



Food Waste Diversion and Nutrient Management

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Vermont Agency of Agriculture

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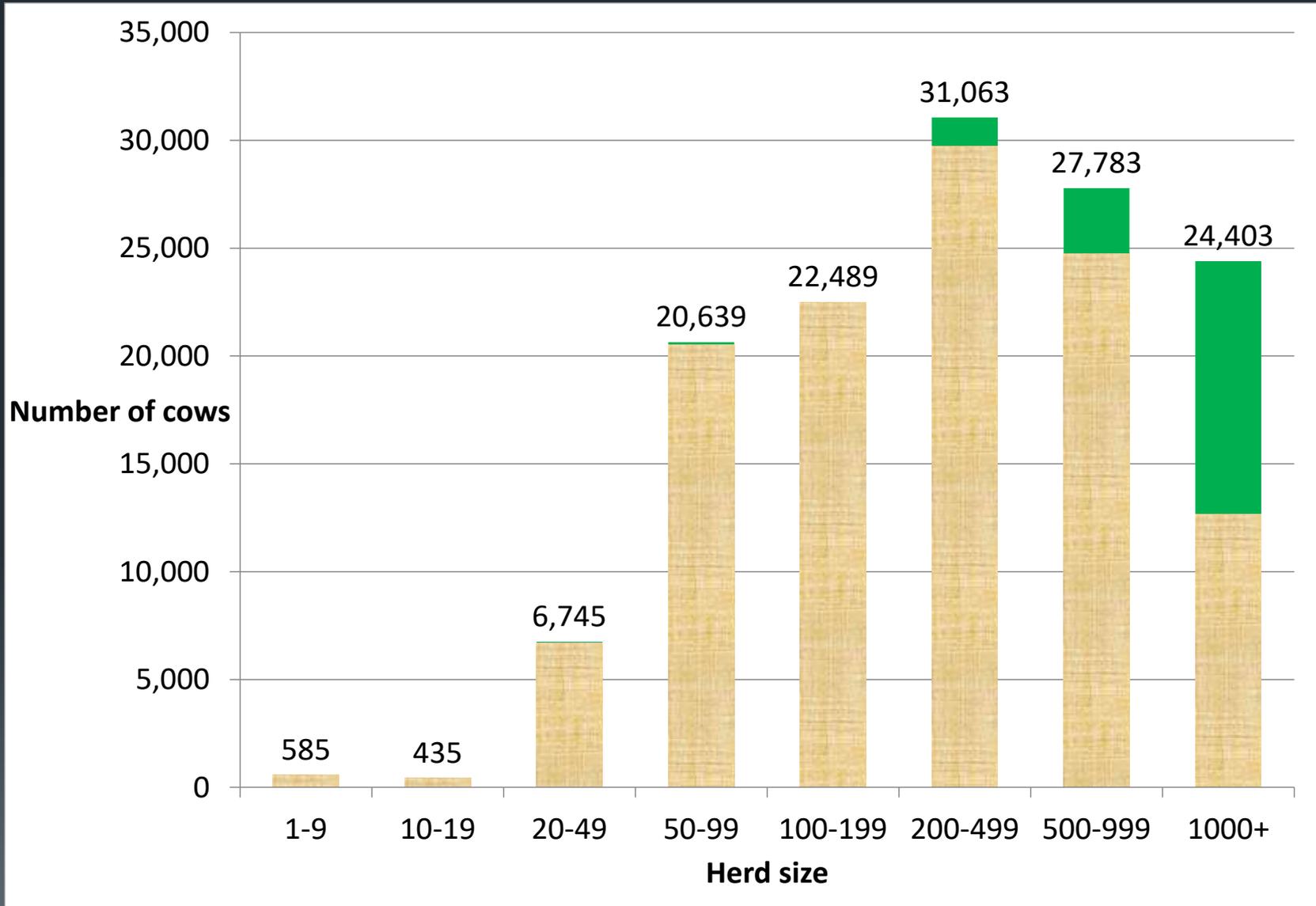
Outline

- Current status
 - Indirect discharge
 - DSM technical analysis
- Business models
 - The waste model
 - Some considerations for farms
 - Multi-farm projects
- Nutrient management
 - Permitting with ANR
 - Phosphorus extraction

Digesters and Food Waste

- 17 farm digesters in Vermont
 - Low usage of pre-consumer waste (“food processing residuals” – FPR – from beverage and food industry production.
 - 8 digesters use 4% of their digester capacity processing FPR.
 - 1 – 9% at individual digesters, except VTC, which is 13% from off the farm, about half of which is brewery waste and half is grease-trap waste.
 - As a percentage of capacity of the 15 digesters, the FPR is about 2%.
- Incoming... ? Solid food waste (SSO).

Dairy herd size (134,000)



Act 148 food waste

- DSM Systems Analysis (October, 2013)
 - 20,000+ tons needing a home by 2022
 - Composting, existing digesters, or new digesters?
 - Could all be handled by 10% of the volume of existing digesters.
 - How?
 - Competition, or complimentary?
 - Who builds capacity, and what does it take?

Business Models

- Composting
 - On-farm is known and well-established.

Next... from

- Vermont Sustainable Jobs Fund, Farm to Plate Network, “Sustaining Agriculture – Module 4, Local Regulatory Context”; page 15
- <http://www.vtfarmtoplate.com/stories/sustaining-agriculture-land-use-planning-modules>

Composting Permit Thresholds

No Municipal Regulation	Municipalities May Regulate		
Backyard Composting Exemption	Vermont Agency of Natural Resources Composting Rules Vermont Solid Waste Management Rules 2012, Subchapter 11, Organics Management (http://dec.vermont.gov/laws , Chapter 6)		
De minimis or backyard composting exemption: less than 100 cy/yr of combined organic material.	<u>Small-Scale Composting</u> <ul style="list-style-type: none"> • Manage up to 2,000 cy/yr of food residuals • Manage less than 5000 cy/yr total organics • No more than four acres involved with the composting activity, not including acreage required for liquid nutrients management • Must follow Accepted Composting Practices (ACPs) • Solid waste approval via registration process 	<u>Medium-Scale Composting</u> <ul style="list-style-type: none"> • Manage up to 5,000 cy/yr of food residuals • Manage less than 40,000 cy/yr total organics • No more than ten acres involved with the composting activity, not including acreage required for liquid nutrients management • Solid waste approval via categorical certification process 	<u>Large-Scale Composting</u> <ul style="list-style-type: none"> • Manage greater than 5,000 cy/yr food residuals and/or greater than 40,000 cy/yr of combined organics • Greater than ten acres, not including acreage required for liquid nutrients management • Requires full solid waste certification
Vermont Agency of Agriculture jurisdiction under Accepted Agricultural Practices			
On-farm compost that is made with farm wastes, manures, bulking agents, and up to 1,000 cy/yr food processing residuals			

Act 250: 10 V.S.A § 6001 (3)(D)(vii)

The construction of improvements below the elevation of 2,500 feet for the onsite storage, preparation, and sale of compost are not considered “development” in Act 250 if:

- compost is produced from no more than 100 cubic yards of material per year, or
- compost is principally produced from inputs grown or produced on the farm; or
- compost is principally used on the farm where it was produced; or
- compost is produced only from manure produced on the farm and unlimited bulking agents; or
- compost is produced on a livestock or poultry farm, only with manure produced on the farm, up to 2,000 cy/yr of inputs approved in the ACPs, including food residuals from any source or imported manure or both, and unlimited bulking agents;
- compost is produced on a primarily non-livestock farm that complies with the ACPs, including up to 5,000 cy/yr total organic inputs from off the farm, of which up to 2,000 cy/yr may be food residuals.

Other composting operations are subject to Act 250 approval.

Act 250 permitting required for all medium- and large-scale composting facilities.



The Manure + Waste Model

- Exeter Agri-Energy
 - Casella (Hadley MA, Rutland, MA)
- Food waste provider as co-owner!

About 20,000 tons of food waste get dumped into the digester annually, but a stream of 50,000 tons is needed to make the expansion project work.

“The choke hold on expansion is food waste,” Adam Wintle says.

To meet that need, the Wintles have launched an organics collection company called Agri-Cycle Energy.



Biogas Project Profile

Real Farm Power

Hadley, Massachusetts 1035

Owners and Developers: Vanguard Renewables, Barstow's Longview Farm, Agri-Mark/Cabot Creamery Cooperative

Contact: Ann Hoogenboom, 802.496.1359, ahoogenboom@cabotcheese.coop

Date Construction Started: 7/1/2013

Date Tank Started Being Filled: 11/1/2013

Date Project was Fully Operational: 12/31/2013



250 cows

Normally, $250/5 = 50$ kW

Inputs and Outputs

Feedstocks:	Barstow's Longview Farm Manure: 9,125 tons/year SSO and Food Scraps from Supermarkets, Food Manufacturers: 20,000 tons/year
Products created:	800kW electricity, digestate, heat

1/3 manure, 2/3 food waste

Manure as a “bulking agent” – a substrate for microbes, and a buffer

Vermont food waste digesters

- ... so far, not
- RFP – no takers
- Special rate – failure to “exercise site control”
- Windham County – feasibility studies

Farm project versus other

- Revenue from producing a product, or from taking a waste?
- Complexity of another business operating on a farm.
 - Permitting
 - More work
 - Investment is large
 - Dollars are scarce for any kind of project

Status as a farm

- Composting
 - Taxation in the current use program
 - Validity of conservation easement
- Anaerobic digester
 - Above, plus status as a farm-methane project rather than a food-waste digester, and therefore the rate paid for electricity.
- Solid waste permitting
 - “The ANR on my farm.”

Two multi-farm projects

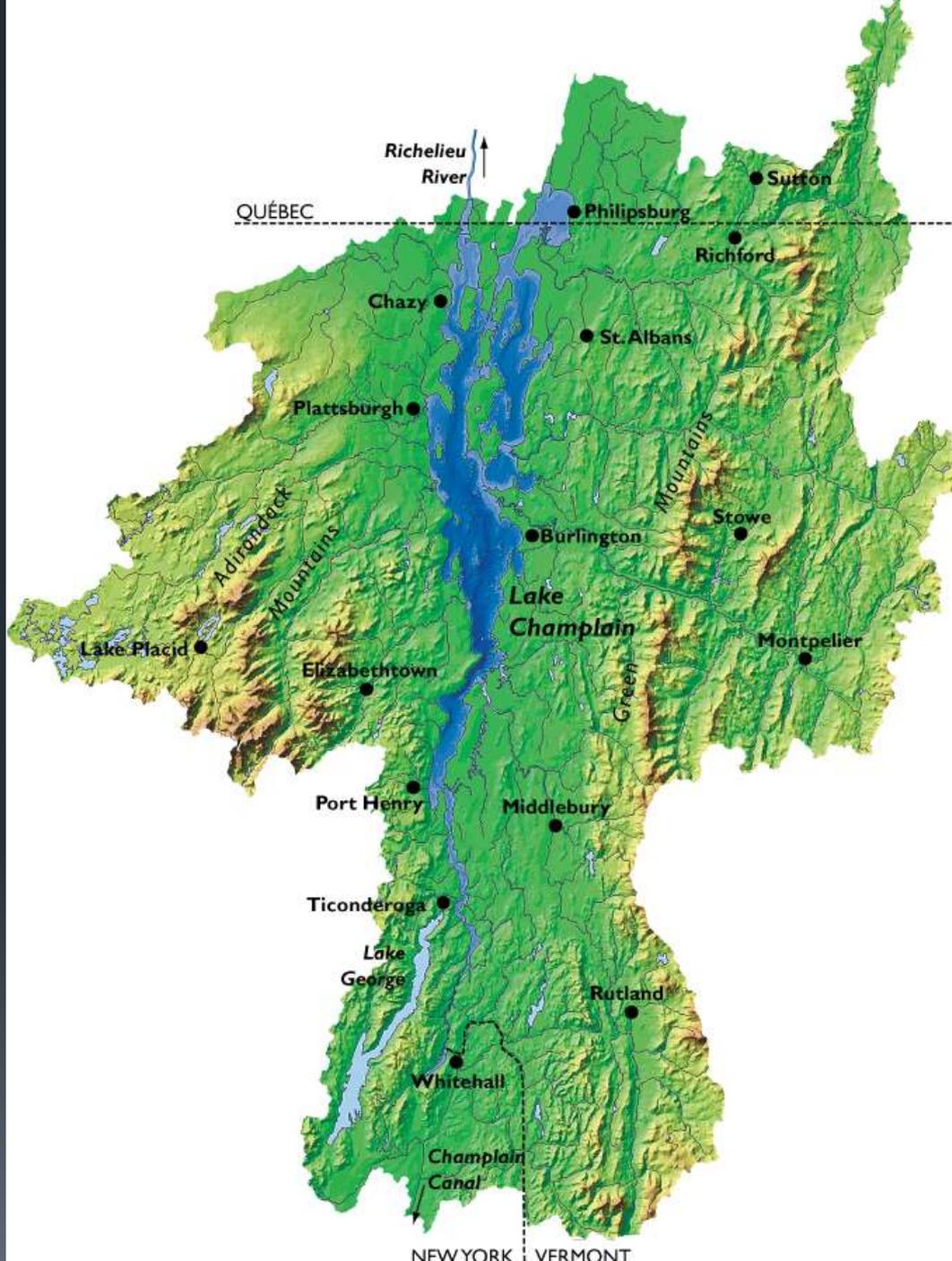
- Green Mountain Power
 - St. Albans Bay
 - Severely impaired watershed → big goals to reduce phosphorus
 - Food waste
 - Methane potential?
 - Competition with their existing Cow Power fleet?
- Lincoln RNG → Middlebury College
- Both three farms

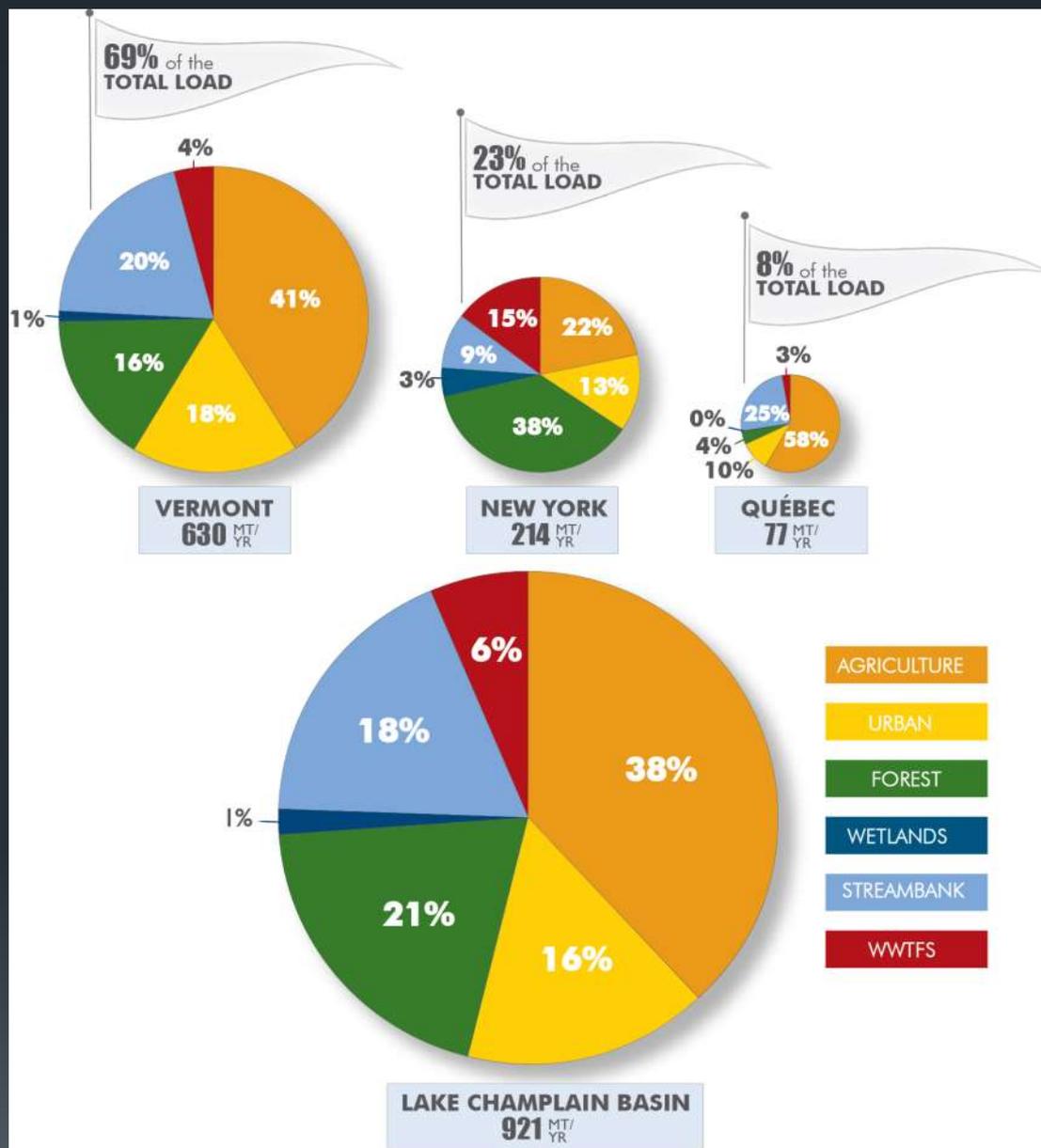
Nutrient management

- Basic Agency of Ag permitting to take off-farm wastes
- Big picture
- Some technology for extracting phosphorus

Agency of Agriculture permitting for food waste

- Basic model:
 - Enough volume in the manure pit to make it through winter?
 - Enough land base that the additional nutrients won't leave the farm?
- Farmer shows us.
- Yes, there's a form.
- Same theory – indirect discharge or solid waste.





NOTE: Grass/Shrub was included in the analysis but excluded from this graphic due to the comparatively low percentage of phosphorus.
 DATA SOURCE: Tetra Tech, 2015.

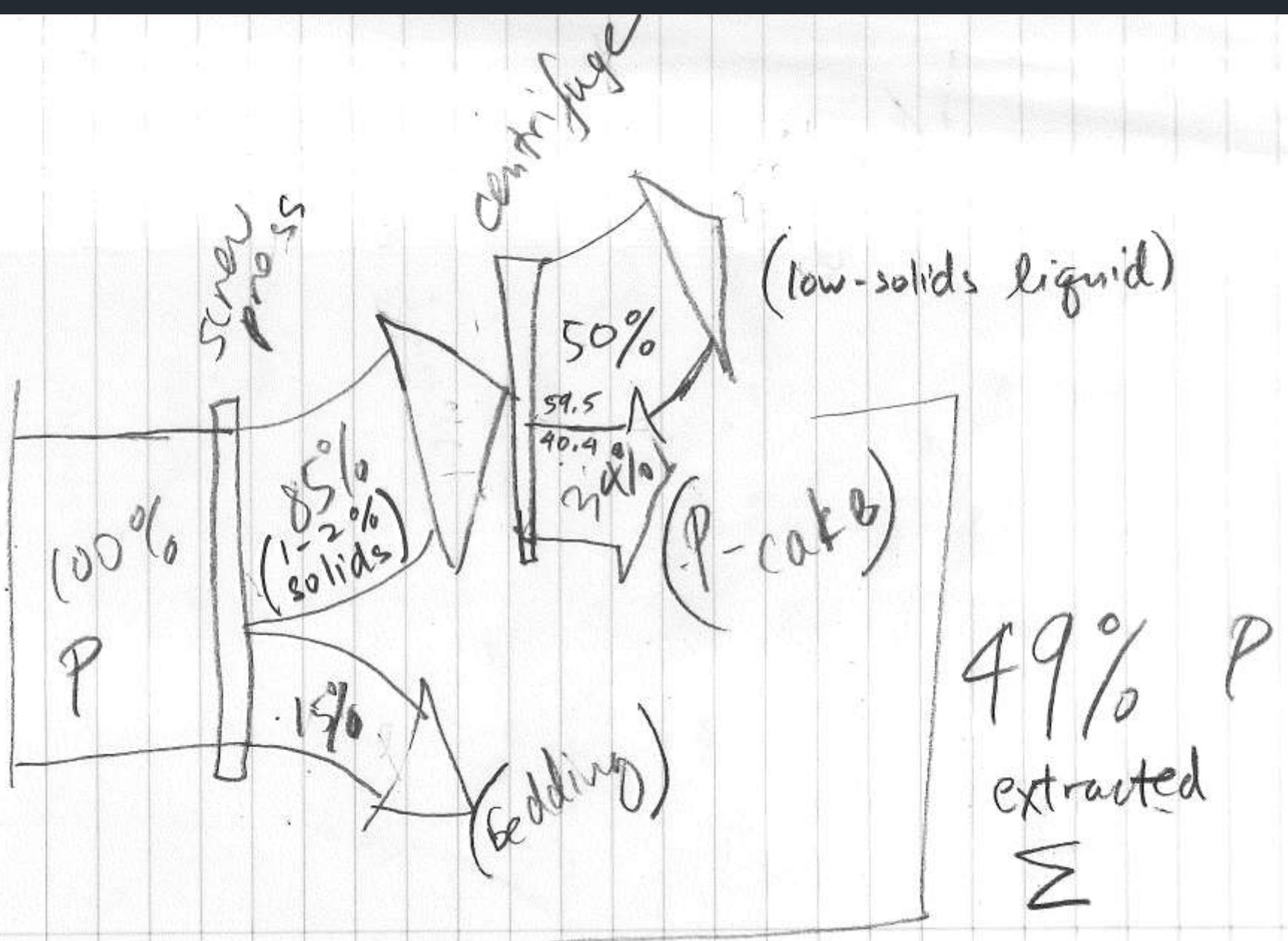
TMDL



Various technologies to extract P

- Centrifuge, filter belt, dissolved air flotation.
- Mostly from wastewater treatment world.
- Most work better downstream of a digester.
- Nutrient Recovery by Biogas Digestate Processing
 - 2015, IEA Bioenergy
- Not cost effective on the phosphorus recovered.
- *Still have to account for eventual disposition of remaining fraction of P!*
- “Source reduction” should be one of the solutions, along with “transport reduction” (less run-off).

Digester





Suggestions

- Bring ‘em on!
- Plato’s Republic.
 - Justice as each person doing that for which they are suited.
 - “There will be no end to the troubles of states until philosophers become rulers in this world, or until rulers become philosophers.”

Suggestions

- Good food waste brokers
 - Composters/haulers
 - Deliver qualified, tested material to digesters.
 - Sally Brown (“rocket fuel for gardens” etc.)
- Good solid-waste rules (duck test)
- P trading within agriculture only.
- Phosphorus removal plus draglining
 - Show the farmer 70% nitrogen and 30-40% P
- Act 64 Clean Water Fund