



**ANIMAL &  
DAIRY SCIENCES**  
University of Wisconsin-Madison

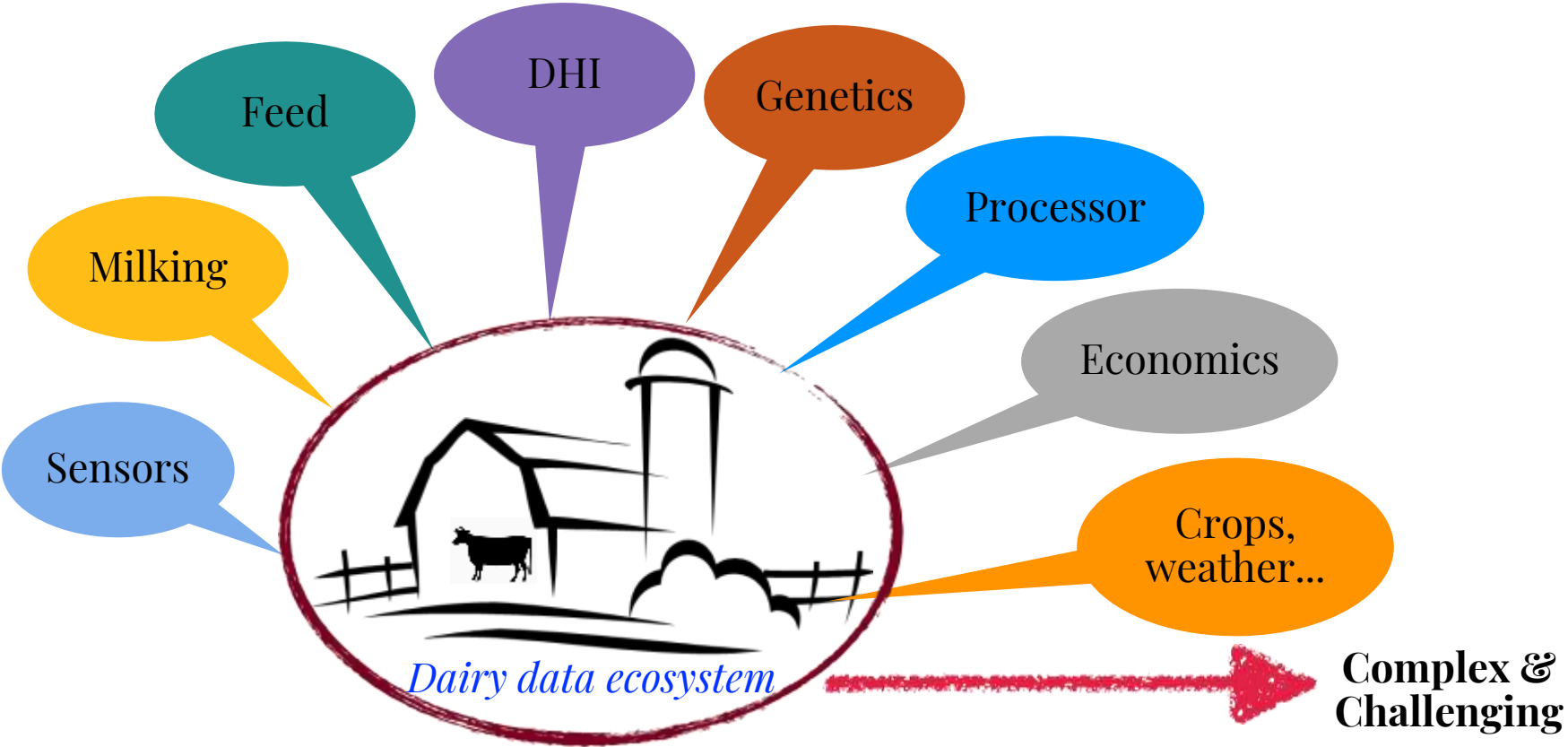


# **The US Dairy Brain Project: Data Integration and Data Applications for Improved Farm Decision-Making**

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**April 29<sup>th</sup>, 2021**

# Current Situation



# Publications on Data integration



## Data integration

**Is lacking** (Cabrera et al., 2020; Cockburn, 2020; Koltes et al., 2019).

**Improve predicted performance of algorithms when compared with only one data source** (Hogeveen et al., 2010) and **data quality** (Menéndez González et al., 2010).

**Key components to improve data usage and decision making through continuous feedback from farmers** (Cabrera et al., 2020; Dairy Brain, 2020; Eastwood et al., 2017; Etherington et al., 1995).

**Automatized data integration is recognized as a tool to give holistic advice on management practices** (Gengler, 2019)

# Publications on Data integration

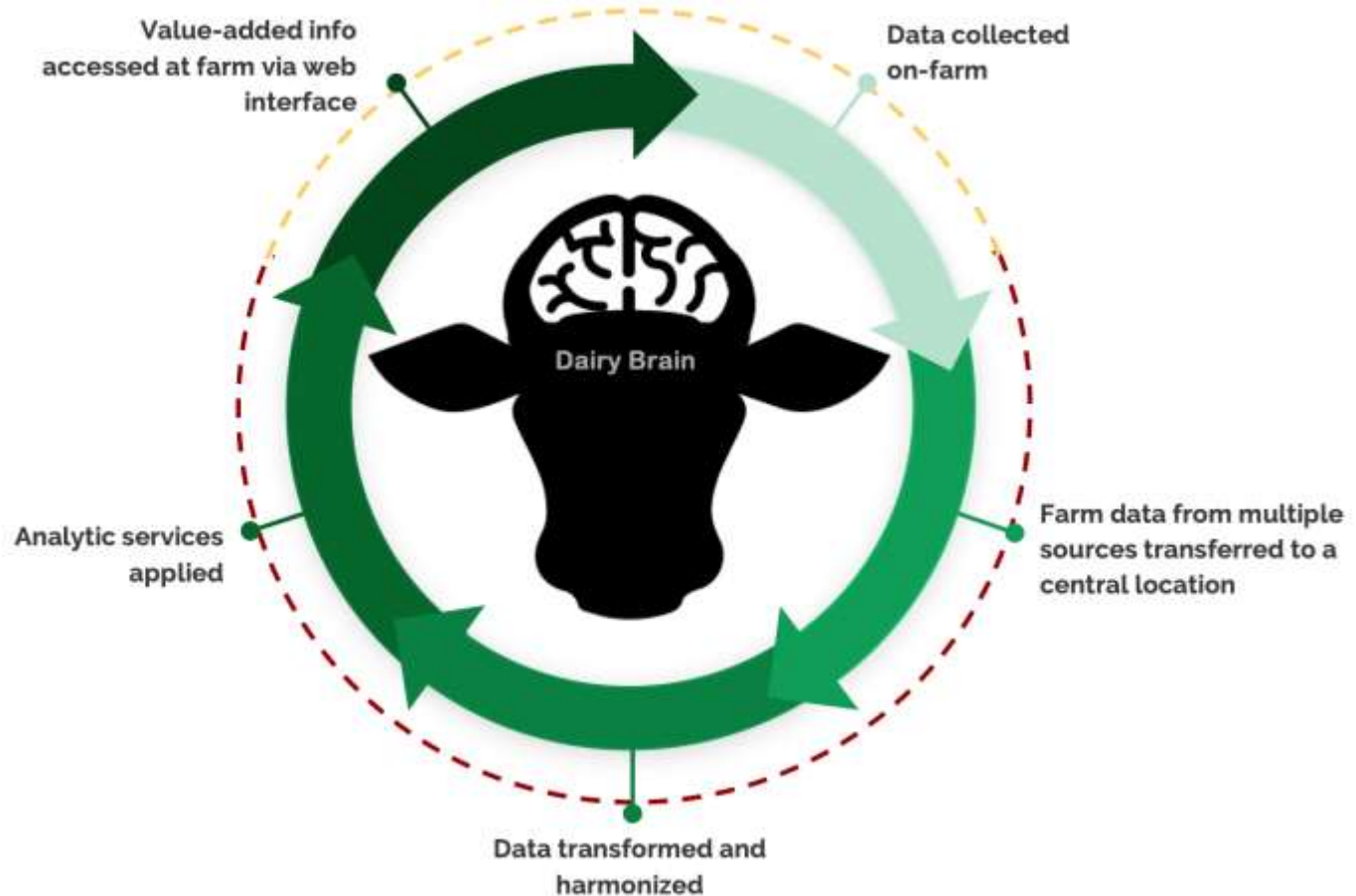


## Data integration

**Using integrated data improves decision making and help a better understanding of the alerts which lead to improved management, welfare and overall sustainability at the farm.**

Cabrera and Fadul-Pacheco, 2021.

# The Dairy Brain... in brief



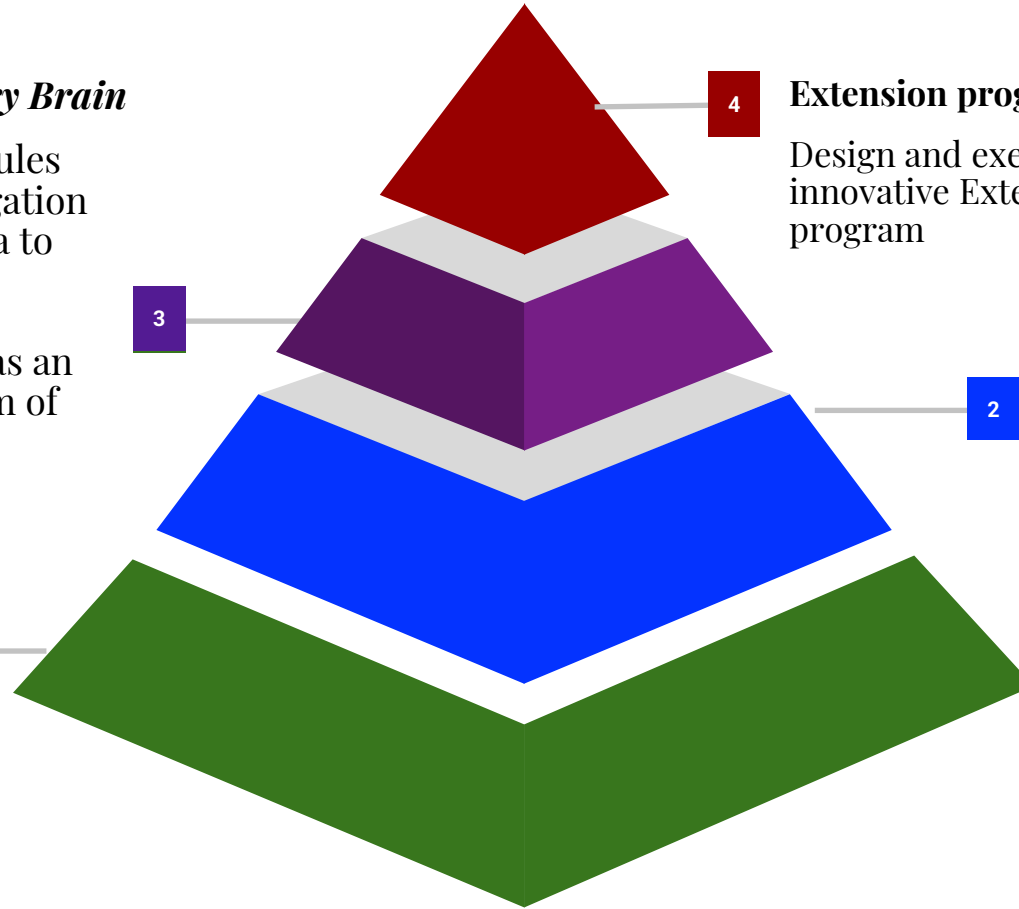
# Dairy Brain strategy



## Build the *Dairy Brain*

A suite of analytical modules that leverages the aggregation service and available data to provide insight to the management of dairy operations and services as an exemplar of an ecosystem of connected services

**Create a CIN**  
A Coordinated Innovation Network to shape the data service development



3

4

2

1

## Extension program

Design and execute an innovative Extension program

## Create an AgDH

A prototype Agricultural Data Hub to gather and disseminate multiple data streams relevant to dairy operations

# 1. Coordinated Innovation Network (CIN)



*“A larger community that addresses bottlenecks... by bringing together experts from different disciplines and domains to identify innovative and synergistic solutions.”*

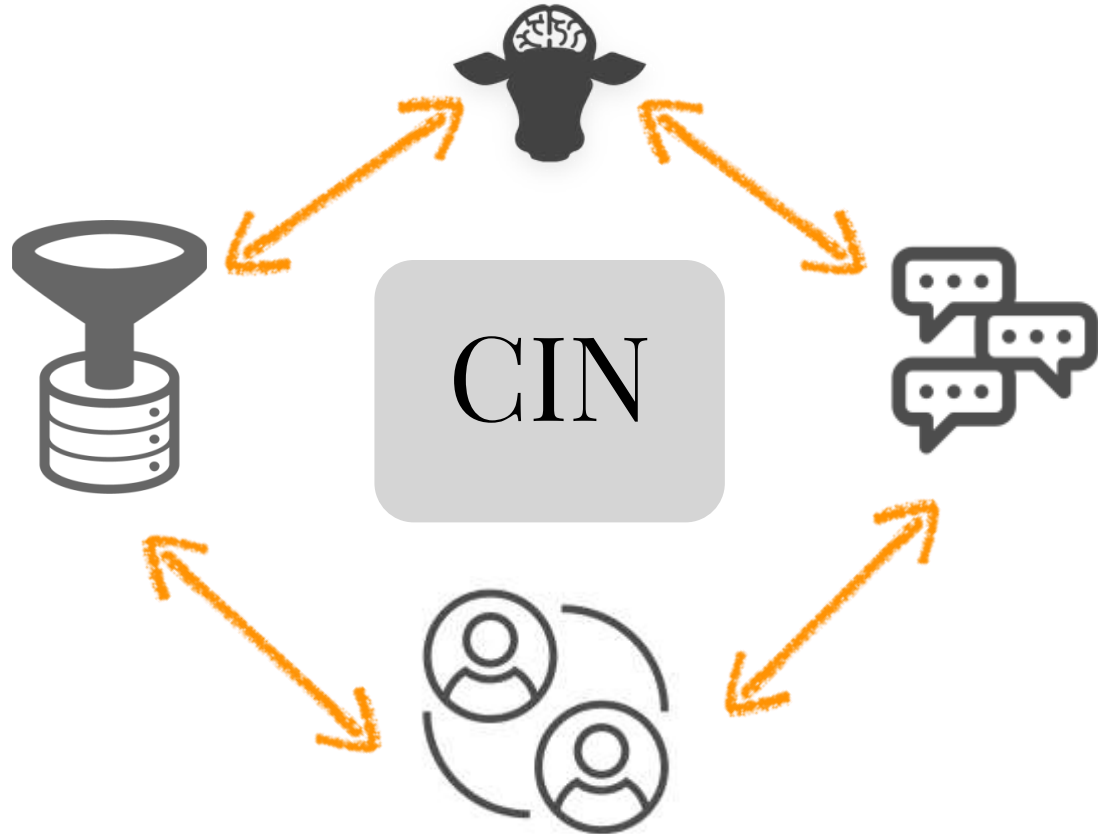


# 1. Coordinated Innovation Network (CIN)



## Network of stakeholders

- Shape the structure and implementation of AgDH and Dairy Brain
- Serve as a basis for broader industry conversations and implementation of services and standards



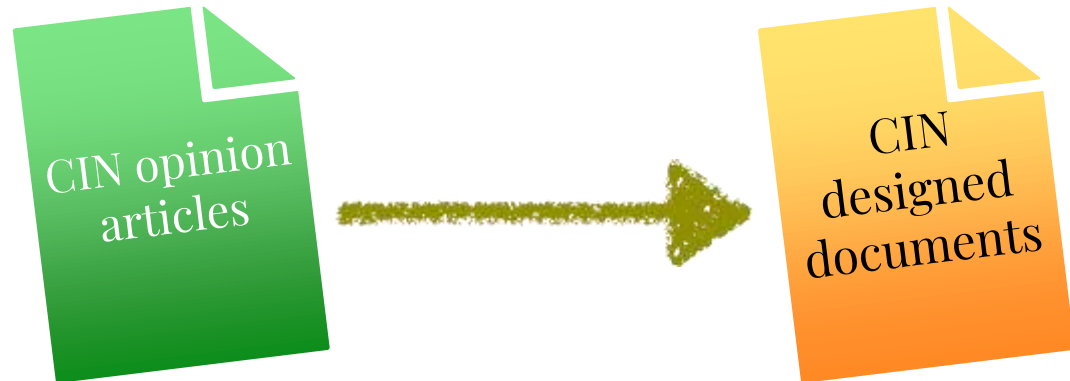


# 1. Coordinated Innovation Network (CIN)



## Roles of the CIN

- Raise awareness
- Facilitation - exchange opinions and discussion
- Create guidelines



# 1. CIN: Option Articles



Help us help you make better use of dairy data  
Feb. 10 2020

As more and more data is collected on land use, farm operations, animal health, and food supply chains, many initiatives, including the Dairy Brain project at the University of Wisconsin-Madison



Farming out data-driven decisions  
March 25 2020

Data has played an integral role in dairy farmers' decision-making process for many decades. Much of this started with foundational work from land-grant universities and state extension services



Data: Think big, but start small  
April 10 2020

Data collection, integration, and analysis are unavoidable factors when it comes to advancing the development of decision support tools in livestock operations

# 1. CIN: Option Articles



Making data work on the farm

April 25 2020

The University of Wisconsin-Madison Dairy Brain's team is committed to developing data-integrated, data-driven, time-sensitive decision support tools (DST) that disseminate research and help improve...



Creating value from data

May 10 2020

Data is a key driver for improving operations and sustainability of physical and business systems

# 1. CIN: *possible* topics design documents



**Data  
Ownership**

**Data security  
and chain of  
custody**

**Adoption of  
data-driven  
decision  
support tools**

**Best practices of  
data  
communication  
and data  
collection**

**Strategies to  
monetize data  
interchange**

# 1. Coordinated Innovation Network (CIN)



## Roles of the CIN

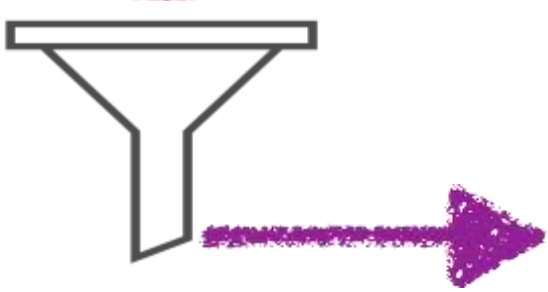
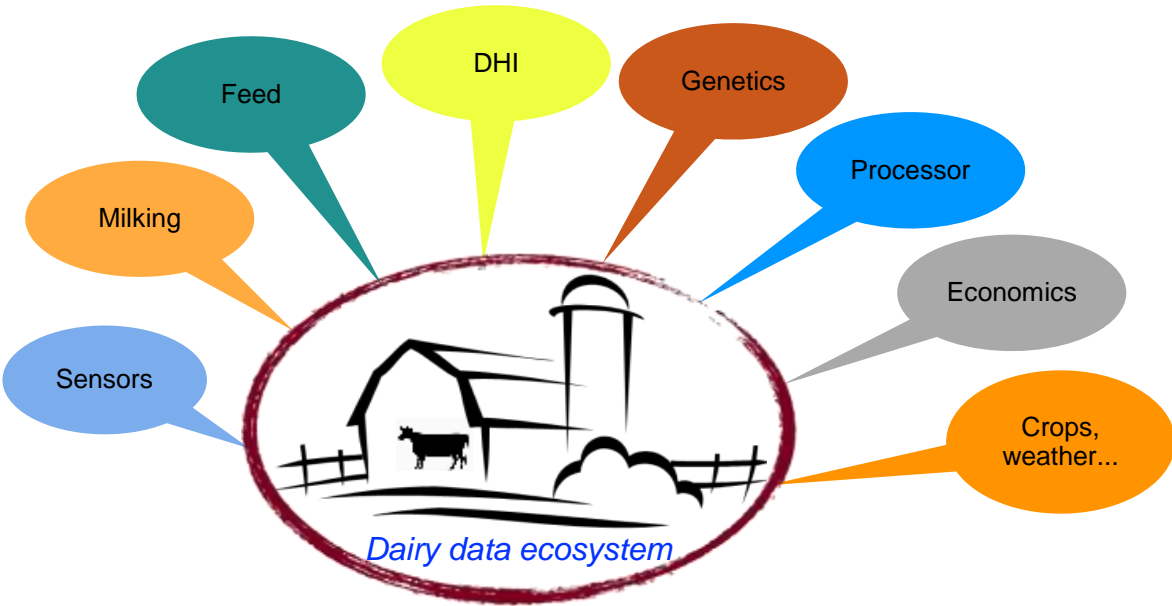
Raise awareness,  
facilitation and **create**  
**guidelines**

Survey to learn more about a number of key topics related to data challenges in the dairy industry





# 2. Create an Agricultural Data Hub



Agricultural Data Hub (AgDH)



Decision Support Tools (DairyBrain)



## 2. Create an Agricultural Data Hub



### Data integration steps

1. Assessing
2. Decoding
3. Cleaning
4. Homogenization
5. Integration

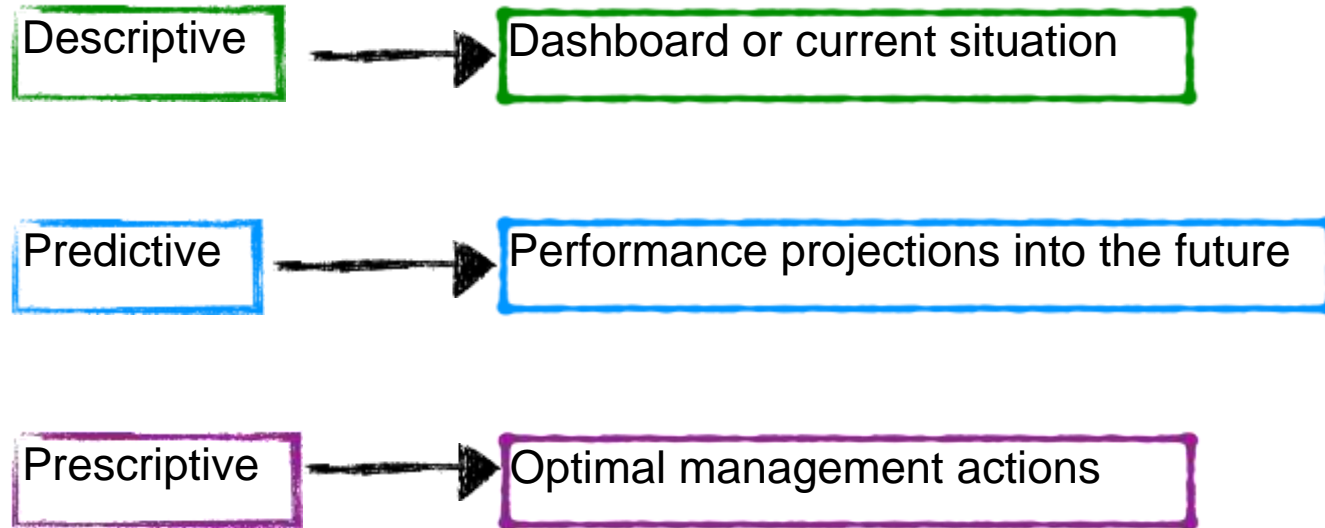


Section 17- 17.5 *Collecting, integrating, harmonizing and connecting data from dairy farms: The US Dairy Brain Project experience.* Victor Cabrera

### 3. Build the *Dairy Brain*



## Decision Support Tools -DST



Exemplar of how multiple data sources can be integrated through the AgDH to advanced analytics



Value added

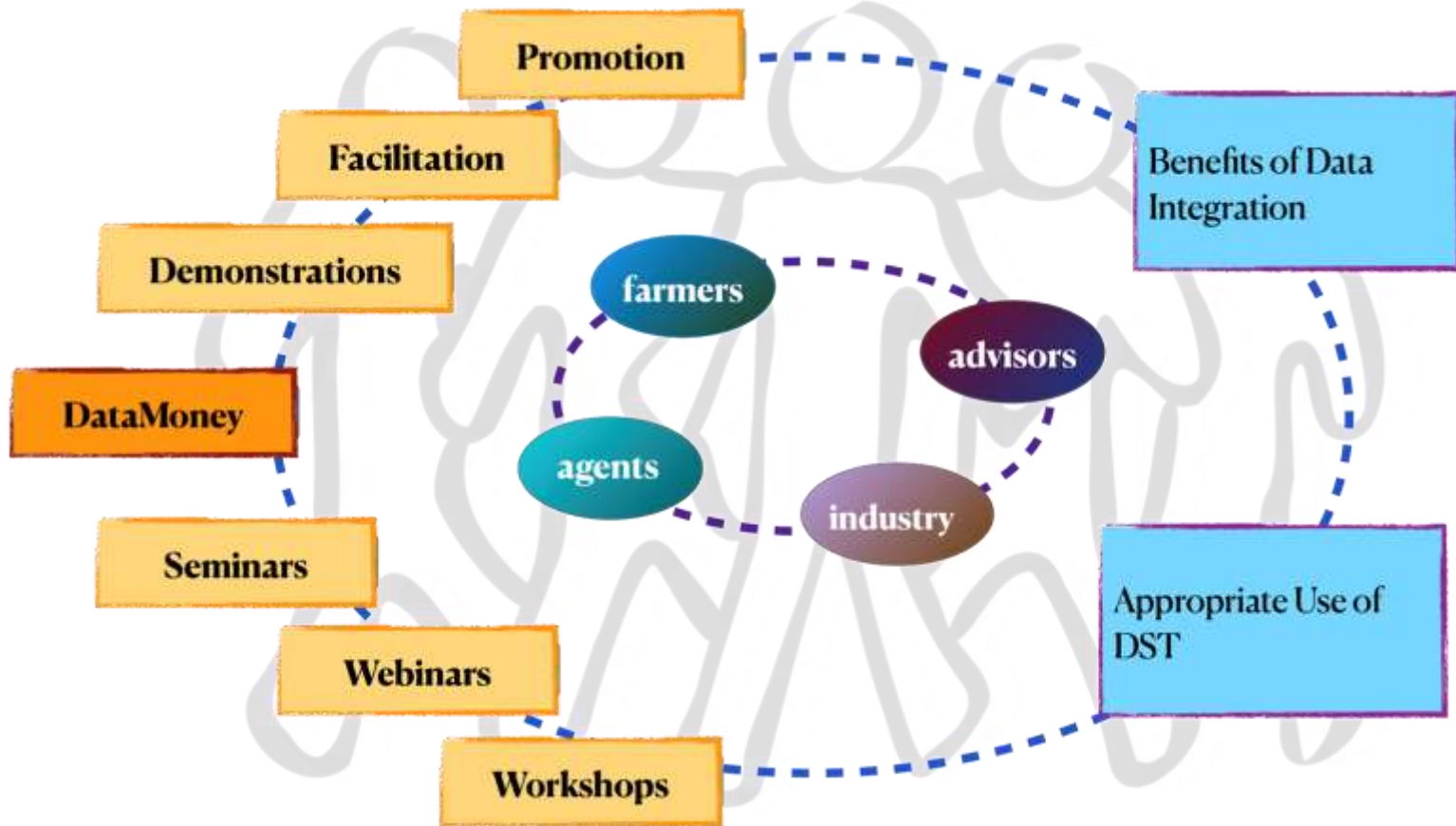


### 3. Build the *Dairy Brain*



Decision level	Decision Support Tool	Algorithm	Integrated Data	Benefit
Operational Short-Term (Descriptive)	Daily feed efficiency	Milk / Feed	Milking parlor, DHI, Feed Monitoring	Early warnings
	Daily milk income over feed cost	Milk value / Feed Cost	Parlor, DHI, Feed Monitoring, Milk Processing	Margins controlled
Tactical Mid-Term (Predictive)	Selection of genetic traits to reduce clinical mastitis	Machine learning	Management, Genetics	Healthier cows and herd
	Dynamic net present value of a cow	Markov chains, Time series	All above and below	Best replacement decisions
Strategic Long-Term (Prescriptive)	Breeding, genetic, and culling decisions	Monte Carlo, Optimization, Machine learning	All above, health and reproductive protocols	Best breeding, genetic, and culling policies
	Continuous nutritional accuracy	Cluster, Nonlinear programming	Management, Feed monitoring, DHI, Parlor	More accurate feeding

# 4. Extension



# 4. Extension



## Integrated data usage assessment



**Know the current status of the data usage in the farm**



**Personalized data tool(s)**



**Help with the decision-making progress**



# Acknowledgments



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United States Department of Agriculture  
National Institute of Food and Agriculture

# Questions

[dairybrain.wisc.edu](http://dairybrain.wisc.edu)

