

“**A**nd it’s a great day to be alive.  
I know the sun’s still shining when I close my eyes.  
There’s some hard times in the neighborhood,  
But why can’t every day be just this good?”  
—Travis Tritt

# **Farming for the Future: Agriculture’s Next Generation**

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## **INTRODUCTION**

**C**ivilization began with agriculture. Artisans, businessmen, politicians, and the historians documenting their deeds did not exist until hunter-gatherers settled down to plant and tend crops. With the sedentary lifestyle, humans moved out of the state of nature.

As centuries passed, a race developed between hungry mouths and agricultural production. Would a growing human population outstrip the resources needed to feed it or would humans find a way to satiate ever-increasing numbers? This question was articulated by the Reverend Thomas Malthus in 1798. Malthus ar-

gued doom and gloom. Starvation lay at the end of the road.

Fortunately, the last two hundred years have proven Malthus wrong. Current demographics project a population leveling off, while current agricultural yields promise to feed us to the plateau and beyond. As country music singer Travis Tritt croons, “It’s a great day to be alive.”

Victory over one problem, feeding the world, has provided the freedom to deal with other problems created during our many-millennia effort to produce enough food for every man, woman, and child. Agriculture’s progress in meeting the world’s growing demand for, first, bread and water and, later, cheeseburgers and French fries caused other problems along the way.

Our waterways are polluted from fertilizer and animal wastes running off into streams, lakes, and rivers. Pesticides cause health concerns, warranted and unwarranted, among consumers. Irrigation diverts water needed in the streams for the survival of fish and other aquatic life. Land conversion for agricultural production presents the greatest threat to South American rain forests.

In the past, these problems were considered secondary to humanity’s need to feed its hungry. But with world population tapering off and possibly even declining by mid-century, it appears that the only problem left to feeding the world is distribution, not production. This metamorphosis allows agriculture to focus its attention on the cleanup required in the aftermath of the fight to feed the world.

Initially, these cleanup efforts will be led by a small number of ecological entrepreneurs, or eco-entrepreneurs, experimenting with new ways of raising food in return for financial rewards and a significant share of the marketplace. As some entrepreneurs are successful and others fall by the wayside, trial and error will lead to increased adoption of the successful methods. But this will happen only if the entrepreneurs leading agriculture into its new future find an institutional framework that allows them to be creative.

Institutions—that is, the formal and informal rules that influ-

ence behavior, such as laws, traditions, and social norms—will play a pivotal role in encouraging success or failure. This paper asks what institutions will best serve agriculture’s new future. What rules and policies will incubate environmental entrepreneurs in the farm sector—and which will hamper or even destroy them?

First, I will look at how agriculture won its battle to feed the planet and what role institutions played in that arena. I will describe the unique position in which agriculture and we, as its human stewards, find ourselves at the beginning of the twenty-first century. Next, I will describe current institutions that are discouraging the efforts of the coming generation of ecological agrarians. Finally, I will conclude by suggesting policies and institutions that can foster the growth of eco-entrepreneurs and their efforts to provide both enough food for the world *and* the environmental quality that humanity demands.

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## THE TRIUMPH OVER HUNGER

Agriculture began in southwest Asia, the area we call the Middle East today, around 8500 B.C. In the region now occupied by Jordan, Iran, and Iraq, experiments with seeding paid off, and a tribe of nomads began the gradual shift from following the herds to “putting down roots” and forming a community around an annual crop. Hunting and gathering would continue to supplement their diets, but they would rely more and more on what they could cultivate from seed.<sup>1</sup>

David and Marcia Pimentel (1996, 59) offer one possible story:

We know that gatherers brought fruits, nuts, vegetables, and seeds, including grains, back to camp for consumption. As expected, some seeds were dropped on the soil in the clearing of the camp and had the opportunity to grow there. Upon returning to the same campsite some time later, the hunter-gatherers

discovered a concentration of grains, vegetables, fruits, and/or nuts. Some of the more observant people probably associated seeds with plants and began to plant the seeds themselves.

Daniel Vasey (1992, 23–39) offers several other theories in his chapter on “The Origins of Agriculture.” But regardless of how agriculture began, it led to great expansion of those cultures that adopted it and it laid the groundwork for modern civilization. As Jared Diamond (1999, 261) wrote in his Pulitzer Prize-winning *Guns, Germs and Steel*, “It became possible, for the first time in human evolution, to develop economically specialized societies consisting of nonfood producing specialists fed by food-producing peasants.” Those specialists became the blacksmiths, granary operators, merchants, historians, philosophers, and soldiers that make up a pre-modern society and, in differing forms, a modern society.

Agriculture led the world into a technological boom. Keeping people in one place meant that they could acquire possessions. In the nomadic lifestyle of the hunter-gatherer, Diamond (1999, 261) writes, “You can’t be burdened with pottery and printing presses as you shift camp.” But when you set up a year-round hut so that you can guard and tend your planted crops, all that changes. Individuals and clans can keep possessions that are larger in both size and number. These possessions—these tools—make life easier and lead to the creation of more tools.

Second, agriculture spawned the technology that made farming success possible. For example, writing, says Charles Heisler (1981,2), “may have come into existence because records were needed by agricultural administrators.”

With technological advance and a more secure food supply, populations began to grow. With more mouths to feed, people put more land into production and strived for higher yields on the lands already in production. The Sumerians pioneered the first large-scale irrigation programs, which were later copied and improved upon

by the Egyptians in the Nile Delta. Later, the Greeks and Romans would continue the tradition and, in the case of Rome, gain fame moving large quantities of water.

Irrigation was not the only technology to draw the attention of ancient thinkers. Columella addressed the proper role of fertilizer for the Roman farmer while musing during the first century A.D. Discussing the use of compost as a substitute for animal manure, he wrote, “Even in a place like this, however, it is a sign of a lazy farmer to be short of fertilizing material” (quoted in White 1970, 132).

Land rotation systems for fighting off weeds and insects developed, along with new forms of machinery. The fallow system probably began in the Middle East’s Fertile Crescent. Proclamations from the Old Testament to let land rest every seventh year may refer to such a system.

Winnowing baskets divided the wheat from the chaff. Plows and domesticated animals tilled the soil. Sickles harvested grain. Mills crushed the grain and produced flour for bread. These technologies all worked to help humans produce more from the ground and get more nutrition out of that produce.

But the battle between a growing population and growing food yields raged onward. Every increase in the annual yield meant another mouth could survive to produce yet more mouths needing higher yields or more cultivated land.

In 1798, the Reverend Thomas Malthus predicted that this cycle could not go on forever. Eventually, available land would run out and food production would fail to meet the demands of ever more hungry people. In *An Essay on the Principle of Population*, Malthus (1993) argued that food production grew arithmetically (1, 2, 3, 4) while human population grew exponentially (1, 2, 4, 8). In such a world, starvation or war would be required to cull population and keep it in check, or some form of moral constraint would be needed as a preventive measure.

But Malthus ignored the role of technology and failed to fathom wealth’s effect on populations. Because of these missed calcula-

tions, Malthus' predictions never came true and, today, it is clear they never will.

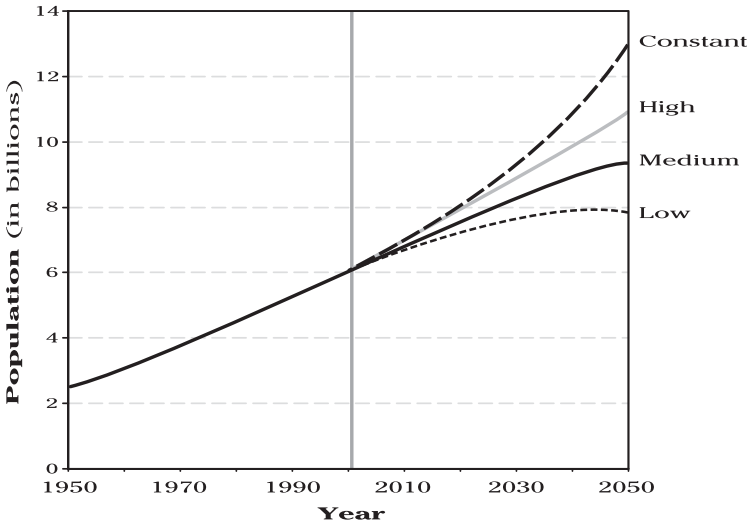
With the arrival of the twenty-first century, almost ten millennia after the advent of agriculture, world population is leveling off. There is enough land and productivity yield to feed every man, woman, and child.

For its low-range estimate, the United Nations Population Division (2001) predicts that world population will begin to decline by mid-century before even reaching 8 billion people (see Figure 1). The mid-range estimates predict a population of 9.3 billion at mid-century and then a leveling off after reaching 11 billion in 2100. Over the last few decades, population growth has mimicked the U.N.'s lower growth numbers, spurring constant downward revisions.

As most of the developed world has already reached steady or declining populations, the changes in the population predictions come from ever falling growth rates for the developing world. Why the decline in population? Rising wealth, better education, and higher survival rates have all led to a decline in the number of children that parents choose to bring into the world. For poor people, children provide a labor force bringing goods to market. As wealth increases, farmers invest more in capital and less in labor. A farmer doesn't need a dozen strapping sons and daughters to plant and clear a field when he has a tractor and a harvester. Among richer people, the children may not work in the fields at all. They represent a cost in feeding, sheltering, and educating—a cost that rises as the family's ambitions rise.

Better education leads women to choose more productive career opportunities for themselves, and the opportunity cost of raising children climbs even more. Finally, increased survival to adulthood lowers the risk parents face that the family name will die out if they have only a few kids. Economists Gary Becker and Robert Barro (1988) discuss many of the decision-making factors that go into having children, while Seth Norton (2002) discusses the institutions that affect those decisions.

**FIGURE 1: ESTIMATED AND PROJECTED WORLD POPULATION**



SOURCE: United Nations Population Division (2001).

Not only is population growth sliding, but we have the capabilities necessary to feed those living now, as well as the additional few coming before the population begins to level off.

The technological changes in agriculture, from the earliest irrigators and simplest plow tools to the hybridization of seeds and the creation of tractors, synthetic fertilizers and pesticides, kept pace with the growing population’s demand for more food. With the amount of land currently removed from production and today’s yields alone, we can meet the food demands of the future. But yield rates continue to rise anyway.

One reason to improve yields even further through new means such as biotechnology is to keep uncultivated or wild lands from production. For much of the last half century, that has been the true accomplishment of increased yields. The question was not whether we would have food to feed everyone, but how much land we would have to plow to attain that necessary food.

Norman Borlaug, who won the 1970 Nobel Peace Prize for increasing grain yields worldwide, explains this achievement. Accord-

ing to Borlaug (2000), an additional 850 million hectares (2.1 billion acres) of land would have been cultivated to equal 1999's cereal harvest if we used 1961 technology instead. And the future remains bright. Jesse Ausubel (2000) of Rockefeller University estimates that if the world's average farmer reaches the yield of the average (not the best!) U.S. corn grower, it will take only half of today's current cropland to feed 10 billion people.

To be sure, distribution problems remain. People still starve in the world. Nobel laureate Amartya Sen identified the cause of starvation as one of poor institutions, not one caused by insufficient availability of food or lack of technology. Sen (1999, 6) challenges anyone to find a functioning democracy where a famine has occurred. There isn't one. Famine occurs in countries suffering from civil strife and inappropriate social institutions. We have enough food; we just need to get it to people.

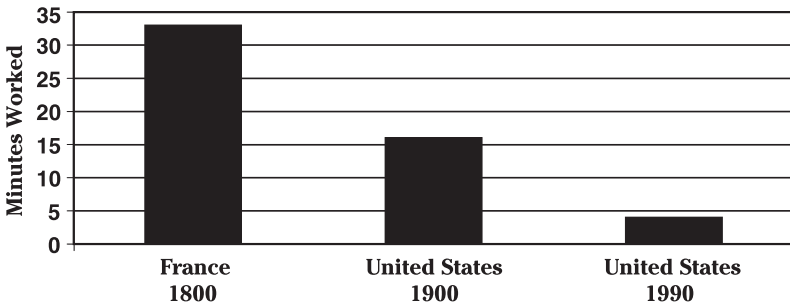
That food is available can also be seen in the prices charged for it. The price of food has plummeted. In the early nineteenth century, Berlin was one of the most technologically advanced cities in the world. Yet at the time, a family of five spent almost three-quarters of its budget on food. Today in the United States, we devote less than 15 percent of our expenditures on food (Grewell and Landry 2003).

In terms of time worked, the price for food has fallen as well. Figure 2 shows the relative time spent working to earn a loaf of bread during the past two centuries. It has plummeted by more than eightfold.

As Grewell and Landry (2003) write, "Never in the history of the world has the average human been as wealthy in terms of the items bought for his or her labor as he or she is today." Sure, there are still problems in the neighborhood, but it's a great day to be alive. As we have solved the problems of the past—in particular, feeding ourselves—we can move on to new problems such as cleaning up the environmental damage created in the process. Our priorities have changed, thanks to our success.



FIGURE 2: MINUTES WORKED TO EARN A LOAF OF BREAD



Source: Grewell and Landry (2003).

## THE RISE OF THE ECOLOGICAL AGRARIAN

With the triumph over hunger, agriculture is looking for new challenges to conquer. There are many out there.

In pursuit of feeding the world, agricultural runoff damaged waterways, and diversions reduced stream flows needed for fish. Nearly 60 percent of pollution in the nation's rivers and streams and 45 percent of the pollution in our lakes stem from agricultural sources (U.S. Environmental Protection Agency 2000). Habitat for land-bound wildlife fell prey to plow and tractor. Chemical fertilizers and pesticides altered natural systems (see Meiners and Morriss 2001).

Today, the public—no longer so focused on the need for food—demands change. As countries and individuals get wealthier, their priorities change. In the field of psychology, Dr. Abraham Maslow (1968, 1971) developed the pyramid, or hierarchy, of human needs. Before people can choose goals of self-actualization or even security, they must meet biological needs for food, oxygen, and other items without which they die. This system of priorities explains the current transformation of society as well.

By meeting the need for food and other basic levels of wealth and well-being, Americans and others have reached a point where we can meet new goals and set new priorities. Elsewhere, with the

exception of countries where civil strife prevents the distribution of food, famine no longer occurs.

Fixing the environmental problems of the past is the new goal for agriculture. To deal with these problems, a new form of agrarian—an ecological agrarian—is stepping forward. In return for premiums on their products and consumer's willingness to choose their products over competing ones, ecological agrarians are taking steps to provide food that satisfies not only the belly but also the mind's hunger for environmental quality.

"Green" brands and "green" labels are popping up around the country. In Belgrade, Montana, Becky Weed markets predator-friendly wool. She eschews traditional sheep herding to guarantee that no wild animals are killed in the protection of her sheep. Environmentally conscious shoppers reward her with almost twice the going rate for wool. Her nearby neighbors, Tom and Mary Kay Milesnick, fence their beef cattle off from riparian areas so they can offer prime fish habitat and fishing to fee-paying anglers. In the midwestern United States, Ron Bowen farms natural grasses whose seeds he uses to create landscapes for homes and businesses that recreate the past ecosystems of the Great Plains. On the East Coast, Jack Sheaffer's waste treatment system improves water quality in the Chesapeake Bay while providing nutrients and irrigation for nearby farming operations. In California, the Corning Land and Cattle Company restricts roaming bovines to protect habitat for deer and quail. In return for their efforts, they sell hunting at a premium.<sup>2</sup>

These eco-entrepreneurs are setting the stage on which agriculture's next evolution, the rise of the ecological agrarian, will take place. The new breed of agriculture has expanded most conspicuously in the United States, because the United States has been among the first to reach a high standard of wealth and food security, so that its citizens were the first to demand more from agriculture. As individuals in other countries feel more stable in their wealth and food security, efforts will expand there as well.

Much of the reason behind agriculture's ability to get over the

first hurdle of feeding the planet is the institutions surrounding agriculture. While agriculture made steady progress providing necessary provisions for most of the last 10,000 years, only in the last 200 years has agriculture really taken off with increasing yields. Much of this revolution in yields occurred thanks to changes in England, which were then transplanted to the United States. In the last fifty years of the twentieth century alone, U.S. crop output per acre (including fruits, nuts, vegetable, and hay) increased by over 250 percent (Beattie 2001, 16).

In a 1976 paper (famous among agricultural historians), Robert Brenner (1985, 54) claimed, “It was indeed, in the last analysis, an agricultural revolution, based on the emergence of capitalist class relations in the countryside, which made it possible for England to become the first nation to experience industrialization.” Brenner argues that the institutions of England regarding property rights and freedom were superior to France in terms of their ability to catalyze agricultural processes. (He could also have included England’s superior rule of law, which included a strong contract system.) Due to these institutions, Brenner (1985, 49) concludes, “the landlords were able to engross, consolidate, and enclose, to create large farms and to lease them to capitalist tenants who could afford to make capital investments. This was the indispensable precondition for significant agrarian advance. . . .” Although Brenner failed to fully understand those institutions,<sup>3</sup> he saw their impact. It was England’s superior institutions that led to agriculture’s boom there.

Institutions mattered then, and they matter now. Institutions—the “rules of the game”—will determine whether the efforts of ecological agrarians are encouraged or discouraged in the next phase of agriculture. It is important that we get them right.

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## INSTITUTIONS THAT FAIL ECO-ENTREPRENEURS

Before attempting to create or strengthen institutions that will foster eco-entrepreneurs in the agricultural sector, the United States should, first, follow the Hippocratic Oath and “do no harm.” A number of institutions do harm ecological agrarians. Due to their timely nature, I will talk about two here.<sup>4</sup> Both the estate tax and agricultural subsidies received new life from congressional efforts in 2002.

### THE ESTATE TAX

The estate or inheritance tax, which falls heavily on the agricultural sector, is a remnant of fundraising efforts for World War I. It leads families to divide up parcels of land that could be open areas of wildlife habitat, while providing little revenue for the federal treasury. In 1998, the Joint Economic Committee of Congress determined that “the estate tax raises very little, if any, net revenue for the federal government” and concluded, “the tax produces no benefits that would justify the large social and economic costs” (Saxton and Thornberry 1998, iii). Among the social costs identified by the committee were environmental harms.

The lands most at risk for environmental damage from the estate tax belong to farmers, ranchers, and tree farmers. Many of those working in the agricultural sector find themselves in the awkward position of being “dirt rich but dollar poor.” One bill introduced in the Senate stated, “Due to the capital intensive nature of farming and its low return on investment, farmers are 15 times more likely to be subject to estate taxes than other Americans” (U.S. Senate 2001, S99).

In 2000, recipients of estates valued in excess of \$675,000 were required to pay federal inheritance taxes at a minimum rate of 37 percent. That payment was due in cash nine months after the estate holder’s death. While half a million dollars seems a

large inheritance, agriculturalists traditionally receive their inheritance in the form of tractors, balers, corrals, barns, and of course, land. To pay off the taxes, they often must sell items essential to the agricultural operation's survival. Fragmenting the land or losing a harvester can send a farm belly up and lead to further sales and possible subdivision of the property.

Environmentalists worry about this division of farmland, because America's agriculturalists, perhaps inadvertently, are environmental managers. More than half of the land in the United States is used for farming and has a substantial impact on wildlife habitat, water quality, and viewsheds. When farmlands are sold to pay estate taxes, the environment pays, too. Michael Bean of Environmental Defense claims, "Federal estate tax requirements are destroying some of the largest and most important endangered species habitats in private ownership" (quoted in Environmental Defense Fund 1995). These privately-held habitats are significant because 78 percent of endangered species in the United States rely on private land for some or all of their habitat (U.S. General Accounting Office [GAO] 1994).

Empirical evidence of the estate tax's harmful effects on the environment can be seen in private forests. Researchers from Mississippi State University and the U.S. Forest Service discovered that nearly 1.4 million acres of non-industrial forestlands are sold annually to pay off federal estate taxes; and 350,000 acres of that land is converted to a more developed use (Greene et al. 2000). As shopping malls, highways, and housing projects go up, wildlife find their traveling corridors fenced off and their foraging patches plowed under.

Most agricultural operations run by eco-entrepreneurs are sole ownerships or partnerships. Ninety-five percent of farms and ranches are either owned by one person or a family partnership (U.S. Senate 2001). This makes these businesses especially susceptible to the tax and its damaging effects. Even if a farm or ranch doesn't have to sell off land, hefty estate planning costs can take

away resources that could be going to worthier projects that clean waterways, protect wildlife, and preserve open space.

The \$1.2 trillion tax cut signed by President Bush in 2001 included a provision to phase out the estate tax over the next decade until 2010, when it would be eliminated. But the provision isn't permanent. The next year, 2011, the tax is fully reinstated. This will create a nightmare for tax planners. More important, it means that the estate tax and its environmental consequences are not gone, merely on sabbatical.<sup>5</sup>

Democrats supported the estate tax on several grounds. They argued that complete repeal would only benefit the rich and could close the door on a significant source of future government funding. There were also worries of a countervailing effect on the environment. Much philanthropical giving is probably spurred by tax benefits, and removing the estate tax would lower those benefits, possibly reducing philanthropic giving. It is difficult, however, to measure to what extent the estate tax affects charity. Also, according to estate tax supporters, only a small portion of the population benefits from its repeal. This is true in some sense, but farmers make up a large share of that small portion of society; because of the ripple effects on the environment and open space, a larger portion of society may be affected.

## AGRICULTURAL SUBSIDIES

Farming requires the use of numerous natural resources. As such, it has a great impact on the environment. Indur Goklany (2003) explains that:

Worldwide, agriculture accounts for 38 percent of land use, 66 percent of freshwater withdrawals, and 85 percent of water consumption. . . . It is responsible for most of the habitat conversion and fragmentation that threaten the world's forests, biodiversity, and terrestrial carbon stores

and sinks. Current agricultural practices . . . have reduced the quantity of water available to the rest of nature, and are among the prime contributors to environmental and water quality problems.

Throughout the world, subsidies aggravate this impact. While agriculture must affect the environment to feed the world, subsidies encourage the cultivation of unneeded marginal land, overuse of scarce environmental resources, and increased releases of chemicals into the natural ecosystem.

B. Delworth Gardner (2001, 83) argues that through the high guaranteed prices of U.S. price-support programs, “Land has been cultivated at the extensive margin that would have remained in rangeland and forests, especially in the southern region and in the semiarid and arid regions of the Great Plains and Rocky Mountains.” John Hosemann (2002, 4), who retired as chief economist for the Farm Bureau in 2000 after thirty-plus years in agriculture, writes, “Aided by government farm programs, farmers clearcut and drained large tracts of forestland, particularly in the Mississippi River Delta Region but also in the mid-Atlantic states.” In the Florida Everglades, over half a million acres of swamplands have been converted to sugar fields, and the Green Scissors Campaign (2001, 26) blames sugar production for destroying three to five acres every day (Bovard 2001). In addition to encouraging draining of wetlands, subsidies divert needed water from the Everglades.

Subsidies also lead to increased use of chemical inputs. In a study of six farming states, Jonathan Tolman found that eliminating subsidies would reduce fertilizer use by 29 percent (cited in Gardner 200, 87). In the North Carolina coastal plain, Kathleen Painter and Douglas Young (1994, 456) estimated that elimination of subsidies could reduce water pollution from nitrogen leaching out of fertilizer by 46 percent. Before the controversial pesticide DDT was banned in 1972, one of its largest proponents was the federal government,

through both direct spraying programs and subsidies (Meiners and Morriss 2001).

In recent years, congressional efforts to decrease adverse environmental impacts from subsidies have focused on revamping the subsidies to give them environmental goals. Senator Tom Harkin of Iowa boasted that the 2002 farm bill contains “more support for conservation than any farm bill in history” (Allen 2002, A1). But even here, more harm than good seems to result. A discussion of two “environmental” subsidies—ethanol and the Conservation Reserve Program—will demonstrate how unintended consequences from subsidies lead good intentions awry.

### *Ethanol*

The most egregious agricultural subsidy is the one to corn growers for ethanol.<sup>6</sup> It is the most egregious because it purports to help the environment while accomplishing quite the opposite effect.

Ethanol is a substitute for gasoline. With 95 percent of its supply coming from corn (GAO 1997, 5), ethanol provides a bonanza for midwestern states such as Iowa and South Dakota. Powerful senators and Iowa’s importance along the way to presidential nominations have ensured the corn-producing states a subsidy of nearly 54 cents per gallon for ethanol (GAO 1997, 10). These subsidies are given in the form of tax credits and reductions in federal fuel excise taxes to the fuel blenders who add ethanol to gasoline. The vast majority of the money goes to one agribusiness, Archer Daniels Midland, which produces 60 percent of the nation’s ethanol and receives in excess of \$400 million per year from the federal treasury (Finegan 2000, 124). These subsidies prop up the price of corn and encourage additional production.

One might overlook this federal largesse if ethanol did what its proponents claim and cleaned the air while providing valuable energy, but it does not. David Pimentel and Marcia Pimentel (1996, 266) summarize ethanol’s environmental hazards: “Ethanol pro-



duced from corn causes environmental degradation from increased soil erosion and aquifer mining, from soil, water, and air pollution, and from increased emissions of global-warming gases.” A Department of Energy study found that burning ethanol increases releases of “toxins called aldehydes and peroxyacyl nitrates” (quoted in Libecap 2003).

In 1997, the GAO concluded that removing the ethanol subsidy would result in “little change in air quality or global environmental quality” (GAO 1997, 14). The study determined that a reduction in ethanol usage would “slightly increase carbon monoxide emissions . . . but slightly reduce emissions of ozone precursors” (6).

Similar results were found by the California Air Resources Board and the Environmental Protection Agency when those agencies conducted studies on giving California a waiver from the 1990 Clean Air Act’s ethanol requirement.<sup>7</sup> The California Air Resources Board explained that ethanol increases the evaporation rate of gasoline, which leads to pollutants that actually increase smog. Fourteen of the EPA’s eighteen most realistic models showed smog would decline if California was freed from the ethanol requirement (U.S. Environmental Protection Agency [EPA] 2001a). In addition, the EPA’s own review of the National Ambient Air Quality Standards concluded in 1996 that smog and its components pose a greater threat to humans than the one thing ethanol does reduce: carbon monoxide (EPA 1996, V49-V53; Lomborg 2001.) Quite dangerous without ventilation, carbon monoxide is relatively benign outdoors.

Perhaps the worst of ethanol’s crimes was uncovered by Cornell scientist David Pimentel (2001) who found that it requires more energy to produce ethanol than ethanol actually provides. Ethanol creates a net energy loss! The government is paying farmers to waste energy. In sum, ethanol reduces air quality, costs money, and results in a net energy loss, but we continue to subsidize it.

The ethanol support program was started with good intentions. It does reduce carbon monoxide, and the problems with evapora-

tion were not known when the country first started subsidizing ethanol in the late 1970s. But with our current knowledge, it would be best if the program went the way of the dodo.

### *The Conservation Reserve Program*

The Conservation Reserve Program (CRP) is another agricultural subsidy that both wastes resources and harms the environment. Implemented in 1985 as part of the Food Security Act, CRP pays farmers to take cropland out of production. The primary goal was to protect lands prone to erosion by setting them aside and not plowing them. Additional goals—improved water quality, better wildlife habitat, and the return of native grasses—built further support for the program from environmentalists and hunters.

CRP payments are made on a per-acre basis. In 1996, program enrollees were paid about \$50 for each acre removed from production. This was nearly twice the revenue from farming the land or leasing it to another farmer (Carey 1996, 6). Total payments that year reached \$1.8 billion and took 36 million acres out of production, an area the size of Michigan. In 2001, CRP was down to \$1.65 billion in funding, but looked to climb in 2002 to \$1.78 billion (Kelley 2001).

The problem with CRP is that it doesn't accomplish anything. Farmers appear to keep food production at the same levels after CRP as before CRP via two methods. First, uncropped land is brought into production. Second, farming intensifies on lands already in production. Consider the first point.

A University of Minnesota geographer conducted a five-year study on CRP's progress in removing land from production on the Great Plains during the early 1990s. He found that farmers received payments to remove 17 million acres from production under the program; however, total cultivated land in the region fell by only 2 million acres. The geographer concluded that "for every eroding acre a farmer idles, another farmer—or sometimes the same

one—simply plows up nearly as much additional erosion-prone land” (quoted in Carey 1996, 6).

In addition, the lands remaining in production and those added to the mix are farmed with more intensity. Additional fertilizer and pesticides are heaped upon crops to get a higher yield to make up for the land lost to CRP. As B. Delworth Gardner (2001, 85) explains:

All things being, equal, converting cropland to the CRP largely eliminated the use of chemicals on those acres. Over some range of production, however, land and capital inputs substitute for one another, so reducing land in crops . . . resulted in increased use of capital inputs, including chemicals, on acres that remained in production.

Whether the overall result is more chemical use or less chemical use is hard to say, but it is clear that the concentration of chemicals increases, which is probably the greater threat to human and animal health. In either case, CRP has proven ineffective at making environmental strides forward and may be impeding them because it is a subsidy that keeps eco-entrepreneurs out of the game.

## DO SUBSIDIES LOWER FOOD PRICES?

It is a fair question to ask whether the evolution that is creating the ecological agrarian would still occur—or happen as quickly—without subsidies. If subsidies lower the cost to farmers or increase their revenue, don't they lower the prices charged to consumers? In simple terms, are subsidies responsible for the lower prices (in terms of time worked) shown earlier in Figure 2?

In the short run, a removal of subsidies would cause producers to produce less, and prices would rise. But, over the longer term, there are several reasons to think prices would return to low levels rather rapidly.

While the bread in Figure 2 might be more expensive without

the subsidies, the average consumer would have more money in his or her pocket with which to buy it. In the year 2000, taxpayers footed a \$20 billion bill for direct payments to farmers, which was an all-time high (GAO 2001, 1). That's \$80 for every man, woman, and child in the country. Whether prices would rise by more than that (or even rise at all in the long run) without subsidies is dependent on a number of factors, including those discussed below.

First, agricultural subsidies are based on previous years' production. They go to those who are already in the farming game, providing them with a barrier to entry against new farmers or ranchers, who might be able to do the job better. By keeping less efficient producers in the game, the subsidies keep the price of food at artificial highs. As better farmers entered, prices would fall.

Second, subsidies in the United States are often implemented in the form of price floors. If the price for a product gets too low, the government buys the extra output to keep the price high. By definition, these particular subsidies do not lower prices.

Finally, agricultural subsidies are a major obstacle to reducing trade barriers. With the passage of the 2002 farm bill,<sup>8</sup> trading partners from around the world questioned the prospects for future trade negotiations with the United States. One *New York Times* article reported that "agriculture has leaped from the backwaters of diplomacy to near the top of the list of international complaints against the United States" (Becker 2002, A3). If U.S. subsidies lead other countries to close their doors to many products, they will not only increase food prices in the United States, they will increase prices on countless other goods to the detriment of consumers.

Agricultural subsidies also retard the ability of eco-entrepreneurs to work within agriculture. As mentioned earlier, Becky Weed sells predator-friendly wool. In return for a guarantee to her customers that no lethal means will be used to protect her sheep from wolves, mountain lions, coyotes, bears, or other predators of the Rocky Mountains, Weed can sell her wool for two times the

price of regular wool (Grewell and Landry 2003). She is a classic example of the rising crop of ecological agrarians. But her efforts face a 300-pound gorilla in the U.S. Department of Agriculture's Wildlife Services program. Despite its name, Wildlife Services spends \$10 million each year to rid the West of coyotes, bears, mountain lions, bobcats, and other predators that get in the way of agriculture (Grewell 2002, 109–11).

Americans consume 5.6 billion gallons of beer per year (Beer Institute 2001). Besides a tremendous amount of water, the beer brewing process employs hundreds of millions of tons of grain each year. While much of the grain is used up in the process, about 4.5 million tons of spent grains remained as a waste product in the year 2000. Crafty eco-entrepreneurs saw an opportunity for agriculture to get involved in cleaning up this nasty mess. The spent grains are perfect feed for beef and dairy cattle. Anheuser-Busch alone sold 1.76 million tons of spent grains to dairy farmers in 1999. This ingenious burst of recycling not only generated revenues for the company but it saved them \$1 million in landfill fees (EPA 2001b).

Deals like these are feeling pressure from a subsidy juggernaut. As ethanol plants go into production across the country from the subsidies discussed above, the spent grain market risks a flood of new waste product looking for a home. Whether or not the nation's cattle can find a place for all of the extra waste (even with their four stomachs) is a question that has environmental managers at the breweries nervous. If the cows can't cut it, another effort at eco-entrepreneurship may fall prey to an agricultural subsidy.

As a more general threat, subsidies act as barriers to entry. While many eco-entrepreneurs have been in agriculture for a long time, a number of the new wave ecological agrarians are newcomers to agriculture. Most agricultural subsidies are based on production numbers from the previous year, so they create an uneven playing field biased to the big players (who have big pro-

duction numbers) and those already in the game. Subsidies can even push out small operations already receiving subsidies of their own. This is a threat because most eco-entrepreneurial efforts start small.

The *New York Times* reports that large corporate farms frequently use agricultural subsidies as capital for buying out smaller neighboring farms (Becker 2001). One of the critiques of the 2002 farm bill offered by the group Environmental Defense was that it would give large farmers “unprecedented funds to swallow up their smaller neighbors” (quoted in Allen 2002, A1). The General Accounting Office (2001) reports that younger people wishing to start their own small farms are discouraged by high prices for farmland due to subsidies. These concerns extend beyond young people to anyone interested in farming on a smaller scale.

The irony of these barriers to small-time farming is that the goal most offered by legislators for providing subsidies is to save the small “family farm” (Hosemann 2003, GAO 2001). The “family farm” myth is a convenient form of sheep’s clothing to cover up the large farms wolfing up the subsidies. Nor do those espousing the political rhetoric of subsidies to “save the small farmer” seem to give a hoot about small farmers in other countries, who will be put out of business by their efforts and with far more dire consequences (Vieth 2002; Thurow and Kilman 2002).

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### INSTITUTIONS FOR ECO-AGRARIAN SUCCESS

The first step in getting the institutions right for eco-entrepreneurs is to eliminate poor institutions already in place. Removing agricultural subsidies should be a priority.

Another lesson for fostering the growth of ecological agrarians can be drawn from the failings of the estate tax. Institutions that fail to respect private property cause unintended consequences. The estate tax forces property holders to break up their property.

This has had the detrimental environmental result of dividing up large, contiguous tracts of habitat. As most ecological agrarians are small business holders, the estate tax can do extensive harm to their operations.

Secure property rights reinforce the environmental axiom, “think globally, act locally,” by giving local land holders the power to make decisions and local consumers the ability to influence those decisions with their pocketbooks. Local decision makers make the best decisions because they have knowledge of the local area and eschew one-size-fits-all solutions. They are the most accountable, because they live nearest the area that will be affected by their decisions, so they bear the costs (and reap the benefits) of their decisions. Local decision-making by its nature sets up millions of different experiments as every locality tweaks solutions to fit local problems. With more experiments, the probability rises that creative and innovative solutions will develop and be adopted by others.

No decision maker is more local than the private property owner. Becky Weed is the one best suited to deciding whether to manage her wool business by catering to premium-paying environmentalists or by lowering her costs from predation. Allowing her the freedom to decide opens the door to creative solutions.

Building on the notion that local property owners have the best information about their land, we would be wise to use the carrot of the marketplace to encourage efforts seen as desirable instead of the stick of government regulation whenever possible. Paying a premium to businesses that do things we like provides an incentive for the business enterprise to share its information. It pays the Milesnicks and Ron Bowen to advertise the good stewardship work they engage in, because they can get paid for it by customers who like what they do.

On the other hand, laws that regulate how the Milesnicks should maintain their quality fish habitat create an incentive to avoid those costly regulations by clamming up about the conditions on their

property. It might even encourage them to destroy the fish habitat before someone discovers and reports it to a government regulator. While this may sound absurd, the regulation of wetlands under §404 of the Clean Water Act creates these very incentives for landowners.

Policies that protect and encourage voluntary efforts will help the ecological agrarians take charge. Voluntary green labeling and building of green brand names are revolutionizing the way many agriculturalists operate. These efforts rely upon reputation. Consumers have to trust that the brand or the label does what it says it does. If the brand name claims that no predators were killed in the raising of the wool, the consumer needs to believe that is true. Government has a useful role here in upholding reputations; both common law and statutory law make fraudulent claims subject to legal suit. It could also be argued, however, that the sheer importance of reputation in receiving a premium provides enough incentive not to cheat. One magazine article exposing a fraud may eliminate the value of the fraudulent label or brand for good.

Government policy should avoid making mandatory those efforts that arose from voluntary pursuits. For instance, discussions about mandatory labeling of genetically modified or “biotech” foods. While there is little reason to believe that biotech foods are less safe than other foods, some consumers worry about ingesting such foods.<sup>9</sup> Their concern, plus lobbying by interest groups such as Greenpeace, have led Congress to consider requiring labels for foods containing genetically-modified organisms (GMOs).<sup>10</sup> But mandatory labeling would kill much of the growing movement by voluntary labelers.

“Organic” foods and foods labeled GMO-free sell exceptionally well to a portion of the overall food market. More than \$5 billion is spent every year on organic foods (Gardner 2001, 81). GMO-free labelers incur extra costs by not using GMOs; to make up for the higher costs, GMO-free entrepreneurs charge a higher price, which concerned consumers are willing to pay.



As Grewell and Landry (2003) explain, “Mandatory labels can eliminate the niche that the agrarian was marketing in because everyone is now forced to meet the standards of that niche.” With mandatory labeling, the ecological agrarian’s product is no longer unique. Consumers who purchased the voluntarily-labeled product to ensure that their food was GMO-free will find labels on virtually any product, since every producer has to label its food. The voluntary labeler will lose the market he or she worked so hard to create. This will also discourage future efforts by eco-entrepreneurs to develop environment-oriented products, because they will see a significant likelihood that their investments will be lost as the government steals their idea and makes it mandatory.

In addition, the consumers who didn’t care about the issue beforehand are now forced to pay extra to cover the labeling costs. U.S. officials have argued that mandatory GMO-labeling would cost companies \$4 billion a year (Elias 2002). Much of those costs would be passed on to consumers.

Furthermore, the concerns of today may not be the concerns of tomorrow. While GMOs may worry folks today, tomorrow the bigger worry could be the increased habitat loss caused by a rejection of GMOs. Governments are much slower to respond to these changes than the market’s voluntary mechanisms. Mandatory labels will lock in yesterday’s preferences for a long time.

The catchword for all of the institutional arrangements recommended above is flexibility. The world is dynamic, ever-changing. To accommodate those changes, institutions are needed that allow for quick responses. Government policies should establish basic rules that aid on-the-ground decision makers in determining consequences from their actions without getting into specifics. As Richard Epstein (1995, xiii) writes in his work *Simple Rules for a Complex World*, “The government works best when it establishes the rules of the road, not when it seeks to determine the composition of the traffic.”

As such, a good agricultural policy for eco-entrepreneurs and their future will:

- | Eliminate agricultural subsidies.
- | Encourage institutions that recognize private property rights, replacing institutions that do not respect private property.
- | Rely on the carrot over the stick whenever possible.
- | Encourage institutions that foster voluntary efforts.

Innovate institutions; don't institutionalize innovations.

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## CONCLUSION

We should welcome the metamorphosis that agriculture is undergoing. Many problems face us, both real and perceived, from water pollution and runoff, increased chemicals in the system, and growing fragmentation of habitat; but there always have been and always will be problems. We should be happy that the ones we face today are not as dire as those of the past. For our ancestors, survival was an immediate concern; not so anymore.

The institutional framework we live in is as important today as it was in revolutionizing eighteenth- and nineteenth-century England. With the proper institutions, the wave of changes sweeping over agriculture will go forward, led by innovative entrepreneurs meeting the needs of a new day. With poor institutions, progress could be slow and opportunities squandered.

As the lyrics opening this paper noted, sure, there are some hard times in the neighborhood, but why can't every day be just this good? We should feel fortunate that it is more than a great day to be alive; it is the greatest day there has ever been.

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## NOTES

1. Diamond (1999, 104–13) offers more insights on how this transition took place.

2. Stories for all of these ecological agrarians can be found in Grewell and Landry (2003). For stories of eco-entrepreneurs outside agriculture, see Anderson and Leal (1997).

3. Brenner claims the French peasants had more complete freedom and stronger property rights. According to Brenner, the property rights were stronger because it was difficult to transfer them. This made it difficult for capitalism to take hold in France. In contrast, most economists would argue that true property rights include the ability to transfer property as well (see Barzel 1997). Much of the value is reduced to the landowner if there is no option to sell.

Another fault in Brenner's analysis comes from the fact that the lords and government of France imposed excessive taxes on the peasantry. This lowered the personal freedom of the French peasant (in contrast to Brenner's argument) by tying his or her hands in what decisions could be made. The high taxes and the lack of transfer make it fair to argue that England's institutions of property and freedom were actually the *more complete* of the two countries. Finally, legal scholars would argue that England's decision to honor and enforce contracts led to the industrial revolution as much as if not more than the move to the city by agrarians who sold their pieces of land to capitalists.

4. The Endangered Species Act, which creates an institutional structure that discourages ecological agrarians, is discussed at length in Grewell and Landry (2003) and (Stroup 1995).

5. In the most bizarre of incentives created by this temporary phase-out, one could imagine unscrupulous children keeping aged parents on life support until 2010 and pulling the plug that year to avoid the consequences in the following one.

6. See Libecap (2003) for a discussion of the politics behind ethanol.

7. The 1990 Clean Air Act does not require California to use ethanol, but it does require smog non-attainment areas like those found in California to add an oxygenate to gasoline. Until 1999, there were two realistic oxygenate options: MTBE and ethanol. When it was discovered that MTBE could contaminate groundwater sources, ethanol was left as the only viable alternative.

8. The bill was enacted as the Farm Security and Rural Investment Act of 2002 on May 13, 2002, Public Law #107-171.

9. Biotech foods may, in fact, be safer than other food items due to the extensive testing around them. See chapter 6 by Gregory Conko in Grewell and Landry (2003).

10. Some congressional leaders support similar action, but both the Clinton and Bush administrations have opposed mandatory labeling (Lee 2002).

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