The Very Idea of Sustainability[1]

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ABSTRACT Discussions of the desirability and ethical justifiability of sustainable agriculture are frequently impeded, if not derailed by the variety of meanings attached to the term "sustainable." This paper suggests a taxonomy of different notions of sustainability distinguishing between agricultural product and process sustainability, in both static and dynamic forms, pursued by reductive (extractive), compensatory, regenerative, and induced homeostasis strategies. The discussion then goes on to argue that ethics demand sustainable agriculture. Finally the paper tries to identify just which types of sustainable agriculture will meet the ethical demands. I conclude with reasons for living sustainably in the present, as opposed to trying to orient agriculture by reference to the rights of future generations.

Current widespread agreement on the importance of sustainability in agriculture conceals the wide range of intentions and priorities collected under the term "sustainable." Such a concealed variety can only serve to confuse discussions of the value or merits of conducting agriculture in a sustainable way.[2] Thus, while we can all agree that sustainability is a good thing in agriculture, we do not agree about what sustainability is, nor then, about why it is good. An example of the resulting confusion is found in a recent conflict between environmentalists and environmentally sensitive producers on the one hand, and Kansas legislators along with Kansas State University research leaders on the other hand. As reported by Dana Jackson, the problem was this:

> In 1987 the Kansas Rural Center organized a citizen's committee to promote sustainable agriculture in the state. Last summer [1989] the joint house and senate committee invited members of the Citizens Sustainable Agriculture Committee to present their views of research done by Kansas Agricultural Experiment Station (KAES). Since 50% of KAES funding comes from state taxes, the legislature reviews its program yearly. The four members of the citizens' committee criticized Kansas State University for not addressing the problems of diversified family farmers making the transition to low chemical input methods and asked that the experiment station direct research to meet more of their needs. The legislators openly disapproved what they called "going back" [*sic*] and doubted that agricultural chemicals caused problems because Kansas farmers were already using the "best management practices."[3]

Clearly, the legislators did not want to reject sustainable agriculture. They simply could not have understood by the terms what the Citizens' Sustainable Agriculture Committee did. Because of the different conceptions of sustainability, both parties to the conflict could favor

sustainability and not agree with what the other advocated. In this discussion I want first to try to eliminate the cause of this confusion by developing a modest taxonomy of the different sorts of sustainability that might be sought in agricultural production.

The *common and basic* theme of sustainability in agriculture is continuity of certain productive activity conducted with certain goals and running over some more or less restricted period.[4] The taxonomy will be set up to capture and clarify the chief variations on this theme that actual agricultural practice has sounded. In proceeding this way, I will separate out some of the positions that in fact have taken the lead in debates over the desirability of sustainable agriculture.

Having set up the taxonomy, I turn to the ethical question of whether and what sort of sustainability we should have in agriculture. I give reasons for agricultural practices and policies that are in tune with only certain sorts of sustainability as opposed to others. (Non-shifting) traditional agriculture will fare better ethically than modern industrial agriculture. Agricultural policy that gives priority to sustainability of certain social and cultural *processes* of production will fare better ethically than policy that gives priority to sustainability of certain levels of *yields*. And, perhaps surprisingly, policy constrained by the rights of *present* generations to use agricultural resources will fare better ethically than policy constrained by the resource use rights of *future* generations.

I. The General Orientations of Agricultural Sustainability: Yield and Process

The taxonomy I develop has three main levels of subdivisions, that of the General *Orientation* of Sustainability in Agriculture, that of the (Static or Dynamic) *Forms* of Sustainability these different orientations can take, and that of the (Strategic) *Modes* of Sustainability in which these different Forms are manifested. Thus, the variety in agricultural sustainability, as I shall understand it, requires us to clarify in any particular case, what orientation it has, what form this orientation takes and in what mode we see this form manifested.[5] Let me turn now to the specifics of these distinctions.

The first thing to notice about discussions of sustainability is that they are sometimes concerned with keeping up production levels or yields and sometimes with continuing agricultural systems or patterns of use. This gives us two different orientations in discussions of sustainability.[6]

Thus we sometimes talk of sustainable yields. The basic idea is that of continuous production with *yields or products* of a certain type, harvested at a certain level over the specified or understood period of planning. When we speak this way, I will say that we are taking the *product* orientation toward sustainability.[7]

But we also talk of *sustainable agriculture* or say that *agriculture* conducted in some way *is not sustainable*. Here our point is not that yields cannot be kept at a certain level for a certain product, but that we cannot continue to work the resource in question in the same ways or with the same patterns or systems of agricultural production, over the duration of the planning period in question. Thus some say modern industrial agriculture, which depends on heavy mechanized tillage and massive chemical amendments, is not sustainable. What they mean is not that it cannot continue to generate yields of certain products and levels for the planning period in question, although that is an implication of what they do mean. Rather, their point is that agriculture conducted as in modern industrial agriculture faces a massive biological collapse and thus is tending toward a condition of the land in which that resource will be unfit for *any* further agricultural production of the sort in question.[8]

To cite another example of people speaking of sustainable agriculture, we hear the claim that United States subsidy programs are such that small scale but chemically dependent family farming is unsustainable. Here the point is that the proprietary structure of small scale family farming and continued economic support of the present cropping systems form an unstable combination and that one of these must pass away leaving the fields to the other.[9] When critics or others speak in these ways, urging us to move toward more sustainable patterns of agricultural activity as opposed to urging us toward a continuation of certain levels of production of certain types of products, they are taking what I shall call the *process* orientation toward questions of sustainable agricultural production.[10]

Noting these two orientations, however, only begins to clarify the different issues at stake in discussions of sustainability. Taking *either* a product *or* a process orientation to sustainability, we can strive for equilibrium or evolution of yields or processes. Further, our striving for sustainability in the static or dynamic forms of yields or processes can demonstrate any one of several different strategies for sustainable resource use. In particular, we can proceed through productive strategies that *reduce*, *compensate for* the lack of, *regenerate*, or *establish as self-maintaining* the productive capacity of the resource. Thus our two orientations can lead to production or process equilibrium or evolution that is sought in a way that is, *reductive*, *compensatory*, *regenerative*, or *self-maintaining*. Let me explain and put some flesh on these abstract bones of the taxonomy by detailing the different possible forms and modes of sustainable product or process oriented agriculture.

II. Forms and Modes of Sustainability: Patterns of Sustained Yield and Process, In Equilibrium and Evolution

Forms and modes of sustainability differ somewhat depending upon whether our orientation to sustainability is process or product. For this reason I need to take the long (but I hope somewhat scenic) route in setting out the

classification scheme. Let us begin with forms and modes of sustainability falling within the product orientation.

A. Product Orientation

Within this orientation, the aim is generally a continuity of agricultural production or production capacity over a specified or implicit planning period.[11] However, this general orientation can take a couple of forms. The first is one in which the producer is seeking to hold constant or to continue in equilibrium, either the type of good produced or the level of production over the planning period in question. Cases of this form of product oriented sustainability, I will categorize as *"static sustainability."* Alternatively, producers can be involved in production where the type of goods produced or the levels of production achieved are changing and the producer is seeking to achieve a different type of product or level of production that he or she can then continue for the planning period in question. Cases of this form of product oriented sustainability, I will refer to as cases of *"dynamic sustainability."*

Thus in static (product oriented) sustainability, understanding production in terms of product yield — bushels of grain *per* acre or pounds of meat *per* animal delivered to market, we can imagine a producer trying to continue production, at *either* the same level of production, *or* in the same type of product throughout the requisite planning period. For example, if a farmer is growing corn in a way yielding 125-130 bushels *per* acre on average, then her or his concern for sustainability from a product orientation might be to continue to produce corn on the fields in question at the 125-130 bushel level throughout some specified or implicit planning period. Here the producer seeks a product oriented sustainability of *both* type of product *and* level of yield. We might also imagine a producer being concerned to sustain a certain level of monetary yield, through a rotation of crops producing that income. Thus a farmer might be willing to rotate alfalfa, corn, and soy beans as long as the yields of these various crops were profitable over the planning period. And, slightly varying this product stasis scheme, a farmer can seek sustainability for production of a certain type of crop even though he or she is willing to see the level of production fluctuate. For example, a farmer might seek to stay in corn in order to protect subsidy base acreage amounts, even though climatic and technological problems cause fluctuations or losses in yields.

In marked contrast to the producer concerned in these ways with stasis or equilibrium of product type, yield, or both, is the producer who is setting out to change the type or levels of production and seeks to be able to sustain the production achieved through these changes. Thus a producer might move into an increasingly organic cropping operation (for whatever reason) and might be concerned to change her or his operation in such a way as to be able to sustain the production of organically grown products when the changes of operation are completed. Or again, a producer might be concerned to increase yields of the same type of products through taking over other farms in the area and thereby increasing the size or production level parameters of the operation. When this expansion is undertaken with controls aimed at being able to sustain the changed levels of yields, this, like the previous example, would be a case of the dynamic form of product oriented sustainability.

The next point to get clear on is that static and dynamic forms of product oriented sustainability can be undertaken in several different modes depending upon the resource use strategy through which the producer hopes to achieve continuity of production. If we review the ways in which producers have tried to achieve continuity of production levels or types we see at least four possibilities to pay attention to. Sometimes the resource use strategy amounts to nothing more than using up a portion of the land and water and then moving on. Other times it involves providing resource amendments that compensate for resource shortfalls interfering with sustained production. Alternatively, the strategy of producers seeking continuity of production type and level of yield has been to see to the resource's regeneration. And a fourth strategy seeks to keep the resource producing in a certain way that leaves the land and water homeostatic (with respect to yield type, level or productive capacity, or else with respect to the type of production systems itself) in the face of use and either climatic or pest threats. These four strategies provide us with four modes in which product oriented sustainability can be manifested in either its static or its dynamic forms.

Now that we have the basic concepts, I can set out each of these modes in each of the forms in question, indicating likely examples as they come to hand.

1) Static Modes of Product Oriented Sustainability

Recall that in static forms of sustainability, the aim is to keep yields or types of production (productive capacity), the same over the requisite period, as much as possible. Now how might an agriculturalist use the productive resource in order to achieve that aim?

a) *Reductive Static Agriculture.* Ecological historians provide us with vivid examples of one answer to that question. Clearly, the planning period of colonial extensive agriculturalists in this country ran no longer than the period in which the resource was not exhausted.[12] Their strategy was to use the land in a way that consumed its productive capacity in exchange for the target levels of harvest. When the resource's productive capacity was used up, the producers would go on to another place where the same activity would be repeated. This was the pattern of use in colonial and post-revolutionary New England, supposedly in post-civil war Ohio, and is to be found today in such widely different resource uses as pineapple plantations and (some) shifting peasant agriculture in the western tropics and India.[13]

Such a reductive mode of static product oriented sustainability is workable in case: *either* the planning periods are sufficiently short (as opposed to the indefinite planning periods of some pastoral uses of land), *or* the resources available are sufficient and population pressures are sufficiently slight so as to allow for relocation and (regeneration or non-reuse) as one parcel becomes productively exhausted and another is developed. Reductive resource uses thus characteristically lessen the resource's yields or yielding capacity for a certain product, but the population or harvest pressure on the total resource is such that producers can continue to hurt the resource as they do and it will continue to yield at a roughly constant rate (other things — such as natural catastrophes or major climatic changes — being negligible), over the planning period.

b) *Compensatory Static Agriculture.* Producers unwilling to just use up the land and move on would use a different strategy to ensure continuous production. They would seek to compensate for the damage they do to the resource or for the resource's shortcomings (relative to yield level or type expectations) and to compensate in such ways that the sought after levels or types of production are made possible for the planning period in question. Such a compensatory strategy has been most clearly in evidence in the U. S. since the second world war. Amendments, such as chemical fertilizers or pesticides, compensate for production's damage or the resource's weakness relative to the sought after production. They have enabled producers to boost and maintain profitable yields for limited planning periods. Similarly, many traditional agriculturalists have embarked on compensatory strategies of organic amendments or irrigation. These were to boost or maintain production, not to rebuild or permanently raise or maintain the resource's yields or capacity for the type of product in question.

c) *Regenerative Static Agriculture.* Through other resource use strategies, producers do contrive to rebuild the soil, range, their cultivars or their herd's breeding stock, either improving their ability to yield at a certain level for a certain product or repairing any degradation in yields or yield capacity of the resource that results from the use in question. According to proponents, an example of this sort of production can be found in Savory Grazing Programs or holistic range management programs, where the object is maximal sustained yields — presumably in equilibrium for some planning period.[14] Another example would be intensive organic farming where the aim is to improve or rebuild the resource, repairing damage done as the producer goes along. A specific technique in question would be, for example, manuring in order to rebuild nutrient levels and to control flooding.[15]

Notice that a use of this type might or might not go along with serving yield or yield capacity homeostasis. If the land involved is marginal, for example, it could be given a regenerative use that does not establish homeostasis, or, that is, is not yield or yield capacity self-maintaining, while under production.

d) *Homeostatic Static Agriculture.* However, some uses of agricultural resources are such that in response to disturbances (climatic or agricultural) the resource returns *naturally* to such a state that subsequent uses will produce the same yields or such that it will have the capacity to produce the same yields, if put to the same uses. The use of organic amendments to control flooding and thereby keep up yields or yield capacity in better than marginal soils and climates is a specific case of a pertinent strategy here, as well as in the previous category. Other more systemic examples would be found in well-established and unchanging traditional resource management techniques in an area the climate of which remains relatively constant.[16] In such a case there is likely to be a convergence between homeostatic uses and regenerative ones. But this convergence is not necessary. A low impact nomadic grazing use of land might be homeostatically sustainable, but not regenerative.

These same four sorts of strategies can be found working in dynamic product oriented sustainable agriculture, as well. Let me run through some explanation of those segments of the taxonomy. In discussing dynamic product sustainability as well as in speaking about process sustainability, I can be relatively brief, since we now have the basic concepts in hand.

2) Dynamic Modes of Product Oriented Sustainability

The aim in cases of the dynamic form of product oriented sustainability is to meet fluctuating demands or desires for yield levels and product types always proceeding in such a way that the final or temporally last set of demands on yields, yield capacities or yield types can be continued for the planning period.[17] With that in mind, we can recognize the following types (or ideal types) of strategic modes suggested by actual uses of agricultural resources.

a) *Reductive Dynamic Agriculture.* There seems to be a wide variety of agricultural activities that are changing in such a way that the producers (at least the ultimate resource users) seek to perpetuate the resulting cropping or other agricultural use of the resource, even though this perpetuation is using up the resource in question without corrective measures and is thus reductive. Many of these are tied to shifts from cropping to grazing activities, which are then carried on for food, profit, or the social status that derives in some cultures from simply owning a herd. The key in these changes often is the frequency of fires set by producers to clear land for cropping or other purposes. As it turns out, if producers burn too frequently, they will end up converting crop land (or forested lands) into pasture or other grassland suitable for grazing but not cropping (or silviculture). Sometimes this change of the types of products of a certain area or parcel is intentional, other times it is accidental. Sometimes it is perpetuated by the agriculturalists who brought it about, the shifting agriculturalists/pastoralists them-

selves. Other times the resulting grazing is pursued and then perpetuated by ranchers who come into possession of the lands after the crop agriculturalists move on.[18] In cases showing all these variations and involving resource degradation, cases ranging from erosion of former Central and South American forest lands that are now grazed to the desertification of African grazing lands that were formerly crop or forage areas, we see examples of reductive, dynamic, product oriented sustainable agricultural uses. (Clearly, in some of these changes we see not only a trade of one type of crop for another or one yield for another [as the transitions move along], but we also see the trade of one agricultural system or set of processes for another. We will come back to that in a moment when we discuss the next orientation in sustainable agriculture.)

b) *Compensatory Dynamic Agriculture.* If the changed type of product or level of production is continued with amendments or other compensating practices making up for the resource's lack of capacity for the new product or yield, or making up for damage done by pursuing the new product or yield, then we would have a case of compensatory dynamic agriculture. An example that comes to the fore is the development of so-called "square tomatoes" to go with mechanical harvesters. In this case, the cultivars themselves and the inorganic amendments used to produce these tomatoes, are changed to compensate for resource capacity shortfalls and weaknesses of formerly preferred cultivars.

c) *Regenerative Dynamic Agriculture.* If the aim is the repair of damage to the resource from the use of other methods, such as a reliance on heavy doses of chemical inputs, and if this is going on in order to maintain yields or product types as they have evolved over some period, then we are confronted with a case of regenerative evolving product oriented agriculture. For example some long-time Northwest Ohio producers of tomatoes and tomato products changed from hand picked cultivars to mechanically picked varieties. Along the way they had been following the rest of United States agriculture in becoming or continuing to be dependent upon heavy chemical inputs. Eventually (and recently) in order to cut operating costs and to rebuild the soil of their fields one of these producers began a transition to organic production methods. His move is aimed at regeneration and associated economies that will allow him to sustain his product type and yields for a longer term than promised by the alternatives. This is a clear case of a regenerative evolving product oriented sustainability.[19]

d) *Homeostatic Dynamic Agriculture.* This last category of dynamic product oriented sustainability captures any case of production where the type of product and yield level or capacities are dynamic or evolving, and where the resource treatment is contrived to achieve homeostasis for the last level of yields or yield capacities of the last product type, over the remainder of the planning period. A clear example is to be found in conversions on marginal lands from plantation crops such as pineapple to tree crops such as Pejibaye. Pineapple wears out the land leaving it good for not much more than a tree crop. Such areas can be converted to Pejibaye production, netting significant yields of economically and nutritionally important flour and oil products from the tree. Further this sort of conversion or evolution of the resource use is advocated in part because of its sustainability without compensating amendments. Indeed, the product seems perfectly suited in such applications to what I have called homeostatic dynamic sustainability in a product oriented resource use approach.[20]

B. Process Orientation

Having some clear idea of the motivating examples we might try to capture within the categories of product oriented sustainability, let us now turn to a parallel division of cases of process sustainability. In these cases, recall, the concern is to continue *a way of producing agricultural products*, not necessarily a type of product or a level of yield or yield capacity. It is what is sometimes called the "agricultural system" that the producers seek to maintain and protect for the planning period in question, not what comes from operating the system.[21] Continuation of particular patterns of agricultural activity on the resource, like the continuation of certain sorts and yields of products, can be static or dynamic in form and can employ any of four different resource use strategies.

1) Static Modes of Process Oriented Sustainability

In this form of process sustainability the aim is to keep agricultural production system types and proprietary structure the same over the requisite period, as much as possible. With that in mind, we can recognize the following characteristic (or ideal) modes of static process sustainability, derived from different modes of using the resource.

a) *Reductive Static Agriculture.* The best example of agriculturalists seeking to use up the resource in a manner that allows them to continue their way of producing food is to be found in the many cases of swidden or shifting slash and burn agriculture practiced with long fallow periods and over quite extensive ranges of land, by groups with relatively stable population sizes. If either the fallow period, the population demands on the resource, or the resource pool size is radically or quickly changed, then this sort of resource use becomes quite unstable. Nevertheless, until recently in many moist tropic regions, shifting traditional agriculture was quite stable as a way of securing food and fiber. As Peters and Neuenschwander explain:

> Although not all swidden groups have succumbed to the pressures of the modern world, few have escaped intact. Population increases, both internal and external, have created conditions of

> land scarcity, in all but the most inaccessible areas. Land scarcity, in turn has often resulted in the collapse of sustainable swidden. Subsequent environmental deterioration merely intensifies the scarcity of arable land. The inevitable consequence of this vicious cycle is the breakdown of tradition, the thread of meaning that runs through a life of subsistence.[22]

Such a loss of meaning is just a loss of or change away from, and thus a failure to sustain, a system or pattern of processes of agriculture.

b) *Compensatory Static Agriculture.* This category would capture any cases in which the resource is worked with methods or inputs that compensate for its shortfall or for damage done in the productive work, but where the main aim is to perpetuate a way of producing food or fiber. One dramatic example can be found in any of those modern industrial production system "packages" that combine genetically engineered cultivars designed to be cultivated with certain specially selected resource standardizing or remaking fertilizers and pesticides.[23] The use of such production packages is commonly required of farmers producing various products on contract. And the particular method of production in question is designed so as to be continued or sustainable over the planning period through the compensating inputs it involves.

If we are more liberal with the phrase "way of producing agricultural products," then any modern industrial agricultural operation that is heavily dependent on chemical inputs and government subsidies to produce ample and low priced food products would qualify as a case of pursuing static process oriented compensatory sustainability. The producers use the chemicals as productivity compensating amendments and to control the pests that often appear when biological means of weed and insect control are short circuited by the chemical fertilizers used. The subsidies (and to some extent the consolidation of farms that has been going on along with growing chemical and subsidy dependence in the United States) are used by the producers to compensate for high (and often leveraged) operational costs combined with low sales revenues. All of this compensation is resorted to in order to sustain the same manner of producing food and fiber. Thus our modern industrial way of producing food and fiber in the United States provides a case in point of static compensatory process oriented sustainability. To the extent that (a) this approach continues to produce low priced food and fiber products (even though not necessarily involving low total cost of food and fiber supplies after we figure in the cost of subsidies and satellite industries), (b) the fossil fuel necessary to drive the system is available, and (c) the compensatory measures involved in the approach do not bring on massive biological collapse, this mode of agriculture is sustainable. The odds are that these conditions cannot be met much longer, according to many environmentally minded critics.

c) *Regenerative Static Agriculture.* Some agriculturalists are quite opposed to compensatory uses of the resource and instead seek to regenerate land and range, thus making possible not so much a level or type of yield, as a way of life. Wendell Berry, noted author and (horse-powered traction) hill farmer in Kentucky, advocates such an approach along with the appropriate set of attitudes toward the resource and to work in small scale family farming. Without romance, Berry urges us to recognize the importance of work to human self-realization, and counsels a use of the land that would recognize the resource's productive limits, regenerate and protect its natural rather than artificial productive powers, and thoroughly integrate the land's sustained regenerative use with the producers' life plans, pursuits, and amusements. The message is carried succinctly in the following short poem:

> I go from the woods into the cleared field:
> A place no human made, a place unmade
> By human greed, and to be made again.
> Where centuries of leaves once built by dying
> A deathless potency of light and stone
> And mold of all that grew and fell, the timeless
> Fell into time. The earth fled with the rain
> The growth of fifty thousand years undone
> In a few careless seasons, stripped to rock
> And clay — a "new land," truly, that no race
> Was ever native to, but hungry mice
> And sparrows and the circling hawks, dry thorns
> And thistles sent by generosity
> Of new beginning. No Eden, this was
> A garden once, a good and perfect gift;
> Its possible abundance stood in it
> As it then stood. But now what it might be
> Must be foreseen, darkly, through many lives
> Thousands of years to make it what it was,
> Beginning now, in our few troubled days.[24]

Regenerative static sustainability might or might not go along with serving agricultural system and structural homeostasis. If, for example, the land involved is marginal, due to extreme climatic conditions, such as in the desert area of the Great Salt Lake Basin worked with irrigation by the Mormon pioneers, land could be given a regenerative use that is compensatory but that would never allow it to achieve productive or agricultural system homeostasis.

d) *Homeorhesic Static Agriculture.* The term "homeorhesic" will be unfamiliar, but is just what we need to label those ways of agricultural production and patterns of proprietary structure that are resilient or self-maintaining in the face of climatic or productive aberrations of the resource. It is a treatment of the resource such that in response to climatic and productive disturbances it returns *naturally* to a state with the ability to continue a certain system or proprietary structure, throughout the

remainder of the planning period. That is, homeorhesic use of agricultural resources is to patterns of resource use, ways of agricultural life and patterns of proprietary structure, what homeostatic use of the resource is to continuation of product type, yields and yield capacities.[25]

Examples are to be found in any social group whose agriculture is not particularly regenerative, but is protected by ritual or other culturally conserving practices, and is simultaneously able to continue and support those protected patterns of resource use even in the face of climatic and social inducements to change.

An example might be found in the ritually governed gardening practices of the Dogon in Africa.[26] Here, for instance, the jackal is allowed to roam through prepared cropping plots before the planting takes place. The shaman then "reads" the tracks to determine the appropriate place to plant the various vegetables that will be grown. An apparent reliance upon what I would call this "cosmological agronomy" proved culturally sustainable for a long period and so has proven to be, for a time, homeorhesically sustainable static agriculture.

The sort of agriculture Wendell Berry advocates would likely fit best with the protection of a way of life that is centered on small scale, animal powered, family agricultural prospects and pursuits.[27] Following Berry's lead, homeorhesic static agriculture would also be regenerative, or would incorporate, as needed, regenerative resource use patterns. This convergence is not necessary for some planning periods, in some regions, of course. The cases of the Dogon and the parallel case of homeostatically sustainable product agriculture found in low impact nomadic grazing resource uses make this clear.

2) Dynamic Modes of Process Oriented Sustainability

In cases that belong in this part of the taxonomy, the aim is to control or carry out fluctuations in the system type or proprietary structure of agriculture, always proceeding in such a way that the final or temporally last system or structural pattern can be sustained for the planning period. With that in mind, we can recognize the following characteristic or ideal modes of dynamic sustainable process agriculture, derived from different modes of using the resource.

a) *Reductive Dynamic Agriculture.* Perhaps the best known, indeed notorious case of this form of agriculture has such a short planning period that it seems to be the antithesis of what we would normally call sustainable agriculture. The agriculturalists are land speculators, the resource areas are lands in the relatively arid intermountain West, and the practice, now outlawed, has been called "sod-busting" or "plow out." In this deliberate change of land uses for a certain period, range lands are plowed and planted with a crop such as wheat. The crop is raised for a couple of years and the land sold before moisture levels show the inevitable ruinous results. The planning period, that during which the producer or speculator needs to keep the changed production system in place is a couple of years, and not the unlimited period typically associated with the term "sustainable." Still the idea of changing production systems or patterns with the intent to keep the last one going even though this will reduce the land's capacity to support such a system, is just the idea in dynamic reductive agriculture.

Another and more convincing example of the category in question now is to be found in the changing system and structure of agriculture at former swidden sites on Central American and South American lands. The switch in these cases is from swidden cropping to extensive pasturing of beef cattle. Again, in talking about this sort of practice in connection with product oriented sustainability, the switch over to grazing is often devastating for the resource parcels. One of the main troubles is erosion, which washes the thin exposed soils ultimately into the sea. Still, in spite of recognizing this reductive dimension of opening lands by shifting agriculture and then converting them to pasture, cattle producers serving ready markets in the United States and elsewhere induce the shift and seek to continue the grazing activity into an indefinite period of profit taking.

b) *Compensatory Dynamic Agriculture.* One example of ways in which the processes of compensatory agriculture are changing with an eye to perpetuating the newly achieved pattern of resource use methods is to be found in the United States in the spread of chemically supported no-till agriculture. Not all no-till agriculture depends on chemicals as did its heavy mechanized traction tillage forerunner. Still much of what is practiced as no-till today depends heavily on chemicals. Here, then, we see an evolution of modern compensatory farming practices toward a soil conserving mode of planting and cultivation, even though the result is an attempt to continue for an indefinite planning period a form of compensatory agriculture.

Perhaps an even better source of examples, however, is to be found in development schemes of Sri Lanka. Much of the dry central area of the island has been converted from slash and burn shifting agriculture or a mix of village tank irrigated and chena (shifting slash and burn) agriculture to lands irrigated from massive projects, most notably the Mahaweli Ganga project. Rice produced in two crops *per* year is the main objective in the regularly irrigated areas. And this development marks a radical shift, at least on colonized lands, from the sort of agriculture formerly practiced there. Also in Sri Lanka, permanent dry land cropping gaining the best income from chilies is another direction of major change from the former working of certain lands as swidden. One case of some apparently successful experiments in this direction is to be found in the aftermath of the now defunct Kurundankulama Dry Farming Settlement. Recently, the land has come to be worked by mechanized means with the use of chemical fertilizers, marking a radical

change from the uses of the resource earlier in this century. Changes such as these two instances in Sri Lanka are reliant upon compensating irrigation or chemicals and are undertaken in the hope of finding new and indefinitely durable ways of working the soil while improving standards of living.[28]

c) *Regenerative Dynamic Agriculture.* An interesting example of the quest for this sort of sustainability is to be found in the work of Louis Bromfield at Malabar Farm in central Ohio. Returning to the area of his youth, a popular and well-healed writer, Bromfield sought to revitalize the all but ruined lands he bought up and consolidated into Malabar Farm. Although never one to shun new technology that might have a place in his operation and always the experimentalist in his work on the land, Bromfield still was concerned most deeply and abidingly with a change of resource use patterns in the direction of rebuilding the soil and then continuing these practices, enjoying the fruits of the regeneration. He even offered a formula for such an undertaking, developing it with the producing farmer in mind. He made the following sorts of claims for his work:

> We found a formula by which we are able to build approximately one inch or more of good topsoil a year *while* producing from the land.... It is a system in which *both* trash-farming and the use of moldboard plow play their parts. There is in it nothing unusual and nothing which is not known to any good *"live"* farmer. We have simply put the elements together in a special pattern by which the maximum results are obtainable. It is a concentrated, high-pressure system, which is in no sense a short cut that would in the long run be profitless. It employs the methods by which Nature originally built our topsoil, simply speeding up the process about a hundred thousand times. I set it forth here because we have tried it and succeeded in building six to seven inches of good topsoil in five years while growing crops on the same land.[29]

The National Academy of Science urges the same sort of change of farming practices or systems toward a suite of regenerative dynamic agricultural systems and the structural changes that might go with that change. Content with their basic life ways and what that implies for the appropriateness of certain agricultural technology and methods, and yet willing to change elements of their resource uses to achieve a state that is homeorhesic for their particular culture, the Amish present a related example of the next category in the taxonomy.

d) *Homeorhesic Dynamic Agriculture.* Amish farming practices can be largely (though they are not exclusively) organic because of their religious prohibition on the use of motorized traction and self-propelled field implements and their substitution of horse power for machines. These organic practices, in turn, are regenerative of the resource as befits the work of stewards of the Deity's provision of land. The Amish do use some chemicals and some of their field machinery is powered by gasoline engines. Indeed, as a recent study makes clear, the Amish have moved away from their solely organic and animal, hydro- or wind powered farming operations in order to remain competitive and to keep their operations highly productive. However, all of the evolution that their farming practices has undergone has been carefully monitored and kept within standardized constraints to serve the continuation of the basic values and religiously centered life of the people. Perhaps there could be no better example of homeorhesic dynamic sustainability. As Donald Kraybill explains:

> The turbulent sixties, which led up to the division of 1966, were a benchmark in Amish history. It was a time when key understandings became inscribed in the Ordung. Horses would stay in the field. Symbols of Amish identity, they would set the pace of things and curb expansionist tendencies. Self-propelled harvesters, combines, and haybines were outlawed, probably forever. Modern farm machinery, such as mowers, balers, sprayers, corn pickers, all powered by engines, would be tolerated if pulled by horses. So the Amish farmers who baffle Moderns by pulling haybailers through the fields with mules are not foolish. They are simply yielding to a reasonable compromise with modernity which respects tradition, curtails expansion, provides labor, protects ethnic identity, and permits just enough technology to let them survive financially. It has become a good bargain — one that harnesses the power of progress in creative ways for the welfare of the ethnic community.[30]

Thus we have here sixteen different and potentially conflicting visions of sustainability in agricultural operations. Not everyone of these is associated with the unlimited planning period sometimes suggested by the term "sustainable." Still, as the illustrations make clear, they are (some of) the categories we need in order to capture all of what might be intended by talk of sustainable agriculture.[31]

In the face of these different categories, is it any wonder that debates over sustainability in agriculture are confused and confusing. Is it any wonder that people can agree on valuing sustainability and disagree on what orientation, form, and mode of agriculture they value? Is it any wonder, for example, that the Kansas legislators can criticize a citizen's committee for the committee's criticism of lack of low input sustainable agriculture research in the Kansas Experiment Station work? Is it any wonder that Iowa fertilizer and chemical dealers can resort to verbal abuse of Iowa State University Research that is LISA oriented? And is it any wonder that while all this heat is being generated, many writers feel that even LISA or other approaches I would classify as compensatory are wrongheaded because they treat soil as a resource to be treated apart from its larger ecological

context and used up? Is it any wonder that when some authorities and power groups are arguing sustainability in terms of varieties of compensatory modes, Wes Jackson can say the following:

> With all of these recent successes in low-input agriculture, we must acknowledge that there will be an *upper limit* in our attempts to save soil, reduce the chemical assault on our soils and water, and reduce fossil fuel dependency with till agriculture. This is especially true if we forget or ignore the need to move the larger economy, of which agriculture is only a part, away from an emphasis on *extraction* to an emphasis on *renewal* . . .. Sustainable agriculture will not be achieved with the likes of better input-output modeling where extension workers teach farmers about "smart management of our agricultural resources." That's part of the old paradigm [which we need to abandon].[32]

Here Jackson is calling for us to turn away from both reductive and compensatory modes of sustainability in favor of either regenerative or homeostatic (homeorhesic) modes. He is urging that there is something wrong about staying with the former instead of turning to the latter.

The taxonomy obviously can help us put all this in sharper focus, so we better understand the stakes of the debate. But can it help us settle the debate? Will the taxonomy help us focus on the ethically preferable sort of sustainability? Do ethical codes — any and all ethical codes — demand sustainability and do they demand some particular orientation, form, and mode(s) of sustainability? I believe the answer is yes. And, in fact, I believe Jackson is on the right track in the passage just quoted above.

III. Do Ethics Demand Sustainability? Two Related Reasons For Answering, "yes": The Intrinsicalist And Instrumentalist Arguments

There are two lines of argument for the claim that ethics demand sustainability. These are completely general in the sense that regardless of the particular normative project an ethic urges, regardless of whether it calls for maximizing social welfare or individual autonomy or social justice or some other ethical goals and values, still the ethic is shown by these lines of argument to demand sustainability. These two lines I will call the intrinsicalist and instrumentalist arguments. Let me explain the basic idea.

Both the intrinsicalist and the instrumentalist arguments start with the question of whether sustainable agriculture or sustainable yields in some form(s) is necessary to the functioning of ethics as guides of human conduct. Depending upon whether or not the conduct in question is the conduct of agriculture, I call the argument, respectively, intrinsicalist or instrumentalist.

The basic strategy of the *intrinsicalist* argument is to show that indeed sustainable agriculture is necessary to any version of the *project of living ethically while being an agriculturalist.* No matter what values or ethical ends in particular we are pursuing in the very conduct of agriculture, still our conduct will qualify as ethical *only if* we are pursuing sustainable processes of agriculture or a form of sustainable yields. That is —

> Intrinsicalism: If we act ethically in producing food and fiber, no matter what our particular ethical project might be, then we will engage in the pursuit of a sustainable agriculture or sustainable yields.

One important consequence of this claim is that if we are not engaged in a sustainable agriculture, then we are not acting ethically in the *very conduct* of agriculture. I do not mean that if we are not engaged in sustainable agriculture, this is one (perhaps not decisive, but at least *prima facie*) ethical reason to change our ways. Rather the argument works toward a stronger point. If we are not producing food and fiber sustainably, then we are not acting ethically, *and all things considered* we should abandon our unsustainable ways.

Thus the intrinsicalist argument purports to be an extremely powerful set of considerations on behalf of sustainability. It amounts to showing that unsustainability in agriculture is simply, all things considered, ethically indefensible and thus that whatever it takes to become sustainable is something we should do, for as long as that is possible.

The second or *instrumentalist line* of argument proceeds to an equally strong conclusion, but not by focusing on the very expression or manifestation of ethical conduct in agricultural production. Rather the emphasis is on what is necessary as a means to the possibility of there being *any* project of ethics *at all* and of there being *any action* in pursuit of that project. The pivotal claim of this line of argument is that if there is to be any ethical project, whatever particular form that might take, then agriculture must be conducted sustainably, in yields and process.

Clearly, the full and final support of such strong claims calls for a careful consideration of a number of contingent and categorical matters most of which are beyond the scope of a single paper. Nevertheless, in the space remaining here I can sketch the arguments and move toward a suggestion of the particular orientation, forms, and modes of sustainability they call for. Both arguments turn on the same fundamental idea. Informally, this is the claim that the justifiability of pursuing an ethical project brings with it the justifiability of being conscientious about making sure we keep available the opportunity and means to pursue that project. That is if we are to pursue some ethic's values or goals, we must take care not to limit our capacity, ability, or opportunity to do so. And, if we are to pursue those values or goals over an indefinite period of time, then we are to take care not to limit our capacity, ability, and opportunity to do so over an indefinite period of time. Let me turn to the

details of this appeal to conscientiousness.

A. The Instrinsicalist Argument

i. *The Responsibility and Accountability Premise.* No matter what ultimate values or goals an ethic calls upon us to pursue, that is, no matter what the ethic's project, we are required to look out for and respond to conditions favorable to the pursuit of that project and to turn away from or avoid conditions unfavorable to it.[33] Further, we are accountable for taking care in these ways to realize the project of the ethic. This means that it is justifiable (other things being equal) for people (perhaps ourselves, perhaps others) to call on us to defend ourselves against blame or liability to punishment whenever we do fail to take advantage of conditions favorable to the project and to avoid conditions unfavorable to the project.[34]

ii. *The Perpetuity Premise.* Furthermore, no matter what the ethic calls for in its particular set of basic values or goals, the project is undated. By that I mean there is no reason (outside of an arbitrary and so indefensible preference) to favor the ethical project's pursuit or realization *at one time rather than another.* There is nothing ethically significant about an act's being performed at one time or another, or about a person having a certain trait at one time or another. Time itself makes no inherent difference to the ethical character of an act, to any of its outcomes or to a trait of a person, at least at the foundations of an ethic, that is at least as a determinant of the basic values or goals of an ethic. What an ethic identifies as good or right most generally, or most basically, is identified as such because it fits some certain characterization. And since our ethic purports to give us guidance on what is right or good, where that guidance is of use for an unspecified period of time, the characteristics it identifies as marks of the good or right will not themselves be characteristics of acts, or outcomes, or traits present in only a certain limited time frame. The ethic purporting to guide us into an unlimited future will urge such things as murder is wrong or peace is good, not such things as murder is wrong until next Tuesday or peace is good for the next thirty days.[35]

Ethical projects are undated even in an action guide that allows revision of its norms. Such an ethic would urge for example that peace and social harmony are good until overwhelming considerations lead us to change that norm or call for a new ethical vision. It would not say that such things are good or their pursuit right during a certain period only or until a certain date. Even if they are open to change, the ethic's specific partitions between the right and the wrong, the good and the bad are treated as abiding. Even revisable ethics respect the difference between using and revising a rule that Rawls made much of many years ago and the point here is that when we specify an ethic's project we are taking up the stance of using not revising that norm, a stance from which the ethic's project is undated.[36]

Now, of course, an ethic might sanction a particular dated project such as a promise to perform a certain act, during only a certain period of time (say the promise to sell or buy grain at a certain price for a certain period of time). But the perpetuity premise is not concerned to preclude such dated ethical norms. Rather the point is that the most basic values or goals of an ethic, those we ultimately appeal to in justifying assessments of individual acts (or even so-called middle level norms), are undated. The ethical force of particular promises may be dated while the ethical force of promises in general is not. The ethical sanctity of particular arrangements for peace and harmony may be dated even though the values of peace and harmony themselves would not be.

Thus to the extent that an ethic seeks to guide us for an unspecified period or into an unspecified future, to that extent the most general or basic values and goals it seeks to guide us toward realizing will remain values and goals for the unspecified period. Since all ethics do seek to afford us such undated guidance, at least in their most general or basic norms, the values or goals defining their sundry projects will also be undated. That is the meaning and rationale of the perpetuity premise.

iii. *The No-Temporal-Bias Premise.* Now then, since any ethic must say that we are responsible for pursuit and realization of the ethic's project, and since that project is undated, future realizations of the project, to the extent that these are in our control are as important as present ones. In other words, at the foundations of ethics, or that is, with respect to the pursuit of an ethic's project, there is no legitimate, no nonarbitrary discount rate. This is true no matter whether we are practicing agriculture, teaching, manufacturing, statecraft, or the management of our personal affairs; it is true no matter the area of human endeavor where we might pursue the ethical project. Therefore, in the pursuit of that project, for example in doing the right thing in the very conduct of producing food and fiber, there is no occasion of production that is more important than another, in and of itself. And, if we were to pay heed to this in our conduct of agriculture, we would not act so as to favor one occasion of producing food and fiber over any other occasion for doing so. Rather, we would act so as to avoid precluding one moment or era of agriculture as we move forward in another, to the extent that this is in our control.

In short, if we act ethically in the very conduct of agriculture, we would act, to the extent this is possible for us, in a way that is without temporal bias. And this is true generally, no matter what else we would do in agriculture.

iv. *The Sustainability Conclusion.* However, to conduct agriculture without temporal bias *is just to conduct it sustainably—either in the pursuit of sustainable yields or as a sustainable process,* for whatever is the appropriate planning period. In the enterprise of conducting agriculture ethically, the planning period is that unspecified period during which we are supposed to attend to the

ethic's project. Thus not only will agriculture as an arena of ethical practice be conducted sustainably, it will be conducted sustainably into an unspecified future. The intrinsicalist argument thus not only supports sustainable agriculture, but it also supports the root idea of sustainability carrying agriculture into an indefinite future.

Now of course, this is no final argument for conducting sustainable agriculture since it is no argument for conducting agriculture at all. It is only an argument for saying that if we are to conduct agriculture and do so ethically, then we will proceed sustainably to the extent this is in our control.

But do we need agriculture at all? Well no, if we can synthesize the various nutrients that our bodies need (— in which case we should urge sustainable synthesizing!).[37] However, fortunately for families or other social units whose cohesion depends upon gathering at meals and for others whose employment depends upon the production, distribution, processing, redistribution, and preparation of food, we are not to the point that we can get along without farmers, ranchers, fishers, and others who produce food and fiber. This is the simple fact that people have in mind when they argue on behalf of sustainable agriculture from considerations of survival. And, this is the seed of the instrumentalist argument. Recall that that line of argument urges that sustainability is called for as a necessary condition not of practicing agriculture ethically, but rather of pursuing any ethical project in any arena of human endeavor. The argument can be sketched as follows.

B. The Instrumentalist Argument[38]

i. *The Pre-condition Premise.* At present, since there is no replacement for agriculture, any ethical project has as an indispensable precondition that we have agriculture for the production of food and fiber.

ii. *The Modified Responsibility and Accountability Premise.* But then since we are responsible as accountable for some ethical project or another and since all ethical projects have as an indispensable precondition that we have agricultural production, then we are responsible as accountable for conducting agriculture, to the extent this is in our control and to the extent this is necessary as a precondition of the conduct of ethical projects.

iii. *The Modified Non-Temporal Bias Pursuit Premise.* However, intrinsically, there is no time bias in non-arbitrary ethical projects, and at present there is no time limitation for the pre-conditional character of agriculture, relative to the pursuit of any ethical project.

iv. *The Modified Sustainability Conclusion.* Therefore until there is some change in the status of agriculture as a pre-condition of the conduct of any ethical project, a time that is not yet knowable or known, then we should conduct agriculture in a way that is non-time biased, that is in a sustainable fashion. I take it that people have had in mind something like this argument when they urged the impossibility of imagining an ethical justification for unsustainable agriculture, or when they urged that it seems crazy, irrational, or fundamentally counterproductive to set aside sustainability.

Still this does not tell us what orientation, form, or mode of sustainable agriculture we should advocate. Those questions take us to the next section.

IV. Do Ethics Demand A Particular Mode And Form Of Sustainability? Narrowing Down The Alternatives

A. Against Reductive Sustainabilities, Malthusian And Skeptical Worries

For the sake of argument, suppose that the world's population does not yet exceed its agricultural carrying capacity as determined by the basic needs everyone has if they are to lead a life approved by some plausible ethic or other. That is suppose that we *can* feed, clothe, and house the world's billions at a level necessary if they are going to lead an ethically acceptable life. Still, it is clear that we cannot provide these necessary levels of support through some reductive mode of agriculture. At least we cannot provide these necessary levels in a sustainable way that is not time biased.

The first reason why has to do with population expansion. Reductive agriculture even at its best was never much better than a source of subsistence for relatively small groups. It could not be intended as more than a supplement to a total food and fiber pool available for the people of the world. Recently, however, because of dwindling land areas and increases of surviving populations among and surrounding dependents on reductive agriculture, even subsistence goals have not always been met.[39] In addition, even population increases and market generated tastes at a remove of thousands of miles have contributed to the lowered effectiveness of much current reductive agriculture in meeting subsistence demands. I refer to the conversions of swidden lands into pasture or crop lands as described above.

Thus the intrinsic and instrumental contributions of reductive agriculture to ethical projects are small and being diminished in several ways by the world population increases.

These Malthusian worries do not counsel abandoning reductive agriculture, of course. They merely, but severely, limit the role such agriculture could play if it is to be sustainable in the non-time-biased way called for by the perpetuity premise of the intrinsicalist and instrumentalist arguments. Nevertheless, if we add to the discussion some skeptical worries, we do seem forced to set aside reductive agriculture in favor of one of the other modes we have investigated. The point at issue here is the responsibility and accountability premise of the intrinsicalist and instrumentalist arguments. The point is simply the following.

It is not clear at what levels of reduction or at what levels of what kinds of cropping we should proceed *even if we were to try to effect a reductive sustainability* in a real world dynamic environment of changing demands, use systems, and proprietary structures. Our ignorance of how much productivity we can strip away and continue to work the earth producing needed food and fiber is equaled only by our ability to ruin that resource. This is clear from the desertification of northern Africa and other areas, from the insupportable (unsustainable, if not also unjustifiable) draw-downs of deep aquifers in the midwestern United States, and from the rate of ruin and erosion of our tropical forests. That much seems indisputable. Therefore, our ignorance would seem to dictate a skeptic's caution, if we are to live up to our responsibilities of non-temporally biased use of resources. In other words, if we are to conduct reductive agriculture striving for control of the harm done so that our work can be sustainable indefinitely, and so that we can be accountable for this, then we need to balance the harm we do against the demands of sustainable yield and process. In a dynamic form of real world agriculture, the only way to effect this balance seems to be by taking care of the resource as a skeptic's hedge against the possibility that we don't know how to sustainably practice reductive agriculture. To take such care, however, is just to abandon the reductive mode in favor of a compensatory, regenerative, or induced homeostatic agriculture. Skeptical worries about reductive agriculture used as a supplement or a primary source of food and fiber drive us to the practices of another mode of agriculture.

B. Against Compensatory Sustainabilities, More Skeptical Worries

When we turn to compensatory agriculture, however, we are no closer to satisfying the responsibility and accountability premise of the intrinsicalist and instrumentalist arguments.[40] Consider static compensatory sustainability first. Surely that has been the goal of so-called maximum sustained yield agriculture. But just as surely, we have failed to achieve that goal because of all the vagaries of independent variables in the production process, vagaries we cannot predict nor then control for, short of remaking the resource in ways that seem not to be sustainable indefinitely. However, dynamic compensatory yield sustainability is no better in this regard, it seems. At least the burden of proof seems to be on those who would urge that our knowledge base equips us better to sustain a shifting yield demand than a static yield demand. The former promises to be as or more complicated than the latter, so that if we do not know enough to compensate for resource deficiencies and impacts as we seek a static yield from the land, then we are surely in worse shape to change and sustain this changed yield. The static project is a little like weighing frogs on a pan balance. As we reach for a counterweight or try to take a reading the frog jumps, squirms, or lurches in a way ruining the attempt. Things will be no better when we try a different scale or a different frog it seems.

Site specific knowledge of our resource might *help* us know how much we can grow indefinitely in a compensatory fashion. But all indications are that while our knowledge of the resource and its response to compensating amendments will help us know how to proceed, it will not provide the best guarantee. Climatic variations, pesticide immunity cycles, soil compaction and erosion, as well as other well-known problems suggest that if our goal is indefinite yields at certain levels, then we cannot act most responsibly in a compensatory mode.[41]

The picture is no more heartening if we turn to compensatory *process* sustainability, either static or dynamic. If there is an economic lesson of the eighties, a decade that ended with continued dependence of bigger producers in the United States on subsidies, and the continued demise of smaller producers, it is that compensatory agriculture in its characteristic American form of modern industrial agriculture is not sustainable in terms of the system and the structure of agriculture — either considered statically or dynamically. Erosion rates of soil, of small scale farmers with invaluable local agricultural and resource knowledge, and of rural communities are too great to continue indefinitely. Ground and surface water pollution and consumption in some areas are too great to continue indefinitely. Subsidies in the United States, if not elsewhere — (consider the Uruguay talks between European nations and England) are too great to continue indefinitely.

C. On To Regenerative And Induced Self-Maintaining Agricultural Modes

The modes of agriculture remaining in my taxonomy are regenerative and homeostatic/homeorhesic modes of sustainability, either in static or dynamic forms of yield and process orientations. But what form (static or dynamic) of regenerative or self-maintaining agriculture should we favor?

Although this is an area where we need considerable sociological and anthropological work to determine the facts of the matter, there seems to be no clear reason why any certain *static* product or yield level or any single static manifestation and cultural setting of regenerative and self-maintaining agriculture is to be favored ethically. To make the case we cannot plausibly argue that there is only one correct ethical project and in fact only one agriculture with which to serve that project intrinsically or instrumentally.

Elsewhere, I have agreed with others that there is no inherently correct ethical project.[42] Thus to suggest that static regenerative or induced self-maintaining agriculture is called for to serve the single preferable and unchanging ethical project is doomed to failure.

However, even if there were one right ethical project, in a world where great cultural diversity is manifested in dramatic economic and technical differences and chal-

lenged by changing climatic, resource, and population conditions, it seems unlikely at best that that "correct" ethical project would be best served by a *static* form of regenerative or self-maintaining agriculture.

Much more likely is that even enduring ethical projects are best served in a changing world by dynamic forms of yield or process agriculture. One prime example of this is the Amish of the United States who, as we saw, have changed dramatically (in some ways) in their agriculture in order to stay the same in their ethical project as the world changes around them and their members increase.

Thus I believe we need to pay closest attention to dynamic forms of sustainability in the modes of regenerative and homeostatic/homeorhesic sustainability. Having said that, however, I have little to add. I know of no clear way of making the complex determination of which of these modes of evolving yield or process sustainability is feasible, and beyond that, which if either is called for intrinsically or instrumentally by some further features common to all ethical projects that are defensible. For now, I can only offer these two possibilities as apparently equally well justified by the two arguments I have offered on behalf of sustainability and against certain modes of agricultural resource use. Suffice it to say that if I am right even that far, then there are large consequences for what is presently our predominant mode of agriculture and our predominant attitudes toward agricultural resource management in this country.

V. Getting Straight Our Priorities Of Orientation Process First And Yield Second

While I cannot choose between regenerative and self-maintaining modes of sustainable agriculture, there is something else to say about the ethically preferable approach to sustainability. There is good reason to establish a priority ranking of the two orientations. The pursuit of a process oriented sustainability takes precedence over the pursuit of a yield orientation.

The short account of why amounts to the fact that if we were forced to choose between the two, sustaining yields and sustaining agricultural systems and structures, there is clear reason for a certain preference. The guiding question is, "If we must choose, then which orientation, product or process, would allow us to be conscientious in the pursuit of our ethical projects?" The idea is summed up in the urging to "never eat your seed corn." The point is that if things have come to such a pass that we must feed fewer, lowering yields or not meeting the latest yield level or capacity, in order to perpetuate the latest system and structure of agriculture, then that is clearly the choice to make. If only some can live to farm and eat another day, while the alternative is that all can eat today but the chances are that there will be no sustainable farming another day, then the choice seems clear, given the premises I have enunciated above in the intrinsicalist and instrumentalist arguments. The premises of responsibility and especially non-temporal bias would be violated if we were to do otherwise than to favor process over yield or product orientation. And if this is right, then there are significant implications — in particular, the process orientation has priority.

Now, in order to respect that ranking, we will need to use agricultural resources at any given time so as to generate yields, as much as possible meeting the basic needs of people and their various ethical projects. However, that aim is ethically subject to the proviso that we are simultaneously practicing a process oriented regenerative or homeorhesic mode of sustainable agriculture. If we cannot practice in such a process oriented way while also meeting yield demands, ethically we should take steps to change those production demands. Thus we want to achieve in sustainable agriculture yields that are 1) adequate to the maximum possible pursuit of the defensible ethical project(s) at stake, and, 2) produced by current but dynamic regenerative or homeorhesic (sustainable) process oriented modes of producing food and fiber.

This goal will require several more or less revolutionary changes for at least the predominant agriculture in western industrialized countries and the U. S. S. R. For example, with regard to identifying optimal yield levels, this process priority approach will call for us to determine the appropriate carrying capacity of the resource and to try to produce at that level. In all likelihood, this will involve some farmers in some common agricultural practices across the globe. However, uniformity of practice would not result (as is now the case) from profit oriented standardization of resource treatment, but instead from cross-regional common regenerative and homeorhesic needs of the resource *and* the common basic needs of ethical project participants served by the resource.[43] Clearly, to the extent that there are local resource and ethical project participant differences, sustainable process oriented agriculture will have to respond to them to ensure optimal yields as specified above. Further, population growth and cultural change previously associated with growth economics may have to be slowed or frozen to make it possible to meet yield demands as specified above.

I do not mean to suggest that agriculture will have to be planned and orchestrated to meet these objectives. Rather, I mean that, as much as possible, every agriculturalist will need to practice so as to meet these objectives and to not interfere with others doing the same. To some extent, this would probably call for smaller scale local market targeted traditional agriculture.[44] But that will not be the only pattern. Areas with appropriate process oriented sustainable bounty will need to produce for those without.

In all of this, people in the private and public sector will be operating under conditions of great uncertainty as they strive for patterns of resource use and policies

through which they can achieve the optimal yield levels described above. Ethically, however, that is the challenge we face if we are to respect the priority of process oriented sustainability.

VI. The Very Idea Of Sustainable Use Rates: Looking Out For Today In A Way That Serves Tomorrow

The above notion of optimal yields as constrained by ethical concern *and* by the priority of process oriented sustainability does not equate to that ideal of a few years ago, namely a use rate that ensures productivity giving maximum sustained yields. Still the above remarks will allow us to say a little about the rates of resource use that are sustainable, and about a related topic, the rights of future generations.

The project of identifying a sustainable use rate seems to be that of identifying a strategy that assures that pressure on the resource never exceeds what is consistent with the continuation of system and structure of agricultural activity that together generate a desired yield throughout the period of planning. Since there is no nonarbitrary temporal bias with respect to ethical projects, no discount rate or savings rate is in question. Rather, the activity and yields in question are presumed to be as defensible tomorrow, as today, as long as there are agents functioning under the constraints or guidance of the pertinent ethical project.

If, as former Secretary of the Interior James Watt allegedly believed, the days of everyone of us are numbered, numbered the same for everyone as we move toward the judgment day, and if the number of days remaining to us is small, then, in fact there is a temporal limit to our concerns with resource use. The planning period is finite and management becomes a *relatively* straightforward set of problems. However, such doomsday predictions are the stuff of faith not reason, and so, in the context of this discussion and until we have appropriate evidence to the contrary, we should proceed as though there is no *de facto* limit on the planning period we are concerned with. Thus we must ask, "How should we act today so as to ensure that in our tomorrows and in tomorrow's tomorrows people will be able to conduct agriculture ethically?"

The question is tricky, however, and we need to beware. It sounds like it seeks a particular use pattern or rate such that for every particular producer, if *this* producer for *this* parcel were to produce in the specified way or at the specified rate, then, tomorrow's ultimate viability for everyone would have been assured. That quest is misguided, however. It sets us looking for the formula that will assign to each in the future her or his proper due, and will translate those just deserts into a picture of exactly what individual uses today will ensure the ultimate desired result. Such a quest is misguided because it is silly and it is confused.

It is silly because there is *no single* use pattern or rate that will ensure the yields we will want in some later tomorrow. What will ensure those yields all depends upon what *others* do today and tomorrow, and it depends on all the other intervening and apparently unpredictable events that will contribute to making today's efforts produce tomorrow's conditions. It all depends upon who is around tomorrow and the rest of the uncertainties that philosophers and economists have repeatedly alerted us to. The question seeks a single and fixed answer today, an answer predicting events beyond the ethically usable reach of prediction because they involve a myriad of individual interactive decisions, policies, and practices based upon unpredictable outcomes of earlier decisions. It asks us to determine something prospectively that we would have ethically responsible knowledge about *only retrospectively*. The question is silly because it is one more quixotic hangover from an intellectually and ethically bankrupt quest for certainty.

The question is confused because it asks what might we do *here and now* that will ensure the perpetual continuation of the desired yields. The point is that there is *nothing* we can do *now* with that upshot. The problem is not that the project of acting today so as to ensure perpetual optimal yields is hopeless, but still something that makes sense to think about. Rather the point is that we will get to tomorrow, enjoying an agriculture with sustainable processes and yields, *only when we have gotten there and because of all that is causally relevant that went before*, not because of the one thing that we are going to do today to ensure that result a hundred tomorrows hence. There is not a single thing, done by a single producer that will ensure the continued productivity in a certain system, structure, and yield of even a certain single plot. Rather sustainability is a matter of what the producer does today *and* over all the intervening days — correcting for, repairing, or otherwise adjusting to whatever else others or the elements do in the interim.

Looking for present day use that will ensure sustainability is like looking for the cause of the continuation of a series, and trying to find that cause outside the particular events that went into the series at each juncture where it could have broken down and stopped. From the fact that the series has continued, we cannot infer that there was at some point or at every point a cause of its *overall* continuity, any more than, as Lord Russell urged upon Father Copleston, from the fact that each event in a causal series was caused by another event, it follows that there was a single cause for the whole of the series.[45] *Sustainability is a property of a series of interconnected uses extending over some period of time*, not a particular use at any one time. Like Rome, sustainability is not built in a day. And, when the planning period is indefinite as ethically it should be, the building of sustainability *unlike* Nero's Rome is never finished.

The use rate or pattern my argument urges is that which, according to the best judgment available at the time, promises to be dynamically regenerative, or,

homeorhesic and homeostatic as defined above. Each of us in using the resource must be responsible for that much and no less, to the extent this is in our individual and cooperatively collective control. That seems to be what we are accountable for, if the above arguments are correct. But that use rate or pattern is different from the silly and confused planner's ideal referred to above. Each producer should act in a process oriented regenerative or homeostatic/homeorhesic manner. If we do so today, tomorrow will take care of itself.

VII. Conservation And The Rights Of Present (Versus Future) Generations

But what about the rights of future generations? Not everyone can make good sense of talk about such rights, of course.[46] Nevertheless, for the sake of argument, let us say that there are rights of future generations. Still, the point of the previous section's argument is that we would be silly and confused to try to act now so as to ensure that we do no violence to those rights. Short of making such a mistake, perhaps we should ask what rights present generations now have to use agricultural resources; perhaps we should abandon the task of looking out for the rights of future generations in favor of the task of sustainably looking out for the rights of present generations. With this shift of perspective, the question becomes, "How much of the earth's bounty is each of us entitled to?" If I am right, I have already gone a ways to answering that question. Each of us is entitled to what can be gathered, and gleaned from a sustainable process orientation toward land, water, and animal stocks, realized in a dynamic and either regenerative or induced self-maintaining use, as much as that is in our control.

It is no simple matter to spell out this idea further. But it is something we can spell out. Also it is something we can begin to understand and something we can empirically check our progress toward. This approach, I believe, suggests a comprehensible articulation of Locke's answer to the question of the rights of future generations. It suggests, a way to spell out our entitlement to use the resources as long as we leave "still enough and as good."[47] Of course, John Locke's test of the limits of our rights was apt to a state of nature, not such a civilized situation as our own. Even so, a sort of sustainability that leaves "still enough and as good" seems just right as we look forward into an unlimited and unformed future through which, for what we can tell, all of our present arrangements will pass away and be replaced a number of times, even while the demand to make conscientious provision for the ethical project of the moment does not pass away or change.

Notes

1. An earlier version of this discussion was presented in May of 1990 at Colorado State University. I wish to thank David Crocker and Holmes Ralston for their comments and questions on that occasion.
2. This confusion and resulting conflict is noted among others, by Dennis R. Keeney, "Toward a Sustainable Agriculture: Need for Clarification of Concepts and Terminology," *American Journal of Alternative Agriculture*, Vol. 4, Numbers 3&4, 1989 (Greenbelt, Maryland: Institute for Alternative Agriculture), pp. 101-105. See also Garth Youngberg and Richard Harwood, "Sustainable Farming Systems: Need and Opportunities," in the same issue of *American Journal of Alternative Agriculture*, p. 100. Also see, William Lockeretz, "Open Questions in Sustainable Agriculture," *American Journal of Alternative Agriculture*, Volume 3, Number 4, 1988; Pierre Crosson, "What is Alternative Agriculture?" and J. Patrick Madden, "What is Alternative Agriculture?," both in *American Journal of Alternative Agriculture*, Volume 4, Number 1, 1989, pp. 28-31 and 32-34, respectively. These authors recognize that we can define sustainable agriculture in terms of certain goals, practices, or agricultural systems, but that doing so is contentious. Others note that we might avail ourselves of current distinctions between, for example, regenerative, sustainable, and organic agriculture and then rationalize our preferences among those. Common to all of these discussions seems to be the understanding that the terms "sustainable agriculture" are far from univocal and that this plurality of meanings leads to trouble in the arenas of assessment and policy making.
3. Dana Jackson, "The Greening of Agricultural Policy, Can It Happen in Kansas?" *The Land Report*, Spring 1990, Number 37, (Salina, Kansas: The Land Institute) p. 38.
4. Often the period in question is said to be indefinite. However, that is just one notion of sustainability — a notion most often associated with the concerns of environmentalists and extensive users of land such as ranchers. Thus, for example, Kenney, in "Toward A Sustainable Agriculture," cited above in note 2, says, "A shorthand definition of Sustainability is 'forever.'" (p. 102) But then he goes on to talk about "operational concepts" of sustainability that are profit oriented and so are not necessarily concerned with 'forever'. Others wish to dissociate the concept of sustainability from an indefinite planning period, *e.g.*, Charles M. Benbrook, "Sustainable Agriculture: Policy Options and Prospects," *American Journal of Alternative Agriculture*, Volume 4, Numbers 3 & 4, 1989. See page 154 where Benbrook says that a question for the emerging policy debate is "What time frame should be applied?" In this discussion, the length of the planning period will be crucial to determining what is an ethically sustainable agriculture.
5. This, as opposed to trying to understand sustainability in terms of a list of goals often mixed along these dimensions and troubled for policy making because

of this mix. For such an approach in terms of goals, see Lockeretz and Keeney cited in note 2 and Benbrook cited in note 4.

6. This difference is part and parcel of the emphasis on agricultural systems in understanding alternative agriculture as opposed to conventional agriculture. See, Committee on the Role of Alternative Farming Methods in Modern Production Agriculture, Board on Agriculture, National Research Council, *Alternative Agriculture*, (Washington, DC: National Academy Press, 1989), p. 3ff., and see a similar emphasis in the definition of alternative agriculture by Benbrook, in "Sustainable Agriculture," cited in note 4: "In short, the definition stresses the general goals and concepts in the farm management decision process, not a discrete specific outcome." (p. 154) A generalization of this separation will closely approximate the separation of orientations I set out here.
7. Another type of product orientation can and does concern itself with maintaining product quality level. This is one aim mentioned frequently by actual producers as an objective of sustainable agriculture. In what follows, I will leave this additional variable out of the discussion, without forgetting it. For examples of this variable at work, see, Nancy Matheson (ed.), *AERO's Guide to Sustainable Agriculture in the Northern Rockies and Plains* (Helena, Montana: Alternative Energy Resources Organization, 1989). See pages 17 and 18 for a number of possible goals for sustainable agriculture including product quality.
8. This seems to be a concern of those speaking of agroecology. See, *e.g.*, Miguel A. Altieri, *Agroecology, The Scientific Basis of Alternative Agriculture* (Boulder, Colorado: Westview Press, 1987).
9. One can recall the famous injunction of Earl Butz, "Get big or get out."
10. A similar distinction is to be found in Nigel Dower, "Philosophy, The Environment and Sustainable Development," *Revista De La Universidad Autonoma De Yucatan*, Febrero, 1990, Edicion Especial (p. 51), and "What is Development? A Philosopher's Answer," *Occasional Papers Series*, Glasgow University Centre for Development Studies, No. 3, 1988.
11. While it is to be understood in what follows, I will not continue to add "or production capacity."
12. See, Carolyn Merchant, *Ecological Revolutions* (Chapel Hill, North Carolina: the University of North Carolina Press, 1989), Chapter 5, especially the last two sections.
13. The reference to Ohio is from a State Park System guide presentation on the predecessors of Louis Bromfield into the area of what is now preserved as Malabar Farms, Lucas Ohio (see: Louis Bromfield, *The Farm*, New York: Avon Books, 1946). See, Eugene B Shultz, Wayne G. Bragg, Alejandro R. Martinez, and David W. Pluymers, "New Strategies for Bioresource Development in the Third World," in Charles V. Blatz, (ed.), *Ethics and Agriculture* Moscow, Idaho: University of Idaho Press, 1992 for a discussion of the conversion of abandoned or used up pineapple plantations to the cultivation of the food bearing palm, Pejibaye. For other examples see, Gene C. Wilken, *Good Farmers: Traditional Agricultural Resource Management in Mexico and Central America* (Berkeley: University of California Press, 1987), and William J. Peters and Leon F. Neuenschwander, *Slash and Burn: Farming in the Third World Forest*, (Moscow, Idaho: University of Idaho Press, 1988), p. 60.
14. See, *e.g.*, Matheson (ed.), *AERO's Guide*, cited in note 7, where holistic range management is reported as a current practice of western U. S. producers. See also the *Savory Newsletter*.
15. See, Matheson (ed.), *AERO's Guide*, cited in note 7 and *Alternative Agriculture* cited in note 6.
16. See Wilken, *Good Farmers*, cited in note 13.
17. Again, this discussion could be complicated along several lines including sustaining product quality. However, that would be unnecessary here.
18. See Peters, *Slash and Burn*, cited in note 13, Chapter 4.
19. The case was described by John Hinsel in the Spring of 1990 at a public talk held at the First Unitarian Church of Toledo.
20. See Shultz, *et al.*, "New Strategies," cited in note 13.
21. Again, in this connection, see *e.g.*, *Alternative Agriculture*, cited in note 6 and Benbrook, cited in note 4.
22. See Peters, *Slash and Burn*, cited in note 13, p. 75.
23. See, *e.g.*, Donald Duvick, "Genetic Diversity and Plant Breeding," in Blatz, (ed.), *Ethics and Agriculture*, cited in note 13 and Keeney, "Toward a Sustainable Agriculture," cited in note 2 above.
24. Wendell Berry, "VIII," *Sabbaths* (San Francisco: North Point Press, 1987), p. 17.
25. The term is that of Eric Jantsch, *The Self-Organizing Universe: Scientific and Human Implications of the Emerging Paradigm of Evolution*, (Oxford: Pergamon Press, 1980).
26. The Dogon practices and cosmology are reported by M. Griaule, *Conversations with Ogotomelli: An Introduction to Dogon Religious Ideas* (London: Oxford University Press, 1965).
27. See also, Leonard J. Arrington, "Can the Family Farm Survive?" in E. Richard Hart, *The Future of Agriculture in the Rocky Mountain West* (Salt Lake City: Westwater Press, 1980).
28. See B. L. C. Johnson and M. Le M. Scrivenor, *Sri Lanka* (London: Heinemann Educational Books Inc., 1981) pp. 70-78.
29. Charles E. Little (ed.), *Louis Bromfield at Malabar, Writings on Farming and Country Life* (Baltimore:

The Johns Hopkins University Press, 1988), p. 123.

30. See Donald B. Kraybill, *The Riddle of Amish Culture* (Baltimore: The Johns Hopkins University Press), p. 187.
31. I say some for I have omitted consideration of sustainable product quality and other objectives in the taxonomy. However, this much at least is necessary. For example, in Keeney, "Toward a Sustainable Agriculture," cited in note 2, we can find concerns with static process compensatory (103 and 104), dynamic process homeorhesic (103), and product oriented sustainable agriculture. Such variety is to be expected in discussions where sustainability is understood in terms of several production and system goals. And it is to be expected in a movement that has been described as having several various "planks," like a political party. See Wes Jackson, "One Victory is Not Enough," *The Land Report*, Fall 1989, Number 36, p. 23.
32. Wes Jackson, "Two Paths to Sustainable Agriculture: Justification for the One Less Traveled," *The Land Report*, Summer 1990, Number 38, p. 32.
33. In another place, I have argued that only permanent traditional agriculture qualifies by its objectives, as well as epistemic, management, and social infrastructural expectations as a form of agriculture that respects the accountability premise. The arguments that follow would supplement that discussion to say that it is permanent traditional agriculture of a certain orientation, form, and mode that alone qualifies in this way as ethical. See my paper, "Styles of Agriculture and Styles of Ethics," *Journal of Agricultural and Environmental Ethics*, 5, 1 (1992), pp. 59-85.
34. See Charles V. Blatz, "Accountability and Answerability," *Journal for the Theory of Social Behaviour*, Vol. 2, Number 2, October, 1972.
35. The prime example of an advocate of this timeless character of norms is G. E. Moore, *Principia Ethica* (Cambridge: Cambridge University Press, 1962). However, we do not have to go so far as to believe with Moore that norms are necessary truths in order to endorse a version of the view that they are timeless in their statement and that we have a derivative ethical concern to be conscientious about taking steps to keep open the possibility of conforming to them throughout the undated period of their legitimacy.
36. See John Rawls, "Two Concepts of Rules," *The Philosophical Review*, Vol. 64 (1955), pp. 3-32.
37. Apparently we are not far from the day when we can carry out such a project of synthesis. Lignocellulose from perennials could be the base source of this food. But even here the suggestion is that the technology would be so complex as to be unsustainable into an undated future. See, David W. Orr, "Food Alchemy and Sustainable Agriculture," *BioScience*, Vol. 38, No. 11, December 1988, pp. 801-802.
38. The Instrumentalist Argument is to be found virtually anywhere there is a discussion of sustainability as a policy concern. A vivid form of it is the following? "Can we afford a sustainable agriculture? Indeed we cannot afford any other type of agriculture! This is the only game in town." Charles A. Francis, "Sustaining Agriculture and Development," *American Journal of Alternative Agriculture*, Vol. 4, Numbers 3 & 4, 1989, p. 192. Would that it were a game and the only one in town rather than a house with many mansions!
39. See *e.g.* Wilken, *Good Farmers*, and Peters, *Slash and Burn*, cited in note 13.
40. See also, Blatz, "Styles of Agriculture and Styles of Ethics," cited in note 33.
41. A similar point is argued most effectively in P. A. Larkin, "An Epitaph for the Concept of Maximum Sustained Yield," *Transactions of the American Fisheries Society*, January, 1977, Vol. 106, Number 1, pp. 1-11.
42. See, for example, Charles V. Blatz, "Ethical Issues in Private and Public Ranch Land Management," *Agriculture and Human Values*, Vol. 1, No. 4, Fall (1984), pp. 3-15.
43. So, I am not disagreeing with those who say that sustainable agriculture has to be profitable. Rather I am trying to put that condition of the continuation of production units into perspective. It is not the most important thing or even something that is important in itself at all. Rather it is something that is important as a means to what is important in itself.
44. See Blatz, "Styles of Agriculture and Styles of Ethics," (cited in note 33) for one argument for this claim.
45. See the discussion of the Russell-Copleston debate in James W. Cornman, Keith Lehrer, and George S. Pappas, *Philosophical Problems and Arguments: An Introduction*, third edition (New York: Macmillan Publishing Co., Inc., 1987), pp. 221-224.
46. See *e.g.*, Richard Sikora and Brian Barry, eds., *Obligations to Future Generations* (Philadelphia: Temple University Press, 1978) and Ernest Partridge ed. *Responsibilities to Future Generations* (Buffalo, NY: Prometheus Books, 1980).
47. John Locke, *The Second Treatise of Government, An Essay Concerning the True Original, Extent, and End of Civil Government*, Book II, Chapter V, "Of Property," section 33 (1690).