

Disruptors in the World of Agriculture:

What to Watch and What to Do

Presenter



Doug Johnson
Director *Ag Industry*
Practice Lead
Moody's Analytics



FARM HERITAGE

Gender Reveal: *Farm Style*

1st Baby Girl Raised in same
Farmhouse since 1897



Agenda

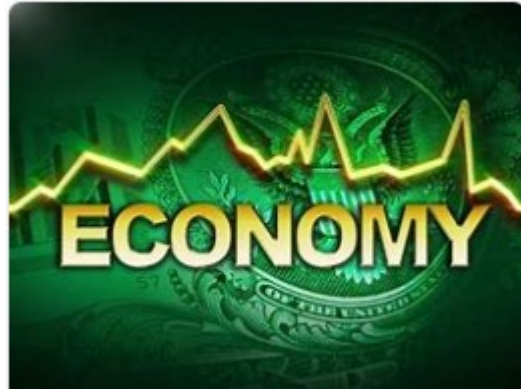
- **Ag Economy:** Headwinds Driving Change
- **Technology:** Production Challenger
- **Generational Knowledge Transfer:** Past Isn't Future
- **Action Items:** Thoughts for Home



1

Ag Economy:

Headwinds Driving Change



Urgent

What's Right In Front Of Us

- Economy - Inflation
- Interest Rates
- Worker Shortage
- Yield & Price
- Water Rights & Usage



Important

What's Swimming Under The Waves

- ESG Trends
- Climate Regulations
- Reduce Emissions
- Lab Raised Food
- De-Globalization

Do you believe we have
a **Worker Shortage?**

We have a **Work ETHIC**
Shortage.

- We paid too long to Not Work
- We exposed the Boot Straps





ESG: What we need to know

- ❑ Ag is starting to learn **what it is** and **what it means** for the farm and the bank
- ❑ What climate issues could trace back to the farm (carbon / methane)
- ❑ What **New Science or Tech** could minimize environmental impacts **BUT** end up changing the way we Produce today

5 Areas of Focus on 2023 Farm Bill

- Increased Focus on Conservation & **Climate Benefits**
- Adjusting Reference Prices Comes with a Price
- Crop Insurance Needs Expanding
- **Congressional Education Needed**
- Hopeful Approved YE 2023

The Secretary of Agriculture announced \$325 million in federal grants for climate initiatives benefitting small producers and underserved communities.

Joshua Baethge | Dec 13, 2022

The Wild, Wild West



Carbon Sequestration

- Carbon Sequestration Credits: What about Tax
 - Today We're "Incented" To Sequester Carbon
 - When Establish **Best Practices**, Likely We'll Be Taxed

Biochar Research Network Act

- Biochar from Energy Crops: Trees (Willow & Poplar) & Grass (Elephant Grass)
- High-Carbon Fine Grained Residue
- Produced via Pyrolysis: Thermal decomposition without oxygen
- Produces Solids: Biochar, Bio-Oil, Syngas (used to produce ammonia & methanol)
- Biochar stays on Farm - Biofuel sent to Refinery
- Yield Impact: Reduce Fertilizer & Irrigation
- Porous: Moisture Retention
- Soil Nutrients: Reduce Leaching

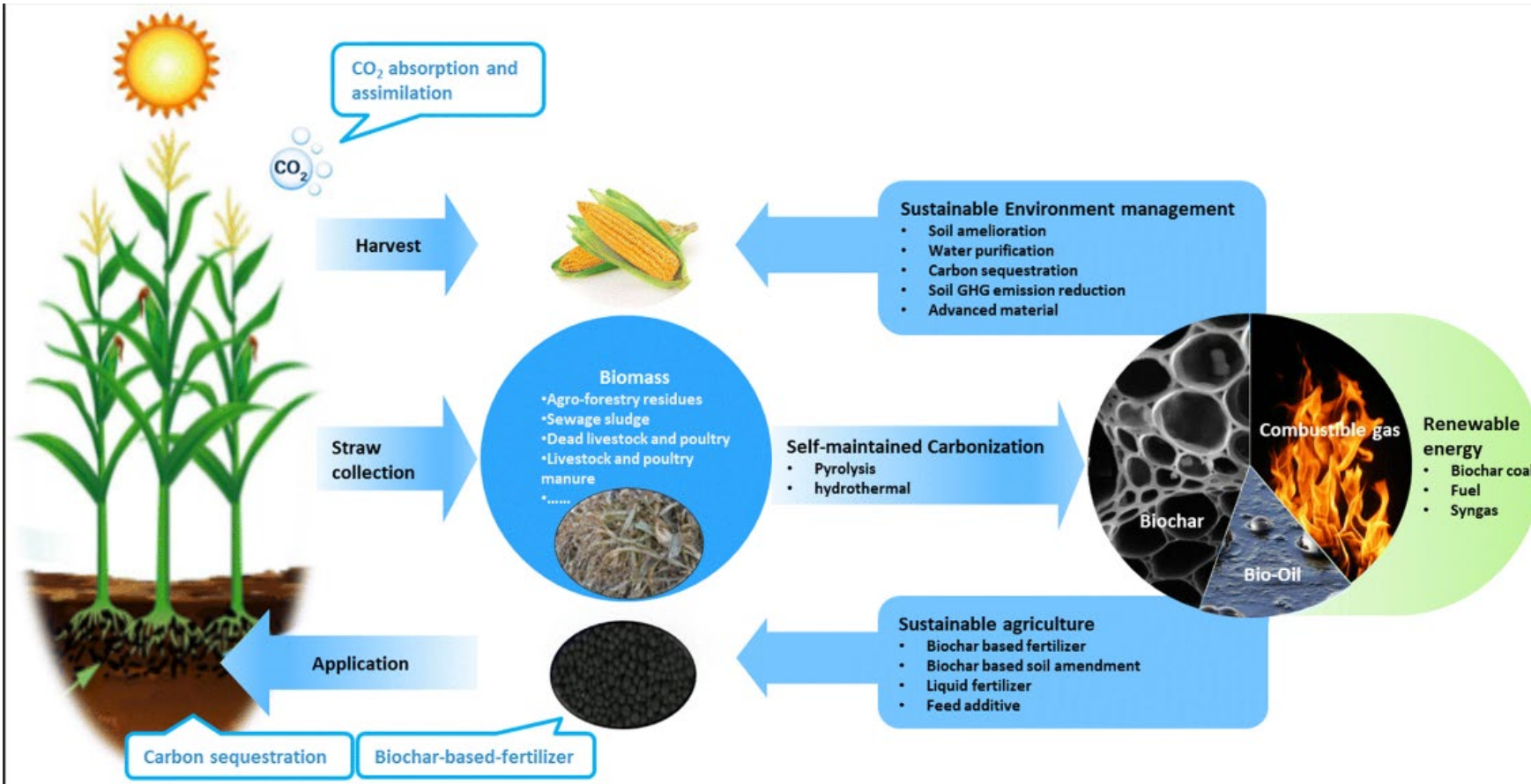


<https://www.grassley.senate.gov/news/news-releases/qanda-outlook-on-next-farm-bill>

<https://www.grassley.senate.gov/news/news-releases/qanda-outlook-on-next-farm-bill><https://en.wikipedia.org/wiki/Biochar>

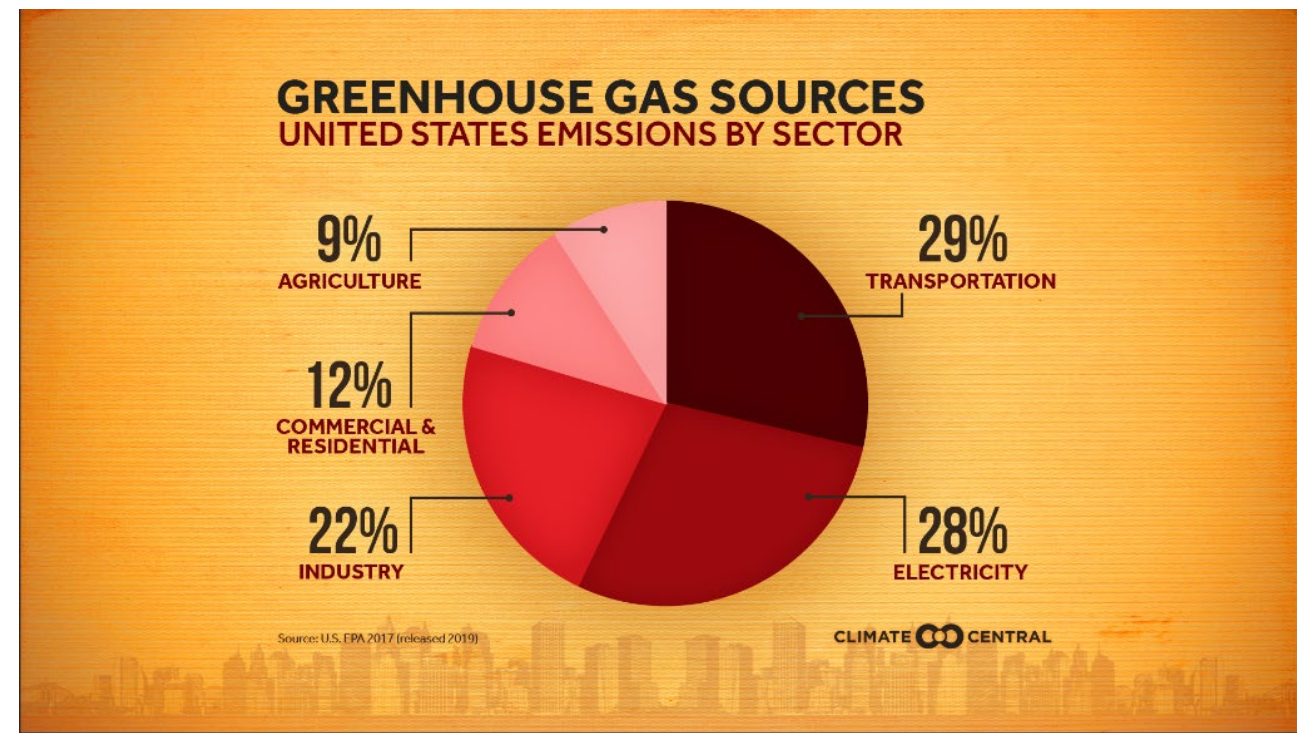
Biochar Potential

- “Low Cost” Potential
- Impact: Soil Type & Condition, Temperature & Humidity



Methane Capture

- Confinements could comply
- Anaerobic Digestors: RNG (*Renewable Natural Gas*)
- Open air feedlots & pasture fed cows
- Tax Credits
 - *Inflation Reduction Act: up to 30% Tax Credit*
 - *PLUS New Markets Tax Credit up to 20%*



ESG Watch List

- Carbon Sequestration: Credit Vs. Tax
- Methane Capture: Impact To Smaller Producers
- Impact To Current Farming Practices: *What “Could” Develop*



Power Of The Pen

July 12, 2022

- Dutch Gov't proposes unrealistic "Emission Reductions" for Ag
- Halve Emissions by 2030
- 35,000 Farmers
- 54,000 Agri-Biz
- Protests Erupt
- "Anti-Farming" Policies

Dutch farming protests spread across EU, highlighting costs of climate goals

by Breanne [Deppisch](#), Energy and Environment Reporter
July 12, [2022](#) 03:48 PM

Thousands of farmers in the Netherlands [protesting proposed emissions reduction rules](#) targeting their fertilizer and livestock were joined this weekend by groups in [Germany, Italy, Spain, and Poland](#) amid [fears](#) that the so-called "anti-farming" policies could soon [spread to their countries](#) as well.

Similar rules have caused unrest in other countries, notably Sri Lanka, which was forced to repeal its ban on all chemical fertilizers after less than a year and now [faces massive political upheaval](#).

PROTESTING DUTCH FARMERS REJECT GOVERNMENT'S TERMS FOR DIALOGUE

Farming is a critical sector of the Dutch economy. Despite being just slightly larger than the state of Maryland, the Netherlands is the world's second-largest exporter of agricultural goods, behind only the United States, and its exports in that sector totaled roughly 105 billion euros last year alone.

Farm and agriculture groups in the country have slammed the Dutch government's plans as "unrealistic" — noting that the country is home to nearly 54,000 agricultural businesses.

"This is not going to work," LTO Nederland Chairman [Sjaak van der Tak](#), whose organization represents 35,000 farmers, said in response to the new targets.

Wednesday, November 30, 2022

ENERGY AND ENVIRONMENT

← Netherlands to buy out and close 3,000 farms to meet climate goals

by Breanne Deppisch, Energy and Environment Reporter
November 29, 2022 11:48 AM

The Dutch government is planning to buy out and close as many as 3,000 farms in the country, [exacerbating an already-bitter dispute](#) with growers as leaders attempt to [halve](#) the country's nitrogen emissions by 2030.

Leaders said last week they plan to allocate some \$25 billion to the [buyout plan](#), which they will use to purchase between 2,000 and 3,000 Dutch farms and other large nitrogen emitters "well over" their property values.

If farmers do not agree to the plan, the buyouts could become compulsory. "There is no better offer coming," Dutch Nitrogen Minister Christianne van der Wal told members of parliament last week.

The plan comes as the Dutch government moves to halve its nitrogen emissions by 2030 in accordance with European Union conservation rules. But to meet that target, the government estimates that 11,200 farms will have to close, and 17,600 others will have to reduce their livestock numbers significantly.

PROTESTING DUTCH FARMERS REJECT GOVERNMENT'S TERMS FOR DIALOGUE

Nov 30, 2022

- Dutch Gov't mandatory farm buyout
- ~3,000 farms close
- \$25 billion buyout
- Compulsory Buyout
- "No Better Offer Coming"
- Est 11,200 farms must close to meet goals
- 17,600 farm must reduce livestock production

Jan 20th, 2023

- New Nebraska Governor: Jim Pillen
- Some Physicians lobbying Governor to *Phase Out Livestock With More Climate Friendly Options*
- Local News (WOWT) Reported: Push for more “climate-smart” crops in Nebraska

By [Laura Sambol](#)

Published: Jan. 20, 2023 at 4:43 PM CST



OMAHA, Neb. (WOWT) - A group of doctors is calling on Nebraska Governor Jim Pillen to phase out factory farming and increase support for crops that require little water instead.

The group, called Physicians Committee for Responsible Medicine, is putting up billboards in Lincoln and the governor’s hometown, Columbus, Nebraska.

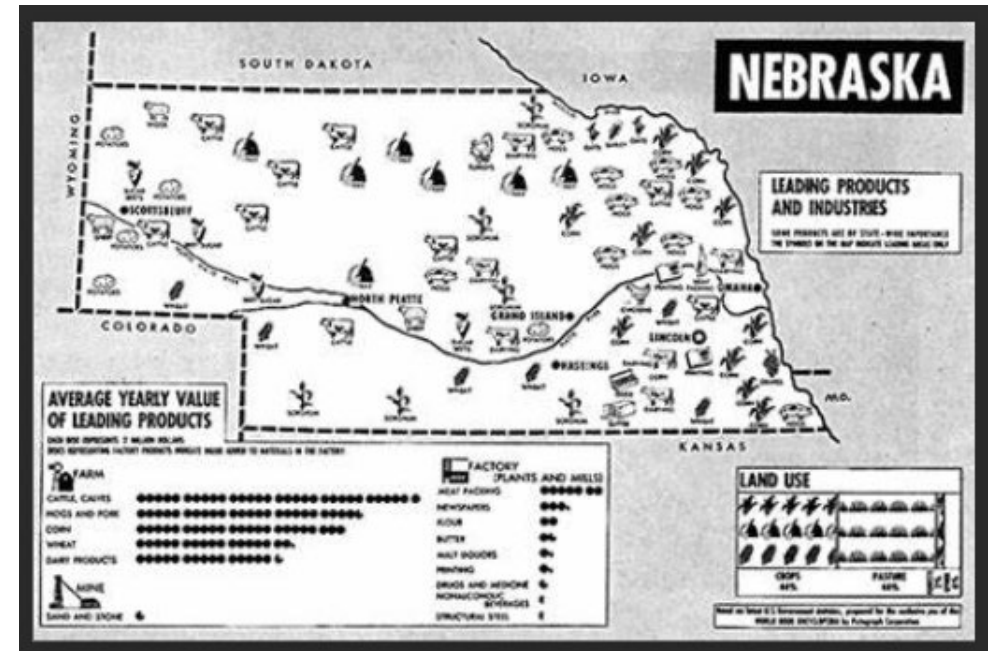
Cody Stubbe, a spokesperson for PCRM, said, “We’re trying to get the governor’s attention, and the community’s attention to bring awareness to the climate change that’s going on.”

Stubbe says livestock operations are bad for the environment because they produce methane and require a lot of water. PCRM is calling for more of what they call climate-smart crops, like lentils, beans and sunflowers. “Nebraska has been going through a drought and this will help with that,” she said.

Nebraska Stats

- 44.9 million acres farmed/ranched (92% of total)
- 44,800 farms in 2021 / 1,000 acres avg.
- 48% farms have Livestock/Poultry
- 2nd in ethanol production in 2020
- 1st in US for commercial cattle slaughter (~7mm head)
- 1 in 4 jobs related to Ag

Source: nda.nebraska.gov/facts.pdf



2

Technology:

Production Challenger

Lab Grown Initiatives

- Beef, Pork, Chicken, Duck, Salmon, Milk, Eggs
- No Livestock Needed
- **WHY???** Consumer “Perception”
 - No Kill
 - No Waste
 - No Water
 - No Smell
 - No Methane

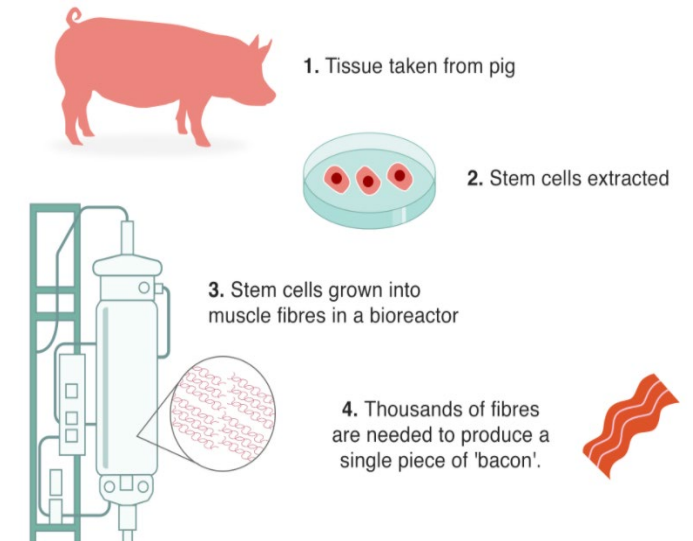
Real meat



Lab-grown meat is **real meat**. It has the exact same animal cells as what we traditionally consider “meat”—the flesh of an animal. The difference has to do with how it gets to your plate: lab-grown meat comes from cells harvested from a living animal, while conventional meat comes from an animal that’s raised and killed for human consumption.

What is lab-grown meat, and how is cultured meat made?

thehumaneleague.org/article/lab-grown-meat



Who Cares Where It Came From?

As long as.....

- Safe & Healthy
- Priced Competitive
- Tastes Good



Lab-grown meat gets first FDA signoff

[Herb Scribner](#)



A technician displays lab-grown chicken meat in a sealed bag. Photo: Jack Guez/AFP via Getty Images
[Lab-grown poultry](#) from a California startup is safe for human consumption, the [Food and Drug Administration](#) said.

https://www.axios.com/2022/11/17/fda-lab-grown-chicken-meat-humans?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axioswhatsnext&stream=science



TECH

'Sushi-grade' fish from salmon cells grown in lab by California startup

By James Leggate, Fox News

September 17, 2020 | 1:39pm



Lab-grown sushi-grade salmon made by Wildtype.

Australia Synthetic Milk

*We are
Green and Clean*

- *Chemically Identical to Dairy Milk*
- *Mycelium fibers produce proteins cheap*
- *Organisms “fed” (sugar) and ferment*
- ***IDENTICAL to traditional products***

1:47 5G 78%

FERMENTATION EXPLAINED

The new 'synthetic milk' is not a plant-based alternative like oat or almond milk but rather is chemically identical to regular dairy milk.

Micro-organisms, such as the thread-like mycelium fibres of mushrooms, are programmed in a lab to produce specific complex molecules such as proteins at very cheap cost.

The organisms are given nutrients such as sugar and then allowed to ferment where they produce the desired proteins.

These proteins are then collected, purified, flavoured and packaged into food products.

The end product's chemical composition is identical to traditional products.

Any type of new food ingredient needs approval from Food Standards Australia New Zealand with no application as yet for this product.

ADVERTISEMENT


1:49 5G 78%

Australian supermarket shelves


Leading the charge in Australia is Eden Brew, based at Werribee in Victoria, which is looking to have products on Australian shelves by mid-2023.


The business is backed by the CSIRO's venture capital unit and Australia's oldest dairy co-operative Norco, with the company helping to bottle and market the product.

Eden Brew CEO Jim Fader claims his synthetic milk is 'indistinguishable from dairy milk'.

 **163** shares

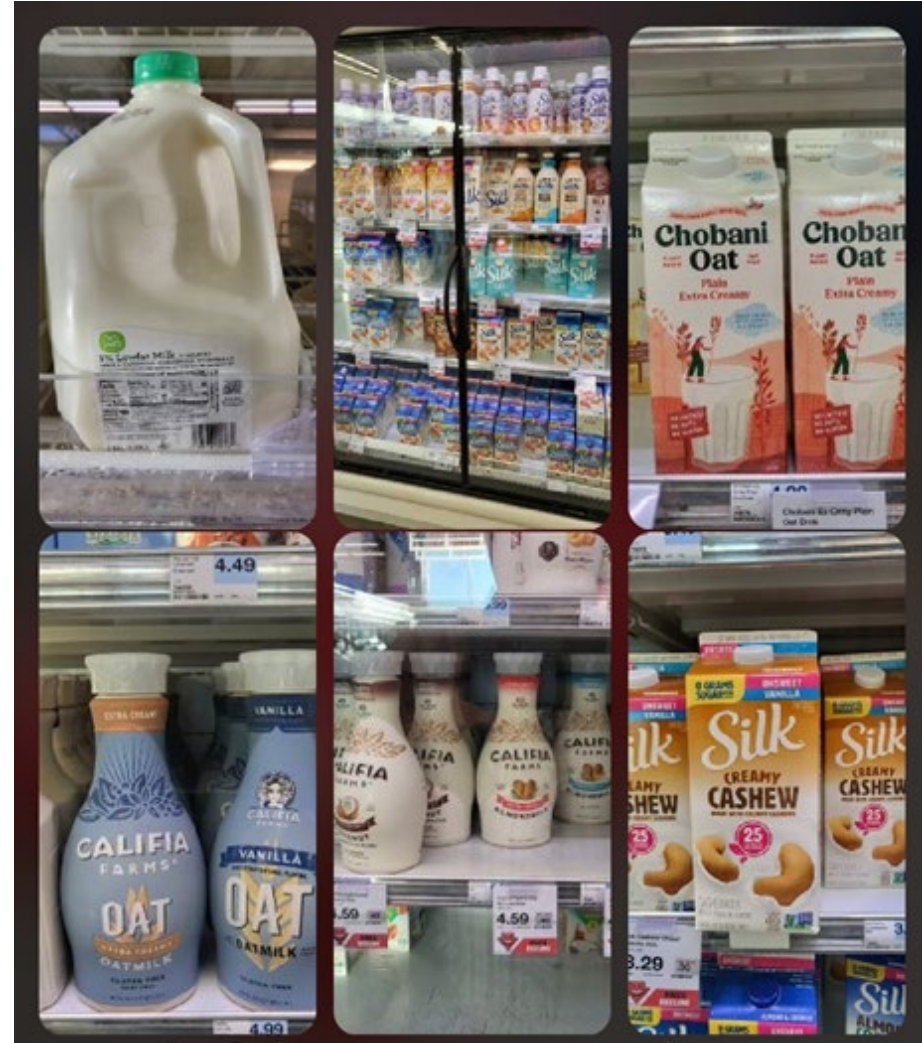
RELATED ARTICLES

 **NASA's Artemis I mission: How £19 billion Space Launch System rocket will blast off on a 42-day...**

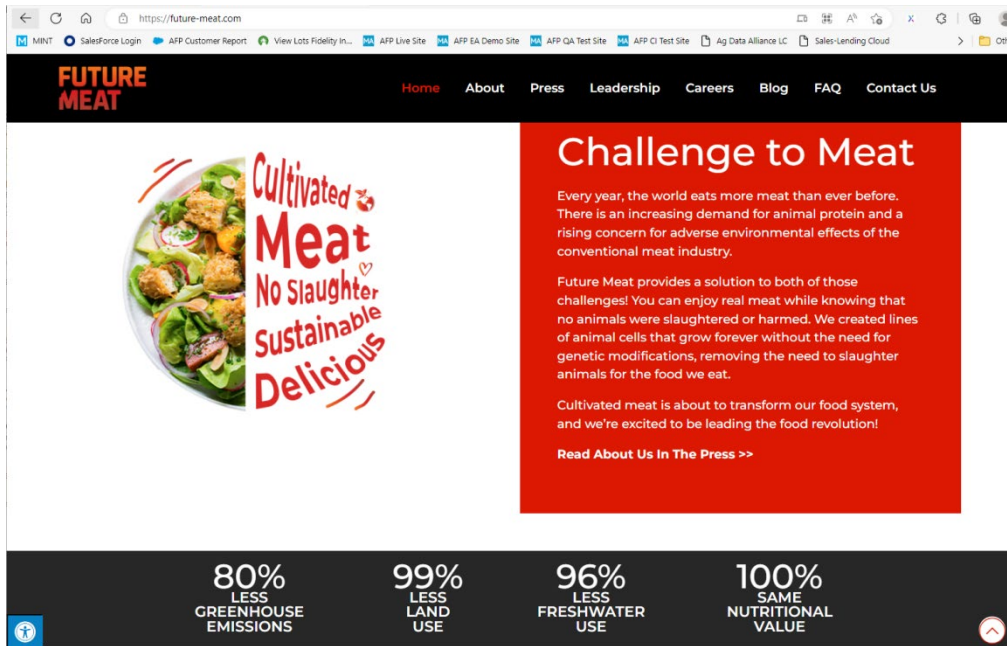
 **Think you know coffee? The secret brew called 'Magic' that real caffeine lovers order at cafés**

He said the business was taking a 'clean

Who Cares? Consumers Buy With Their Eyes



Lab Raised Food Could Solve....



Think About This:

1% Feeds 100% -- Consumers 3 Generations Displaced From Farm

“Growing” Meat In City Vs Farm Could Solve:

- ESG: Methane / Carbon
- Minimal Water Use
- No Penned Animals / No Smell
- No Slaughter Of Animals
- No Worries About Supply Chain Disruptions
- No Price Gouging Because There’s No Shortages

Storyline of Lab Meat: Logical Argument (*Future Meat company claims*)

- 99% Less Land
- 96% less Water
- 80% fewer Greenhouse Gases
- 100% Nutritional Value

Source: <https://future-meat.com/>

Consumers Don’t Care Where Food Comes From, If:

- Healthy | Available | Affordable | Tastes Good

Good Read....

<https://future-meat.com/blog/5-cultured-meat-advantages/>

**FUTURE
MEAT**

Home About Press Leadership Careers

5 Cultured Meat Advantages: Cultivating the Future of Meat



Educating Our Ag Industry



1 Packing Plant Exec on Lab Raised Meat:

“We’ll Adjust Our Business Model To Adapt To Consumer Needs”

1% Feed 100%

Consumer 3 Generations Displaced From Farm

Shorter Runway Than Expected

US Lab Meat Companies

- **Bluenalu** (fish/seafood)
- **Finless Foods** (bluefin tuna)
- **Just** (Waygu)
- **Memphis Meats** (general)
- **Mission Barns** (general)
- **New Age Meats** (pork)
- **Wild Type** (unsure)
- **Balletic Foods** (unsure)

<https://cellbasedtech.com/lab-grown-meat-companies>



Failure Point

...”a modern pork producer could produce about **3.5 million pounds** of pork per year in the same 70,000 square feet of space Upside Foods will currently use to make **50,000 pounds** of product.”

Source: Hurley Hog Marketing Update

Singularity Hub

The World's Biggest Cultured Meat Factory Is Under Construction in the US

With a production capacity of 10,000 metric tons, Believer says the facility will be the biggest of its type in the world.

Written by

Vanessa Bates Ramirez

Est. reading time

4 minutes

Dec 14th



Worlds Largest Lab Raised Company in NC

Given the way cultured meat is made, there's no reason why the above list can't expand even more. Cells are extracted from an animal's tissue (in a process that doesn't harm the animal at all) and mixed with a cocktail of nutrients, oxygen, and moisture. Inside large bioreactors, the mixture is kept at the same temperature cells would be at in an animal's body. The cells divide, multiply, and mature, with any waste products being removed to keep the environment pure.

You can just as easily take cells from a pig as from a cow, chicken, turkey, lamb, or fish (etc, etc). But growing the cells is the (relatively) easy part; the bioreactors don't pop out ready-to-eat chicken breasts or racks of lamb. Replicating meat's structure—that is, the tendons, muscle, fat, bone, and connective tissue that comes with it—is a complex process, and crucial to giving whole cuts of meat their distinctive texture and flavor. After the cells are "harvested" from the bioreactors they grew in, they need to be refined and shaped into a final product, which could involve extrusion cooking, molding, and even 3D printing.

Our Future Isn't About Tradition

It's About Change

Unified Voice At The Table

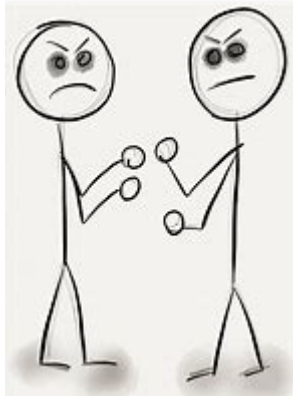
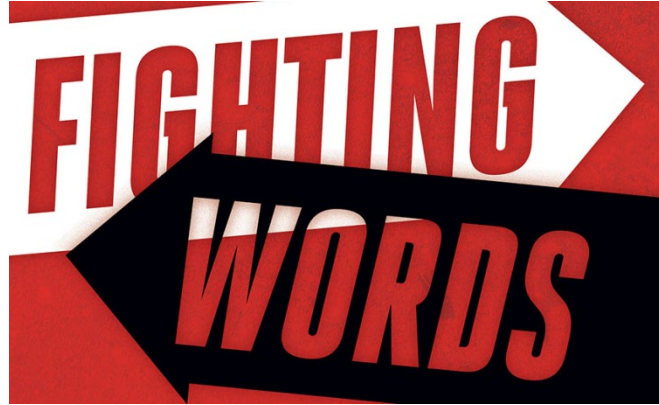


Sustainable Transformation

3

Generational Knowledge Transfer

Past Isn't Future



Tech & Data:
Could a **Non-Farm Kid**
farm equally as well as
a **Farm Kid with Technology**

???

Generational Knowledge Transfer

We're not losing our
Knowledge in Ag

We're losing our **Wisdom**

Quote: Doug Lund, WI Lender





Yardstick of Life

We Have Limited Time For *Redo's*

We Have to Get It Right

Farm Experience: This is a Problem



Farm Experience: This is a Solution



Passing On
Our Ag
Heritage

- Only 20% of farms have a transition plan
- Generational farming:
 - 30% pass to 2nd generation
 - 12% pass to 3rd generation
 - 2% pass to 4th generation

Source: AgriLegacy MO study

- It takes 2 generations to build a farm
- It takes 1 to tear it down
- Succession: Family + Heritage

4

Accelerate Farm Profits

Accelerate Farm Profits™

What is.....



SHARK TANK

Tractor Drivers

vs.

Business Acumen

What's the Issue?

- Good at Production
- How Improve Profitability



New:

Lender | Producer Tool

Producer:

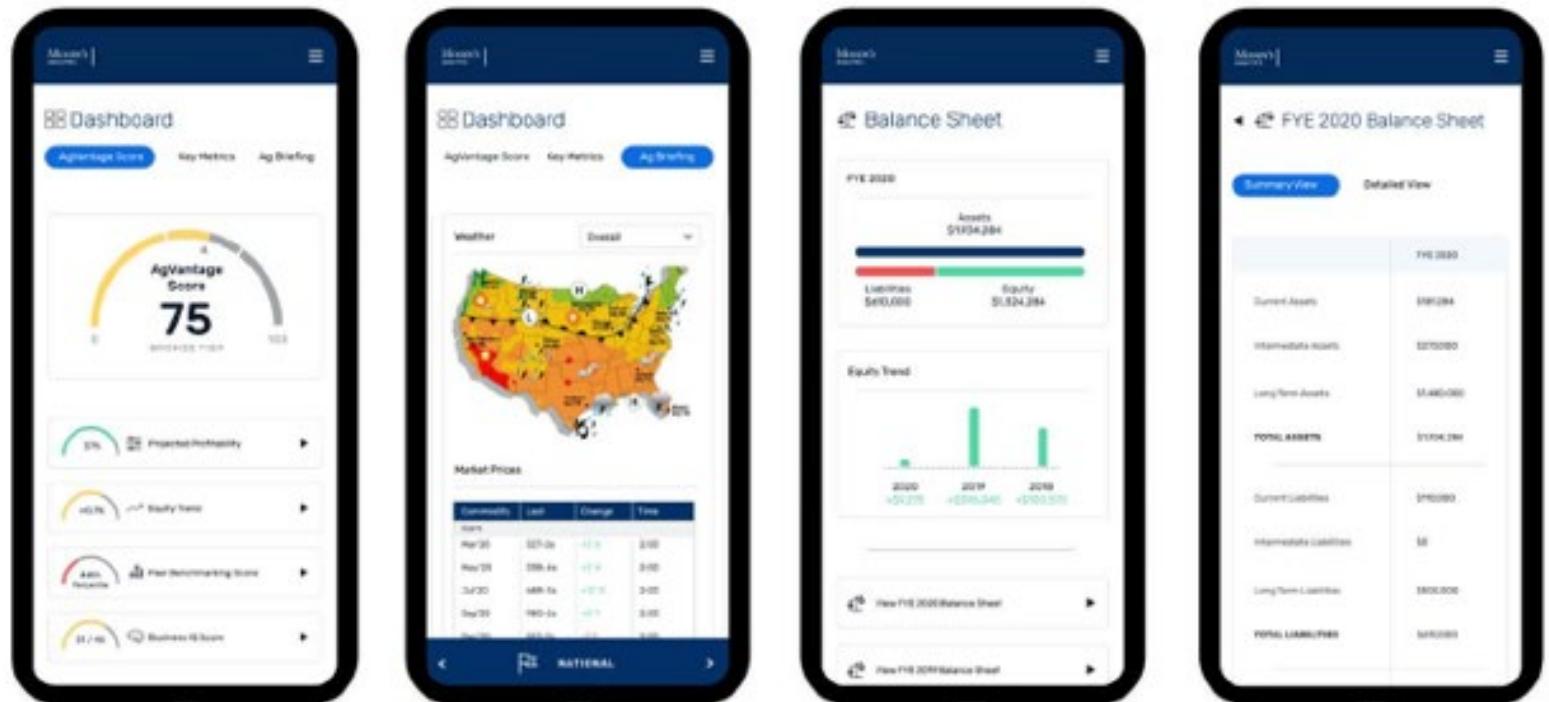
- Farm Overview
- Peer Benchmarks
- Daily Business Updates
- Financial Statements
- Marketing Plans
- Predictive Analytics
- Business IQ

Lender:

- Portfolio Overview
- Collaboration Tool
- Risk Assessment

Predictive Analytics

Advanced predictive analytics help you forecast your yields, expenses, and sale prices across commodities.



What Producers need to manage their Farm

Weather:

- Local
- Regional
- National
- Global

Yield:

- Forecast
- Historical

Price:

- Local
- CBOT


News:

- Who Did What

My Ag Briefing
Monitor the most relevant external factors likely to impact your financial success.

LOCAL **REGIONAL** **NATIONAL** **GLOBAL**

Weather Overall



Market Prices

Days	Last	Change	Time
Mar 20	327-2s	+13s	2:00
May 20	338-4s	+17s	2:00
Jul 20	688-8s	+121s	2:00
Sep 20	593-2s	+87s	2:00
Dec 20	557-2s	-7s	2:00

Wheat

Mar 20	327-2s	+13s	2:00
May 20	355-1s	+27s	2:00
Jul 20	688-8s	+121s	2:00
Sep 20	435-2s	+87s	2:00
Dec 20	557-2s	-7s	2:00

Soybeans

Mar 20	327-2s	+13s	2:00
May 20	329-4s	+17s	2:00
Jul 20	542-3s	+121s	2:00
Sep 20	435-2s	+87s	2:00
Dec 20	427-2s	-7s	2:00

Small Grains

Mar 20	327-2s	+13s	2:00
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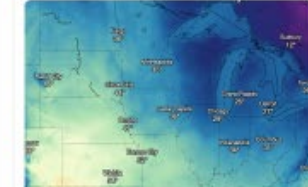
Bulletins and News All Bulletins and News

- REPLY** 09:08 PM Jan 21, 2021
- A New Environment for Ag Policy**
AgWeb.com -- Following a turbulent 2020, which included a global pandemic, hard-fought presidential race and numerous...
- WEATHER** 03:38 PM Jan 19, 2021
- Daily US Agriculture Weather Highlights**
Source: USDA
- MARKETS** 10:06 AM Jan 19, 2021
- Stock and Awe in Corn Market**
AgWeb.com -- Several bullish revisions by USDA in their revisions in their...

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Weather Temperature (celsius)



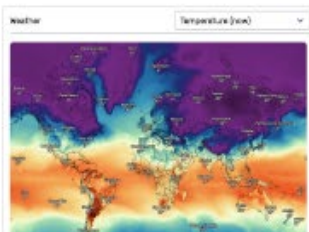
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- TRADE** 01:18 PM Jan 20, 2021
- China's 2020 U.S. Soybean Imports Surged Though Likely Missed...**
Reuters -- China's soybean imports from the United States in 2020 rose for \$2.8B from a year earlier, customs data showed...
- MARKETS** 10:08 AM Jan 21, 2021
- Weekly International Weather and Crop Highlights**
USDA -- Click to view.
- TRADE** 02:30 AM Jan 19, 2021
- China's pork reserves running out as prices soar, analysts say**
Financial Times -- Selling sets down from meat after African swine...

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Monitor the most relevant external factors likely to impact your financial success.

LOCAL **REGIONAL** **NATIONAL** **GLOBAL**

14 Day Forecast Zip Code: 68701

TUES 18 Showers 55/38 70% 20% 20% 20%

WED 19 Cloudy 68/32 70% 14% 20% 20%

THURS 20 Cloudy 55/36 70% 10% 20% 20%

FRI 21 Showers 55/32 70% 50% 20% 20%

Local Elevations Zip Code: 68701

Commodity	Price	Basis	Date
Water Elevator - Wisnac, NE			
Corn	\$4.02	-0.43	1/20/2021
Soy Beans	\$15.71	-0.88	1/20/2021
Wheat	\$1.41	-0.50	1/20/2021
ADM Grain Co - Wisnac, NE			
Corn	\$4.21	-0.47	1/20/2021
Soy Beans	\$15.76	-0.85	1/20/2021
Wheat	\$1.41	-0.50	1/20/2021
Becker Grain - Beemer, NE			
Corn	\$4.66	-0.46	1/20/2021
Soy Beans	\$15.07	-0.86	1/20/2021
Wheat	\$1.05	-0.50	1/20/2021
Mohrman Grain - Beemer, NE			
Corn	\$4.32	-0.41	1/20/2021
Soy Beans	\$15.21	-0.88	1/20/2021
Wheat	\$1.45	-0.40	1/20/2021

Bulletins and News All Bulletins and News

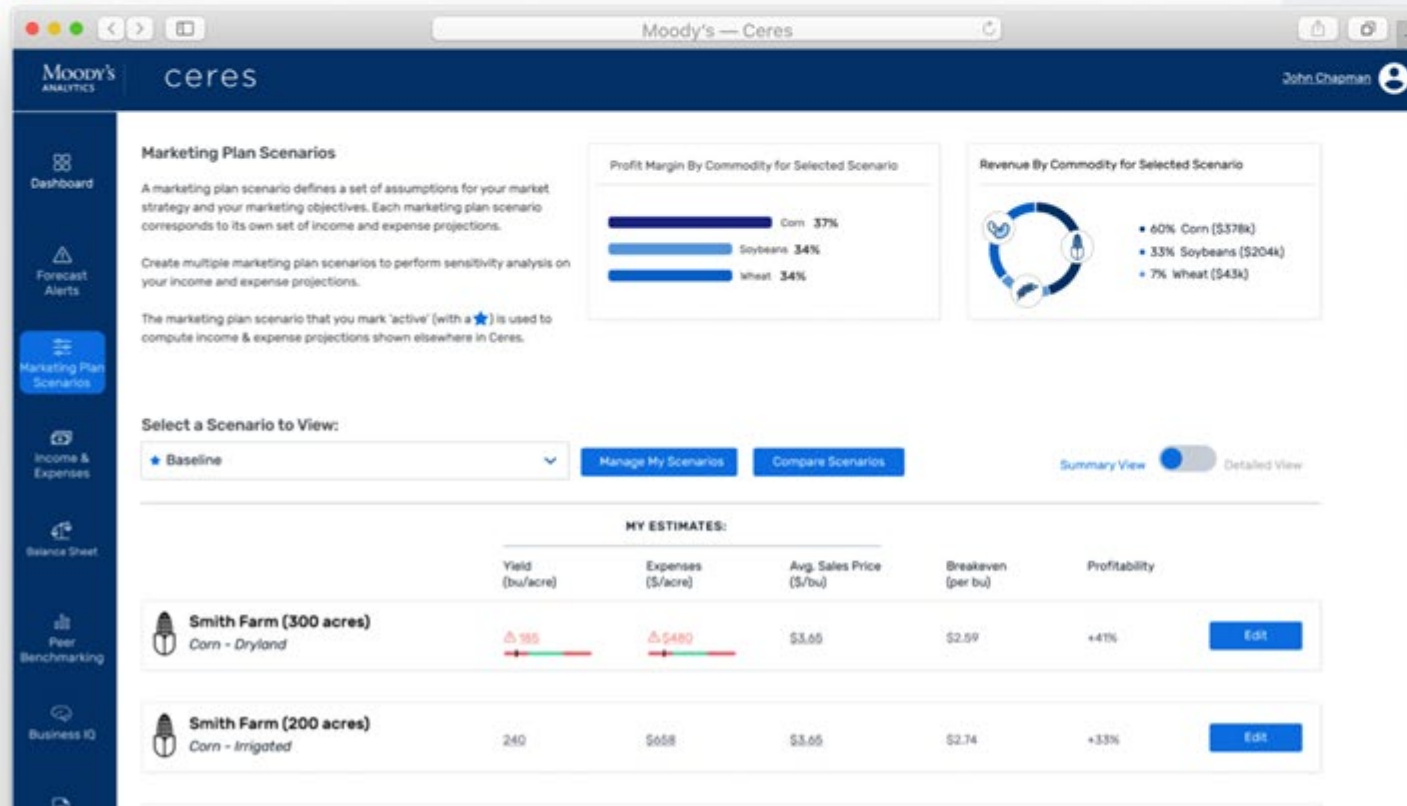
- MARKETS** 03:38 PM Jan 21, 2021
- WYDA 2020 Settles a Victory for Mutualist Flow System**
Progressive Farmer -- As 2020 came to an end, WYDA 2020 was passed and signed into law.
- MARKETS** 10:08 AM Jan 20, 2021
- Cuming County up sales top \$1 billion**
West Point News Opinion -- Cuming County now has more data to help back up it's claim that it's the top agriculture county...
- MARKETS** 04:30 PM Jan 4, 2021
- Dubuq-Superior Port Says Farewell to 2020 Grain Shipping Season**
Progressive Farmer -- The last battle of the port of Dubuq-Superior grain...

Building Quality Financial Statements

PRODUCER

Marketing Plan Scenarios

Create, compare, and forecast marketing plan scenarios.



Your corn yield estimate is within Ceres' forecasted range.



188
bu/acre

207
bu / acre

RANGE FACTOR	VALUE	IMPACT
United States:	173.4 bu/acre	↓
Nebraska:	183.2 bu/acre	↑
Franklin County:	210.8 bu/acre	↑
Monthly rainfall from normal:	5% Below Normal	↓
Monthly Temperature from	7% Above Normal	↑
Monthly fertilizer impact:	3% Below Normal	↓

Business IQ:

Management Factors

- Self-Assessment
- Is the **Business** side as good as the **Production** side
- **Goals** to Improve
- **Strengths** to Maintain

Business IQ: Management Factors Critical Questions for Crucial Conversations				
Farmer Checklist	Your Score	Green (3 points or 4*)	Yellow (2 points)	Red (1 point)
1. Knows cost of production		Written	In head	No idea
2. Knows cost of production by enterprise		Written*	In head	No idea
3. Goals - business, family, & personal		Written*	In head	No idea
4. Record keeping system		Accrual	Schedule F (one & done)	No idea
5. Projected cash flow		Written*	In head	No idea
6. Financial sensitivity analysis		Written*	In head	No idea
7. Understand financial ratios, break evens		Written*	In head	No idea
8. Work with advisory team and lender		Yes*	Sometimes	Never
9. Marketing plan written and executed		Yes	Sometimes	Never
10. Risk management plan executed		Yes	Sometimes	Never
11. Modest lifestyle habits, family living budget		Yes*	Sometimes	Non existent
12. Written plan for improvement executed & strong people management		Yes*	Sometimes	Non existent
13. Transition plan/Business Owner plan		Yes	Working on plan	Non existent/controversy
14. Educational seminars/courses		Yes*	Sometimes	Never attend
15. Attitude		Proactive	Reactive	Indifferent
*Extra Points: - Progressive Business may receive 4 points for #2,6,7,8,14 - Struggling Business Attempting Turnaround may receive 4 points for #3,5,8,11,12 (See pg. 2 for Progressive and Attempting Turnaround)		Score	Overall Analysis	
		35-54	Strong management rating, strong potential for resiliency & agility	
		24-34	Moderate management rating, potential issues in resiliency & agility	
		<24	Weak management rating, potential major issues in resiliency & agility	

2021 Version - Developed by: Dr. David M. Kohl, Professor Emeritus, Ag & Applied Economics, in cooperation with Dr. Alex White, Dairy Science, Virginia Tech

Source: Dr. David M. Kohl, Professor Emeritus, Virginia Tech

5

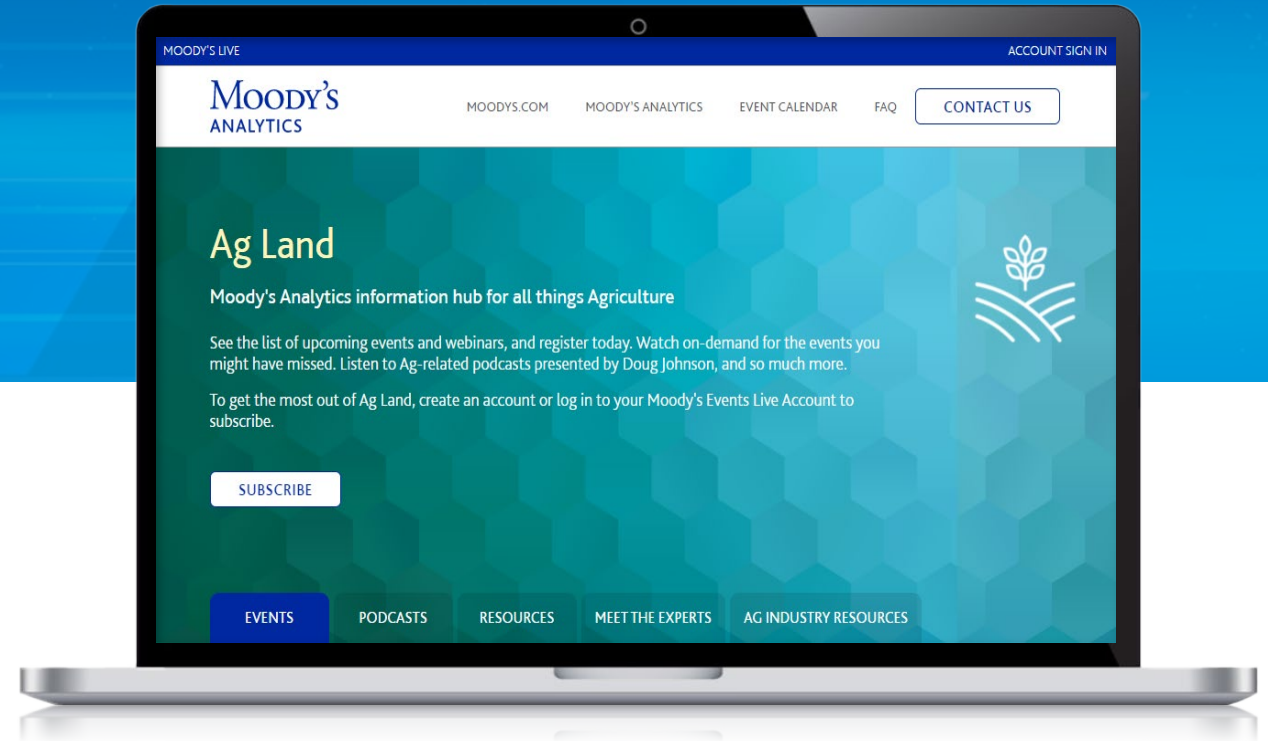
Action Items

Ag Land Hub

- » **Centralized Ag Repository**
- » **Complimentary resource**
- » **Create “alerts” for new postings**
 - Ag Webinars
 - Ag Podcasts
 - Ag Conferences
 - Ag Whitepapers

Subscribe: *(No Cost)*

<https://live.moody's.io/ag-land-channel>





Action Items

- **Urgent:** Economy
- **Important:** ESG Impacts
- **Preservation:** Our Future & Our Heritage



Keep Farmers Farming and Ag Lenders Lending
Thank You for Supporting Agriculture

MOODY'S
ANALYTICS

Better
Faster
Decisions

Doug Johnson, Ag Industry Practice Lead
Moody's Analytics
1010 N. 102nd Street
Omaha, NE
Cell: 402-639-4271
douglas.johnson@moodys.com

moodysanalytics.com