



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison





DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# **UW Dairy Innovation Hub**

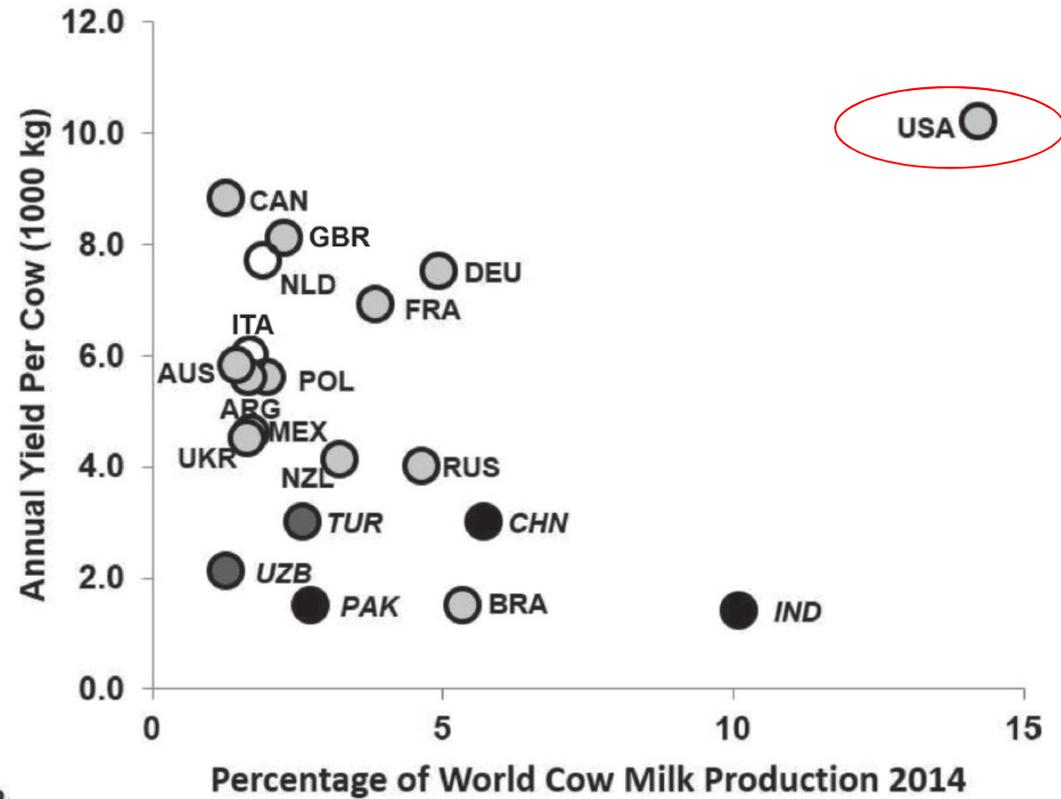
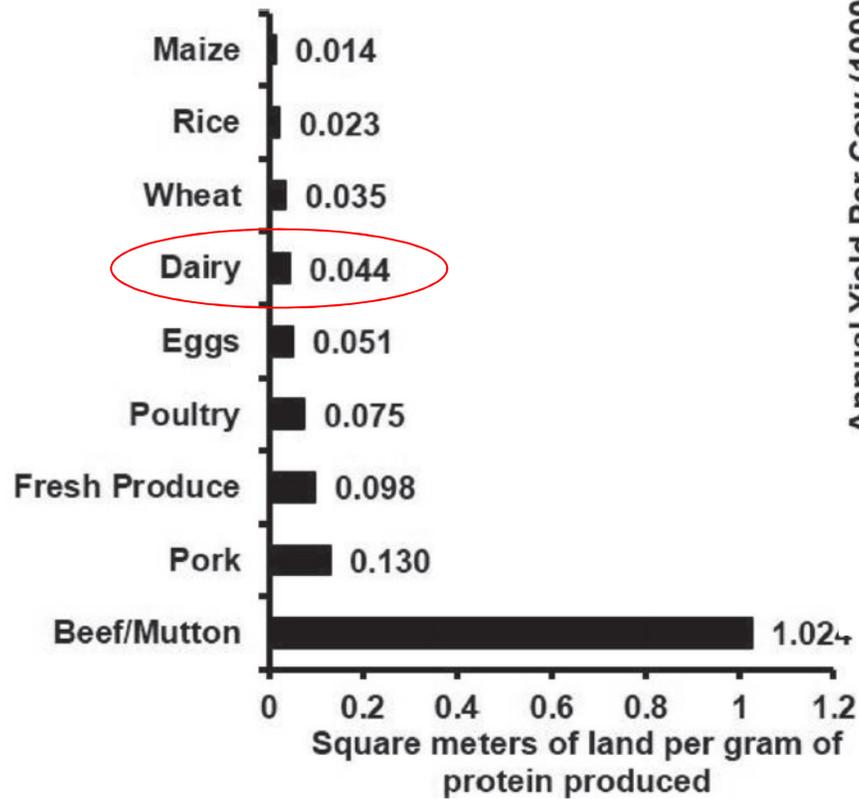
## ***We Start Today!***

**Dr. Kent A. Weigel**  
**Department of Dairy Science**  
**University of Wisconsin – Madison**



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# Why does our dairy industry exist?



We are really good at feeding people



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# What do we want our industry to be?



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# Produce commodity milk cheaper than anyone else?



We need 30 of these



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# Keep people in rural Wisconsin gainfully employed?



We need 30,000 of these



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# What are our options?



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

Get big?



Specialize?



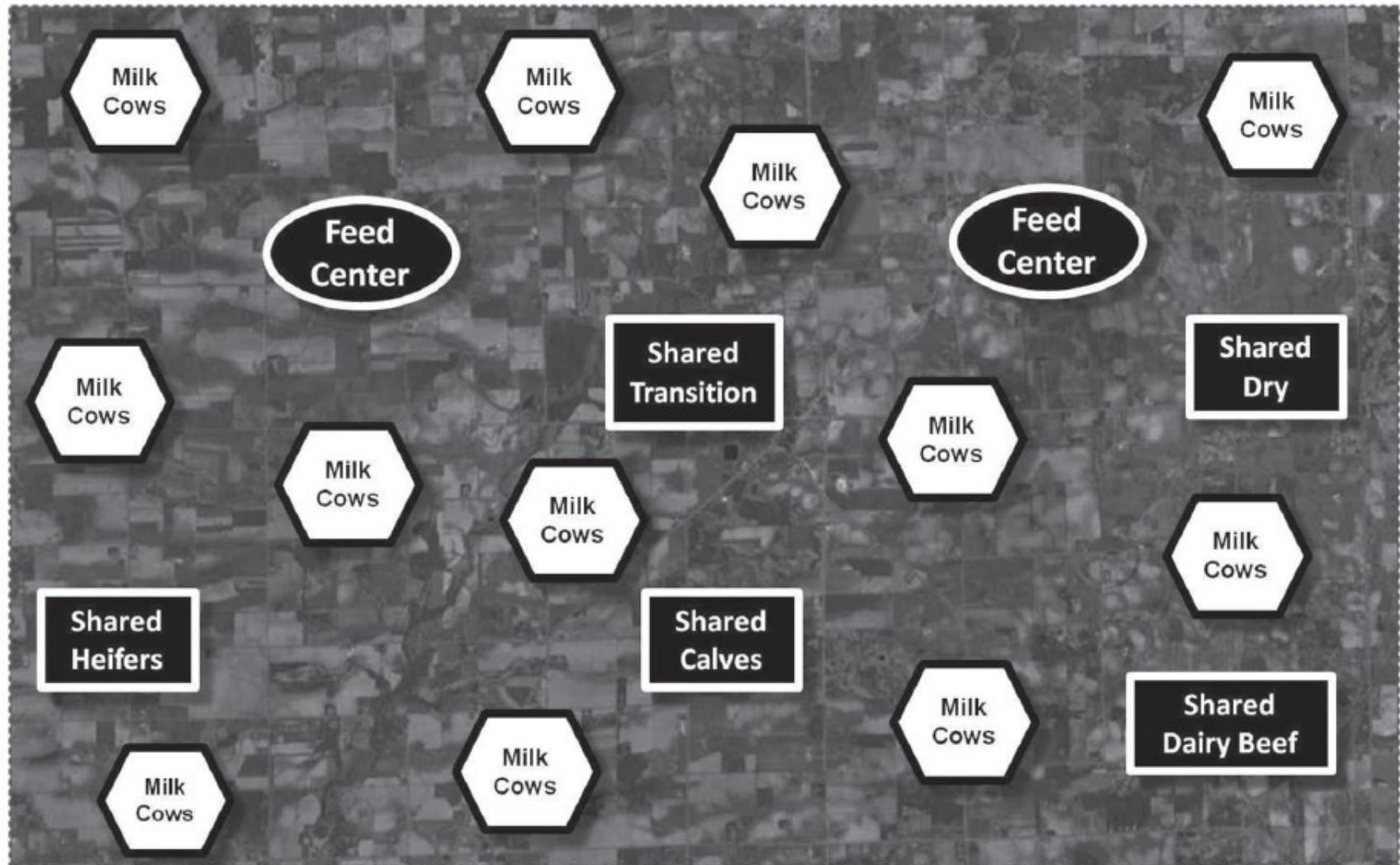
Give up?



**Best advice to U.S. dairy farmers?  
'Sell out as fast as you can'**



## Is there another path?





DEPARTMENT OF  
DAIRY SCIENCE  
University of Wisconsin-Madison

We need new products  
and innovations



Every year, because  
heifers are basically free



And the faucets  
will be turned up





DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

**UW-Madison is the R&D engine . . .**

# A Century of Excellence



DEPARTMENT OF DAIRY SCIENCE  
University of Wisconsin-Madison

## DISCOVERY

### Nutrition

- 1898 First publication of Feeds and Feeding (Henry, later by Morrison)
- 1905 Salt requirement experiments
- 1924 Generation of Vitamin D activity in foods by irradiation
- 1940 NPN utilization by ruminants established
- 1940 Trace mineral salt experiments
- 1951 Low milk fat test related to changes in rumen acids
- 1951 Identification of rumen acids (acetic, propionic, butyric)
- 1951 Propionic acid shown to reduce ketosis
- 1971 Active forms of Vitamin D discovered
- 1974 Ammonia requirements for microbial protein production
- 1983 Use of forage particle length to calculate roughage indexes
- 1988 Limited hepatic lipoprotein secretion causes fatty liver
- 1993 Effectiveness of fiber in byproducts quantified
- 1998 Use of NIR for analysis of forage digestible fiber and degradable protein
- 2000 Effects of processing corn silage nutritive value
- 2000 Phosphorus management on dairy farms
- 2004 Use of choline to prevent fatty liver
- 2005 Incorporation of milk urea nitrogen analysis and use in management software

### Management

- 1890 Babcock Test for milk fat introduced
- 1891 Round silo promoted
- 1906 First cow test association formed
- 1941 Initiation of dairy cattle housing and milking parlor research
- 1950 Research on environmental influences on production in 50 herds
- 1967 Dairy beef project initiated
- 1968 Shift from Babcock test to infra-red technology and automated milk analysis
- 1970 Post-milking teat dip experiment
- 1973 Computerized ration balancing made available
- 1975 AM-PM and test interval adjustment factors implemented
- 1981 Milk yield loss associated with subclinical mastitis as indicated by SCC
- 1991 Model for marginal increases in feed costs for milk, fat, protein, and lactose
- 2002 Development of "Milk Money" program to improve milk quality

### Physiology

- 1895 First use of Tuberculin test
- 1917 First use of diagnostic test for Johne's Disease
- 1934 Brucellosis eradication program initiated
- 1939 2000 cows artificially inseminated in Wisconsin
- 1940 Egg-yolk buffer medium developed as semen extender
- 1949 Dicoumarol as cause of bleeding in cows fed spoiled sweet clover hay
- 1949 Research on embryo mortality
- 1959 Rate of milking studies
- 1963 Early breeding of heifers studies
- 1964 Wisconsin Mastitis Test developed
- 1970 Somatic Cell Test based on DNA developed and used in DHI laboratories
- 1978 Concept of estrogen receptors in the uterus developed
- 1982 Bovine placental lactogen isolated and characterized
- 1994 Development of Ovsynch program
- 2004 Increased steroid metabolism link in high milk production and reproduction

### Animal Breeding and Genetics

- 1912 First genetics experiments conducted
- 1935 Sire proving program started
- 1940 Experimental bull stud established on campus
- 1953 Inbreeding, line breeding and out-crossing research at Emmons Blaine farm
- 1951 First successful embryo transplants in cattle
- 1957 Dairy Herd Improvement records computerized
- 1980 Non-surgical ova transfer procedure developed
- 1982 Scoring system for SCC with optimum statistical properties
- 1989 First sire evaluations for SCC
- 1991 Genetic markers for milk production identified
- 2004 Gene identification through crossbreeding experiments

vitamin D

ketosis

phosphorous

teat dips

somatic cell count

### Historic Moments

Under the guidance of the first professor of agriculture, William A. Henry, the University of Wisconsin provided scientific research to expand the state's dairy industry in the late 19<sup>th</sup> century. Using the university farm and the newly created experimental station, Henry promoted the use of round silos for storing feed for cattle during the winter. In 1887 Henry hired Stephen Babcock who developed the Babcock test for milk fat.

This simple test enabled the dairy farmer to determine the fat content of his milk. It also allowed high quality milk to be sold at a premium price consistently. The College of Agriculture also pioneered testing for bacteria leading to practical methods of milk pasteurization.

Working with fellow New Yorker William D. Hoard, Henry helped establish the powerful and progressive Wisconsin Dairymen's Association in Waterloo, Wisconsin. Hoard provided education in new dairy practices to farmers even though its primary focus was on dairy products.

In 1886 the university offered its first winter agricultural "short course". Stephen Babcock established the first "Dairy School" in the nation in 1890. Created with support from the legislature, these schools were significant in moving farmers from traditional methods to modern dairy practices. The Wisconsin Farmers Institute held its first meeting in 1906 to share ideas and information among dairy farmers.

In 1895, Dean Russell proved to farmers that the Tuberculin test was accurate. Twenty animals from the UW herd that had been slaughtered before a large crowd at a dramatic demonstration proved that the test was accurate.

In 1933 a farmer brought a bucket of blood to the UW from a cow that had died for no apparent reason. Professor K.P. Linn determined the cause of death was a blood disease called dicoumarol, a blood toxin that is still present in spoiled sweet clover hay.

The National Dairy Cattle Congress in Waterloo, Iowa, began experiencing financial difficulties in the mid-1960's. Dr. James W. Crowley, working with several prominent dairy cattle breeders from Wisconsin, made plans to establish a World Dairy Expo in Madison.

CALS Dean Glenn Pound wholeheartedly supported the project and offered the services of UW Dairy Science faculty and staff to assist in conducting the show. The first show, held in 1968, and every subsequent World Dairy Expo has had the full support of CALS. Dairy Science faculty, staff, and members of the Badger Dairy Club continue to provide valuable assistance in the operation of the premier dairy exposition in the world.

\$1 million at Rosy-Lane

## EDUCATION

- about 1300 undergraduates degrees in Dairy Husbandry/Science since 1938
- approximately 350 Master of Science degrees granted since 1938
- nearly 200 Ph.D. degrees granted since 1938
- more than 16,000 students in Farm & Industry Short Course since 1886
- 9 National Dairy Shrine Student Recognition winners since 1969
- 9 National Championship Dairy Cattle Judging Teams since 1918
- 4 Platinum Award Dairy Challenge Teams since 2002
- 3 ADSA Purina Mills Teaching Award winning faculty since 1973
- 4 ADSA Delaval Extension Award winning faculty since 1951
- 12 UW CALS Outstanding Teaching Award faculty

## EXCELLENCE



(L-R) I.W. Rupel (1963), R.P. Niedermeier (1977), L.H. Schultz (1983), B.R. Baumgardt (1985), N.A. Jorgensen (1991), L.D. Satter (1997)

- 6 American Dairy Science Association Presidents (pictured above)
- 4 ADSA Award of Honor Recipients
- 5 ADSA Distinguished Service Award Recipients
- 45 ADSA Faculty Awards

## LANDMARK EVENTS

- 1883 Wisconsin legislature appropriates funding for establishment of an agricultural experiment station
- 1885 W.D. Hoard publishes first Hoard's Dairymen magazine
- 1886 First Short Course in Agriculture established
- 1887 Dean W.A. Henry hires S.M. Babcock
- 1890 Establishment of the "First Dairy School in the World"
- 1898 Campus dairy barn and teaching center completed
- 1938 Dairy Husbandry Department formed (Heizer, Chair)
- 1954 Dairy Cattle Instruction and Research Center constructed on campus
- 1955 Sale of Hill Farm research facility results in purchase of Arlington research farm and expansion of research herd
- 1972 Animal Science building constructed
- 1981 US Dairy Forage Research Center established on UW campus
- 2003 Construction of Integrated Dairy Facilities initiated

\$58 million per year in WI

embryo transfer

50,000 calves per month

genomic selection



Research creates ripples  
and a sustainable  
competitive advantage



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison



In the 1970s, **45 cents**  
of every dollar in UW-  
Madison's budget came  
from WI taxpayers



Today, it's only **13 cents**

Other states have reinvested in animal agriculture: FL, MI, NE, NY



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# UW Dairy Innovation Hub



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

## UW Dairy Innovation Hub

*Wisconsin became America's Dairyland because Governor W.D. Hoard asked daring questions and enlisted University of Wisconsin scientists to develop technologies and practices that would make Wisconsin's dairy industry the envy of the world. We must enable our farmers to stay one step ahead by asking daring questions and combining talent with technology to develop innovative solutions that will meet tomorrow's marketplace demands, both locally and globally.*

*Research allows us discover solutions that keep us ahead of our challenges, and we need the best minds and facilities to carry out research that will drive Wisconsin's dairy industry for another century.*

### Steward Land & Water Resources

- Reduce on-farm water use
- Protect topsoil & improve soil health
- Improve air quality & limit greenhouse gas emissions
- Optimize feed efficiency & use of land resources
- Develop alternative uses for farm waste
- Minimize nutrient losses to lakes and rivers

### Enrich Human Health & Nutrition

- Design packaging for convenience & shelf life
- Limit risk of food-borne illnesses
- Create lactose-intolerant & allergy-free alternatives
- Improve the nutritional value of milk & meat
- Minimize pathogen risks in soil & water
- Reduce obesity & preventable health problems



### Ensure Animal Health & Welfare

- Find effective alternatives to antibiotics
- Monitor animal health with sensor technologies
- Improve reproductive rates & replacement policies
- Reduce animal stress & enhance consumer trust
- Minimize risk of disease from animal contact
- Deploy genomic selection for healthy animals

### Grow Farm Businesses & Communities

- Establish agricultural technology start-ups
- Use big data to optimize dairy farm operations
- Market specialty milk & meat products
- Develop a skilled & tech-savvy rural workforce
- Improve financial literacy & return on assets
- Understand global markets & opportunities

A vision for innovation,  
developed with PDPW  
and UW System leaders

A public investment to  
keep Wisconsin's #1  
industry at the forefront



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

## **Fuel Wisconsin's Financial Future**

**Enable Bold Discoveries**

**Build a World-Class Talent Pool**

**Advance our Competitive Advantage**

**Maximize our Value to Society**



DEPARTMENT OF  
DAIRY SCIENCE  
University of Wisconsin-Madison

## **Enrich Human Health & Nutrition**

*Design packaging for convenience & shelf life*

*Limit risk of food-borne illnesses*

*Create lactose-intolerant & allergy-free alternatives*

*Improve the nutritional value of milk & meat*

*Minimize pathogen risks in soil & water*

*Reduce obesity & preventable health problems*

feed the people



DEPARTMENT OF  
DAIRY SCIENCE  
University of Wisconsin-Madison

## **Steward Land & Water Resources**

*Reduce on-farm water use*

*Protect topsoil & improve soil health*

*Improve air quality & limit greenhouse gas emissions*

*Optimize feed efficiency & use of land resources*

*Develop alternative uses for farm waste*

*Minimize nutrient losses to lakes and rivers*

don't wreck the environment



DEPARTMENT OF  
DAIRY SCIENCE  
University of Wisconsin-Madison

## **Ensure Animal Health & Welfare**

*Find effective alternatives to antibiotics*

*Monitor animal health with sensor technologies*

*Improve reproductive rates & replacement policies*

*Reduce animal stress & enhance consumer trust*

*Minimize risk of disease from animal contact*

*Deploy genomic selection for healthy animals*

don't hurt the cows



DEPARTMENT OF  
DAIRY SCIENCE  
University of Wisconsin-Madison

## **Grow Farm Businesses & Communities**

*Establish agricultural technology start-ups*

*Use big data to optimize dairy farm operations*

*Market specialty milk & meat products*

*Develop a skilled & tech-savvy rural workforce*

*Improve financial literacy & return on assets*

*Understand global markets & opportunities*

help rural Wisconsin survive (and thrive?)



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

# When should we do this?



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison

**Now.**



DEPARTMENT OF  
**DAIRY SCIENCE**  
University of Wisconsin-Madison



*Mooving Forward.*  
DAIRY SCIENCE AT WISCONSIN

Questions?