

April 7, 2020

Considerations for Landspreading Milk Webinar



College of
Agricultural & Life Sciences
UNIVERSITY OF WISCONSIN-MADISON



NPM

Nutrient and Pest Management Program



Extension
UNIVERSITY OF WISCONSIN-MADISON

Where we are and why are we here: A look at the dairy markets



Image source: <http://commons.wikimedia.org>

Mark Stephenson

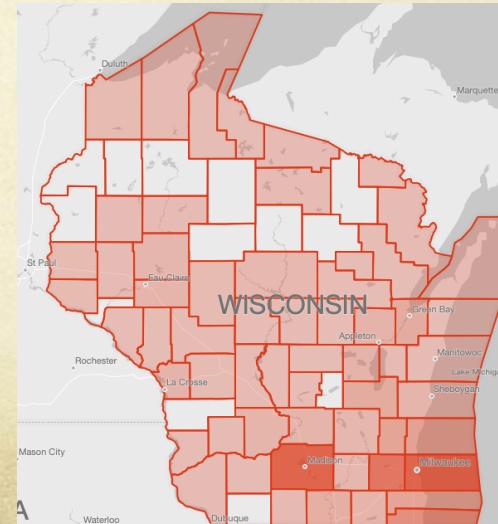
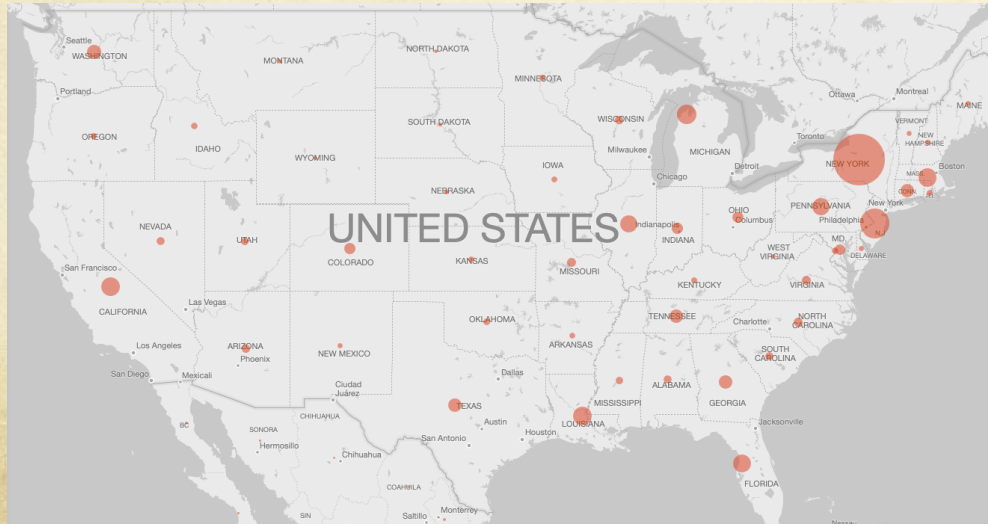
Extension Dairy Policy Specialist & Director
UW-Madison Extension & Center for Dairy Profitability

COVID-19 And the Dairy Industry

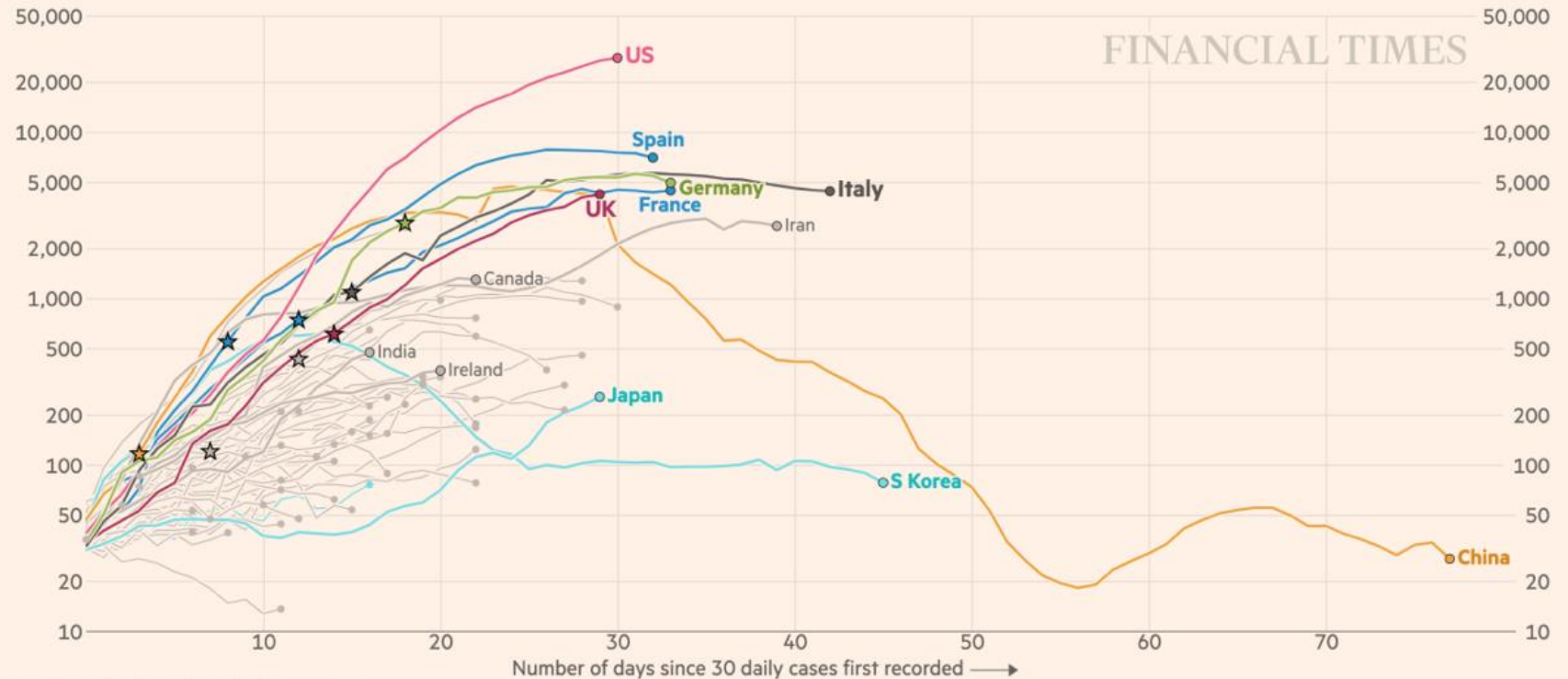
Mark Stephenson, PhD
University of Wisconsin, Madison

What Do We Know

- Worldwide: 1,331,032 cases, 73,917 deaths
- United States: 362,108 cases 10,677 deaths
- Wisconsin: 2,440 cases, 77 deaths



What Do We Know



FT graphic: John Burn-Murdoch / @jburnmurdoch

Source: FT analysis of European Centre for Disease Prevention and Control; Worldometers; FT research. Data updated April 06, 19:00 GMT

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The Markets are Moving Milk To Meet Consumer Demand

- About half of cheese is consumed in out-of-home eating
 - The vast majority of American processed cheese is served through food service
 - Majority of pizza sales are take-out anyway and by several accounts, those sales have surged
- Total cheese consumption up at retail and down at food service and institutional establishments. Net negative maybe 5-10%

Barrel Cheese Plants in Our Region

- AMPI plant in Paynesville, MN
- Bongards Creamery in Perham, MN
- First District in Litchfield, MN
- Grassland Dairy Products in Greenwood, WI
- Wisconsin Whey Proteins in Darlington, WI

These plants account for about 12% of milk production in the two states.
We could accommodate this volume through other plants, but it is quite a bit.

The Markets are Moving Milk To Meet Consumer Demand

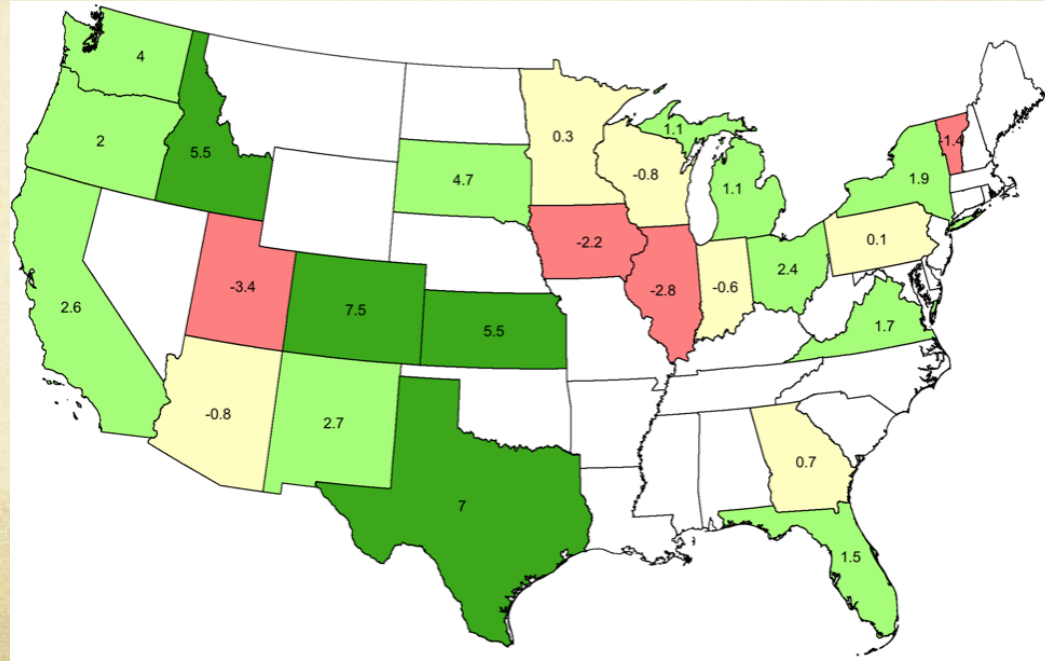
- About two-thirds of fluid milk is consumed in the home
 - Fluid sales are up, reversing a long-standing trend
 - Reports of empty coolers were short-lived
 - Food service and institutional sales are way down
 - Total fluid consumption net negative maybe 5-10%

The Markets are Moving Milk To Meet Consumer Demand

- More than half of butter is used in out-of-home eating
 - Food service and institutional uses are substantial
- Butter sales are up at retail, but not by enough to offset the losses in out-of-home use.
- Total butter consumption net negative maybe 10-20%

The Big Concerns

- Milk production is up 1.7% across the country and so are cow numbers. It looks like a big flush, though not so much in Wisconsin.

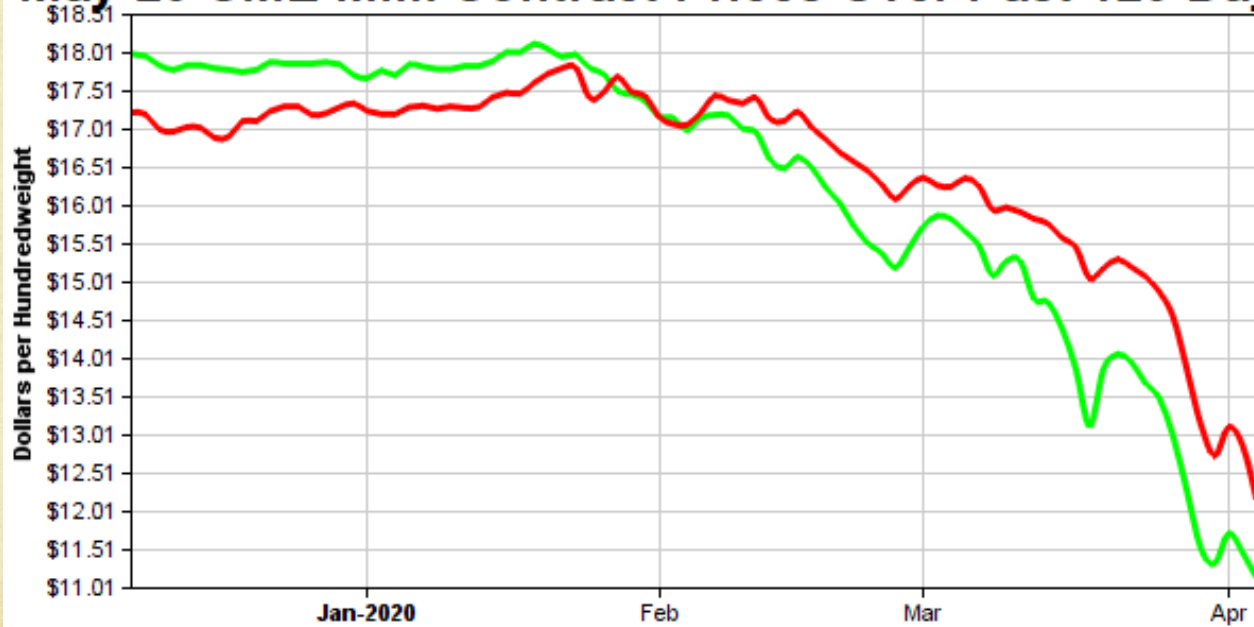


Big Concerns

- Large milk production would be keeping a lid on prices anyway.
- There are adequate inventories of storable dairy products, so no one is in a hurry to purchase early.
- Export disruptions
 - Lack of orders from countries distracted by COVID-19
 - Problems with closed, or limited service at ports
- Tailspin into worldwide recession because of virus induced supply chain disruptions (not just dairy).

Big Concerns

May-20 CME Milk Contract Prices Over Past 120 Days



Other Concerns

- It's bad enough if a farm operator or worker contracts the virus, but it could be worse downstream from the farm.
- Many of our milk haulers, perhaps as much as half of the milk in the state, is transported by 1 or 2 truck operations. If they get sick and need to quarantine, getting milk off your farm could be a problem.
- If a dairy plant gets a positive coronavirus ID, it could impact the entire plant. Finding a home for that much milk could be a real problem in today's environment.

Facts, Rumors and...

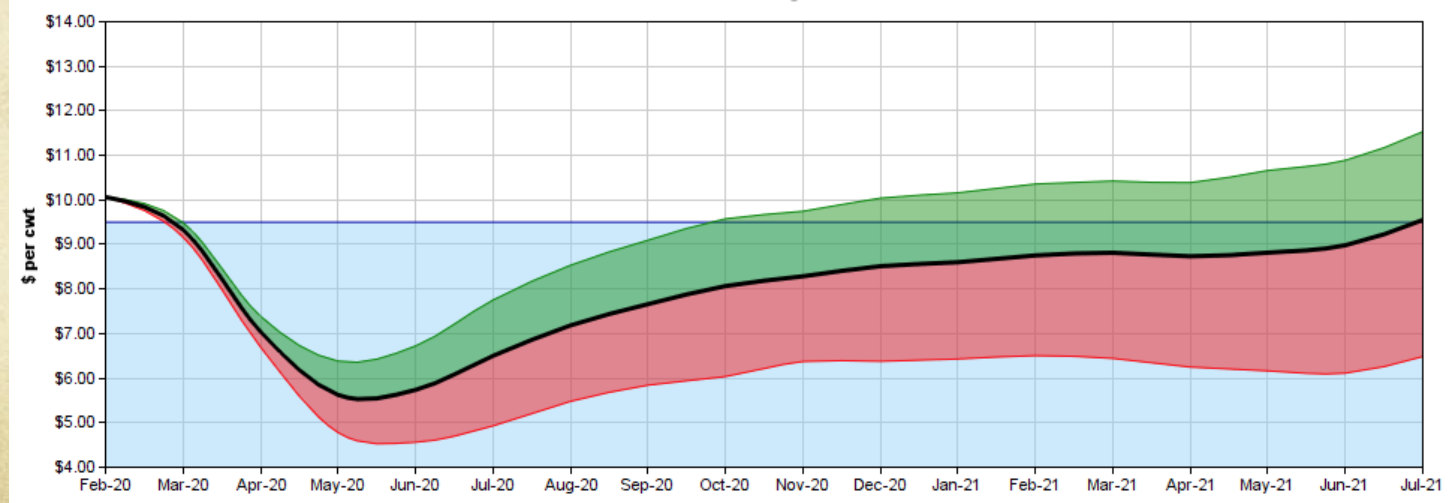
- Several coops have sent out letters to their members
 - Asking for voluntary reductions in milk
 - Reminding them that they have supply management protocols in place which *could* be invoked
- Milk is already being dumped across the state.
- Milk is also being sold at “distressed” prices.

This Could be Another Brutal Year

- This was supposed to be price recovery year, but it now looks like it could be the 6th year of low prices and this year has the potential to be a very low price year.
- Farmers should meet with their banker to establish whether they need additional access to credit or to restructure loans.
- Some farms should ask themselves whether this is time to exit the industry on their terms.
- I think that milk prices will decline by enough to operate barns at below capacity.
- Perhaps consider feeding strategy to not push production as hard—lower purchased feed costs, reduce milk supply to help milk prices recover.

This Could be Another Brutal Year

- Dairy Margin Coverage has gone from a forecast of no payments to payments beginning in March and throughout the rest of the year
- Corn prices have declined by 50¢



Federal Help?

- The CARES Act—\$2.2 trillion
 - \$14B for CCC Replenishment
 - \$9.5B for USDA Secretary
 - \$15.8B for SNAP
 - \$350B for SBA for Paycheck Protection Loan Program
- Agriculture has been identified as a “critical” sector
 - Transportation drivers will not “time-out”
- NMPF and others are asking for DMC to be reopened for a second chance.
 - Also asking for a one-time new production history
 - Maybe coupled with production reduction

Questions?

Nutrient availability, agronomics, and water quality issues associated with landspreading milk



Carrie Laboski

Extension Soil Scientist & Professor
UW-Madison Department of Soil Science

Nutrient Availability, Agronomics, & Water Quality Issues Associated With Land Applied Milk

Carrie Laboski, Jamie Patton, Kevin Shelley

UW Nutrient & Pest Management Program

Considerations for Landspreading Milk Webinar, 4/7/20

Water quality concerns

- Compared to liquid dairy manure (< 4% DM), milk has...
 - 6 x more available N
 - 9 x more available P_2O_5
 - 5 x more BOD
- What is biochemical oxygen demand (BOD)?
 - Amount of oxygen required by microbes to breakdown organic materials
 - Low dissolved oxygen results in fish kills and destroys aquatic habitat

Bacteria can consume all the oxygen in 1,600 gallons of water when 1 pint of milk is added

N, P₂O₅, and K₂O
fertilizer value of milk is
\$32.60/1,000 gal

Available nutrients in raw milk

Nutrient	Milk	Dairy Manure (< 4% DM)
	----- lb/1,000 gal -----	
N	46	7
P ₂ O ₅	26	3
K ₂ O	17	11
Ca	13	15
Mg	1.4	6.9
S	2.0	1
B	<0.01	0.02
Mn	nil	0.13
Zn	0.04	0.31

- 100% of nutrients in milk are plant available
- Nitrogen
 - Nearly all N is readily degradable protein
 - < 1 lb/1,000 gal of milk urea N
 - % protein x 13.48 = lb N/1,000 gal
- Phosphorus
 - Apply milk to meet crop N need may oversupply P
 - Consider soil test P when selecting an application rate
 - < 50 ppm P – apply to crop N need or legume N removal
 - 50 to 100 ppm P – do not exceed crop removal
 - > 100 ppm P – do not exceed 75% of crop removal
 - Alternatively use PI in SnapPlus

Application guidance

- Milk should NOT enter ground or surface water
- Follow all NMP setbacks
- Apply only to soils that are suitably dry
 - < 75% of field capacity in top 8"
 - Indicator (for most soils) - soil forms ball & no moisture appears on hand when squeezed
- Avoid applying when rain is predicted, eminent, or directly after rain
 - Check Runoff Risk Advisory Forecast
<http://www.manureadvisorysystem.wi.gov/runoffrisk/index>
- Milk should not runoff or pond during application

Application guidance, continued

- All other nutrients that have been or will be applied must be credited towards the total nutrient application rate
- Apply uniformly across a field
 - Shallow inject or incorporate to reduce odor & risk of runoff
 - If milk must be applied to tiled fields, till the soil 3-5" deep before application; tile should not be running
- Properly calibrate application equipment
- Consider multiple applications with less volume per application
 - New Zealand research suggests waiting 20 days between applications to allow for microbial degradation

Field selection – avoid these areas



- Steep slopes or long slope length
- Soil test P greater than 100 ppm
- Estimated P Index > 6
- Estimated erosion rates > tolerable soil loss (T)
- Nearby streams, rivers, lakes, wetlands, drainage ditches
- Seasonal or permanent high water table
- High to moderate potential for flooding

Field selection continued – avoid these areas

- Sandy or loamy sand soils, particularly the subsoil
- Soils shallow to bedrock
- Large drying cracks at soil surface
- Manure or fertilizer since last summer
- Alfalfa or forage legume stand that was terminated last fall
- Tile drained
- Nearby neighbors who may be impacted by odor



Use SnapPlus and your nutrient management plan to help select fields that have the least potential for milk to impact ground and surface water

www.snapplus.wisc.edu

Considerations for corn, sorghum-sudan, & other warm season grasses

- Consider sidedressing to reduce potential for early season N loss and increase crop utilization on...
 - Somewhat poorly drained and wetter soils
 - Sandy soils and soils that are somewhat excessively drained
- Preplant applications on moderately well and well drained soils
 - Lower temperature early in season may limit odor
 - May not be ideal on somewhat poorly drained and wetter soils
 - Discouraged on sandy soils and soils that are somewhat excessively drained
- Avoid applying over top of plants
 - In multi-cut forage, apply soon after harvest to minimize crop damage
- In warm-season grass system, milk could be applied and incorporated after last harvest if conditions are conducive for cover crop establishment

4,300 gal/a will supply
200 lb N/a

Considerations for small grains – all uses

- Preplant applications provide opportunity for incorporation
- Milk application should not exceed crop N need; excess N can...
 - Increase lodging
 - Increase vegetative growth & conditions for increased disease incidence
- Limit milk applications over the top of growing crops
 - Reduces potential for nutrient loss after rainfall and reduces odor
- After harvest, a milk application can be made if a cover crop can be established

Considerations for legumes

- Legumes use soil N preferentially over fixing N
- Topdress alfalfa & clover shortly after harvest to minimize crown damage
- Applications to soybean may result in lush vegetative growth
 - Potential lodging & increase risk of infection by the white mold pathogen

Crop	Yield Range	Max. N application	Max. milk application
		lb/a	gal/a
Alfalfa or red clover	< 1.5 T/a	50	1,100
	1.5 - 2.5 T/a	100	2,200
	2.6 - 3.5 T/a	155	3,400
	> 3.5 T/a	205	4,500
Soybean	15 - 25 bu/a	75	1,600
	26 - 35 bu/a	115	2,500
	36 - 45 bu/a	155	3,400
	> 45 bu/a	195	4,200

Considerations for pastures

Pasture/hay	Yield range	Max. N application	Max. milk application
		lb/a	gal/a
Grass	all	130	2,800
Legume-grass	0.5 - 1.9 T/a	55	1,200
	2.0 - 3.0 T/a	115	2,500
	3.1 - 4.0 T/a	160	3,500
	>4.0 T/a	205	4,500

Manure deposited by animals or applied mechanically must be included as part of the total N application

- Apply shortly after grazing/harvest
- Time to maximize the number of days between application and grazing/harvest
- Unknown how milk on foliage will alter forage palatability ensiling and/or quality
- For grass, split into 2-3 applications with final application in mid-August

Other considerations

- Application to soils with excessively high soil test K may result in luxury consumption of K, particularly alfalfa.
 - Monitor forage K levels, especially if fed to dry cows or springing heifers
- Milk sugars in soil may promote growth of normal soil organic matter decomposers (saprophytes; eg. fungi)
 - White mats of mycelium may be present
 - Saprophytes are beneficial and fungicide is not warranted
- Nutrients from all sources should not exceed crop nutrient need
 - Or acceptable N removal for legumes
- Where milk is applied, consider soil sampling fields before the next growing season

Applicable DATCP & DNR rules/regulations for landspreading milk



Image source: <http://commons.wikipedia.org>

Aaron O'Rourke

Nutrient Management Program Coordinator
Wisconsin DNR

Applicable rules/regulations for landspreading milk

Aaron O'Rourke

WDNR Nutrient Management Program Coordinator

What should you do if disposal is needed?

Non-Permitted Farms

- **Dispose of milk in the farm's manure structure**
 - Land apply contents at a later date according to Nutrient Management Plan (NMP)
 - Farms do not need department approval
- **Land apply milk according to NMP**
 - Farms do not need department approval
 - May use book values for nutrient content
 - If farm needs assistance with their NMP, contact DATCP staff
 - Sue Porter- 608-224-4605 or Ryan Erisman- 608-224-4604
 - DATCP will assist with NMPs at no cost
 - If staff cannot assist, they will find someone who can

DNR Suspension of NMP

Non-Permitted Farms

- **If farm cannot dispose of milk in storage or land apply according to an NMP, DNR may suspend the NMP requirement under NR 151.07(3)**
 - **Land application may not cause an unpermitted discharge of pollutants to waters of the state**
 - **Goal is to use best practices when land applying to minimize environmental risk**
 - Uniform application
 - Correct rates and application methods
 - Finding appropriate land
 - Weather
 - **Contact your DNR Non-Point Source Coordinator for further information**

What should you do if disposal is needed?

Permitted Farms (CAFOs)

- **Dispose of milk in the farm's manure structure**
 - Land apply contents at a later date according to Nutrient Management Plan (NMP)
 - Farms do not need department approval
- **Land apply milk according to NMP**
 - Farms do not need department approval
 - Apply as a process wastewater in NR 243 NMP
 - May use book values for nutrient content
 - Farms do not need department approval

Expedited Substantial Revisions

Permitted Farms (CAFOs)

- **Adding land or other changes to NMP for purposes of emergency land application of milk**
 - Public notice period may be reduced down to 1 day on a case-by-case basis
 - May take a few days for processing and review
 - *ONLY* for purposes of land application of milk
 - Contact regional CAFO specialist if you plan to do this, so they can inform the correct staff person

Contacts

- **DNR Contacts**

- Chris Clayton (608-333-9265; Christopherr.Clayton@Wisconsin.gov)
- Aaron O'Rourke (715-214-5503; Aaron.Orourke@Wisconsin.gov)
- Mike Gilbertson (608-267-7628; Mike.Gilbertson@Wisconsin.gov)

- **DATCP Contacts**

- Lacey Cochart (608-224-4603; Lacey.Cochart@Wisconsin.gov)
- Sue Porter (608-224-4605; Sue.Porter@Wisconsin.gov)
- Ryan Erisman (608-224-4604; Ryan.Erisman@Wisconsin.gov)



COVID-19 ENVIRONMENTAL COMPLIANCE PROCESS



If you foresee
COVID-19
posing a
**POTENTIAL
COMPLIANCE
ISSUE**
at your site or
facility, follow
these steps to
request special
DNR assistance.

EMERGENCIES

Contact the DNR immediately if there is an **imminent or actual danger or threat** to human health or the environment.

Call 1-800-943-0003 • select #1

As part of DNR's response, staff will initiate a request for compliance assistance, where applicable, once the threat is addressed.



NON-EMERGENCIES

If there is no threat or danger, request
Pre-Approval for Compliance Assistance:

FIRST | Email DNR point-of-contact to submit a request.

IF | If a confirmed DNR contact is not established...

THEN | Submit DNR's online form:
www.surveymonkey.com/r/WDNRComplAssist

The DNR will evaluate requests
on a case-by-case basis.



The DNR will work as quickly as possible on a solution in response to the compliance assistance request.

Do not implement alternative methods until receiving DNR written approval.

Managing milk in manure storage, handling, and treatment systems



Becky Larson

Extension Specialist & Associate Professor
UW-Madison Extension &
Department of Biological Systems Engineering



Considerations for Land Spreading Milk



Becky Larson

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UW-Madison Extension &
Department of Biological Systems Engineering

Manure Systems

- Milk has fat that will coat mechanical systems and may result in clogging
- Add milk to manure storages
 - Additions must be less than storage permitting allows (10% by volume)
 - Mix evenly
- Odor will INCREASE
 - Odors would remain for some time
 - Uses beneficial management practices to reduce and disperse odors in storage and land application

Manure Storage Gases

- Milk has sugars and other easily degradable materials that we know can increase gas production, carbon dioxide and methane asphyxiation and explosion risk
- Toxicity from H₂S production typically the major concern
 - Concentrations likely to be similar or slightly increased
 - Sulfur content of milk is approximately 0.023%, or about 2 lbs per 1,000 gallons
 - Sulfur content in liquid/slurry dairy manure is 0.6 to 3.2 lbs per 1,000 gallons (Laboski & Peters, 2012)
- Ammonia may be similar or slightly increase depending upon nitrogen concentrations
 - Nitrogen content of milk ~0.5%, similar to dairy manure
- Follow recommended manure gas safety procedures as always
 - Larson, R.A, H. Aguirre-Villegas, C. Skjolaas, J. Shutske, J. Nelson, J, Schauer, & K. Erb. 2017. Reducing Risks from Manure Storage Agitation Gases. University of Wisconsin-Extension, Publication No. UWEX A4131-06 GWQ 078.
 - <https://cdn.shopify.com/s/files/1/0145/8808/4272/files/A4131-06.pdf>

Anaerobic Digesters

- Studies show increase in biogas production with increase milk additions until a threshold is reached and production is reduced
- Add milk slowly to allow for microbial communities to adjust and to assess impacts to biogas and methane
- Do not exceed permit volumes
- Be aware of implications for Renewable Identification Number (RIN) credits (e.g. D3 or D5)
- Wu, X., Dong, C., Tao, W. & J. Zhu. 2011. Anaerobic digestion of dairy manure influenced by the waste milk from milking operations. J. Animal Sci. 94, 3778-3786.
 - Added milk by volume up to 19%
 - Increased biogas production for all additions
 - Methane percentage decreased at higher additions

Additional Resources

Extension COVID Resources

Extension Dairy Team

<https://fyi.extension.wisc.edu/dairy/>

Extension Responds to COVID 19

<https://fyi.extension.wisc.edu/covid19/>

Nutrient Management

Nutrient and Pest Management Program

<https://ipcm.wisc.edu/>

WI DNR COVID-19: Environmental Compliance Process

<https://dnr.wi.gov/emergency/COVID19Compliance.html>



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