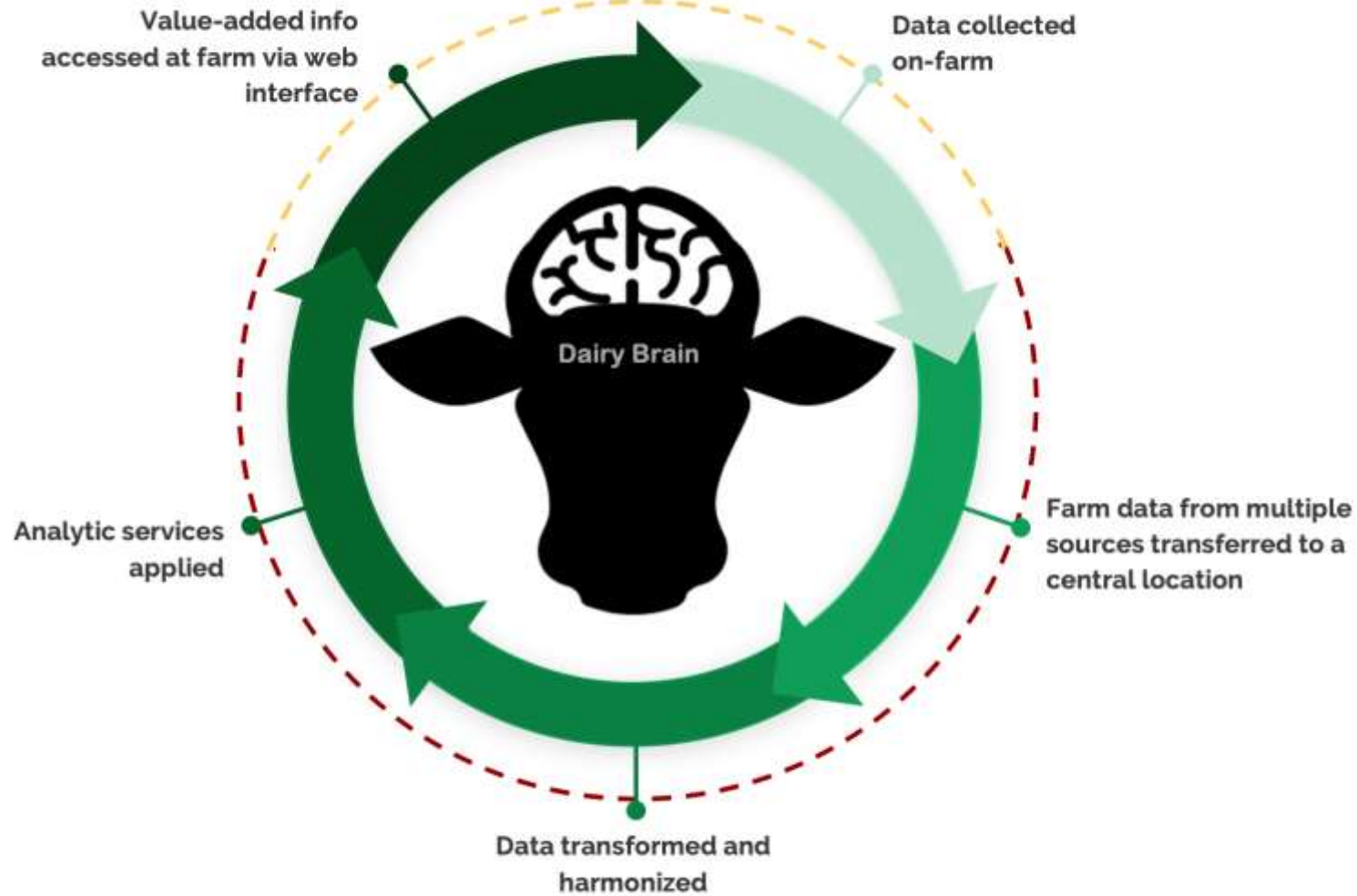
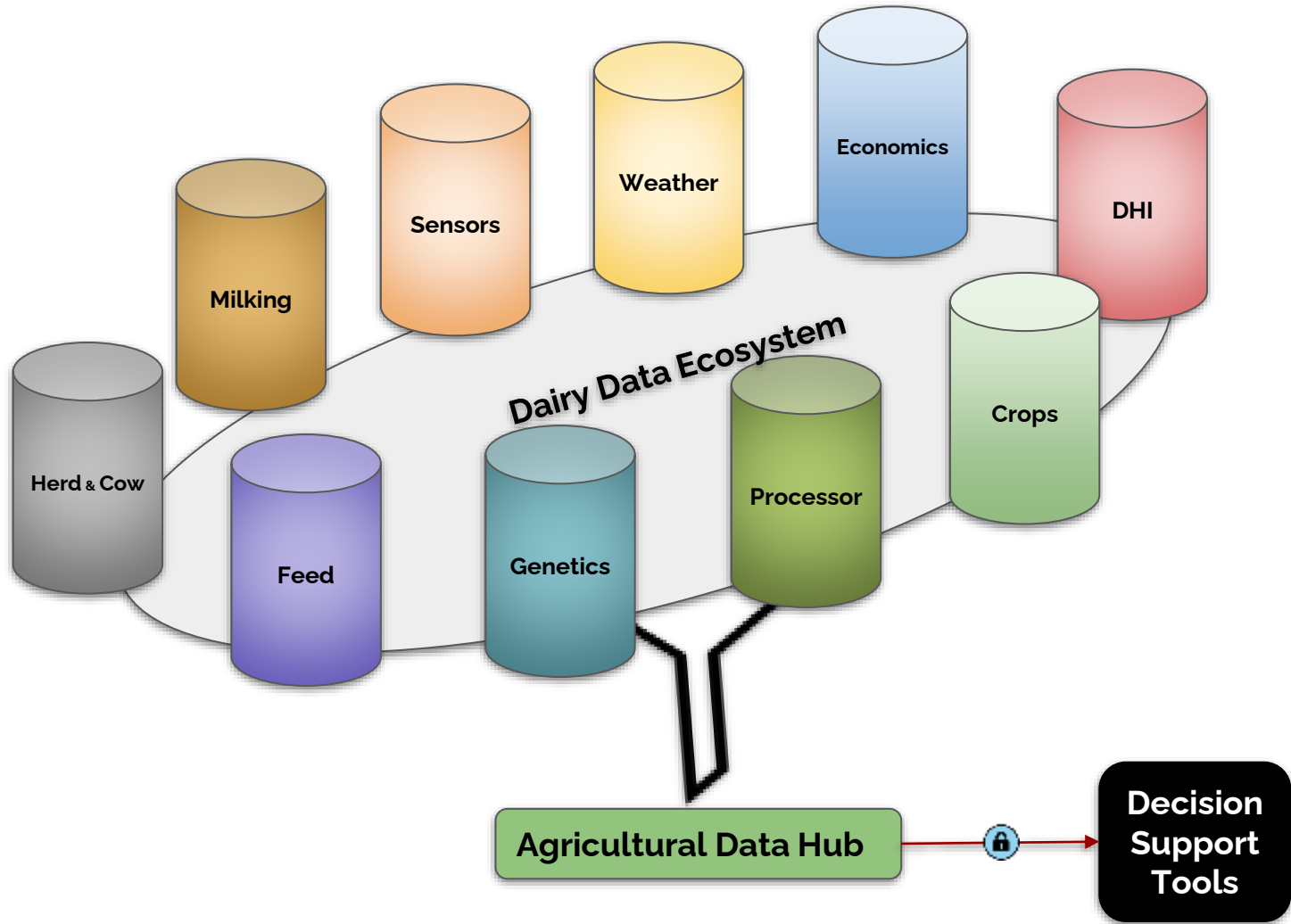


# Collecting, Integrating, Harmonizing and Connecting Data from Dairy Farms: The US Dairy Brain Project Experience

V. E. Cabrera, L. Fadul-Pacheco, S. Wangen, T. da Silva, F.  
Zhang, R. H. Fourdraine, J. Mattison







# Agricultural Data Hub (AgDH)

1) Accessing



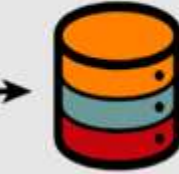
2) Decoding



3) Cleaning



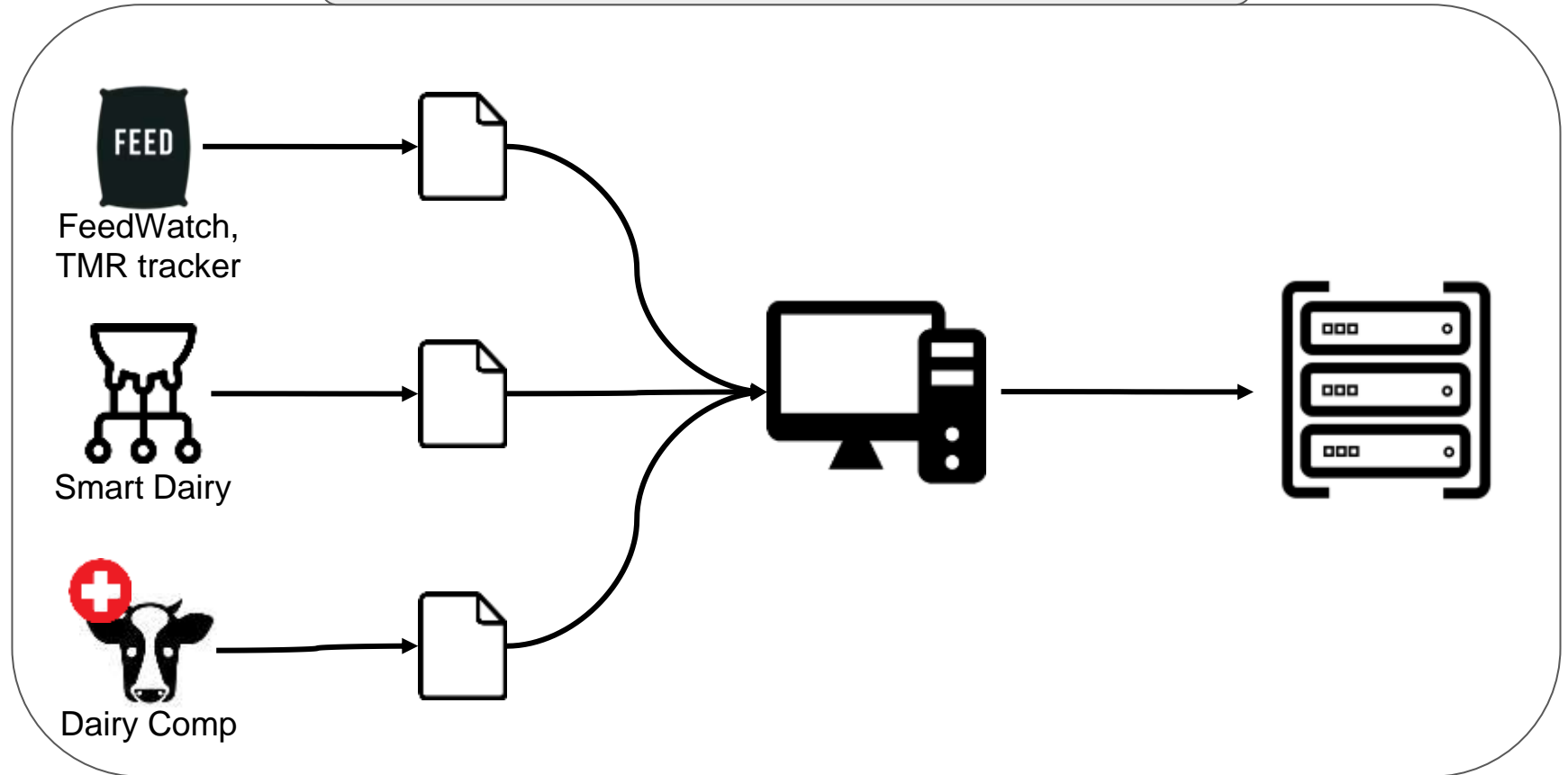
4) Homogenization



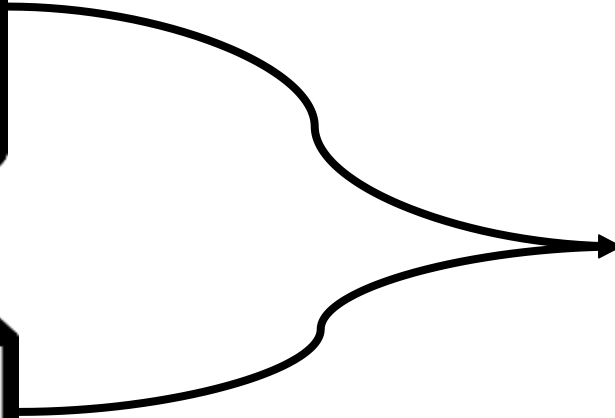
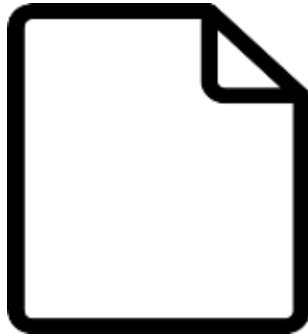
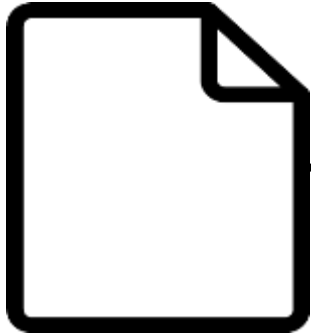
5) Integration



## Accessing



## Decoding



DM Intake

Column Operator Value  
 CompanyName = University of Wisconsin  
 ReportDate between 3/1/2019, 3/7/2019  
 [-] Totals Only

		Avg	Tot.	Avg.	Tot.	Avg.	
Pen Name	Report Date	Pen Count	Dropped	Dropped	Weighbacks	Weighbacks	
Pen 1	3/7/19	53.04	5957.57	85.4	0	0	
	3/6/19	83.74	6297.78	46.96	0	0	
	3/5/19	118.5	5099.02	53.29	0	0	
	3/4/19	44.24	5766.24	30.26	0	0	
	3/3/19	84.24	4943.4	82.08	0	0	
	3/2/19	50.16	2374.56	33.69	0	0	
	3/1/19	75.32	7044.8	86.66	0	0	
Pen 1 Totals:		64.04	28763.94	88.85	0	0	
Pen 2	3/7/19	190.4	8806.32	42.3	0	0	
	3/6/19	208.29	9571.77	54.54	-165.55	-2.44	
	3/5/19	152	4244.73	47.34	-685.13	-2.16	
	3/4/19	214.4	11762.8	72.99	-821.1	-4.74	
	3/3/19	181.2	12802.23	75.11	-399.84	-2.14	
	3/2/19	96	7258.4	26.9	-512.82	-4.16	
	3/1/19	230.4	7339.24	78.4	-180.38	-2.77	
Pen 2 Totals:		215.87	76952.02	44.63	-1794.54	-1.31	



farm_id	company_name	pen_name	report_date	avg_pen_count	total_dropped	avg_dropped	total_weighbacks	avg_weighbacks
1	University of Wisconsin	Pen 1	3/7/19	53.04	5957.57	85.4	0	0
1	University of Wisconsin	Pen 1	3/6/19	83.74	6297.78	46.96	0	0
1	University of Wisconsin	Pen 1	3/5/19	118.5	5099.02	53.29	0	0
1	University of Wisconsin	Pen 1	3/4/19	44.24	5766.24	30.26	0	0
1	University of Wisconsin	Pen 1	3/3/19	84.24	4943.4	82.08	0	0
1	University of Wisconsin	Pen 1	3/2/19	50.16	2374.56	33.69	0	0
1	University of Wisconsin	Pen 1	3/1/19	75.32	7044.8	86.66	0	0
1	University of Wisconsin	Pen 2	3/7/19	190.4	8806.32	42.3	0	0
1	University of Wisconsin	Pen 2	3/6/19	208.29	9571.77	54.54	-165.55	-2.44
1	University of Wisconsin	Pen 2	3/5/19	152	4244.73	47.34	-685.13	-2.16
1	University of Wisconsin	Pen 2	3/4/19	214.4	11762.8	72.99	-821.1	-4.74
1	University of Wisconsin	Pen 2	3/3/19	181.2	12802.23	75.11	-399.84	-2.14
1	University of Wisconsin	Pen 2	3/2/19	96	7258.4	26.9	-512.82	-4.16
1	University of Wisconsin	Pen 2	3/1/19	230.4	7339.24	78.4	-180.38	-2.77

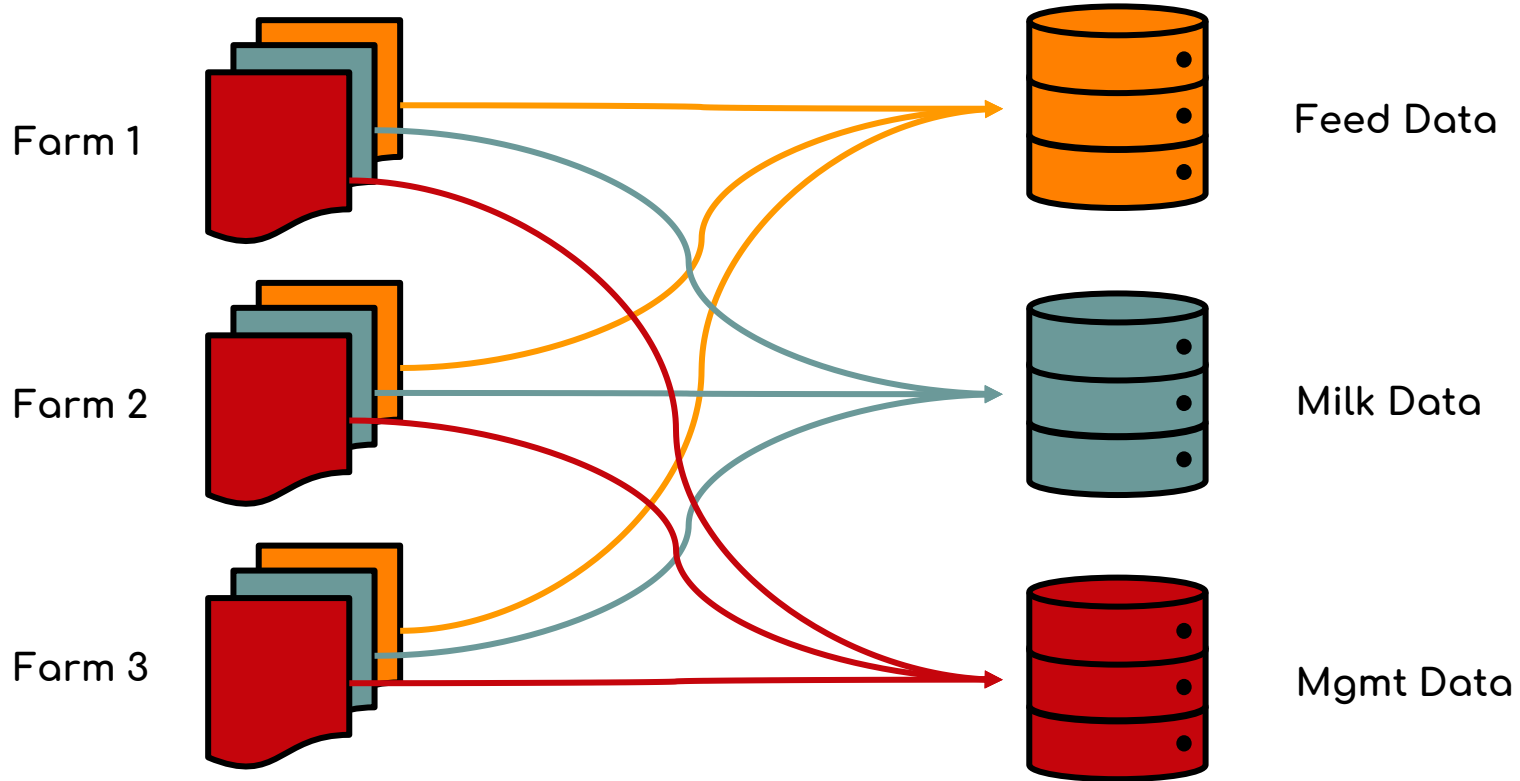


## Cleaning



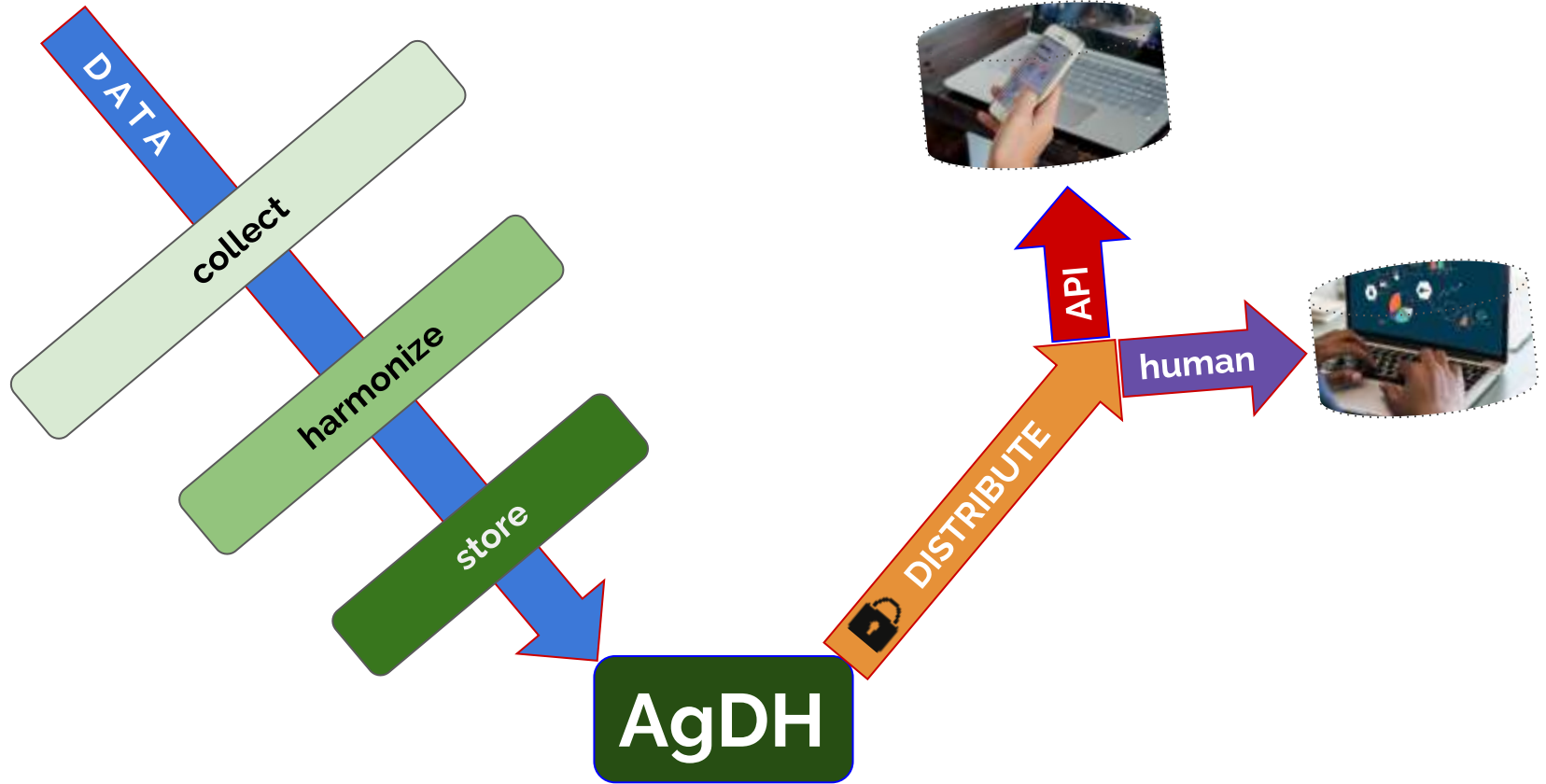


## Homogenizing

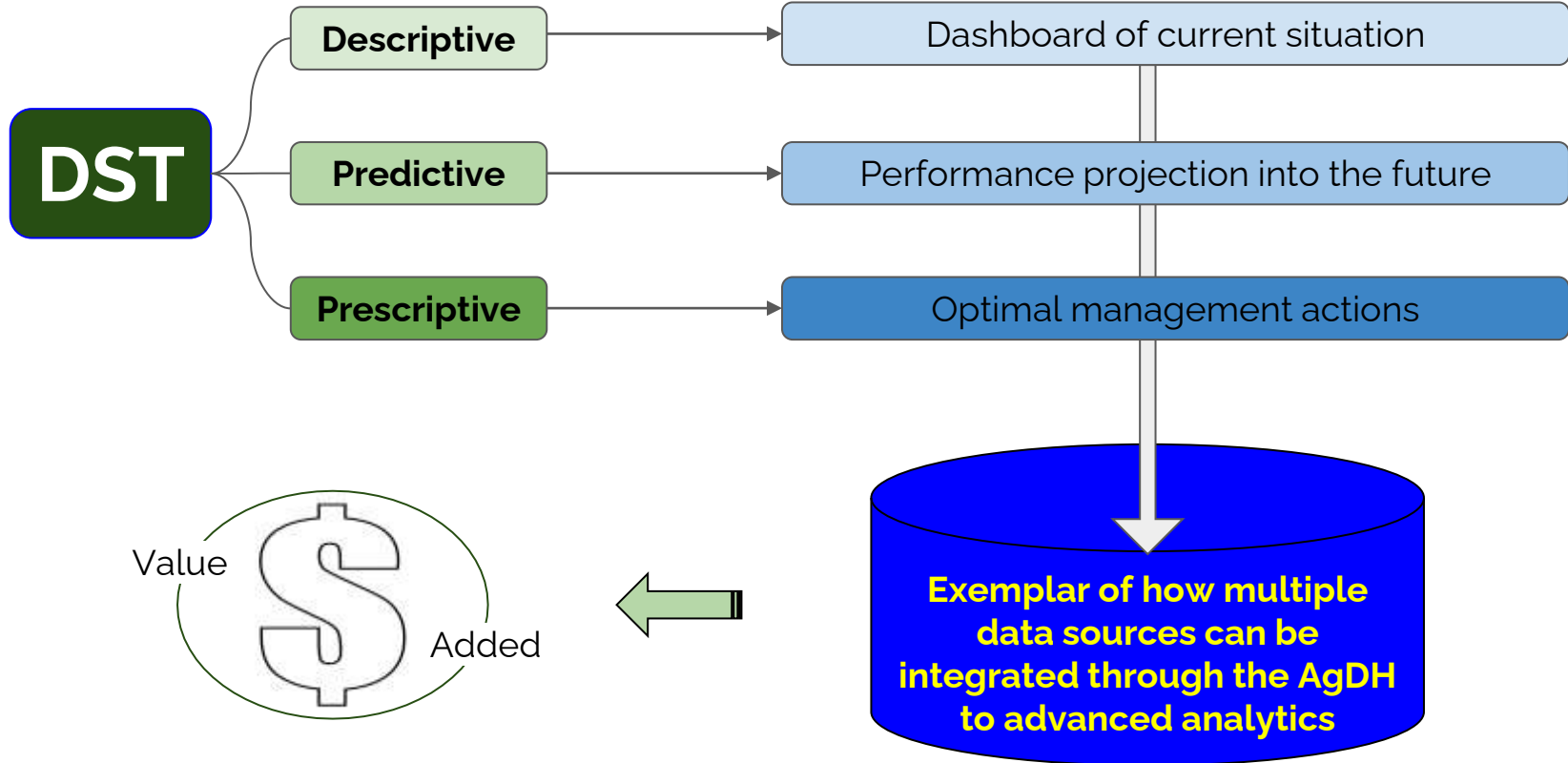




# Automation and Deployment of the AgDH



# Dairy Brain - Decision Support Tools



# Dairy Brain - Decision Support Systems

→ Research-grade models, **Decision Support Systems** (DSS)

Decision level	Model/Decision Support System	Algorithm	Live, Integrated Data	Benefit
Operational Short-Term	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, Processing	Margins controlled
Tactical Mid-Term	Selection of genetic traits to reduce clinical mastitis	Logistic regression, 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	Continuous nutritional accuracy	Cluster, Nonlinear programming	Management, Feed monitoring, DHI, Parlor	More accurate feeding
	Breeding, genetic, and culling decisions	Monte Carlo, Optimization, Machine learning	All above, health and reproductive protocols	Best breeding, genetic, and culling policies





# Acknowledgments



United States Department of Agriculture  
National Institute of Food and Agriculture

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