Giant miscanthus production on Maryland Eastern Shore marginal land: Grassroots efforts to research an alternative crop

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Introduction and preliminary research

Miscanthus giganteus

- Miscanthus is warm season perennial grass grow for biomass (Fig. 1)
- Can grow up to 12 ft tall and last 15 years (Kalmbach et al., 2020)
- It is genetically sterile because it is a triploid hybrid and makes non-viable seeds, therefore, it has minimal risk of becoming invasive
- Forms a clump and spreads roughly 1 ft per year
- Is being used by the poultry industry for bedding material
- Can grow roots up to 8 ft deep (Kalmbach et al., 2020)
- Miscanthus costs roughly $1000 per acre to plant and mut be planted using fresh rhizomes

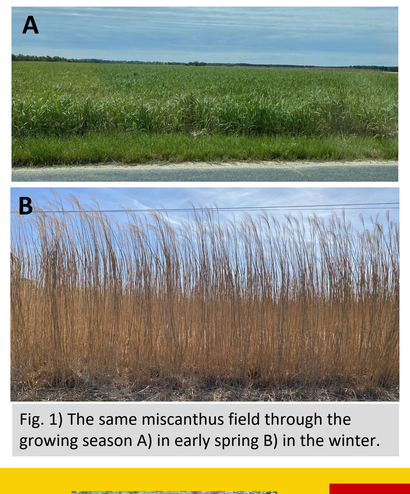


Fig. 1) The same miscanthus field through the growing season A) in early spring B) in the winter.

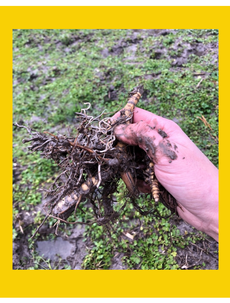
Initial study for observations

- Apr 2021, a field plot was established on a farm in Dorchester County, MD (Fig. 2)
- Site selected was a saltwater intruded field, with flooding and heavy deer pressure (had consecutive years of total soybean loss as a result of deer grazing)
- Two initial soil tests confirmed high sodium in soil (between 200 – 560 ppm), soil salinity is considered too high for most crops at levels above >200 ppm Na
- Two small plot of 40 total miscanthus rhizomes were planted in two different areas of the field, all but two emerged

Fig. 2) Topographical map of the Delmarva peninsula with low elevation circled where saltwater intrusion has begun. The yellow star indicates the location of the 10-acre miscanthus planting.

Problems on crop land!

- Saltwater intrusion in low-lying farm fields
- Deer pressure
- Flooding or weeks long waterlogging events



Hypothesis: Miscanthus will grow and be profitable on marginal land

Research: Evaluate yield, deer damage and commercial viability of miscanthus on marginal land

Methods and field work

- May 2022 two adjacent fields were planted with miscanthus rhizomes which began to emerge in Jun

Fig. 3) field one on the top with 12 X ½ acre plots and field two on the bottom with 8 plots. Blue square indicate the location of the 20 X 1-meter subplots.

Fig. 4) Areas of field where soil moisture data loggers were installed. A) dryer areas of the field B) Wetter area of the field.

Field was mapped using GPS

- Fields were subdividing in a grid with 20 X ½ acre plots for separate soil analysis (Fig. 3)
- Soil samples taken along transect with a complete analysis
- Within each plot a subplot of 1 m² was flagged for soil sampling and yield data

Soil moisture monitoring

- Six soil moisture data loggers with probes were installed next to the 1 m² subplots (Fig. 4)
- Each data logger connected to 5 probes at depths of 3, 6, 12, 18, and 32 inches
- Two data loggers were installed in wetter areas of the field and two were placed in dyer areas of the field
- Data was collected from soil probes twice between Jul 2022 and Jan of 2023

Deer Monitoring

- Two wildlife cameras were installed in Jul. at the back of field, by the woods near a visible deer path

Yield measurements

- Stand count was performed after emergence in each 1-meter subplot in Jul 2022
- Total biomass in each 1-meter subplot was collected dried and weighed in Mar 2023

Results

Deer Monitoring

- Frequent deer activity was recorded from wildlife cameras during Oct – Dec (Fig. 5)
- Deer prints as well as trails (Fig. 6) were noted in the field upon each visit
- No deer browsing detected throughout the entire field on any of the seven field visits between Jul 2022 – Mar 2023

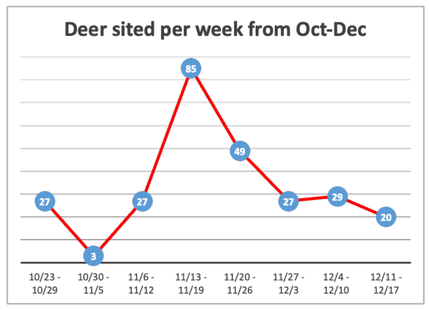


Fig. 5) Deer sightings per week from wildlife camera 1.

Fig. 6) Deer trail through field.

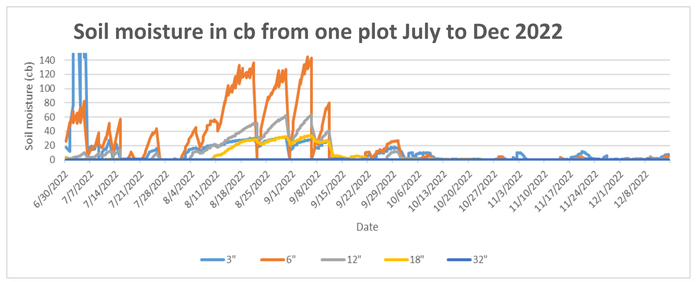


Fig. 7) Deer trail through field.

Fig. 8) subplot harvest.

Yield analysis from first year

- The average yield of the 1 m² 20 subplots was 1.4 lb (Fig. 8)
- This yield would be equivalent to 5502 lb per acre, or 2.8 tons
- There was 0.4 lb biomass per induvial stand (based on stand count preformed in July 2022)

Soil analysis and moisture monitoring

- Soil samples from the 20 plots ranged in sodium content from 120 – 620 ppm
- The mean soil sodium content in the subplots was 316 ppm
- Soil at a 32” depth stayed continuously wet from Jul to Dec at the two wetter plots
- Soil stayed saturated from Oct to Dec at all five depths for all active moisture sensor sites in the field (Fig. 7)

Future directions

- Second year stand count will be performed in Apr 2023
- Deer monitoring and soil moisture monitoring will continue
- In summer of 2023 we will host a field day on this site to introduce local producers to this crop and show its potential on marginal land
- Second year biomass yields will be collected in 1-meter plots in Feb. 2024
- One fact sheet will be written based on the results of this field trial

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Conclusions

Our results show that miscanthus is promising crop for areas of the Eastern Shore with flooding, saltwater intrusion and deer pressure. Our average first-year yield based on the subplots was 2.8 tons per acre which is close to the predicted yield for an ideal field of 3 tons per acre Kalmbach et al., 2020).

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Sources

Kalmbach, Brian, et al. "Soil Fertility Recommendations: Nitrogen, Phosphorus, and Potassium Requirements of Miscanthus." *University of Maryland Extension Bulletin*. EB-443 (2020).