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Flawed Perceptions in the Foundations of Public Policy:
The Case of Hardin's Tragedy of the Commons

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Introduction

"History," writes Thomas Kuhn, "if viewed as a repository for more than anecdote or chronology, could produce a decisive transformation in the image of science by which we are now possessed." (1) Political scientists, in particular those political scientists concerned with policy analysis as a discipline, usually ignore history except as an "issue background" (2) which provides an historical context rarely reaching beyond a decade. Even this use of history is too shallow to explain much of the policy area; recommendations based on these analyses "are likely to fail if they have been fashioned without a clear analysis of the circumstances and the political forces that led to the existing policy." (3) The use of historical analysis in understanding a policy area may fall short in several ways. First, it may be simply an analysis of an inadequate time frame. A true understanding may involve an historical context spanning a century or more. (4) Second, and perhaps more important, our interpretations of history are firmly encompassed with our own understandings of the nature of man and the social forces which drive him. We become trapped in our own world view and misunderstand the true nature of the policy problem. Thus the impact of historical analysis may be to misinform (rather than to inform) current policy sciences, leading to faulty recommendations based on improper structuring of already ill-structured problems. (5) The thesis of this paper is that an historical perspective in research is often essential to policy analysis and, in particular, to the problem-structuring phase of analysis.

"The Tragedy of the Commons"

An important example of misinformation is found in the present-day understanding of the so-called "tragedy of the commons." This term, coined by Garrett Hardin in 1968, (6) has slipped into common parlance at colleges and universities and is rapidly becoming public property. (7) Discussion of the inevitability of such a tragedy is the lawful prey of economists, sociologists, philosophers, and theologians. Certainly we cannot deny that the phenomenon exists: ruination of a limited resource when confronted with unlimited access by an expanding population. However, the historical antecedents of the tragedy of the commons as developed by Hardin and others following the 1968 article, and as commonly understood by students and professors, ~~is~~ inaccurate. (8)
are

"The Tragedy of the Commons" Defined

Hardin credits William Forster Lloyd with providing the impetus to the commons concept. In 1832, in the midst of the Enclosure Acts, Lloyd published Two Lectures on the Checks to Population in which he describes the situation existing when a resource is held in common:

Again, suppose two persons to have a common purse, to which each may freely resort. The ordinary source of motive for economy is a foresight of the diminution in the means of future enjoyment depending on each act of present expenditure. If a man takes a guinea out of his own purse, the remainder, which he can spend afterwards, is diminished by a guinea. But not so, if he takes it from a fund, to which he and another have an equal right of access. The loss falling upon both, he spends a guinea with as little consideration as he would use in spending half a guinea, were the fund divided. Each determines his expenditure as if the whole of the joint stock were his own. Consequently, in a multitude of partners, where the diminution effected by each separate act of expenditure is insensible, the motive for economy entirely vanishes.(9)

Later, in the same lecture, Lloyd applies his description directly to common land, "Why", he asks, "are the cattle on a common so puny and stunted? Why is the common itself so bare-worn and cropped so differently from the adjoining enclosures?" He answers his own question:

In an enclosed pasture, there is a point of saturation, if I may so call it, (by which, I mean a barrier depending on consideration of interest), beyond which no prudent man will add to his stock. In a common, also, there is in like manner a point of saturation. But the position of the point in the two cases is obviously different. Were a number of adjoining pastures, already fully stocked, to be at once thrown open, and converted into one vast common, the position of the point of saturation would immediately be changed. The stock would be increased, and would be made to press much more forcibly against the means of subsistence.(10)

The language seems to point unmistakably to eighteenth and nineteenth century British commons and enclosures, but Hardin is careful in his initial article to avoid such categorization. His language is relatively free of cultural phenomena:

The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality....

...the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another.... But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit -- in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.(11)

Examples offered by Hardin of the tragedy in operation are the national rangelands in the western United States, American national parks, and environmental pollution; the purpose of his article is to dramatize the dangers of uncontrolled human reproduction.

Later references to Hardin's tragedy of the commons reflect a more explicit historical perspective. In 1977 Hardin used allusions to the Enclosure Acts of the late eighteenth and early nineteenth centuries to explain how the tragedy might be cured.(12) In 1969, Beryl Crowe wrote:

The commons is a fundamental social institution that has a history going back through our own colonial experience to a body of English common law which antedates the Roman Conquest. That law recognized that in societies there are some environmental objects which have never been, and should never be, exclusively appropriated to any individual or group of individuals. In England the classic example of the commons is the pasture set aside for public use, and the "tragedy of the commons" to which Hardin refers was a tragedy of overgrazing and lack of care and fertilization which resulted in erosion and underproduction so destructive that there developed in the late 19th century an enclosure movement.(13)

Hardin included Crowe's article in his 1977 anthology Managing

the Commons; a similar illustration is used in Robert Bish's article "Environmental Resource Management: Public or Private," anthologized in the same volume. Bish illustrates the commons dilemma through the "enclosure movement in medieval England" during which the "stronger lords and nobles undertook to exclude peasant flocks from what had formerly been common land," thus saving the commons from "overgrazing and destruction of the pasturage." (14)

Perhaps the most extensive anglicization of the commons is found in This Endangered Planet by Richard Falk. He writes that Hardin "has evolved an effective metaphor of [the paradox of aggregation] from a historical experience, the destruction of the common pastures of English country towns in the 1700's and 1800's through overgrazing herds." (15)

Further examples can be found, almost ad infinitum and certainly ad nauseum. Questioning of graduate students in economics or planning or public administration elicits the same historical background on the tragedy of the commons as is shown by Falk. The general impression is that the tragedy was a regular occurrence on the common lands of the villages in medieval and post-medieval England.

Not so. *Indeed, not so! Some interpret Hardin's idea as caveat, not history.*

The Commons Defined

In order to dispel the myth of the tragedy of the commons, we must first discover the definition of "commons" as it was understood in medieval England. The legal right of common is "a right which one or more persons have to take or use some portion of that which another's soil produces...and is a right to part of the profits of the soil, and to part only, the right of the soil lying with another and not with the person who claims common." (16) This right is an ancient one: "recent archaeological and historical work indicates that in many places nucleated villages did not come into being until the ninth, tenth, or even the eleventh centuries...But whatever their origins, the classic common field system probably developed with them..." (17) These rights "were not something specifically granted by a generous landlord, but were the residue of rights that were much more extensive, rights that are in all probability older than the modern conception of private property. They probably antedate the idea of private property in land, and are therefore of vast antiquity." (18) The right of common was a right granted to specific persons because these persons had some prior claim to the land or because the actual owner of the land granted them that right in return for their services.

Our modern-day notions of "common" as a public right does not accurately describe the medieval commons. Gonner in 1912 wrote:

[Common] now is taken as denoting the claims, somewhat vague and precarious, of the public as against those holding the land and engaged in its cultivation. But this finds no sanction in a time when over very many, if not most, cultivated districts common was a result of claim to land, and formed a necessary condition of its proper management.... The early rights of common were anything but vague, and were invariably vested in those employed in cultivation or their representatives; they were anything rather than a general claim on the part of the public.... [Common rights] were a necessary element in the agricultural system, they were involved in the ownership and cultivation of the land, and they were largely the source of the profits obtained from the land and the means of rendering its cultivation effective. (19)

Clearly our use of "common" to describe public access to national parks or to deep-ocean fishing is at variance with the original use of the term. (20)

Under the original, legal status of the common, either by common law right as freehold tenant or through usage and grants, an English villager was entitled to pasture limited numbers of specific animals on the lord's waste. It is important to note that even from the beginning, the use of the common was not unrestricted: "Common pasture of stubble and fallow was a feature of open-field husbandry from the start...and with it went communal control." (21) The English common was not available to the general public but was only available to certain individuals who owned or were granted the right to use it. Use of the common even by these people was not unregulated. The types and in some cases the numbers of animals each tenant could pasture were limited, based at least partly on a recognition of the limited carrying capacity of the land.

The Management of the Commons

The earliest records for communal farming regulations are the manor court rolls of the mid-thirteenth century. (22) The earliest record for a village meeting is the fourteenth century. Joan Thirsk writes:

From these dates the evidence points unequivocally to the autonomy of village communities in determining the form of, and the rules governing their field system.... In villages which possessed no more than one manor, matters were agreed in the manorial court, and the decisions sometimes, but not always, recorded on the court roll. Decisions affecting villages which shared the use of commons were taken

at the court of the chief lord, at which all the vills were represented. In villages where more than one manor existed, agreement might be reached at a village meeting at which all tenants and lords were present or represented.(23)

Similarly, the author of a Northumberland survey of 1664, after naming the manorial fields, wrote of the regulatory process:

Which said fields, after the corns and hay are off, are laid open, and eaten, sometimes with, sometimes without, stint. But how many beasts and sheep everie tenement may keep is uncertain and left as ye Neighbors may agree among themselves; and that severall parcels of ye common fields have been enclosed.(24)

Such agreements among the neighbors are recorded in the village bylaws. These bylaws

emphasize the degree to which...agricultural practice was directed and controlled by an assembly of cultivators, the manorial court, who coordinated and regulated the season-by-season activities of the whole community. Arable and meadowland were normally thrown open for common pasturing by the stock of all the commoners after harvest and in fallow times, and this necessitated some rules about cropping, fencing, and grazing beasts. Similarly, all the cultivators of the intermixed strips enjoyed common pasturage in the waste, and in addition, the rights to gather timber, peat and other commodities were essential concomitants of the possession of arable and meadow shares.(25)

What is important to note here is the detail with which the open fields were regulated. Ault notes bylaws covering such points as where field workers are paid (at the granary rather than in the field, where payment in kind might lead to accusations of theft) and at what age boys may begin to pasture sheep on the common (sixteen). The commons were carefully and painstakingly regulated, and those instances in which the common deteriorated were most often due to lawbreaking and to oppression of the poorer tenant rather than to egoistic abuse of a common resource.

The Inevitable Decline of the Commons

By 1880, Parliamentary enclosure of formerly commonland was well under way. Enclosed land showed a striking increase in productivity, and this increased productivity was often touted by land reformers--wealthy or otherwise--as proof of the evils of the commons system. However, the change was the result of many factors, and not just of enclosure. Some of the increase would probably have occurred without enclosure, but enclosure

hastened the process. The common land was not the best land. The lord's waste was often reclaimed land, cultivated from forest and marsh. Morton in 1712 wrote: "Many of the Lordships, and especially the larger ones, have a Common or uninclosed [sic] Pasture for their cattle in the Outskirts of the Fields. Most of these have formerly been plowed; but being generally their worst sort of ground, and at so great Distance from the towns, the Manuring and Culture of them were found so inconvenient that they have been laid down for Greensod." (26) Enclosure took the better land and subjected it to the new and improved methods of agriculture which had been all but impossible under the common system; for the management of the common could not be changed unless all commoners agreed and, just as important, remained agreed. (27) Improved roads and transportation facilities made marketing easier, and of course, the land had fewer people to support. Economies of scale made it profitable to use improved stock. In 1760, Robert Bakewell, the founder of modern methods of livestock improvement, began selective breeding of farm animals. (28) Previously forbidden by ecclesiastical authorities as incest, inbreeding of animals with desirable qualities soon led to dramatic improvements in stock. (29) Planting the enclosure with nitrogen-fixing crops such as clover improved the soil; drainage improved livestock health. Animals were disturbed less by driving to and from land pasture. All of these factors combined to improve the productivity of the formerly common land.

That enclosure improved productivity is neither a surprise nor a shame to the commons. The commons system "was falling into disuse, a new system was taking its place, and with the change the actual use made of the common or common rights declined. It might indeed have been retorted [to advocates of enclosure] that what was wanted was a stricter enforcement of the whole common right system." (30) A related view was expressed in 1974 by Van Rensselaer Potter:

When I first read Hardin's article (on the tragedy of the commons), I wondered if the users of the early English commons weren't prevented from committing the fatal error of overgrazing by a kind of 'bioethics' enforced by the moral pressure of their neighbors. Indeed, the commons system operated successfully in England for several hundred years. Now we read that, before the colonial era in the Sahel, 'overpasturage was avoided' by rules worked out by tribal chiefs. When deep wells were drilled to obtain water 'the boreholes threw into chaos the traditional system of pasture use based on agreements among tribal chieftains.' Thus, we see the tragedy of the commons not as a defect in the concept of a 'commons' but as a result of the disastrous transition period between the loss of an effective bioethic and its replacement by a new bioethic that

could once again bring biological realities and human values into a viable balance.(31)

Discussion

First, let us explore the "bioethic" of the English common. If we assume, for argument's sake, that the villagers were not driven by economic self-interest, how else might their behavior be explained? One explanation is that they would choose to observe the regulation of the common, and indeed would choose to devise the regulation, for community harmony. The common was poor land and was used by all the villagers, and honoring the commons regulation ensured a minimum of grazing for each villager. The regulation-abiding villager avoided the opprobrium of his peers and gained their approval, a commodity much in demand in the closed and often inbred village environment.

Our villager was also bound by custom, no less than we are today. The commoning system existed for centuries and, having worked well in the past, was expected to continue to work well in the future. Further, villagers were religious in an unlettered, superstitious sense, and were unlikely to provoke supernatural retribution for changing custom.

Finally, the regulations were enforced by both the lord (or his representatives) and the ecclesiastical authorities. They had an interest in compliance with all local customs and regulation, as much of the villagers' time was spent in laboring on their masters' behalf, performing such tasks as building or repairing roads, ploughing, or harvesting.(32) Even though commons regulations were set by the villagers, resolution of disputes could, as a last resort, be taken to the lord.

One striking characteristic of all of these explanations is the scale of the endeavor. The commons were small, and the number of people using them was tightly bounded by family ties, geography, political domains, and the extreme restrictiveness of travel. Very little was imported into a village, and its size was limited by its need for self-sufficiency.(33)

My argument can be summarized thus: if villagers were motivated primarily by economic self-interest, the village commons system would have been destroyed by greedy men seeking to circumvent the regulations. Instead, the commons system worked successfully for centuries, and plausible explanations for its success are easy to find. In addition, the explanation for its demise does not rely on an economic base. Therefore, we can accept as reasonable hypothesis the argument that Economic Man was not the primary inhabitant of a commoning village in medieval England.

Exploration of this hypothesis raises important questions to be considered in analyzing resource problems.

First is the concern for what analysts term a "Type III error": answering the wrong problem. Problem structuring is the first and the most difficult step in policy analyses.(34) How to gather preliminary information and when to stop is as much art as science, and if the formulation of the problem is based on insufficient information, the resulting solutions are likely to be insufficient as well. This has two costs. One is that wrong solutions will be attempted; the second is that right solutions --or the opportunity for them--are lost. If, as many academics assume, the medieval commons were "saved" from unprofitability by the Enclosure Movement, then expanded government intervention or a modern privatization of today's commons such as fisheries or timber resources might well be a solution to dwindling resources.

It is beyond dispute that issues such as depletion of limited resources, environmental quality, fisheries economics, and national land management are of great and increasing concern. How those issues are dealt with depends in large part on our perceptions of the disposition of similar issues in the past. If we misunderstand the true nature of the commons, we also misunderstand the implications of the demise of the traditional commons system. Perhaps what existed in fact was not a "tragedy of the commons" but rather a triumph: that for hundreds of years--and perhaps thousands, although written records do not exist to prove the longer era--land was managed successfully by communities. That the system failed to survive the industrial revolution, agrarian reform, and transfigured farming practices is hardly to be wondered at. The "wrong" problem is to look for ways to overcome and to eliminate the commons system rushing to ruin. The analyst who misunderstands the nature of the common will try to generalize from small, self-sufficient communities to larger groups of individuals united only by their common interest in utilizing a resource. He will confuse a common-grazing land, which is stationary and unable to replenish itself without human intervention, with resource pool such as fisheries, which requires no active human management and respects no political boundaries.(35) The "right" problem will lead the analyst to search for the ideas that led to successful commoning for centuries. The small scale of community activity and the lack of a market system may limit the usefulness of the model, but the model still has a value in those situations to which it applies.

The second concern raised by historical inaccuracy is epistemological. We accept, largely without question, the dominance of "Economics Man" in our daily lives. Modern economic theory relies on two assumptions:

First, that economic man and political man are basically the same animal pursuing the same ends by different means, the one through the market place, the other through pressure to obtain legislation favourable to his interests;

secondly, that politics can be essentially described as a process whereby the state mediates between competing interest groups, where the interests involved are either directly economic or capable of being expressed in economic terms.(36)

While few of us would maintain with Tullock that there is no such construct as "public interest,"(37) we might be reluctant to recognize forces other than economic self-interest that may drive our actions, such as "honour, vanity, social esteem, love of ease, and love of domination."(38) They are out of fashion. We pretend that all useful analysis can be reduced to practical, factual, value-free terms and--one hopes--quantitative models. Douglas Amy writes:

- . The attempt to engage in "value-free" analysis cannot eliminate the normative dimensions but can only obscure them.
- . The result is that normative assumptions are surreptitiously and arbitrarily introduced into studies (imbedded in the definitions of the problem being studied, in the models used in the analysis, in the choice of alternatives to be investigated, etc.) and are beyond the range of public scrutiny.(39)

Thus in refusing to confront our values and assumptions before we begin the analysis, we leave them to lie undiscovered in the working of the analysis. We take Economic Man as the only reality and foreclose consideration of alternate views of man, views that were once ~~so~~ accepted but are now seen as naive or laughable. The accurate study of history can force us to the realization that in other times, men of intelligence and insight saw the world in a different light than we.(40) Further, it is reasonable to expect that their view is a more accurate explanation of the cultural and social behavior of their times than is our view, imposed from a centuries-distant perspective.

If we question the existence of Economic Man in running the commons of medieval England, then we must also question the dominance of Economic Man in our own society. Policy analysts have adopted as truth the capitalist economic theory of which economic man is an integral part. If our perceptions of human nature are awry, then we must--without delay--answer some critical questions. If Homo economicus does not control society, then who does? Do we need to re-examine our concepts of civic man, social man, or even religious man? Is it possible that in assuming we are dominated by economic interest, we in fact become so dominated? Have we assumed ourselves into economic behavior that is specific to our times? Can we change? Do we want to change? This is certainly a richer, albeit a much messier, field

^{what}
for reflection; the new alternatives such considerations present may suggest solutions for ~~we~~ have thought were insurmountable problems.

The third and final facet of concern for history lies in the practical implications of our concern. If history and the other humanities provide essential skills for policy analysis, then our method of education for policy analysis is weak. To become good analysts, our graduate students need a broader education. History and the other humanities *

are important to policy analysts because they offer ways of thinking and moral insights, because they suggest new ideas and because they often have necessary evidence about the particulars of some social problem. (41)

At a minimum our students need courses in the history and philosophy of science and in philosophy and political theory, to teach them that the world as we know it was not the world known by the Greeks, or Romans, or Sir Thomas More, or Charles Dickens. It is unlikely to be the world known by our great-grandchildren. Students must realize that ours is but one among many world views.* Such a realization will enrich their abilities to offer insights and alternatives. With luck, it will reduce the arrogance that afflicts many analysts who find such comfort in their myth of value free, neutral analysis.

Policy analysts and would-be analysts need to challenge assumptions. The study of history and the other humanities provides one basis for detecting and challenging our assumptions. Our assumptions may be correct but they must survive the challenge of the most rigorous analysis we can present. To accept these assumptions without challenge is cowardice.

* other academic disciplines?
other current cultures?

ENDNOTES

1. Thomas Kuhn, Structure of Scientific Revolutions (2nd Edition) (Chicago: University of Chicago Press, 1970), p. 1.
2. See, for example, Clarke Cochran, Lawrence Mayer, T.C. Carr, and N.J. Cayer, American Public Policy (New York: St. Martin's Press, 1982), p. 59, p. 94, p. 125.
3. Bruce Payne, "Contexts and Epiphanies: Policy Analysis and the Humanities." Journal of Policy Analysis and Management 4(1), Fall 1984, p. 103.
4. For example, no understanding of the complex issues in fisheries management of the Chesapeake Bay is possible without understanding the conflict between Maryland and Virginia that began in the sixteenth century (see S. Cox, "Fisheries Management and Interstate Cooperation in the Chesapeake Bay," paper presented at the 1985 Annual Conference, American Society for Public Administration, Indianapolis). Similarly, explanations of black violence in the 1960s and 1970s "are chiefly historical -- the uniquely violent treatment of the slaves, and the special virulence of antiblack racism in much of America" (Bruce Payne, p. 93, discussing Charles Silberman, Criminal Violence, Criminal Justice [New York: Random House, 1978] pp. 160-167.)
5. For a discussion of well-structured, moderately structured, and ill-structured problems, see William Dunn, Public Policy Analysis (Englewood Cliffs, N.J.: Prentice Hall, 1981), pp. 103-106. Dunn notes that "most important policy problems are ill-structured" as they have many decision makers who must deal with virtually unlimited alternatives about which the probable outcomes are unknown.
6. Garrett Hardin, "The Tragedy of the Commons," Science 162(1968), pp. 1243-1248.
7. Who could mistake the content--or inspiration--of articles such as "The Use of the Commons Dilemma in Examining the Allocation of Common Resources" (R. Kenneth Godwin and W. Bruce Shepard, Resources for the Future Reprint 179), or "Legislating Commons: The Navajo Tribal Council and the Navajo Range" (Gary D. Libecap and Ronald N. Johnson, Economic Inquiry 18 [1980]:69-86), or Managing the Commons (Cited above, Note 4)? See also basic American government texts such as Robert Lineberry, Government in America (2nd ed.) (Boston: Little, Brown, 1983) in which he identifies the tragedy of the commons as "a parable about sheep overgrazing a common meadow" (pp. 579-580, and text accompanying photograph on p. 580.)
8. The following discussion is from my article, "No Tragedy on the Commons", Environmental Ethics 7 (Spring, 1985), pp. 49-61. ✓

9. William Forster Lloyd, Two Lectures on the Checks to Population, delivered before the University of Oxford, in Michaelmas Term 1832, condensed, edited, and reprinted as "On the Checks to Population" in Garrett Hardin and John Baden, eds., Managing the Commons, pp. 8-15. The above quotation is from p. 9.

10. Hardin and Baden, p. 11.

11. Garrett Hardin, "The Tragedy of the Commons," in Hardin and Baden, eds., Managing the Commons, p. 20. The original article is cited above in Note 1.

12. Garrett Hardin, "Denial and Disguise," in Hardin and Baden, eds., Managing the Commons, pp. 45-52. Hardin acknowledges the injustice of the Enclosure Acts but applauds the increase in agricultural productivity that they entailed.

13. Beryl Crowe, "The Tragedy of the Commons Revisited," in Hardin and Baden, Managing the Commons: 54-55. Original in Science 166 (1969): 1103-1107.

14. Robert Bish, "Environmental Resource Management", in Hardin and Baden, eds., Managing the Commons: 221.

15. Richard A. Falk, This Endangered Planet (New York: Random, 1971), p. 48.

16. E.C.K. Gonner, Common Land and Inclosure (London: Cass, 1912; 2nd ed., 1966).

The first portion of this quote is quoted by Gonner without attribution. This is not, however, an out-moded or esoteric definition: basic American college dictionaries provide the same definition.

17. C.C. Taylor, "Archeology and the Origins of Open-Field Agriculture," in Trever Rowley, ed., The Origins of Open-Field Agriculture (London: Groom Helm, 1981): 21. See also Della Hooke, "Open-field Agriculture -- The Evidence from the Pre-Conquest Charters of the West Midlands," in Rowley, p. 58: "land held in common by a community is clearly in evidence by the tenth century...."

18. W.G. Hoskins and L. Dudley Stamp, The Common Land of England and Wales (St. James' Place, London: Collins, 1965), p. 6.

19. Gonner, pp. 3-4.

20. One might argue that within a given discipline, the term "common" or "common property" has a distinctive definition that excludes the sort of resource being described here. Indeed, Kenneth Godwin and Bruce Shepard (see Note 7) explicitly exclude English commons lands from their definition of common property (p. 267). This point, however, is not germane to my argument. A narrow, discipline-specific definition of a term that is widely

held in academic circles to mean something else is not helpful in dispelling the effects of the misunderstanding.

21. W.O. Ault, Open-Field Farming in Medieval England (London: Allen and Unwin, 1972), p. 17 (notes omitted).

22. Ault gives 1246 as the earliest manor court rolls; the earliest manorial reeve's accounts are for 1208-1209. Ault, p. 18.

23. Joan Thirsk, "Field Systems of the East Midlands," in Alan R.H. Baker and Robin A. Butlin, eds., Studies of Field Systems in the British Isles (Cambridge, England: University Press, 1973), p. 232. ✓

24. Northumberland County History, x, 1941, p. 140, quoted in R.A. Butlin, "Field Systems of Northumberland and Durham," in Baker and Butlin, pp. 122-123.

The "stinting" referred to is a formal allocation of the number and type of beast that could be grazed on the waste.

25. B.K. Roberts, "Field Systems of the West Midlands," in Baker and Butlin, p. 199.

26. David Hall, "The Origins of Open-Field Agriculture-The Archaeological Fieldwork Evidence," in Rowley (see note 17), p. 27.

27. Edward Scrutton, Commons and Common Fields (New York: Burt Franklin, 1887; reprinted; New York: Lenox Hill, 1970), pp. 120-121. ✓

For example, all the farmers might agree to let one field lie fallow against custom for two years. If, in the second year, one tenant decided to return to the customary management and to graze his cattle in the field, the rest were powerless to stop him, and of course, the result would be the use of the field by all the tenants.

28. Victor Rice, Frederick Andrews, Everett Warwick, and James Legates, Breeding and Improvement of Farm Animals (New York: McGraw-Hill, 1957), p. 16.

29. For example, between 1710 and 1790, the weight at Smithfield of cattle changed from 370 pounds to 800 pounds, of calves from 50 to 148, of sheep from 28 to 80, and of lambs from 18 to 50. This weight change is of course due to a multitude of causes. Scrutton, p. 121.

30. Gonner, pp. 306-307.

31. Van Rensselaer Potter, Science 185 (September, 1974): 813.

32. Eileen Power, Medieval People (Garden City, N.Y.: Doubleday, 1954; original edition, Houghton Mifflin, 1924), Chapter 1:

The Peasant Bodo, esp. pp. 18-19.

33. Of course, poor sanitation, poor nutrition, and little health care also contributed to the enduring small size of villages; changes in these conditions are also secondary causes of the demise of the commons.

34. See, for example, William Dunn, Public Policy analysis (Englewood Cliffs, N.J.: Prentice Hall, 1981), pp. 97-139; Duncan MacRae, Jr. and James Wilde, Policy Analysis for Public Decisions (North Scituate, MA: Duxbury Press, 1979), pp. 16-43; Gary Brewer and Peter DeLeon, Foundations of Policy analysis (Homewood, Illinois: Dorsey, 1983), pp. 35-66.

35. See also S.V. Ciriacy-Wantrup, "Economics of Environmental Policy," Land Economics XLVII (1), February, 1971, pp. 36-45. He makes an important distinction between common property resources (which may be controlled through institutional arrangements) and fugitive resources (which are not necessarily common resources.) See esp. pp. 43-44. Similar evidence may also be offered in the realms of land use among primitive people. Frank G. Speck, "Land Ownership Among Hunting Peoples in Primitive America and the World's Marginal Areas," Proceedings of the Twenty-Second International Congress of Americanists [Rome, 1926] II, pp. 323-337) writes:

Old theories of land tenure have assumed that primitive peoples, those existing in a hunting stage, occupy territories over which they hunt without restrictions or consciousness of boundary, trespass, or inheritance rulings, hence that they possess no rights of land tenure... [On] the contrary, the marginal peoples of the world; those in an exclusively hunting and gathering culture stage, show themselves... to have hunting territories with more or less well-defined boundaries, generally inherited from father to son within the family group, with prohibitions against trespass, with game conservation systems... in short, with sufficient recognition of formal rights to establish their land claims as "legal" holdings in the modern sense.

36. Donald Winch, Adam Smith's Politics (Cambridge: Cambridge University Press, 1978), p. 166. In support of Winch's arguments, see such texts as Robert Haveman, Economics of the Public Sector (New York: John Wiley, 1976). J.H. Dales, Pollution, Property and Prices (Toronto: University of Toronto Press, 1963) suggests a pollution rights purchase system in which a potential polluter pays for the opportunity to pollute, assuming implicitly that economic incentives are the most effective way to reduce pollution.

37. Gordon Tullock, guest speaker at the Center for Public Administration and Policy, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, Spring 1983.

38. Winch, p. 167.

39. Douglas Amy, "Why Policy Analysis and Ethics are Incompatible", Journal of Policy Analysis and Management 3(4), Summer 1984, p. 574.

40. Kuhn notes in the Preface to Structure of Scientific Revolutions (see note 1) that it was a course in the history of science that led him to abandon his dissertation in theoretical physics. He could no longer assert that his view of physics was the correct one in light of the many theories that had gone before and been subsequently changed. Physics is not the only discipline for which this phenomenon occurs.

41. Payne, p. 97. (See Note 3).