COLLÈGE DE FRANCE 1530

Gestion des ressources naturelles

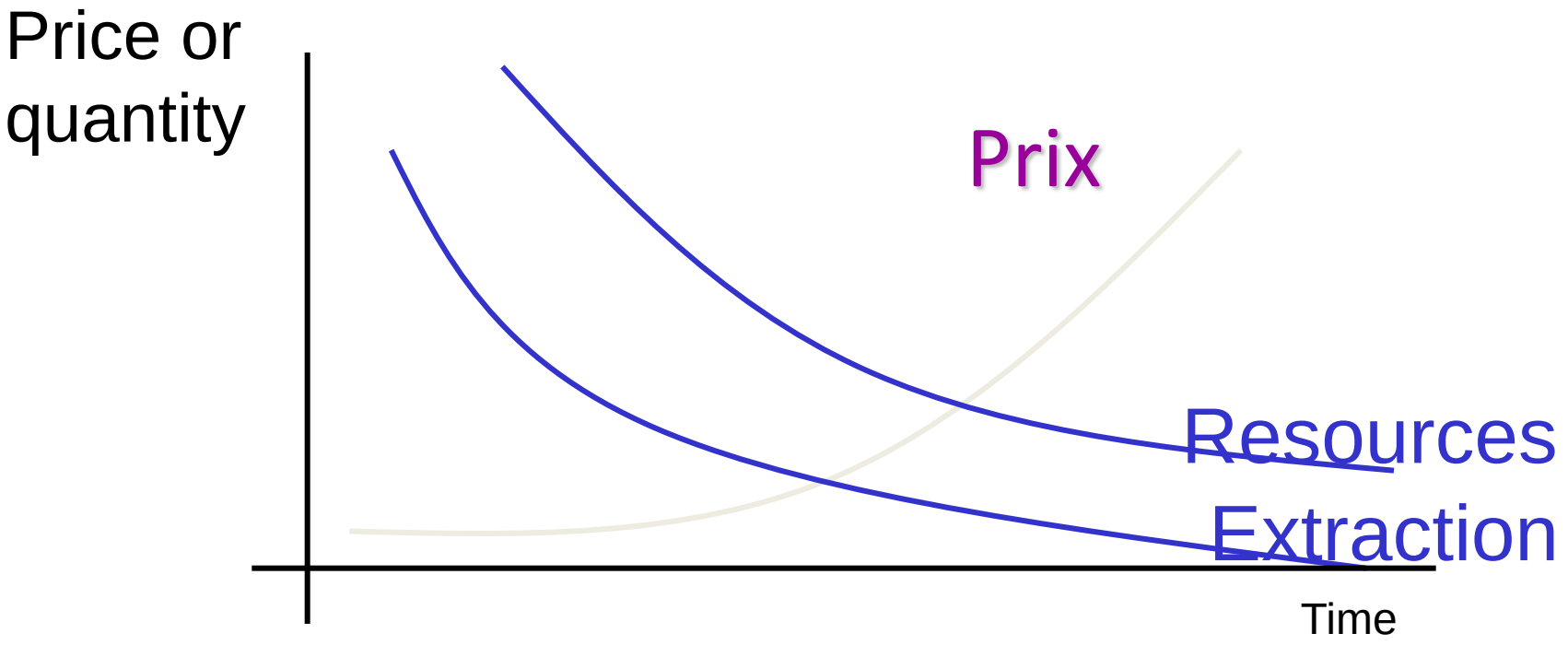
Sém: Gérer l'irrigation par des classes de priorité: François Salanié Toulouse

Todays Lecture

1. Temporal analysis Hotelling (GP?)
2. Fishery and ITQ – equity aspects Beia Paper
3. Spatial (use ER and Von Thûnen)
4. Ecosystem
5. Property rights, enclosure and Ostrom
6. Soil erosion
7. Forestry
8. Irrigation

MANAGEMENT of Natural Resources

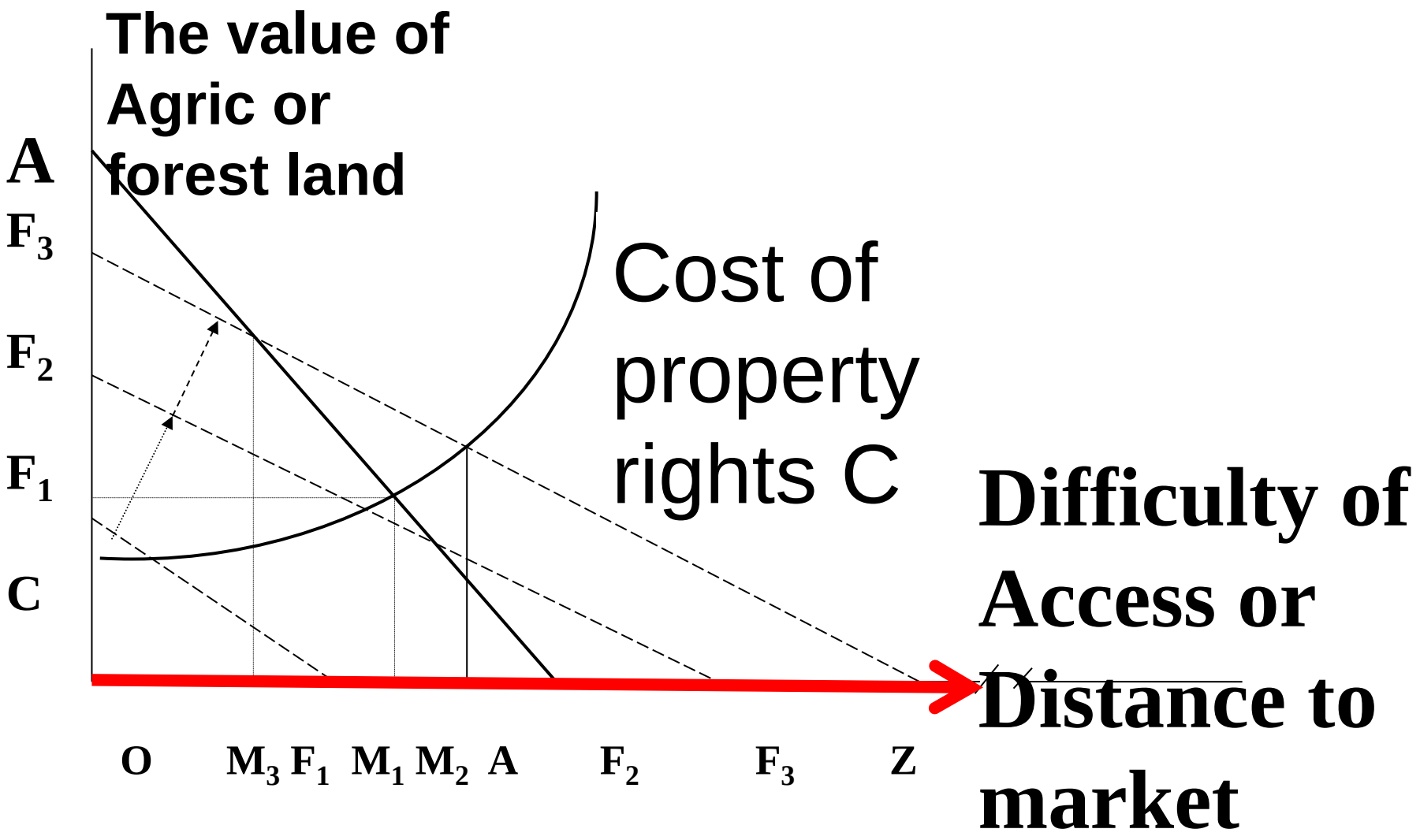
- **INTERTEMPORAL setting**
- **Spatial setting**
- **Ecological Setting**



Rente de rareté augmente

Spatial aspects

The important spatial dimension

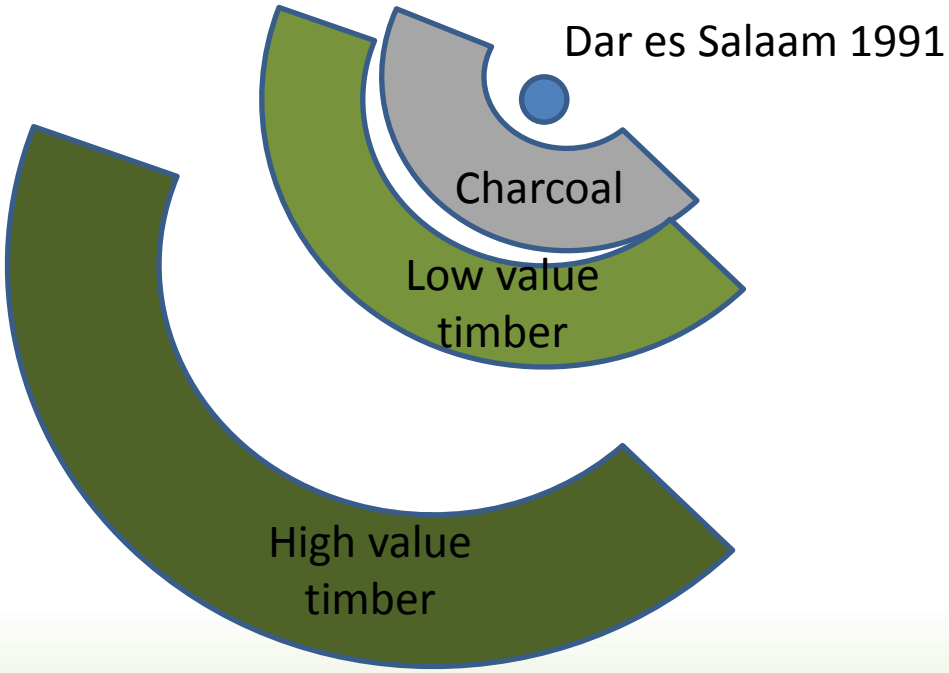


SPATIAL HETEROGENEITY AND ECOSYSTEMS

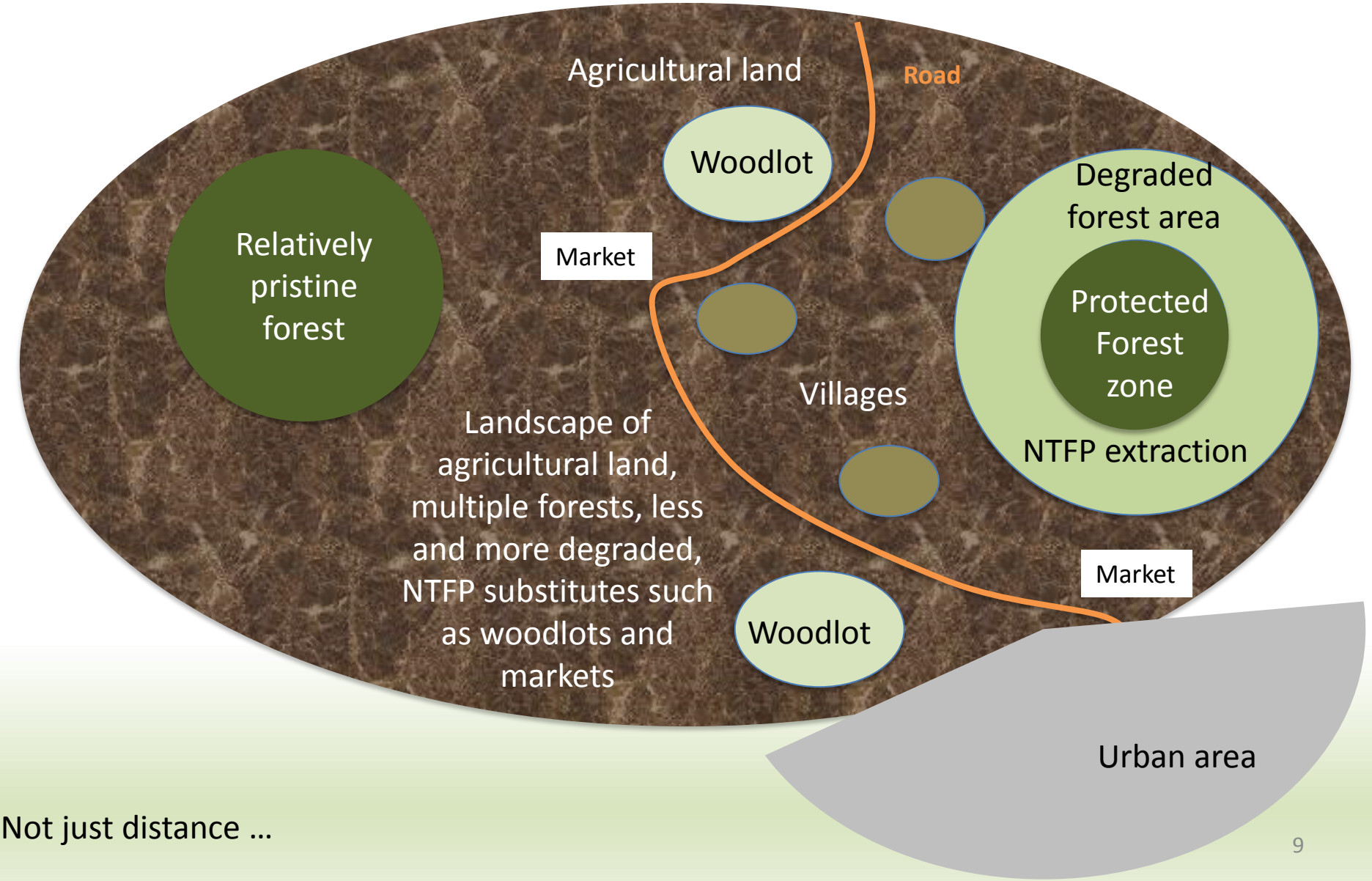
- Spatial heterogeneity, patchiness and connectivity issues are fundamental for the preservation of biodiversity and the management of protected natural areas.

- Rural Urban issues

Ahrends et al, 2010 (spatial patterns)



Starting point: what our landscape might look like



Not just distance …

L'érosion des sols et externalités en aval

- **Analyse policy for farmers' soil capital, agricultral inputs and downstream effects**

- Ekbom, A, Y Alem and T Sterner, (2013) "Integrating soil science into agricultural production frontiers" *Environment and Development Economics* vol. 18, , s. 291-308

Agriculture causes river sedimentation

Water pollution

Envasement des récifs coralliens

Theoretical context:

- Builds on McConnell (1983)
- Other models Barbier (1990), Barrett (1991), LaFrance (1992), Goetz (1997), Grepperud (1996; 2000), Yesuf (2004).

- Soil is a form of capital
- Can be depleted or sustained
- Farmers do not have the same objective function as the government

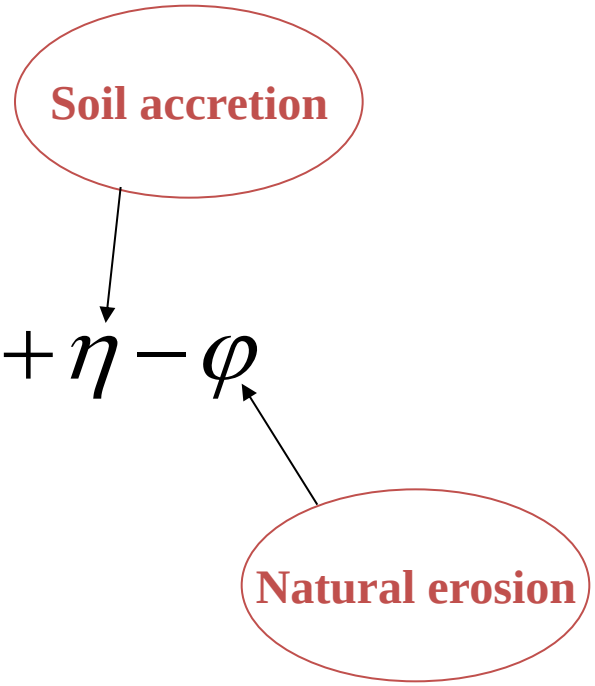
The Model (1):

Agricultural production:

$$Q = f(S, L_Q, F)$$

Soil motion:

$$\dot{S} = h(L_C, L_Q) + \eta - \varphi$$



Les sols sont la seule richesse

The Model (2):

Downstream env. quality:

$$E = b[\dot{S} - \Phi(F)]$$

Objective function:

Downstream externalities

$$\pi = \int_{t=o}^{\infty} \Big[pQ - w(L_C + L_Q) - vF + \overbrace{b(\dot{S} - \Phi(F))} \Big] e^{-rt} dt$$

The Model (3):

Hamiltonian:

Net agricultural profits

Shadow value of soil capital

$$H = pf(S, L_Q, F) - w(L_Q + L_C) - vF + \lambda\left(g(L_C) - \psi(L_Q) + \sigma\right) + b\left(g(L_C) - \psi(L_Q) + \sigma - \Phi(F)\right)$$

Downstream externalities

The Model (4):

First order conditions:

$$\frac{\partial H}{\partial F} = 0 \Rightarrow pf_F = v + \Phi'(F)$$

$$\dot{\lambda} - r\lambda = -\frac{\partial H}{\partial S} = -pf_S$$

Social marg. downstream cost of fertilizers

$$\frac{\partial H}{\partial L_Q} = 0 \Rightarrow pf_{L_Q} = w + \lambda\psi'(L_Q) + b\psi'(L_Q)$$

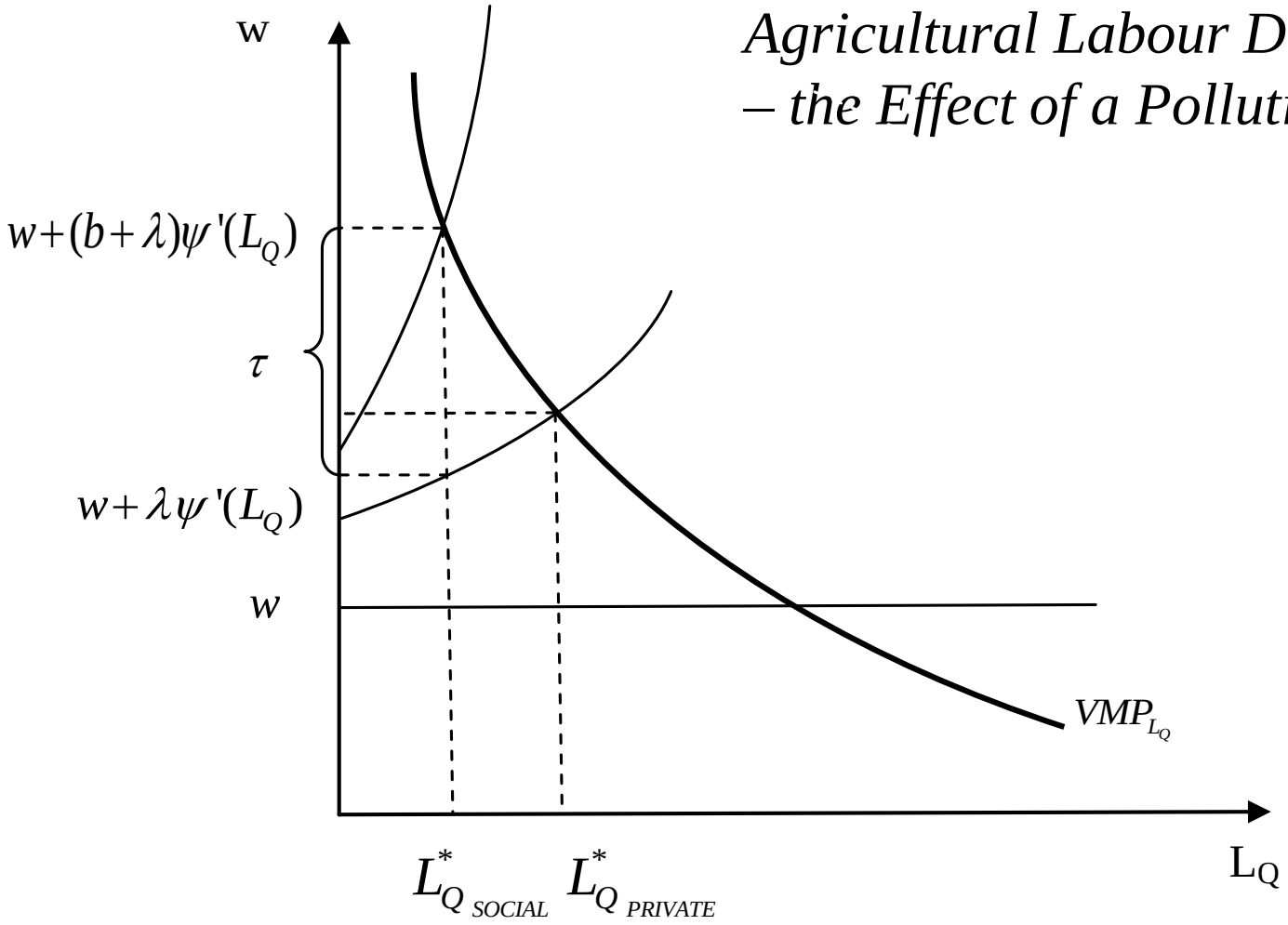
$$\frac{\partial H}{\partial L_C} = 0 \Rightarrow w = \lambda g'(L_C) + bg'(L_C)$$

Social marg. downstream effects of L_Q, L_C

Comparative statics Results

Change in	Effect on		
	Soil (dS/S)	Fertilizer (dF/F)	Labour (dL_C/L_C; dL_Q/L_Q)
r	< 0	< 0	< 0
W	?	?	< 0
V	?	< 0	< 0
p	?	> 0	> 0

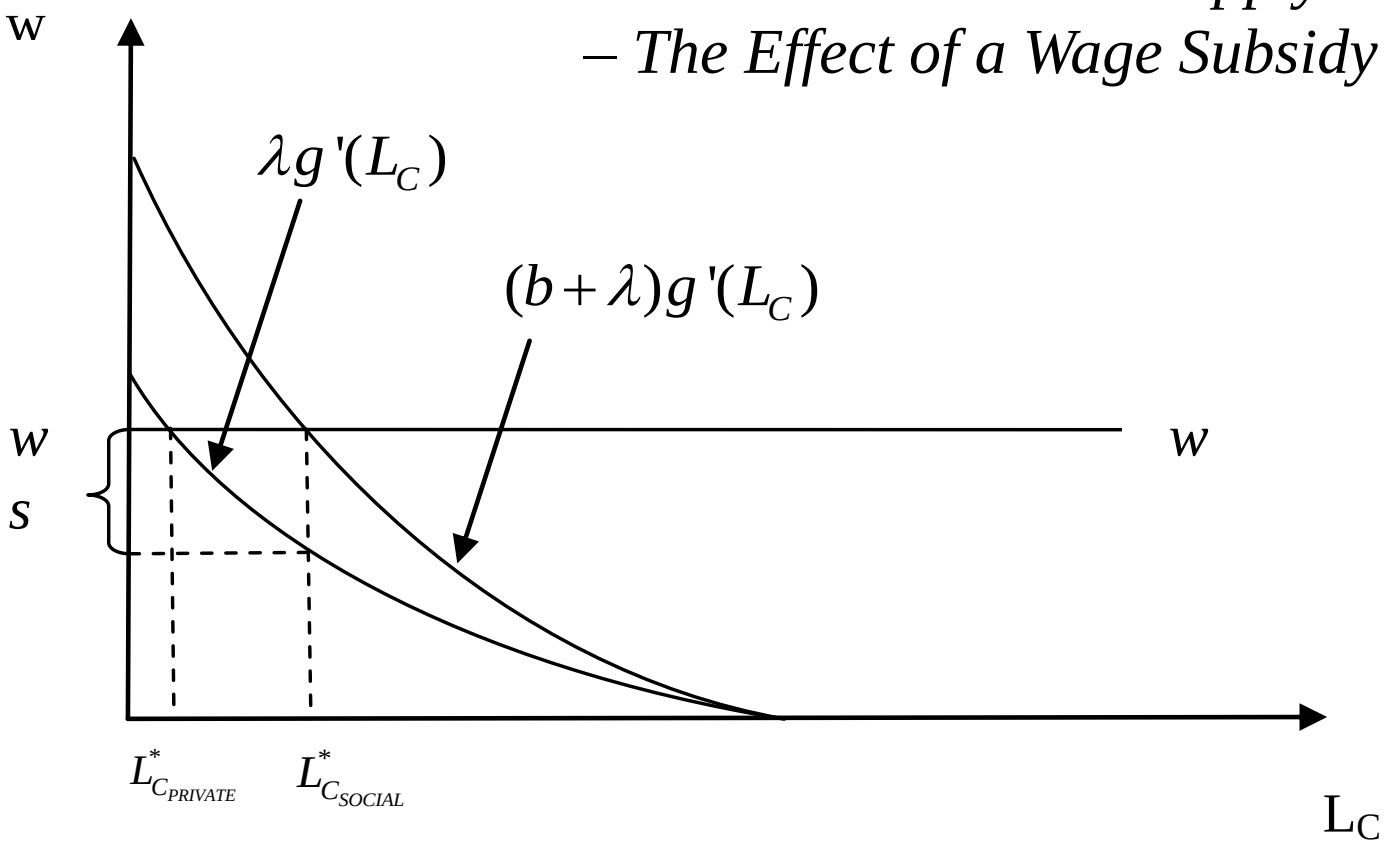
Policy implications (1)



Agricultural Labour Demand – the Effect of a Pollution Charge

Policy implications (2)

Conservation Labour Supply
– The Effect of a Wage Subsidy (*s*)



Policy implications (3)

Provide incentives to farmers which promote build up of S and prevent downstream externalities:

- build roads, infrastructure

- provide credits & insurance

- subsidize conservation (PES)

- taxation of polluting inputs may be considered

Lowers farmers Discount rate

Policy Instrument Menu

PRICE-TYPE	RIGHTS	REGULATION	INFO/LEGAL
Taxes	**Property rights**	Technological Standard	Public participation
Subsidy (Reduct.)	Tradable permits	Performance Standard	Information disclosure
Charge, Fee/Tariff	Tradable Quotas	Ban	Voluntary Agreement
Deposit-refund	Certificate	Permit	Liability
Refunded Charge	**CPR**	Zoning	

Carrying Capacity

Garrett Hardin and the Tragedy

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ARTICLES

The Tragedy of the Commons

Garrett Hardin

+ Author Affiliations

Science 13 Dec 1968:
Vol. 162, Issue 3859, pp. 1243-1248
DOI: 10.1126/science.162.3859.1243

Tragedy of the Commons

- As a rational being, each herdsman seeks to maximize his gain.
- Bentham's goal of "the greatest good for the greatest number
- The optimum population is, then, less than maximum; Relinquish freedom to breed
- Every new enclosure of the commons involves the infringement of somebody's personal liberty.

Elinor Ostrom

Property / Law: Which first

- Private or Common L(Natural)/ Public law
- **10 Commandments**
- 1-3 No other Gods
- 4-5 Sabbath; parents
- 6-8 Don’t kill, commit adult. Or **Steal**
- 9 No false evidence
- 10 No **envy of others** house, wife or other property

Property Rights

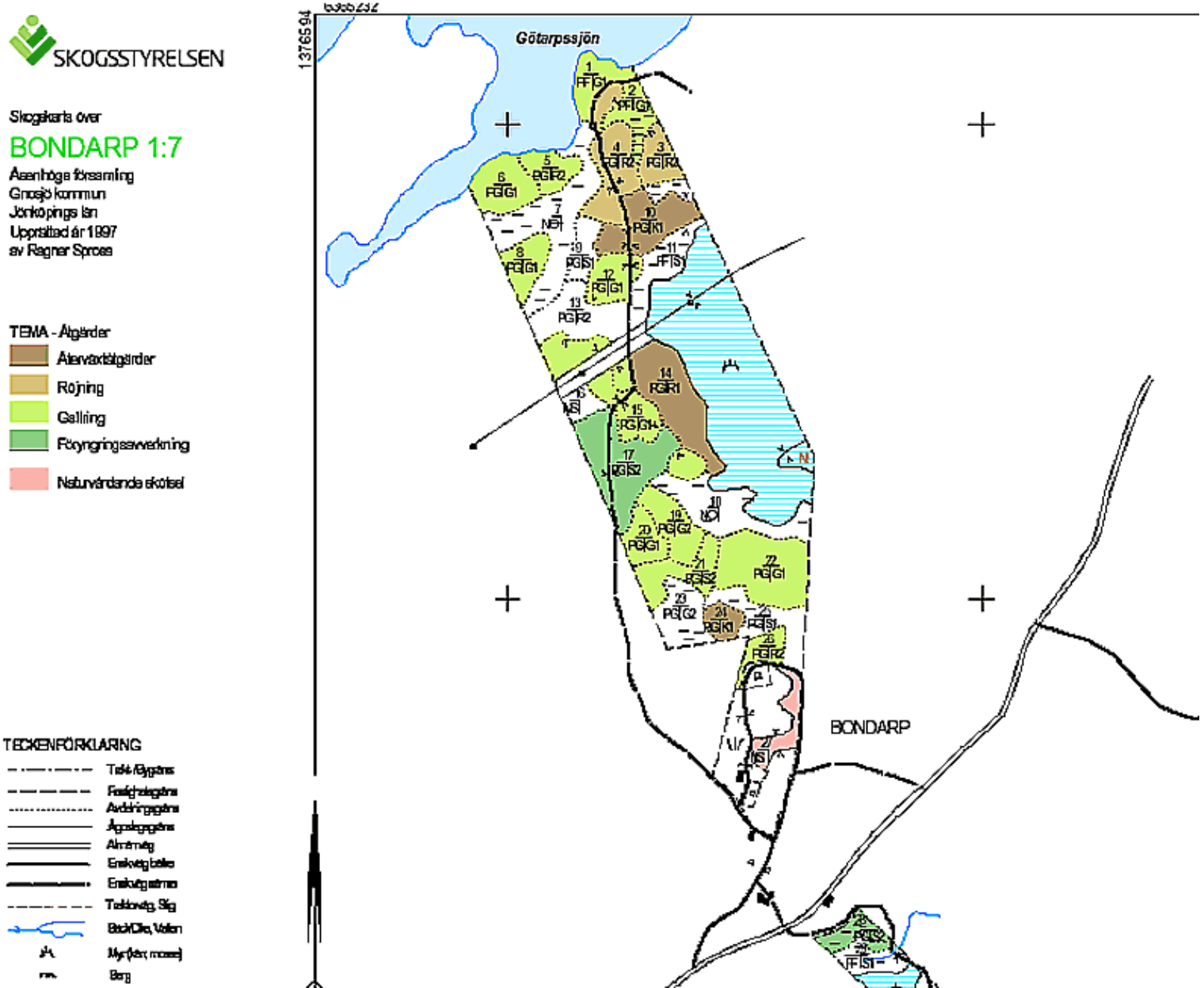
“Bundles" of Rights = PROPERTY

- use it productively, enjoy profit
- rights of sale, lease and inheritance
- right of excluding others
- move, change or adapt
- even destroy or dispose of property

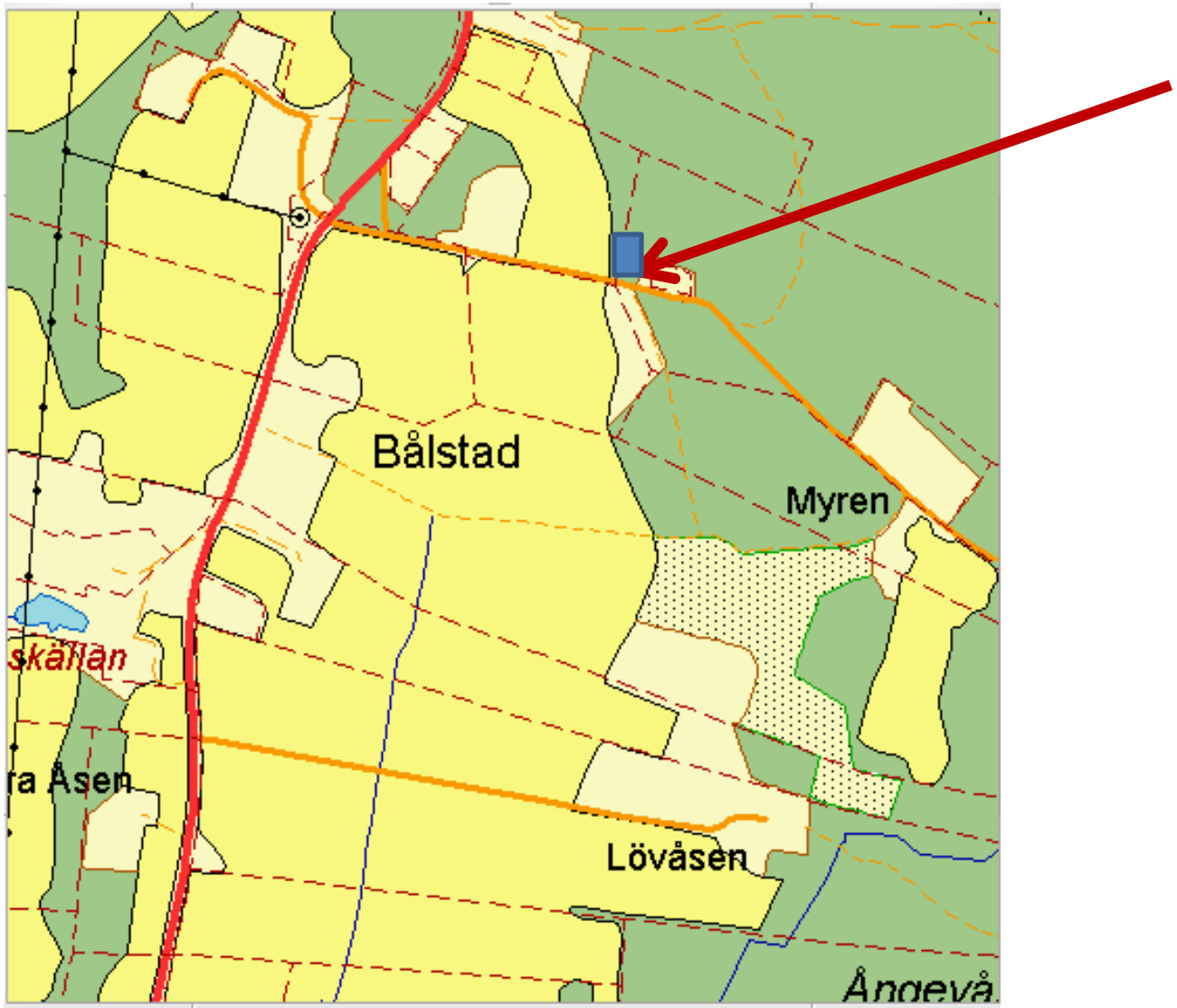
Evolution of rights

- **REAL Estate (Rex)**
- Norman invasion of England 11th Century → Feudalism
- **Bargaining à stability, inheritance**

Land titles


SKOGSSTYRELSEN
Skogskarta över
BONDARP 1:7
Åsenhöga församling
Gnosjö kommun
Jönköpings län
Upprättad år 1997
av Ragner Spross
TEMA - Åtgärder
Återväxtåtgärder
Röjning
Gallring
Föryngringsavverkning
Naturvärdande skötsel
TECKENFÖRKLARING
Götarpssjön
BONDARP

Property delineations



Land→Minerals →Water →Eco

- Rights of landowner to water and oil or minerals. Compare US/Mexico
- US: landowner
- Mexico: State

- Land reallocations – Ethiopia.
- Feudalism –Jap-Ch

Water law

- ***riparian* doctrine**
- ***prior appropriation***
- ***Constitutional rights of state governments***
- ***Roman and Spanish water law***
- ***Moorish law***

Lessons for environm. resources

- Prior Appropriation
- La tierra para quien trabaja
- Forests – Binswanger, Costa Rica
- Even houses – squatters
- Factory owner with smoke

Squatter wins £2m London plot after 18-year stay

By Emily Dugan
Thursday, 24 May 2007

For most people a property on Hampstead Heath would be many mortgages or lottery tickets away, but a squatter has been granted the rights to a plot of land worth £2m for nothing.

Harry Hallowes, who has lived in a shack on the corner of the heath in north London for more than 18 years, has been given deeds to the thicket he calls home. Mr Hallowes, who says he "never had any trade or profession", had been squatting in the grounds of Athlone House nursing home, but when the land was bought by developers he feared he would be evicted.

But now an agreement made under section 106 of the Town and Country Planning Act has ensured that he will be there for life. Mr Hallowes' lawyer, Morris Evans, said: "Mr Hallowes is now officially the owner of the plot. Until recently the law said that if you occupied land for 12 years or more without being thrown out, then you were entitled to own it."

The developer, Dwyer Asset Management, which bought the Victorian nursing home and its

EDITOR'S CHOICE


First lady of fashion:

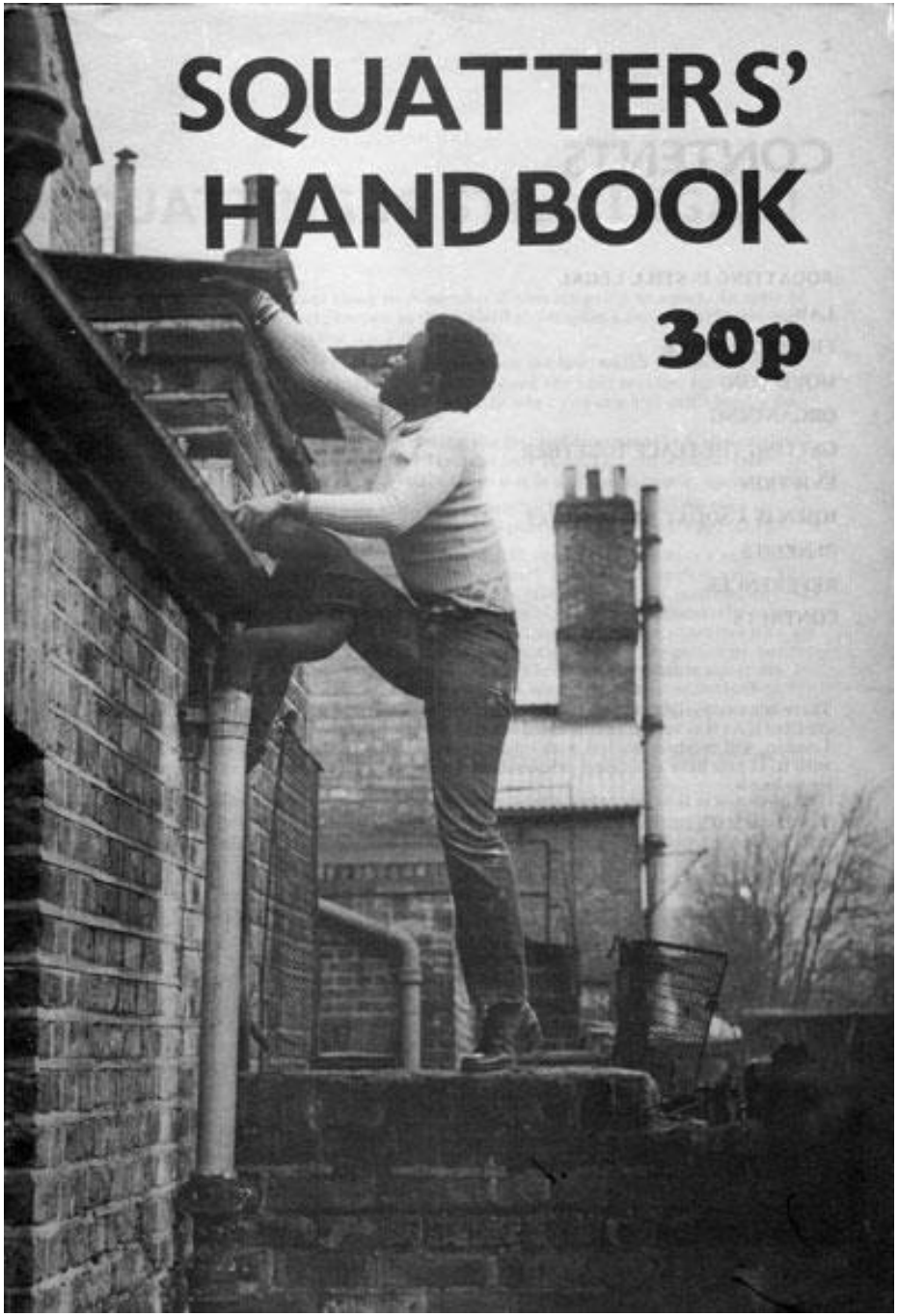

The ultra-orthodox


The pioneers who are


The headtea

SQUATTERS' HANDBOOK

30p



Common property resources

- *res communes*
- Institutes of Justinian "‘[b]y natural law these things are common to all: air, running water, the sea and as a consequence, the shores of the sea.’"
-

Enclosure of the Commons

- The Statute of Merton 1235, Henry III & barons. 20 years after Magna Carta, another limitation of the rights of the King. It allowed Lords to enclose common land providing sufficient pasture remained for his tenants - setting out in what cases, and in what manner, Lords may approve part of the wastes, woods, and pastures, belonging to their Manors, against the tenants. Ireland in 1236 then quickly became a basis for English common law, developing and clarifying legal concepts of ownership. In January 1550, it was revived under John Dudley, the Duke of Northumberland, to enable lords to enclose their land at their own discretion. It was, in fact, only finally repealed in 1948


ENCLOSURE

Enclosure 2

Sir Thomas More 1516 Utopia enclosure → theft

But I do not think that this necessity of stealing arises only from hence; there is another cause of it, more peculiar to England.' 'What is that?' said the Cardinal: 'The increase of pasture,' said I, 'by which your sheep, which are naturally mild, and easily kept in order, may be said now to devour men and unpeople, not only villages, but towns; for wherever it is found that the sheep of any soil yield a softer and richer wool than ordinary, there the nobility and gentry, and even those holy men, the abbots not contented with the old rents which their farms yielded, nor thinking it enough that they, living at their ease, do no good to the public, resolve to do it hurt instead of good. They stop the course of agriculture, destroying houses and towns, reserving only the churches, and enclose grounds that they may lodge their sheep in them.

Enclosure 3

- The whole of British History permeated by the riots and the struggles concerning enclosure…

- biodiversity, radio frequencies, seas, Antarctic, space, genetics.
- “Monsanto + Rights” > 5 Million hits

What about collective property

- Common property resource management
- Communal or cooperative management
- NOT = open access
- See OSTROM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HUERTA IRRIGATION SYSTEMS

- Rivers in Valencia, Murcia, Alicante in Spain.
- Documented irrigation cooperation >1435
- Small & very erratic rainfall.
- Farmers elect syndic and other officials who preside weekly TRIBUNAL DE LAS AGUAS outside church in Valencia etc.
- low water → farmers take turns at water:
- Fixed order for turns; each farmer decides q.
- Physical waiting for turn is automatic (low-cost) mechanism for monitoring
- Fine books 1443/1486 preserved. Few fines.
- Small, graduated fines in general: 2/3 for the Syndic and 1/3 for accuser

ALANJA, TURKEY

- ~100 Fishermen
- 1970's Unrestrained fishing => stock decline
- Took > 10 yrs to design the following system:
- 1.- Sept. list of all eligible fishermen
- 2.- Each fishing site named (with spacing)
- 3.- Fishermen draw lots for first day
- 4.- Each day everyone moves one East
- => *Sufficient spacing for efficiency*
- => *Limit on fishing for reprod.*
- => *Equity*
- => *Monitoring*

Törbel; Switzerland

- AlpTop Meadows/woods; steep slopes; Little rain
- Since 1224: Comunal land includes Alpine grazing;forests; irrigations, paths
- "Fremde" excluded even if landowners
- "Cowrights" allotted according to criteria:
- Pasture, share in cheese; Number of cows fed in winter; Hay; Land (Acres or Value); Coop Shares
- Annual meetings make rules & select officials, hire staff & decide:
- Fines for Misuse
- Allocation of manure on summer pastures
- Roads & other maintenance work
- The allocation of wood by various criteria.
- Trees marked by officials, Only felled in season by work teams, hauled into stacks allocated by lottery

Ostroms 7 principles for CPRs

1. Clear Boundaries. Exclusion possible
2. Local rules of provision & appropriation
3. Decisionmaking is participatory
4. Locally designated agents monitor
5. Availability of local ”courts”
6. Graduated sanctions
7. Outside goverments respect CPR rules

Second-Tier Variables of a SES

Social, Economic, and Political Settings (S)

S1- Economic development. S2- Demographic trends. S3- Political stability.
S4- Government resource policies. S5- Market incentives. S6- Media organization.

Resource Systems (RS)

- RS1- Sector (e.g., water, forests, pasture, fish)
- RS2- Clarity of system boundaries
- RS3- Size of resource system*
- RS4- Human-constructed facilities
- RS5- Productivity of system*
- RS6- Equilibrium properties
- RS7- Predictability of system dynamics*
- RS8- Storage characteristics
- RS9- Location

Governance Systems (GS)

- GS1- Government organizations
- GS2- Nongovernment organizations
- GS3- Network structure
- GS4- Property-rights systems
- GS5- Operational rules
- GS6- Collective-choice rules*
- GS7- Constitutional rules
- GS8- Monitoring and sanctioning processes

Resource Units (RU)

- RU1- Resource unit mobility*
- RU2- Growth or replacement rate
- RU3- Interaction among resource units
- RU4- Economic value
- RU5- Number of units
- RU6- Distinctive markings
- RU7- Spatial and temporal distribution

Users (U)

- U1- Number of users*
- U2- Socioeconomic attributes of users
- U3- History of use
- U4- Location
- U5- Leadership/entrepreneurship*
- U6- Norms/social capital*
- U7- Knowledge of SES/mental models*
- U8- Importance of resource*
- U9- Technology used

ACTION SITUATIONS [Interactions (I) → Outcomes (O)]

- I1- Harvesting levels of diverse users
- I2- Information sharing among users
- I3- Deliberation processes
- I4- Conflicts among users
- I5- Investment activities
- I6- Lobbying activities
- I7- Self-organizing activities
- I8- Networking activities

- O1- Social performance measures (e.g., efficiency, equity, accountability, sustainability)
- O2- Ecological performance measures (e.g., overharvested, resilience, biodiversity, sustainability)
- O3- Externalities to other SESs

Related Ecosystems (ECO)

ECO1- Climate patterns. ECO2- Pollution patterns. ECO3- Flows into and out of focal SES.

***Subset of variables found to be associated with self-organization.**

Gérer l’irrigation par des classes de priorité

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