

Pollination Markets and Bee Forage

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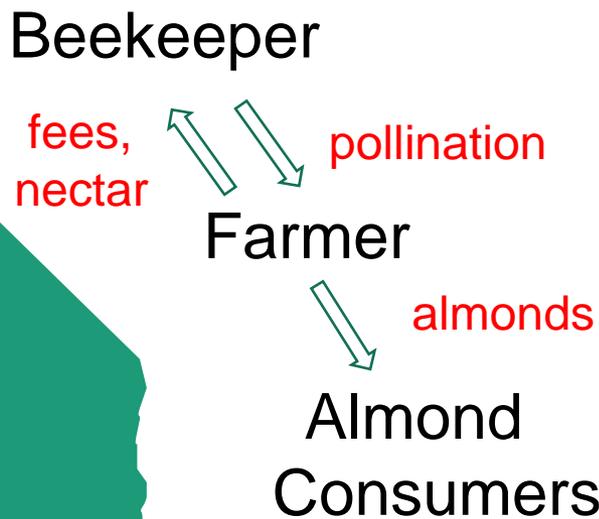
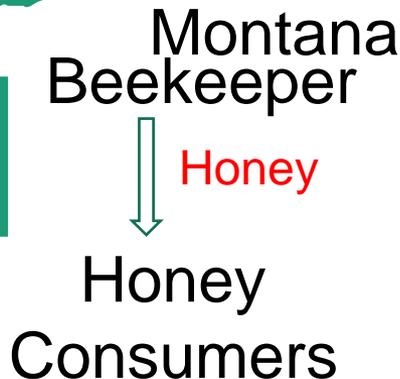
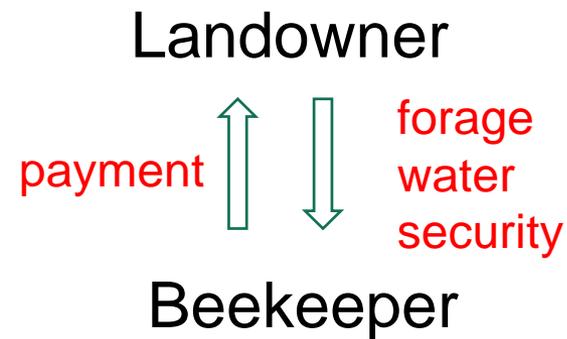
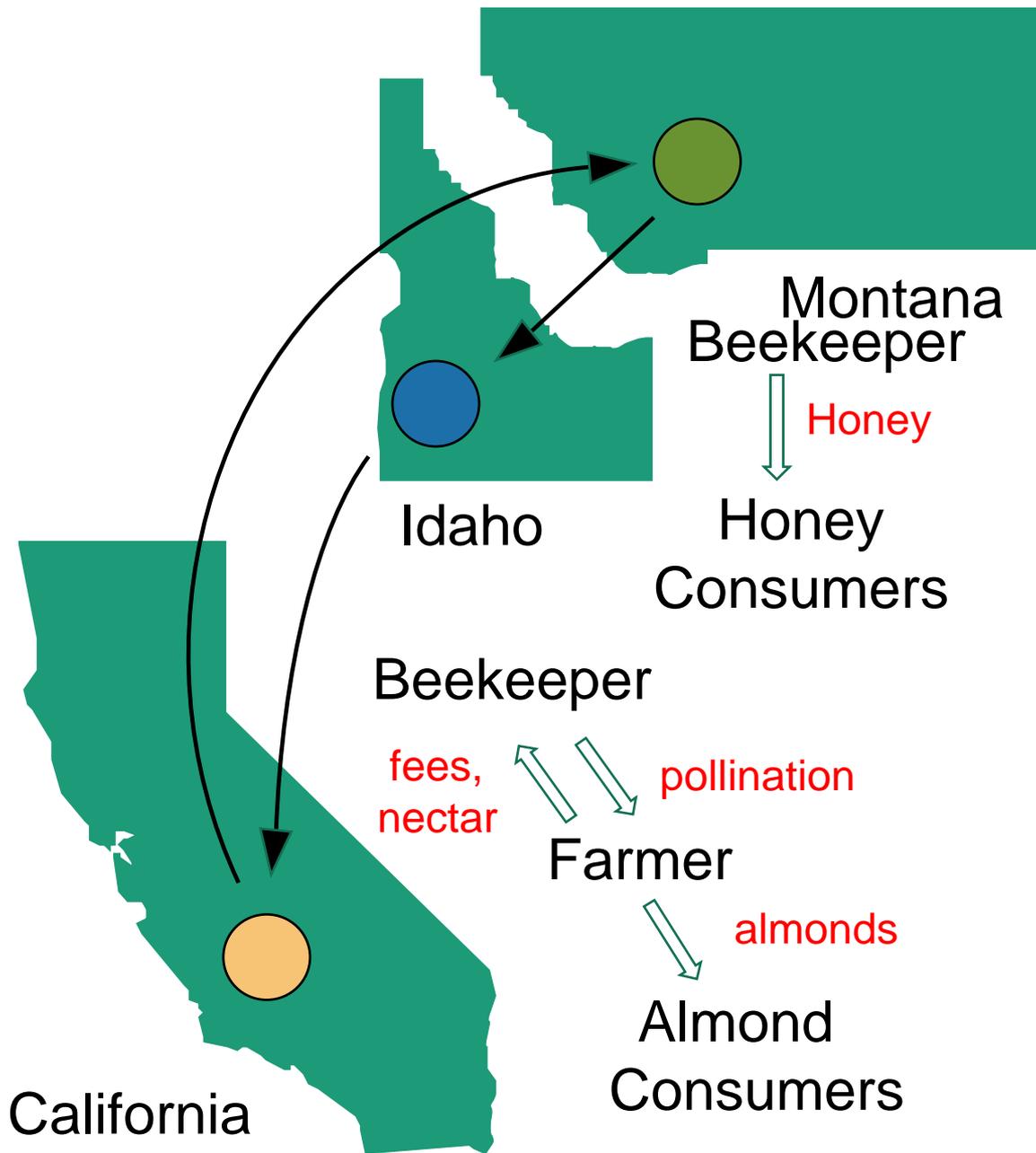


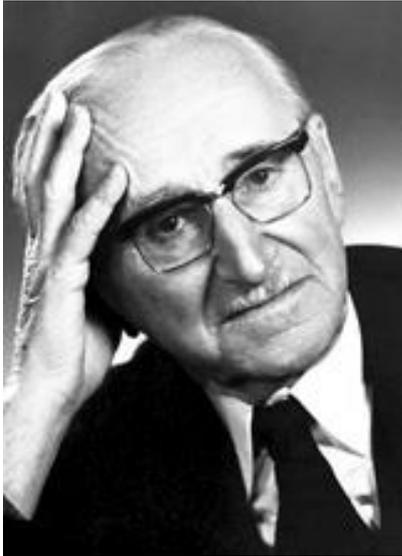
A stack of white wooden beehive boxes, likely made of plywood or similar material, arranged in a vertical column. The boxes are slightly weathered and have some dark spots. The text is overlaid on the side of the boxes. The background shows some dry grass at the bottom.

1. Bees in economics

2. Pollination markets

3. Forage markets





***Friedrich Hayek
1974 Nobel Prize in Economics***



***Markets are evolved systems
that exploit decentralized knowledge***

Bees in economic thought

***Nobel prize winner James Meade (1952)
wrote about externalities and bees***

- ***some are good, some are bad***
- ***bees-and-apples example of reciprocal externality***

Steven Cheung (1973)

- ***beekeepers and apple growers transact***
- ***first economic analysis of
pollination markets***

Pollination Markets

- ***Rucker, Thurman, and Burgett,***

“Honey Bee Pollination Markets and the Internalization of Reciprocal Benefits”

(Am J of Ag Econ, 2012)

Pollination fees depend upon pollination value, honey value, beekeeping costs

- ***Markets solve sophisticated information problems over space and time:***

information discovery, generation, gathering, and processing

Markets facilitate adaptation

- ***Rucker, Thurman, and Burgett,***

***“Colony Collapse and the Consequences of Bee Disease: Market Adaptation to Environmental Change”
(J of Assoc of Env and Res Econ, 2019)***

U.S. honey bee numbers, queen and package prices, honey production, and (all but almond) fees show no evidence of CCD.

Markets evolve

Standardization of contract by frame count/colony strength

See recent work by Goodrich.

The Evolution of Markets

Markets didn't always exist.

What does it take to make pollination markets?

- *crops that benefit*
- *biological knowledge – Olmstead & Wooten*
- *roads/infrastructure*
- *rule of law to allow contracting and prevent theft*
- *forage*

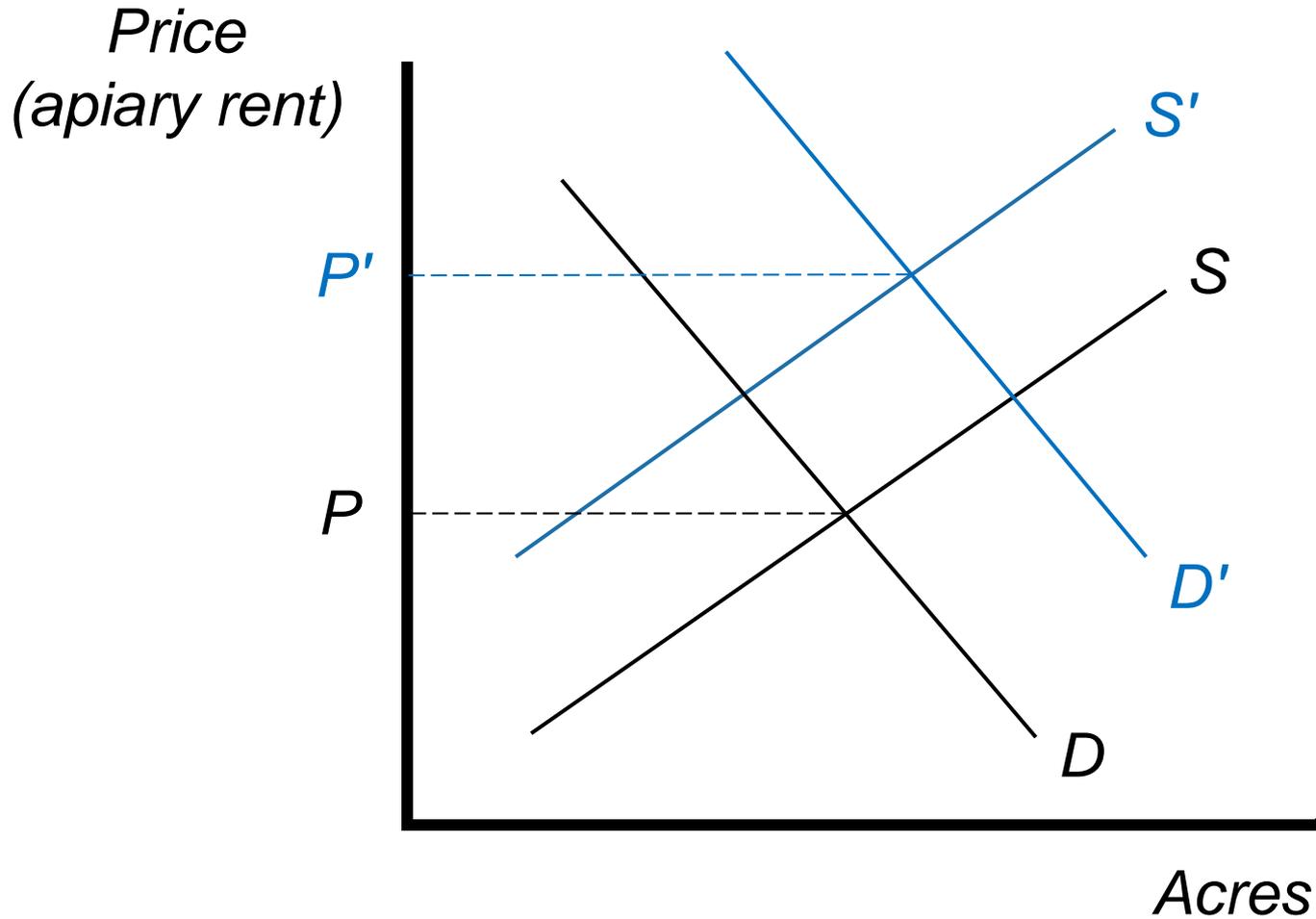
The Importance of Forage

- *February/March: 1 million acres of almonds and 2 million colonies of bees*
- *Summer forage: 79 acres per colony*
- *Bees per acre density 158 times greater in almonds (pollination) than on forage (honey)*
- *Bees on almonds require 8% of lower-48 state land mass for later-season forage (Montana plus Minnesota)*

Has the supply of forage decreased?

- ***Otto, Roth, Carlson, and Smart, “Land Use Changes Reduces Habitat Suitability for Supporting Managed Honey Bee Colonies in the Northern Great Plains” PNAS (Sept 13, 2016)***
- ***Sunflower acreage in Dakotas, now partly replaced with soybeans and corn (ethanol policy)***

The Market for Forage



Forage Markets?

- ***Smart et al., “The Influence of Spatiotemporally Decoupled Land Use on Honey Bee Colony Health and Pollination Service Delivery,” Env Res Letters (2018)***
 - ***Higher summer forage quality leads to higher subsequent frame count***
 - ***10,000 colony operation would earn at least \$820,000 more per year with access to high-quality forage***
 - ***If forage value isn’t reflected in payments to land owners, then money is left on the table.***

Do apiary rents reflect value?

- ***What about 5 pounds of honey paid to land owners? Gift or price? (Or is it 5 gallons?)***
- ***Is the supply of good forage available elastically, and cheaply?***

If forage markets don't work, why?

- *Property rights in forage access difficult to enforce*
- *Transaction costs of exchange*

Bottom line

- ***Cheung rebutted claims of pollination externalities.***
 - ***Is this another rebuttal opportunity? Or are there significant impediments to exchange? Implies a research agenda.***
- ***Land-intensive bee forage is increasingly important:***
 - ***Pollinated crops depend on it***
 - ***Sustainability of the managed pollinator agricultural system depends on it***