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PROPERTY AND THE FUTURE OF AGRICULTURE

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"Each recognition of a new thing as the object of legal rights has opened a new chapter in the law, often one of vast complexity" (Philbrick)

This paper is about complexity. I am going to examine complexity and property in two ways--a short way and a long way. The short way is a cowboy story and the long way is the same principle explained in the words of an economist.

Consider the cowboy (this is an agricultural paper--apologies to the marine economists who are familiar with shipwrecked Crusoes). He rode alone unto an open range with only his horse and saddle as property. He rounded up wild cattle of appropriate gender, and confined them and their offspring until he had a herd. The herd grew by itself limited only by natural predation, cowboy consumption, and sales of beef to the folks back East.

Enter cowboy 2 who did likewise. Organizational opportunities consisted of 1) a shoot out, winner (if any) take all, or 2) a slightly more complicated property arrangement by which cattle were claimed, recorded by branding (if the cattle had any say they would have preferred title registration in deference to their smoldering flanks). The cattle were comingled with cattle of other brands on the common prairie.

One year rain was short, so was the grass, and land for grazing

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became scarce. Organizational opportunities arose again 1) another shoot out or 2) a slightly more complicated property arrangement by which the cowboys, then numbering 3, agreed to limit the size of their herds by formula. The formula worked fine until the enterprising cowboys weighed the risks of cheating against getting caught. Organizational opportunities arose again 1) one or more shoot outs or 2) a still more complicated arrangement which conceded enforcement to a fourth party (they didn't like the enforcer very much so they called him government).

When the range became too crowded with cowboys some of them took to growing clover for the cows and carrots for horses. But open range is a poor place to grow clover and carrots with cattle and horses around so still more organization opportunities arose 1) more shoot outs or 2) some rather complicated property arrangements involving surveys, fences, deeds, recording, inter vivos transfers and caveat emptor. Some of the cowboys could not speak Latin so lawyers were invented. Cowboys no longer spoke or shot it out with other cowboys. Cowboys spoke to lawyers who spoke to other lawyers who spoke to cowboys.

Meanwhile ranchland became scarce. The old free range became expensive and cowboys discovered it was more profitable (and whole lot easier) to sell land than to raise and sell cattle. Organizational opportunities abounded but instead of shoot outs there were contracts, litigation and legislation. Leasing contracts, for example allowed buying for just a short time. Land became so valuable that people could only buy or rent the separate services of land one at a time. Each of these separate services became a right. Computers were enlisted to maintain a

continuous record of all the property rights.. In time the land itself was forgotten and major industry was built on the trade of real property rights. Organizational opportunities flourished even when the land did not. The story fades out in the year 2027 when a third generation cowboy and a battery of lawyers invented a transferable viewing right for the sunset over Rattlesnake Butte. [end of parable]

### Introduction:

"The problem of the ownership of property is in my view, one of great importance and of common concern throughout the free world." (Meade)

We have been asked to consider, as part of our Association proceedings, the future of property and agriculture. The reason is plain. The rules comprising the institution of property affect the way wealth and income are distributed and the way resources are used. It is as important for us to understand our future property rules as it is to understand future demands and supplies of, petroleum, fertilizer, labor, or seed.

The task of translating the past into the future should not be difficult; it is a process we have used from early childhood. Each of us have learned, with varying success, to identify important events and activities. So it is with the future of property. The future of property should be no more difficult to predict than the future of technology, society and mankind. Nor is it, I fear, any less difficult.

### The approach

This is not the place for a discourse on methodology but it is perhaps

useful to distinguish between predictive models and reasoned speculation.

The approach to the future of property used in this paper is best described as speculation. I doubt if any treatment of the future can be much more. A model for prediction implies facts for testing that, by the very nature of the future, are not available. In Ludwig Lachman's words: "the impossibility of prediction in economics follows from the facts that economic change is linked to change in knowledge, and future knowledge cannot be gained before its time." (Lachman)<sup>1</sup>

Our speculation is about those human interdependencies and organizations of the future that pertain to property, especially land in agriculture.

#### Property semantics

What is property? Richard Ely remarked that "the essence of property is in the relations among men arising out of their relations to things." (Ely, p. 96) Others variously define property as a system of authoritatively sanctioned rights, duties, privileges, and liabilities among persons with respect to property objects (Wunderlich).<sup>2</sup> The objects might be goods, services, territory, ideas, or enterprises. The persons can be natural persons or legal entities such as corporations or trusts. The sanctioning authority is government or its substitute. The rights and duties are relations between the holder and others.<sup>3</sup>

The critical element to be distilled from the definitions and descriptions is "distribution." Property distributes opportunities and obligations among persons. Only indirectly, by personifying benefits and costs, does property prescribe use of things. The effect of property on

decisions about the levels and combinations of resources is inferred from incentives presumed to exist from the distributive qualities of property.

The rights and privileges attending property are assumed to create incentives and these incentives are assumed to create behavior with respect to resource use. These assumptions are so plausible that they seem not to have been seriously questioned and the linkage between distribution of rights among persons, benefits and costs, incentives, decisions, and behavior have been fused into a doctrine of appropriability and liability. The doctrine of appropriability and liability provided conceptual underpinnings for the literature of externalities that bloomed in the environmentalist era.

Thus, some rather elementary ideas about property added immensely to economic understanding (Demsetz, McKean, Furubotn and Pejovich (1972)).<sup>4</sup> Unfortunately there has been little quid pro quo. Economics has not been equally generous to the concept of property. The "bundle of rights" remains more or less as stated by Reinold Noyes in 1936:

"...this rather will-o'-wisp thing called dominion or ownership...is said to represent a bundle of rights of a certain nature with reference to a certain object. Other kinds of bundles may exist with reference to the same object.... All the aggregates combined, which have reference to a single object, constitute complete property in that object." (Noyes, p. 309-310)

Describing property as a distributive instrument does not diminish its role in resource use. It merely affirms property as primarily an aspect of the distribution of wealth, power, and status which may in turn affect the way property objects (resources) are used.

Looking at the future of property one should give first priority to distribution of property rights and then examine the implications for resource use, say, in agriculture.

### Complex Systems and Property as Information

Property is a system through which owners communicate to others their interests in property objects. Essentially, property is an information system.

As the number of property objects, interests and owners increases, the property system becomes more complex. Simple one to one contracts give way to generalized rules. Then the general rules become numerous, requiring codifications with increasingly formal and elaborate procedures for enforcement, adjudication, and modification.

An expansion of property objects and persons would cause one to expect the property system to rely more on groups, voluntary organizations and government to become decision makers. These organizations have increasing needs for information. Systems capable of handling large volumes of information tend to become specialized. Davis and North explain the tendency:

"In general, not only is information costly, but it is subject to increasing returns. That is, one must frequently pay for information, but the cost does not change much whether that information is used to effect one, one hundred, or one thousand transactions. If information costs are substantial and if they are subject to decreasing costs, it is likely that substantial profits are to be earned from increasing information flows that decrease uncertainty." (Davis and North, p. 21)

The market for land has traditionally been local and specific to a particular unit; each transaction has been, to a large extent, "tailor made." However, conditions surrounding the exchange of land are changing. Already a specification market is developing in urban residential real estate. Thus, according to Davis and North criteria, the conditions for institutional innovation exist in real property rights.

The increasing complexity of the real property system is an inevitable consequence of more parcels of land, more separable rights and more right holders. There are currently between 85 and 100 million (USDC, Behrens) parcels of land counted for tax purposes. From these units of ownership, at least a third (Statistical Abstract) have separated a leasehold interest. Most parcels are subject to some separations of interest such as easement, reservation, covenant, or security, regulation and tax.

What does this complexity mean in terms of the distribution of land ownership. It means that the bundle of rights is divided in many parts and the parts are held by many people. What we have called complexity in the property system may result in a wider distribution of real property than is indicated by available measures such as a Gini ratio of land ownership (Johnson). A small portion of a population holding fee ownership, for example, does not necessarily mean that the distribution of all interests in land is concentrated. The degree of concentration of land ownership may be an illusion resulting from our narrowness of concept of ownership and the inadequacy of information about ownership.

The many interests in a parcel of land are much more difficult to identify and comprehend than the parcel itself. We tend to be object (say, parcel of land) rather than concept oriented, and the tendency is



to assign to an owner a single interest to an object. This tendency is revealed in the choice of the word "attenuation" in the property rights literature (Furubotn and Pejovich, p. 1148) for example:

"By considering how the attenuation of basic property rights affects the actions of decision makers, it becomes possible to secure new insight in the behavior of various types of firms..."

Attenuation connotes a diminution or disappearance rather than separation or relocation. Is it correct to say that a lease--the right to use a parcel of land for a given period of time--is an attenuation or is it a separation of a use right from the fee ownership.. Likewise, does an easement or regulation reduce or attenuate a right to use; or does an easement simply relocate a particular right, and a regulation represent the exercise of a right a government had all along.

The idea of attenuation results in part because the inadequate information quality of our present property system allows all the separable property interests, save the original fee, to disappear into oblivion. Presumably a more sophisticated information system could identify, record, publicize, trade and tax<sup>5</sup> each of the separable property interests. To do so would result in a more accurate valuation, and marketing of separable rights. One of the interesting consequences of the recent attraction of transferable development rights is that separable rights for particular uses are distinguished and traded.

In the long run it is likely that the benefits to someone of developing the more sophisticated property information system will exceed the cost. The precondition for organization innovation, in terms of the

Davis and North<sup>6</sup> criteria, will exist and enterprising individuals, groups and governments will refine the market for property rights. Interests in property will become more widely distributed, not merely attenuated.

The anomaly of power will be that, as the distribution of property interests become more widespread, and as information systems become more specialized (high initial costs, low unit costs) new forms of concentration of property may arise. Particular types of interests may become the focus of information specialists who control access to information sources. To some extent the present limits on access to multiple listing in real estate is a step in that direction. As the information system becomes organized and regulated access to the system may be restricted and its value expressed as franchise--a seat on the New York Stock Exchange, for example.

Thus the concentration of economic or political power associated with the ownership of large amounts of land could be submerged by control of information about land. What the stock market has done for capital, the land information market will do for land.

#### The future<sup>7</sup> of property

In general, what can be said about the future of the real property system in the U.S.? The following speculations and their consequences are offered as a step toward a better understanding of that future. The speculations are presented more or less in descending order of certainty and directed toward land.

1. There will be more holders of property. Demographers project

more people, and we have no reason for assuming that organizations, trusts, and other potential holders of rights will not increase with the number of people.

There will be more property objects. Unless the human tendency to make and collect things change there will be more ideas, goods, services, and continued vertical and horizontal divisions of territory.

There will be more separation of interests (rights) in property. Wants will become more specialized, less enduring, so the rights, duties, privileges and obligations will become more narrowly defined and will turnover more rapidly.

Thus the quantity of property interests will increase. The rules pertaining to the property interests will increase in number or include larger numbers of interests within each rule.

More legislative, administrative and judicial resources will be required for the organizational overhead to manage larger systems. Success of future property systems will depend on highly sophisticated mechanisms for separating, identifying, transferring, collecting, and managing property interests. Information handling will determine the character of our institutional future.

2. Property rights in land will become increasingly separated permitting the retention of the fee in fewer hands, especially by groups and organizations. More of the interests in land held by individuals will be second-order interests such as negotiable stock in a land holding corporation. Land for investment will be held by incorporated and syndicated holders with security interests in large financial organizations.

Property interests will be concentrated along classes of property, e.g. a single group may own all the development rights in an area. A power company may specialize in owning rights of way for operation of an electric power grid. Some of the concentration will include government. For example, county government may hold scenic easements on all agricultural land to insure an overall visual quality in the county.

3. New systems of classification, brokerage, marketing and finance will permit more rapid purchase and sale of fee interests, leases, options, easements and other separated interests. The real estate market will be increasingly national and international.

4. Title assurance, recording and registration will be automated and simplified. Uniform standards will reduce costs and ease interstate and international transactions.

5. Government will acquire, hold, and manage more interests in real property. Common property will become more common. The share of interests in land held by government will increase proportionately with the number of people, parcels, and interest separation. This speculation is based on the theory that as an organization, such as a nation, becomes larger and more complex, a larger share of total resources are devoted to management and coordination. At least some of the centralizing tendency will take the form of government.

6. Against the centralizing tendencies of management in large scale organization and the waste of coordination is the decentralizing tendency to form small scale autonomous decision units. Polycentrism (Ostrom) is the term given to systems whose elements make mutual adjustments within a

general set of rules. Polycentric organization may permit refinement in property information without elaborate machinery for policing and adjudicating rights.

#### The future of agriculture and property

"The condition most favorable to the prosperity of agriculture exists when there are no entails, no unalienable endowments, no common lands, no right of redemption, no titles..."<sup>8</sup> (Polanyi, p. 180)

The future of agriculture will be determined by a large number of factors, including, but not limited to, property. Biological sciences will be the most important influence on the future direction of what we now call agriculture, but the property system will affect the distribution of benefits and costs, and may have some effect on the direction and pace of change (Boxley).

The bio-technical features of world food and fiber in relation to population has been stated in the optimistic terms of Herman Kahn and William Brown.

"For the balance of this century, the prognosis is quite favorable for two-thirds of humanity...but quite ambiguous for the poorest third of the world.... Our assertion, however, is that these can be greatly mitigated and possibly solved by creating sensible programs within and outside the trouble areas....

Would there be enough food, we may still ask, if, after 200 years, the world population reached, say, 20 billion, about five times the current population? The answer to that question, we assert, is a simple yes!" (Kahn and Brown, p. 332)

Don Paarlberg <sup>9</sup> is less sanguine than Kahn and Brown:

"...Agricultural production, even in the less developed countries, will probably increase at a rate somewhat greater than population over the next 10 years, so that per capital supplies of food are likely to increase moderately. The improvement will not be great, however, and it will not be sufficient to satisfy either the nutritional needs or the expectations of the people.... Let us now direct our attention to the long-term food problem, which will extend well into the 21st century. Unless there is a check in the rate of population growth, I see no solution to the food problem." (Paarlberg, pp. 300-301)

For those even less optimistic than Paarlberg, the biological image presented by Borgstrom is even more formidable:

"Demographers expect the world population to double between 1975 and 2000. That means that even if we somehow manage to double world production of food, minerals, housing and everything else, more people than ever would still be starving and malnourished. The hunger gap can be removed only by trebling food production during the next 25 years.

In biological terms, the true feeding burden of the planet is not 4 billion people, but rather 20 billion population equivalents (PEs): We must include livestock as well. A PE is a unit of protein intake; that of a human is one. The feeding population of the United States is 1.7 billion PEs, a number that includes 215 million human beings, 150 million pets, and livestock. The one billion more people the demographers expect in the next 13 years

are really--in biological terms--five billion." (Borgstrom, pp. 71-72.)

In the long run there is little basis for optimism unless mankind can bring itself under biological control. In the short run, food and fiber production can be greatly expanded by mere extension of present knowledge. Control of insects and diseases, improved fertility and water management, soil conservation, refined materials processing all will increase the capacity of the nation to produce food and fiber 10 (Association of Agricultural Bankers, National Academy of Sciences).

In the longer run at least two technological advancements--energy management 11 (Steinhart) and genetic engineering--will greatly enhance the potential for food and fiber production and will also affect the organization of agriculture. Solar energy is presently used at a small fraction of what might be available. There is great potential in methods to tap the power of the sun (Calvin). Plants may be used to store energy for fuel, particularly in humid areas. In arid areas solar power generation is possible through heat and steam or chemical generation of electricity. Solar energy, however, awaits major scientific and technological development before it becomes our main source of power.

The remarkable advancements in the science of genetic information clearly portends major development in food and fiber production. Plants and animals will be designed with a combination of selective breeding and DNA modification. Insects can be bred for toxic vulnerability to cheap non-polluting poisons. Nitrogen fixing qualities can be built into plants. Animals can be designed for market preferences. Many opportunities exist but genetic engineering is in its infancy and the scientific community is proceeding conservatively. The redesign of humans to expand economic capability of resources--smaller people, for example--

is an intriguing possibility but unlikely in the near future.

With more energy and more efficient plants and animals to use the energy, the likelihood of the omnivorous, flexible, homo sapiens to survive and prosper is great if not assured. The quality of life, satisfaction of demands, and specific adjustments of the supplies of goods and services will depend on population levels, structure, and tastes such as nutritional values.

The effectiveness with which scientific effort is encouraged and used will depend to a great extent on organization. It is almost certain that agriculture of the future will look no more like today's agriculture than today's agriculture resembles neolithic food gathering. The organizational change from today's agriculture probably will be toward two general forms 1) the food and fiber factories, concentrated physically and financially to serve national and global transportation facilities; and 2) the natural farms based on occupational (today's subsistence, part-time and retirement farms) recreational (today's hobby farms but in greater number) and cultural (tomorrow's art form) objectives. The two organizational forms will coexist and to some extent will support one another. Financial requirements will tend to centralize and concentrate the food factories. The hobby, art, recreational, subsistence and other natural farms are to a large extent consumption activities. They will not influence the bulk of the food and fiber production.

Speculation about the likelihood of future of farm factories does not mean that they are particularly desirable or inevitable (Clark, Shumacher). The potential for monopolization of food availability and the potential for a calamitous interruption of supply are two



strong arguments against food factories, or other forms of concentration. With a direction of research and development of more intensive, safe, imaginative and pleasant use of labor; small scale technology; production techniques for small scale enterprises; small scale marketing and financial institutions a widely dispersed production-oriented agriculture could persist for a long time.

If there is continued unionization of the labor force, concentration of financial resources, and emphasis on mass production techniques in agriculture, then the food factory is likely. Resource markets will correspond to the concentrated production organization.

Two markets for land will appear 1) industrial, where high prices for land will encourage capital intensity, which in turn will increase the price of land and 2) consumptive or subsistence. Capital intensive, financially sophisticated food and fiber factories will trend toward a separation of property interests in land and a development toward second order interests in land (negotiable, transferable interest in a land holding entity such as a corporation or syndicate). The consumption or subsistence farms will involve less separation of interests in land than the food factories but greater parcellation; an appropriate analogy might be today's single family detached home, compared to an apartment condominium.

Much of the future of property and agriculture would appear to depend on effective information management. Both biological and organizational processes, almost by necessity, will become more complex. In research, management, and legislation, information requirements will increase.

Issues of privacy, independence, freedom, responsibility, interdependency, control and equity will surface in many ways in many places. Better information, obtained faster and less expensively, will be needed to resolve these issues. The property system will be no exception.

The problem of organizational complexity and information as it pertains to property and agriculture in the past and in the future suggest two areas of social science research: 1) historical theory of complexity, equilibrium and growth of institutions and 2) a theory of the conservation of information <sup>12</sup> on which research and design of organizations could be based.

## Footnotes

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The author appreciates the review of an earlier draft by Robert Boxley,  
James Lewis, Carmen Sandretto and Roger Ströhhbehn.

1. Shackle (1972) states further "The analyst can reason only about  
what is in effect complete; and in a world where there is time,  
nothing is ever complete."
2. The concept of property here draws from Ely 1914; Hohfeld 1913;  
American Law Institute 1936; Noyes 1936 and from suggestions and  
ideas from Quintin Johnstone, Myres McDougal and Harold Lasswell;  
it is described in greater detail in Wunderlich 1969.
3. Hohfeld (1913) claimed that "one of the greatest hindrances to  
the clear understanding...arises from the express or tacit  
assumption that all legal relations may be reduced to 'rights'  
and 'duties'..." He thereupon classified all legal relations into  
jural opposites (right, no right; privilege, duty; power,  
disability, and immunity liability) and jural correlatives  
(right, duty; privilege, no right; power, liability; immunity  
disability). Hohfeld's scheme was useful largely because it  
showed the implications of rights, privileges held by one party on  
the duties and on rights of others.

4. Following Ronald Coase's concepts of social cost, published in 1960, Demsets (1967) and others (e.g. McKean 1970) explained externalities in terms of failures to assign property. The doctrine of appropriability, referred to as the "property approach" to economic efficiency issues, was reviewed in Furubotn and Pejovich (1972).
5. Conceivably each separate interest could be assigned a value and taxed. Such a system would be intricate but would have the advantage of precluding some current tax aberrations such as preferential use value assessment.
6. Davis and North, op cit pp. 41-44, 51-54. Their model for institutional innovation, reduced from its refinements, is simply that an innovation will come into being when "there are potential profits that can be harvested by anyone (or any group who can innovate new institutional arrangements that will overcome... barriers [of economy of scale, externality, risk aversion, political pressure, etc.]." Ibid p. 61.
7. The future means anytime after now, but primarily 50 or more years hence.
8. Quotation attributed to Bentham by Polanyi (1957).
9. See Paarlberg (1976) "Agriculture 200 Years from Now" and Rasmussen (1976) "The Past 200 Years of American Farming."

10. For a more systematic examination of current food systems and near futures see ERS, USDA, Food and Agriculture, Report to Resources for the Future (draft) 1976 and some 1985 projections in Quance (1976). The National Academy of Sciences report (1975) is consistent with Paarlberg supra. The Academy report summarized with: "For the next decade or so, we think we perceive that the supply of food, feed and fiber will be adequate..." But the report adds: "This period of adequacy, which we believe we can foresee, is somewhat irrelevant in view of the concerns raised in this report."

11. The use of machinery in the U.S. has resulted in a net loss of energy, i.e., agricultural consumes, through oil more energy in BTU's (British Thermal Units) than it produces in food. Moreover, the energy "subsidy" (calories of input in relation to calories of output) has risen from 1 in 1910 to 8 in 1970.

12. By conservation of information I mean nothing more than the efficient use of information overtime---no more channels, no more messages, no more encoders and decoders than necessary to reduce uncertainty to a desired level.

## References

- Behrens, John. "Real World Data: Property Taxes, Property Values and Real Property Parcels." Assessors Jour., Vol. 11, No. 2, June, 1976, p. 131.
- Borgstorm, George. "The Numbers Force Us Into a World Like None in History," Smithsonian, July 1976, pp. 71-72.
- Boxley, Robert. "Structure, Control and the Use of Agricultural Resources" (draft). Forward Look in Agriculture, USDA, ERS, NRED, 1976.
- Calvin, Melvin. "Solar Energy by Photosynthesis." Science, Vol. 184, April 19, 1974, p. 375.
- Clark, Wilson. "Big and/or little? Search is on for right technology." Smithsonian, Vol. 7, July 1976, p. 44.
- Davis, Lance E. and D. North. Institutional Change and American Economic Growth. Cambridge at the Univ. Press, 1971, p. 21.
- Demsetz, Harold. "Toward a Theory of Property Rights." Amer. Econ. Rev., Vol. 5, May, 1967, p. 347.
- Ely, Richard. Property and Contract and their Relation to the Distribution of Wealth. New York: Macmillan Co., 1914, p. 96.
- Furubotn, Eirich and S. Pejovich. "Property Rights and Economic Theory: A Survey of Recent Literature." Jour. Econ. Lit., Vol. 10, Dec., 1972, p. 1137.

Furubotn, Eirich and S. Pejovich. Supra, p. 1148.

Johnson, Bruce. Farmland Tenure Patterns in the United States,  
USDA, ERS, Agr. Econ. Rep. No. 249, 1974, p. 23.

Kahn, Herman, and W. Brown. "A World Turning Point and a Better Prospect  
for the Future." The Futurist, Vol. 9, Dec. 1975, p. 332.

Lachman, Ludwig. Professor Shackle on the Economic Significance of  
Time Metroeconomica. Vol. 11, April, 1959, p. 71.

McKean, Roland. "Products Liability: Implications of Some Changing  
Property Rights." Quar. Jour. Econ., Vol. 83, Nov. 1970, p. 611.

Meade, J.E. Efficiency, Equality and the Ownership of Property,  
1965, p. 77.

National Academy of Sciences. Agricultural Production Efficiency,  
Wash., D.C., 1975, p. 184.

National Academy of Sciences. World Food and Nutrition Study, Washington,  
D.C., 1975, p. 102.

Noyes, C. Reinhold. The Institution of Property. New York: Longman  
Green, 1936, p. 309-310.

Ostrom, Vincent. "Polycentricity." Address before the American  
Political Science Association, Sept. 1972.

Paarlberg, Don. "A World Food Policy that Can Succeed." The Futurist,  
Vol. 9, Dec. 1975, pp. 300-301.

\_\_\_\_\_. "Agriculture 200 Years from Now." USDA, Agr.  
Outlook, AO-12, July 1976.

Philbrick, Francis. "Changing Conceptions of Property in Law."  
Univ. of Penn. Law Review, Vol, 86, No. 7, May 1938, p. 692.

Polanyi, Karl. The Great Transformation: The Political and Economic  
Origins of Our Time. Boston: Beacon Press, 1957, p. 180.

Quance, Leory. "Long Range Outlook for U.S. Agriculture." Asso.  
of Agr'l. Bankers, June 1976.

Rasmussen, Wayne. "The Past 200 Years of American Farming." USDA,  
Agr. Outlook, AO-12, July 1976.

Shackle, G.L.S. Epistemics and Economics. Cambridge at the University  
Press, 1972, p. 27.

Shumacher, E.F. Small is Beautiful: Economics as if People Mattered.  
N.Y.: Harper and Row (1973).

Statistical Abstract. op cit pp. 609 and 717.

Steinhart, John, and C. Steinhart. "Energy Use in the U.S. Food  
System, Science, Vol. 184, Apr. 19, 1974, p. 307.



U.S. Department of Commerce, Bureau of the Census. Land Title Recording  
in the United States: A Statistical Summary, SS 67, Washington,  
D.C., 1974, p. 15.

Wolf, Martin. "Solar Energy Utilization by Physical Methods." Science,  
Vol. 184, April 19, 1974.

Wunderlich, Gene. "A Concept of Property," Agr. Econ. Res., Vol. 21,  
January, 1969, p. 1.