Water Rights
Making a Market That Works for Farmers

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Who Am I? Why Am I Here?

NOT a farmer

NOT a water expert

NOT a Nebraskan
Who Am I? Why Am I Here?

I’m here because I believe that a water-rights market will make farmers better off:

- + Convenience
- + Value
- + Sustainability

... and because success in Nebraska could be a model for positive change around the world!!
No, Really, Why Am I Here?

It’s actually an interesting story:

• Jim Schneider (NE DNR) read my book “Game-Changer” …
• … and invited me to Lincoln to talk about economics of water

I raised the idea of a water-rights market as a “win-win-win” for farmers, for NE DNR, and for streamflow users …
No, Really, Why Am I Here?

It’s actually an interesting story:

• Jim Schneider (NE DNR) read my book “Game-Changer” …
• … and invited me to Lincoln to talk about economics of water

…. but I emphasized that, for a water-rights market to succeed, FARMERS MUST COME FIRST
What Benefits Farmers?

Chantale Lacasse (NERA) and I are here to learn from you how to make a water-rights market that creates the most value for farmers
What Benefits Farmers?

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Plan for My Remarks

WHY Am I Here?

WHY A Water-Rights Market?

WHAT Market Design Is Best For Farmers?
Why A Market?

1. Enable value-enhancing trade

2. Price discovery

3. Support sustainable farming practices
Enable Value-Enhancing Trade

A
value = $8
has water

B
value = $12
wants water

C
value = $18
wants water

D
value = $14
has water

TOTAL VALUE OF WATER USE
$22
Enable Value-Enhancing Trade

A

value = $8
paid $10

B buys at $10

B

value = $12
pays $10

C buys at $16

C

value = $18
pays $16

D

value = $14
paid $16

TOTAL VALUE
OF WATER USE
$30

TOTAL VALUE
OF WATER USE
$30
Enable Value-Enhancing Trade

groundwater price = $13

A
value = $8
paid $13

B
value = $12
paid $13

C
value = $18
paid $13

D
value = $14
paid $13

TOTAL VALUE OF WATER USE $32
Enable Value-Enhancing Trade

value = $8
paid $10

value = $12
pays $10

value = $8
paid $10

value = $18
paid $10 + $10

value = $14
pays $10

groundwater price = $10

TOTAL VALUE OF WATER USE $36

value for C’s stream impact = $10
Why A Market?

1. Enable value-enhancing trade

2. Price discovery

3. Support sustainable farming practices
Price Discovery

The Water-Rights Market establishes:

- “groundwater price,” i.e. price for water at a (hypothetical) location with zero stream impact
- “streamflow price”

These benchmark prices can be used to facilitate contracting of all kinds outside the context of the Water-Rights Market
Why A Market?

1. Enable value-enhancing trade

2. Price discovery

3. Support sustainable farming practices
Support Sustainable Farming

Our system of “use-it-or-lose-it” water rights discourages farmers from adopting the most efficient / most sustainable farming practices

Example #1: Crop Rotation

Example #2: Rainfed Rotation Crop
Example: Crop Rotation

Rotating corn with soybean has many benefits, including

- enhanced corn yields
- pest mitigation

Allowing farmers to lease their water rights on an annual basis would free them to rotate crops when doing so is most efficient!!
Example: Crop Rotation

Imagine a farmer with:
- two acres of prime land
- water rights for only one of those acres

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| "unirrigated acre" | "irrigated acre" |
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Example: Crop Rotation

Farmer will plant:

- low-water crops year after year on unirrigated acres
- high-water crops year after year on irrigated acres

CORN

SOYBEAN
Example: Crop Rotation

Farmer will plant:

- low-water crops year after year on unirrigated acres
- high-water crops year after year on irrigated acres

... leading to pest problems and lower yields
Example: Crop Rotation

A Water-Rights Market for one-year “leases” of water rights would facilitate efficient rotation:

• Year 1: Standard planting
Example: Crop Rotation

A Water-Rights Market for one-year “leases” of water rights would facilitates efficient rotation:

- Year 1: Standard planting
- Year 2: Sell temporary right to irrigated acres + Buy temporary right to unirrigated acres

More corn and fewer pests!!
Example: Rainfed Rotation Crop

When rotating corn and soybean, will farmers irrigate or rainfeed the soybean crop?

- irrigation increases soybean yield

Given use-it-or-lose-it water right, farmers will naturally choose to irrigate their soybean …
Example: Rainfed Rotation Crop

When rotating corn and soybean, will farmers irrigate or rainfeed the soybean crop?

- irrigation increases soybean yield

BUT

- value of water on soybean acres is lower than value of water on corn acres

Water-Rights Market creates an opportunity to lease soybean-acre rights when efficient
Enable Value-Enhancing Trade

Farmers A, B each have two irrigated acres on which they rotate corn and soybean

value on corn = $20
value on soybean = $5

TOTAL VALUE OF WATER USE
$50 / year

value on corn = $20
value on soybean = $5

stream impact value = $10 * 2
Enable Value-Enhancing Trade

Water-Rights Market gives farmers an incentive to leave their soybean rainfed, when it is efficient to do so.

- value on corn = **$20**
- value on soybean = **$5**
- paid = **$10**

TOTAL VALUE OF WATER USE

$60 / year
Plan for My Remarks

WHY Am I Here?

WHY A Water-Rights Market?

WHAT Market Design Is Best For Farmers?
Goals and Concerns?

• How do you envision the Water-Rights Market being of value to farmers?  
  – what would “good outcomes” be?

• What are your concerns for farmers or farming communities?  
  – what would “bad outcomes” be?
We Need Your Help

We need your input:

• what sort of market rules will instill confidence and maximize farmer participation?
• what sort of communication strategies will be most effective at “getting out the word”?

We need your leadership:

• the Water-Rights Market will only achieve its full potential when farmers embrace it as their own
THANK YOU!!
Trading water rights can be valuable to farmers and streamflow users, whether on a permanent or temporary basis

- permanent trades → efficient investment and long-term planning
- temporary trades → flexibility in water use responsive to changing conditions
A Case for Limits on Trade

Unrestricted trade benefits individual farmers, but could harm farming communities(**)

- such “negative externalities” potentially justify restrictions on market transactions

- one option: constraining water use in each locality not to fall below a prespecified lower bound

(**) Of course, by putting more money in farmers’ pockets, the Water-Rights Market also benefits farming communities
Visible Streamflow Bids

In a market with “visible streamflow bids”:

1. streamflow users bid their willingness to pay for streamflow BEFORE the market event

2. streamflow bids (and available “streamflow premiums”) are visible to farmers ahead of time
How The Market Works

FOR FARMERS
(LOOKING TO SELL)

1. Farmer indicates value of water-right to himself

This “bid to sell” indicates the LOWEST price at which the farmer is willing to sell

VALUE TO FARMER
How The Market Works

1. Farmer indicates value of water-right to himself
2. Market determines value of water-right to other market participants

Market value varies with location, depending on streamflow impact. [more on this later]
How The Market Works

1. Farmer indicates value of water-right to himself
2. Market determines value of water-right to other market participants
3. Farmer sells – and is paid full market value – if his own value is LESS than the full market value

FOR FARMERS (LOOKING TO SELL)

VALUE TO FARMER

PRICE FARMER GETS

PROFIT!!
How The Market Works

1. Farmer indicates value of water-right to himself

2. Market determines value of water-right to other market participants

3. Farmer buys – and pays full market value – if his own value is MORE than the full market value

For Farmers (Looking To Buy)
What Determines Value to Others?

Water not used on a farm can be used in many ways, e.g.:

1. by another farmer with the same streamflow impact
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1. by another farmer with the same streamflow impact

PROFIT FROM TRADE!!

VALUE TO FARMER

VALUE TO ANOTHER FARMER WITH SAME STREAM IMPACT
What Determines Value to Others?

Water not used on a farm can be used in many ways, e.g.:

1. by another farmer with the same stream impact
2. by a farmer with less stream impact AND extra streamflow
What Determines Value to Others?

Water not used on a farm can be used in many ways, e.g.:

1. by another farmer with the same stream impact

2. by a farmer with less stream impact AND extra streamflow

3. by a farmer with more stream impact BUT less streamflow
What Determines Value to Others?

Water not used on a farm can be used in many ways, e.g.:

1. by another farmer with the same stream impact

2. by a farmer with less stream impact AND extra streamflow

3. by a farmer with more stream impact BUT less streamflow
What Determines Value to Others?

The market finds the highest-value alternative use of each farmer’s water …

… and, in so doing, finds the trade that generates the most profit possible for each farmer.
How the Market Works

FOR STREAMFLOW BUYER
(NE DNR & PRRIP)

1. Before the market, NE DNR & PRRIP indicate the per-unit price they are willing to pay to procure different amounts.

This determines the so-called “demand curve” for streamflow.

Note: Demand for streamflow is set BEFORE farmers bid.
How the Market Works

FOR STREAMFLOW BUYER
(NE DNR & PRRIP)

1. NE DNR & PRRIP submit streamflow demand curve

2. Based on farmers’ bids, the market then determines the collective cost to farmers of increasing streamflow

This determines the so-called “supply curve” for streamflow
How the Market Works

FOR STREAMFLOW BUYER (NE DNR & PRRIP)

1. NE DNR & PRRIP submit streamflow demand curve

2. Farmers’ bids determine the streamflow supply curve

3. “Demand = Supply” sets market price $P^*$ for streamflow
   - NE DNR & PRRIP pay $P^*$ for each unit of streamflow they procure
   - Each farmer’s water price includes streamflow premium based on $P^*$

![Diagram of market equilibrium with demand and supply curves, indicating the equilibrium price $P^*$ and quantity $Q^*$]
The price at which a farmer can buy / sell water-rights can be thought of as the SUM of two parts:

1. Market price for groundwater …

Farmers with no stream impact can buy / sell at this price

2. PLUS Streamflow premium = (Market price for streamflow) * (Stream Impact Factor)

Stream Impact Factor varies from farm to farm, as determined by hydrological model