

FOOD AND VIRTUAL WATER IN THE GREAT LAKES STATES

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Water Scarcity

- Water scarcity: one of the greatest challenges of the 21st century, particularly related to food security
- Agriculture is the largest water-user worldwide.
- Agriculture uses 70% of all water used for human consumption.
 - water rights
 - trade offs between water uses

Purpose of Presentation

- Identify hidden export of Great Lakes water:
 - water is exported in the form of food products.

- Scanlan & Kehl, *Food and Virtual Water in the Great Lakes States*, 63 DePaul Law Review 771 (2014).
 - Data suggest Great Lakes region is a net exporter of virtual water through its agricultural exports.

 - We analyze these data in light of the existing legal framework for managing the waters of the Great Lakes Basin and discuss the potential for existing laws to address the net water loss.

Virtual Water Concept

Virtual water is not just water *embedded* in the agricultural or manufactured goods, but also the water used in production and lost through evapotranspiration.

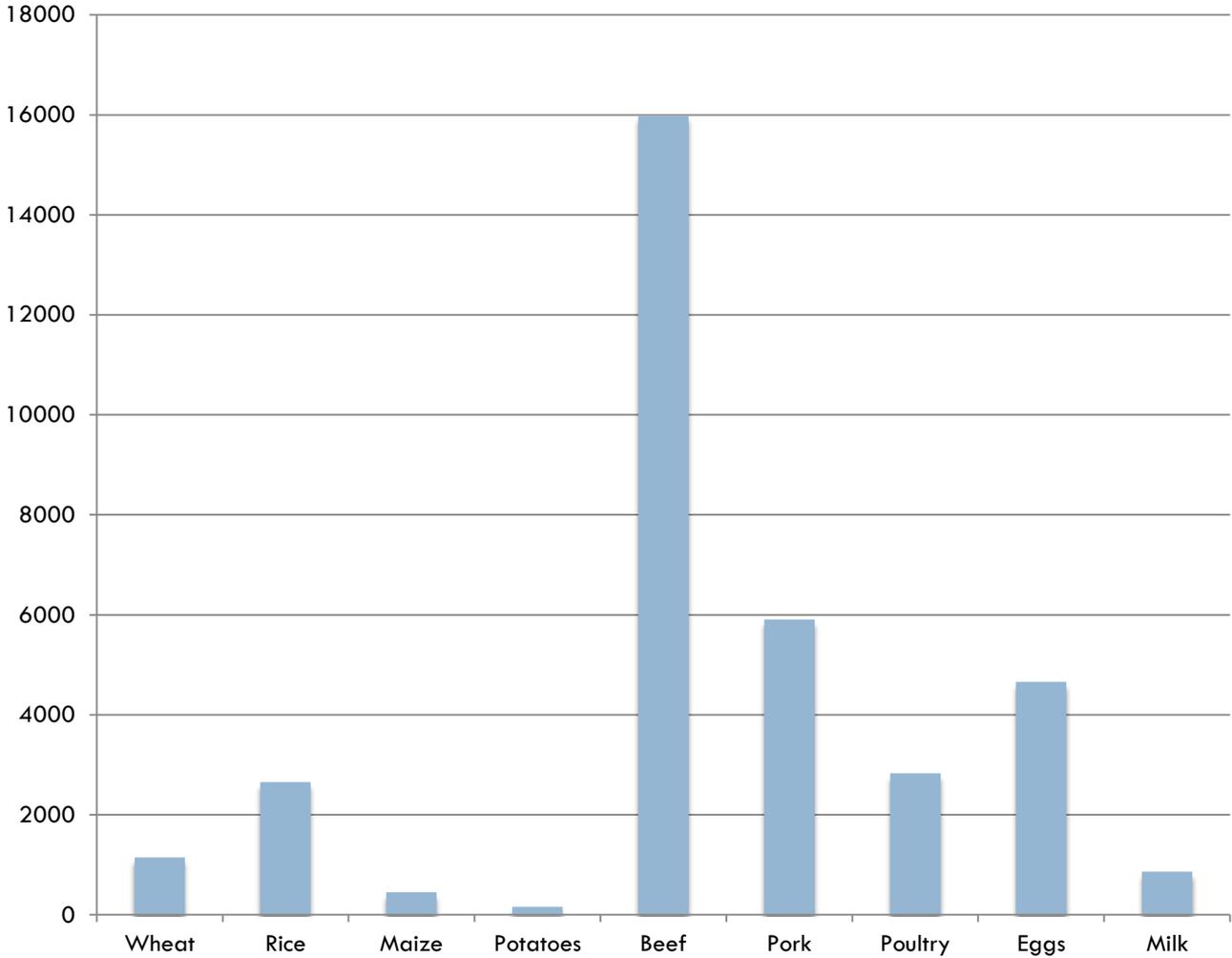
□ Examples:

- 1 gallon of water → 1 California almond
- 119 gallons of water → 1 ear of corn
- 500 liters of water → 1 cup of rice
- 4,500 liters of water → serving of beef

Virtual Water Measurements

- VW content = influenced by regional climate, evapotranspiration, soil conditions, production methods, technology, and other variables of hydrology.
- VW content = most commonly reported as meters per ton (m^3/ton).

Table 1: *Virtual Water Content Per Product* presents estimates for several of the most commonly produced and traded food crops, in m³/ton.



Data from Hoekstra and Hung 2003, Chapagain and Hoekstra 2003.

2003-2012: Six of the eight Great Lakes states are net virtual water exporters, meaning there is a net water loss from the region.

- Illinois net exporter of vw
- Indiana net exporter of vw
- Michigan net exporter of vw
- Minnesota net exporter of vw
- New York net importer*
- Ohio net exporter of vw
- Pennsylvania net importer*
- Wisconsin net exporter of vw

*Only when including highly populated parts of the state that are outside the Great Lakes Basin.

Great Lakes Regulation and Diversions

ALBANY RIVER BASIN

Ogoki Diversion

Long Lac Diversion

MINNESOTA

LAKE NIPIGON

LONG LAKE

ONTARIO

Lake Superior Control Works

DULUTH

Lake Superior

SAULT STE. MARIE

SAULT STE. MARIE

St. Marys River

WISCONSIN

GREEN BAY

Lake Huron

TORONTO

Lake Ontario

Lake Ontario Control Works

QUEBEC

Ottawa River

River

CORNWALL

MONTREAL

OTTAWA

OTTAWA

OSWEGO

NEW YORK

Lake Michigan Diversion at Chicago

CHICAGO

Lake Michigan

MICHIGAN

Lake St. Clair

DETROIT

Lake Erie

BUFFALO

New York State Barge Canal Diversion

TOLEDO

PENN.

ILLINOIS

OHIO

Long Lake and Ogoki Diversions	Chicago Diversion	Net Diversion
5,200 cfs into the basin	3,200 cfs out of the basin	2,000 cfs into the basin

Lake Superior average outflow	Lake Ontario average outflow
74,000 cfs	201,000 cfs
Both set by IJC approved regulation plans	



Existing Legal Framework for Addressing Net Virtual Water Exports

- Considering the water losses to the region, do the policies in place to govern the public trust adequately address virtual water losses?
 - Public Trust Doctrine
 - Great Lakes – St. Lawrence River Basin Water Resources Compact

Public Trust Doctrine

□ Core

- All states received navigable waters and lands beneath them from Federal government when they entered the union.
- The public trust doctrine describes the state as holding these navigable and tidal waters in trust for the use and enjoyment of the public for navigation, commerce, and fishing. Some states expand this to include all recreational, ecology, natural beauty, and access.
- Great Lakes waters are to be protected as a trust: shared, recycling system of interconnected private and public rights.

Illinois Central (1892)

- “ownership of the navigable waters . . . is a subject of public concern to the whole people of the state.”
- “The sovereign power itself, therefore, cannot . . . make a direct and absolute grant of the waters of the state, divesting all the citizens of their common right.”
- State power to make lakebed grants = extremely limited
- States have never made outright grants of the water

Can the state make grants of water?

- The new tool of calculating the virtual water removed from the basin in agricultural products, presents a conceptual challenge to managing waters as a public trust.
- While research remains to be done to more accurately understand the volume and impact of Great Lakes waters being removed and not returned to the Basin, the trustees have a duty to ensure that research is underway.

Great Lakes – St. Lawrence River Basin Water Resources Compact

- Based on the need to create a comprehensive basin-wide approach to managing water, the Compact makes it clear that diversions outside the basin are generally prohibited.
- As virtual water exports through agricultural products create a net water loss from the Great Lakes region, is this a diversion under the compact? Prohibited?
 - Is it regulated? Is it accounted for in any way?

Compact and Virtual Water in Agr

- Water used for agricultural production and not returned to the Basin is by definition in the Compact:
 - not a prohibited diversion

Instead it is:

- a withdrawal and consumptive use

Compact: How is VW in agr regulated?

- Uniform minimum standard applied to all regulated withdrawals and consumptive uses of waters within the Basin.
- Only applies to new or increased withdrawals and consumptive uses.
 - ▣ Uniform Standard S. 4.1 1: no significant indiv or cum. Impacts, incorporate conservation, comply with all state laws (i.e., public trust related laws), reasonable use factors
 - ▣ Applies to irrigated agriculture (not rainfall)
 - ▣ Each state sets regulatory trigger

State regulation of consumptive uses

- Uniform standard only applies:
 - Wisconsin: “water loss” averages >5 million GPD in 90 day period
 - Indiana: withdrawals from L.Michigan averages > 5 million GPD in 90 day period
 - New York: all agricultural uses of water in existence and registered on 2/15/12 are EXEMPT
 - Ohio, Minnesota, Illinois: consumptive uses of 2 million GPD averaged over specified time periods
 - Michigan: seasonal withdrawals > 2 million GPD averaged over 90 day period
 - Pennsylvania: unclear. Appears to not implement water permit program for this uniform standard

Conclusions

- The concept of virtual water is changing the way we understand water exports.
- Preliminary calculations show the Great Lakes states have a net water loss from exporting virtual water contained in agricultural products.
- The legal framework of the Great Lakes protects against water diversions, but this does not currently include virtual water in agricultural products.
- Compact Council should review and recommend strengthening state programs
- Data on virtual water exports and net water loss will become more important as water scarcity increases, and we need to support additional research in this area.

QUESTIONS, OBSERVATIONS, IDEAS?

THANK YOU.

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