Do Independent Farmers Serve the Common Good?

Michael J. Ellerbrock[1] and Gordon Groover
Virginia Tech
Blacksburg, VA

Abstract

In the management of agricultural resources, private initiative is often advocated as the surest path to sustainability due to its reliance on human self-interest and innovative entrepreneurship. Aimed at helping students develop critical thinking skills, we explore the difference between political versus economic independence among farmers. Game theory is applied to farmers' management strategies and outcomes. Application of the Prisoners' Dilemma suggests that the motive of self-interest, though powerful, does not necessarily lead to outcomes that promote the long-term common good. The key to wise agricultural management is not independent decision-making, but voluntary and transparent cooperation guided by cultural norms.

Introduction

Thomas Jefferson's model of an agrarian America envisioned "a nation of small, independent farmers as the proper basis for democratic society" (Knutson et al., 1983). Today, the independent mindset of many American farmers remains an enduring cultural ethos based on a deeply held value system with powerful implications. Yet, what does it mean to be "independent"? There can be a difference between having an independent mindset versus behaving independently.

Possessing an independent mindset has broad personal and political dimensions that may or may not be consistent with farmers' focused economic behavior. For example, in our national elections most U.S. farmers vote along conservative lines by a 2 to 1 margin for reasons that resonate with their personal and political values (Walker, 2012). However, considerably more American than European farmers vote for liberal candidates based on U.S. economic policies that traditionally support cooperative farm programs (de Graaf et al., 1995).

Agricultural educators need to help students distinguish between independent thinking versus acting in the agrarian milieu. Under oligopolistic (few sellers) market structures, independent minded farmers can be better off when they collaborate, rather than compete, with each other in the economic arena. Similarly, on a global scale, the few giant agribusiness firms generally choose to consolidate and concentrate their resources geographically and sectorally based on the market strategies of peer firms to avoid direct competition (Rama, 2005).

Using oligopolistic game theory, this article offers a simple lesson with hypothetical rules of engagement to illustrate how independent behavior can impede attainment of the common good across current and future generations. A lack of trust among players erodes cooperative behavior, with perverse results for all.

One of the most powerful metaphors in agricultural economics education is Adam Smith's famous notion of an *Invisible Hand*: when rational individuals and groups act out of their own self-interest, with or without regard for others, the outcome maximizes the common good. In other words, a rising tide lifts all boats. It is a powerful phenomenon - to the extent that it is true.

Agricultural educators have long professed a mixed attitude toward reliance on the free market to allocate resources. Which is more important for farmers to follow: market incentives or cultural norms? Libertarians assert that private landowners have a strong incentive to manage their natural assets in a sustainable manner. In their view, government should adopt a *laissez faire* (hands off) approach toward the private sector, including agribusiness.

Conversely, skeptics of raw capitalism advocate voluntary agreements or government regulation where members agree to "co-operate" for the common good. Nevertheless, because of its reliance on individual self-interest and entrepreneurial initiative, many resource managers advocate privatization as the surest path to sustainable agriculture.

However, under certain conditions/rules, rational self-interest, private initiative and unregulated markets

do not lead to the socially optimal outcome (Frank, 2000). In other words, the *Invisible Hand* may sometimes be too aggressive and need a counterbalancing element of justice to achieve sustainability. For example, Hardin's (1968) classic analysis of the "Tragedy of the Commons" offers students an example how private initiative can backfire.

Classroom Exercise: Management of Common Property Resources

Ask your students: "Who likes to fish? Who likes to make money?" Ask for four volunteer fishers. Have them stand around the four edges of a table, surrounded by the rest of their classmates. Tell the four fishers that the rules are simple.

Rules: You will place 20-30 pieces of Goldfish Crackers on the table, each representing one fish. The four fishers, without talking to each other, will simultaneously fish for 30 seconds, competitively gathering as many fish as they wish with their hands. For each fish they "catch," you will "pay" them one dollar (or a quarter, piece of candy, points on next exam … some tangible reward per fish caught).

After each 30 second round of fishing, you will pay the fishers, then add two additional "baby" fish for the next round for each fish left un-caught on the table … replenishing the species. Without much discussion or delay, "Go!"

Usually, one or more fishers will exploit the resource by trying to catch all or most of the fish, leaving none or a few for replenishing the species for future rounds of fishing/harvests. If so, pause and ask the class about what happened and why?

Now change the rules: using two belts or yard sticks, form an "X" on the table. Place an approximately equal

number of fish in each quadrant. Assign one quadrant as property rights to each of the four fishers, as their fishery to manage as they wish. Inform them that cheating will not be tolerated and heavily enforced. Then play another iteration of fishing rounds. Usually, students realize that it is in their best interests to manage the resource in a sustainable manner.

Ask students to identify other examples of the Tragedy of the Commons (crowded beaches, highway congestion), including success stories (American bison, campus parking permits) where management systems were implemented to ration the resource in a sustainable framework.

Theoretical Model

It is generally good for one farmer to have a bumper crop. However, it can be disastrous for all farmers to simultaneously have bumper crops ... market prices will likely plummet, especially for food/fiber products viewed as necessities (inelastic demand) by consumers who want only a certain quantity regardless of price. Hence, the production planning behavior of farmers is framed within their expectations of other farmers' decisions. Such behavior in oligopolistic markets is typically explained in the context of players in game theory analysis (Mathis and Koscianski, 2002), where one's outcome is dependent upon the actions of others, such as the famous Prisoners' Dilemma (PD) paradigm (Nicholson, 1989). For example, see Figure 1.

Working in collusion, two criminals are guilty of committing a crime. When captured and interrogated separately by police, the criminals are told that if they both confess they will each receive four years in prison (Cell 1,1: Row 1, Column 1 in upper left quadrant). If one confesses, but the other does not, the confessor will be granted leniency with probation and no jail time and the non-confessor will be severely punished with a six year sentence (Cell 1,2 or 2,1). If neither party confesses, they will both be charged with a lesser crime and likely receive two years each in jail (Cell 2,2). Each outcome (cell) has a probability of 0.25 of occurring.

If the criminals act in their own individual self-interest, each of their optimal strategies is to confess. From the perspective of Prisoner A, to confess is clearly the optimal ("dominant") strategy because both of his potential outcomes, depending on Prisoner B's decision, result in less jail time than if Prisoner A does not confess: 0 < 2 or 4 < 6. The same is true for Prisoner B.

A "Dominant Strategy" occurs when a player's optimal strategy (not outcome) is independent of the expected behavior of others. A PD with Dominant Strategies is a special case of Nash Equilibrium (Mathis and Koscianski, 2002), as in the example above.

Figure 1. Years Incarcerated Based on Individual's Responses

		Prisoner B Strategy	
		Confess	Don't Confess
Prisoner A Strategy	**Confess**	B = 4 A+B = 8 A = 4	B = 6 A+B = 6 A = 0
	Don't Confess	B = 0 A+B = 6 A = 6	B = 2 A+B = 4 A = 2

The PD represents a non-zero-sum game in an oligopolistic market structure. Ethicist Gary Comstock (2002) believes that the PD illustrates the fallacy of assuming or asserting that the human motive of self-interest leads to socially optimal outcomes. Under the above conditions/rules, the strategy of maximizing self-interest leads to disaster. By both confessing, the prisoners incur the worst possible collective result: a combined total of eight years in jail. Collectively, the best outcome would be a combined four year sentence (two years each) if neither prisoner confesses. However, in the absence of trust, to not confess is a risky strategy.

Regarding the management of agricultural resources, some scholars assert that the root of the problem is a lack of property rights and hence privatization of ownership presents the best, perhaps only, solution because it empowers landowners to act to maximize their self-interest (Sanera and Shaw, 1996). Independence is a farmer's virtue!

At the macro level, some analysts assert that an oligopolistic market structure can entice sustainable behavior by producers. For example, Datta and Mirman (1999: 233) demonstrate that oligopolistic market power induces under-harvesting of species for the sake of future production, thereby avoiding exploitation even with a lack of property rights.

Other scholars argue that the real issue is cooperation to eliminate free-riders, i.e., lone operators who let everyone else cut back production while they don't (Seitz et al., 2002). Similarly, Morgenstern (1995) sees the problem in the light of an externality: "when private and social costs diverge, private profit-maximizing decisions are not socially efficient." Thus, Costanza (1991) says that independent farmers "must realize that their activities are individually rational, [yet] collectively undesirable." Appropriate informal rules developed over generations can achieve "governance without government" (Swallow and Bromley, 1992: 12).

Laissez faire advocates view government regulation as an unacceptable solution because it relies on legal coercion; though Hardin (1968) responds that market prices, fees and fines are also a form of "mutually agreed upon mutual coercion." Recognizing that perfectly competitive markets seldom exist, laissez faire disciples stress that government solutions are universally infallible (Anderson and Leal, 1992: 412).

Results

Individual self-interest and privatization of property do not necessarily lead to socially optimal outcomes and, under certain conditions, can backfire, i.e., detract from maximizing the common good. Applying the PD to agriculture can illustrate the predicament.

Figure 2. Relative Units of Agricultural Output Based on Strategies Adopted

** Physically unsustainable long-term level of output.

* Culturally unsustainable long-term distribution of output.

In contrast to Figure 1, the numerical values in Figure 2 are good things (relative levels of agricultural output) as opposed to jail time. Assume that both farmers/firms seek to maximize production in (Cell 1,1) by free range grazing on common property. Collective output is maximized at eight units in the short-term, which is physically unsustainable in the long-term due to loss of soil fertility, erosion, depletion of irrigation water, rising marginal input costs, falling product prices and/or labor fatigue.

Instead, assume both farmers agree to engage in cooperative management (Cell 2,2) by reducing their own level of production by 25%, perhaps by rotational grazing. They each generate three units of output for a collective level of six, which is sustainable indefinitely. If one farmer cheats (Cells 1,2 or 2,1), under-reporting his/her harvest or secretly grazing livestock, his/her output returns to four units and the cooperative farmer's is three, which may be physically – but likely not culturally – sustainable. Once the cooperative farmer finds out, he/she will likely return to competitive behavior. Furthermore, community resentment and/or peer pressure will likely surface. Hence, the situation results in a long-term sustainable solution (Cell 2,2) only under the conditions of multiple iterations (repeated cycles that reveal actual behavior), earned trust, effective supervision and ecological feasibility.

Discussion

"Hundreds of reviews and case studies" (Grafton, 2000) demonstrate the conditions under which various management strategies lead to socially optimal outcomes, depending upon factors such as a reliable degree of trust

or third-party enforcement, well defined and defensible geographical boundaries, small numbers of members and dependence of the community on the resource. A common culture in rural agriculture enhances the likelihood of cooperation in managing shared agricultural resources (Ostrom and Ostrom, 2004). A key factor in sustaining agricultural resources is transparent collaboration.

Leeson (2003: 35-54) and Brennan (2000: 7) acknowledge that single-round PDs (a type of coercion) can fail to attain a sustainably optimal solution, whereas repeated negotiations between individuals can achieve the common good without coercion. Just, et al., (2005: 470) explored the conditions under which a Nash bargaining strategy can lead to cooperation among players: transparent and enforceable property rights (ownership, access, excludability); acceptable rules of access and withdrawal; effective supervision and dispute resolution mechanisms; cultural norms and trust; and repeatable interactions and information gained.

Even without a third-party overseer, it is possible to achieve a stable coalition of cooperators, even with some defecting free-riders, depending on the relative amounts of benefits and costs in managing a shared resource (Becker and Easter, 1999; Kathuria and Sterner, 2002). Feeny et al., (1996) demonstrated that the typical libertarian assumptions of profit maximization, homogeneous agents, free entry and exit and lack of altruism and non-pecuniary rewards seldom hold.

Summary

In today's Western culture, competition is as pervasive as water to a fish. For better and worse, the competitive impulse governs most dimensions of life: nature, economics, education, science, law, politics, entertainment, media, arts, sexuality, religion, sports, crime and war. Though competition, self-interest and private property are powerful stimulants for advancing many citizens' quality of life, when unregulated they are neither assurances of each other, nor guarantors of socially optimal outcomes.

Markets pose the primary means for valuing and managing scarce natural resources. However, competition, self-interest and private property are necessary, but not sufficient conditions for market-based solutions to work efficiently. Successful strategies for sustainable agriculture must balance humanity's competitive nature with relationships based on cooperation and consensus. The goal is achieving win/win strategies, where "getting ahead" is not measured by those one passes. Collaboration may not be humanity's instinctive impulse, but may be our most reliable path to a sustainable future.

Literature Cited

Anderson, T.L. and R.R. Leal. 2005. Free market versus political environmentalism. in environmental philosophy: from animal rights to radical ecology (Michael E. Zimmerman, et al., Upper Saddle River, NJ: Pearson-Prentice Hall, 4th edition), 409-418.

Becker, N. and K.W. Easter. 1999. Conflict and cooperation in managing international water resources such as the great lakes. Land Economics 75(2): 233-245.

Brennan, T.J. 2000. The economics of competition policy: recent developments and cautionary notes in antitrust regulation. Resources for the Future Discussion Paper 00-07. Washington, DC.

Comstock, G.L. 2002. Life science ethics. Ames: Iowa State Press. pp. 175-176, 179.

Costanza, R. 1991. Ecological economics: The science and management of sustainability. New York: Columbia University Press. pp.322, 408-410.

Datta, M. and L.J. Mirman. 1999. Externalities, market power, and resource extraction. Jour. of Environmental Economics and Management 37: 233-255.

de Graaf, N.D., P. Nieuwbeerta and A. Heath. 1995. Class mobility and political preferences: Individual and contextual effects. American Jour. of Sociology 100(4): 1008-1027.

Feeny, D. S. Hanna and A.F. McEvoy. 1996. Questioning the assumptions of the "tragedy of the commons" model of fisheries. Land Economics 72(2): 187-205.

Frank, T. 2000. One market under God. New York: Anchor Books. pp. 436.

Grafton, R.Q. 2000. Governance of the commons: A role for the state? Land Economics 76(4): 504-517.

Hardin, G. 1968. The tragedy of the commons. Science 162: 1243-1248.

Just, R. S. Mitra and S. Netanyahu. 2005. Implications of nash bargaining for horizontal industry integration. American Jour. of Agricultural Economics 87(2): 467-481.

Kathuria, V. and T. Sterner. 2002. Monitoring and enforcement: Is two-tier regulation robust? Resources for the Future Discussion Paper 02-17. Washington, DC.

Knutson, R.D., J.B. Penn and W.T. Boehm. 1983. Agricultural and food policy. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Leeson, P.T. 2003. Contracts without government. Jour. of Private Enterprise 18(2): 35-54.

Mathis, S.A. and J. Koscianski. 2002. Microeconomic theory: An integrated approach. Upper Saddle River, NJ: Prentice-Hall, Inc.

Morgenstern, R. 1995. Environmental taxes: Dead or alive? Resources for the Future Discussion Paper 96-03. Washington, DC.

Nicholson, W. 1989. Microeconomic theory: Basic principles and extensions. Chicago, IL: The Dryden Press.

Ostrom, E. and V.Ostrom. 2004. The quest for meaning in public choice. American Jour. for Economics and Sociology 63(1): 1-43.

Rama, R. 2005. The changing structure of the world's food oligopoly. Multinational Agribusinesses. New York: Food Products Press, 22-28.

Sanera, M. and J.S. Shaw. 1996. Facts not fear: A parent's guide to teaching children about the environment. Washington, D.C.: Regenery Publishing, Inc. pp. 36, 51-52, 118.

Seitz, W.D., G.C. Nelson and H.G. Halcrow. 2002. Economics of resources, agriculture, and food. New York: McGraw-Hill. pp. 370-372.

Swallow, B.M. and D.W. Bromley. 1992. Institutions, governance, and incentives in common property regimes for African rangelands. Institute for Environmental Studies, University of Wisconsin-Madison. 1-15.

Walker, J. 2012. The industry divide in the elections. (Gallup Poll) http://elections.firedoglake.com.

Mark Your Calendars Now!
June 24 - 28
2014 NACTA Conference

"Learning Runs through It"
Montana State University, Bozeman

NACTA
north american colleges and teachers of agriculture
connect | develop | achieve