1st cash cover crop for the Midwest

CoverCress

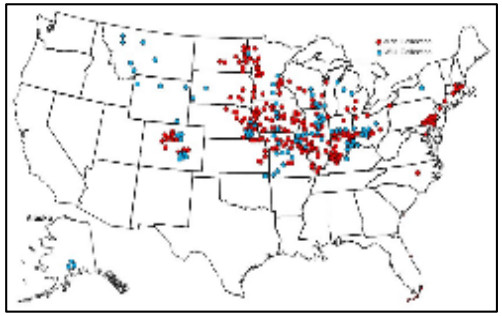
December 2019

Suggested topics for this webinar

1. **CoverCress progress**
2. Next steps
3. How can CAAFI and it's network help?

CoverCress is a winter oilseed, relative of canola

Derived from collection of native pennycress + **6 years of breeding and field testing** + **Genome editing program with university partnerships (non-GMO)** → **CoverCress!**



Main collections in 2013-14

On track for 1st commercial planting in 2021/2022, with plan for 0.5-1 B lbs. by 2028-2030

CoverCress shows low carbon intensity score, fitting nicely into low carbon fuel standard markets

Also adds to the social side of sustainability by supporting farmers with direct revenue

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Life Cycle Associates

Table 5. Disaggregated GHG Emissions based on CA_GREET3 calculations

	Farming	Fertilizers	N2O in soil	CoverCress Transportation	Oil extraction	Oil Transportation	Feedstock Total	BD Production	BD T&D	Fuel Total	Tank-to-Wheel	LUC	Final CI, gCO2e/MJ
Unallocated	1.52	3.86	8.49	0.43	7.39	1.27	22.98	10.35	1.49	11.84			
Mass allocated	1.44	3.67	8.07	0.41	3.33	1.21	18.14	9.84	1.49	11.33	0.76	0.00	30.23

CoverCress feedstock showed a CI of 18.14

Biodiesel production showed a CI of 11.33

Total CI: 30.23

Jet fuel expected to have similar carbon intensity

CoverCress fits between corn harvest and soybean planting using common equipment, keeping low production costs

~30 million acres each year of open overwinter land in southern half of Midwest

- Seed spread on the surface
- Farmer's normal fall practices (tillage or no-till)

- Fall and early spring cover
- Only 50 units of N in early spring
- Scavenges about 30% of its nitrogen from remaining after corn

- Harvested by a soybean combine in May
- Local collection site, processed in Midwest crush plant

Full season no-till soybeans planted immediately following CoverCress harvest

EXPECT TO BE AMONG THE LOWEST MARGINAL COST CROPS TO PRODUCE OIL AND MEAL DUE TO OVERWINTER USE OF LAND

CoverCress oil/meal are in line with canola products, opening fuel + food oil uses and high protein meal

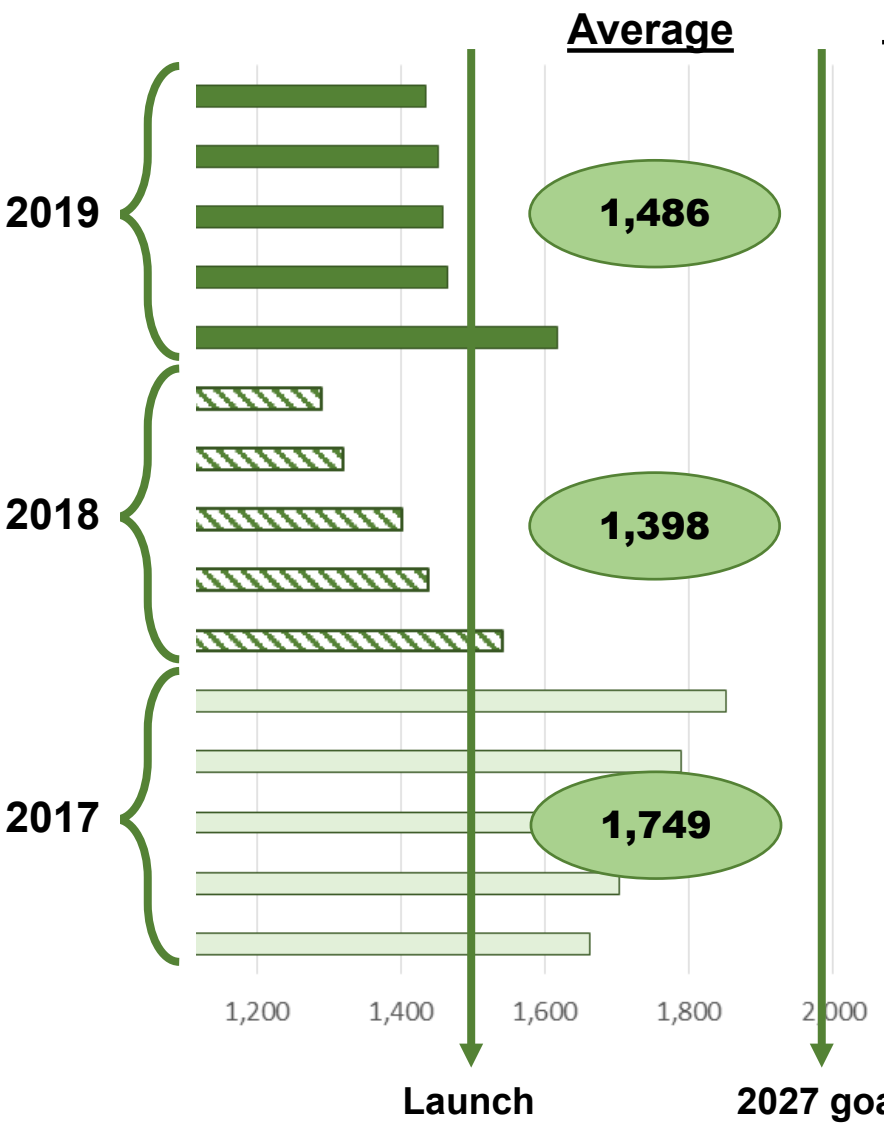
CoverCress

- ✓ Biodiesel, renewable diesel and jet fuel
- ✓ Unique food oil

- ✓ High protein meal likely suitable for poultry, swine and cattle feed

✓ CoverCress meal analytically similar to Canola meal
✓ Feeding trials of increasing scale in 2020-2021

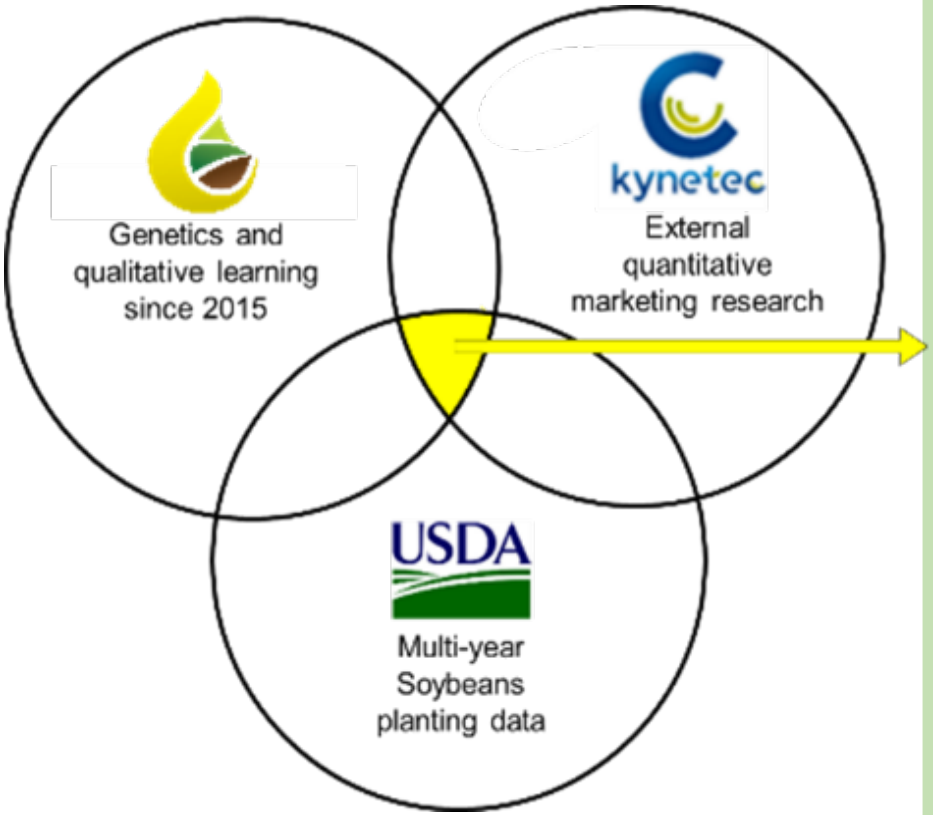
Top lines have consistently been at initial target yields that are economically viable – (data for top 5 lines across 3 years in lbs./acre) -



	Locations	Replicates	Plot Soil Quality		
			Top	Medium	Low
2019	3	9	✓	✓	✓
2018	1	5		✓	
2017	1	2	✓		

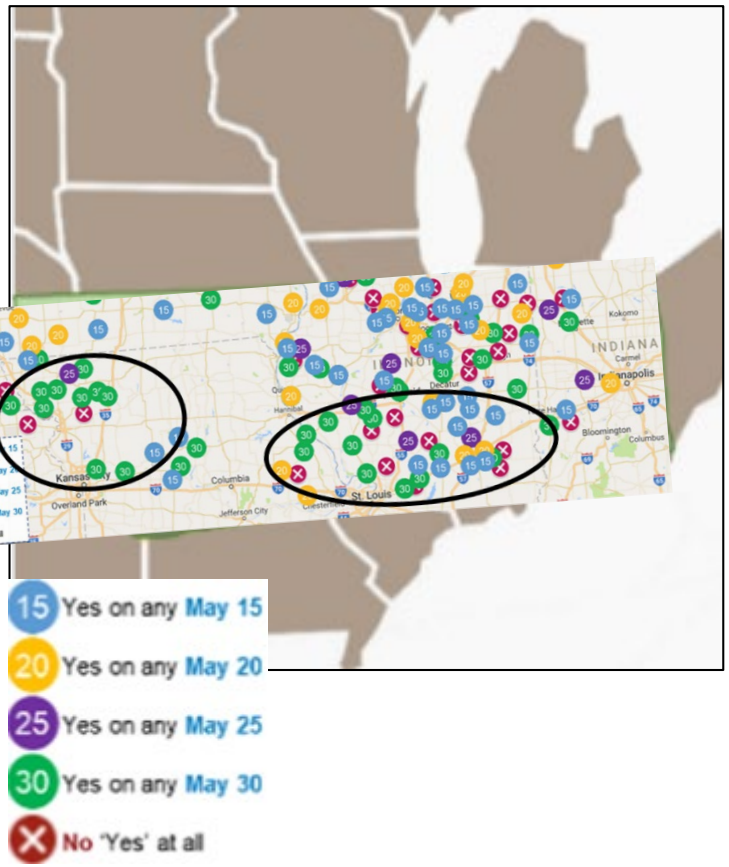
2019-2020 has more sites and larger fields across all soil types

Our conclusions from interactions with 500+ farmers over the last 3 years:



- ✓ CoverCress harvest date and $50+/acre cash margin (via yield) are the top 2 drivers for farmers.
- ✓ Post corn harvest planting methods fit enough farmers for 3 years in the southern half zone.
- ✓ $50/acre cash margin/acre can be delivered at 1500 lbs. yields. Aim for more with 2000 lbs.
- ✓ May 25-31 harvest date is ok for initial acreage in southern half of zone.
- ✓ Concept needs to be demonstrated locally for maximum adoption.
- ✓ Yield and maturity dates need to be improved for ramp up.

Quantitative market research highlights



2018 (214 farmers)

- ✓ 88% of farmers surveyed **south of Decatur** would try at May 25-31st harvest and a $50/A margin.
- ✓ 48% of farmers in **whole zone** say they'll try if harvest at **May 20th or earlier.**
- ✓ **Cover crop users show higher** interest in trying, and there are more of them in the southern area.
- ✓ Farmers like aerial planting --Successful planting over standing corn will increase planting window

2019 (315 farmers)

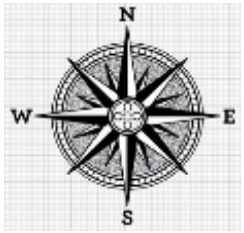
- ✓ 40% of farmers would try CoverCress **once the concept was proven** to work locally (assume "working" implies ok for their soybean planting)
- ✓ Custom planting, harvest options, and piggyback trips increases interest (i.e. mounting air seeder on combine, vertical tillage for one pass).
- ✓ 60% of farmers perform fall tillage, and 41% apply fall herbicide.

The plan is to start CoverCress commercial planting in the southern half to match maturity stage, prove the model, and grow across the target area as earlier lines are ready.

Existing germplasm will drive maturity of our earliest varieties from late-May toward mid-May in breeding cycle 2 with molecular characterization driving next-gen progress

- CoverCress wide germplasm collection has lines with significantly earlier than average maturity.
- This line (2032) can offer 7 to 10 days earlier maturity when compared to other elite breeding lines.
- **Cycle 2 progenies of 2032 and elite breeding lines compose 50% of 2019-20 testing.**
- Exploring molecular basis for 2032 earliness along with other known genes via UMN and ISU.

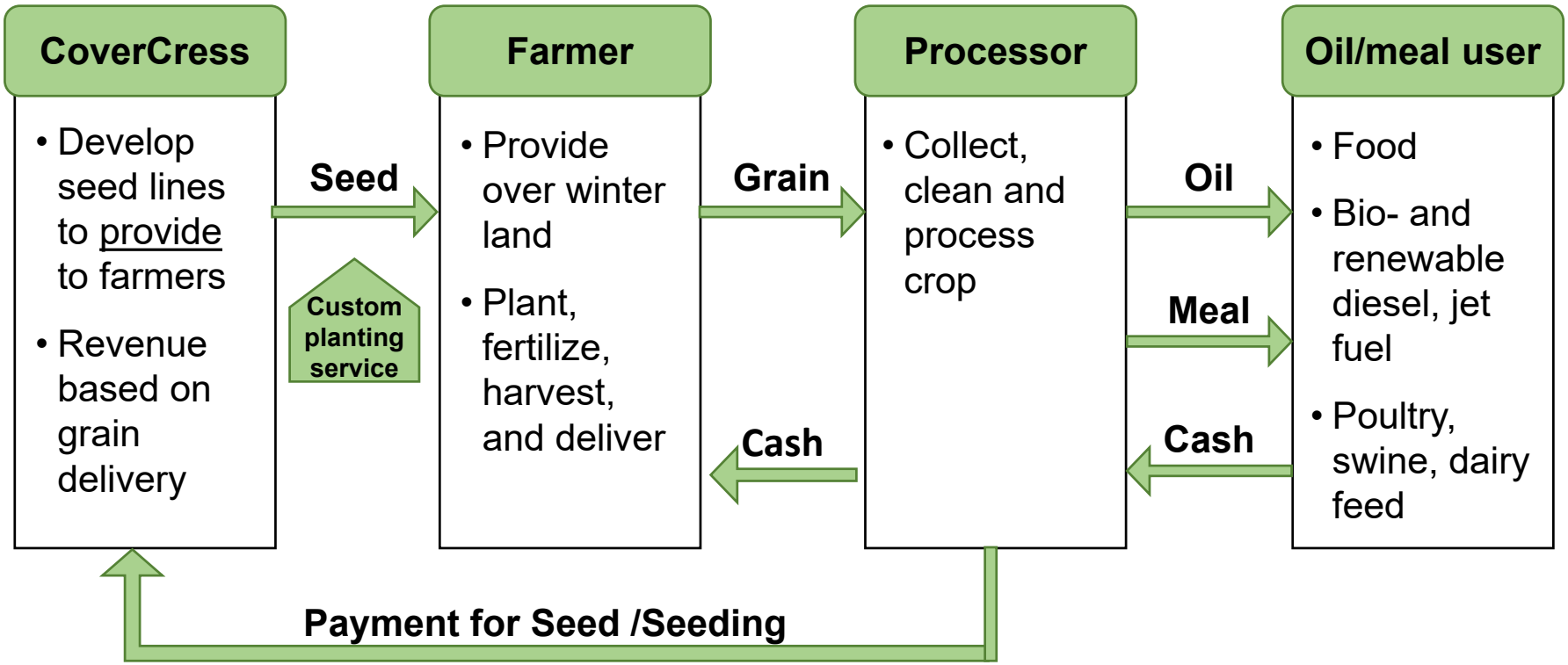
"All lines*" harvest dates:



	2015	2016	2017	2018	2019
Northern locations	Mid June	-	6/05	6/4	6/4-6/5
Southern locations	05/27	05/30	05/15	5/30-6/1	5/28-6/3

* Harvested when ALL lines are ready at research fields with several distinct genetics

CoverCress business plan is an integrated proprietary crop model



Tremendous opportunity to scale oil and meal supply

US market size (available acres)

30 M acres
(Midwest going from corn to soy per year)

10 M acres
(leaving 2/3s for very early soy planting)

3M acres by 2030

1.5 B lbs. of oil

Expect 10 M acres Opportunity ex-US

US Oil use (using fuel only)

Bio-renewable Diesel / Jet

23 B lbs. feedstock

2030 estimate

40 B lbs. feedstock

3M tons CoverCress

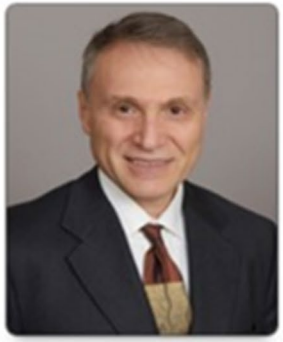
US Meal use

US protein meals ~$30 B in 2018

CoverCress by 2030
$ 0.4B

The CoverCress team

Jerry Steiner
CEO
Former Monsanto EVP



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Former U of MO

University Partnerships:

ISU UMN WIU UCSD

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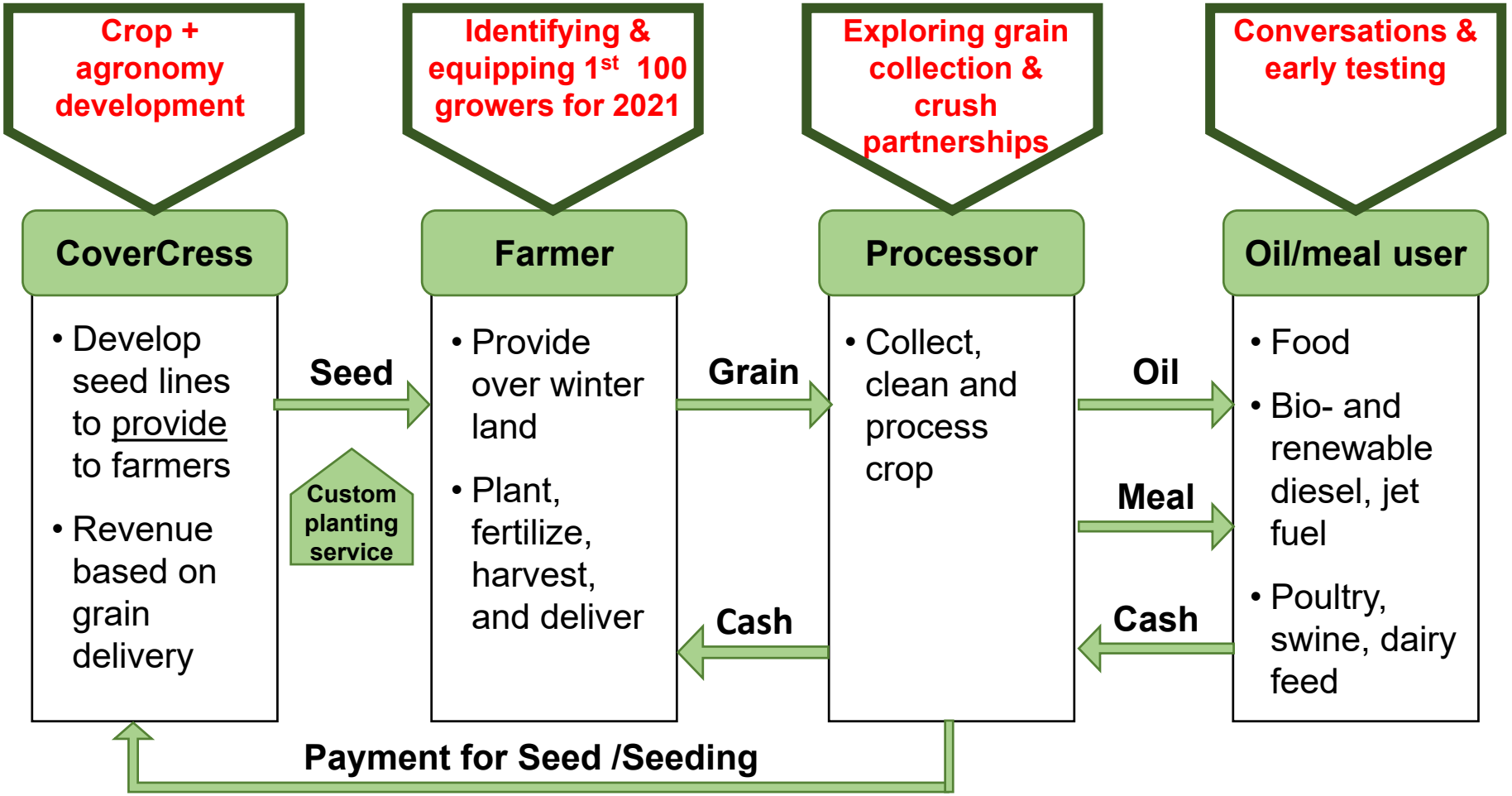
Main focus of CoverCress happening now include all parts of the supply chain



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We can use help from CAAFI and it's network!

- **Clear demand signals for low carbon feedstocks**
- **Offtake agreements to facilitate processing partnerships**
- **Communication on desire for low CI fuels**
- **Supply chain development, site selection, etc.**

CAAFI leadership is on the IPREFER advisory board

Thank you