

# Breeding the Next Generation of Oil Crops

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# Vegetable oil in the US: a recent phenomenon

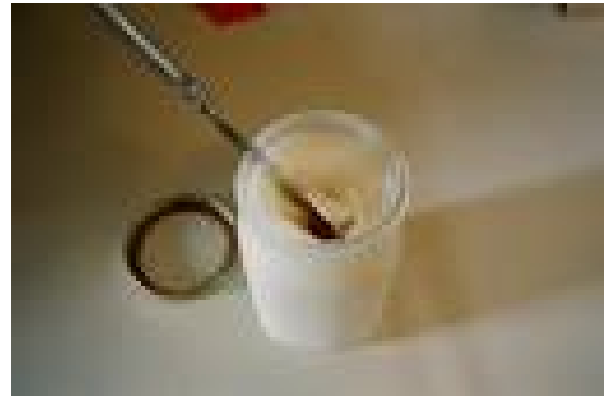
Pre- WWII fats & oils:



butter



olive oil



lard

# Current US annual production

Soy oil	20,000	million lb
Corn oil	2,700	
Butter	1,300	
Cottonseed oil	950	
Canola oil	900	
Lard	800	
Sunflower oil	600	
Linseed oil	300	

Source: Oil Crops Yearbook, USDA

# Seed and Oil Yields

	Seed Yield (kg/ha)	Oil yield (kg/ha)
Soybean	2900	500
Corn	9300	250
Cottonseed	1400	300
Canola	1600	600
Sunflower	1800	800
Peanut	3300	1400

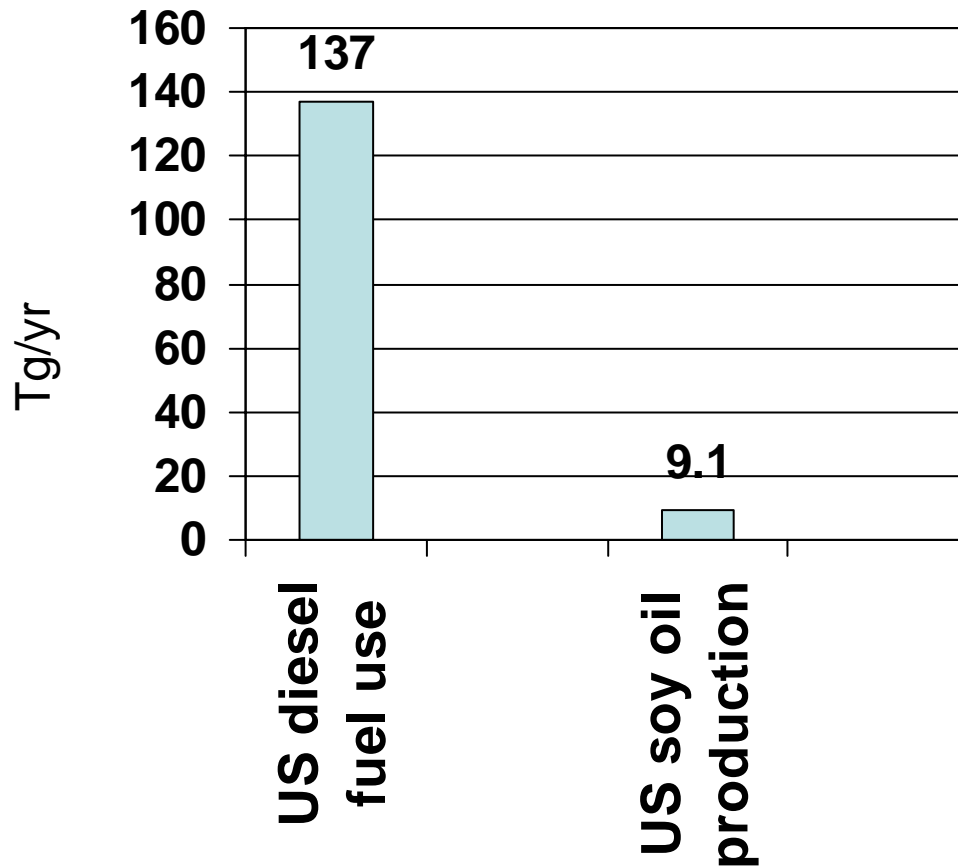
# Oil and **Protein** Yields

	Oil yield (kg/ha)	Protein yield (kg/ha)
Soybean	500	<b>1000</b>
Corn	250	800
Cottonseed	300	300
Canola	600	300
Sunflower	800	300
Peanut	1400	1000

# Uses in Fuel and BioProducts



# Supply: a serious constraint to the use of soy biodiesel



# Ohio BioProducts Innovation Center (OBIC) Bridges Ohio's Leading Industries

Ohio's  
Agricultural  
Output  
\$79.6 Billion



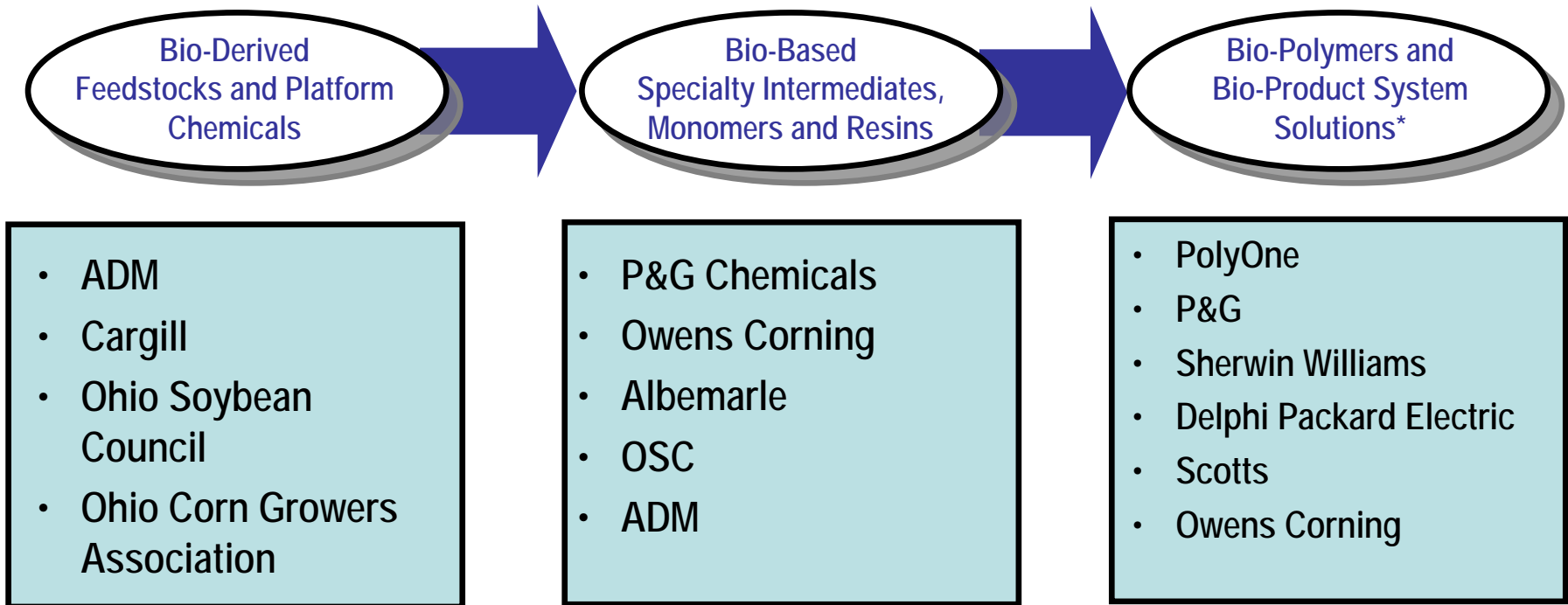
**Ohio BioProducts  
Innovation Center**

Ohio's  
Chemicals, Plastics,  
Rubber Materials  
Output  
\$49 Billion





# OBIC's Industry Collaborators



\* Coatings, Adhesives, Composites, Durable Goods

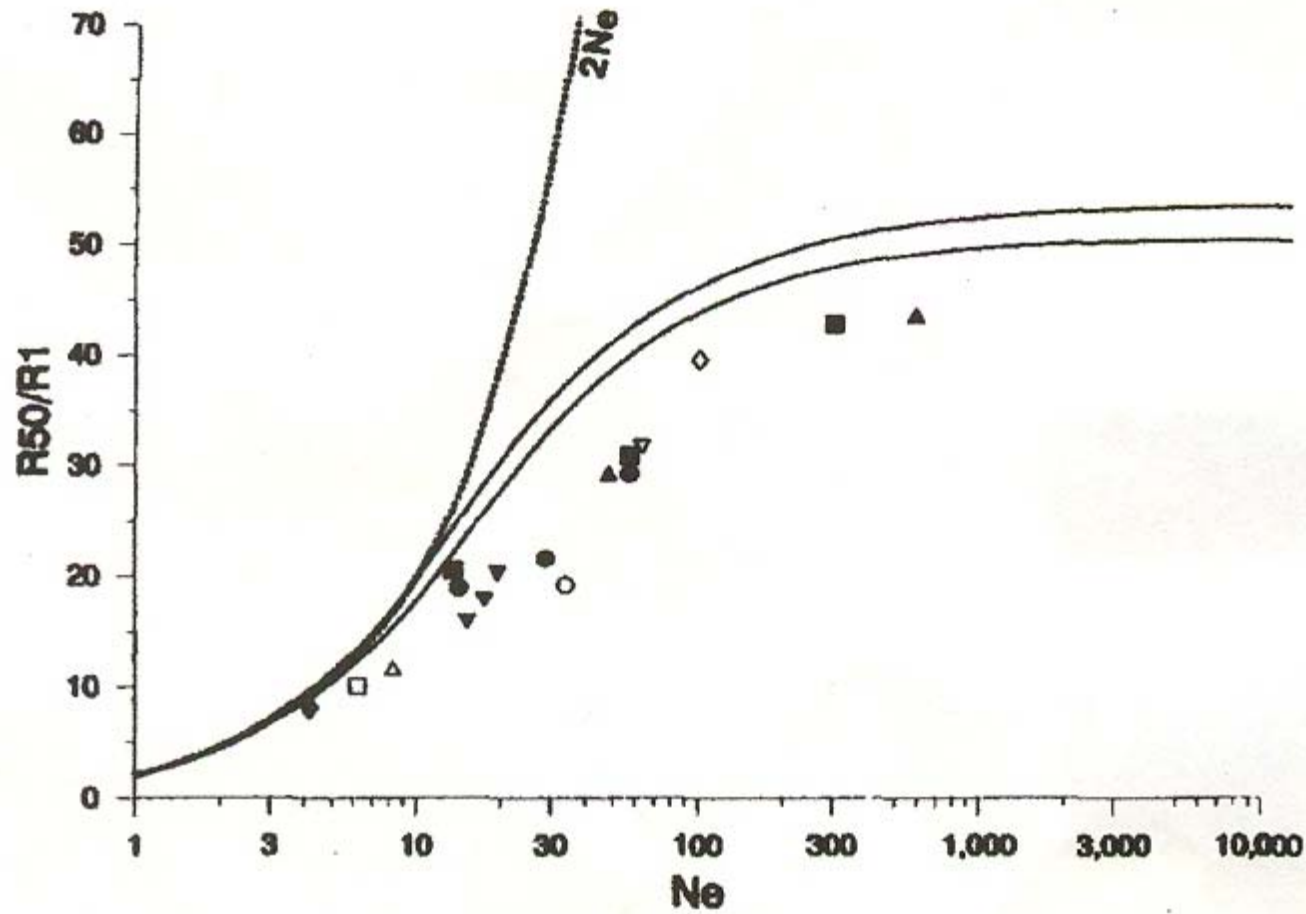
# Challenges to Plant Breeders

- Increasing yield
- Modifying oil
- Dealing with proprietary traits
- Using transgenic technology

Given the narrow germplasm base:

Are future yield gains possible in  
Soybean?

# Long term response vs. effective population size – a metaanalysis



Are future yield gains possible?

Sure.

We're not even halfway to the limit yet.

# Are future yield gains possible?

## Sure.

We're not even halfway to the limit yet.

(And the population is not closed anyway,  
due to introgression of new germplasm  
and transgenes.)

# Comment

- Billion Ton Report calls for 2:1 ratio of residue:grain in soybeans.
- But maximizing grain yield requires optimum harvest index, i.e., probably closer to 1:1.

# Modification of Oil

- Canola: a spectacular success story
  - Reduced erucic acid
  - Reduced glucosinolates (meal fraction)





# Modification of Oil

- Sunflower oil:
  - high-oleic acid
- Soybean oil:
  - low linolenic
  - low saturated
  - increased oleic



# Modification of Oil

- Many modifications that are desirable in food uses are also beneficial in industrial applications.
- Some modifications are yield-neutral, some are not.

# Proprietary Traits



- + High demand by growers
- + Provide funding for breeding
- Barrier to germplasm exchange
- Genetic bottlenecks and dead ends

# Transgenic Traits

- + Potential for new traits
- Long, expensive regulatory process
- Public acceptance slow





These are  
exciting times for  
agriculture!!





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But we've got lots of work to do.