

Agricultural sustainability: what it is and what it is not

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Philosophy can help clarify hidden assumptions in alternative definitions and approaches to sustainability. Current usage reveals two main substantive approaches, resource sufficiency and functional integrity, as well as widespread non-substantive usage intended to promote social action. Although accounting based resource sufficiency approaches have been the main focus in technical approaches, functional integrity approaches may be more transparent with respect to value judgements that inform the notion of sustainable systems. The 'paradox of sustainability' arises because substantive, research based approaches to sustainability may be too complex to effectively motivate appropriate social responses. Nevertheless, debate over the meaning of sustainability can stimulate a fuller appreciation of the complex empirical processes and potentially contestable values that are implicated in any attempt to accomplish sustainability in agriculture.

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Introduction

Philosophers spend a large part of their time scrutinizing words and concepts, attempting to get clear on what they mean, and on the implications of their meaning for human endeavours. Philosophical analysis of words and concepts yields a more explicit statement of assumptions that are generally taken for granted when people speak in a certain way. Analysis can reveal ambiguity that leads to confusion and miscommunication, and it can provide insight in how interpreting a concept in one way or another can lead to large and systematic differences in the way that two people using a single vocabulary approach a given topic. Programmes in sustainable agriculture apply human, biological and financial resources to the development of technology and social institutions. They generally draw upon agronomy and other agricultural sciences to research and disseminate tools and techniques that farmers can use, or they draw on the applied social sciences to support

decision-making and social organization to meet the local problems of rural communities. Philosophy is a very abstract activity, and sustainable agriculture a very concrete activity. What can they have to do with one another?

There are at least two points of contact. The presumptuous title of this paper is intended to convey the idea that philosophical debate over the meaning of sustainable agriculture will prove to be a useful and important exercise. Sustainable agriculture programmes are constantly subjected to criticism and debate about what, precisely, they should be doing. Some believe that resources should be allocated to agronomic techniques characterized by reduced chemical use or low inputs. Some believe that resources should be allocated to programmes that make farms of a certain scale or pattern of land use more profitable. Still others believe that conventional agriculture is just fine as it is, and that there is no need or basis for special programmes on 'sustainable' agriculture. Each of these viewpoints involves a different perspective on what it means for a farm, a production system

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or a more comprehensive food system to be sustainable. The variety of views on what it means to be sustainable has multiplied since the early 1980s, when critics of conventional agriculture began to claim that it was 'unsustainable'. The debate is no longer confined to agriculture. Others now want to talk about 'sustainable development', 'sustainable land-use,' and even 'sustainable architecture'. Yet few that participate in these debates have the time, inclination or skills to step back and analyse whether what separates them is a difference in values and perspectives, or a simple verbal dispute.

Philosophy can at least help clarify what is being disputed, even if it cannot resolve the dispute. It is possible that the philosopher's task will end when the terms of debate have been clarified. Yet I think that sustainability will turn out to be a contested concept of more enduring and fundamental interest. In some cases, our thinking and communication can be clarified simply by attending closely to a specific definition. Other times we find that a particular concept is so important to the way we understand ourselves and our world that we cannot gain mastery over it simply by specifying a definition for a given context. Concepts like 'truth', 'objectivity', 'causality', and 'justice' have been contested throughout human history. Such concepts have resisted our attempts to specify them in any final sense, yet it seems we must use these concepts to think at all. I believe that as we come to think more deeply and carefully about the impact of human activity on the broader environment and on the opportunities of future generations, we will find that our conceptions of sustainability have a tremendous impact on the way that we frame these problems. So philosophy encounters sustainable agriculture first by offering tools to better understand disputed visions of what sustainable agriculture might involve, and second because the debate over sustainable agriculture may well be the opening to an important new area for environmental ethics.

Encountering sustainability

Philosophers generally began to take an interest in the concept of sustainability in the late 1980s, and I have been working on it myself for almost

20 years. My thinking on sustainability has two main phases. From about 1988 until about 1994, I was fairly sceptical and even cynical about the idea of sustainability. This is not to say that I was ever opposed to sustainable agriculture, for I was not. However, for about six years I believed that the debates over sustainable agriculture and sustainable development were driven by different conceptions of social justice, at best, and underlying economic interests at worst. Big fertilizer, seed and equipment firms thought that sustainability meant continued profitability for big fertilizer, seed and equipment firms, small farmers in Nebraska thought that sustainability meant being able to continue farming at a small scale in Nebraska, advocates for Latin American peasants thought that sustainability meant social justice for Latin American peasants, etc. My writing from this period argued there was little ethical significance to any claim putatively announcing that one type of agriculture was sustainable or that another was not. It was, I believed, much better to articulate the ethical claims that might be made on behalf of the environment, farmers, peasants or the capitalist system in more direct and conventional language. However, I did believe that there were important empirical questions to answer about whether a given practice or ensemble of technologies was or was not sustainable. By an 'empirical question' I meant that it is meaningful to question how long one would be able to continue doing what one was doing before scarcity of resources or some internal contradiction in one's practice would lead to its undoing.

There are three other dimensions to this early work that should be summarized. First, I believed then and still believe that it is impossible to answer the empirical question about sustainability without taking a systems view of agriculture, development or whatever practice is in question. By this I mean that no particular production technology, form of land tenure or other human practice is either sustainable or unsustainable in isolation. One examines a practice within a system context and then asks whether the total system is sustainable, presuming that what happens outside system borders remains stable. Taking a systems view, however, involves value judgements, and these value judgements open the door for philosophical inquiry and debate. It is, for example, possible to

assess sustainability at the level of a farmer's field, and such an assessment might focus on nutrient exchange, the population of soil microorganisms or physical changes in the field due to erosion or soil compaction. Assessing sustainability in such terms presumes that the farmer is 'outside' the system. Not outside in the sense that the farmer's actions have no impact on the system. Rather, the farmer is beyond system borders in the sense that this way of understanding the sustainability of the field presumes that there will always be a farmer there to manage inputs. What if the continued presence of the farmer is itself in doubt? One can then reframe the question of sustainability by asking what system has to be in place to insure that a farmer (either a particular farmer, or any given farmer) will always be there to farm.

The broader point here is to illustrate how the definition of system borders involves a value judgement that frames the empirical assessment of sustainability. If one takes the farmer for granted, one gets one set of borders and a corresponding system that may consist largely of soil, water and microorganisms; if one asks how the farmer's continued involvement can be assured, one is dealing with a very different system, one that may involve banks, loans and government payments. Which of these perspectives, which way of defining system borders, is appropriate? My answer to this question is that it depends on what kind of practical problem one is trying to solve. Some people who write about sustainability seem to think that advanced systems modelling is a wholly value free process that will, through pure science, generate the information we need to save the planet. But my view is that the way that we conceptualize a system is deeply value laden, and reflects judgements about what is thought to be problematic, as well as likely guesses about where solutions might lie (Thompson, 1995). This point is also emphasized in Bryan Norton's recent work on sustainability (Norton, 2003, 2005).

Second, my discussion of sustainability and systems took issue with the viewpoint of Richard Bawden, from whom I have learned a great deal on sustainability, on a particular question of ontology. Bawden was at the time arguing that systems are pure conceptual constructs, that there is nothing real about them. He had come to this view, I believe, out of frustration with systems

theorists who had devoted what he took to be a pedantic concern with modelling physical aspects of systems and who had neglected elements of human praxis, not to mention the sense in which a system model is typically developed in response to a given felt need (Bawden, 1991, Bawden & Packham, 1993). In contrast, I argued that we would not be particularly distressed about instability or unsustainability of a system if we did not believe that the system was real (Thompson, 1995). The perishability of our conceptual constructs is not, in most instances, of great concern to us.

Pursuit of these ontological themes may prove to be an additional area where philosophers can be helpful in specifying an adequate concept of sustainability. The environmental philosopher Holmes Rolston III has argued against those who view wilderness as a 'social construction' in a similar vein (Rolston, 2001). However, a detailed pursuit of the ontological questions involved in systems science and in the definition of sustainability presupposes closure on a set of prior philosophical issues, namely those that describe the conceptual relationships between systems, system modeling and sustainability as such. It is these prior issues that are the primary focus of discussion below. A more complete discussion of ontological issues must be set aside for the time being.

Third, because of this systems approach, I have argued that it is possible for a person who is morally committed to sustainability to be overwhelmed by a more comprehensive and unsustainable system. By this I mean that someone who tries to farm or eat sustainably can be part of a society that is, in aggregate, doing itself in, and that there may be very little that any individual's commitment to sustainable farming can do about it. It is also possible for someone who neither thinks nor cares about sustainability to farm (or engage in other practices) in a way that nevertheless contributes to the sustainability of the overall system. We can presume that many people in the past did so, for thinking and caring about sustainability is of comparatively recent origin. As such, it matters less that we promote sustainability as a personal ideal than that we pursue sustainability at a system level. This may mean that we are careful to maintain norms and beliefs that contribute to sustainability, even if they are not articulated as injunctions

to pursue sustainability as such (Thompson, 1986, 1992). This aspect of my earlier views has drawn the most comment, as well as some caustic and critical responses (see especially Campbell, 1998).

In 1994, several colleagues and I undertook a fairly extensive review of the way that people were defining and using the concept of sustainability in a variety of problem solving and policy contexts. Many of the authors we read were trying to find ways of answering the empirical questions that I had already identified as meaningful. This research did not lead me to recant my earlier views, but it did lead me to recast them. I recognized that attempts to answer the empirical questions would not be straightforward, and would involve a number of subtle value judgements. Furthermore, I came to the view that although there are dozens, perhaps hundreds, of distinct methodologies for measuring and pursuing sustainability through technical research, there are two broad paradigms for conceptualizing sustainability. These two paradigms did not contradict one another so much as they represented alternative approaches, each of which would tend to subsume the other. They differed in which questions they took to be most fundamental, and this difference had implications for how one would organize and conduct research on sustainability, how one would understand our ethical responsibility to make our practices more sustainable. The tension between these competing paradigms has also led me to think that there may be something of enduring philosophical interest here, after all. As a result, what I have been writing lately has a less cynical and more hopeful tone, and it takes sustainability more seriously.

Many of the technical approaches my colleagues and I reviewed conceptualize sustainability as a problem of *resource sufficiency*. People working within this paradigm arrive at working definitions of sustainability through the way that they approach two measurement problems. First, one must measure the rate at which a given production or consumption practice depletes or utilizes resources. Second, one must estimate the stock or store of resources available. The relative sustainability of a practice is then determined by predicting how long the practice may be continued, given the existing stock of resources (Munasinghe and Shearer, 1995). The other approach conceptualizes

sustainability in terms of the *functional integrity* of a self-regenerating system. On this view, a practice that creates a threat to the system's capacity for reproducing itself over time is said to be unsustainable (Stewart *et al.*, 1991). This approach requires an account of the system in question that specifies its reproductive mechanisms, as well as an account of how specific practices, conceived as system activities, place those mechanisms at risk (Thompson, 1997, 1998a).

On reflection, however, I recognize that when I carve up the discourse on sustainability, I am actually left with three groups, rather than two. In addition to these two paradigms, I should add that there are still a number of people writing and talking about sustainability that seem to be making a *non-substantive* use of the word. There is a sense in which calling a practice or a pattern of conduct unsustainable is just a way of saying, 'You may get away with that this time, but eventually you'll be sorry!' This might point toward a deeper sense in which the practice or conduct will lead to its own undoing, but more frequently it is just a very general form of moral or prudential rebuke. In this sense, calling something 'unsustainable' is just a mild way of calling it bad. I was harshly critical of such talk in earlier publications, arguing that it just created confusion and muddled thinking. However, I must admit that mildness can be important, especially in the mid-west where the only thing worse than accusing someone of bad farming is to praise *yourself* as being a good farmer (or as knowing more about farming). In such contexts, the phrase 'sustainable agriculture' is just a polite way of saying 'good agriculture'.

One goal for this paper is to push my thinking on sustainability a little farther by exploring some of the implications of resource sufficiency and functional integrity within environmental ethics. Eventually, I will examine how these competing conceptions play out within the way that we understand our broad obligations to nature and to future generations, and this discussion should be relevant beyond agriculture. However, I would like to begin by returning briefly to some the non-substantive uses of sustainability, and to consider how this way of talking about sustainability enables and promotes some very healthy activities within local *and* global debates. Here, sustainable agriculture is still my primary focus.

Non-substantive sustainability

Dale Jamieson traces the concept of sustainable development from a 1980 report from the International Union for the Conservation of Nature and natural Resources, through the 1987 Brundtland Commission report, to its current plethora of uses and applications. Jamieson concludes that the word is useful in structuring popular discussions and debate, but that it has little philosophical content or motivational power (Jamieson, 1998: 188). The philosophical indictment amounts to the claim that conceptualizing human activities in terms of sustainability does nothing to enhance our understanding of moral and prudential obligations associated with those activities. The second claim, that sustainability has no motivational power, amounts to the claim that characterizing one course of action as more sustainable than another will have little effect on human behaviour. I will consider these claims in turn.

First, Jamieson is right to point out that 'sustainability' is a good conversation starter, and a way to bring different interests to the table. What I have called *non-substantive* uses of the word 'sustainable' can be important in bringing people with different interests and values together. When this use generates definitions of sustainability, they tend to be highly general. Two economists offered this definition: 'We define sustainable agricultural development in this paper as an agricultural system which over the long run, enhances environmental quality and the resource base on which agriculture depends, provides for basic human food and fiber needs, is economically viable, and enhances the quality of life of farmers and society as a whole' (Davis & Langham, 1995: 21–22). This definition acknowledges that agriculture feeds the human population, provides income for farmers and rural communities, and affects the environment, and in doing so it at least acknowledges multiple interests and multiple objectives. Yet has there ever been an agricultural technology or development project that was not intended to be sustainable, given this definition? Not every project succeeds in meeting these goals, but that just brings us back to equating 'sustainable' and 'good'.

Non-substantive uses of the term sustainable are often intended to link environmental impact with

social justice. Gordon Douglass (1984) noted this in his essay on different approaches to sustainability. In most instances, authors simply assert that socially unjust practices are unsustainable (see George, 1992; Thrupp, 1993; Barkin, 1998). Patricia Allen and Carolyn Sachs defend this use of the term 'sustainable', when they describe sustainable agriculture as a 'banner' under which a number of groups interested in environment and social justice have assembled (Allen & Sachs, 1992). Allen and Sachs argue that an adequate conception of sustainability must include the interests of labour, of the poor and of marginalized groups (Allen & Sachs, 1993), but this claim derives its warrant solely from the judgement that the interests of these politically weak groups should be adequately considered in any politically defensible discussion of agriculture. Allen and Sachs do not provide any argument for seeing why inclusion of these interests is related to sustainability as such.

This suggests that we can lump people who make non-substantive uses of sustainability into the 'mildness' camp and the 'banner' camp. Neither is particularly interested in what the word 'sustainability' might mean. The mild wish to use the term as a way of conveying approval and disapproval in an inoffensive manner. Banner waving organizers want to use sustainability to unify political and social causes. As Allen and Sachs (1993) are aware, one problem with the banner approach is that people with different conceptions of social justice are likely to propose different definitions of sustainability. Indeed, some authors writing on sustainable agriculture have equated sustainability with ordinary profitability, both for agricultural producers, (Lynam & Herdt, 1989) and for agribusiness firms (Richgels *et al.*, 1990).

Neither mildness nor banners get us very far in understanding what criteria should be brought forward in judging a practice to be sustainable, however. No one (well, hardly anyone) sets out to practice bad or unjust agriculture as his or her primary goal. Telling people that they should not be bad or unjust is virtually meaningless in the context of agriculture unless one also lays out some agriculture-specific criteria as to what bad or unjust means. The substantive debate concerns the standard according to which sustainability is to be judged, and this takes things beyond anything

that mildness and banners can hope to accomplish. The debate over standards becomes acrimonious when either money or social approval is attached to sustainability. Everyone will want to make sure that sustainability is then measured in a manner that leaves them qualified for the rewards. People scramble to 'define' sustainability in ways that resemble the annual society page listing of who is 'in' and who is 'out', and what may have started out as politeness evolves into factional politics. Replaying the debate over social justice within a rhetoric of sustainability has not altered the familiar pattern of political alliances and ideological positions.

Non-substantive conceptions of sustainability are, thus, useful conversation starters, but the conversation does not go very far unless it eventually turns toward a serious attempt to understand what sustainability could mean in a substantive sense. The basic problem with non-substantive claims is that when we call something sustainable or unsustainable, we generally think that we are making a statement that could potentially be shown to be true or false. We thus need some conception of sustainability that does more than indicating mild approval or that reiterates the work being done by contested concepts such as social justice. One solution to this problem is to allow the values and interests of individuals working within a specific decision making context to determine the parameters of sustainability (see Walters *et al.*, 1990). This has been the de facto approach of applied researchers for the last decade. The result is that the literature contains many technical definitions of sustainability that are inapplicable beyond the specific agronomic, economic or ecological problems for which they have been tailored. Can these problem specific approaches to sustainability be generalized?

Why sustainability is important

In the first phase of my work I approached the question of sustainability by asking whether it represented some sort of intrinsic good, or some comprehensive synthesis of goods. If this were the case, information about sustainability would be important because we would have an ethical obligation to pursue sustainability as such (see

George, 1992; Norton, 1992). I concluded that this is not the best way to characterize the ethics of sustainability. The argument can be summarized by considering an extreme question. We can ask whether murder is sustainable in terms of resource sufficiency by measuring the rate at which murder consumes victims, and the number of victims available. We can ask whether murder is sustainable in terms of functional integrity by asking how murder threatens the human population's ability to reproduce itself. As an empirical matter, it seems likely that murder would turn out to be relatively sustainable, so long as more people are born than killed off. We are not inclined to view this fact about murder as anything in favour of the practice. We are not in the least inclined to say, 'Well, at least it's a *sustainable* practice'. From this kind of argument, I have concluded that we should view sustainability as an 'add-on' value, rather than an end in itself. Once we have deemed a practice worthwhile on other grounds, it becomes meaningful to ask whether it is sustainable, and to seek relatively more sustainable ways of securing the values or achieving the goals that make a practice worthwhile in the first place (Thompson, 1992, 1995).

Though sustainability is not intrinsically valuable, it may seem obvious that knowing which of several ways to further other values is more sustainable is important for personal or social planning. Yet even this judgement needs to be unpacked. For example, consider a hypothetical problem for the resource sufficiency approach. Assume that we have determined that one food production strategy will produce a great deal of satisfaction for society at large over a few generations. Assume further that an alternative is more sustainable in that it will endure for a few more generations, but at such drastically reduced levels of satisfaction that there will be less total well-being produced even over the long run. It is not at all clear that we should choose sustainability in this case (Thompson *et al.*, 1994; Attfeld, 1998). It seems we would choose the alternative that leads to more satisfaction overall.

This suggests that sustainability over time is just a dimension of the general utilitarian maxim proposed by Jeremy Bentham over 200 years ago. The maxim states that we should choose practices that maximize total well-being or utility, and Bentham describes several ways to measure

utility. One of these is to increase the duration of pleasurable or satisfying experiences, but increase in duration can be swamped by increase in intensity or extent (i.e. in the number of parties experiencing satisfaction) (Bentham, 1789: 30). The underlying principle is optimization, not sustainability. Nevertheless, it must be admitted that even if sustainability simply points us toward the duration of well-being over time, it is worth including in a comparison of alternative social policies. Information about sustainability in the sense of resource sufficiency is important for planning, but not in a way that adds anything to the traditional statement of utilitarian philosophy.

So far, the argument does not provide any basis to contradict Jamieson's judgement that there is nothing novel or philosophically interesting about sustainability, but perhaps this is simply a result of the resource sufficiency approach. To examine this possibility, consider again the practice of murder. Taking first the sustainability-as-duration idea suggested by the resource sufficiency approach, we could argue that society's capacity to sustain a murder rate over time is of little value because the costs or harms associated with almost any given murder outweigh any benefits. Lengthening the duration of a murder rate for society might be a good thing in comparison to an alternative where the murder rate increases, but not because of sustainability. The moral judgement is simply a matter of the total welfare produced by each alternative. Duration, again, is only a dimension of the increase or decrease in total utility, total benefit and harm.

Switching to a functional integrity approach, we ask how murder threatens a society's ability to reproduce itself. We might first assess the question in terms of biological births and deaths, but the sustainability of murder is, on the face of it, a much more complicated question than whether there are enough victims to keep up the killing. We are led immediately to consider whether a given murder rate, or perhaps murders of a particular kind or within a particular sector of society might threaten democratic or family institutions. Answering these questions might, in turn, lead us to conclude that even if the birth rate is adequate to supply a continuous stream of victims, murder *does* threaten a society's ability to regenerate its fundamental institutions. *This* conclusion adds

something to the urgency with which murder is understood as a social problem. The harm done by murder is itself sufficient reason to expend resources on police and courts, but the stakes are even higher when we become convinced that it threatens fundamental institutions.

I believe that a similar comparison can be made for ecological, environmental and agricultural applications of these two approaches, though the issues are more complex. If we take a resource sufficiency approach to food production, the problem is still one of balancing costs and benefits. The accounting becomes very complicated and contentious, in part because there is little consensus about the environmental costs of food production. There is far less agreement than with respect to the costs and benefits of murder. Yet if we did reach consensus on the costs and benefits of food production, the value of sustainability would be entirely subsumed in this larger optimization problem. We would compare the relative costs and benefits of different ways for producing food. The comparison would be made difficult by the disparity between different kinds of cost or benefit (e.g. gustatory vs. nutritional value; producer vs. consumer benefit; human vs. ecosystem health), but sustainability-as-duration would certainly be one of the least difficult aspects of the comparison to accomplish.

Consider then how food production affects our society's ability to reproduce itself. This, too, is a problem of almost overwhelming complexity, for society must be understood as a system comprising many subsystems that are threatened in different ways by different approaches to producing food. One aspect of social reproduction is the regeneration of our bodies, a reproductive process that requires food consumption. The human population's need for food sets one system parameter, but in meeting this parameter it is possible to deplete soil, water and genetic resources used in food production. Since each of these is a regenerative subsystem, threats to these subsystems represent threats to total system sustainability. Similarly, farms and rural communities represent subsystems. If farming is unprofitable, or if the local institutions that support farming are not regenerated, the sustainability of the larger system is threatened. Our desire to maintain the functional integrity of all these subsystems might make us conservative in

the sense advocated by Edmund Burke. That is, we might be very cautious about 'improving' a subsystem that seemed to be functioning well enough for fear that what we would do might upset the complex interconnection of the whole.

Far from understanding sustainability as one dimension of optimization, we would understand it as a relative equilibrium among social and natural subsystems, an equilibrium that we challenge at our peril. We might say that we value these natural and social subsystems because they provide the context or the constitutional basis for personal and group identity, and for the formation of preferences that would give rise to a given conception of well being. Nevertheless, I believe this stops short of making sustainability into an intrinsic value, for we would feel considerably less compunction about interfering in a system that did not seem to be functioning well. It might be worth some risk, in other words, to change a social system that produces wretchedness and social injustice in large measure. I also hasten to add that this conception of sustainability would not entail conservatism in every case. If our knowledge about threats to system integrity indicated that our food production system was headed for collapse, sustainability-as-functional integrity would provide a basis for even extreme restorative measures.

We may summarize and tie this discussion to a broader literature in ethics and political philosophy. Resource sufficiency points toward an interpretation of sustainability as a measure of the duration associated with practices that produce (or detract from) well-being. It leaves questions about whose well-being and the relative measure of different forms of satisfaction open. It is consistent with the general form of the utilitarian maxim, and indeed seems to specify nothing more than the temporal dimension of it. It is therefore an important component of the information we need to carry out moral and political duties conceptualized in utilitarian terms, but it is not particularly interesting from a philosophical perspective. Functional integrity, however, describes the mechanisms that allow whole systems (such as human societies or human dominated ecosystems) to regenerate themselves over time. System level stability manifests itself in social institutions, renewal of soil, water and genetic resources (including wildlife), and cultural identity. The basis of our obligation to maintain

this stability is sometimes obscure but can be expressed as prudential advice to be cautious about very uncertain risks. It may also be expressed in more communitarian terms as a duty to maintain the integrity of institutions and natural processes that are the basis for our collective sense of identity and purpose.

Resource sufficiency vs. functional integrity

The concepts that have been sketched out above are problematic in more ways than can be discussed in a single essay. The problematic character of these general approaches to sustainability is what accounts for their philosophical significance. If sustainability were just the temporal dimension of a maximization rule, it would not merit much philosophical analysis. But sustainability is a contested concept, with functional-integrity advocates claiming that it describes part/whole relationships in a way that is central to socio-natural organization of human activity. It is therefore worth taking some pains to clarify and understand what is being contested, and how functional integrity is different from resource sufficiency. The present format avails scope for discussing only one dimension of this comparison and contrast, so the goal here is not to exhaust the philosophical analysis of sustainability but merely to tease readers into a continuing philosophical discussion. What is more, resource sufficiency and functional integrity are not so easily distinguished once empirical analysis begins. There is less difference in the way that these two approaches portray the facts than might appear. However, the empirical interconnections only serve to underscore the way that advocates of each approach are interpreting facts in normatively different ways.

Any attempt to carry out the empirical measurement and system modelling implied by resource sufficiency and functional integrity will tend to bring these two approaches to sustainability together. Consider what an analyst attempting to evaluate the sustainability of a given strategy for food production would do. Measuring the resources needed to produce food would lead one immediately to renewable soil, water and genetic

resources. Accounting for the availability of these resources over time requires knowledge of the rates at which they are replenished. The resource sufficiency analyst is thus led to many of the same questions as the functional integrity analyst. Production strategies that maintain the functional integrity of regenerative subsystems for renewable resources are likely to come out as 'more sustainable', on either the resource availability or the functional integrity approach.

Given this similarity, why is there a debate at all? Jamieson reviews the debate between advocates of *strong sustainability*, who insist that natural capital must not decline over time, and those who advocate *weak sustainability*, that is, that human well-being does not decline over time. Both groups operationalize their respective conceptions of sustainability with accounting arguments of a resource sufficiency kind. The primary difference is that weak sustainability presumes that one means for maintaining human well-being is as good as any other. Crucially, they believe that it will be possible to maintain well-being by substituting human for natural capital (see Pearce, 1993). Advocates of strong sustainability believe that future generations have a right to the same amount of natural capital as present generations, and that protecting this right places a prior constraint on preference maximization by present generations (Howarth, 1995; Bromley, 1998). Norton (2003, 2005) also stresses the difference between strong and weak sustainability as approaches in ecosystem management. Here again, I will emphasize agriculture.

Strong and weak sustainability represent significantly different perspectives for evaluating agriculture. Specifically, advocates of weak sustainability may see agricultural science as a way to compensate for declining soil fertility, water quality or genetic variability. To say that human capital is substituted for natural capital is economists' talk for saying that science will continue to increase yields, even as the renewable resource base declines. Norton and other advocates of strong sustainability reject this strategy, claiming that it violates the rights of future generations. This approach is consistent with resource sufficiency approaches to the measurement of sustainability. It is consistent with the welfarism of utilitarianism (i.e. the view that it is the well-being of individuals

that is ethically important) and differs from classical utilitarianism primarily in 'taking rights seriously', in this case, the rights of unborn future generations. Thus the basic philosophical machinery in this approach to strong sustainability is consistent with recent work in ethics and political theory that is largely unconcerned with and uninformed by ecology or principles of functional integrity. Key work in reconciling rights with the consequentialism (i.e. understanding ethics as being intrinsically engaged in comparing the expected consequences of alternative courses of action) was accomplished by Ronald Dworkin (1977) and Amartya Sen (1987). This approach does not demand a systems analysis or orientation, and presupposes only that one has some reasonably reliable means for predicting the consequences of one's action, generally as a sequence of causal relationships.

Yet one wonders whether there is not a functional integrity argument lurking in the background of strong sustainability. One way that systems can creep in to the strong sustainability view is when predicting the consequences of human action is done using models that are, effectively, systems-based. However, this makes it seem as if the predicting is purely a scientific activity. One of Norton's (1992, 2003, 2005) key points is that it is important to avoid a 'value-free' notion of science precisely because doing so conceals key value judgements that may have been made in conceptualizing system borders. The chance of such concealment is significant when the systems orientation is buried in the model being used to predict outcomes. Thus one philosophical advantage of functional integrity is that the language in which sustainability is articulated invests the system of interest with significance in an obvious way. Clearly, the only way that natural capital can be preserved consistent with rights of present generations (let alone future ones) is to utilize renewable natural resources within their capacity for regeneration and renewal. In *saying* that sustainability is about the integrity of the renewable resource subsystem, as opposed to welfare or rights, one surfaces the values implicit in viewing natural resources as a system capable of regeneration.

Another argument for resisting the dependence on science that is implicit in a resource sufficiency approach also points us toward functional integrity in stressing that key vulnerabilities reside in social

(rather than soil and water) subsystems. First, if science is generating the technology crucial to meeting food needs, we must be sure that the subsystem that supports agricultural science is itself secure, and that there are good reasons to think that continuous increases in yield are in store. Yet funding for agricultural science has declined steadily over the last decade, and as the number of farmers who lobby for research declines, it is not at all clear that the social apparatus needed to support the research system is stable (Buttel, 1993). Second, increases in yield have been accompanied by patterns of industrialization in agriculture that deplete rural populations, and that shift farmers' economic livelihood away from dependence on soil, water and genetic resources, and toward dependence on finance. This shift strikes to the heart of the sustainable agriculture movement, for people fear that the social and biological systems that support agriculture have been weakened, and that farming has shifted toward greater dependence on an inherently risky system for regenerating financial capital. Each of these subsystems is seen as becoming more brittle as we drift toward industrial agriculture.

I am not asserting that risks to the science subsystem or the rural community subsystem have been proven. My point is simply to sketch the implicit links between strong sustainability and a functional integrity point of view. However, this sketch does suggest that a more explicit statement of the functional basis for imputing rights to future generations would result in a more plausible and more potent philosophical statement of the case for strong sustainability. Although advocates of strong sustainability use the accounting language of resource sufficiency, it seems likely that their conservatism derives from a deeper consideration of the way that food production depends on the continued performance of many inter-linked subsystems. They believe that unbridled industrial agriculture poses significant risks to the stability of social, scientific, financial and renewable resource subsystems. They therefore challenge the weak sustainability estimate of resource availability. Ultimately a defense of this viewpoint depends more heavily on a plausible account of risks to system integrity than on the imputation of rights to future generations.

Conclusion

Jamieson's negative assessment of the philosophical richness in various conceptions of sustainability is unwarranted. Even if one is inclined to favour a simple norm of optimization, one must admit that resource sufficiency and functional integrity present philosophically complex alternatives for conceptualizing the nature of human responsibility to act sustainably. However, I am only slightly less pessimistic than Jamieson about the motivational effectiveness of sustainability. On the one hand, I hope that I have shown why sustainability is important, and why getting a clearer understanding of sustainability is crucial to policy planning and project management. On the other hand, the sheer complexity of sustainability (the fact of which is part of my argument for treating it as a philosophical problem) weighs against its use as an idea that can mobilize mass political movements. It is questionable whether it can be useful in motivating individual behaviour.

This leaves us with the paradox of sustainability. On the one hand, the human polity ought to act sustainably. On the other hand, the human polity cannot mobilize around the goal of sustainability. Looked at in one way, there is no contradiction here. It is just a way of saying that it is better to be lucky than smart. If we have simple norms that provide little insight into the regenerative systems of ecology and society, but that guide our behaviour in ways that allow those systems to function, we should retain those simple norms. We ought *not* to replace them with complicated conceptual or mathematical models that are 'smart' in providing predictive knowledge of system failure, but that are too complex for people to follow on a day-to-day basis (Thompson, 1995; Grant & Thompson, 1997).

While not strictly paradoxical, the upshot is at least ironic. Though we ought to improve our understanding of sustainability in a deep sense, and despite the fact that non-substantive discussions of sustainability make this more difficult, non-substantive talk about sustainability may be more sustainable (in the sense of promoting a genuinely sustainable society) than reforming the public discourse with an ecologically and philosophically richer idea. Mora Campbell has taken me

to task for advocating this position. She claims that since my conceptualization of sustainability establishes a system perspective that is unavailable to people making decisions on a day-to-day basis, I have established a normative framework that is inherently elitist and exclusionary. According to Campbell, a conceptual apparatus that demands an ideal observer's perspective for establishing its normative claims is normatively unacceptable because any acceptable normative perspective must, in principle, be accessible to all (Campbell, 1998).

Campbell does *not* mean that every person must be able to 'occupy' or have deep affective sympathy with a perspective for it to have moral validity. That would be contrary to the general principles of the feminist critique her paper undertakes. Feminist thought in environmental ethics has promoted an interpretation of rightness (or the normatively correct) that is capable of accommodating deep incompatibilities in perspective (Warren, 2000; Plumwood, 2002) This is not the place to launch into a detailed discussion of feminist thought, but Campbell's critique shows, contra Jamieson, that even if my approach to sustainability is motivationally weak, it is weak in a philosophically interesting way.

In reply I offer two concluding disclaimers and qualifications that hopefully deflate the elitist and exclusionary pretensions Campbell associates with my position. First, although I have argued that the systems-modelling approach to sustainability yields a conceptualization more adequate to the task of reforming conduct and policy, I have *not* argued that adopting this approach is either a necessary or sufficient condition for adequate moral decision making. Normative inquiry is complex and I agree with the main thrust of the feminist critique: it is important to both figuratively imagine and to actually conduct inquiries into the norms and goals that guide our lives in an open and welcoming manner. We should not dismiss different views as 'irrational' nor should we try to police our normative discourse in light of philosophical conceits. We should instead try to hear and accommodate each other's voices (Thompson, 1998b).

Second, I have *not* argued that we should allow the numbers that hard systems models generate to override other considerations when reviewing how to adjust our conduct or policy. Indeed, I do not think that specific predictions and measurements

of either resource sufficiency or functional integrity should be given much weight at all. In fact I think that it is very likely that current models omit crucial factors and that to rely on them too heavily in policy making would be to fall victim to the fallacy of 'state simplifications', (Scott, 1998). The argument that I *have* made is that the systems-modelling approach yields an informative and normatively more adequate *conceptualization* of sustainability, one that gives us a better sense of what we are shooting for, one that helps us better understand what our adjustments, approximations and ameliorative strategies should be striving toward. Models can also reveal patterns of association and interaction that tend to be maintained among various system elements, including human activity. Such revelations are normatively useful, even when the predictions are imprecise.

On my view, sustainability is neither equivalent to norms that we have long associated with democracy and social justice, nor should it be presumed that achieving these norms will necessarily result in a sustainable society. Yet people seeking to make their societies more sustainable at the same time that they seek to make them more democratic or more just would be well advised to develop an understanding of sustainability that has been informed by the lessons of ecology and systems modelling. They should also regard the definition and conceptualization of sustainability as a philosophically open ended and always evolving task. We will never have a complete understanding of sustainability; we must always be willing and eager to think it through again.

References

- Allen, P. and Sachs, C. (1992) The poverty of sustainability: An analysis of current discourse. *Agriculture and Human Values* 9 (4), 30–37.
- Allen, P. and Sachs, C. (1993) Sustainable agriculture in the United States: engagements, silences, and possibilities for transformation. In P. Allen, (ed.) *Food for the Future: Conditions and Contradictions of Sustainability* pp. 139–167 (New York: John Wiley and Sons).
- Attfield, R. (1998) Environmental ethics and intergenerational equity. *Inquiry* 41, 207–222.
- Barkin, D. (1998) Sustainability: The political economy of autonomous development. *Organization and Environment* 11, 5–32.

- Bawden, R.J. (1991) Systems thinking and practice in agriculture. *Journal of Dairy Science* 14, 2362–2373.
- Bawden, R.J. and Packham, R.G. (1993) Systemic praxis in the education of the agricultural systems practitioner. *Systemic Practice and Action Research* 6, 7–19.
- Bentham, J. (1789) [1948] *The Principles of Morals and Legislation*. New York: Hafner Press.
- Bromley, D.W. (1998) Searching for sustainability: The poverty of spontaneous order. *Ecological Economics* 24, 231–240.
- Buttel, F.H. (1993) The production of agricultural sustainability: Observations from the sociology of science and technology. In P. Allen, (ed.) *Food For the Future* (pp. 19–46). New York: Wiley.
- Campbell, M. (1998) Dirt in our mouths and hunger in our bellies: Metaphor, theory-making and systems approaches to sustainable agriculture. *Agriculture and Human Values* 15, 57–64.
- Davis, C. and Langham, M. (1995) Agricultural industrialization and sustainable development: A global perspective. *Journal of Agricultural and Applied Economics* 27, 21–34.
- Douglass, G.K. (1984) The meanings of agricultural sustainability. In G.K. Douglass (ed.) *Agricultural Sustainability in a Changing World Order* (pp. 3–29). Boulder, Colorado: Westview Press.
- Dworkin, R. (1977) *Taking Rights Seriously*. Cambridge, MA: Harvard University Press.
- George, K.P. (1992) Sustainability and the moral community. *Agriculture and Human Values* 9 (4), 48–57.
- Grant, W.E. and Thompson, P.B. (1997) Integrated ecological models: Simulation of socio-cultural constraints on ecological dynamics. *Ecological Modeling* 100, 43–59.
- Howarth, R.B. (1995) Sustainability under uncertainty: A deontological approach. *Land Economics* 71 (4), 417–427.
- Jamieson, D. (1998) Sustainability and beyond. *Ecological Economics* 24, 183–192.
- Lynam, J.K., and Herdt, R.W. (1989) Sense and sustainability: sustainability as an objective in international research. *Agricultural Economics* 3, 381–398.
- Munasinghe, M. and Shearer, W. (1995) *Defining and Measuring Sustainability: The Biogeophysical Foundations*. Washington DC: World Bank and United Nations University.
- Norton, B.G. (1992) Sustainability, Human Welfare, and Ecosystem Health. *Environmental Values* 1, 97–111.
- Norton, B.G. (2003) *Searching for Sustainability*. Cambridge: Cambridge University Press.
- Norton, B.G. (2005) *Sustainability*. Chicago: University of Chicago Press.
- Pearce, D. (1993) *Economic Value and the Natural World*. London: Earthscan.
- Plumwood, V. (2002) *Environmental Culture: The Ecological Crisis of Reason*. London: Routledge.
- Richgels, C.E., Barrick, S.J. Foell, R.H. et al. (1990) Sustainable agriculture, perspectives from industry. *Journal of Soil and Water Conservation* 45, 31–33.
- Rolston, H., III (2001) Natural and unnatural; Wild and cultural. *Western North American Naturalist* 61, 267–276.
- Scott, J.C. (1998) *Seeing Like a State*. New Haven, CT: Yale University Press.
- Sen, A.K. (1987) *One Ethics and Economics*. Oxford: Basil Blackwell.
- Stewart, B.A., Lal, R. and El-Swaify, S.A. (1991) Sustaining the resource base of an expanding world agriculture. In R. Lal and F. Pierce (eds) *Soil Management for Sustainability*, Ankeny, Iowa: Soil and Water Conservation Society.
- Thompson, P.B. (1986) The social goals of agriculture. *Agriculture and Human Values* 3 (4), 32–42.
- Thompson, P.B. (1992) The varieties of sustainability. *Agriculture and Human Values* 9 (4), 11–19.
- Thompson, P.B. (1995) *The Spirit of the Soil: Agriculture and Environmental Ethics*. Routledge Publishing Co.
- Thompson, P.B. (1997) The varieties of sustainability in livestock farming. In J.T. Sørensen (ed.) *Livestock Farming Systems: More Than Food Production* (pp. 5–15) Wageningen, The Netherlands: Wageningen Pers.
- Thompson, P.B. (1998a) *Agricultural Ethics: Research, Teaching and Public Policy*. Ames, IA: Iowa State University Press.
- Thompson, P.B. (1998b) Environmentalism, feminism and agrarianism: Three isms in search of sustainable agriculture. *Agriculture and Human Values* 12, 170–176.
- Thompson, P.B., Matthews, R. and van Ravenswaay, E. (1994) *Ethics, Public Policy and Agriculture*. New York: Macmillan Publishing Co.
- Thrupp, L.A. (1993) Political ecology of sustainable rural development: Dynamics of social and natural resource degradation. In P. Allen (ed.) *Food for the Future: Conditions and Contradictions of Sustainability* (pp. 47–73). New York: John Wiley and Sons.
- Walters, D.T., Mortensen, D.A. Francis, C.A. Elmore, R.W. and King, J.W. (1990) Specificity: The context of research for sustainability. *Journal of Soil and Water Conservation* January-February, 55.
- Warren, K.J. (2000) *Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters*. Lanham, MD: Rowman and Littlefield.