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## THE AGRICULTURAL ETHICS OF BIOFUELS: A FIRST LOOK

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**ABSTRACT.** A noticeable push toward using agricultural crops for ethanol production and for undertaking research to expand the range of possible biofuels began to dominate discussions of agricultural science and policy in the United States around 2005. This paper proposes two complementary philosophical approaches to examining the philosophical questions that should be posed in connection with this turn of events. One stresses a critique of underlying epistemological commitments in the scientific models being developed to determine the feasibility of various biofuels proposals. The second begins with a broader set of questions about the philosophical goals of agriculture, then queries the place that a turn to biofuels might have within the philosophy of agriculture. Both are portrayed as viable and important. The paper itself is a preliminary stage-setting reflection on the need for these two types of philosophical inquiry.

**KEY WORDS:** energy, bioenergy, ethanol, agrarianism, philosophy of technology

What can philosophy contribute to the push toward biofuels? This paper will provide a provisional answer to this question by first arguing for a broad way of framing the discussion and then identifying two angles of approach to biofuels that highlight assumptions, questions, or value judgments that are inherently philosophical in nature. The first way hones in on epistemological assumptions and methodological issues implicit in the emerging literature on how and whether renewable resources should contribute to the supply of combustible fuels. The second line of thought probes the way that a push toward biofuels fits into broader questions in the philosophy of agriculture. My question is not intended to be rhetorical. I am truly interested in the *contribution* that philosophy and philosophers might make to the various scientific, industrial, and political efforts now underway in connection with biofuels.

The answer offered herein is only a “first look” in that I make absolutely no pretensions toward either completeness or finality. There are undoubtedly a number of other ways to approach biofuels philosophically, and nothing discussed below is covered in sufficient depth, in any case. I am furthermore early enough in my own thinking that I am far from clear in my

own mind what to think. The original manuscript for this paper elicited seven anonymous reviews, all returned within 60 days of my original submission to *JAgEE*. While all were thoughtful and have been extremely helpful in making revisions and improvements to the paper, the comments ranged over an extraordinarily broad array of issues and concerns, and expressed a number of apparently incompatible perspectives on biofuels, on philosophy's possible contributions to understanding and debating biofuels, and, indeed, on the usefulness of the remarks that follow. It would have been impossible to respond to all of these reviewers without producing a highly convoluted (and probably self-contradictory) argument, so perhaps some of them will be moved to turn their thoughtful reactions into commentary articles that can be shared with the world at large. This suggests that the greatest value in this preliminary evaluation may lie in presenting a target for others to aim at in mounting subsequent critical and clarificatory arguments. There will, one suspects, be some philosophical debate over the agricultural ethics of biofuels, and this preliminary statement may be most useful as a document that is criticized by subsequent authors. It is thus with genuine humility that I proceed.

## 1. BIOFUELS: SOME "DEFINITIONS" AND FRAMING JUDGMENTS

A cluster of terms including "biofuels," "bio-economy," "grain-ethanol," "cellulosic ethanol," and "bio-diesel" have begun to appear widely in American newspapers, the farm press and in political discourse. They are occasionally linked to very broadly described enabling technologies including biotechnology, genetic engineering, and nanotechnology, as well as to large-scale production methods for current crops such as maize or sugar cane and possible future crops such as sawgrass. There is also a less well-publicized discourse of biofuels that stresses small-scale production or capture of fuels derived from methane or vegetable oils. People who think that they understand what the term "biofuels" means based on a technical or scientific vocabulary have almost certainly made a number of simplifying assumptions or contextual specifications that narrows this range to a considerable degree. But the vagueness and ambiguity of the terminology will almost certainly play an extremely important role in the way that our current push toward biofuels matures and develops. As such, instead of definitions in the usual sense, what I will offer is a brief and impressionistic narrative that is intended to set the context for the philosophical remarks that follow.

What I am here calling “the push toward biofuels” is primarily a North American phenomenon, despite the fact that the possibilities for biofuel development are global in scope. And of course it is Brazil that has had the greatest success in making biofuels into a real source of energy (though the sustainability of their approach is debatable). There are other “pushes toward biofuels” elsewhere, but for the purposes of this paper, the focus is on American culture and politics. Two of the anonymous reviews objected to this stipulation, despite the fact that it was strongly qualified even in the original manuscript. These objections are well made, for most of the philosophical points argued in sketching two alternative ways of addressing biofuels are hardly unique to the North American situation. Yet the qualification is necessary if only because this preliminary study has not undertaken any serious attempt to examine the technical and political debates over biofuels beyond the United States and Canada. There is also a more substantive point to be made in connection with my reliance on “brief and impressionistic narrative” as opposed to technically explicit definitions. My aim is to build a prudential and ethical argument against the standard scientific practice of offering stipulative definitions, and to substitute a form of context setting narrative as an alternative way to frame subsequent discussions. The argument is prudential in holding that stipulative technical definition giving will prove to be self-defeating when it comes to democratic or deliberative debates over biofuels. It is normative in holding the decision about whether our society commits to biofuels *should* be a democratic one. But here the word “our” betrays the notion of a particular political community and a particular history.

The narrative begins by noting the recent and suddenly renewed interest in both the utilization of existing means to convert agriculturally produced biomass into transportation fuels, and in research intended to develop new means of doing so for the future. Ethanol fuels have been around for a long time, but there is a new commitment of capital for building infrastructure to support conversion of maize into ethanol, as well as a significant amount of interest in both public and private sector research to develop new technologies. These new technologies are imagined on the one hand to improve efficiencies in ethanol conversion from existing crops, especially maize, and on the other to create breakthroughs that will allow utilization of totally new forms of biomass for fuel production. There is, furthermore, a clear willingness on the part of state and Federal authorities to facilitate these developments, though the exact nature of this facilitation is not entirely clear at this time. On June 27, 2007, the United States Department of Energy (DOE) announced a \$350 million dollar award to establish centers for biofuels research at three American land-grant universities, my own among them. Provisions for the support of biofuels that may be enacted in the next

round of farm support legislation (expected in the fall of 2007) are unknown as of this writing.

It is important to recognize that neither the idea nor the material technology of biofuels are new. Henry Ford tested biofuels in the 1930s, and I personally remember fueling my 64 *Fairlane 500* with 10% ethanol for something in the neighborhood of 19cents per gallon. There is, thus, what one might call a “trajectory” associated with biofuels that begins about 80 years ago and that has enjoyed alternating periods of enthusiasm and quiescence ever since. Prior to the current period, corn-ethanol was a hot topic during the late 1970s and early 1980s when oil embargos and a farm debt crisis conspired to make Midwestern farmers willing to try anything. The trajectory achieved a somewhat stable profile approximately 25 years ago after a round of energy balance studies in which Bill A. Stout was a frequent participant. His studies showed, at best, marginal gains and quite probably a net energy loss associated with any expansion of corn-based ethanol production (Ofoli and Stout, 1981; Stout, 1983; Green et al. 1983). Thus, biofuels were on a mildly ascendant trajectory for approximately 50 years during the middle of the 20th century, but that trajectory leveled off rather dramatically during the last quarter, even after oil prices experienced a sharp rise in the 1970s.

The meaning of the term “trajectory” here can be reasonably inferred from common usage, but it is adapted from Don Ihde’s philosophy of technology. Ihde uses the term to emphasize the way that important philosophical questions about technology cannot be framed when one is too narrowly focused on a specific set of tools and techniques. Instead, we tend to imagine both a past and a future for our technologies. We see them emerging out of certain past practices that establish a background set of values and assumptions, and we see them as including a number of developments and adjustments that are built upon present capabilities, but that may in fact involve solutions to scientific, engineering, or political problems that are not available at the present time, (Ihde, 1990, 1998).

Arguments over technology may actually be better understood as arguments over trajectory. The molecular biologists who developed recombinant methods for plant transformation certainly saw it as having a very different past and a very different future than did the activists who opposed it, (Stone, 2002), for example. The biofuels trajectory enters a new stage in conjunction with events that barely need mentioning. Two decade’s worth of technical advances have led some to revisit the energy balance question, and some studies are far more optimistic than Stout’s. A few articles documenting this new thinking are referenced in the succeeding section. This new scientific literature provides a plausible basis for investments such as that of the DOE, cited above, but it is at least

arguable that a number of other factors have played a more significant role in the suddenness with which biofuels have burst upon agriculture's ethical horizon.

First, global climate change has created an environmental argument for producing fuels from carbon-neutral sources that did not exist a generation ago. While burning of fossil fuels releases stored carbon into the atmosphere, it is argued that fuels derived from biomass "cycle" carbon back into (temporary) storage in the form of plant matter. The type of epistemological study described in the following suggestion might well include a careful analysis of this argument from the perspective of environmental ethics. On a less technical level, September 11 created a political environment in which achieving energy independence is the patriotic thing to do. President George W. Bush and his Secretary of Agriculture Mike Johanns are especially associated with this element of the push for biofuels. Finally, another spike in US gasoline prices has made even existing technical efficiencies in corn-ethanol production economically attractive. This is, on the one hand, a matter of economics: when automobile fuels reach a given price, it becomes financially attractive for people to build and operate plants that will convert biomass into ethanol. The "given price" is a moving target, of course, because it depends upon the price of corn or alternative biomass, which in turn reflects the price of fuel (along with other things such as subsidy payments), but it is reasonable to surmise that the given price was reached in North America sometime in 2005 or 2006. On the other hand, there is a fair bit of politics and popular culture in the mix, as well, since enthusiasm for building these plants is affected by state and federal planning or regulatory boards, as well as by general expectations. The fact that Detroit is better situated to produce engines that burn 85% ethanol than foreign competitors may have made biofuels especially popular in rust belt states that are tied to the US auto industry.

However, what may be most important for the trajectory of biofuels is that at least some in the scientific and environmental communities are convinced that commitments over the short-run are critical to achieving an energy sector that is more consistent with broad goals of ecological integrity and sustainability. This rationale is certainly evident in popular discourse, but muted. The carbon-balance theme noted above is an important component in this element of the rationale for biofuels, but so is a more long-standing appreciation of the idea that sustainability involves greater reliance on solar and renewable resources as opposed to the mining of finite mineral resources. Further, there is also an implicit faith in the idea that technical problems eventually yield to scientific discovery, if only sufficient resources are devoted to them. The vague-and-still-yet-to-be-determined-future-made-possible-by-science-investments-today provides an important philosophical

reason to view biofuels not as a specific technology, but as a technological trajectory that has elements of *multi-stability*.

Ihde introduced the idea of multi-stability into the philosophy of technology in *Technology and the Lifeworld* (Ihde, 1990). The idea is that, like a Necker cube illusion, which can be interpretatively seen with either the top right or bottom left corner as the frontmost surface, the path that a technology will take both in its development in the way that it suggests interpretive possibilities for economic and political application is neither wholly flexible, nor wholly determined. Andrew Feenberg stresses the need to grasp the multi-stability of possible trajectories for technology as the prerequisite for democratic steering of technological developments, (Feenberg, 2002). It is only when one has grasped both the way in which a technology does indeed commit humanity to a given future, and also the way in which that future is open to a limited number of possible manifestations that one can truly grapple with technologically significant decisions in a democratic manner. Biofuels could take on different meanings in the present, and could determine different paths in the future depending on a large number of contingent factors. But the pliability is not infinite, and the selection of contingent factors either by chance or by design is accompanied by elements of path dependence that will significantly limit the choices that can be made in the future.

This characterization of biofuels anticipates my account of how philosophy might play a role in the development of research, public policy, or political debate. Unless I have just totally misread the situation, there are a number of junctures at which assumptions, felt needs, and strategic thinking will affect the trajectory of biofuels in much the same manner as a subtle jolt, a pulsating magnetic field, or a glancing blow might affect the trajectory of a pinball arcing toward the super bonus bumper. And in philosophy, assumptions, felt needs, and strategic thinking ‘R us. As already indicated, I will sketch two types of philosophical inquiry that could contribute to democratic, deliberative discussions on biofuels and the future of society. Before doing so, it is important to consolidate an argument that has thus far left a number of points implicit.

While it may indeed be useful to stipulate technically precise terminology for biofuels and the bioeconomy within the context of science (where participants undergo years of training in giving and adhering to stipulative definitions), expecting the broader public to firmly dissociate factors such as the energy potential of biomass and President George W. Bush’s rhetoric of energy independence as a response to the threat of Al Qaeda terrorists is naïve. We (that is, those of us in North America, at least) can anticipate that some people will be “for” or “against” biofuels in virtue of their feelings about Bush. Furthermore, a significant move toward biofuels could have

(indeed is intended to have) profound impact on land use, environmental quality, and a host of other factors indirectly related to agriculture, natural resources, and rural areas. As such, the biofuels question is an inherently political question that should be debated widely and decided democratically.

Rather than presuming that biofuels can be specified narrowly under technical definitions, it is better to recognize that biofuels represent a technological trajectory. The past, present, and future of this trajectory are multistable elements. Someone who sees biofuels *originating* with the September 11 attacks will interpret them quite differently from someone who sees them starting with chemurgy in the 1930s, (see Finlay, 2003 for the latter view). Part of the debate over biofuels will therefore be an *interpretive* debate. Scientists who work on biofuels should recognize that they do not occupy a high ground in this debate that allows them to presume that their own visions of the past and future will hold sway. They must *establish* a given interpretive framework, as must we all. Given this starting point, what roles should philosophers play in stabilizing the trajectory of biofuels?

## 2. THE EPISTEMOLOGICAL AND METHODOLOGICAL QUESTIONS

As noted, there is already a robust debate emerging about the likely benefits and burdens that will follow from the biofuels trajectory as it is currently envisioned. The core of this controversy concerns the new round of energy balance calculations. A plethora of scientific articles have been published in the last 5 years attempting to articulate the net effect of biomass conversion for transportation fuels (see, for example, Pacela and Scolow, 2004; Pimentel and Patzek, 2005; Kim and Dale, 2005; Samson et al., 2005; Farrell et al., 2006; Tilman et al., 2006). There are seemingly dozens of articles related to what may be about a half dozen distinct scientific studies, and 37 activist websites that have been put up in response to each article. There is, thus, no shortage of debate about the economic and ecological impacts of several key biofuels strategies. Someone with a modicum of training in the philosophy of science plus some familiarity with the science itself could wade through these studies and elucidate exactly how the models differ in their assumptions and methodology. Clearly these studies differ in terms of both the types of impact that they have considered as well as in their assumptions about how technology will perform. A clear compare-and-contrast philosophical study of differing assumptions and methodologies would certainly make it possible to have a more rationally informed technical debate. It is also possible that philosophers and historians of science can weigh in on questions of relevance and timeliness of various studies. Thus if one or more



of these studies is utilizing outdated models or data (as one of my anonymous referees suggests) that is the kind of thing that a careful evaluation of epistemological assumptions can reveal.

But of course, the energy balance piece of this debate is only the beginning. There are a host of economic and environmental impacts that would be associated with any significant diversion of the annual maize harvest. How will an expansion of the capacity to process corn into ethanol affect animal production? Answers to this question also take a technical turn very rapidly, as some will assert that residues from biomass conversions typically referred to as “distillers grains,” are very good substitutes for the whole grains that have been used for livestock feed, while others will assert that the ability to utilize distillers grains in livestock feeds are sharply limited. This is, again, not the sort of debate into which philosophers can easily insert themselves, though again there are questions about assumptions and methods that a patient and assiduous epistemologist might actually help us answer.

And then there are the broader environmental questions. How will the incentive to plant more and more corn impact the conservation reserve? And how will this in turn affect soil erosion or dead zones in the Gulf of Mexico? Here we mostly have questions only (Ogg, 2007), but we can anticipate models producing conflicting results very soon. Beyond these environmental questions, there are relatively straightforward economic questions about how corn prices will be affected. These questions are only relatively straightforward because econometric models to predict prices require assumptions about things like import substitution for substitutions or the long-term price of oil, (Ferris and Joshi, 2007). Though the economic projections that I have read do not give great cause for alarm, one should not dismiss the possibility that hungry people will be forced into a bidding war for grain with American SUVs. So even when we finish with the hot and heavy energy balance debate, there are still plenty of issues to keep our applied epistemologist busy for several lifetimes. All of these are entirely legitimate and potentially important questions of a classically philosophical nature.

Yet, while I would certainly not discourage anyone from launching into these questions, and may find myself writing a grant to study them any day now, the sheer complexity of these issues brings to mind a thesis argued by Dan Sarewitz in a paper called “How Science Makes Environmental Controversies Worse.” Before taking readers through a very instructive account of how differing epistemological orientations and value judgments have exacerbated controversies ranging from climate change to spotted owls to GM crops, Sarewitz asks us to imagine what would have happened had we decided to use science to resolve the question of whether George Bush or Al



Gore deserved the State of Florida's Electoral College votes in the 2000 Presidential election. "On its face, it is hard to imagine a problem more suited to a strictly technical approach," he writes. "The correct answer is known to be an integer, and it is derived through the simplest possible arithmetic process," (Sarewitz, 2004, p. 387).

Yet Sarewitz needs only to propose a few thought experiments to demonstrate how ridiculous this proposition actually is. He imagines a statistics group to determine the reliability of voting machines, and a neuroscience group to study the relationship between perception and ballot design.

Fundamental research could address such questions as chad behavior under different states of compressive stress (material science), the relation between the physical strength of the voter and chad behavior (physiology), the variable behavior of vote-punch machines (mechanical engineering), and the causes of overvotes (psychology).

The first result of these analyses would likely be reports with technical-sounding titles such as "Florida's Residual Votes, Voting Technology, and the 2000 Election," or "Elections: Statistical Analysis of Factors that Affected Uncounted Votes in the 2000 Presidential Election," or "The Butterfly Did It: The Aberrant Vote for Buchanan in Palm. Beach County, Florida" (Sarewitz, 2004, p. 387).

Soon this search for an integer will have devolved into the same kind of methodological disputes that I have cataloged in connection with biofuels. It is with this in mind that Sarewitz concludes with the advice that sometimes a political mechanism for making a decision may be much better than science, (Sarewitz, 2004).

Sarewitz offers a perspective that may be combined with several comments from my anonymous referees to draw several preliminary conclusions about the nature of epistemology's contribution to the biofuels debate. First, although someone trained in epistemology and the philosophy of science might well undertake the kind of inquiry described above, philosophers are not uniquely qualified to undertake it. Scientists (including social scientists) are themselves entirely capable of carrying on this debate without philosophers. The robust and fast-moving discourse that has already emerged is evidence in support of this point, though one might add (in the spirit of Sarewitz) that the debate moves *so* fast that careful analysis of underlying assumptions will almost certainly be out of date by the time it appears in print. Indeed, one anonymous reviewer suggests that philosophers have already done the work I describe in this section (though unhelpfully no cites were provided) and that *I* am out of date. My search of scholarly data bases on July 20, 2007 revealed no entries *by* philosophers holding academic appointments on the epistemological and methodological issues discussed

above. An admittedly less thorough search of the World Wide Web turned up many sites advertising an evaluation of biofuels in light of “eco-friendly philosophy” and similar references to philosophy, but nothing that resembles the kind of epistemic/philosophy of science type review discussed above. It would not surprise me if such studies were to appear in the interval required for final preparation and typesetting of this manuscript.

Second, skepticism, irony, and even sarcasm would appear to be warranted about the significance that such work will have, when it does arrive. This is, in part, simply an observation based on hard experience. Jeffrey Burkhardt (1988, 2001), Gary Comstock (1989, 2000), and I (Thompson, 1987, 2003) undertook serious phil-science studies of agricultural biotechnology over a 20-year period, but this work is little noted by molecular biologists or by policy analysts who have studied the GMO debate. And of course the idea that our work has had any impact on public opinion is simply ludicrous. Our articles and books are more like the contributions to the election science literature that Sarewitz conjures to make his point, (titles that are, in fact, actual published articles). Indeed, the one anonymous reviewer who self-identified as a biofuels scientist described the philosophical points noted in the original manuscript as “esoteric” (though in fairness the review went on to make a number of very useful suggestions). In sum, although epistemology is one avenue of approach for philosophy to engage the biofuels debate, I am personally not sanguine about the uniqueness or relevance that such analysis will have to broader political debates.

### 3. THE PHILOSOPHY OF AGRICULTURE

The second line of questioning into the trajectory of biofuels is more overtly political, at least in a philosophical sense. It starts not with biofuels and the concerns that are driving us toward them, but with the general question, “What do we want from agriculture?” There are almost as many hidden questions that can derail *this* inquiry as Sarewitz imagines for his fanciful research program to decide the 2000 election. What counts as agriculture? Does it include forestry and fishing? Should we distinguish wants and needs? And most critically, who are “we” anyway? My philosophical training inclines me to take these questions seriously, but my immediate desire is to press ahead toward a set of questions that will have some obvious relevance to biofuels. And so, I cut to the chase.

I have previously argued that those of us in the United States at least can think of the philosophy of agriculture in terms of two broad options. On the one hand there is *industrial agriculture*, which philosophically looks at farming as an industry, that is, as just another sector of the nation’s econ-

omy. Each sector of the economy is expected to bring forth its fundamental commodities in as efficient a manner as possible, subject to the constraint that it has internalized all relevant costs. There is thus a philosophical program that must support industrial agriculture, as we must understand external costs in the form of pollution, animal welfare, displacement of wild ecosystems, justice to farm workers, and the like, and we must understand efficiency not only in terms of production economics, but also in light of consumer preferences. None of these are simple and there is serious philosophical work that needs to supplement the considerable economic research that is already going on to understand them. On the other hand, there is what many call “sustainable agriculture,” but what I believe can be more accurately described as *agrarianism* (see Thompson, 2000; 2001).

Now it goes without saying that agriculture’s social role will involve the production of food and fiber, but agrarianism sees agriculture as also playing a key role forming the moral character not only of individuals, but also of society as a whole. The types of character appropriate to a nation or community vary from one time and place to another, so there are long stories that have to be told about what any given society can and should expect from its farms and ranches. Thomas Jefferson thought that farming would cultivate citizenship, mainly because he thought that fixing wealth in land ownership aligned personal economic interests more consistently with those of the nation. Ralph Waldo Emerson believed that farming would promote integrity and self-reliance, virtues that would heal the alienation he already associated with urbanization in the mid 19th century (Thompson, 1998). To hold fast to agrarian ideals that may have been appropriate once but are no longer is appropriately called “agrarian fundamentalism,” (Davis, 1935). I do not believe that either Jeffersonian or Emersonian agrarianism is appropriate for our time, and this is not the time or place for me to attempt even a summary of how I think that agrarian themes need to be rehabilitated.

There are, nonetheless, a number of themes that can be lumped under the agrarian banner. One is that a readily surveyed nexus of food and farm has the capacity to reproduce environmental values throughout the population whenever they eat or purchase food. A second is that diversified family farms are associated with healthy rural communities, and that healthy rural communities are part of the storyline that has framed our national political dialog since the days of European settlement, at least. A third is that tighter connections between agricultural producers and food consumers will strengthen sense of place values that are a critical component of social capital and environmental protection, alike. A fourth is that farmers who live on their land are more likely to practice humane and environmentally benign farming. These are bland assertions that must

simply be taken at face value in the present context. I offer them not as true, but as characterizations of an agrarian philosophy. They would lend support to a number of social movements commonly linked under the banner of sustainability, including farmers' markets, community supported agriculture, "buying local," and possibly organic farming and fair trade.

Kathryn Brasier (2002) has argued that something like this division between industrial and agrarian ideologies can be traced through the rhetoric of farm groups as they lobbied Congress prior to the 1996 Farm Bill. She develops a methodology to demonstrate how advocates of the industrial point of view were, in fact, more inclined toward strategic manipulation of discourse than were advocates of agrarian views, but that is neither here nor there in the present context. Matthew Mariola (2005) bemoans the decline of agrarian ideals in the professional discourse on farmland preservation, arguing that an "economic utilitarianism," more characteristic of what I associate with an industrial philosophy of agriculture is the preferred language of conservation advocates. My own view is that within a proper dialectical discourse, both of these philosophies – both modes of discourse – can bring insight into our understanding of what we want from agriculture. When they are brought together in a classically dialogical fashion they produce a more complete philosophy of agriculture than either one does on its own. Mark Sagoff quotes F. Scott Fitzgerald ("The test of a first-rate intelligence is the ability to hold two opposed ideas in mind at the same time, and still retain the ability to function,") in arguing that maintaining this kind of dialectical tension is the fundamental challenge for environmental philosophy in the 21st century (Sagoff, 2007).

The question is this: Do biofuels weigh in so heavily on the industrial side that they disable the healthy dialectic that has been emerging in the wake of these social movements? I do not have an answer here. It seems on the face of it that if we are to regard our land mass as an industrial base, then putting it to its most valued use might well include using it to produce fuel. There are many subsequent questions to be answered about possible externalities, and the epistemological orientation discussed above shows exactly how philosophy might play a handmaiden's role in addressing those questions. If externalities can indeed be internalized, then we should indeed be open to the possibility of using our land to produce biofuels. But what are the agrarian implications of a shift to biofuels? At the very least they seem disconnected if not antithetical to a vision of agrarian philosophy that stresses a strong food-farmer-eater nexus. Perhaps we can feel connected to the land when we fuel up our vehicles. As ridiculous as that sounds today, it should not be discounted entirely.

One of my anonymous reviewers argues that producing fuels would indeed contribute to a person's sense of sustainability and ecological integrity.

This seems plausible in reference to farmers, but part of the neo-agrarian philosophy holds that virtues of stewardship, sustainability, and integration with nature can be communicated and reinforced throughout society as a whole when people eat sustainably produced foods. It is plausible to think that farmers' markets and local foods can provoke a non-farmer to think more broadly about the functional integrity of our food systems, possibly leading on to a reflective engagement with the idea of sustainability. It is plausible to think that a pattern of purchasing, preparing, and eating food or clothing that is sustainably produced could induce patterns of stewardship and environmental responsibility among consumers. However, if biofuels are merged into the pump and pay modalities of the present system for transportation fuels, they will hardly communicate any such thing to the average consumer. It is hard to see how they would even be thought of as distinct from gasoline, though perhaps this is simply a limitation of my own imagination. Yet, these are the kinds of inquiry that will have to be probed if biofuels, like GM crops, do not become so thoroughly tied to an industrial philosophy that the possibility of a healthy dialectic becomes impossible.

## CONCLUSION

So there are at least two broad avenues by which the push toward biofuels might be usefully approached by someone with an interest in agricultural ethics. The first of these dives immediately into the issues that are already starting to be hotly debated. While I do not dismiss the possibility that people with training in ethics and philosophy of science might become valued participants in that debate, it is one that is already well underway and will undoubtedly carry on without us. There is a clear role for epistemological analysis of the various scientific models and methods that are currently fueling much of that debate, as there is a role for a political economy of the debate that would chart the underlying interests that will be affected by it. While philosophers are certainly qualified to fill that role, they are not uniquely qualified. Persons versed in either sociology and economics or in the underlying science of the various models will doubtlessly pursue these issues over the foreseeable future.

The alternative tack is to start with the big questions in the philosophy of agriculture. My treatment of these questions above is exceedingly abbreviated, even abrupt, but it will be important for *anyone* who takes this tack to avoid boring the non-philosophers in the audience to tears. My hypothesis here is that the current trajectory of biofuels places it squarely in the domain of industrial agriculture. It is possible that an interpretation of biofuels that looks beyond the US context and toward sustainable fuels for the devel-

oping world could articulate a more agrarian rationale for them, and it is even possible that a vision of “moving off the grid” that includes wind power and methane generation could encompass an American vision of alternative technology. These are possibilities that philosophers, with others will need to explore.

For now, I will remain hopeful rather than simply neutral. The environmental promise of biofuels seems worth some risk of deflating the rising agrarian discourse. Yet environmentalists and environmental philosophers would be well advised to remain attuned to the wisdom inherent in the agrarian tradition, and to seek ways of answering the question concerning biofuels in an agrarian voice. What is more, we philosophers as well as the scientists would be advised to think of biofuels not as specific tools or techniques, but as a multi-stable technological trajectory. This means that biofuels have a past that cannot be readily discarded or ignored, and that any projection of where biofuels might go given a significant R & D effort will also involve an interpretive task aimed at broader communication and argumentation. A democratic version of biofuels will require that the construction of pasts and futures for biofuels be done in forums that are open to all and where participants are willing to take each other’s ideas seriously. It is within such fora that the two strands I have identified in this “first look” can be followed up in the most promising and helpful manner.

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