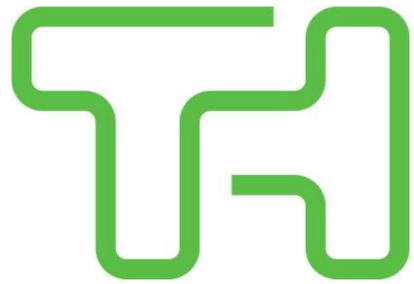CLIMATE-SMART AGRICULTURE:

Farm-to-Tank SAF

Growing Oilseeds for Biofuel in Rural America

Prepared for **BETO Workshop** on **Purpose-Grown Energy Crops**

JUNE 6-7, 2023

TEKHOLDING
SUSTAINABLE SOLUTIONS

Pilot Project: Growing Carinata in Alabama

CARINATA
ETHIOPIAN MUSTARD

Characteristics of Carinata

- ❖ **Enduring** winter crop
- ❖ **Frost, heat, drought** tolerant
- ❖ Excellent **cover crop**
- ❖ **Improves soil quality** by reducing soil **erosion** and improving soil **fertility**
- ❖ **Winter hardiness:** can be used as **second cash crop** during **alternate seasons** of main cash crop.

Carinata planting seasons*

Oct	
Oct/Nov	
Nov	

*Seepaul 2019

BLACK BELT REGION
OF CENTRAL ALABAMA

TUSKEGEE UNIVERSITY

Marion
ALABAMA

PILOT STUDY RECRUITMENT

COUNTY	ACREAGE
Houston	25
Perry	100
Wilcox	103

THL PILOT STUDY 2022-2023
MURPHY FAMILY FARM

Nov   Dec   Jan   Feb   Mar   Apr   May

CARINATA PLANTED

UNSEASONABLY COLD

Seed pods

TEKHOLDING

Relying on Data: Moving Towards the Farm of the Future

TYPES OF DATA USED CURRENTLY

Daily Temperature Tracking
2022-2023 Carinata Season
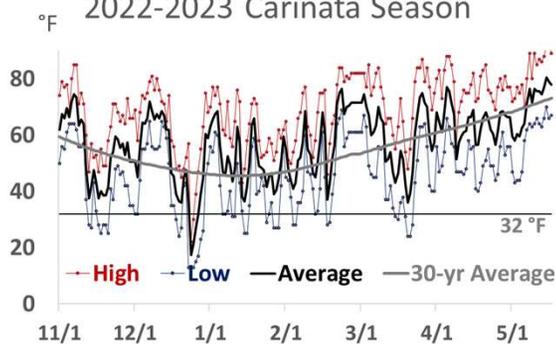
Climate Tracking

Climate information (e.g., temperature, precipitation) is **currently manually assembled** from NOAA database APIs to assess conditions and calculate trends

Soil Test Data

Soil is **manually collected** & shipped to local extension offices for analysis.

FARM OF THE FUTURE

Artificial Intelligence

Geospatial AI will be employed to assist farmers in clearly prioritizing, visualizing, and interpreting complex datasets.

Specialized Dashboards

The development of API dashboards designed based on **individual farm needs** that **access, compile,** *and* **assess** information from sources such as data from:

- ❖ **Satellites** (e.g., LandSat, SentiNel)
- ❖ **Sensors** (e.g., soil compositions, sublocal temperature readings)
- ❖ **NOAA** (e.g., temperature, precipitation)
- ❖ **Crowdsourced observations**

to provide farmers with clear, precision-based snapshots that aid in real-time decision making.

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THL's Roadmap of Technological & Economic Development

DEVELOPING the FARM OF THE FUTURE

Recruitment of small, rural farms with a focus on **disadvantaged communities**

- Black-belt of AL
- Cherokee tribe in NC
- Blackfeet tribe in MT
- More to come

Development of **regional cooperatives** to **eliminate barriers** in agricultural development of the **purpose-grown energy crop industry**

Grow region-specific oilseeds for SAF production such as **carinata, camelina, pennycress**

Implement **climate-smart** methods with **data-based ag** and identified **metrics** of success for **sustainable agricultural** practices

- Geospatial AI
- Specialized dashboards
- Application programming interfaces (API)
- Localized sensors

PRODUCING and VALIDATING SUSTAINABLE AVIATION FUEL

Seed oil extraction from THL-grown oilseeds

Flight testing of THL's oilseed-based SAF

2-step **SAF production** from raw seed oil

$R - COOH$ → **Step 1** HYDROTREAT → $\begin{pmatrix} H & H \\ | & | \\ C - C \\ | & | \\ H & H \end{pmatrix}_n$ → **Step 2** HYDROCRACK → $C_8 - C_{20}$

RAW SEED OIL n Carbons   **NO HETEROATOMS** n Carbons   **SAF** 8-20 Carbons

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