Implications of National Biofuel and Biomass Policies for Global Forests

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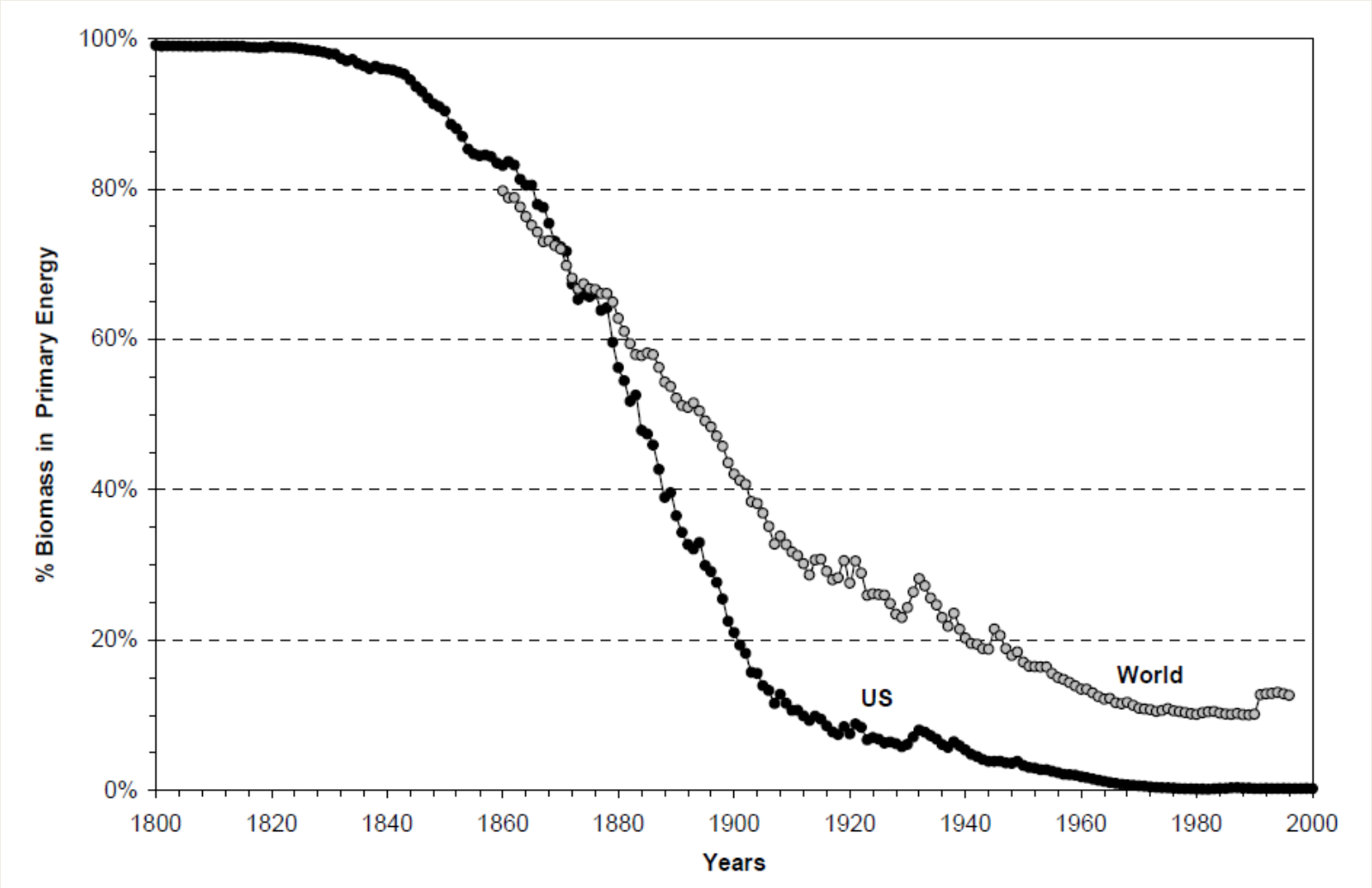
Note: References provided upon request

- US and European policies are placing lots of demands on forests for biomass energy.

- Estimates indicate that achieving growth in biofuels from forests will come at a steep cost.

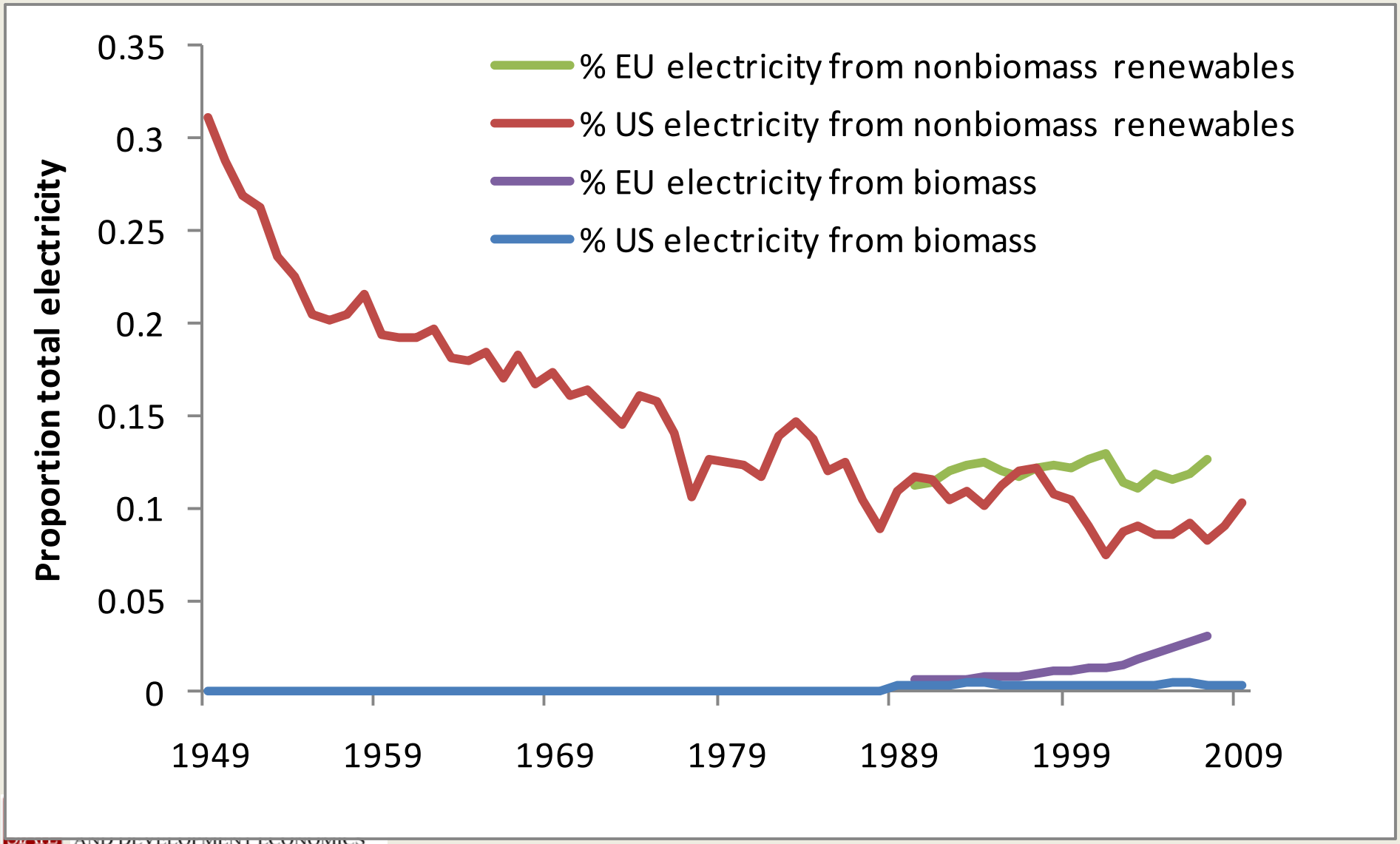
- Costs: extraction, competition, lost opportunities.

Biomass as a source of energy has been declining historically

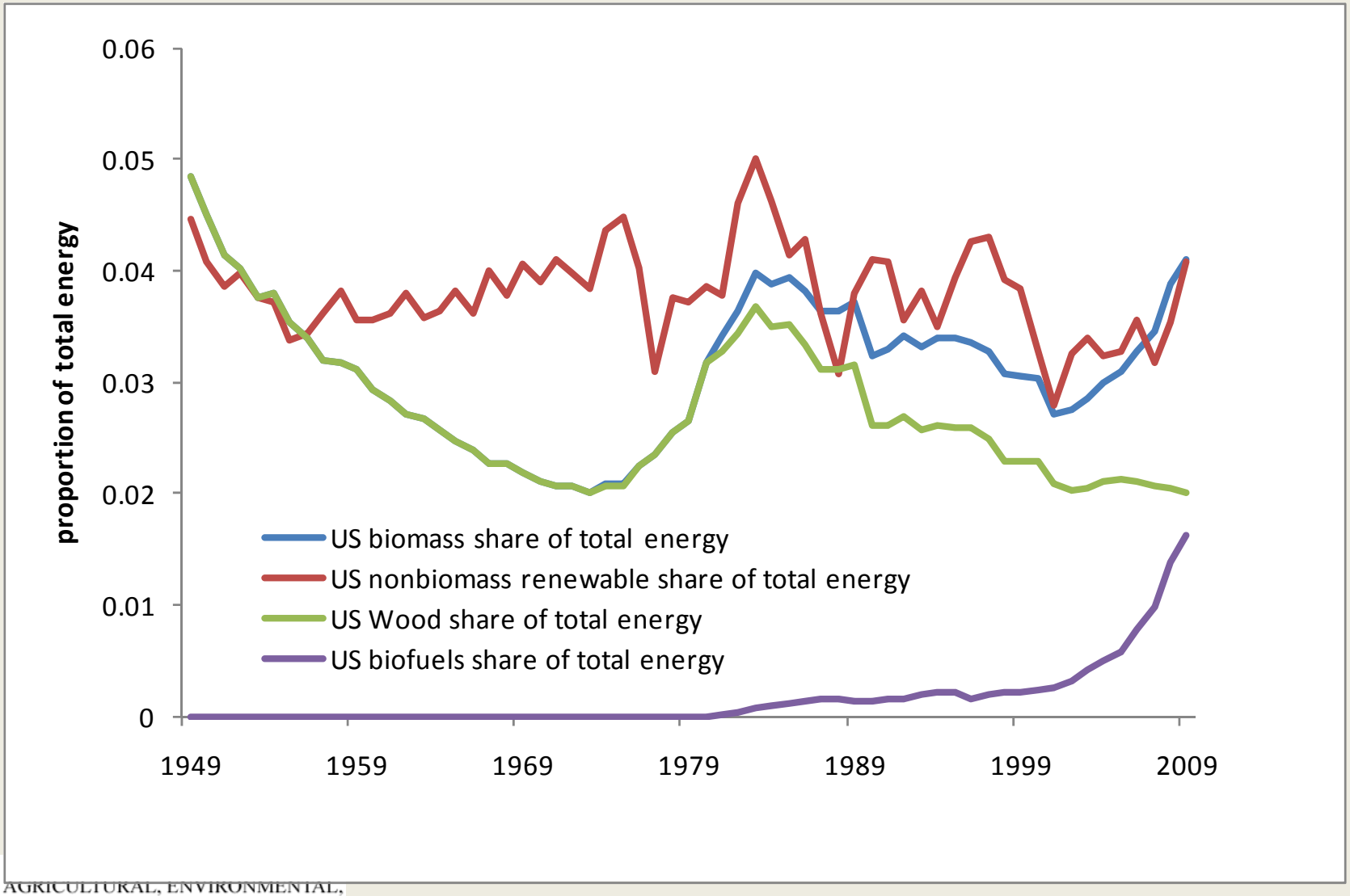


Source: Victor & Victor, 2002

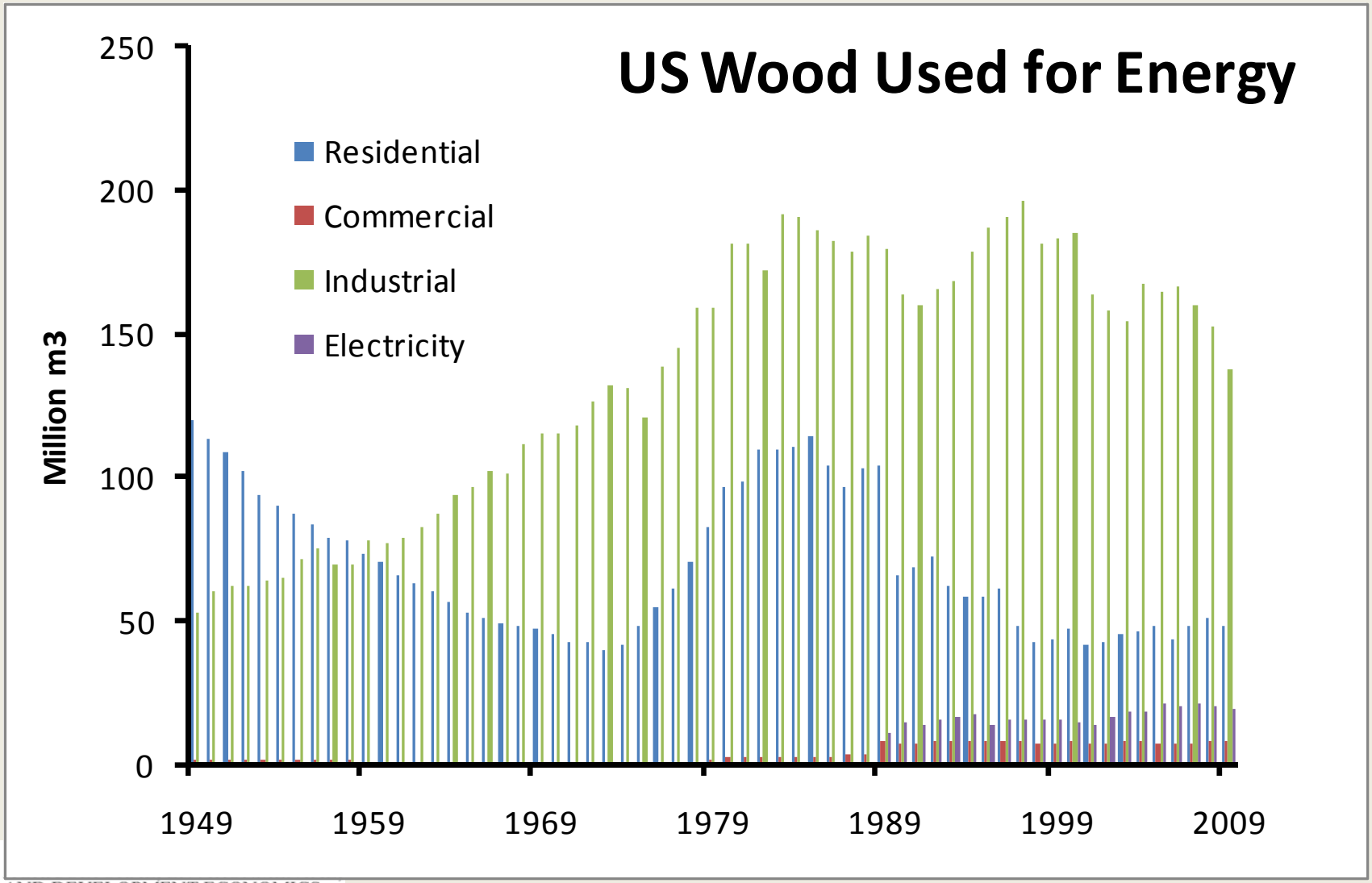
Are recent trends reversing this?



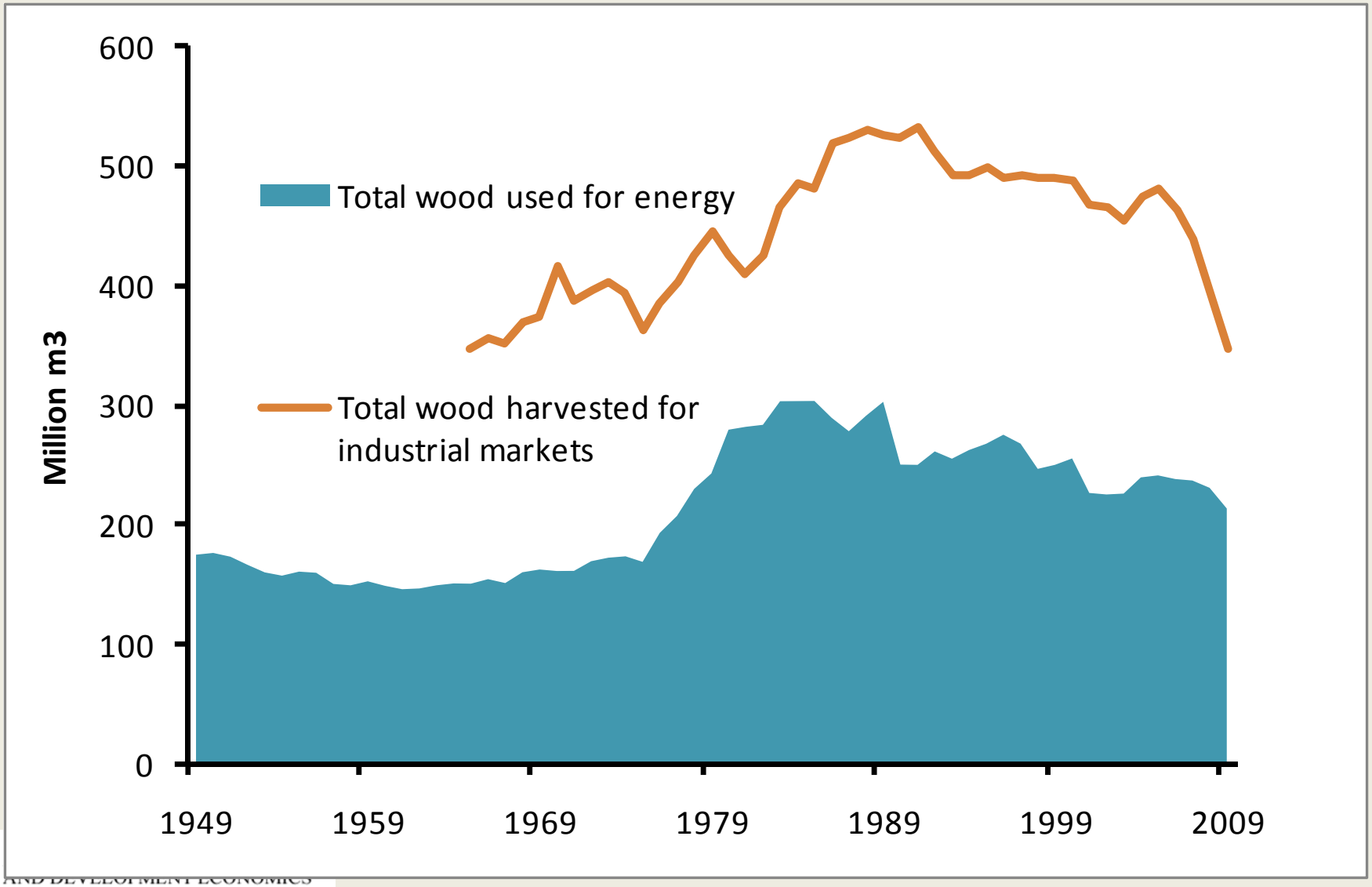
In US, trends are reversing due to biofuels, not wood-based biomass



In US, most wood used for energy is in industrial and residential sectors…



Wood used for energy is big…

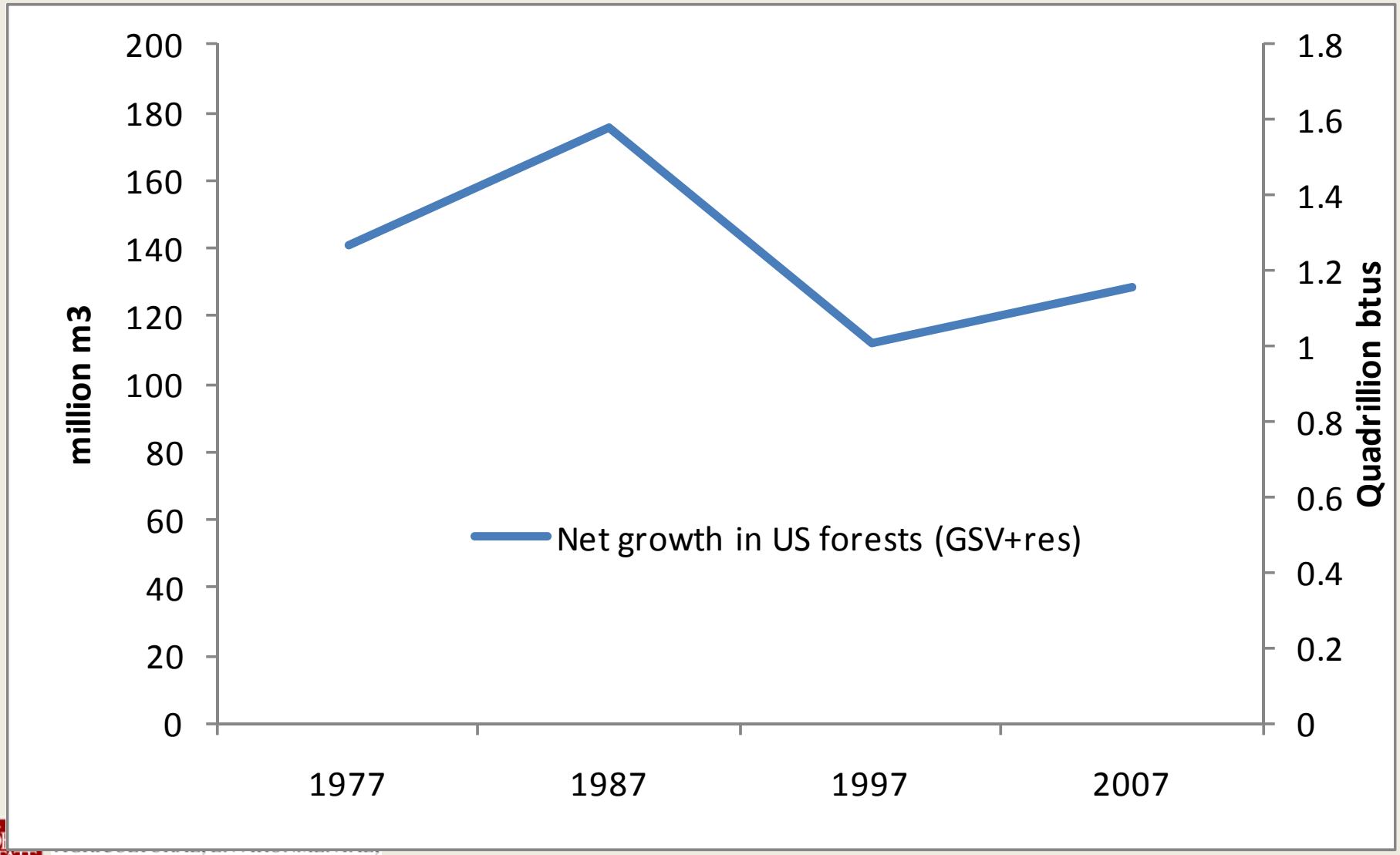


Can we increase the share of energy from wood?

- Around 2% of total energy
  - 2 Quadrillion btus, 8 billion $ft^{3,}$ or 226 million m^3
- Doubling to 4 Quads, or 4%, would require an additional 226 million m3
- Do we have it?

How much more wood is possible?

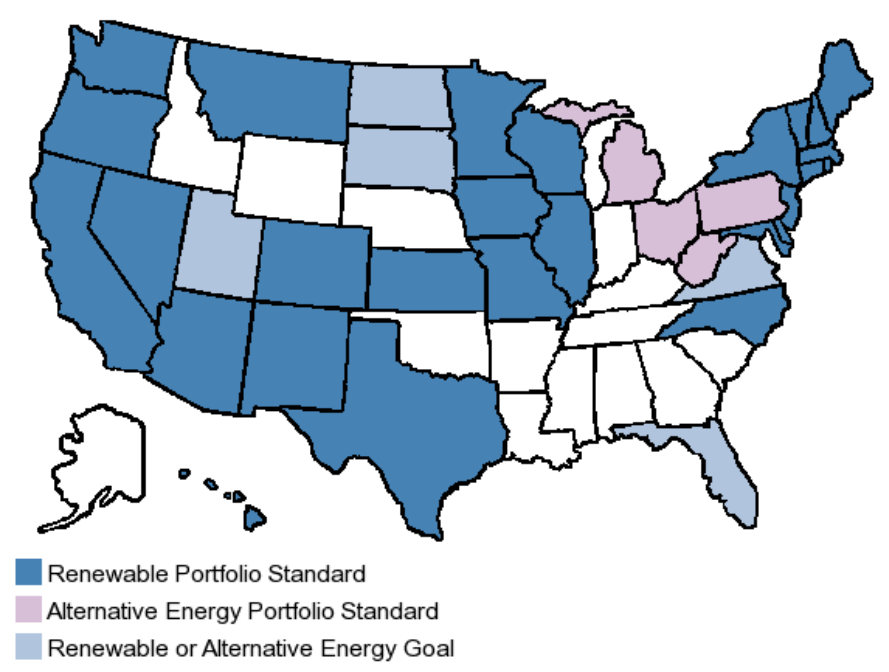
Net growth of US private forests



Regardless of physical or economic constraints…

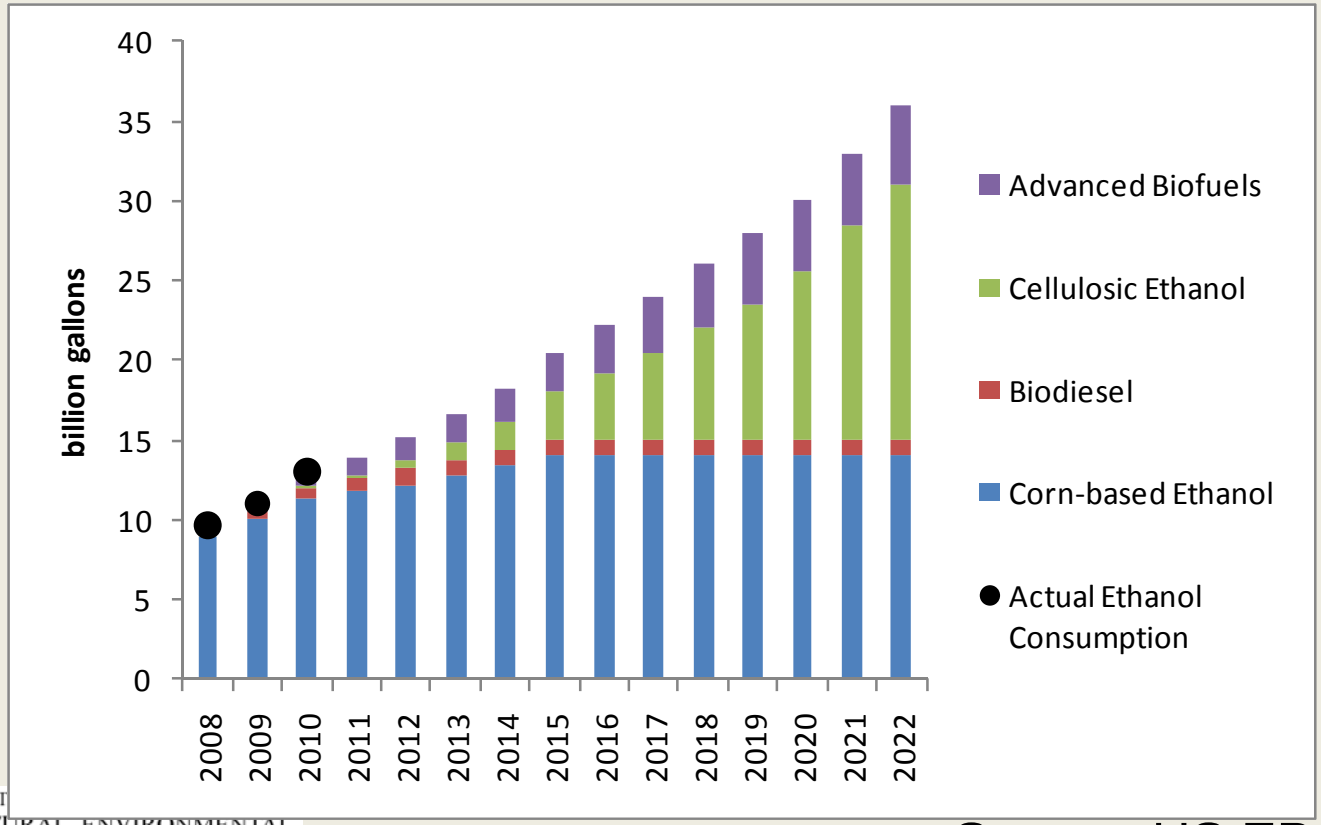
- Federal energy legislation: Energy Independence and Security Act of 2007 (EISA)
  - Cellulosic ethanol.

- State level renewable energy standards
  - RES, RPS, etc.



Federal/State Energy Policy

- EISA (2007) requires large increase in ethanol, most of which must come from cellulosic ethanol, advanced ethanol or biodiesel



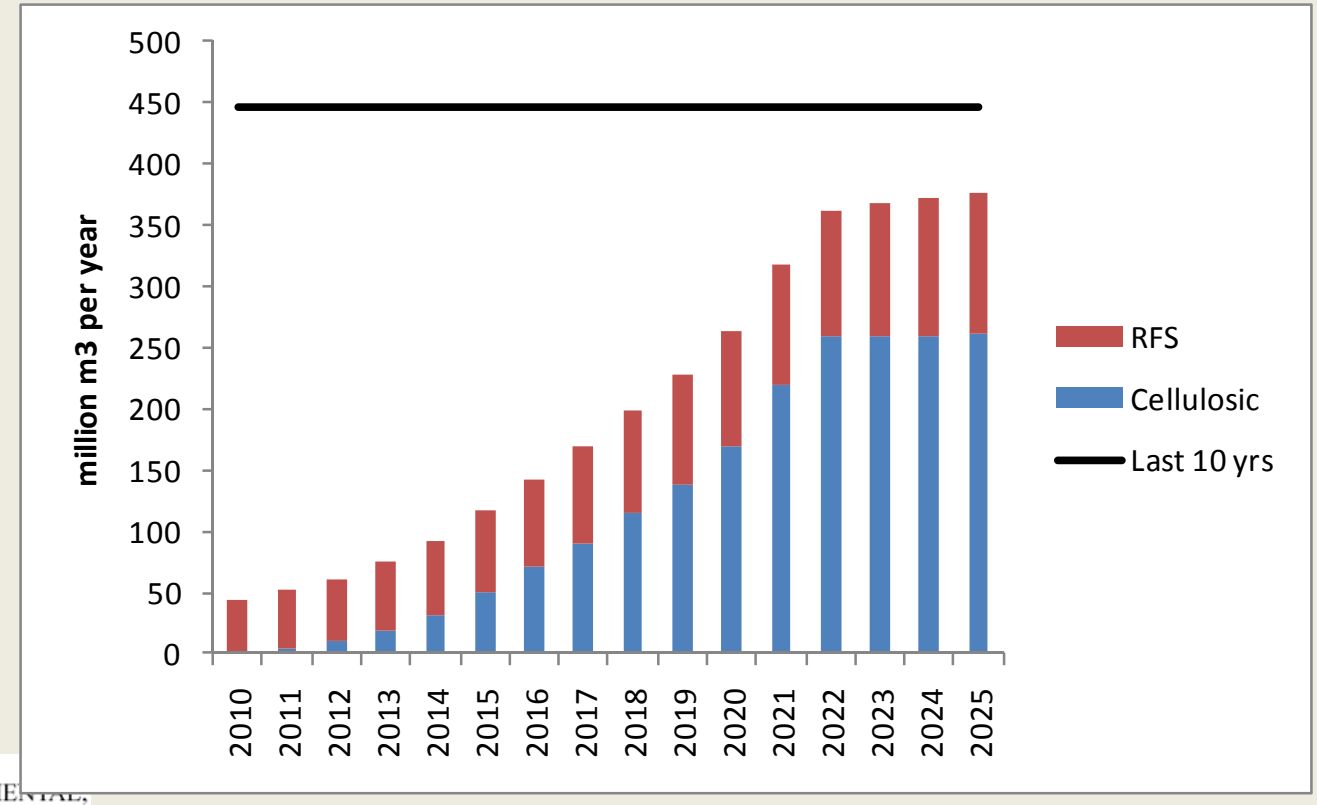
Source: US EPA

Federal/State Energy Policy

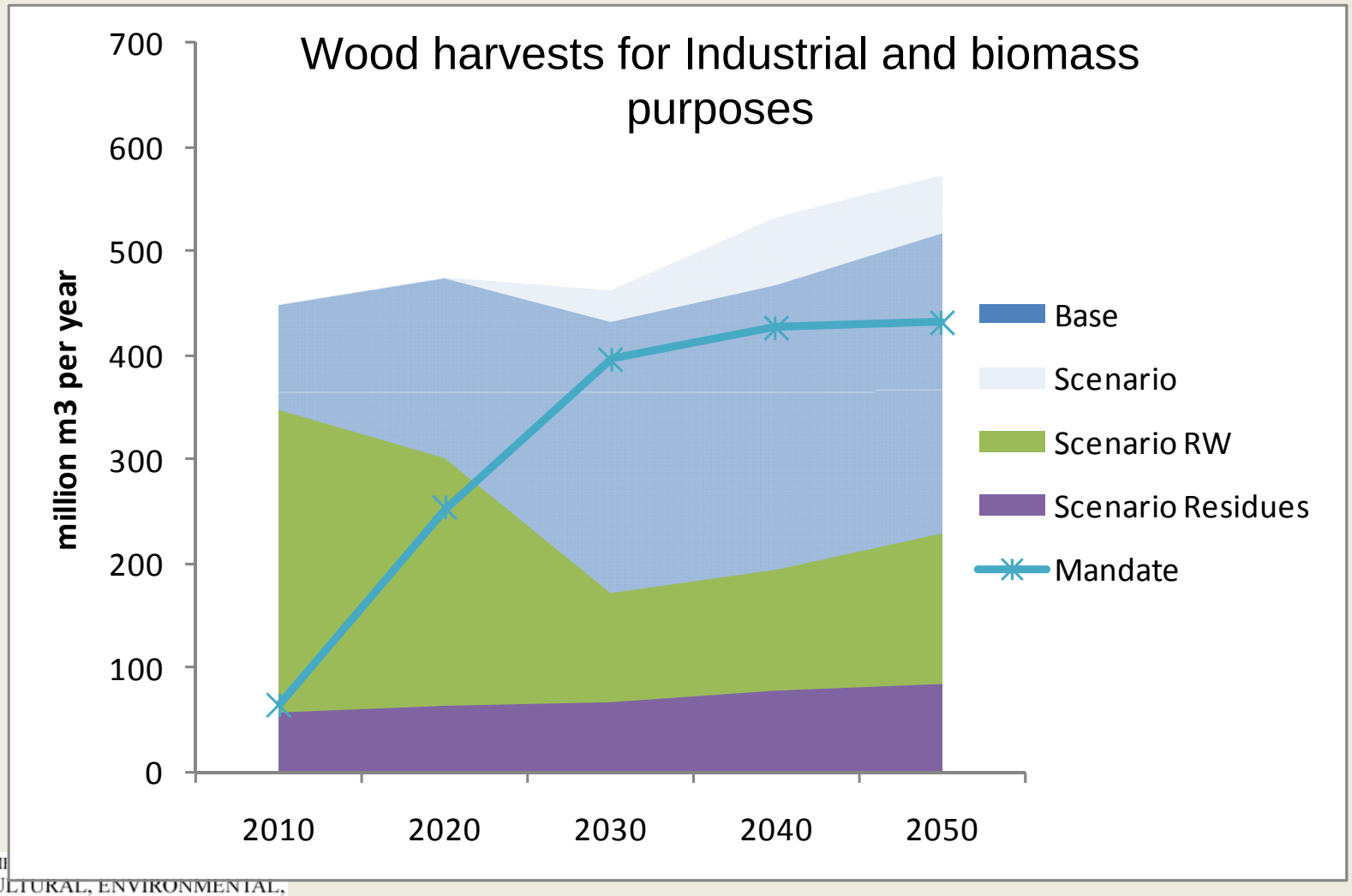
- Combining cellulosic ethanol and renewable energy standards for electricity, the increase on resource demands will be dramatic.

Note:
Assume
70-90 gallons
per dry ton;

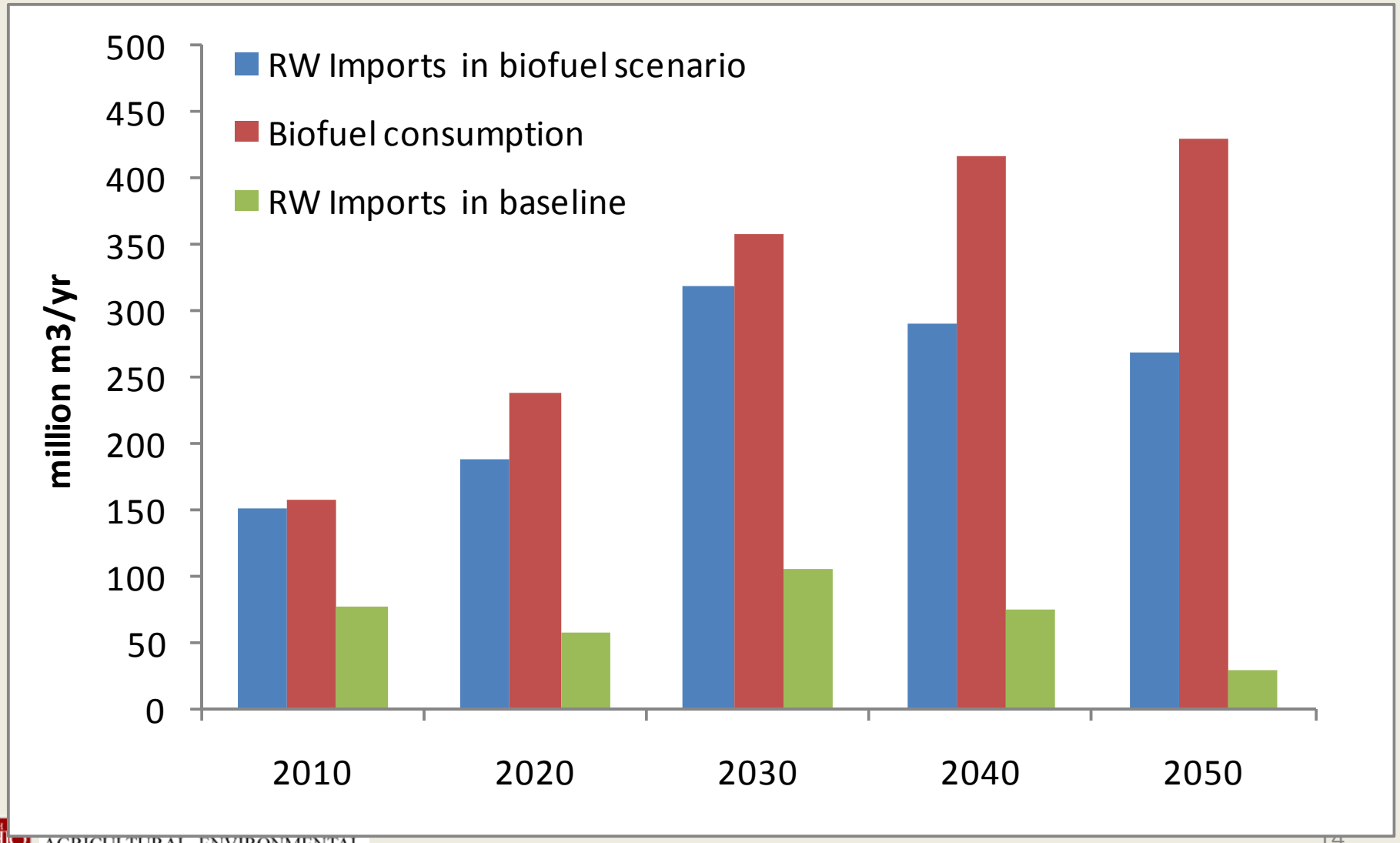
EIA, AEO est.
of biomass
for state RES.



Cellulosic ethanol and RES will cause major disruptions in markets…

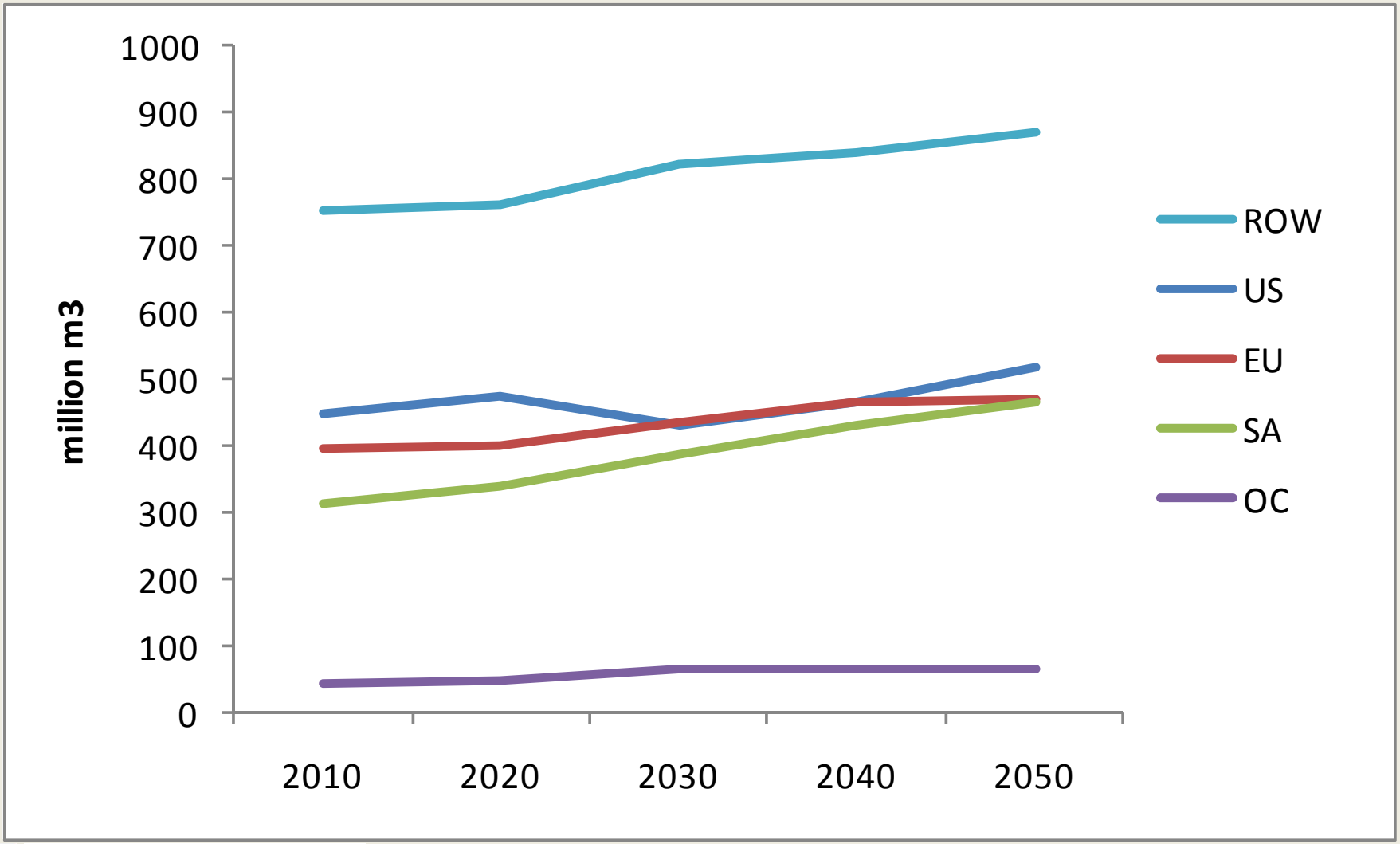


Extra wood largely from imports…



In the baseline:

Large growth in harvests outside US



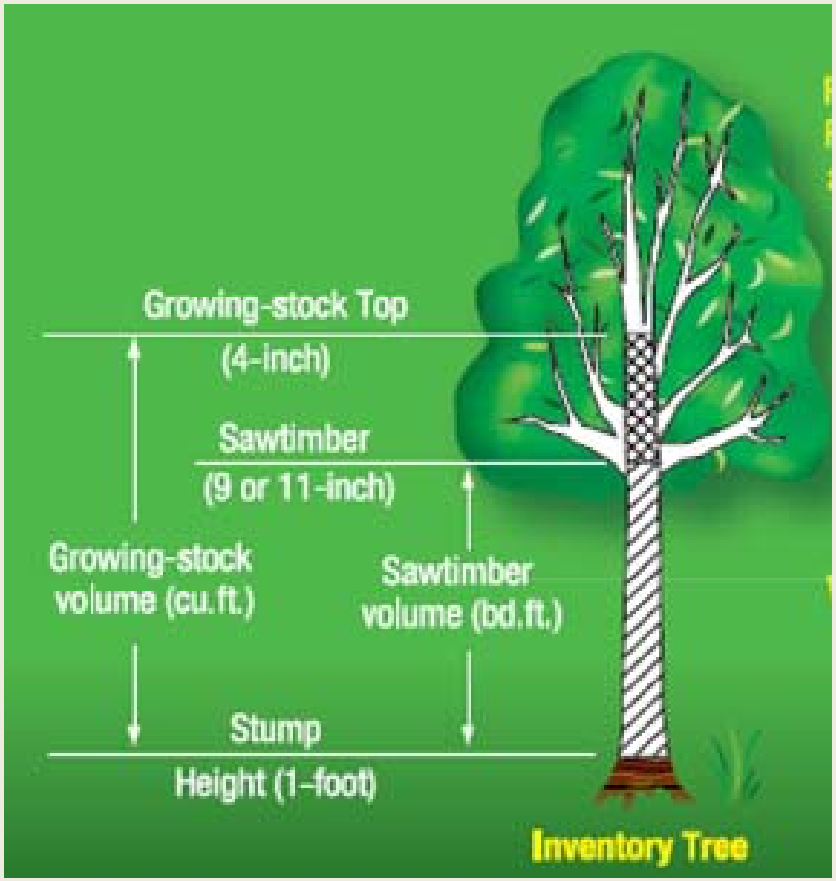
Why? Yields are high

	Cubbage et al. (2008)			Sedjo (1983) ca. 1978			
	Rotation	**m^3/ha**	**m^3/ha/yr**	**Rotation**	**m^3/ha**	**m^3/ha/yr**	**Annual Increase (%)**
Brazil	15	450	30	15	240	16	2.1%
	15	525	35	16	345	22	1.6%
Chile	19	490	26	27	513	19	1.0%
New Zealand	28	480	17	23	400	18	-0.1%
South Africa	30	526	14	20	287	15	-0.2%
USA	27	369	14	33	326	10	1.1%
	45	833	19	40	572	14	0.9%
Average			22.0			16.2	0.9%

Why is it so hard to increase output?

- Marginal costs of extracting “residues” are high
- Marginal costs of competing with alternatives
- Marginal opportunity costs of increasing production.

Marginal costs of extracting residues



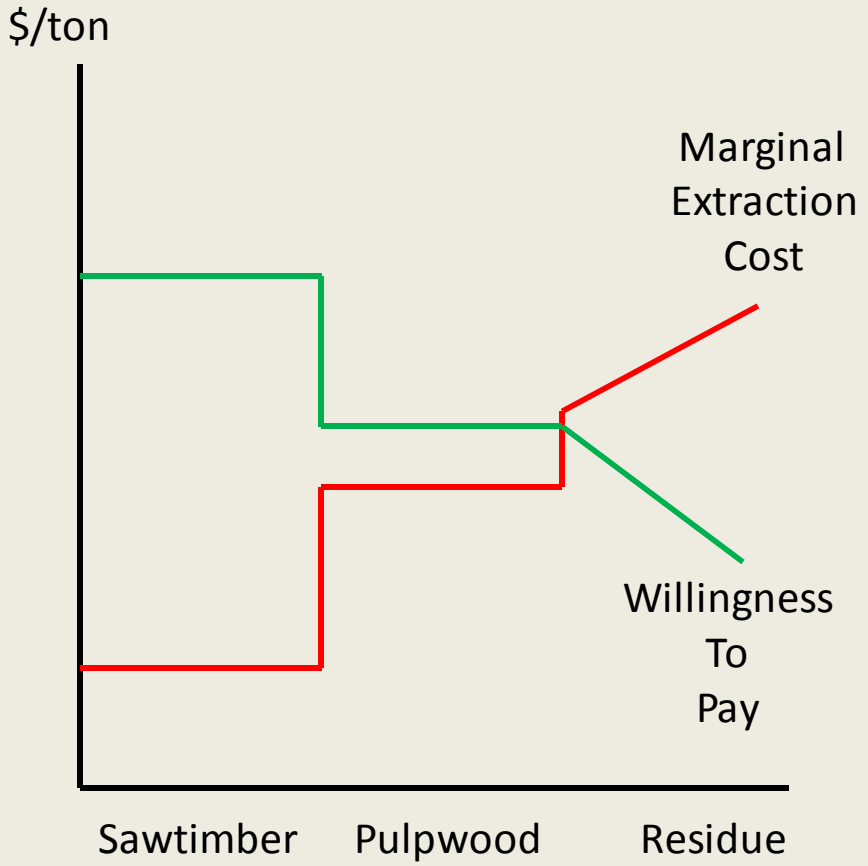
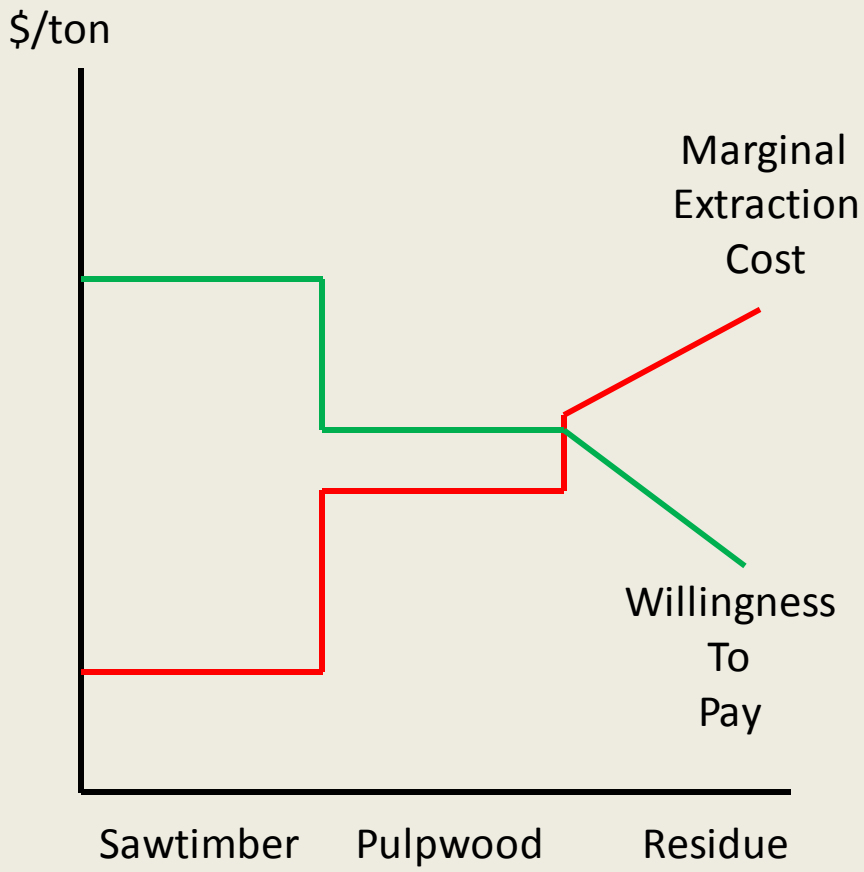


Figure 8 from Perlack et al. (2005)

Residue costs > fuelwood WTP

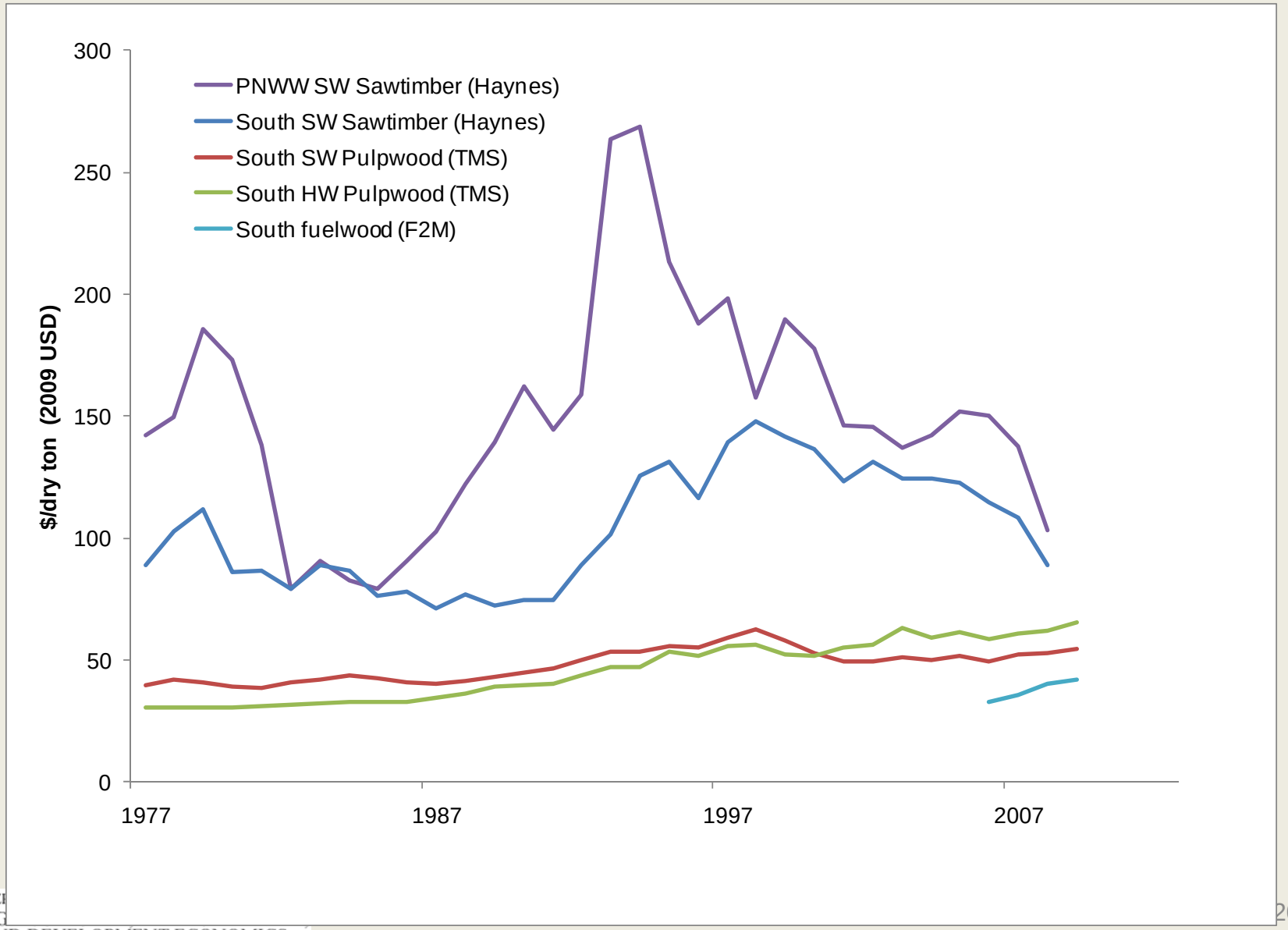


Eastern US: >$45/dt to deliver

Western US: > $52/dt to deliver

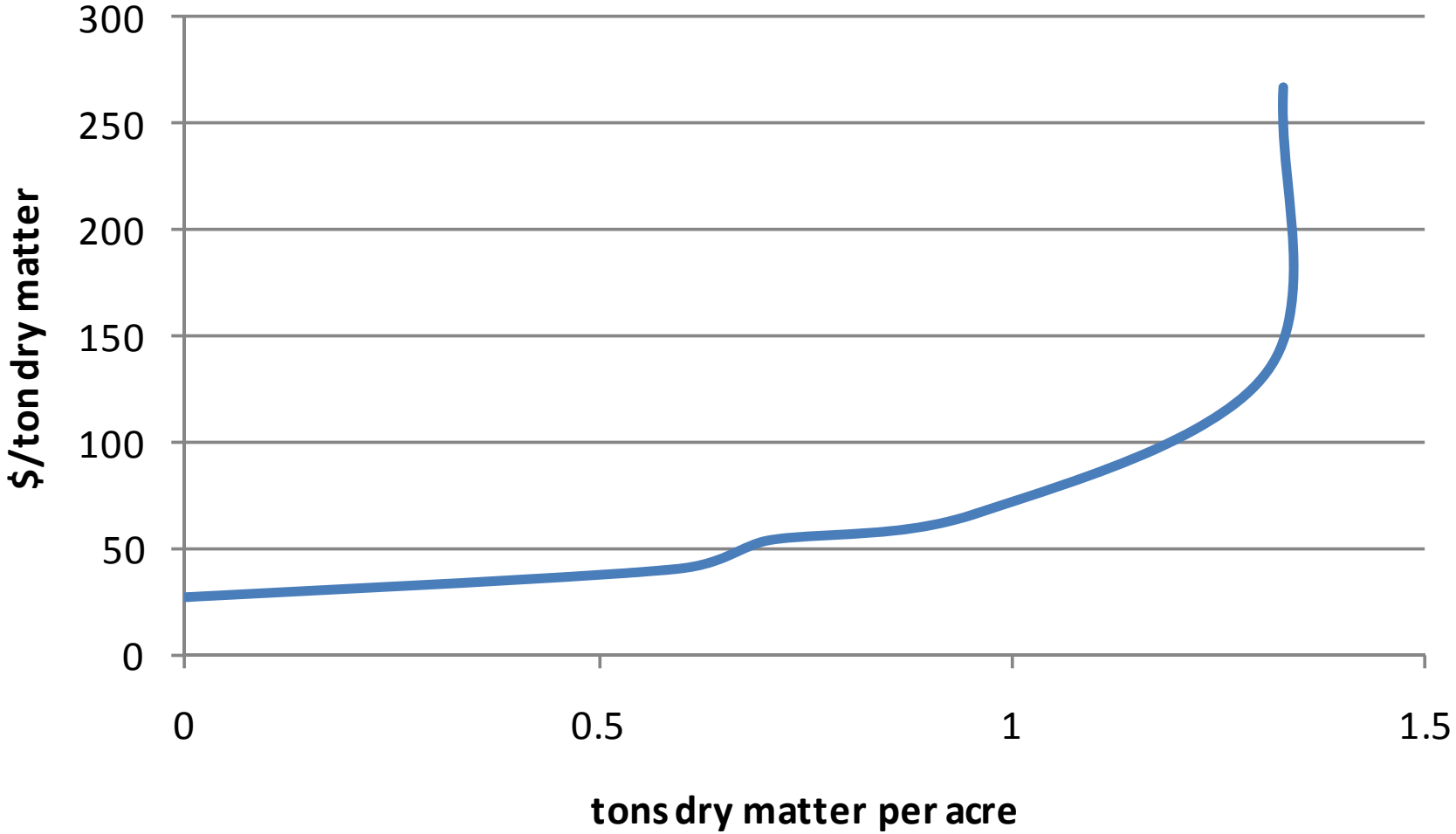
Eastern US: $30-$35/dt

Competing with alternatives



Southern Pine Example

High site loblolly stand in Alabama



Conclusion

- Data points to increased demand for biomass energy from forests globally, but particularly within the US and EU.
- Current proposals suggest large impacts in forests, but only marginal increases in US timber harvests.
- Marginal costs are high; low cost provider is outside the US.
  - Imports rise.