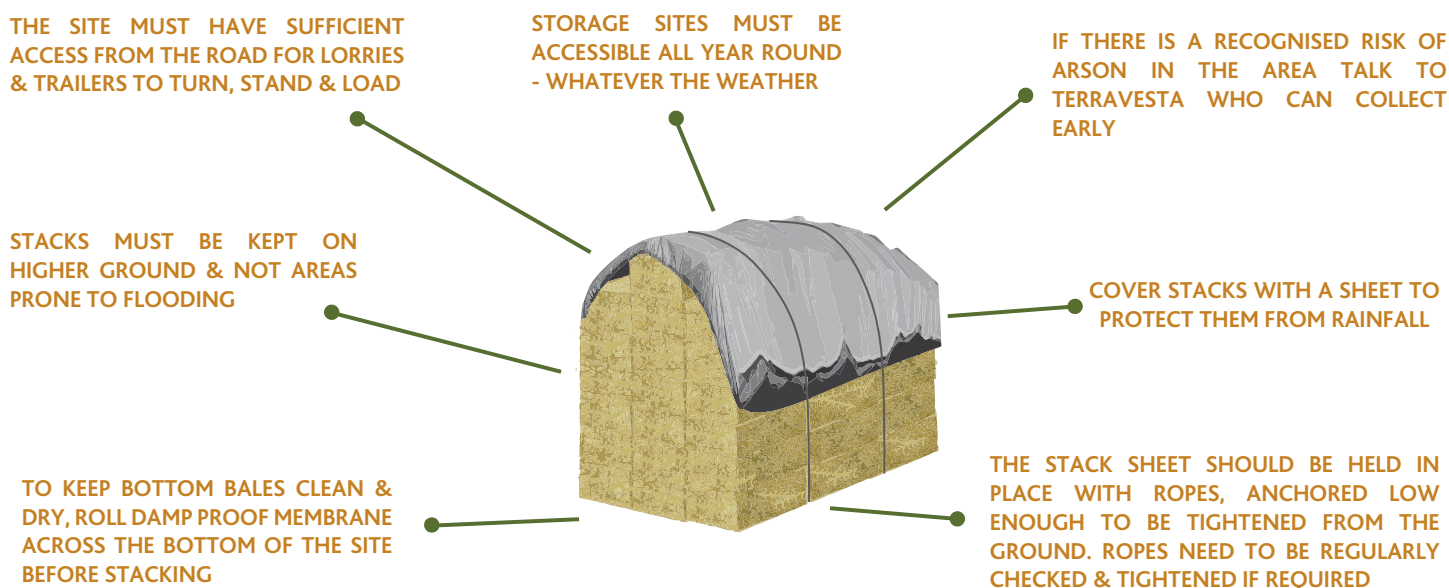
INDOOR STORAGE

Stacking inside, rather than stacking and covering outside, is always the preferred option. On average, growers can lose around 20% of their harvested Miscanthus because of poor storage.



OUTDOOR STORAGE

In the case that indoor space isn't available, you can cover the stacked bales at a suitable site.



STACKING BALES

At the stacking stage, it is important to check moisture levels by sampling bales with a moisture probe as they come off the wagon and are put on the stack. If there are wet bales, stack them separately, label or mark the bales, and inform Terravesta in the online declaration form.

Stack as high as safely possible, step bales to close gaps and therefore prevent the creation of a 'gutter' effect for water to travel down.

Ensure 4x4 hesston bales are stacked with strings to the side and that 4x3 hesston bales are stacked with strings facing upwards.



ONLINE HARVEST DECLARATION

Good communication is crucial for efficient management and therefore maximum profit.

Notify Terravesta about all the details of your harvest as soon as possible using the online harvest declaration form.

The online harvest declaration will enable growers to alert Terravesta of any issue, such as crop moisture levels, or the date the storage site needs to be vacated for example. It pays to keep us fully in the loop with your harvest, so that you get the best return from your crop.

This way, any issues or requests can be dealt with in good time. Details of harvest declarations will be communicated early spring.

The digital harvest declaration forms can be accessed online, and please use the Google Chrome web browser where possible: www.terravesta.com/declaration

LOADING & HAULING MISCANTHUS

Terravesta manages the collection and haulage of your Miscanthus bales via a national network of hauliers, which ensures the most competitive price for haulage and availability throughout the year.

The price in your contract is a delivered price in pounds per tonne (from stack to processor), and Terravesta will deduct this cost from your payment following collection.

Transport is a significant cost for the grower. Therefore certainty of your bales location and spec is key to avoid unforeseen charges. Always communicate this with Terravesta prior to bale collection.

3 WAYS TO INCREASE SUCCESS

01 REDUCE WASTED JOURNEYS

Rejected bales e.g. deemed too wet, will increase costs if they have to be delivered elsewhere. Extra journeys will add up as haulage payments are made after delivery. Reduce these costs by meeting specifications and communicating with Terravesta.

02 ACCESSIBILITY & QUALITY

Make sure bales are accesible and meet specifications. E.g. preparing for a quick turnaround with the collection lorry could bring your haulage price down by as much as half. Penalties will be charged if loading takes longer than one hour.

03 STRONG RELATIONSHIPS

Building a strong relationship with transporters can improve the reputation of the UK grower network through reduced wasted time and journeys. It can drive haulage costs down across the board by building confidence through consistent, quick turnarounds and guaranteed single destination journeys.

AIM FOR ONE HOUR ON-FARM LOADING & TURNAROUND

This will not be achievable loading a single bale at a time. Those with reach trucks should consider investing in a three-bale grab.





MISCANTHUS MAINTENANCE & CARE

MISCANTHUS

As a low input crop, Miscanthus requires very little maintenance. However, as with any crop, good management maximises yield and return.

FIRST HARVEST

At the end of the first spring, one year after planting, it's unlikely that your crop will be economically harvestable. Generally speaking, best practice at this stage is to top off the canes with a tractor and mower, leaving the cuttings on the ground. There will be a further spraying opportunity before the emergence of the new shoots, so its worth talking to your agronomist about this.

By the end of the second year, you should have your first harvestable crop. It's important to plan ahead for this by considering key elements, such as the storage site, to avoid any issues later on.

ADDRESSING PROBLEM AREAS

Don't be deterred if you encounter any problems during crop establishment. Remember that growing Miscanthus is a long-term commitment with long-term returns, so don't be afraid to put harvest on hold for a year if necessary. If in doubt, talk to Terravesta about any issues and the best way to address them.



WEED CONTROL IS ESSENTIAL IN THE FIRST TWO YEARS TO AVOID COMPETITION AS THE CROP BECOMES ESTABLISHED AND MAY BE JUSTIFIED ON A SPOT BASIS THEREAFTER



NEVER SPREAD SEWAGE SLUDGE ONTO THE CROP AS IT CAN CONTAIN TRACES OF HEAVY METALS WHICH CAN CAUSE SIGNIFICANT PROBLEMS FOR CROP END USE



IF YOU APPLY MANURE OR FERTILISER YOU MUST REPORT FULL DETAILS OF APPLICATION TO TERRAVESTA. SOME FERTILISERS HAVE A DETRIMENTAL IMPACT ON THE SUSTAINABILITY OF THE CROP, AND YOU MAY BE ASKED TO EXPLAIN ITS USE BY PROVIDING SOIL RESULTS



CURRENTLY MINIMAL PESTS AND DISEASES AFFECT MISCANTHUS. HARES AND RABBITS CAN BE AN ISSUE FOR ESTABLISHING CROPS. IT'S ALSO IMPORTANT NOT TO PLANT IN AREAS WHERE WIREWORM IS AN ISSUE



FOR TACKLING HARES AND RABBITS, RABBIT PROOF FENCING IS AN OPTION. FACTOR THIS INTO THE BUDGET. AFTER TWO GROWING SEASONS NEITHER PEST WILL BE AN ISSUE

REMEDIAL WORK

During the crops life, issues such as compaction can limit the crops potential. Simple remediation practices such as subsoiling and ground cultivation can increase crop quality and yield significantly.

SOIL TESTING

We would recommend that this is routinely carried out every four years. This can be done inexpensively, and your agronomist/fertiliser supplier will normally do this for you. Best practice is to sample good areas as well as less favourable areas within a field and also different soil types within the same field, naming them so you can identify them in future years. Using the method of 'W-path' sampling will ensure a good representative sample. The number of samples required per field will be determined by the difference in crop performance and soil type.

The soil test results will enable you to see if there are any nutrient deficiencies that need resolving. At best, a good result will exclude the need for costly fertilisers and allow you to exclude nutrition as a cause of any problems - it could also highlight nutrition as part of the reason for a problem.

WEED CONTROL

After harvest, before new shoots emerge, is the time to evaluate if any additional weed control is required. Here, time is of the essence as it is important to get the herbicide on before new shoots emerge or open up to expose new leaf growth. The pictures on the right illustrate when it is OK to spray and when you must not spray.

SPRAY



WHEN THE SHOOTS ARE RED

DON'T SPRAY



WHEN THERE IS GREEN LEAF SHOWING

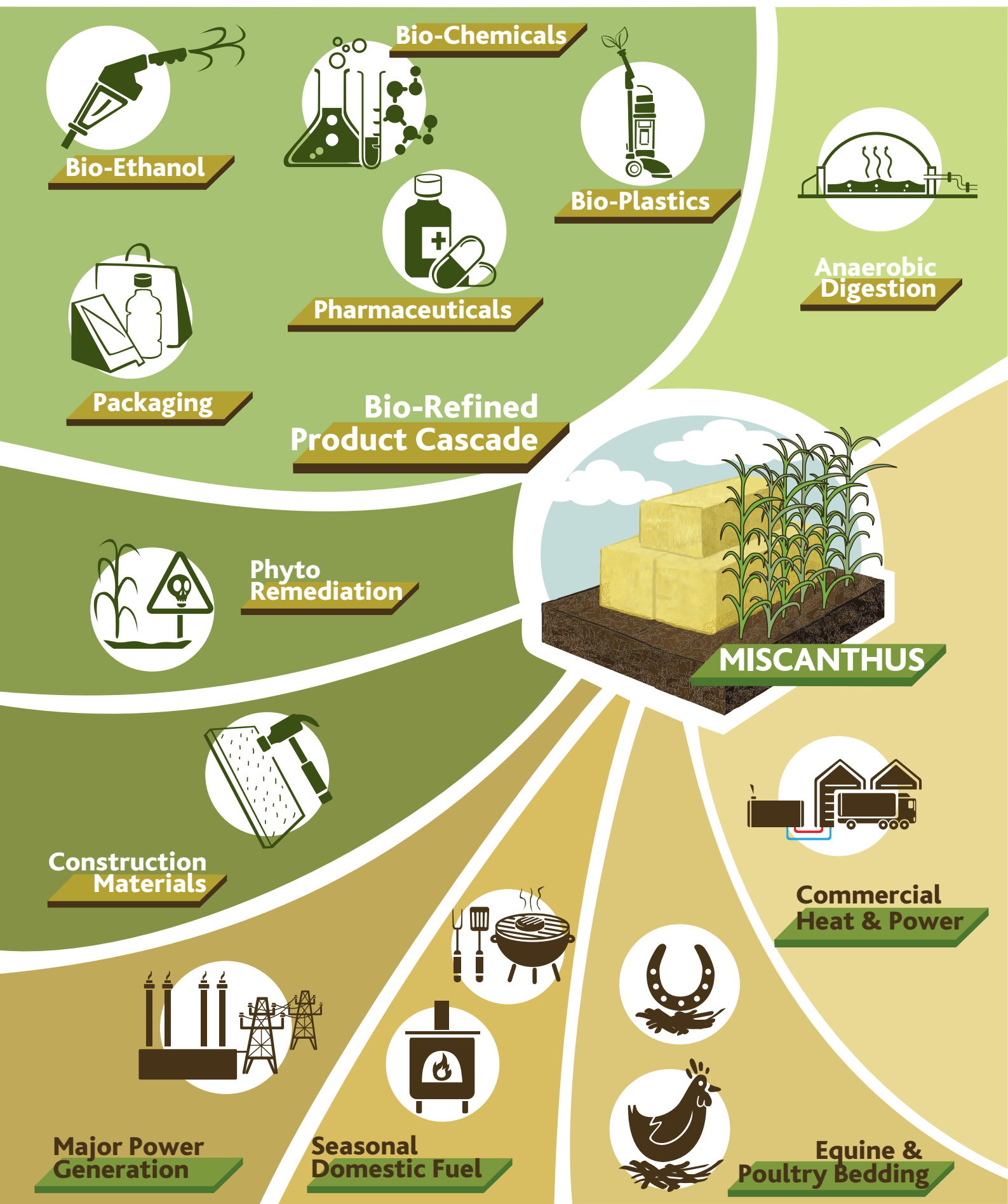
REJUVENATION WORK

In older, well-established crops, we have seen compaction begin to limit the crops productivity. The compaction may have been caused by cutting and baling in wet conditions or where bales may have been stacked on the field or even excess turning/traffic due to awkward field shapes. The only way to alleviate this is by sub-soiling, if the soil conditions allow.

Older crops can be thickened by sub-soiling and ground cultivation in order to spread the rhizomes into the empty spaces. If you feel that this is something you may wish to consider, please contact Terravesta for advice on the most appropriate methods for your soil type.

Where you have large gaps, sub-soiling and thickening will not be enough to fill these and it could be worth considering infill replanting. Once again it may be worth booking a visit from Terravesta to assess the issues and soil type you have.

FUTURE MARKETS



CURRENT MARKETS

NOTES

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

USEFUL CONTACTS

CUTTING

Tim Russon 07721 333558
K H Wendt 07568 581870
Chris Liversedge 07973 965490
Paul Ducksbury 07860 269788

BALING & CHASING

K H Wendt 07568 581870
Richard Francis 07786 134161
Andy Holmes 07973 120620
Paul Ducksbury 07860 269788
JS & J Buckley 07850 652131
Paul Headley 07860 712261

CUTTING

Tim Russon 07721 333558
K H Wendt 07568 581870
Adam Preston 07968 309140
Mick Hurst 07765 401618
Paul Ducksbury 07860 269788

BALING & CHASING

JN & AJ Austin Ltd. 07860 574665
Rob Deane 07889 780572
Adam Preston 07968 309140
Dennis Stocks 07973 549338
Paul Ducksbury 07860 269788
K H Wendt 07568 581870

YORKSHIRE & THE HUMBER

EAST MIDLANDS

EAST ANGLIA

CUTTING

Tim Russon 07721 333558
Agri-Bale 07515 744135
K H Wendt 07568 581870
Dean Bartram 07880 793399

BALING & CHASING

Richard Sneath 07860 633455
Dean Bartram 07880 793399
Agri-Bale 07515 744135
K H Wendt 07568 581870

CENTRAL ENGLAND

CUTTING

Adam Preston 07968 309140
Mick Hurst 07765 401618
Phil Benson 07860 232632
Agri-Bale 07515 744135

BALING & CHASING

Dennis Stocks 07973 549338
JN & AJ Austin Ltd. 07860 574665
Rob Deane 07889 780572
Adam Preston 07968 309140
Graham Watts 07966 444332
Phil Benson 07860 232632
Agri-Bale 07515 744135

SOUTH WEST

CUTTING

Mark Andrew 07767 870400
Alvis Contracting 07787 241341
A & B Contracting 01271 882006
Chris Awdry 07885 243446
Ian Webber 07831 364644

BALING & CHASING

Alvis Contracting 07787 241341/
07721 558361
Phil Hill 07774 989120
Ian Webber 07831 364644
Mark Andrew 07767 870400
(Far SW)

CUTTING

Wilson Farming 07817 220671

BALING & CHASING

Stephen Banks 07712 627858
Rob Deane 07889 780572

CUTTING

Stepside Agri 07966 521386

BALING & CHASING

Stepside Agri 078966 521386

MID & SOUTH WALES

WEST MIDLANDS

For the most up to date approved contractors list please visit:
<https://www.terravesta.com/miscanthus/#growing>



MISCANTHUS FACTS



MISCANTHUS INCREASES ON FARM BIODIVERSITY

COMMERCIAL HARVEST IS IN
2 YEARS

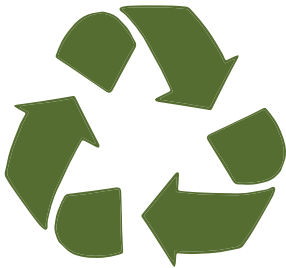


DELIVERS YEARLY PROFITS WITH LOW INPUTS

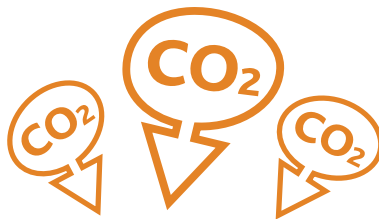
AVERAGE ESTABLISHMENT RATE OF

95%

MISCANTHUS REQUIRES NO FERTILISER BECAUSE THE ROOT STOCK, KNOWN AS THE RHIZOME, RECYCLES NUTRIENTS BACK INTO THE SOIL



IT ABSORBS MORE CARBON THAN IT RELEASES THROUGHOUT ITS LIFETIME



THRIVES ON ALL SOIL TYPES, INCLUDING BOTH FLOOD AND DROUGHT PRONE LAND

GROWING BIOENERGY CROPS SUCH AS MISCANTHUS, HAS THE POTENTIAL TO MITIGATE ATMOSPHERIC CARBON DIOXIDE EMISSIONS BY STORING CARBON IN THE SOIL

AVERAGE YIELD OF

13 TONNES
PER HECTARE



IT'S PLANTED ONCE IN THE SPRING, AND HARVESTED ANNUALLY IN THE WINTER/EARLY SPRING SO IT DOESN'T CONFLICT WITH ARABLE CROP HARVESTS



CAN GROW TO HEIGHTS OF
10-15ft

www.terravesta.com

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