



Impact of Biofuels Production on Marginal Lands

Presented by

Dileep K. Birur

Department of Agricultural Economics
Purdue University, West Lafayette, IN.

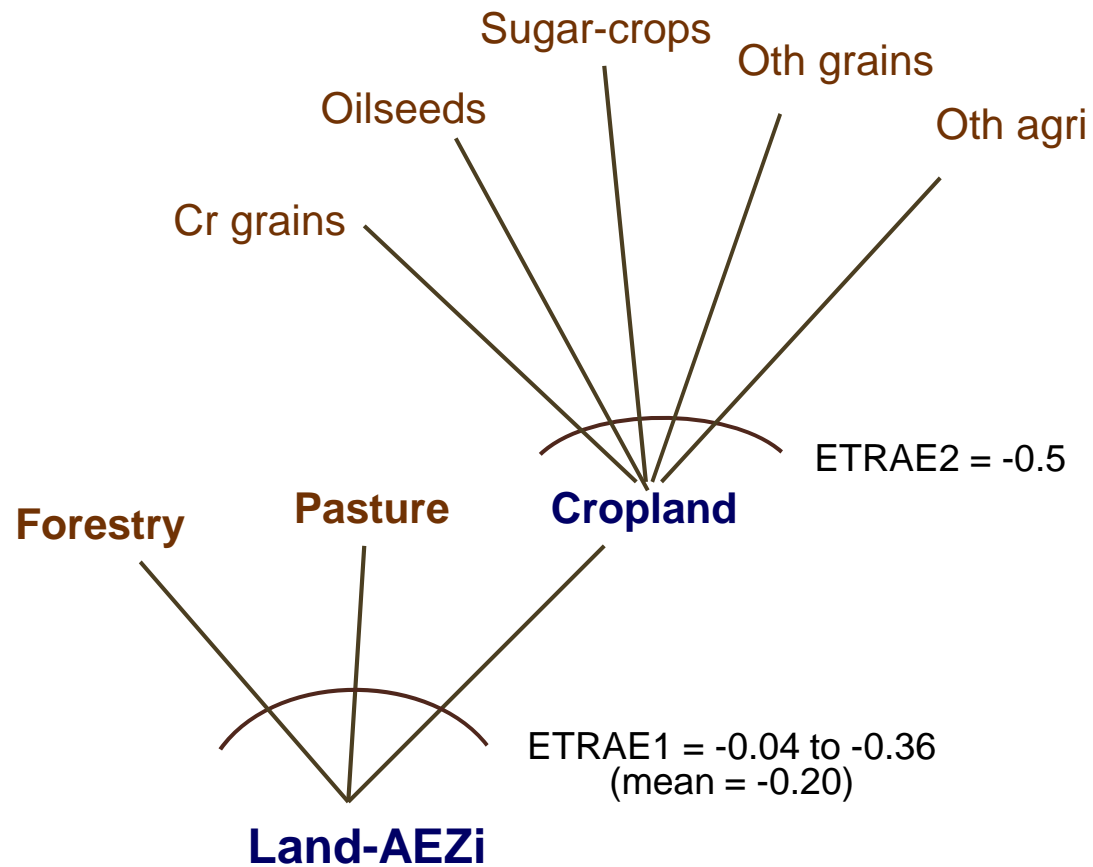
Argonne – Purdue Stakeholders' Workshop
January 26, 2009



Structure of Land-Supply in GTAP

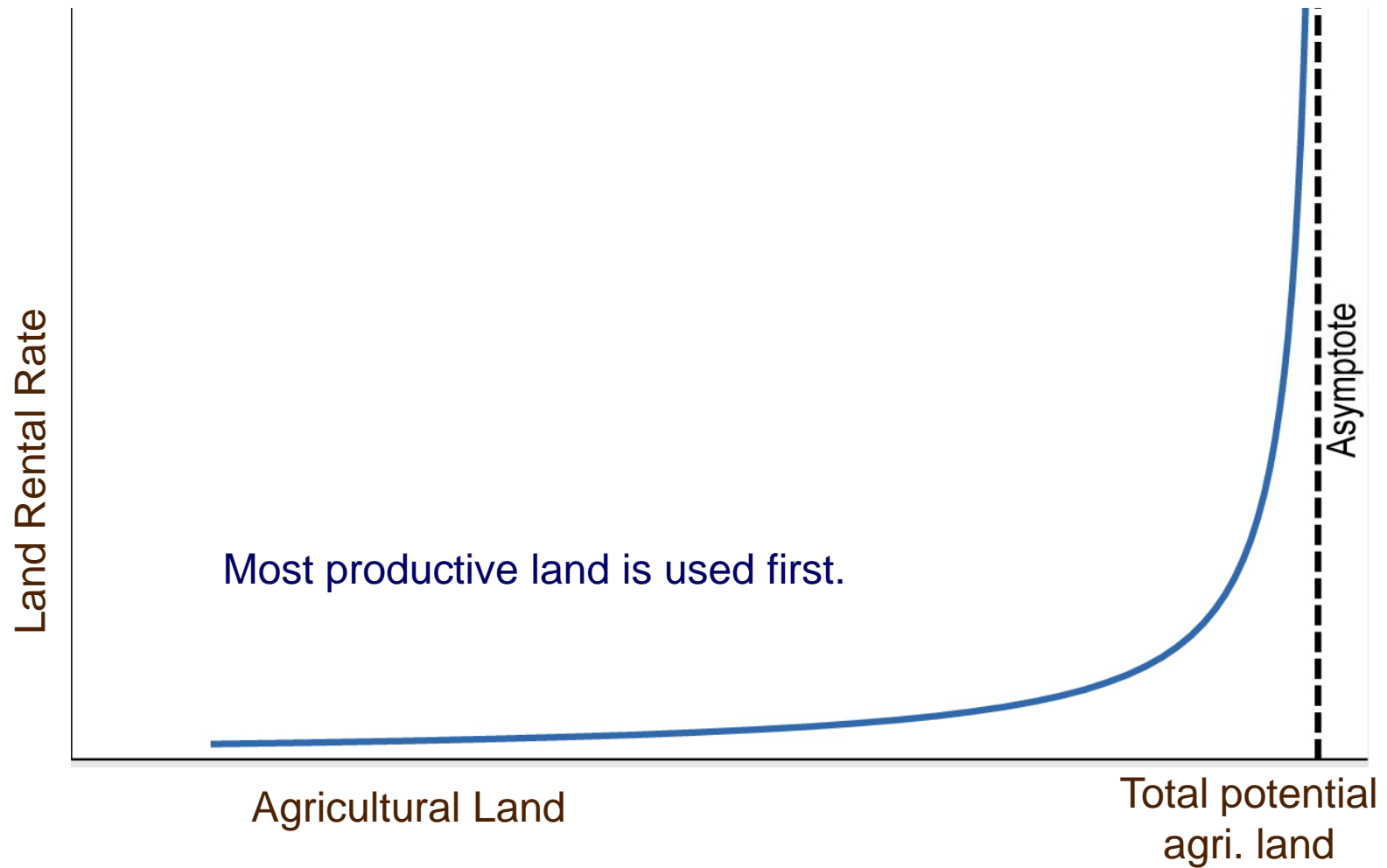
- Conceptual land-owner's problem (Keeney and Hertel , 2008)
 - Maximizes total returns to land (CET revenue function) subject to constraint on transforming land from one use to another.
 - In the first stage, the land owner allocates land across crops within the harvest cropland with the transformation parameter -0.5 (Keeney and Hertel, 2008).
 - In the second stage, the allocation happens across cover types (crop-cover, pasture-cover, forest-cover) with the transformation parameter -0.20 (Lubowski *et al.* 2008).

Land in value-added nest



Land Supply Curve – LEI approach.

-Determining land conversion and land rental rate



Source: van Meijl *et al.* (2006)



Potential Impact on Marginal Lands

With the growing demand for food and biofuel feedstocks, there is potential pressure on *marginal/idle* lands to grow these crops.

- The marginal lands that can be brought under cultivation of food/feedstock crops particularly in the U.S. are (i) cropland pasture and (ii) Idle cropland – CRP, WRP, etc.
- *Cropland pasture* : includes land used for growing pasture crops (long-term rotation).
- *Idle cropland* : includes cropland enrolled in Federal Conservative Reserve Program (CRP) and Wetland Reserve Program (WRP).



Marginal Lands in the context of Biofuels

CRP originally designed to reduce soil erosion and commodity surpluses, has evidently resulted in other environmental benefits.

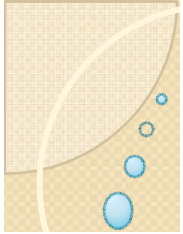
- CRP rewards farmers with annual rental payments and cost-share assistance.
- USDA will distribute \$1.8 billion over 430,000 farms at an average of \$50.93/acre, in the FY 2009.
- Loss of CRP lands could have many implications on – beekeeping industry, specialty crop industry, etc.



Current Status of CRP Lands

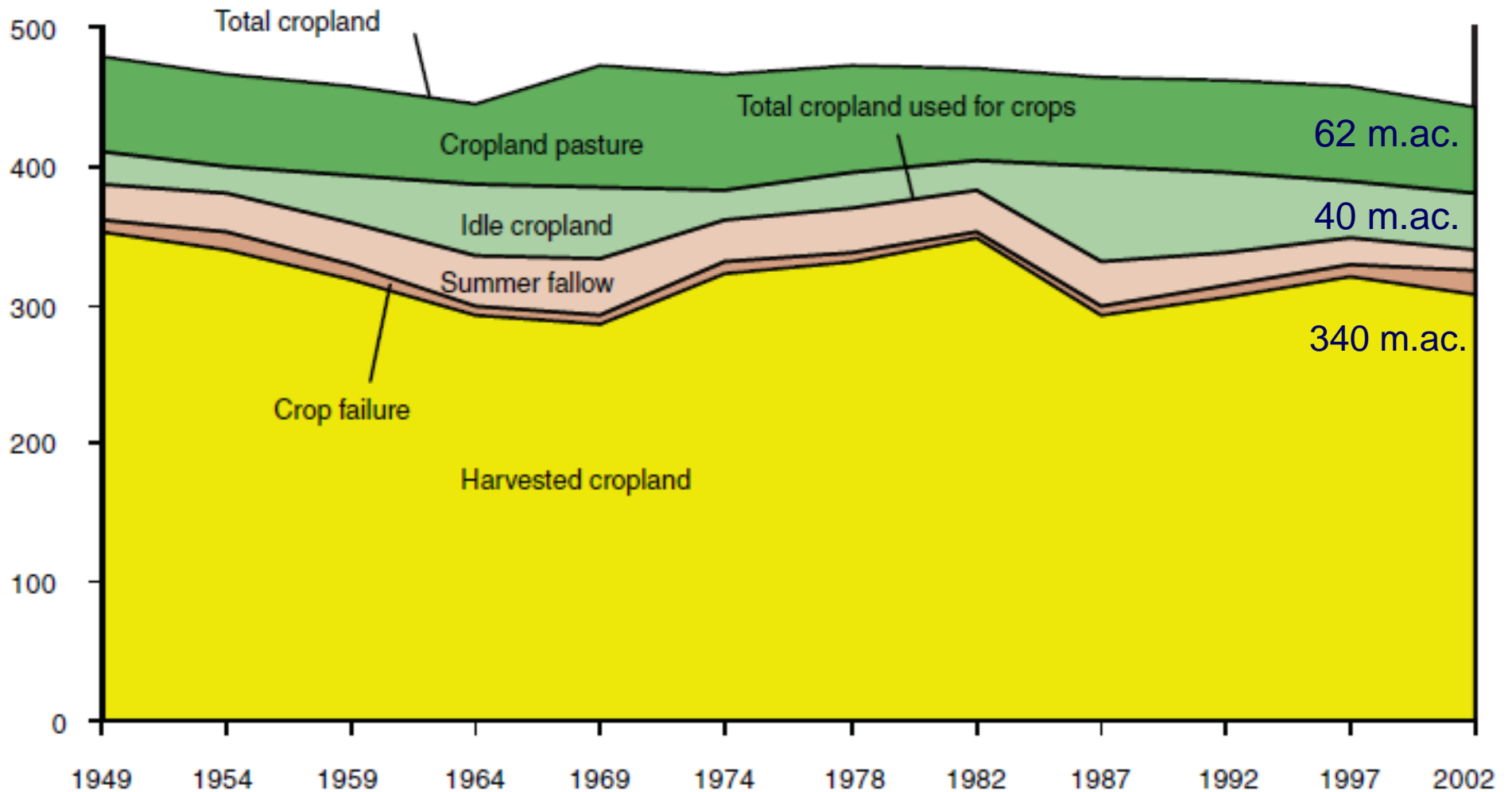
The Food, Conservation, and Energy Act of 2008 extends the CRP enrollment authority through September 30, 2012.

- Enrollment authority set at 39.2 million acres through 2009 and reduced to 32.0 million acres for fiscal years 2010, 2011, and 2012.
- Commodity prices and cost of production would determine the early release of land in CRP.



Major Uses of U.S. Cropland

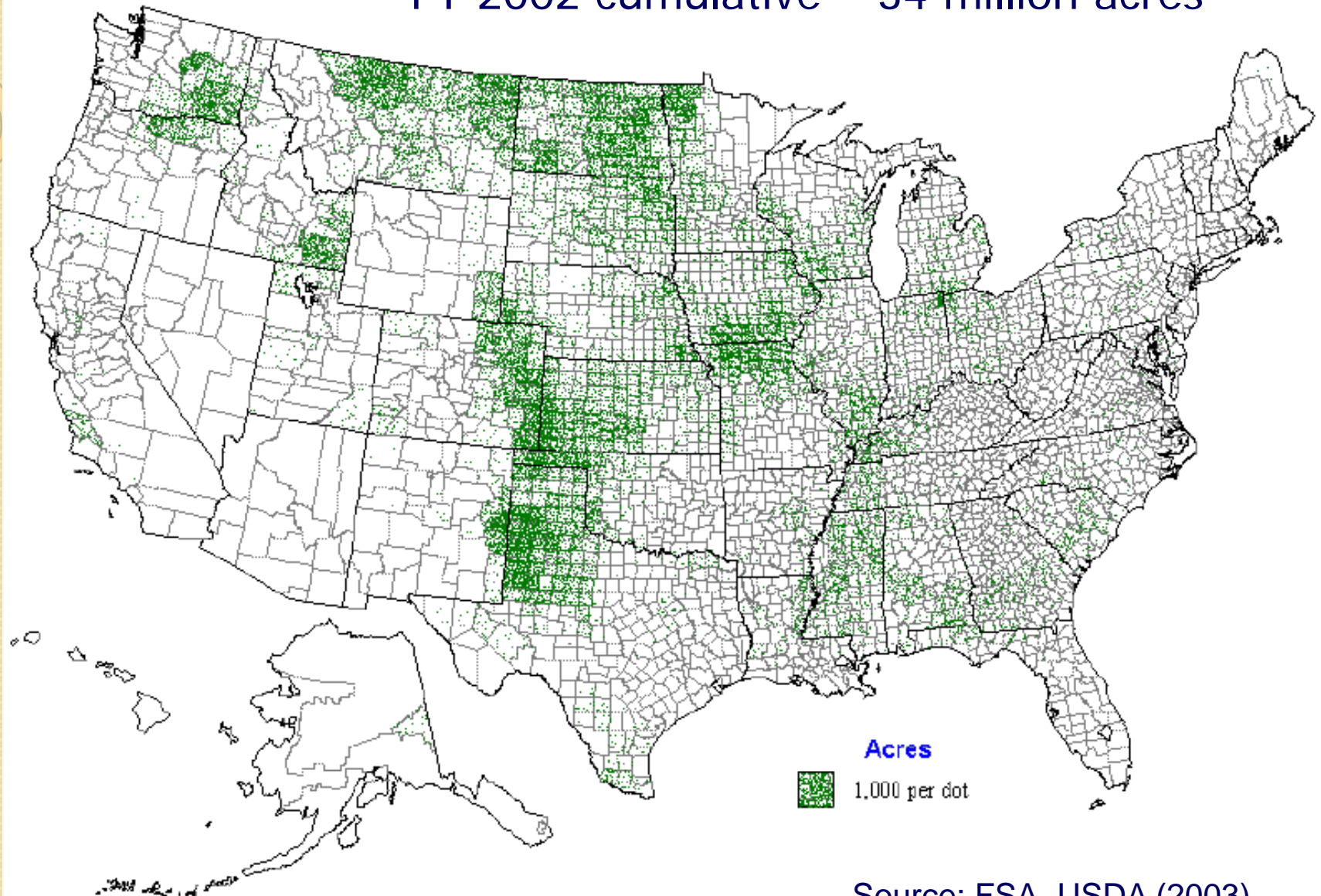
Million acres



Source: Lubowski *et al.* (2006)

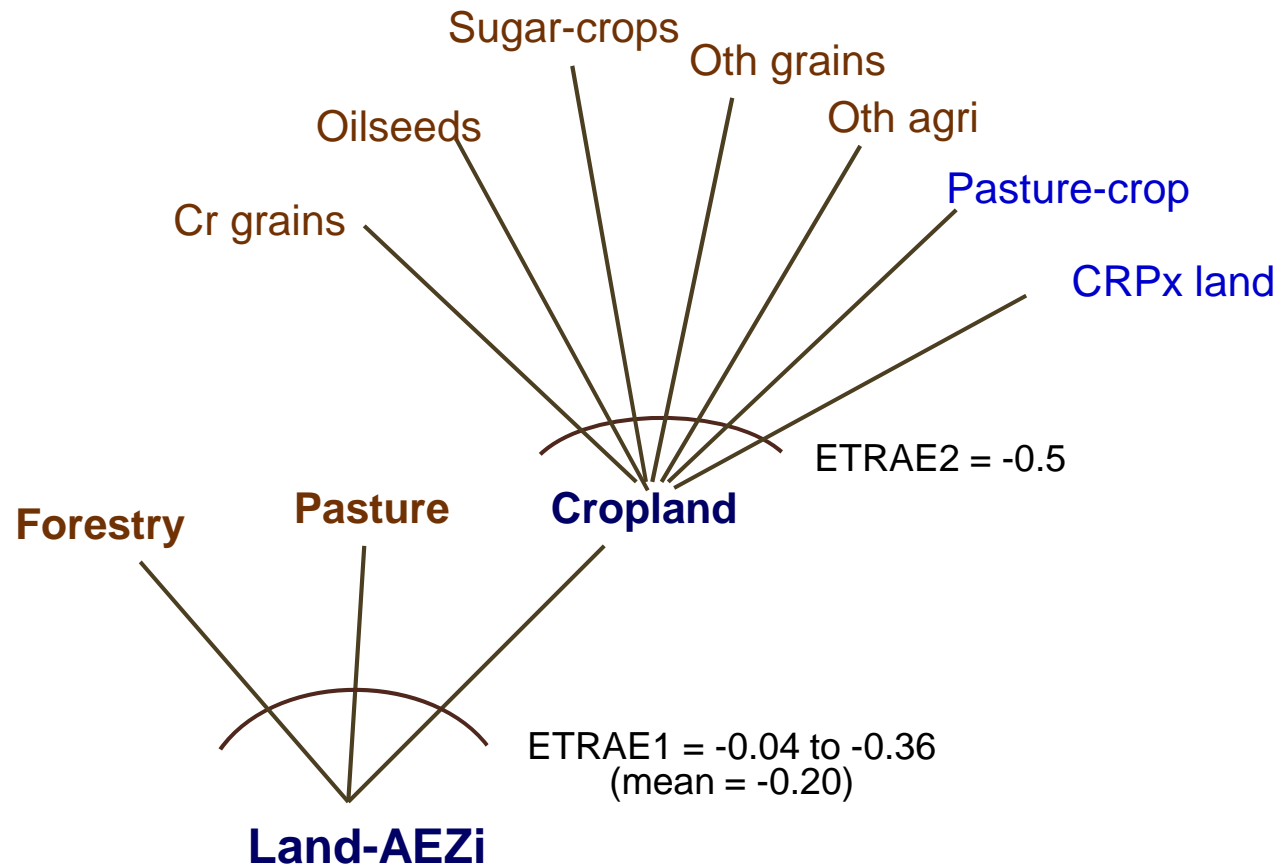
CRP Enrollment:

FY 2002 cumulative – 34 million acres



Source: FSA, USDA (2003)

Adding Marginal Land Information



Data on Land-use and Land-cover - USA

	(million acres)	SAGE	NASS, ERS/USDA	Modified
1	Crop-cover	454	442	454
2	Forest-cover	835	651	835
3	Pasture-cover	573	587	573
4	Unmanaged land	276	228	276
	Total	2,137	1,908	2,137
5	Harvested Area	326	340	326
6	Pasture-crop (U of T)	56	62	62
7	CRP-Idle Land (U of T)	28	40	40
	Total	410	442	428

Data on Land-use and Land-cover - Brazil

	<i>(million acres)</i>	SAGE	ORNL (Table-6)	Modified
1	Crop-cover	127	124	124
2	Forest-cover	389		389
3	Pasture-cover	447	378	378
4	Unmanaged land	401		401
	Total	1365		1293
5	Harvested Area	120		120
6	Pasture-crop (ORNL)		58	58
	Total	1365		1352

Computing Land Rents for Marginal Lands across AEZs

➤ Pasture-crop

$$LR_{i'pasturecrop'r} = \begin{cases} 0 & \text{if } LR_{i'livestock'r} < 0 \text{ else,} \\ \theta_{ijr} \cdot LR_{i'livestock'r} + (1 - \theta_{ijr}) \cdot \frac{\sum_{k=food\ crops}^n LR_{ikr}}{n} \end{cases}$$

$\theta_{ijr} = 0.6$ in the U.S., 0.8 in Brazil

➤ CRP-Lands

$$LR_{i'CRP\&land'r} = \theta_{ijr} \frac{\sum_{k=food\ crops}^n LR_{ikr}}{n}$$

$\theta_{ijr} = 0.7$ in the U.S.



Qualifications

Though we expect that the new modification in the land-supply would reduce pressure on forest and pasture cover, it is subjected to sensitivity of various factors:

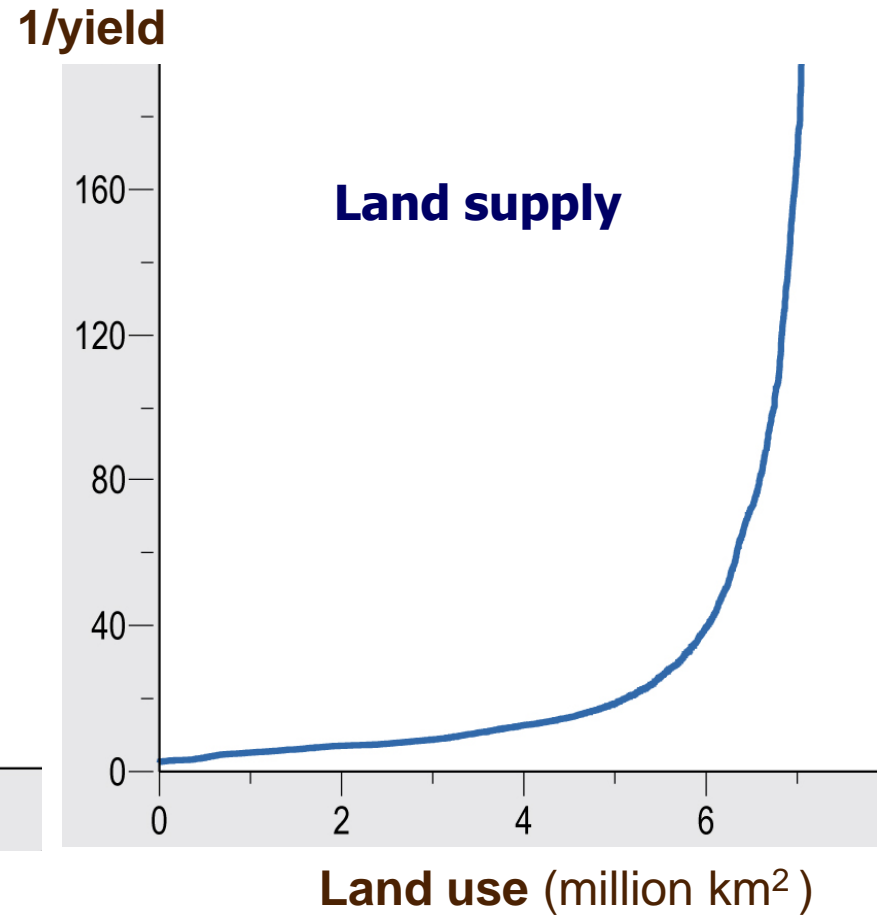
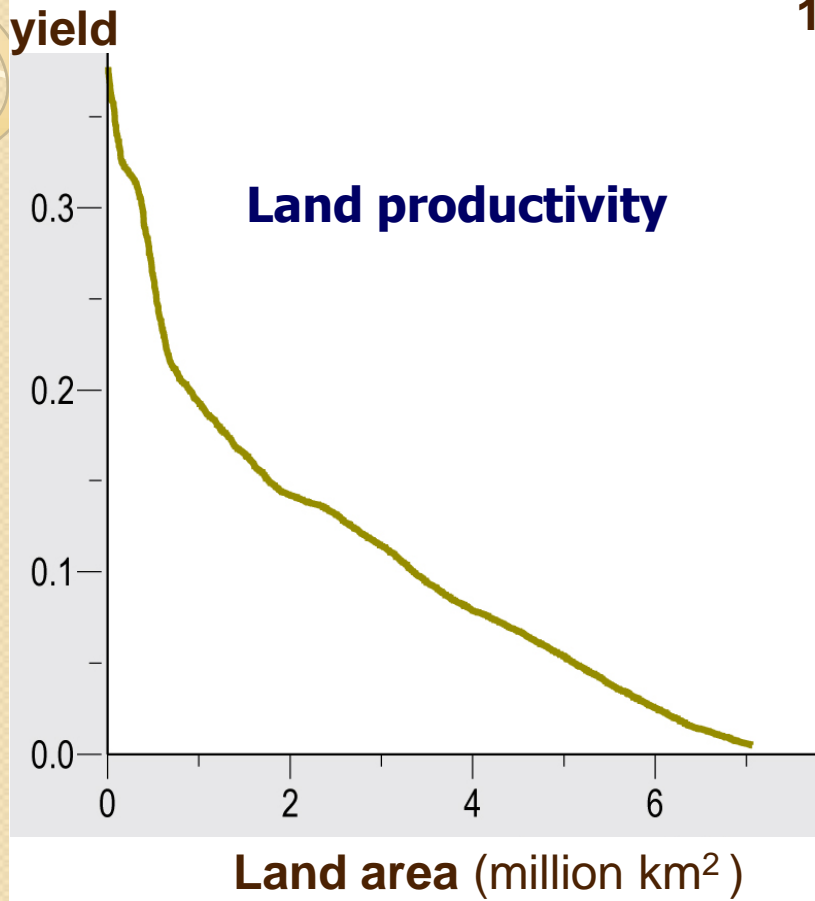
- Our assumptions in computing land-rents (as indicators of productivity) for pasture-crop and CRP lands.
- Structure of land supply function.
- Elasticity of transformation of marginal lands.
- Any associated conversion costs that we ignore here.



Thank You

Questions / Comments?

Land Supply Curve – Canada



Source: Eickhout *et al.* (2008)