Economic Module:

Updates and options ahead

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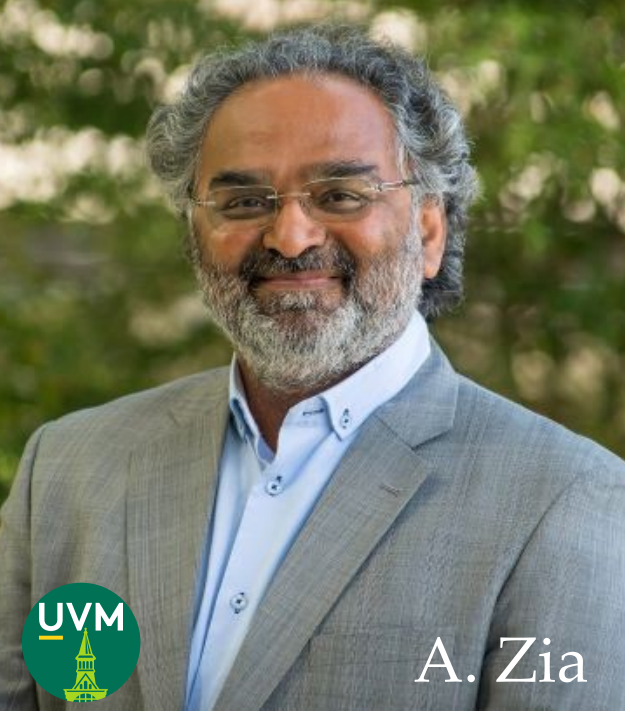
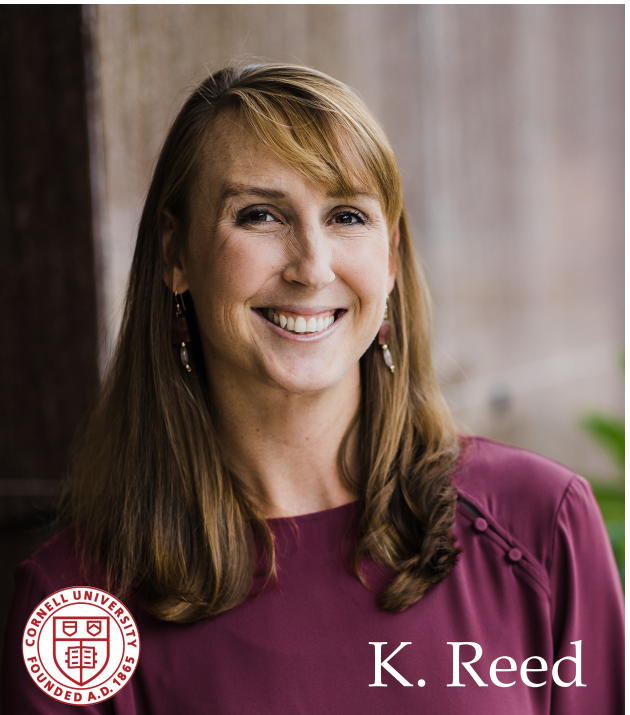
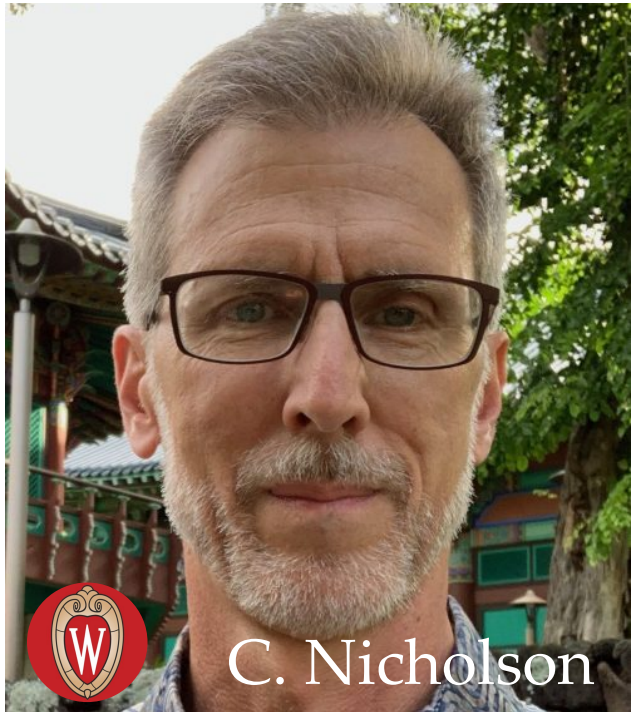






Team and Project Collaborators

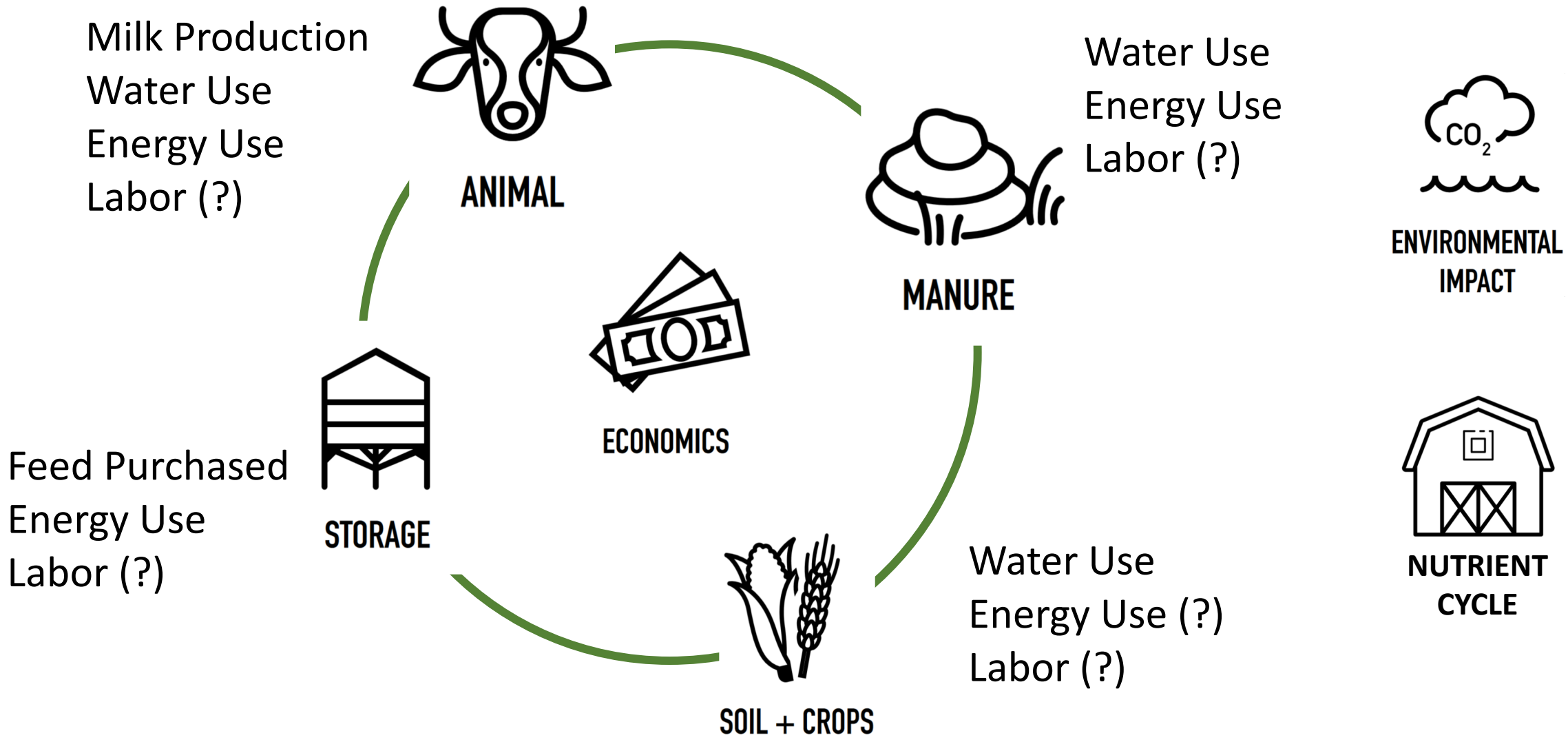
Goals

- Advance RuFaS Economic Module
- Conduct ecological economic analysis of dairy farm costs for alternate portfolios of management practices
- Develop a DSS module for RuFaS that predicts the ecological economic costs and benefits for user-defined portfolios of management practices.

Economic Module Components

Capital Costs	?
Operating Costs	Energy | Water | Feed | Labor (?)
Revenues	Milk

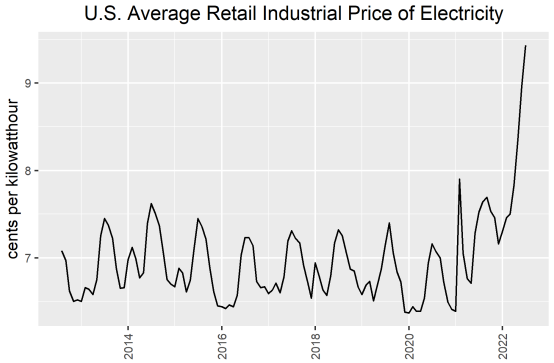
RuFaS Modules links with Economics

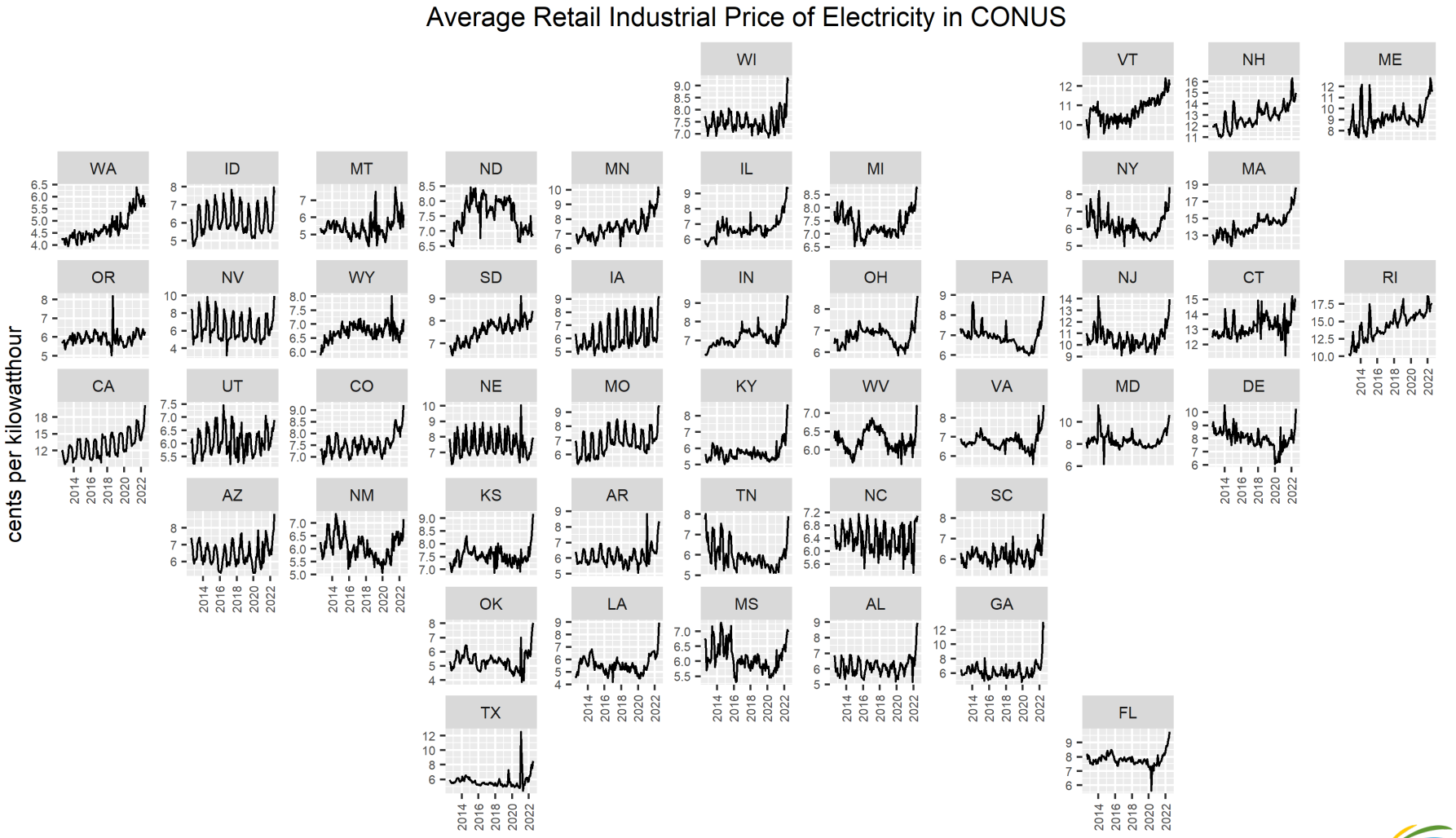


Energy Cost

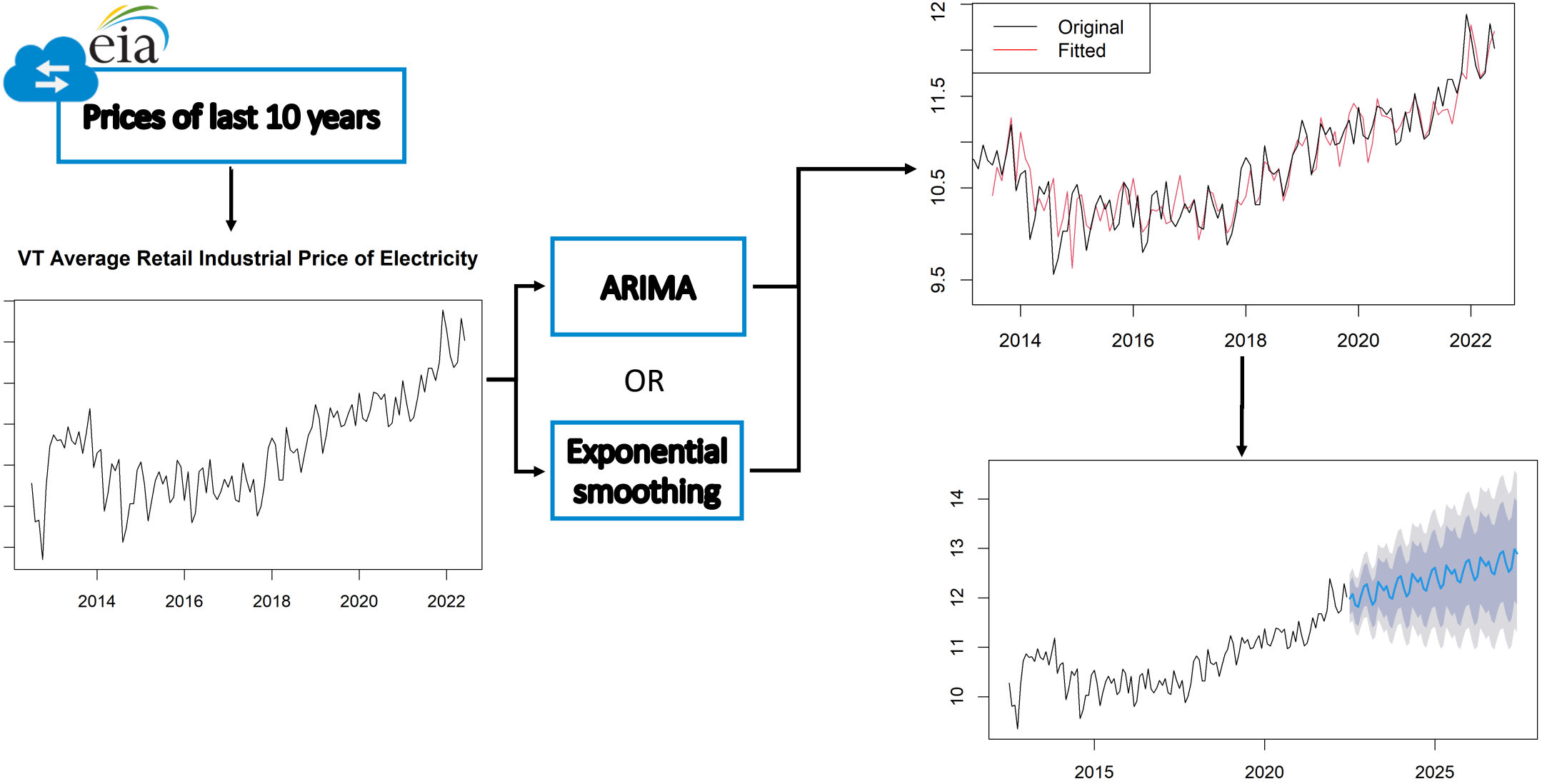
- Electricity
- Natural Gas
- Gasoline
- Diesel
- Propane

Modeling Electricity Cost at State Level



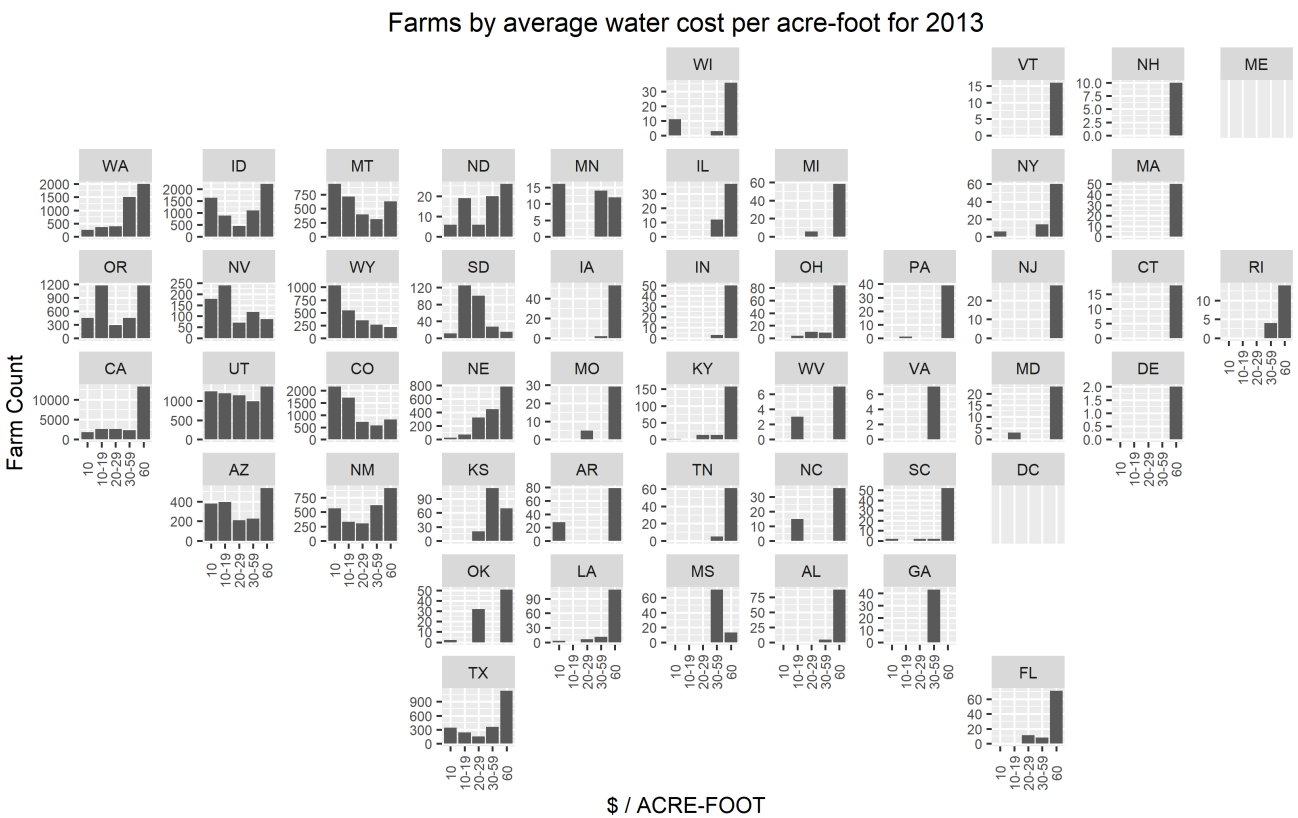


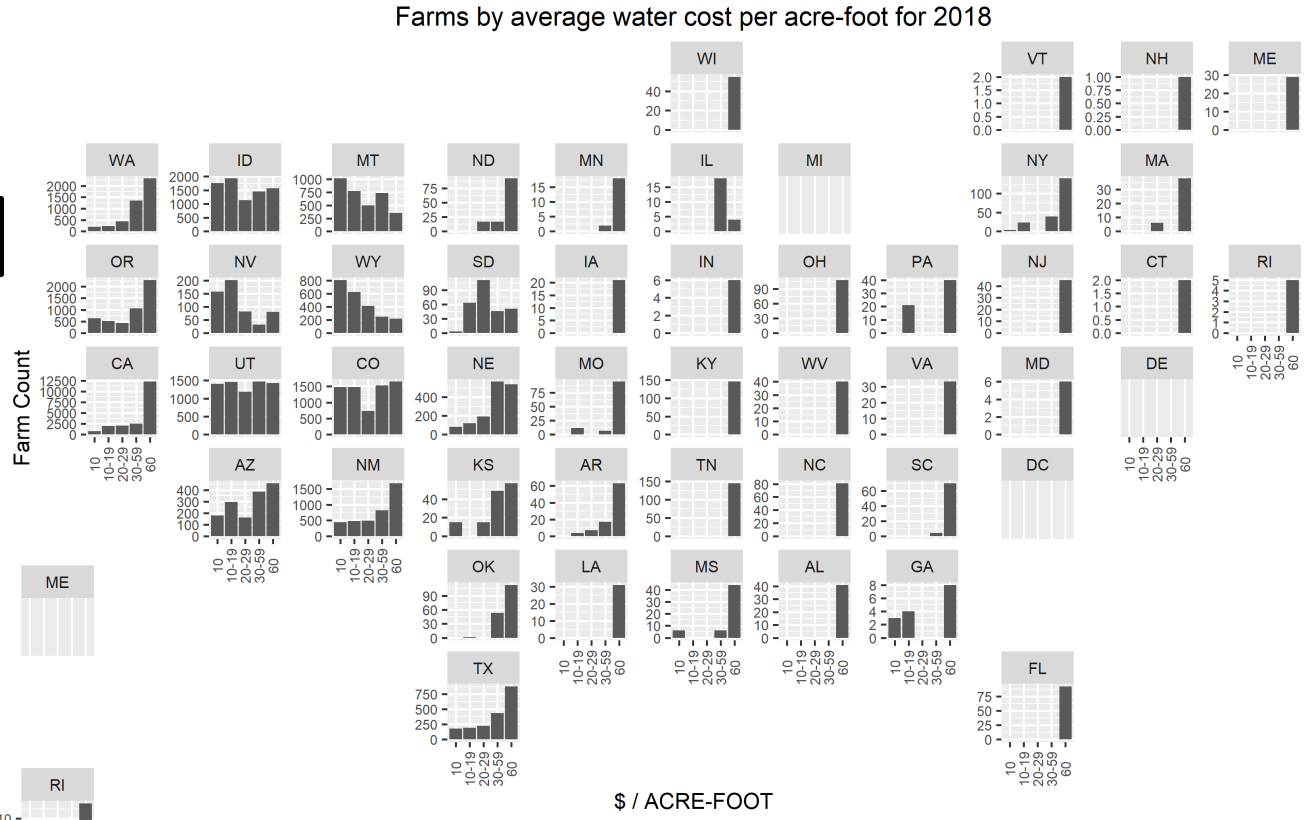
CONUS Energy Cost Forecasting



Water Cost

CONUS Modeling of Water Cost at State Level





CONUS Water Cost Forecasting

- Limited Data
- State Level Mean Water Cost per acre/foot is a viable option
- Linear trend of State mean water cost based on 2003, 2008, 2013, and 2018

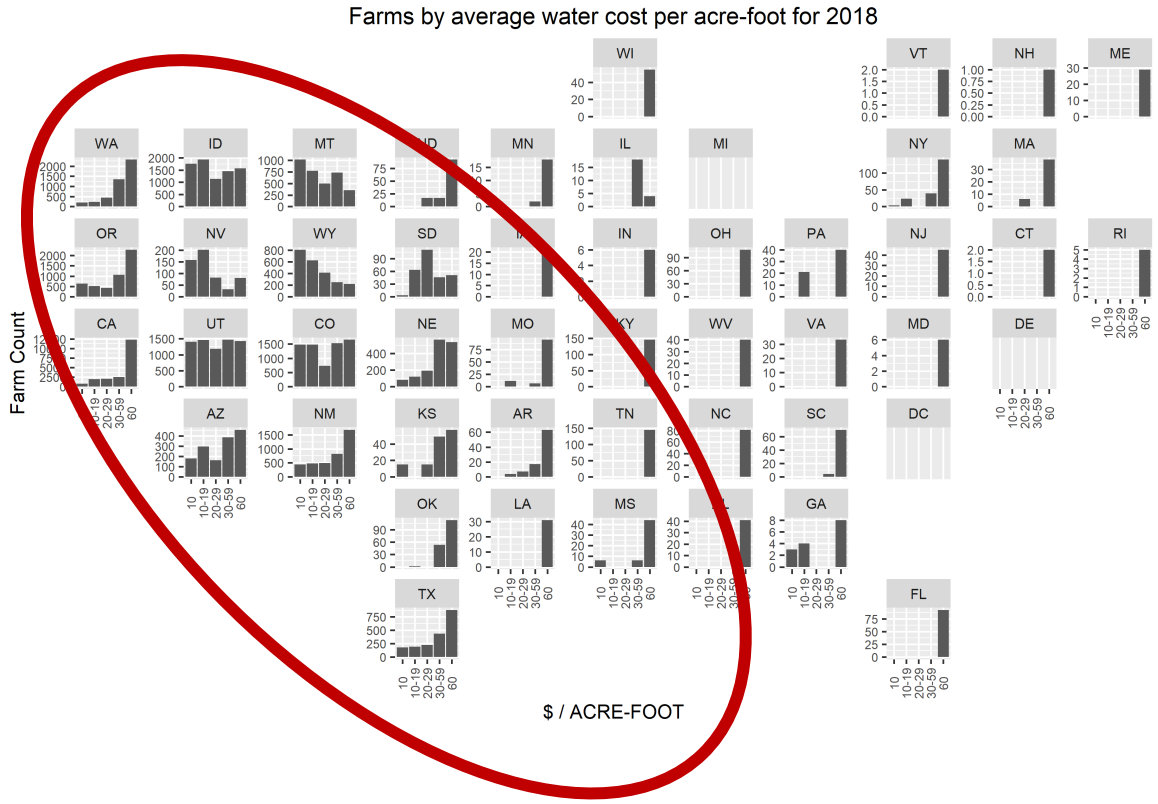
State	Average cost per acre-foot			
	2003	2008	2013	2018
Alabama	54.35	183.77	407.61	495.9
Alaska	NA	NA	131.43	165
Arizona	15.91	28.76	29.43	30.18
Arkansas	13.11	4.92	27.52	49.62
California	29.56	48.03	45.59	67.97
Colorado	7.28	14.29	16.96	14.19
Connecticut	131.23	125.58	155.41	NA
Delaware	NA	NA	200	NA
Florida	9.41	14.16	64.72	124.12
Georgia	NA	NA	41.63	43.59
Hawaii	19.88	157.75	151.45	235.42
Idaho	10.53	15.13	17.65	16.78
Illinois	NA	NA	115.85	42.31
Indiana	NA	NA	107.57	150
Iowa	2.39	10.67	78.76	62.31
Kansas	25.78	28.58	47.16	41.55
Kentucky	238.33	1111.67	1258.07	2186.57
Louisiana	5.79	73.01	70.53	254.17
Maine	26.72	NA	NA	2486.17
Maryland	71.32	13.94	566.47	279.4
Massachusetts	5.12	NA	435.19	432.72
Michigan	NA	NA	198.2	NA
Minnesota	4.09	1.88	9.83	836.1
Mississippi	NA	300	58.35	135.51
Missouri	4.17	8	192.61	257.02

State	Average cost per acre-foot			
	2003	2008	2013	2018
Montana	7.46	12.03	10.98	14.81
Nebraska	14.94	22.38	42.19	32.96
Nevada	6.15	10.28	13.6	11.65
New Hampshire	NA	NA	204.17	NA
New Jersey	31.37	NA	226.33	632.43
New Mexico	5.34	24.76	41.46	32.4
New York	153.97	36.84	406.72	164.95
North Carolina	NA	300	63.7	756.67
North Dakota	9.06	17.71	38.85	50.81
Ohio	44.42	38.64	606.02	522.74
Oklahoma	18.55	175.89	8.76	53.27
Oregon	11.8	15.68	20.18	24.22
Pennsylvania	NA	100	638.83	270.41
Rhode Island	NA	225.81	819.17	3625
South Carolina	NA	520.59	53.18	171.07
South Dakota	1.52	15.78	16.8	25.38
Tennessee	52.03	143.44	210.39	648.63
Texas	19.37	19.41	31.05	29.83
Utah	7.91	10.88	13.34	13.48
Vermont	145.91	NA	80	NA
Virginia	NA	22.68	30	130.3
Washington	19.24	26.61	32.01	39.05
West Virginia	NA	NA	123.5	1850
Wisconsin	12.12	133.04	34.1	201.29
Wyoming	3.58	5.83	8.14	8.64

Sensitivity Analysis of Water Cost Forecasting

- Linear trend of State mean water cost for 2003, 2008, 2013, and 2018

- Sensitivity analysis for some states of the mean estimation
  - ➢ Condition n≥30 and bins>3
  - ➢ Chebyshev's inequality



Feed Cost

Acquired Prices for RuFaS Feed Items

USDA Agricultural Marketing Service	
Alfalfa Meal	Feather Meal
Almond Hulls	Fish Meal
Barley	Linseed Meal
Beet Pulp	Meat and Bone Meal
Cane Molasses	Meat Meal
Canola Meal	Oats
Corn	Rice Bran
Corn Distillers Dried Grain	Soybean Hulls
Corn Gluten Feed	Soybean Meal High Protein
Corn Gluten Feed Meal	Soybean Meal Low Protein
Yellow Corn Hominy Feed	Soybean Oil
Cottonseed Meal	Sunflower Meal
Cottonseed Whole	Wheat Bran
	Wheat Middling

ADM
Blood Meal
Fats and Oils
Calcium carbonate
Dicalcium Phosphate, dibasic
Calcium Phosphate monobasic
Calcium Sulfate, dihydrate
Magnesium Oxide
Potassium Chloride
Sodium Bicarbonate
Sodium Phosphate, Monohydrate
Potassium Sulfate
Ammonium Chloride
Calcium Chloride dihydrate
Whey

Different Sources

Varying temporal span

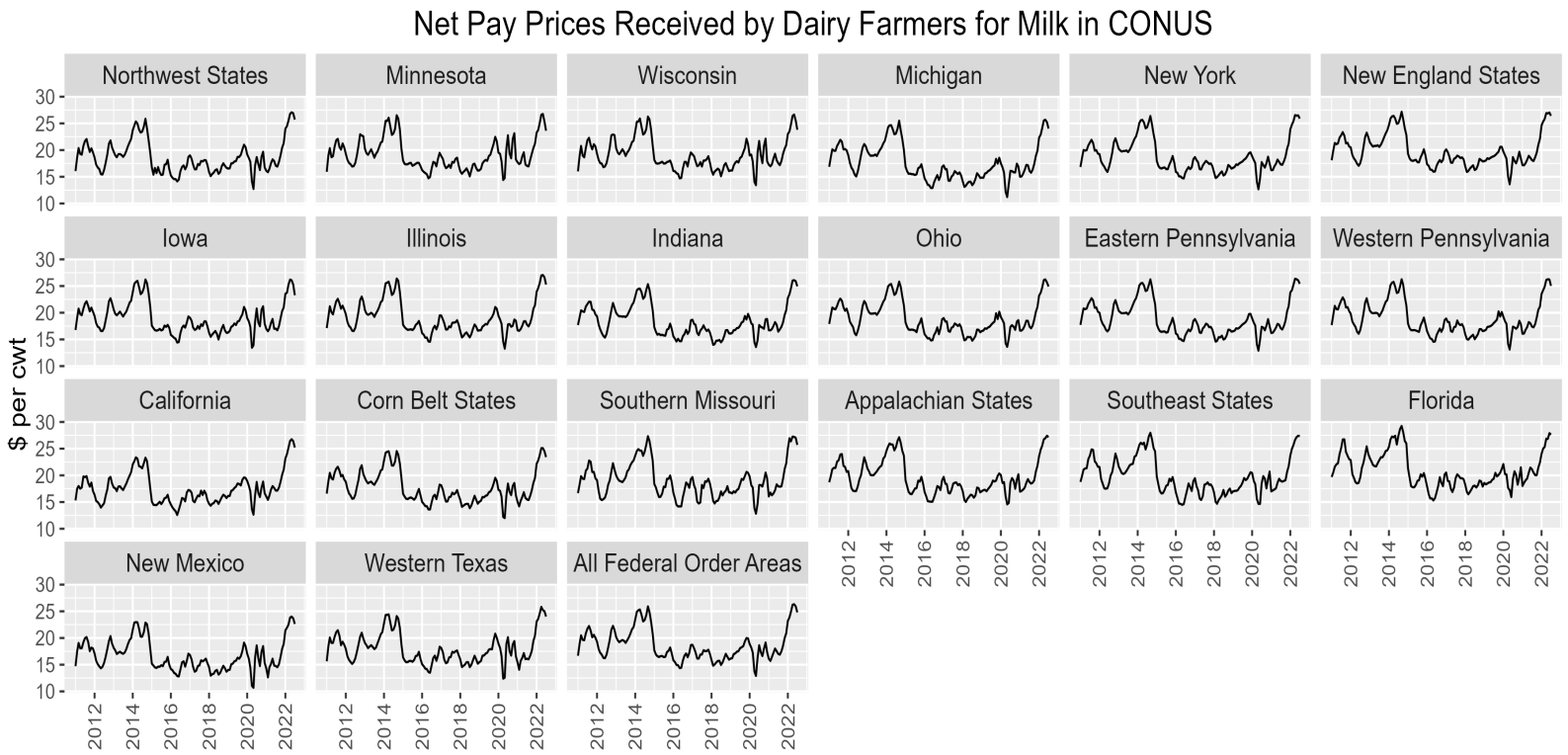
Varying temporal step

No automated way to pull information for some feed items

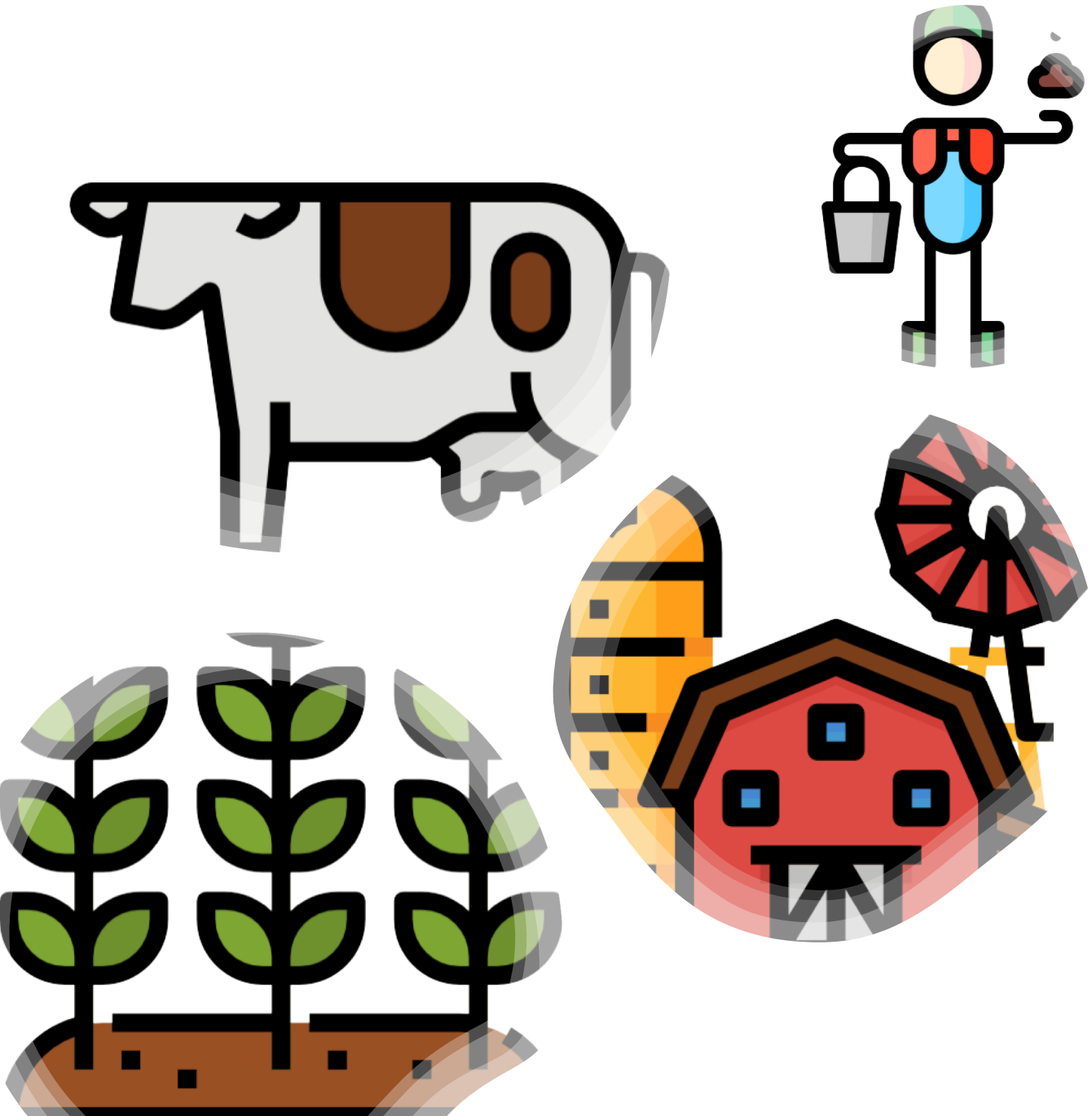
Milk Price

USDA Agricultural Marketing Service
U.S. DEPARTMENT OF AGRICULTURE

Modeling Milk Prices at Reporting Areas Level



Ecological economic analysis of dairy farm costs



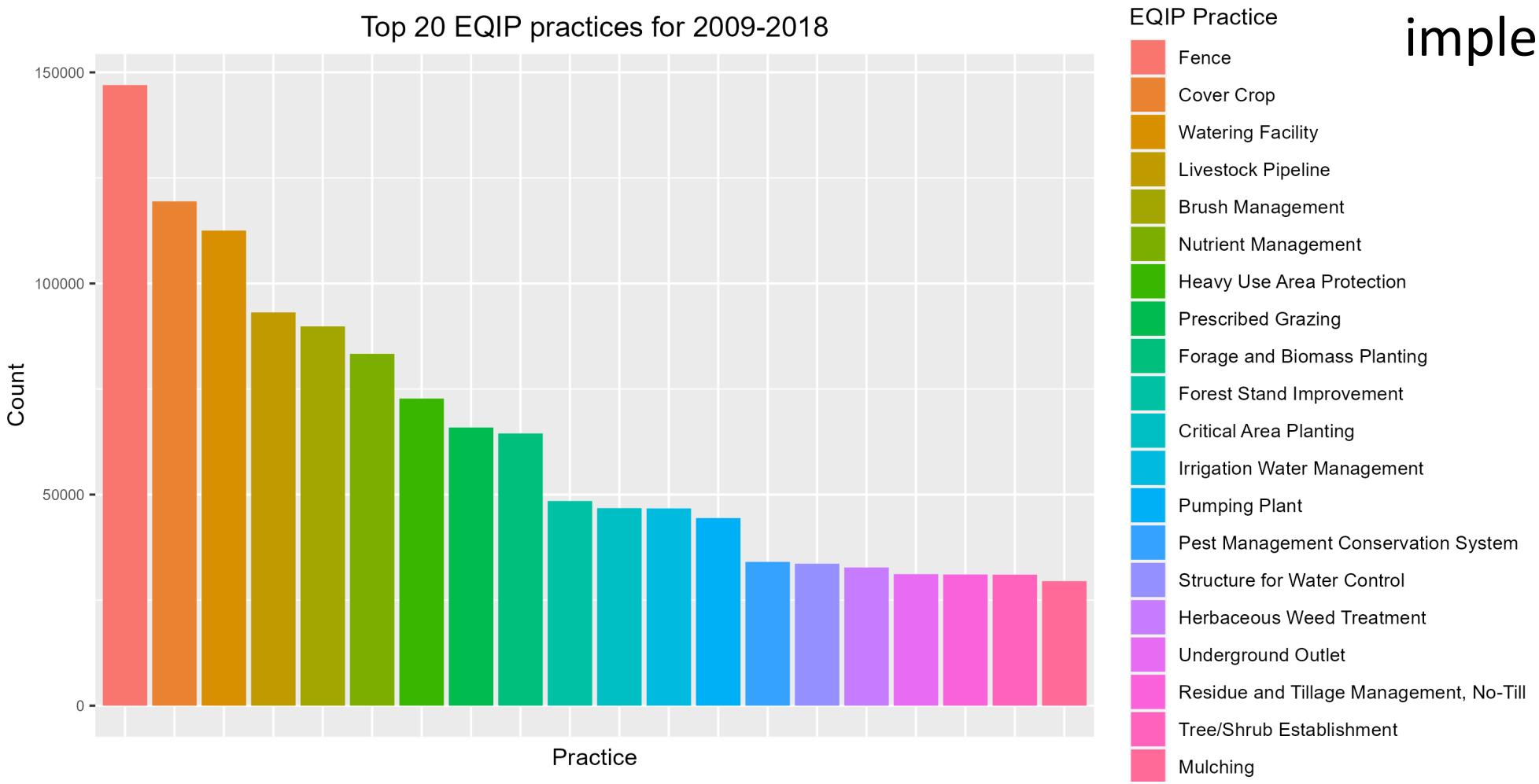
Management Practices

- Feed Storage
- Animal
- Manure
- Crop & Soil

Environmental Quality Incentives Program Data Set

247 practices in the dataset

45-75% of the implementation cost



Discussion

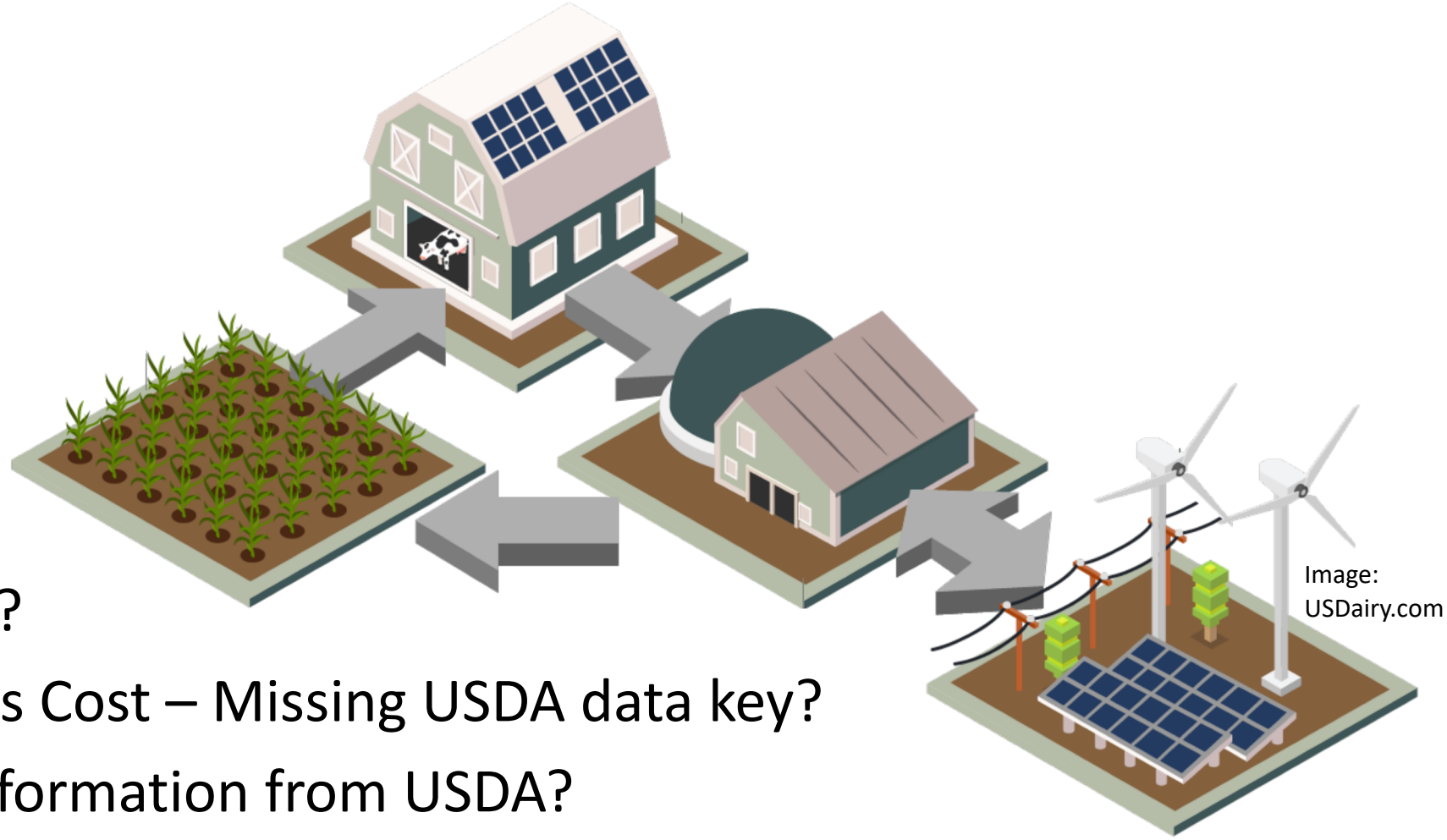


Image: USDairy.com

- Simulation timeframe?
- Management Practices Cost – Missing USDA data key?
- Detailed water cost information from USDA?
- How to take into account labor cost for RuFaS v1.0?
- Exogenous regressors for mailbox milk price?
- Inflows (Outflows) from (to) the other RuFaS components?

Thank you for your attention!