Agriculture
On & Around Tug Hill
Past Present Future

Joe Lawrence

Tug Hill Commission

October 2021

Ruminant Animals and Climate

https://www.blm.gov/programs/natural-resources/rangelands-and-grazing/reindeer-grazing

http://factsanddetails.com/asian/cat68/sub433/entry-3575.html

Lewis Co. / Northern NY

- Well suited for dairy cows (ruminants)
  - Forage utilization
    - Forage Digestibility
  - Air Temp
    - Dairy Cows optimum air temp is ~45^{o}F
  - Fresh Water
    - Milk is over 90% water

Lewis County

- A lot has changed……..and a lot has not
- U.S. Census – past and present
  - Cattle
  - Horses
  - Mules
  - Hogs
  - Sheep
  - Poultry
  - Corn
  - Small Grains
  - Hay Crops
  - Maple

'The things (natural resources, industries, etc.) that defined Lewis County when it was first formed are the same things that define use today.'

– Tom Yousey, 2019

Lewis County

Dairy as % of Total Farms

Year	Total Farms	Dairy Farms	% as Dairy	Milk Produced, lbs
1900	3838	3225	84%	132,637,408
1935	2766	2271	82%	175,323,368
1959	1291	991	77%	252,240,512
2017	625	207	33%	592,661,000

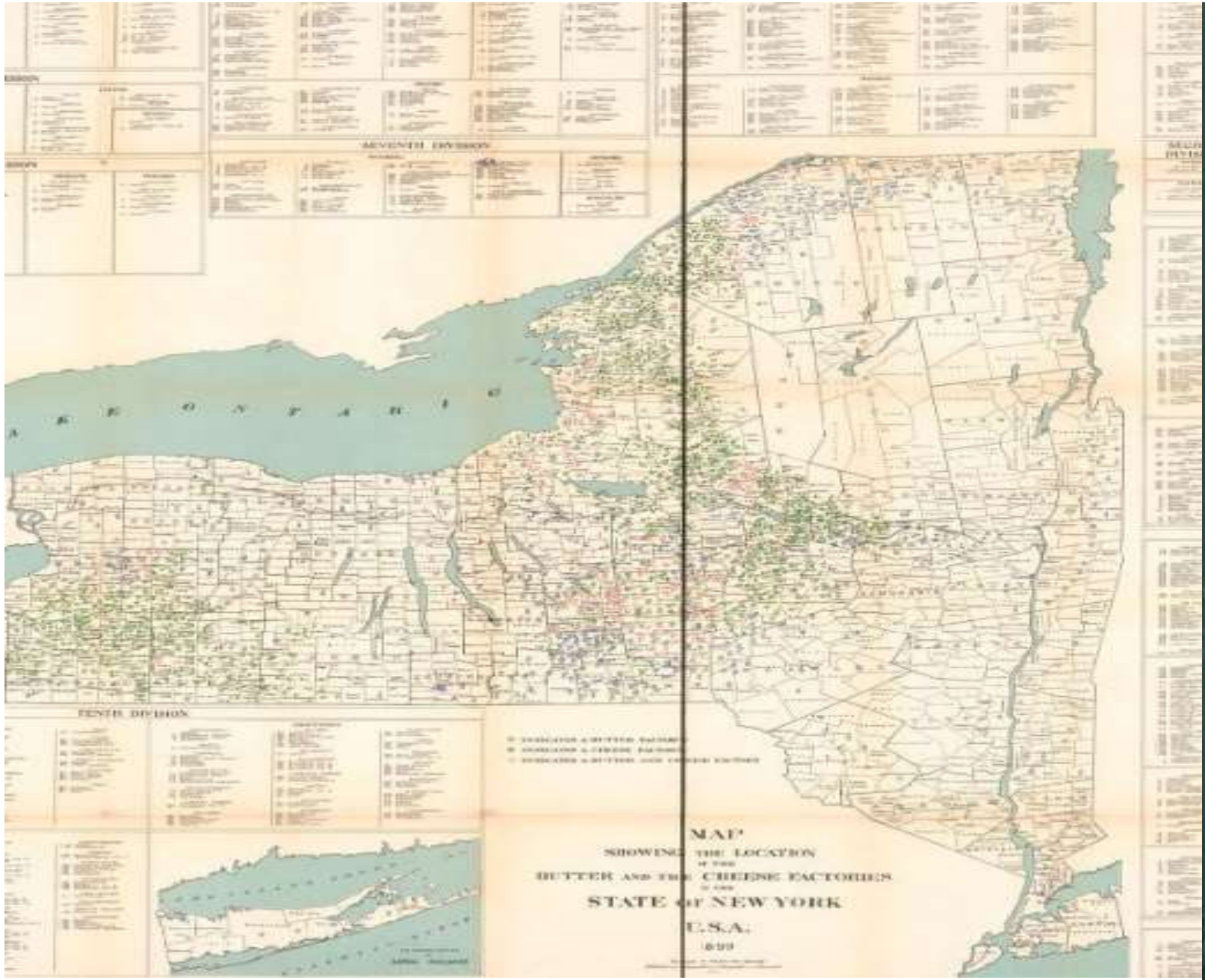
Milk	Gal. Produced	Gal. Sold	% Sold
1900	16,579,676	12,062,931	73%

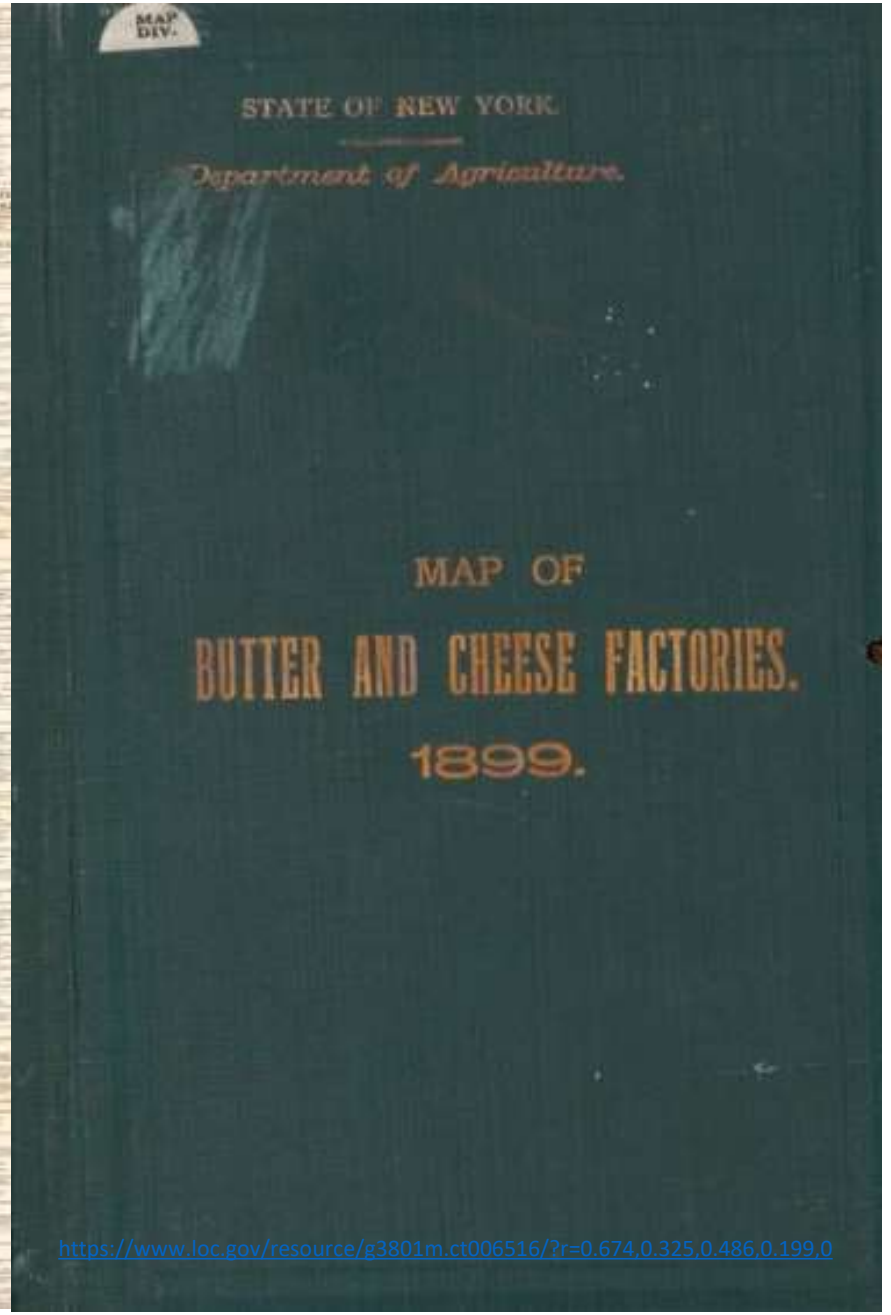
Source: USDA-NASS

http://agcensus.mannlib.cornell.edu/AgCensus/getVolumeOnePart.do?year=1982&part_id=32&number=32&title=New%20York

Dairy is still by far the largest economically

Forestry
Livestock
Honey
Grapes
Apples
Vegetables
Small Fruits
Christmas Trees
Horticulture
Agri-tourism





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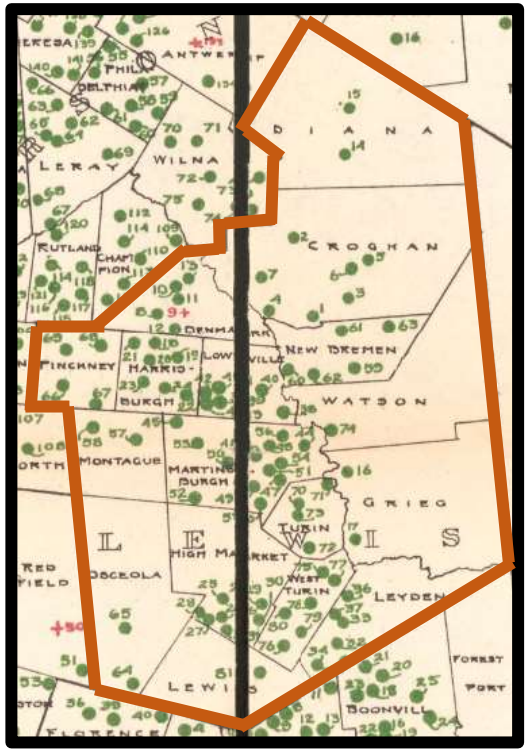
Lewis County

1899 - 80 Butter and Cheese Plants



LEWIS

CROGHAN
1 Champion Spring
2 Clover Valley
3 Croghan
4 Haller
5 Indian River
6 Renaux
7 Swiss Creek

DENMARK
8 Copenhagen
9 Crown Brand
10 Harter
11 Imperial
12 Rising Star
13 Standring

DIANA
14 Erie
15 Sterling

GREIG
16 Independence
17 Spring Brook

HARRISBURGH
18 Lanpher
19 New Columbia
20 New Model
21 River Street
22 South Harrisburgh
23 Valley Dale
24 West Harrisburgh

HIGH MARKET
25 Alpine
26 Anken
27 Dairy Hill
28 Fish Creek
29 Legal Tender
30 Plummer
31 West Leyden

LEWIS
81 Sins & Bierley

LEYDEN
32 Cloverdale
33 Leyden Cheese Ass'n

LEYDEN
34 Meadow Brook
35 Silver Spring
36 Spring Hill
37 Malcolm

LOWVILLE
38 Lowville
39 High Market
40 Sharp
41 Sulphur Spring
42 Searls No. 1
43 Eagle

MARTINSBURGH
44 Black River Valley
45 Boston Brand
46 Gilt Edge
47 Glendale
48 Gowdy
49 Maple Ridge
50 Leonard
51 Martinsburgh

MARTINSBURGH
52 Mud Lake
53 Noble
54 Searls No. 2
55 Starring
56 Valley Spring

MONTAGUE
57 Rector
58 Forks

NEW BREMEN
59 Beach Hill
60 Clover Valley
61 Cold Spring
62 Farmers Choice
63 Kirschnerville

OSCEOLA
64 Croniser
65 F. N. Chrestien

PINCKNEY
66 Barnes Corners

PINCKNEY
67 New Boston
68 Pinckney Corners
69 Union

TURIN
70 Carpenter
71 Houseville
72 Petrie
73 Welsh Hill

WATSON
74 Cedar Spring

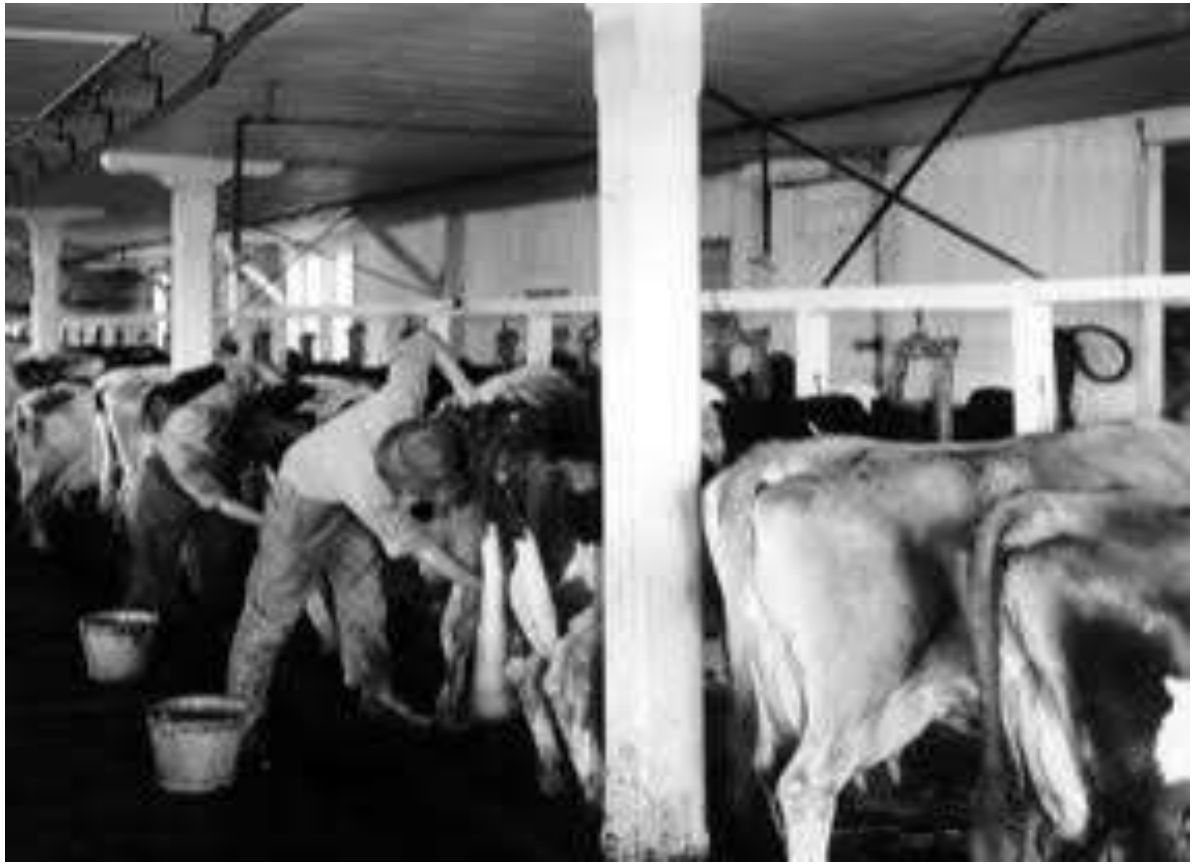
WEST TURIN
75 Grass Valley
76 A. Katzmayer
77 Kollinsville
78 Miller
79 Mohawk Hill
80 Regetz

https://www.loc.gov/resource/g3801m.ct006516/?r=0.674,0.325,0.486,0.199,0

1913 - Certified Bottled Milk

The first bottled and certified milk from Lewis County came from a farm in Denmark owned by Mr. Herbert E. Cook. In 1913 they began shipping milk from a plant on their farm. They were also one of the first farms in the county that used milking machines and a silo. Pictured is workers at the Herbert E. Cook farm in Denmark NY preparing the cows to be milked, 1916.

Source: Black River Valley Naturals



The Big Cheese

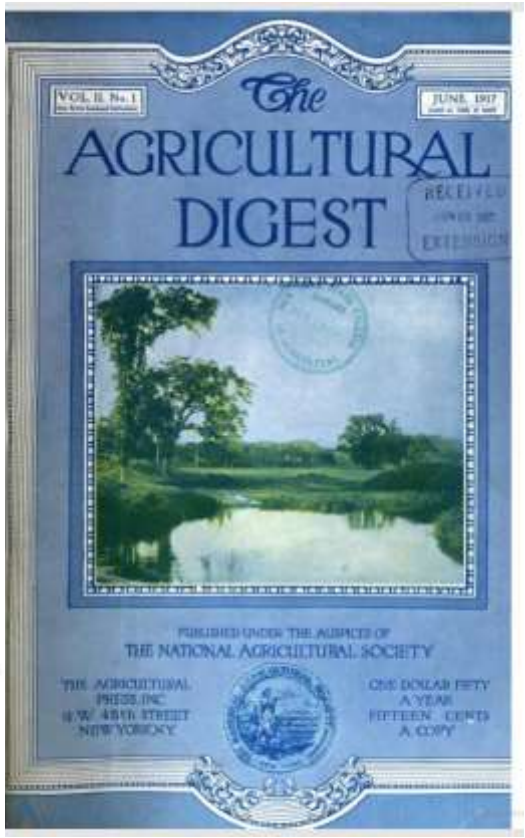
1916

- Big Cheese made in West Martinsburg appears at World's Fair

- Weight: 11,000 lbs
- 20 ft circumference
- Milk from 2850 cows
  - 105,000 lbs (13,125 gal.) of milk used
- Milk capacity of 25 factories for one day

This huge cheese was made in West Martinsburg, N. Y., under the direction of H. A. Reese, of Lowville, N. Y. It weighed, when exhibited, 11,000 pounds, and was more than 20 feet in circumference. One hundred and five thousand pounds of milk, the intake of 25 factories for one day, were used in the making. It was taken to the factory by 13 teams in the form of curd, where it was molded in hoops of galvanized sheet steel by Mr. Reese and 15 assistants. The base was made of small cheeses weighing 60 pounds each.

747



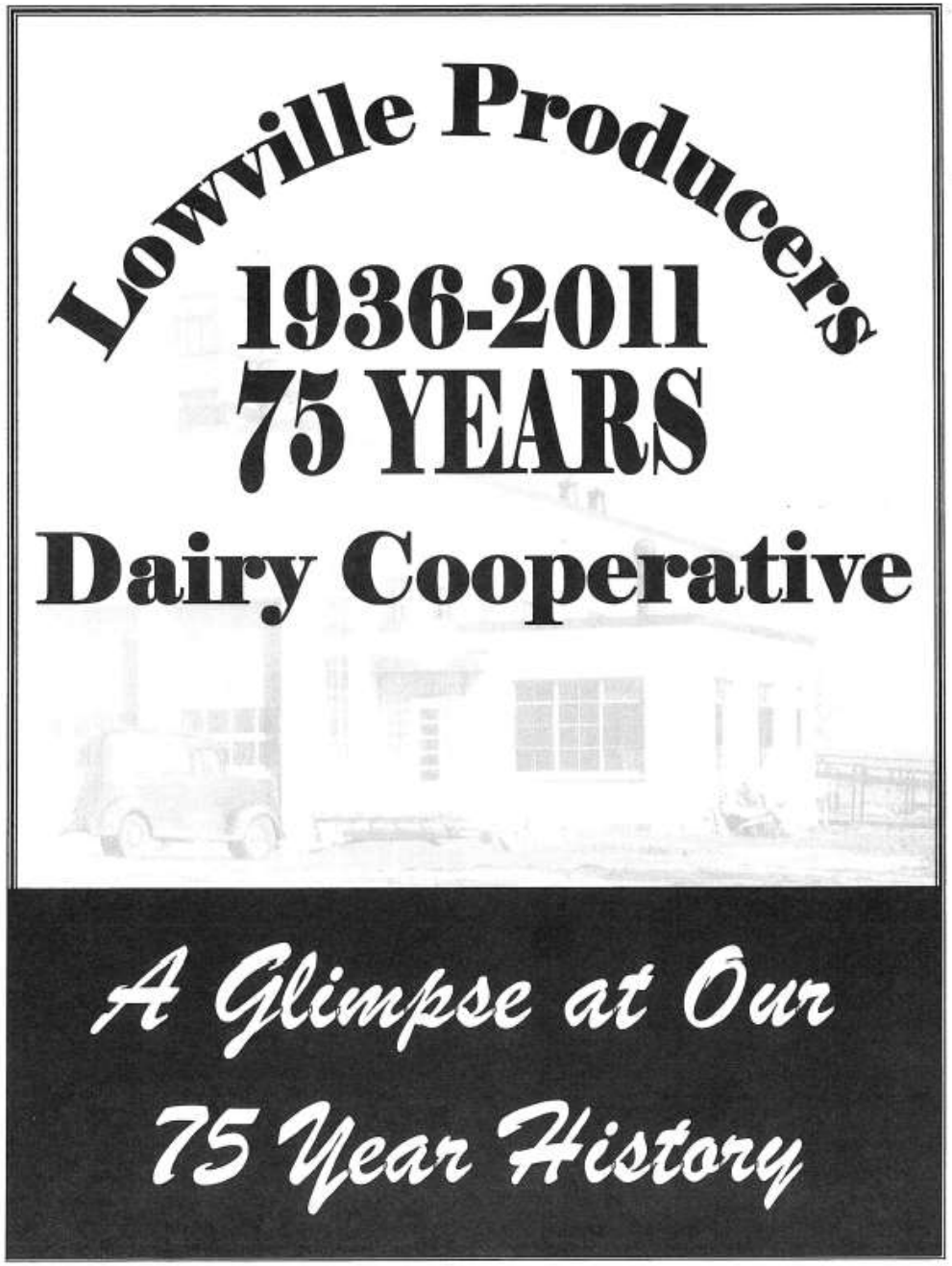
Milk Plant Capacity

1916 - Big Cheese

- Milk from 2850 cows
    - 105,000 lbs (13,125 gal.) of milk used
        - Avg. 38 lbs/cow
- Milk capacity of 25 factories for one day
    - Avg. 4,200 lbs per plant per day

2020: Kraft-Heinz

- Processes ~2 – 2.5 million lbs per day



- Cooperatives were created as a way for small producers to gain bargaining power by working as a group.
- Co-ops are protected by special laws.

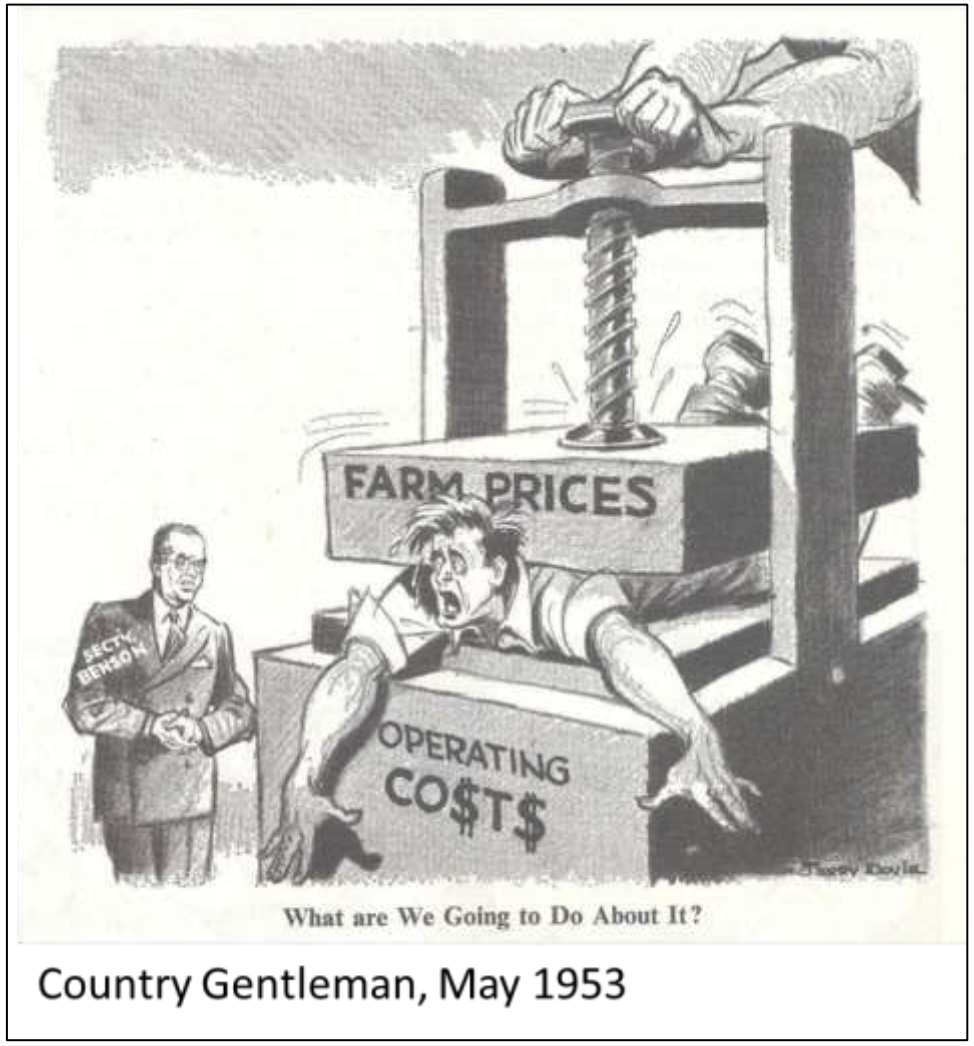
1936
- 266 member farms

1938
- 297 member farms

2020
- ~150 member farms

The Ag Economy

- Tight Margins are a generational issue
- Food treated as a commodity
- Efficiency is a blessing and a curse



Country Gentleman, May 1953

Croghan Milk Front Remains Quiet With Sheriff on Duty

Lowville—All was quiet on the Croghan front Friday, as the strike of the Dairy Farmers' Union went well into its second week in Lewis County against the Sheffield Farms, Inc.

Following Thursday's verbal skirmish between Sheriff Albert Schoff and Christopher Yousey, mayor of the village of Croghan, when Mayor Yousey ordered the sheriff out of Croghan, the peace and quiet which reigned Friday was more or less of a surprise to Lewis residents. In spite of the lack of trouble, a certain tension remained and interest reached a peak in this section.

"All was quiet on the Croghan front Friday, as the strike of the Dairy Farmers' Union went well into its second week in Lewis County against the Sheffield Farms, Inc."
Ogdensburg Journal, September 04, 1937

1928

1928

J.L. Kraft purchased the Phenix Cheese Company in Lowville, which later became the Kraft-Phenix Cheese Corporation. Two different articles from the Journal & Republican refer to this same building (I'm pretty sure it's the same building!) as Lowville Cold Storage and Kraft Cold Storage, once considered to be the largest cold storage for cheese in the U.S. or the world (depending which article!). We believe this is one of the buildings across from the Lowville Farmer's Coop fertilizer mixing building, along the railroad tracks.

1944

Lowville Cold Storage was the shipping point for **all** cheese being shipped to Europe.

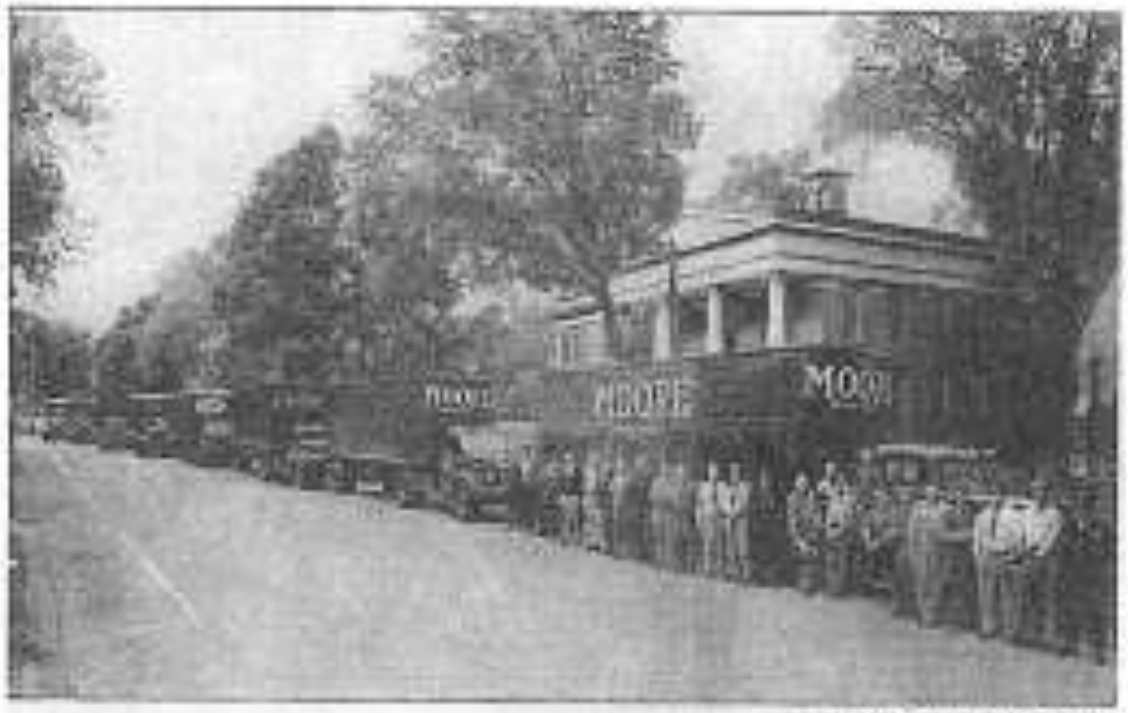


Photo submitted by Gordon Allen

A quarter of a million pounds of cheese from Lowville heading for the war front, June 3,1944.

9/7-8/08

Remember when...

Some will still remember when the Lowville Cold Storage was the shipping point for all cheese being shipped to Europe during World War II. Nancy Renodin loaned us this photo that belonged to her dad, the late George Veitch. I worked for Kraft and for George during a summer vacation from college in 1962.

The photo was taken along State Street in the village of Lowville (the Lewis County Court House can be seen in the background). Moore Northern Haulers trucks had been loaded with 213,961 pounds of cheese and were headed for the docks of an East Coast port.

2021

- Philadelphia Cream Cheese
- String Cheese
- Daily Milk Usage > Lewis Co. Supply
- Private Sector Employment

Processing in the Region

- Kraft Heinz (Lewis Co.)
- Black River Valley Naturals (Lewis Co.)
- Great Lakes Cheese (Jefferson Co.)
- Crowleys (Jefferson Co.)
- Upstate Niagara (SL Co.)
- Hood (Oneida Co.)

Lewis Co. On-farm

- Shultz Cheese Curd
- Autumn Ridge Goat Farm
- Cedar Hedge Goat Farm
- Hidden Pastures Goat Dairy
- O'Brien Family

Quick Break Q &A

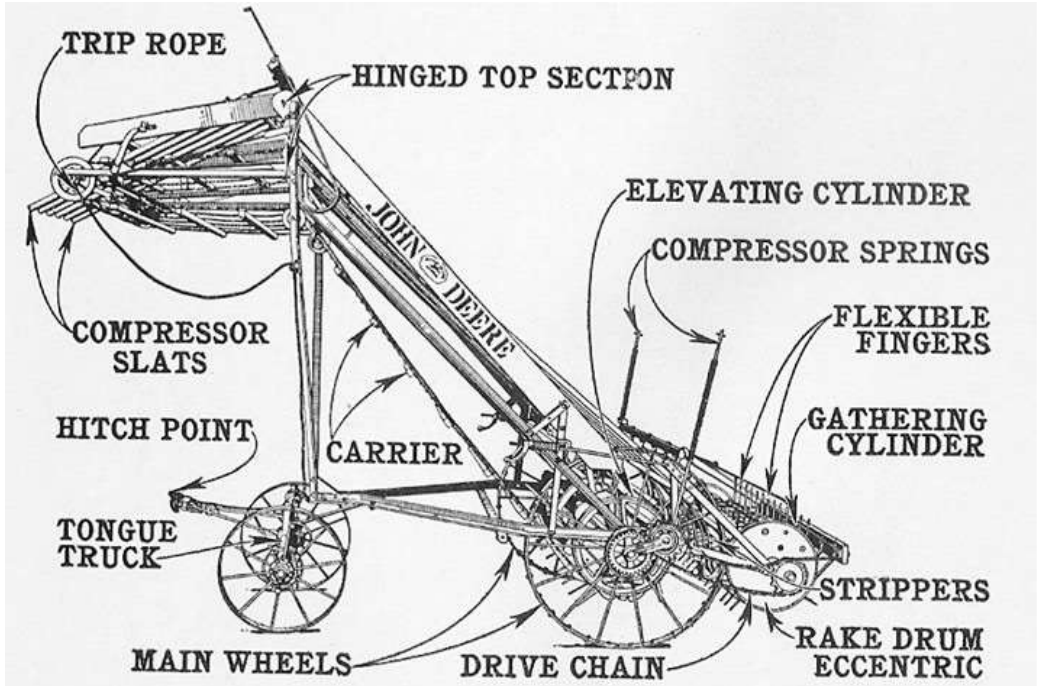


Figure 130—Double-cylinder loader with the more important parts named.

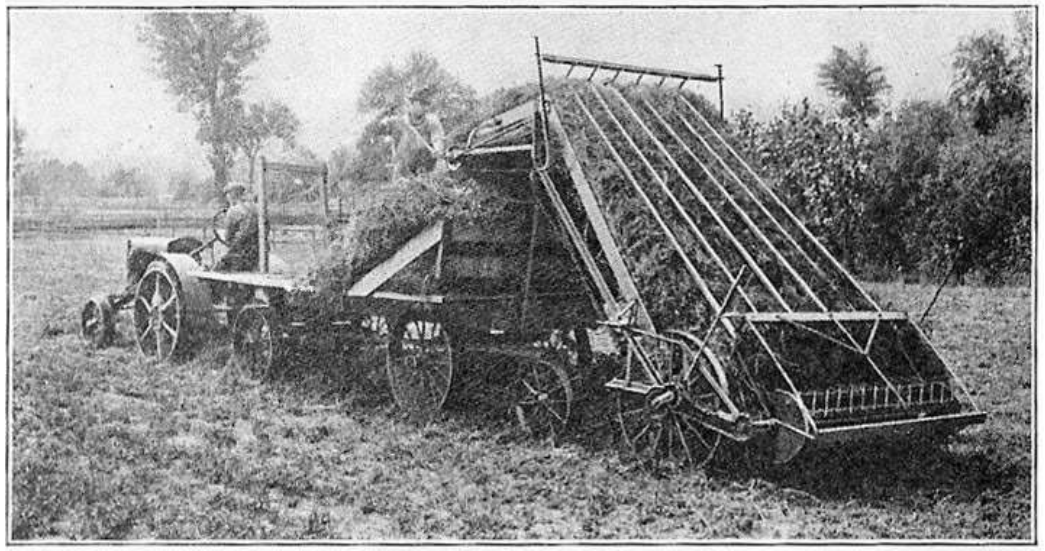


Figure 131—Starting a load with the carrier of the double-cylinder loader down.

Continual Advancement

- Production per cow
  - Genetics
  - Nutrition
  - Cow Comfort

- Resources needed per unit of output
  - Water
  - Land

Lewis County

Farms with Horses

1935

- 2081 (75% of farms)

1959

- 412 (32% of farms)

Joseph Ebersole harvests 15-foot-high corn on his Beaver Falls farm. By the 1890s, ensilage—the storage of green fodder for later use—was becoming widespread. When grain is tightly packed in a silo, oxidation and fermentation are limited, preserving the taste and nutritional value of the food. Before ensilage became popular, dairy farmers often avoided the cost of wintering their cows by selling them in the fall and buying a new herd in the spring. (Larry Myers collection.)

36

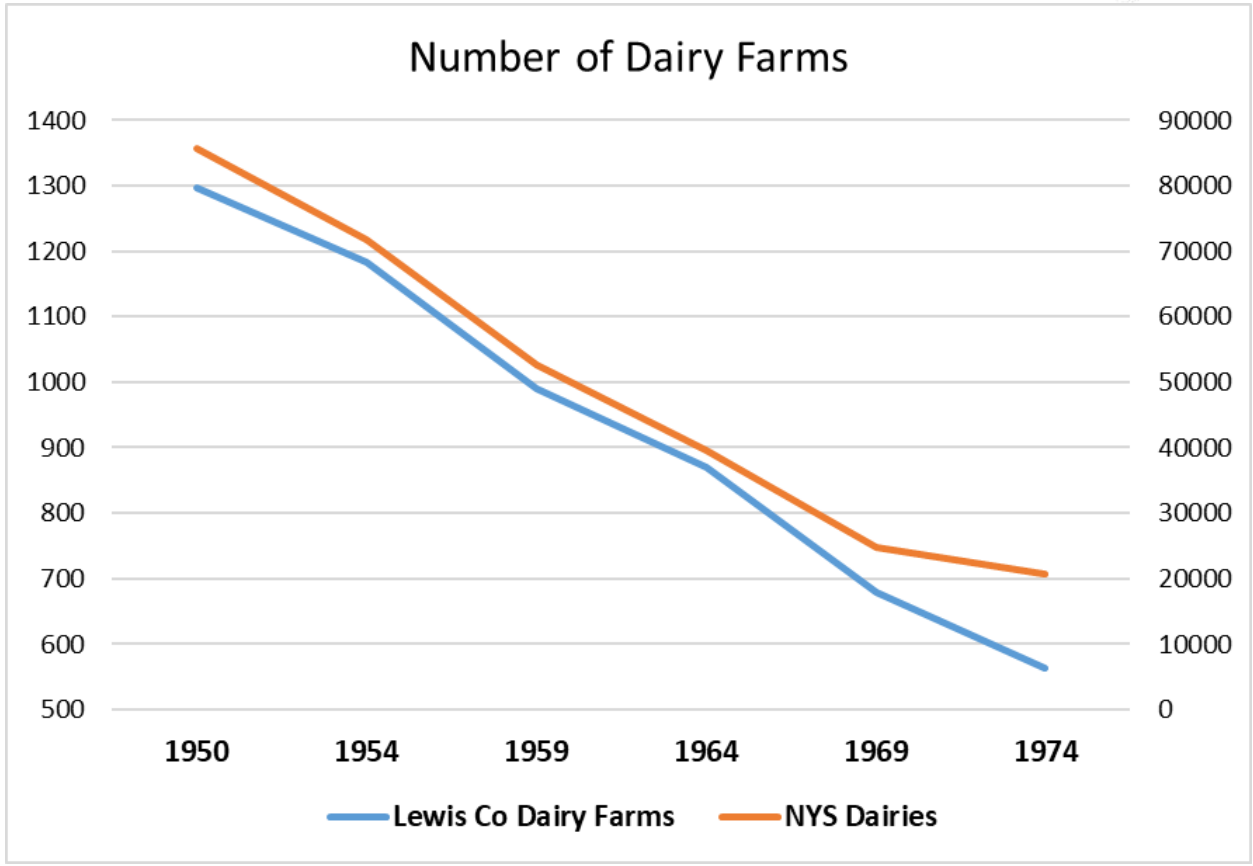
Technology and Food Safety

Dairy Farm numbers dropped quickly in the 1950's

% drop from 1950 to 1969

NYS: 58%

Lewis Co: 48%



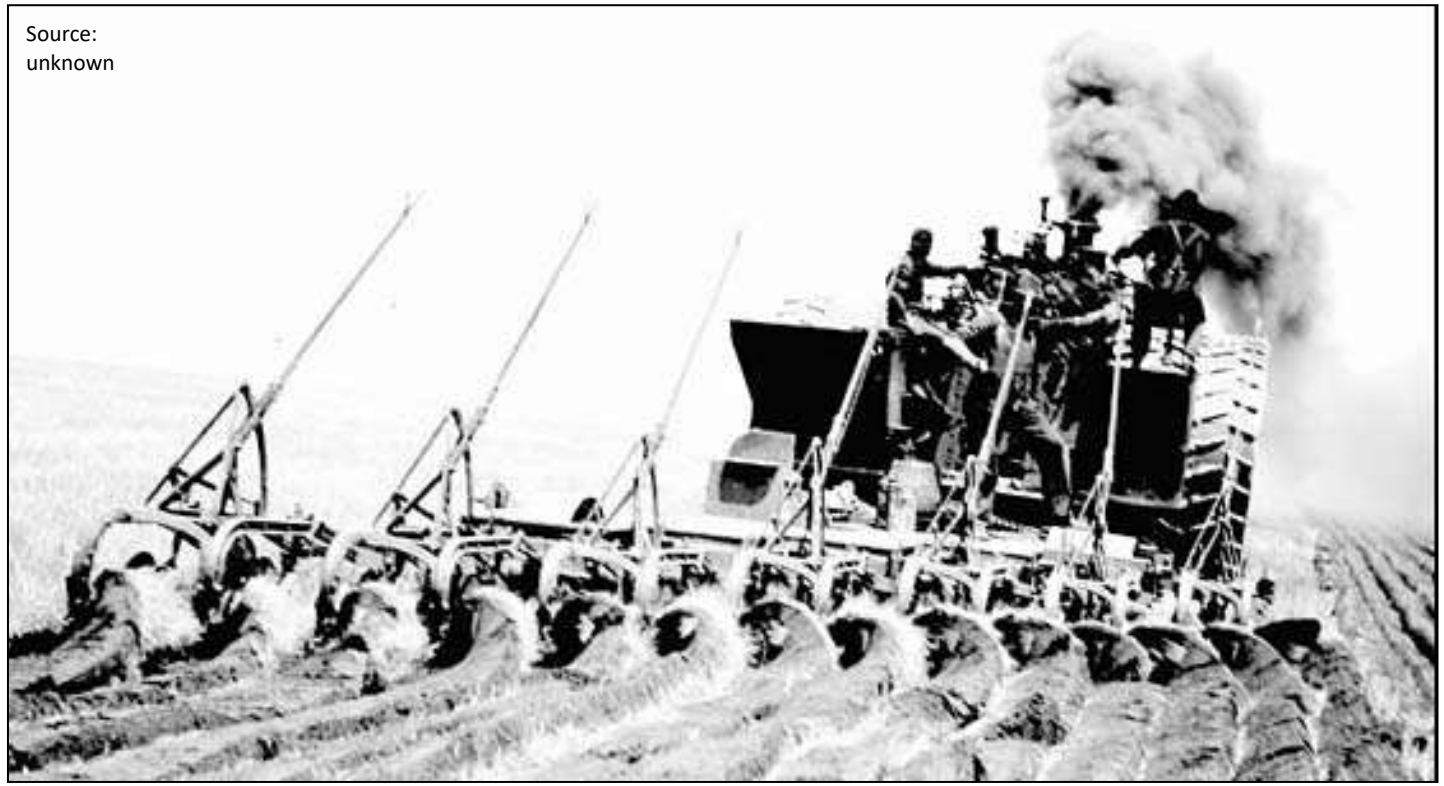
Source: USDA-NASS

Technology and Food Safety

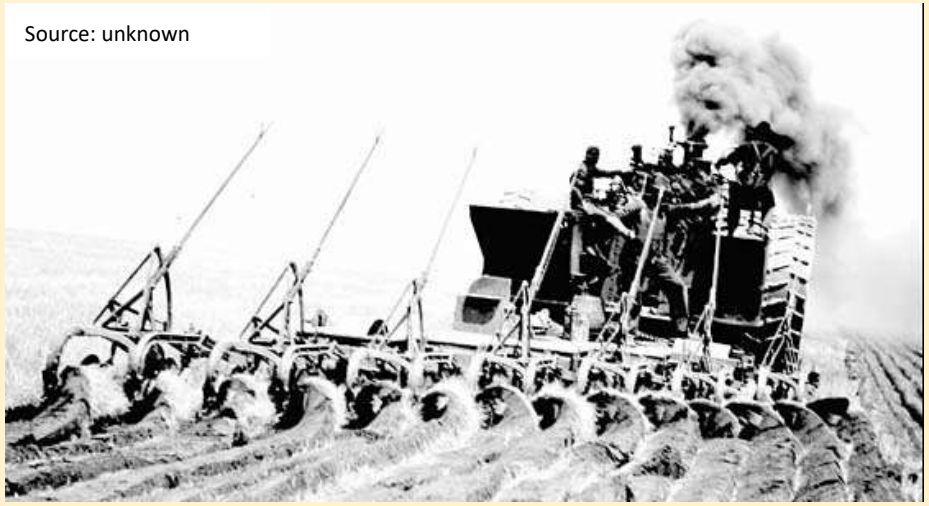
http://www.mtfca.com/discus/messages/257047/285918.html?1335871590

Learn & Adapt

Source:
unknown



Change Takes Many Forms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Corn Yields

- Plant Genetics
  - Traditional
  - Biotech
- Plant Nutrition
- Pest Management
- Soil Health

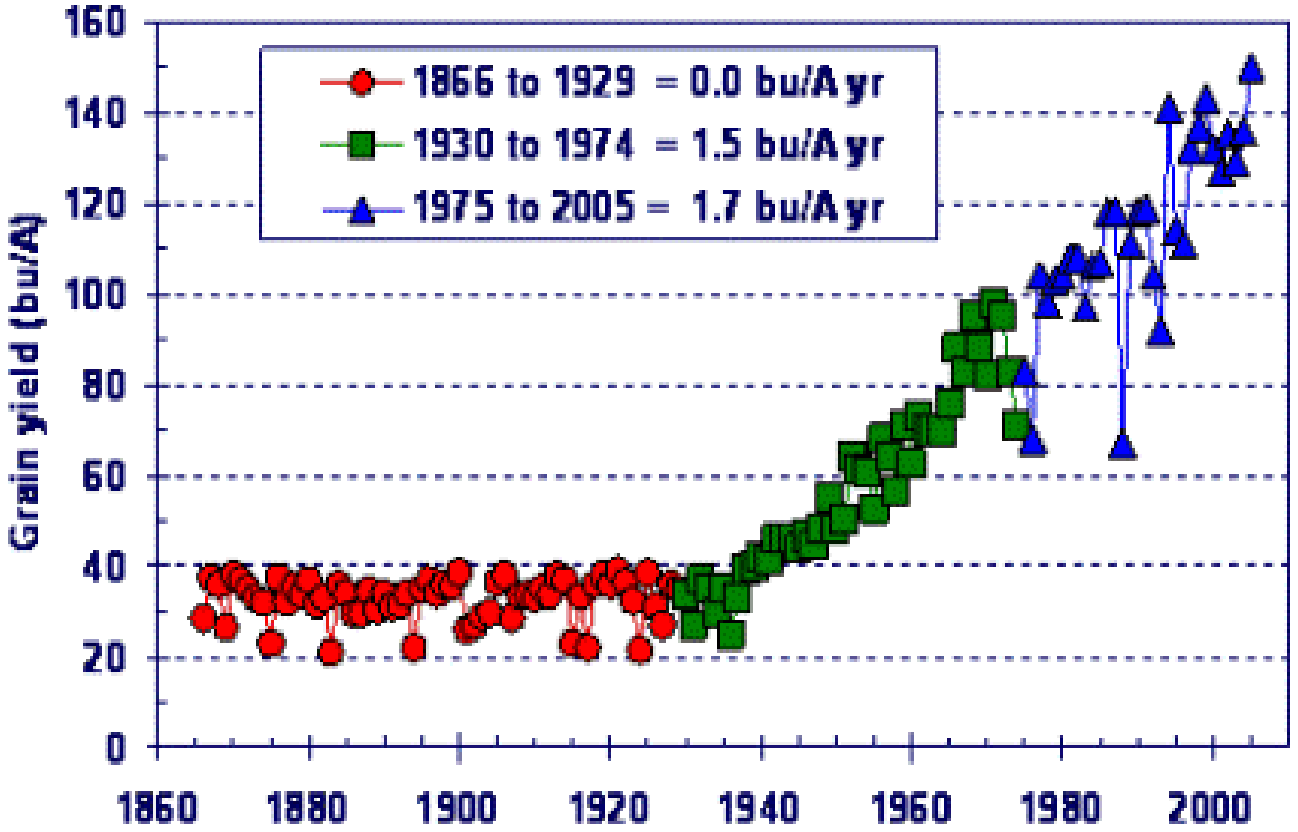
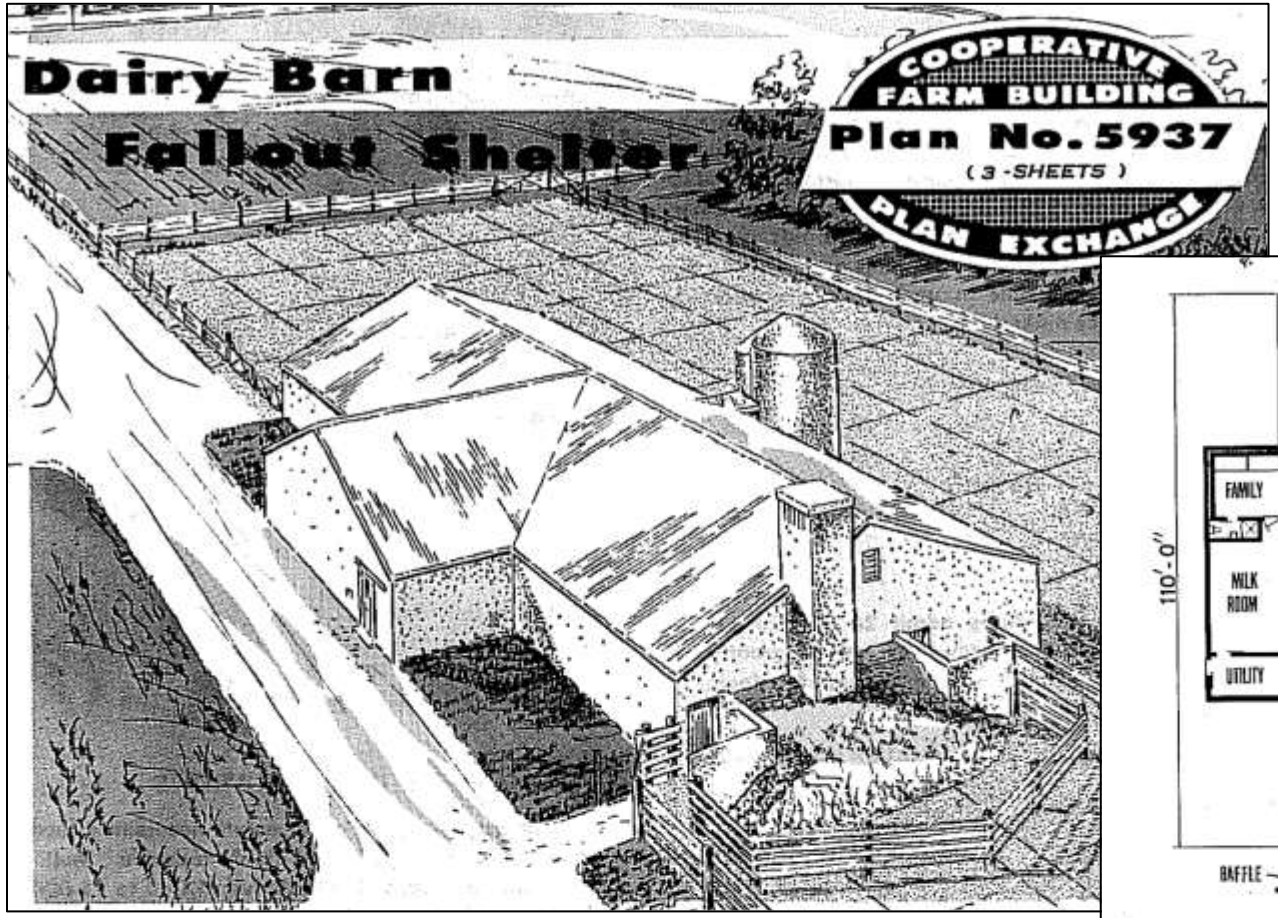
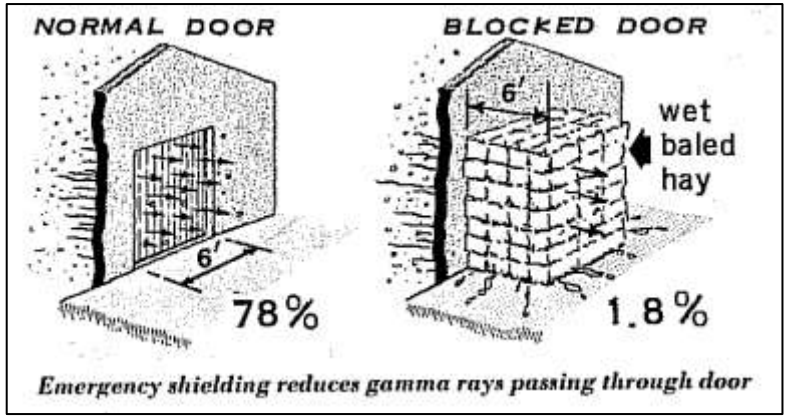


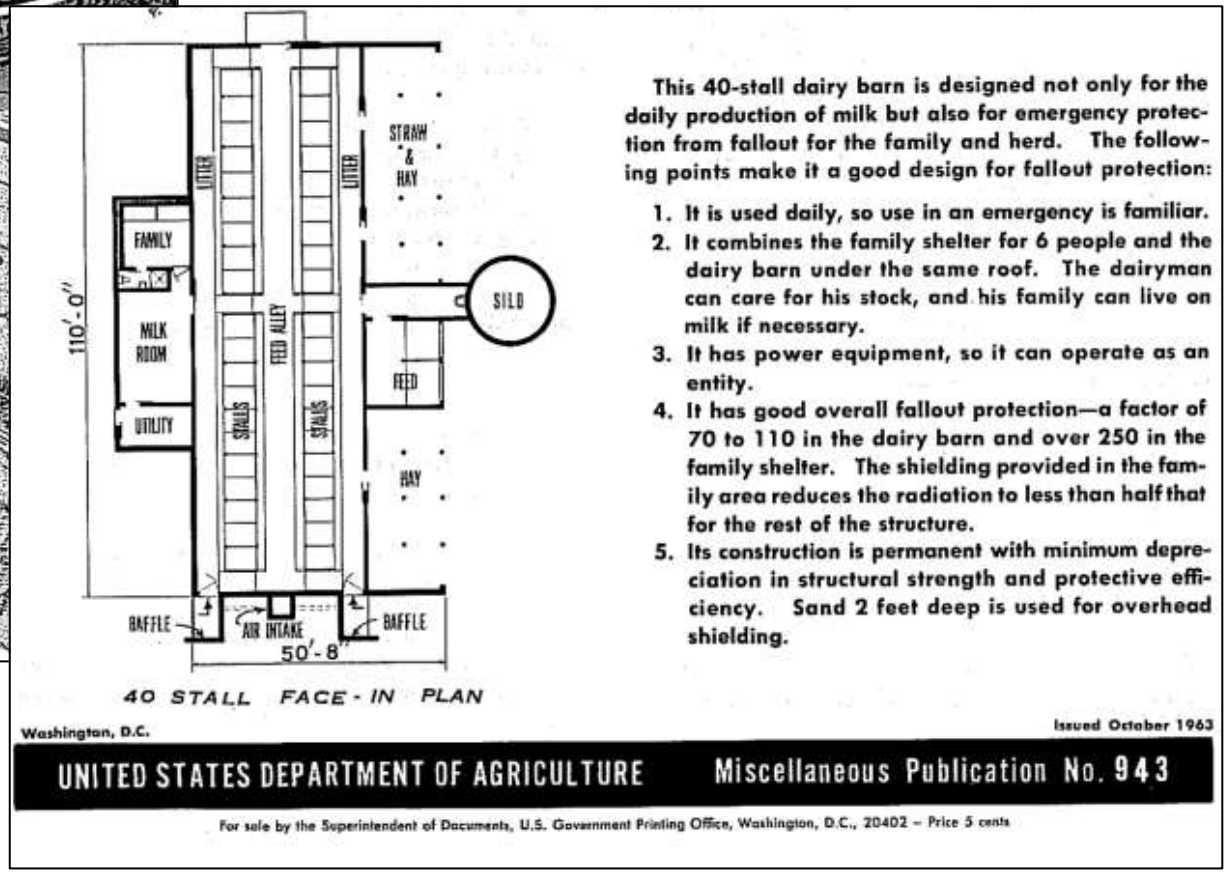
Figure 1. Wisconsin corn grain yield and rate of grain yield increase for three periods. Data derived from USDA – Statistics Service (1866-2005).

http://corn.agronomy.wisc.edu/WCM/W177.aspx

Dairy Housing







Issued: October 1963

Focus on the Cow

https://www.progressivedairycanada.com/

http://www.asapdairy.com/

https://www.gea.com/

Milk Production & Natural Resources

Year	Cow Numbers (million cows)		Milk Produced (billion pounds)	
1944	25.6		117	
2007	9.2	**(- 64%)**	186	**(+ 59%)**

1944 to 2007

Modern dairy systems (2007) use;

- **10% of the land**
- **23% of the feedstuffs**
- **35% of the water**

required to produce the same amount of milk in 1944.

2007 dairy farming produced only;

- **24% of the manure**
- **43% of the methane output**

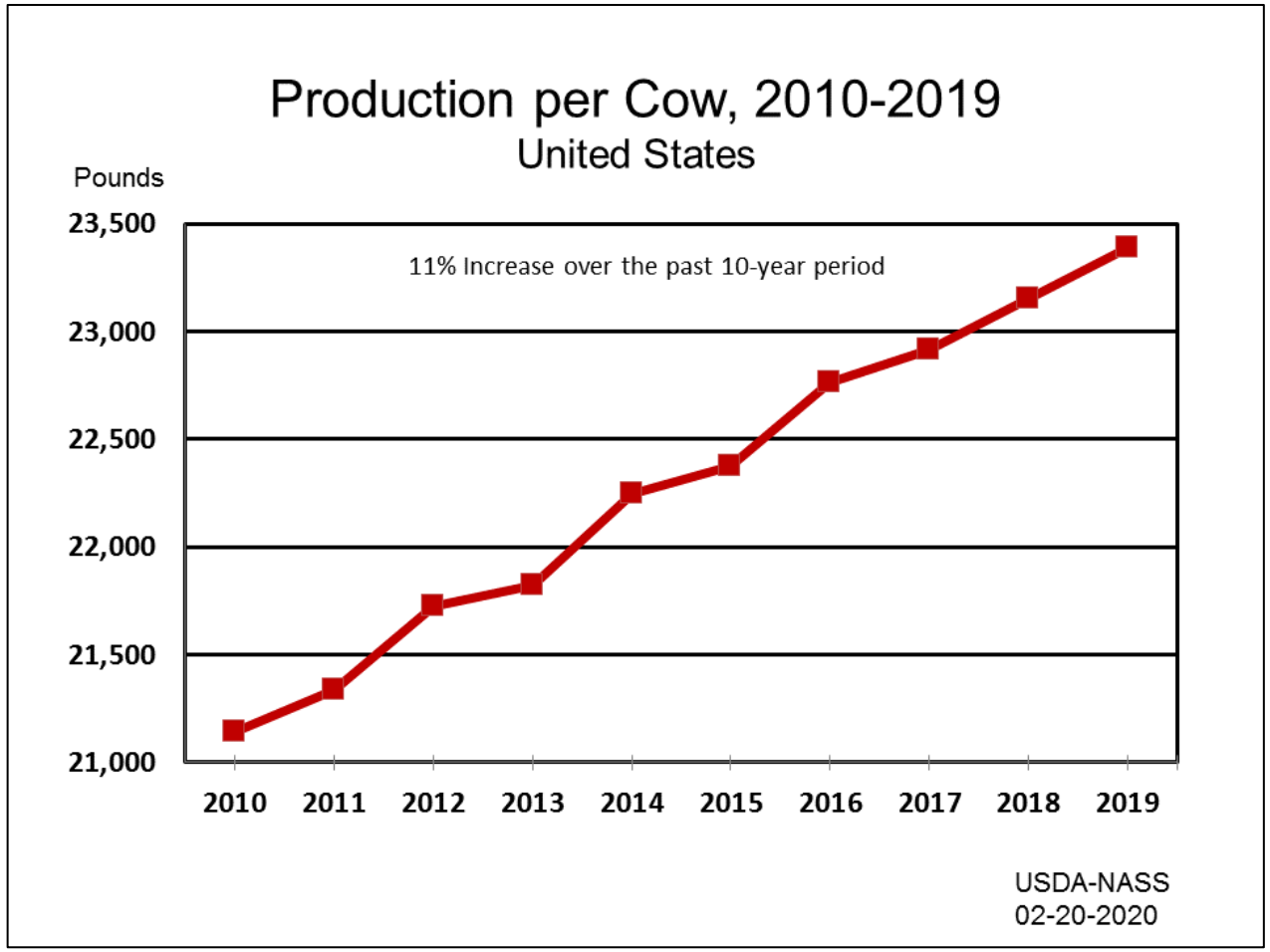
per gallon of milk compared to farming in 1944.

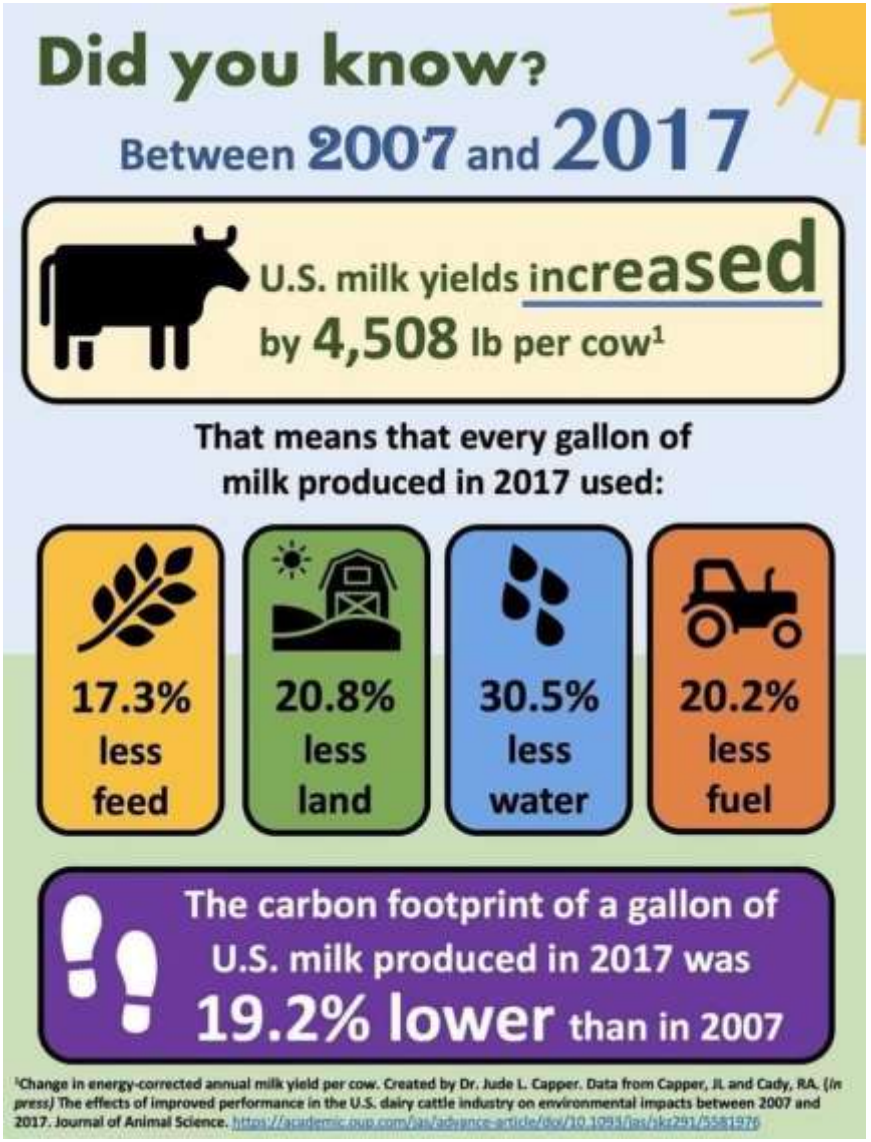
- Capper et al., Journal of Dairy Science (87:6)

"The total carbon footprint for U.S. milk production has fallen 41 percent"

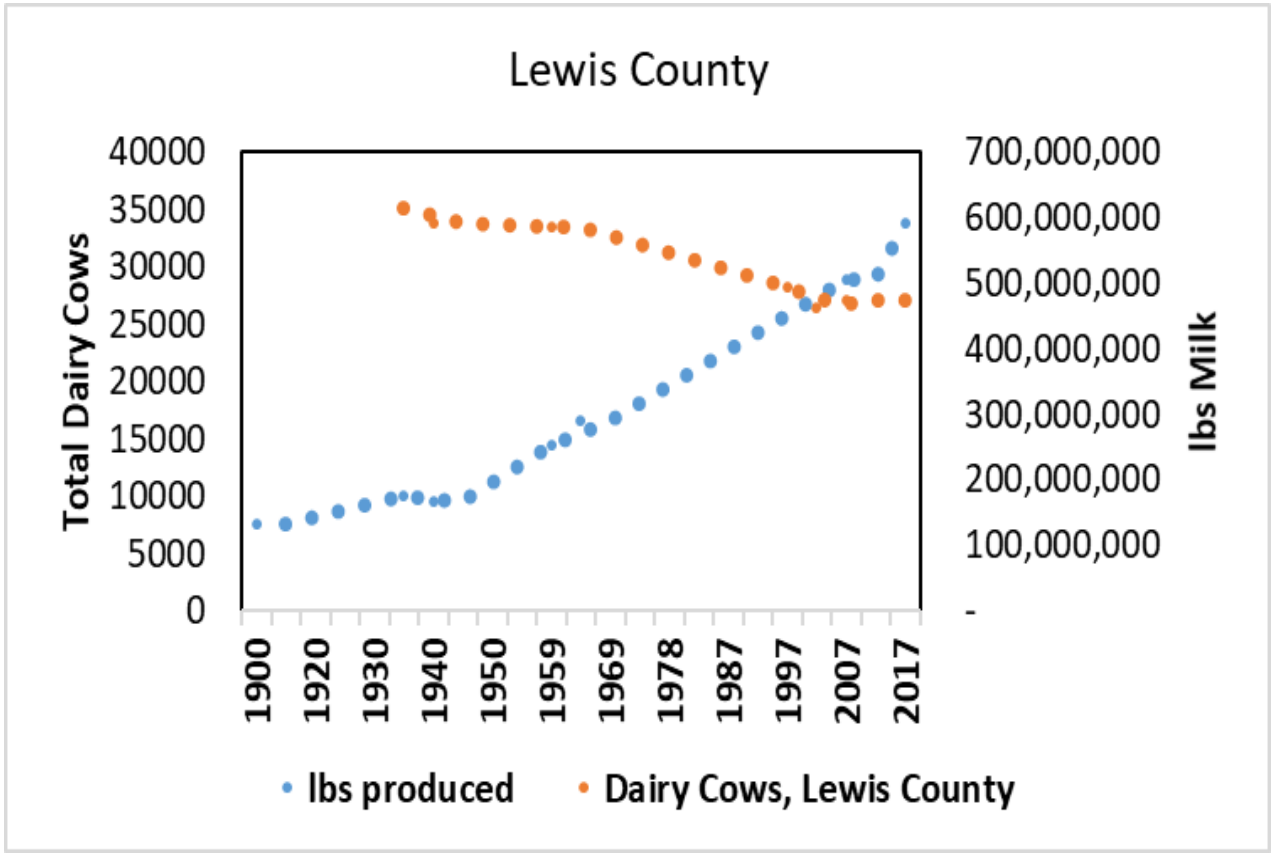
- Capper et al., Journal of Dairy Science (87:6)

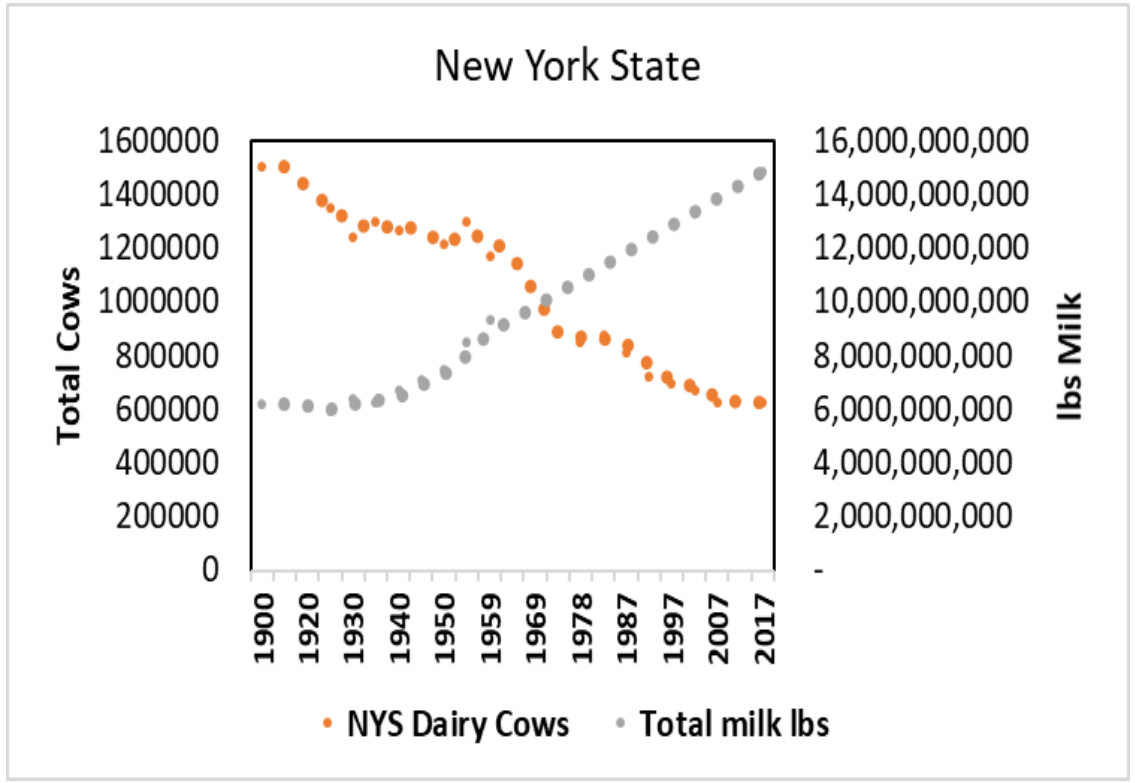
Since 2007


Production per Cow, 2010-2019
United States
Pounds
23,500
23,000
22,500
22,000
21,500
21,000
11% Increase over the past 10-year period
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
USDA-NASS
02-20-2020


Did you know?
Between 2007 and 2017
U.S. milk yields increased
by 4,508 lb per cow[1]
That means that every gallon of
milk produced in 2017 used:
17.3% less feed
20.8% less land
30.5% less water
20.2% less fuel
The carbon footprint of a gallon of
U.S. milk produced in 2017 was
19.2% lower than in 2007
[1]Change in energy-corrected annual milk yield per cow. Created by Dr. Jude L. Capper. Data from Capper, JL and Cady, RA. (in press) The effects of improved performance in the U.S. dairy cattle industry on environmental impacts between 2007 and 2017. Journal of Animal Science.

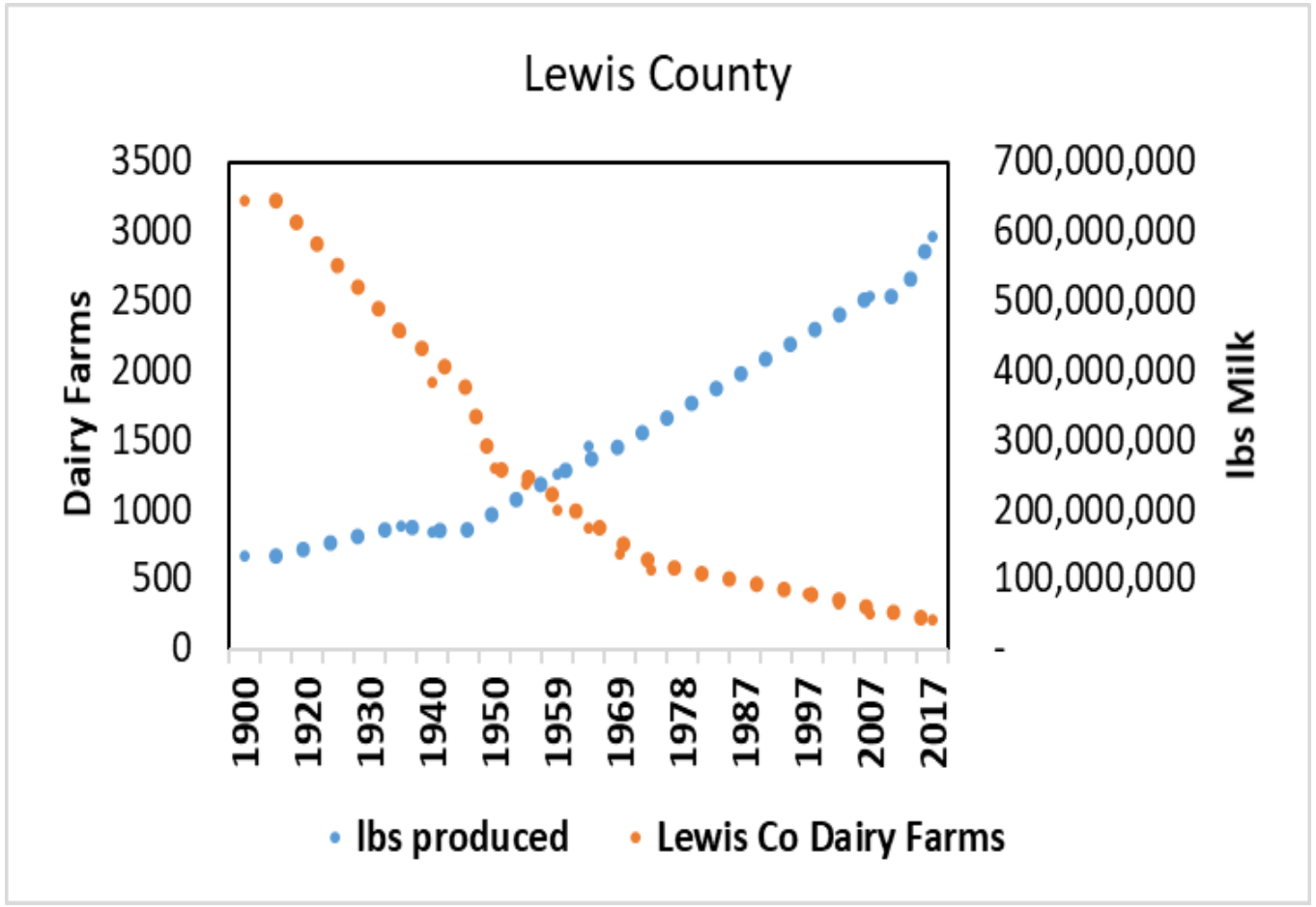
Dairy Trends

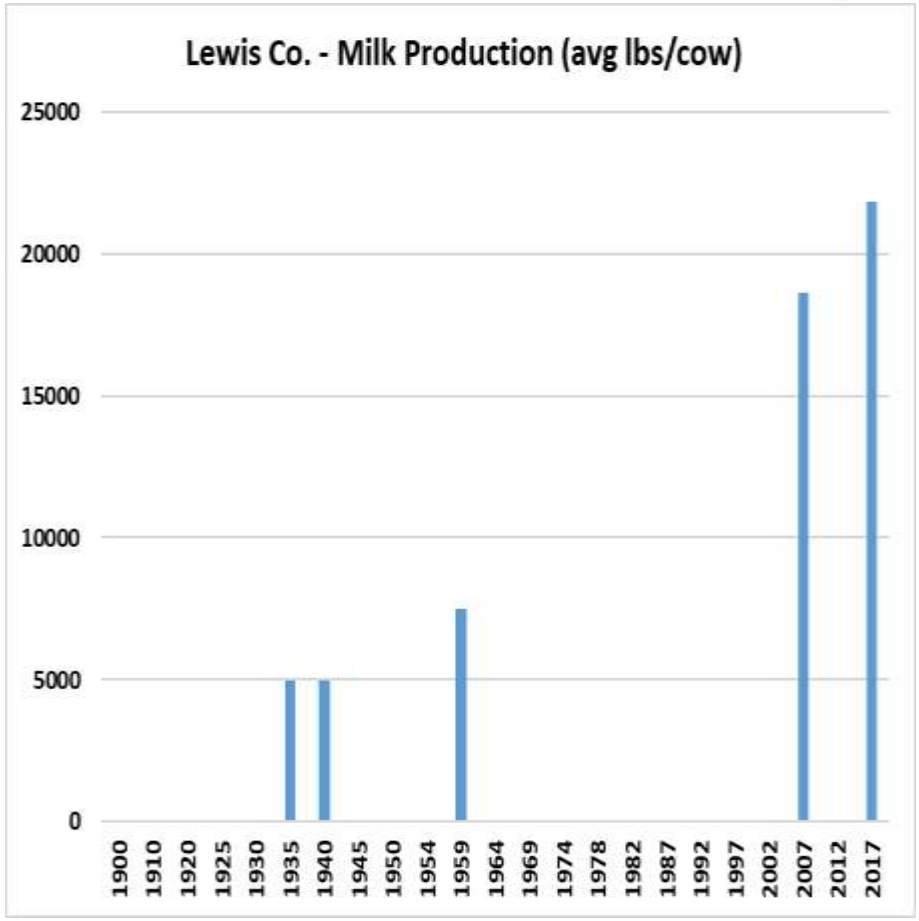




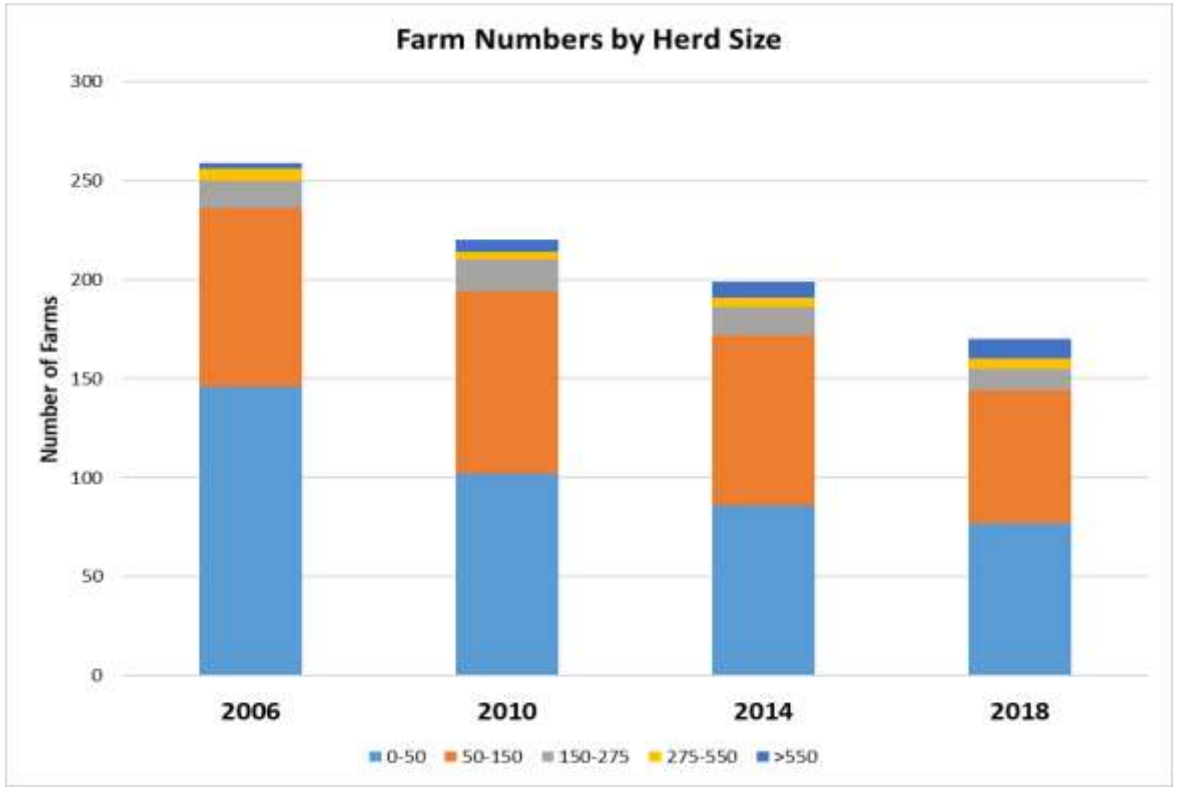
Source: USDA-NASS

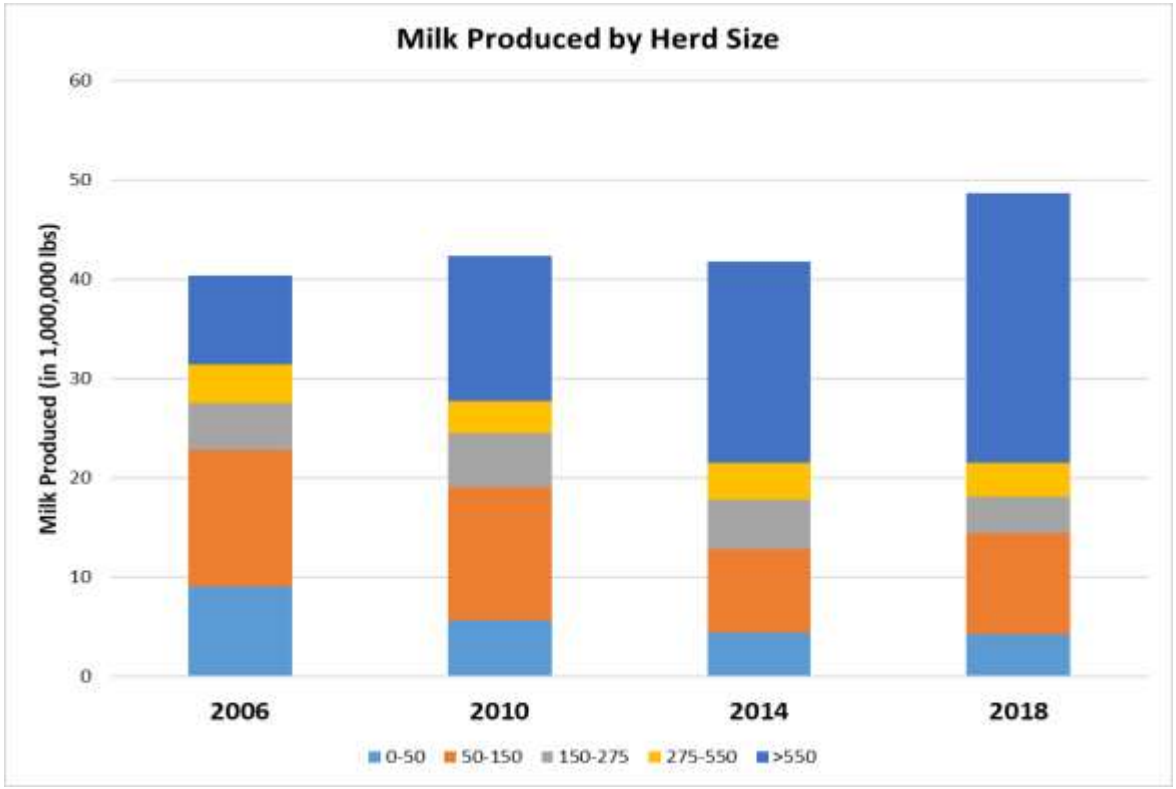
Dairy Trends





Lewis County Trends





34.4% less farms shipping **20.5%** more milk.....*since 2006*

***5.9%** of farms are producing **55.9%** of the milk*

Data compiled by: Lewis Co. CCE
Robin Wendell-Zabielowicz, Peggy Murray

Source: USDA-NASS
Milk Market Administrator

Quick Break
Q &A

Moving Forward

CLIMATE

A Global Economy

A Local Economy

A National System

”there are 9.5 million links between counties on our map”

https://www.agrimarketing.com/s/127071

Long term trends towards
specialization **&** *consolidation.*

- **Capitalism**
- **Weather**
- **Food Safety**
- **Technology**
- **Efficient Transportation**
  - **No Carbon Penalty**

Core Counties for the US food supply

Nov. 2019

“A study showed that these *nine* counties – mostly in California – are most central to the overall structure of the food supply network.

COVID-19

A disruption to any of these counties may have ripple effects to the food supply chain of the entire country.”

https://www.agrimarketing.com/s/127071

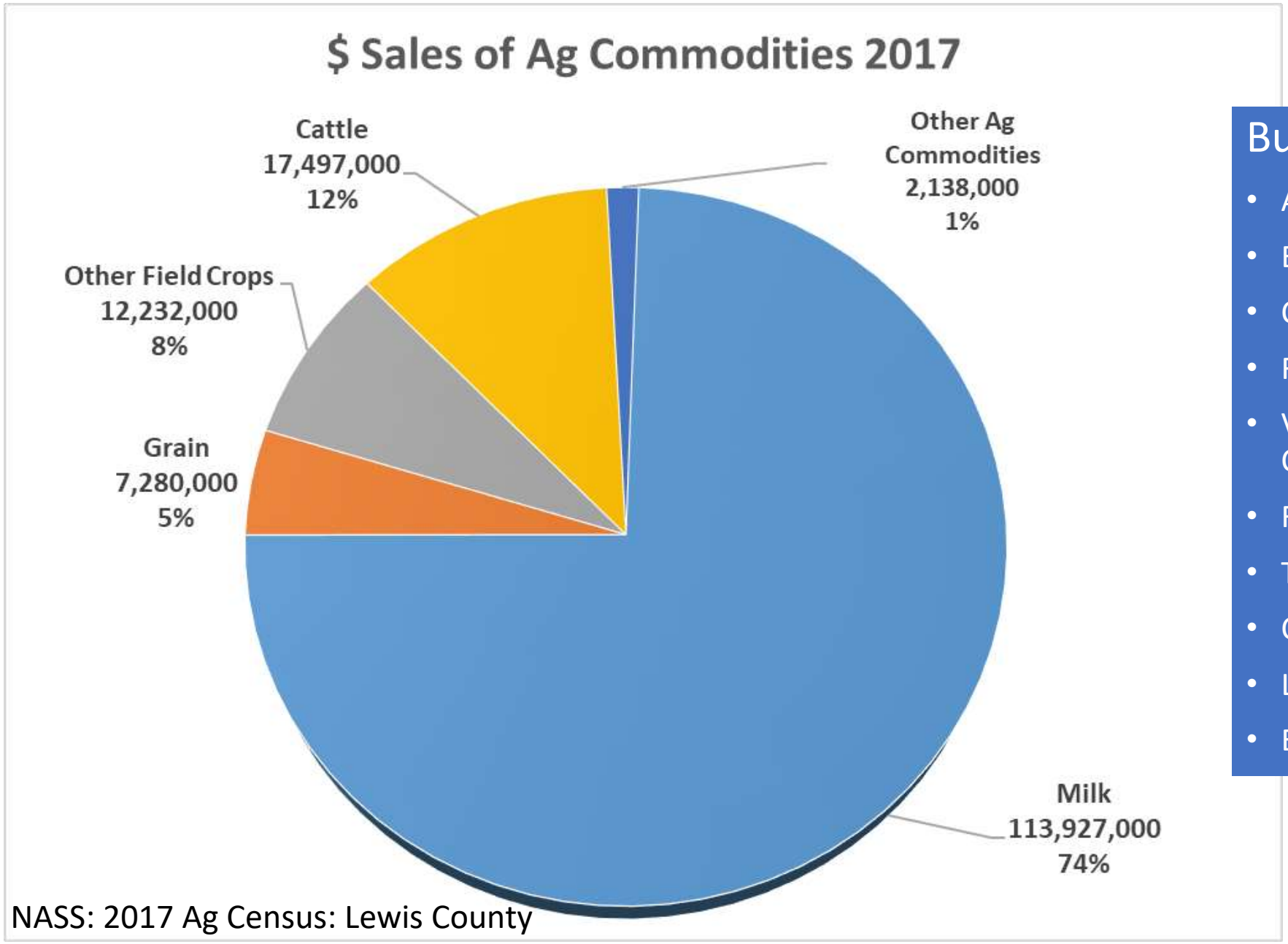
Lewis County

Human Population:	26,551 (2017)	
Total Cattle:	60,565 (2017)	***~2,794 gallons/resident***
Milking Cows:	27,500 (2015)	
Milk Produced (lbs):	592,661,000 (2017)	
Maple Taps:	198,574 (2017)	***~1.56 gallons/resident***
Syrup Produced (gal.):	41,506 (2017)	

Source: USDA-NASS

Forestry
Livestock
Honey
Grapes
Apples
Vegetables
Small Fruits
Christmas Trees
Horticulture
Agri-tourism

Lewis County is a part of this network (*Philadelphia Cream Cheese*)



NASS: 2017 Ag Census: Lewis County

Businesses Impacted:

- Ag Sales & Services
- Equipment
- Crop Consulting
- Retail
- Vet & Animal Services/ Consulting
- Financial
- Trucking & Transportation
- Contractors (Small Bus. Owners)
- LC-based regional professionals
- Education/ Local Government

Credit: Robin Wendell – Zabielowicz, CCE

Dairy is a Crucial to Lewis County In 2019 …..

158
Lewis County Dairy Farms

$

spent
$122 mn

to make **570**
mn lbs of milk

from
27,000
cows

utilizing
$370 mn in land & assets

to make **$124**
mn

And drive
$267
mn in economic impact

Credit: Robin Wendell – Zabielowicz, CCE

Lewis County Agricultural Sustainability Council

Dairies Role in Economy & Competing Land Use

Economic Activity from Dairy

	Input Values	
$ in economy from acres supporting milk production per year		
Production per cow	80	lbs milk/day
Production per cow per year	29,200	lbs/year
100 weights of milk (cwt)	292	cwt/cow/year
Milk Price	$ 18.50	per cwt
gross milk sales	$ 5,402.00	per cow
economic multiplier for gross milk sales	1.72	
acres needed per cow (& replacement)	2	acres
$ in economy (generated from milk sales)	$ 9,291.44	per cow
	$ 4,645.72	per acre

Cost of production (C.O.P.)	$18.00	per cwt

https://www.tughill.org/agriculture-solar-calculator/

Revenue from land (Dairy) per year		
gross milk sales	$ 5,402.00	per cow
	$ 2,701.00	per acre
net milk sales	$146.00	per cow
	$73.00	per acre

200 acres in dairy
= ~$1 million/year

*Fluctuates with Milk Price

Carbon footprint of food production

Yes, food production has an environmental impact

- There is a lot of scrutiny on today's numbers but seldom do we think about how they compare to the past.

Since WWII population has continually increased

BUT

Total Carbon footprint of food production has decreased

We feed more people with *less* impact…….
the impact will never be zero

Net Zero vs. Zero

Addressing Environmental Impact

Ag is a Biological System –
It takes decades and many individuals to create a problem,
and it often takes decades and many individual changes to get it fixed.
We can't just do a recall.

Adapted from article by Mike Rankin, Hay & Forage Grower Magazine

How do we think about food sustainability?

- Entire food chain
  - Production
  - Processing
  - Retail
  - Home
  - Over consumption

Globally over 30% of food goes to waste.

Food safety is very energy and resource (water) intensive.

Study suggest, "Making minor changes to how food is **produced**, **supplied** and **consumed** around the world could free up around a fifth of agricultural land".

Average person's daily caloric intake is way too high.

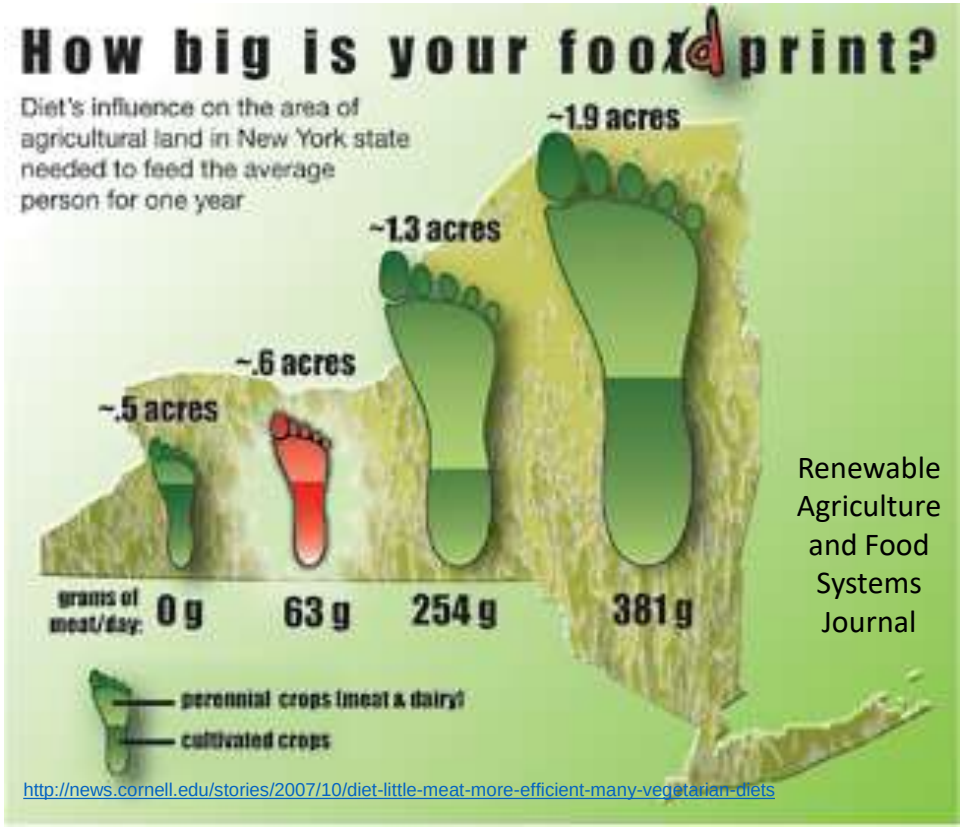
Lewis Co. - Primary Products

Product	Nutrient Density / grams greenhouse gas emission
Dairy Milk	**53.8 per 99 grams (0.543)**
Soy Milk	**7.6 per 30 grams (0.253)**

Nutrient density of beverages in relation to climate impact
Food & Nutrition Research 54, November 2010

Maple → Sugar → Health → ?

If we are going to consume sugar, less refined is better.



Renewable Agriculture and Food Systems Journal

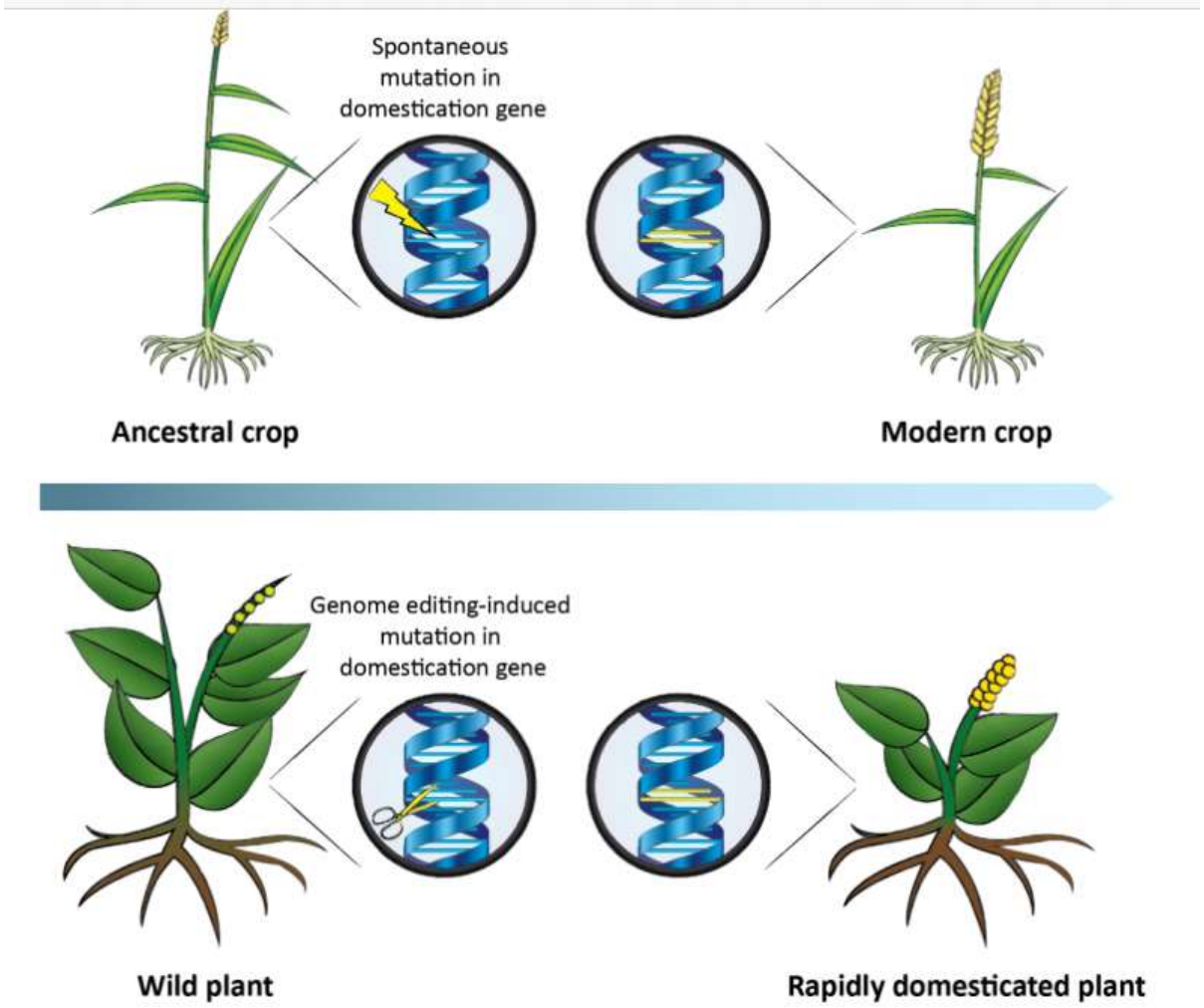
Genetics - Terminology

GMO – Genetically Modified Organism

GE – Genetically Engineered

***Transgenic* - an organism that contains genetic material into which DNA from an unrelated organism has been artificially introduced**

***GE/Transgenic are better terms for modern breeding techniques than GMO**



Source: https://phys.org/news/2017-03-crop-variety-crispr-domestication.html

Selection of traits desired by humans

Art credit: Giovanni Stanchi, 1645-1672

The watermelon, then and now. (Christie Images LTD 2015, Shutterstock)

Comparison: James Nienhuis, Univ. Wisconsin

Dr. Margaret Smith, Cornell University

GE Crops approved for use in U.S.

Herbicide Tolerance

Insect Tolerance

- Corn
- Soybeans
- Cotton

- Sugar Beets
- Canola

Forage Quality

- Alfalfa

Virus Resistance

- Papaya
- Squash

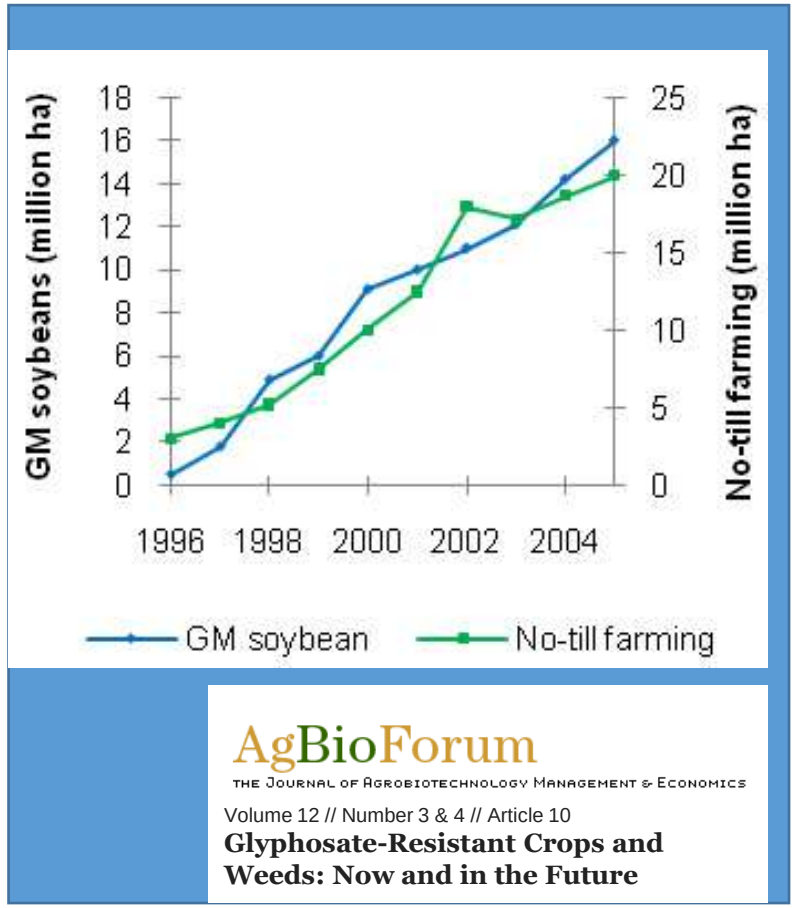
More recent USDA approvals

Focus on human benefits rather than production practices

- Apple
  - Artic (non-browning)
- Potato
  - Low acrylamide

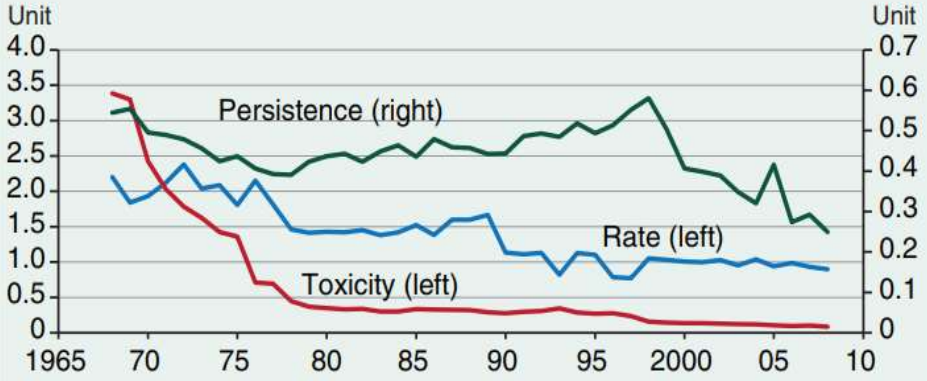
Benefits of Tech

- Ability to adapt better practices
  - Reduced or No-tillage
- Reduction in insecticide usage
- Shift in herbicides being used
- Yield Stability



AgBioForum
THE JOURNAL OF AGROBIOTECHNOLOGY MANAGEMENT & ECONOMICS
Volume 12 // Number 3 & 4 // Article 10
Glyphosate-Resistant Crops and Weeds: Now and in the Future

Box figure 4.1
Average quality characteristics of pesticides applied to four major crops, 1968-2008

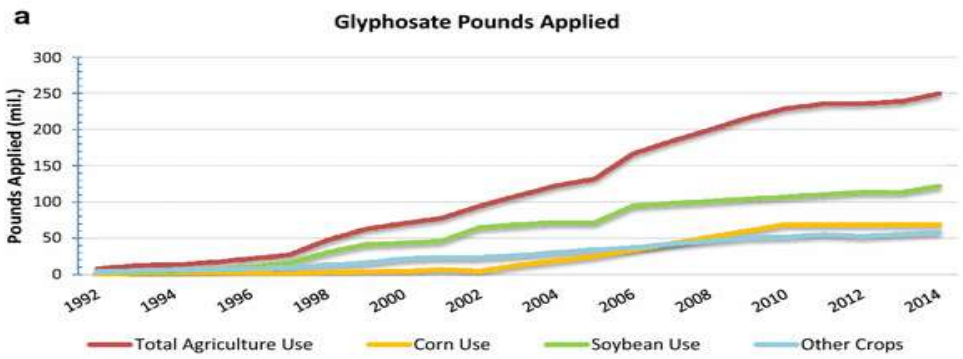


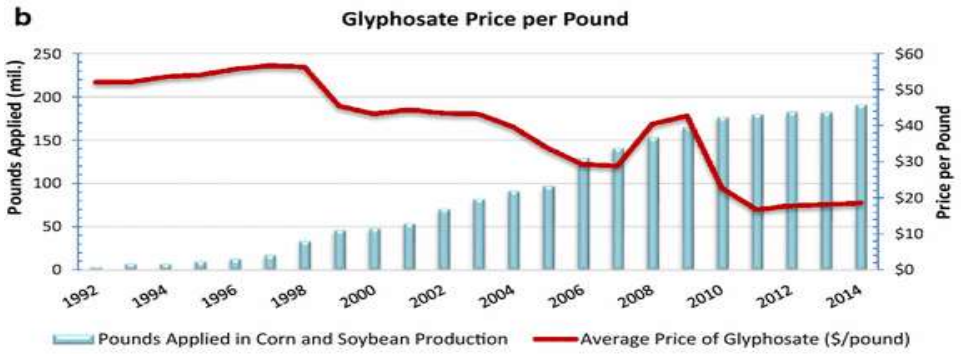
Rate: Pounds of active ingredient applied per acre in one application times the number of applications per year.
Sources: Estimates based on USDA and proprietary data (Appendix 2) for four major crops: corn, soybeans, cotton and sorghum.

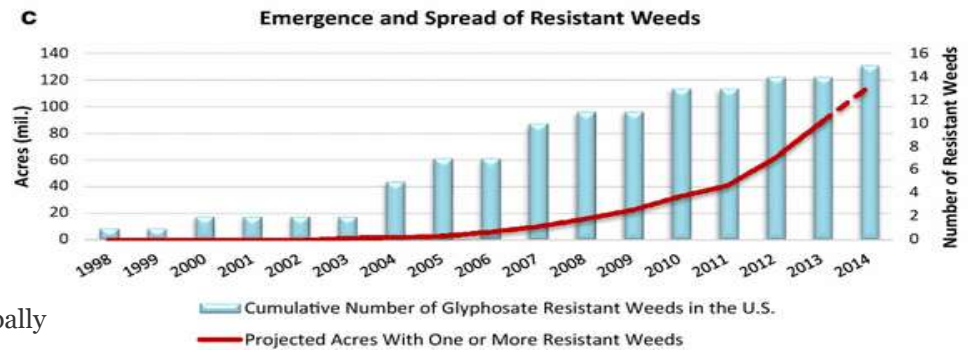
Challenges of Tech

- Overuse of certain tools in toolbox

- Unintended Consequences

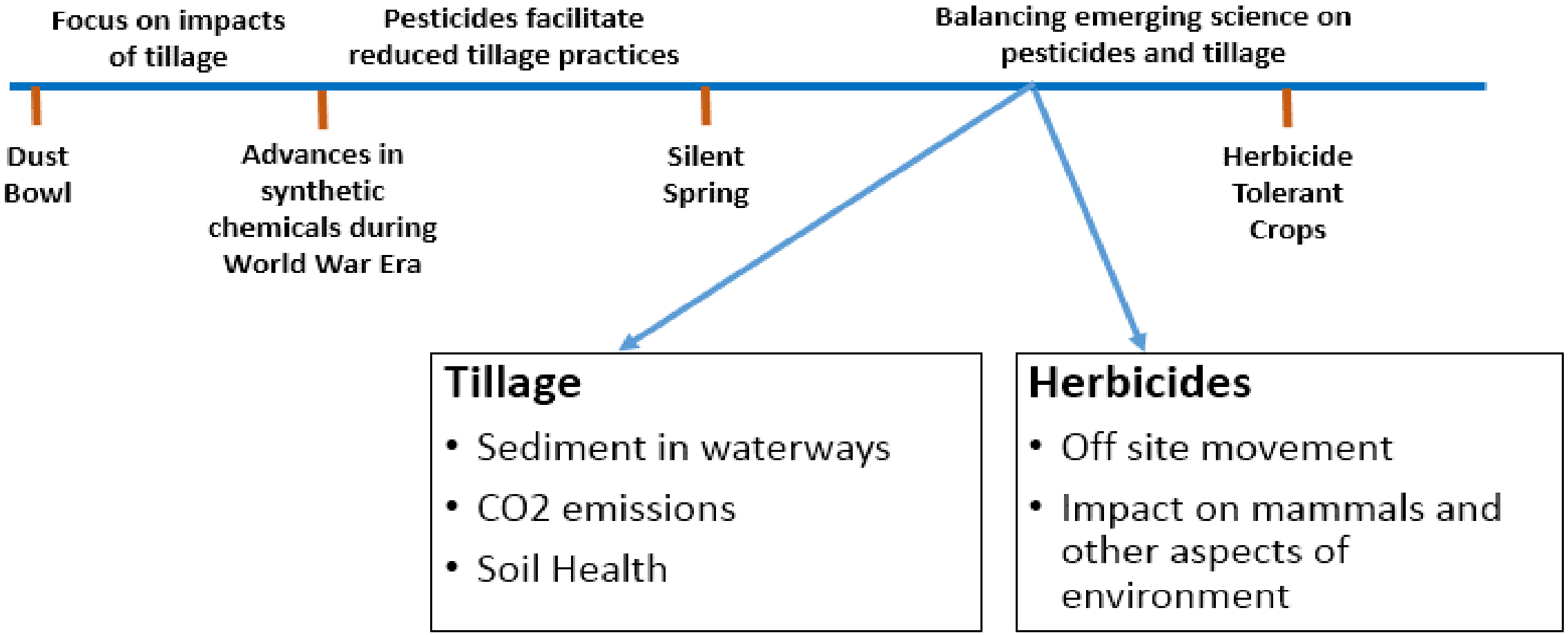






Trends in glyphosate herbicide use in the United States and globally
Charles M. Benbrook
Environmental Sciences Europe
Bridging Science and Regulation at the Regional and European Level2016 **28**:3

Tillage and Pesticides:
A decades long balancing act



There is a tendency to confuse *Production Practices* with *Health Indicators*

Production Practice

- **Organic**
- **Grass Fed**
- **Non-GMO**
- **Cage Free**

Health Indicator

- **Fat**
- **Whole Grains**
- **Sugar**
- **Processing**

DannonWave

- 3 brands of yogurt will be made from milk sourced from cows fed non-GMO rations. (Dannon, Oikos, Danimals).
- Will need about 50,000 cows and are targeting about 18 herds.

2,777 cows/herd

Phillippe Caradec – Vice President:
2017 Wisconsin Dairy Products Association symposium

- DannonWave **does not** question the safety of GMO-linked foods.
- **20% of consumers are actively seeking non-GMO foods.**

Slide credit: Larry Chase, Cornell

Responsible management of technologies used in crop production requires;

- continual advancement of technologies,
- sound and on-going scientific review of their safety and effectiveness,
- producer accountability in proper use of technologies,
- public confidence in the scientific process,
- Food chain support of sound production practices.

U.S. Food System

Current Food System	Opportunities	Threats
	• Cost of Production • Economic and Environmental Efficiency • Established Business Model	• Climate Change • Regional Food Security • Consumer disconnect with Science • Carbon Penalty for Transportation • Interest in Local Foods • Processed Foods • Global Competition • Labor

The Future ??

LEWIS COUNTY	Opportunities	Threats

	• Our People and Culture
	• Proximity to Population Centers
	• Need for local and regional food security
	• Interest in Local Food
	• Climate
	• Healthy Natural Resources
	  • Water
	  • Soil
		• Erratic Weather
		• Cost of Production
		• Timeline for shift in food system
		• Healthy Economy
		  • Consumer willing to "put their money where their mouth is"
		• Capital Intensive Businesses
		  • Adoption of Technology
		• Balancing Supply and Demand

Local Economic Portfolio:

Marathoner **Mid-distance** **Sprinter**

The Future??

- Addressing Climate Change
  - Environment vs Economics
  - Land in Agriculture drives economy but……
    - Fixed Environmental Cost for each Acres in Production
      - Return on that cost for Marginal Land?
    - Optimize Productivity of Better Farmland
    - Return Marginal Land to Woods….Carbon “Sink”
      - GHG Associated with New York State’s Natural and Working Lands Forests, Farms, and Wetlands. NYSERDA Report Number 20-06. February 2020

The Future??

- Growing Crops in the area we haven't before
  - New Varieties
    - Cold Hardy
      - Grapes (U. of Minnesota)
      - Apples
  - Shifting Winter Hardiness Zones
    - Existing Varieties now able to persist here

The Future??

- A mix of commodity production and value added.
- Return of more diverse production: fruits and vegetables?
- "Right-sizing" Production

- Commodities
  - Marathoner
  - Economically and Environmentally efficient

- Value added
  - Sprinter, hopefully mid-distance
  - More affected by disposable income
  - Smaller producers have to show their environmental footprint can be as low as larger producers.

Thank You!

PRODAIRY
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