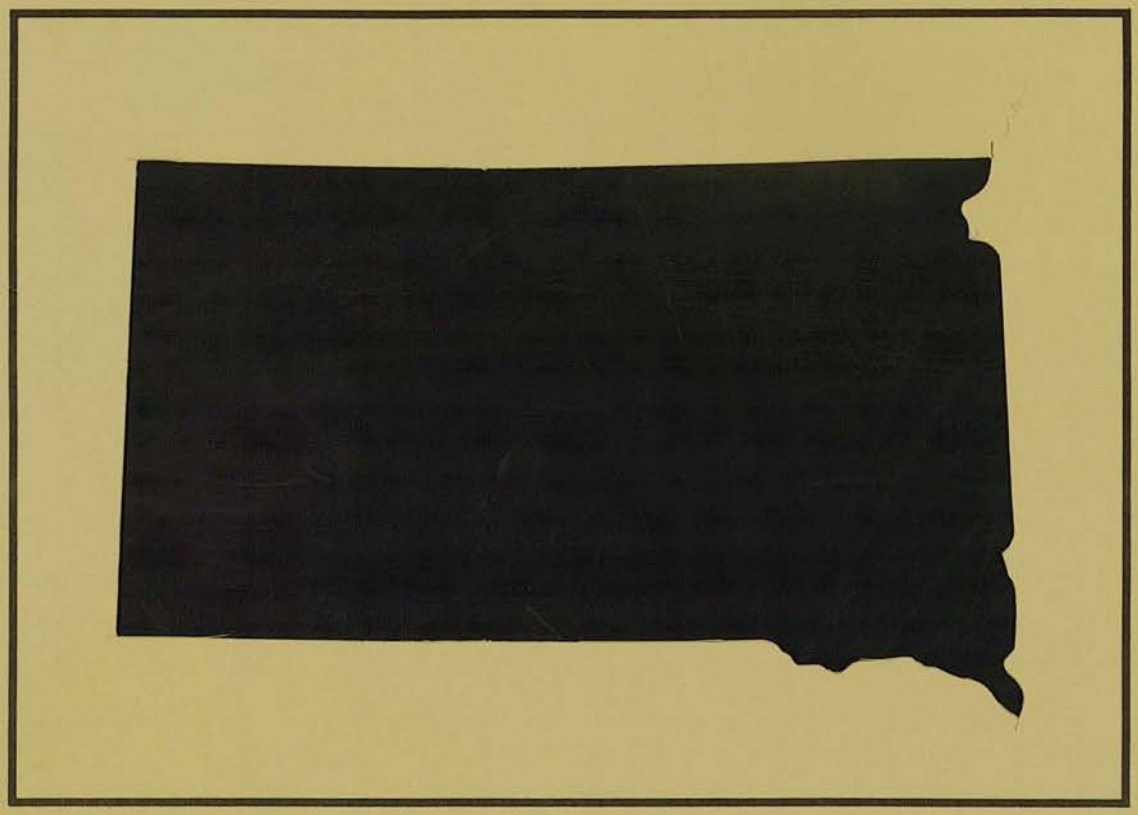

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UNDERLYING VALUES AND BELIEFS "MODERN SCIENCE" VERSUS "SUSTAINABLE DEVELOPMENT"

by

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UNDERLYING VALUES AND BELIEFS: "MODERN SCIENCE" VERSUS "SUSTAINABLE DEVELOPMENT" [1]

by Donald C. Taylor

"Sustainable development" is a broad, multifaceted topic without a universally-accepted definition. In broad terms, however, sustainable development concerns philosophies and courses of action to help insure the **long-term** ecological/environmental, institutional/social, and economic "staying power" of various geographical entities in the world: villages, towns, counties, states, countries, regions, and the world at-large.

"Sustainable development" is a highly controversial topic. Part of the controversy arises because of ambiguities in the definition of "sustainability" (Allen, et al., 1991; Batie and Taylor, 1991; Crosson, 1989; Keeney, 1989; Madden, 1989; Toman, 1992). Controversy also arises because of differences in the personal values and beliefs among different people and how those values and beliefs translate into decisions in the home and in the private and public work place (Beus and Dunlop, 1990; Dahlberg, 1986; Freudenberger, 1986; Henning and Mangun, 1989; Kirschenmann, 1988; Soule and Piper, 1992).

This article focuses on personal values and beliefs that critically underlie the "sustainable development" controversy and on the implications of those values and beliefs to personal and professional decision-making. The issues are presented through two contrasting paradigms: a "modern scientific worldview" (MSW) and a "sustainable development worldview" (SDW). MSW is intended to characterize the perspectives of most current-day academics, development practitioners, businessmen,[2] and everyday citizens. SDW characterizes those disenchanted with MSW. Their disenchantment arises from concerns over possible adverse long-term implications of decisions arising from MSW which tend to be dominated by relatively immediate, narrowly-based, and self-interested considerations.

The first section in the article provides a brief historical perspective on the emergence of "sustainable development" as an issue in current-day society and in public policy decision-

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[1]This manuscript, submitted for possible publishing by **Agriculture and Human Values,** is an expanded and modified version of papers presented (a) at an International Workshop on Sustainable Development for a Better Future sponsored by the Association of Southeast Asian Nations (ASEAN) and the New Zealand Government held in Serdang, Malaysia on December 10-12, 1991 under the title of "Sustainable Development: Concepts and Processes" and (b) as the Annual Phi Kappa Phi Lecture at South Dakota State University on October 26, 1992 under the title of "The 21st Century: The World to be Dominated by 'Modern Science' or 'Sustainable Development?'."

For a summary of the main points in the paper, see Table 1 (p 4A) and Table 2 (p 11).

[2]When the terms "man" or "mankind" are used in this article, the terms are intended to be gender-neutral.

making. Eight illustrative contrasting MSW-SDW personal values and beliefs are then presented, followed by six illustrative impacts of those values and beliefs on private and public decision-making. The article concludes with the issuing of a challenge to the reader.

People, ecosystem, and economics

At the center of the sustainable development arena are people, the ecosystem, and economics. People's values and beliefs are reflected (1) individually as family members, businessmen, government servants, and other types of workers and professionals and (2) collectively through our involvement with various private and public institutions. The world's "ecosystem" consists of natural resources, nutrient and water recycling, water and air filtration, climatic and atmospheric gases regulation, and other phenomena that support animal (including human) and plant life, protect health, and otherwise enable maintenance of critical natural world functions and equilibria (after Westman, 1977). Economics involves the allocation of resources available to society so as to maximize personal well-being through determination of such items as prices for various inputs and outputs, incomes earned by individual members of society and businesses, savings and investment, and the gross national product.

A central factor determining the current and prospective future welfare of mankind revolves around the balance between (1) increases in the demands placed on the ecosystem by man through increases in population and in personal income and (2) the capacity of the world's ecosystem to meet those increased demands. Until relatively recently in "macro-time," a substantial surplus-cushion existed between the supply of regional and world ecosystem services and the demands of mankind for those services. As a result, issues of regional and world sustainability remained latent.

During the current century, however, the world's population has increased 3-fold and the world's economy 20-fold (Colby, 1990). In recent decades, especially, rates of growth in the world's population and world economy have risen to be unparalleled in history. "Modern science"-driven technology, man's ingenuity, and institutional innovations have enabled many of the challenges accompanying rapid population and economic growth to be met (Simon and Kahn, 1984). Because the capacity of the world's ecosystem is essentially fixed, however, certain threats to localized and world ecological stability and resilience have arisen (Colby, 1990; Daly and Cobb, 1989; Heilbroner, 1980; Norgaard, 1988).

As the 20th Century comes to a close, a growing minority of the world's population has become deeply concerned over one or more of the following ecosystem and institutional stresses and strains (Berry, 1977; Frederick and Sedjo, 1991; Harwood, 1990; Jackson, 1985; Poincelot, 1986; Rodale, 1983; WCED, 1987):

* Deterioration in the quality/quantity of ground and surface water resources, farmland, and forestry and coastal resources (Anderson, 1990; Chua, et al., 1989; Dixon, 1990; Edwards, 1988; Follett, 1989; Francis and Youngberg, 1990; Goodland, 1990; Gregersen, 1988; Hallberg, 1987; NRC, 1989; Papendick, 1987; Repetto and Gillis, 1988; Waddell and Bower, 1988);

* Threats to human health through (a) workers handling toxic synthetic chemicals and/or working under unsafe conditions (Howard, et al., 1981) and (b) diet-sensitive consumers eating foods or drinking water containing harmful chemical residues (Balasubramaniam, 1974; Coye, 1986; Halloran, 1986; Ruttan, 1990a);

* Fewer family farms (Daniels, 1989; Lappe, 1985; Strange, 1988), weakened family structures (Bauer, 1992; Swindoll, 1991), and the demise of traditional rural communities (Allen, et al., 1991; Berry, 1977; Daly and Cobb, 1989; Flora, 1990a and 1990b; Hassebrook and Hagyes, 1989; Jackson, 1984; Naess, 1989; Rosenblatt, 1990; Strange, 1990);

* Inequitable distribution of wealth among various groups of people and limited access of poor/young people to sources of new income-earning streams (Crosson, 1986; Strange, 1991; Vosti, et al., 1991);[3]

* Depletion of non-renewable energy resources (Clark, 1990; Darmstadter, 1992; Hirsch, 1987; Kopp, 1992; Pimentel and Pimentel, 1986);

* Intensified urban and industrial air, noise, and solid waste pollution (Cao, 1989; Elkington, 1989; Kneese, 1984; Smith, 1987);

* Acid rain build-up, ozone layer depletion, global warming, and rising sea level (Martin, 1990; Morrisette and Rosenberg, 1992; Reilly and Anderson, 1992; Rosenberg, et al., 1989; Ruttan, 1990b; Stern, et al., 1992);

* Rapid population growth (Ridker, 1992; Southgate, et al., 1990); and

* Loss of cultural-diversity (Alexander and Kumaran, 1992; Norgaard, 1988) and bio-diversity (Affolter, et al., 1992; Cook, 1991; Merrick, 1990; Reid, 1989; Sedjo, 1992).

What are the prospects for mankind in the 21st Century? The answer to that question depends critically on the nature of decisions concerning natural and human resource development and use that will be made by public policy officials at all levels of government, private sector businessmen, community leaders, and parents/family heads. Those decisions will be importantly determined by people's personal values and beliefs.

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[3]See Tobey (1989) for a discussion of the proposition that, whereas economic development has tended to contribute to environmental degradation in industrialized countries, economic development offers prospect of curing some of the most pervasive environmental problems (e.g., deforestation, desertification, water-borne diseases) in developing countries.

Personal values and beliefs

Polar positions represented by the modern science worldview (MSW) and the sustainable development worldview (SDW) regarding seven critical personal values and beliefs are summarized in Table 1.[4]

Man dominant over or an ally with nature?

With MSW, nature is perceived as a resource for use by humans. Man has a right to use natural resources; these resources exist for his benefit. Man views himself to be dominant over nature. He seeks ways to make nature more fully meet his needs (Dahlberg, 1987; White, 1967). This view is epitomized in a statement by former U.S. Secretary of Agriculture, Earl Butz (1972, 5), "We are achieving progress, but we must battle with Mother Nature to unlock more of her secrets and to adapt more of her assets to mankind's benefit."

With SDW, on the other hand, man perceives natural resources to have intrinsic worth. Man appreciates the inherent function and natural beauty of nature. He views himself as an ally of nature. He respects and desires to live in harmony with nature (Bailey, 1905; Berry, 1990). He is reluctant to adopt approaches in development that "unduly" disturb nature--realizing that bottom-line, "Mother Nature bats last" (Rodale, 1981, 24). Man realizes that natural resources are a gift from the Creator to be used, but for a time, and then to be passed on to the next generation. He feels responsible to pass on to his children natural resources that are in at least as good condition as they were when he first received them. He places priority on preservation of natural wildlife and biological diversity (Devall and Sessions, 1985; Doyle, 1991; Weiss, 1990).

The deep value placed on nature by SDW adherents may be reflected in the way such persons might physically handle soil. They would likely pick up a handful of soil, carefully finger it, appreciate its tilth, and remember the multitude of various plant and animal forms that are present in the soil which give it "life" and contribute to its natural productivity. They ponder courses of action that might jointly (1) enhance the current productivity of the soil and (2) maintain and enhance the long-term productive potential of the soil.

Natural resources adequate to meet man's needs?

MSW adherents believe that natural resource reserves are adequate to meet foreseeable needs for the resources. They believe that new reserves of natural resources may be discovered to replace those that are used up. Even if the stocks of non-renewable natural resources (e.g.,

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[4]Since MSW is more familiar than SDW to most readers, I provide less elaboration in the article on MSW than SDW. The fact that I have done so does not necessarily imply that I am a stronger advocate of one worldview than another.

Table 1. Personal values and beliefs underlying "modern scientific" and "sustainable development" worldviews.

Modern scientific worldview	Sustainable development worldview
Man dominant over or an ally with nature	
Nature is a resource for use by humans	Natural resources have intrinsic worth
Resources are meant to be used by man	Man appreciates nature's beauty and function
Man has a right to dominate nature	Man is an ally with nature
Man uses nature to meet his needs	Man is reluctant to disturb nature too much
Natural resources adequate to meet man's needs?	
Natural resources are abundant	Man consumes "too many" natural resources
New natural resources may be discovered	Non-renewable resources are running out
Renewable resources can be substituted for non-renewable resources	Renewable and semi-renewable resources (especially solar) must be developed
Human ingenuity and broad-spectrum high technology adequate and appropriate to meet man's needs?	
Man's ingenuity & nature's capacity are boundless	Man's mind is finite; humanity has its limits
Man and technology team up: "human progress"	Negative spillovers may result from new technology
Rapid, global changes are okay	Pace of change needs to be controlled
	Human progress depends on more than just science and technology
Comfortable living at the center or sideline of life?	
Man seeks to improve his material quality of living:	Man lives simply
	There is such a thing as "enough"
* Accumulate ever more possessions	Man is broadly and deeply motivated
* Live ever more comfortably	Personal relationships are more important than a comfortable lifestyle
Man has unlimited wants	
Man dominated by individual self-interests or by community interests?	
Economic development is based on individual people seeking their own self-interests	Man works to achieve community goals
	Man is willing to make personal sacrifices for the good of his extended family and the community
Individual personal freedoms are highly important	Man derives as much personal satisfaction from the "best" that comes to others as the "best" that comes to himself
Man's health threatened?	
Current drug use and waste disposal regulations adequately protect man	Scientists can't necessarily detect all future possible dangers to man's health
If people don't follow regulations, "it's their own fault"	Some people don't understand dangers in drugs and wastes; accidents can happen
Perceived health problems from chemical residues in food are largely imaginary	Some people have arrived at or are approaching their threshold levels of chemical residues in food and water
Population growth a factor to be arrested?	
People are assets in development	The more people in the world, the greater the demands for resources
Technological progress will enable the earth to meet the needs of an expanding population	The world's population is rapidly growing, but the carrying capacity of the world ecosystem is essentially fixed
As long as people can afford children, they have a right to have the children	
Poor people responsible for their being in poverty?	
People in poverty are believed to not care about being in poverty	People are poor because of matters beyond their control, e.g., limited education, not personally connected with "big people"
They spend money on unworthwhile things, are lazy	Poverty is a vicious circle
Through economic growth, people can rise above poverty	

fossil fuels, minerals, metals) diminish greatly, they believe that renewable resources can be developed and substituted for them (NRC, 1986; Simon, 1990).

SDW adherents are deeply concerned about (1) the high level of consumption of non-renewable energy resources in industrialized countries and (2) the current rapid growth in the consumption of non-renewable energy resources in developing countries experiencing rapidly increasing per capita incomes (WCED, 1987; WRI, 1992). They foresee the day when the supply of non-renewable energy resources will be exhausted. They contemplate possible incentives that could be created for reducing consumption of non-renewable resources and expanding development and use of renewable (e.g., plants, animals, sun, water, wind) and semi-renewable (e.g., soil quality, ecological life-support systems, assimilative capacity of the environment) resources. They realize the importance of the world switching from its dependence on stock resources, especially from fossil hydrocarbons, to continuously current energy flows from the sun (after Crews, et al., 1991; Flavin and Lenssen, 1991; Frederick, 1992; Jackson, 1985; Norgaard, 1988).[5]

In countries with rapid population growth and economic development, the demand for water for agricultural, industrial, and municipal purposes is expanding rapidly. In some locations with limited natural precipitation and a heavy dependence on groundwater sources, rates of annual water withdrawals are exceeding rates of natural aquifer water recharge (Wang, 1989). As a result of year-to-year declining water tables, costs of lifting water are increasing and assurance of adequate long-term water supplies has come into question. Within this context, SDW adherents are concerned that already-developed water sources be used with maximum efficiency. Further, they believe that development of new water sources should be minimized--especially if such development would involve reservoir construction, watershed disturbance, and/or the relocation of local residents (after Echeverria, et al., 1989; Frederick, 1992; Lowrance, 1992; and Thukral, 1992).[6]

Human ingenuity and broad-spectrum high technology adequate/appropriate to meet man's needs?

MSW adherents believe that man has a deep and never-ending capacity to learn. His ingenuity and nature's capacity are both viewed to be boundless (Whitten, 1966). When "man's back is to the wall," he will be able to determine a way out. The almost explosive development of new technologies in recent decades reinforces the optimism/faith of many people in the positive possibilities of man and technology teaming up to achieve ever continued "human

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[5]Tidal waves are another resource which provides a continuous energy flow over time; also, some geothermal resources can be used for a long time (Norgaard, 1988).

[6]In some arid and semi-arid areas, problems of salinization, waterlogging, and desertification have been accentuated as a result of man's agricultural development interventions (Mannion, 1991). See Small (1984) for a discussion on interconnections between (a) development and management of public irrigation systems and (b) human health.

progress" (Clawson, 1960). People of this persuasion view economic and social development to inevitably involve change; a rapid pace of change is not necessarily viewed with alarm. Neither is a drive to search for universal solutions to common problems in various parts of the world viewed with alarm.

SDW adherents are less sanguine than their MSW counterparts in their views about human ingenuity. They believe that man's mind is finite and that many complexities in nature and life defy human explanation and understanding. They believe that very few newly introduced technologies or policies can bring "good" to everyone (WCED, 1987). Since negative spillover-effects from newly developed technologies may more than counterbalance intended benefits, man must be careful to not automatically jump on the "development-of-new-technologies bandwagon." SDW adherents, therefore, deliberately choose a moderate pace of change. Further, they appreciate unique (1) natural resource endowments, (2) technologies, and (3) human resources, institutions, and culture in individual local settings. SDW adherents believe that factors other than science and technology (e.g., indigenous culture, artistic values) should play critical roles in determining the "progress" of mankind (after Daly and Cobb, 1989; Ehrenfeld, 1978; Norgaard, 1988).

Comfortable living at the center or sideline of life?

With MSW, man's efforts are heavily focused on consumerism and improving one's material quality of living. MSW adherents tend to act as if their overriding objective in life is to have ever more possessions and live ever more comfortably (Durning, 1991). The fundamental presupposition in the discipline of economics of man having "unlimited wants" is directly in accord with MSW.

SDW adherents, on the other hand, believe in relatively simple lifestyles (Foster, 1981; Logsdon, 1984). There is such a thing as "enough" (Seabrook, 1978). SDW followers shed themselves of some of the baggage of "luxuries" which, for the MSW majority, are perceived to represent "basic needs". SDW adherents tend to be especially broad and deep in motivation, often with top priority to achieving deep inner self-realization. They realize that their welfare depends not only on their material possessions, but also on such things as (1) exercise of brotherly love and compassion, (2) security and stability of their community, (3) having a regional and national identity, and (4) richness of their culture and its artistic activities. For many SDW followers, personal relationships with their Creator, themselves, and other people are more important than achieving an ever more comfortable lifestyle (after Berry, 1990; Daly and Cobb, 1989; Devall and Sessions, 1985; Durning, 1991).

Man dominated by individual self-interests or by community interests?

The discipline of economics generally accepts the tenet that life is properly ordered if each person rationally seeks her/his own self-interest.[7] Embedded deep in the culture of many democratic countries--including especially our own--is a prominent role for individual personal freedom and independence. MSW adherents tend to not question the general exercise of personal freedom dictated by individual self-interest.

SDW adherents recognize that people come into this world through close interpersonal relationships and have no identity apart from such relationships. As members of local communities, they accord priority to community goals such as the following: (1) availability of satisfying and useful work for members of the community; (2) community morality, security, stability, and vitality; and (3) secure access for all members of the community to basic life necessities and services that make life varied, stimulating, and satisfying. They recognize that each person independently pursuing individual self-interests may not contribute to realization of some of these community goals.

To contribute to the welfare of the larger community, SDW followers develop personal discipline to live beyond themselves. They are sensitive to and take into account potential adverse third party spillover-effects from courses of action that otherwise might be attractive for them individually. SDW followers who are particularly mature may be able to find as much inner personal satisfaction from the "best" that comes to others as the "best" that comes to themselves. Such interpersonal sensitivity and response is likely to occur first with loved ones and immediate family, and later with the community at-large (after Berry, 1990; Daly and Cobb, 1989).

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[7]Daly and Cobb (1989, 138) indicate, however, that the Greek word from which "economics" is derived is "oikonomia," which means "the management of the household so as to increase its use value to **all members** of the household over the **long run**." They indicate that the current academic discipline of economics is much more attune to "chrematistics," which is defined as "the branch of political economy relating to the manipulation of property and wealth so as to maximize **short-term** monetary exchange **value to the owner**" (bold emphasis mine). According to "oikonomia," there is such a thing as enough. For "chrematistics," on the other hand, more is always better.

For an insightful treatment of modifying national income accounts so as to take into account natural resource depletion, see Repetto, et al. (1989).

Man's health threatened?[8]

MSW adherents trust regulatory agencies to (1) soundly evaluate potential harms in newly developed drugs and in industrial, agricultural, and municipal wastes and (2) formulate suitable guidelines for safe use of drugs and regulations to adequately protect against potential human harms from waste disposal (ACSH, 1990; Collins, et al., 1989). Further, those who follow MSW believe in a relatively laissez-faire approach for providing people protection from possible personal dangers in life. People are presumed to be intelligent enough to read and follow safety regulations on pesticides and other potentially dangerous consumer and producer goods. Health problems perceived to arise from harmful chemical residues in foods are believed by MSW adherents to be largely imaginary and/or extremely rare.

SDW adherents tend to be skeptical about the capacity of people and science to clearly and accurately determine the long-term potential dangers from newly developed drugs and intensified generation of industrial, agricultural, and municipal wastes (after Burke, 1992; Ferguson and Szmedra, 1991; Forcella, 1988; Mott and Snyder, 1990; Scherer and Juanillo, 1992).[9] Complex ethical issues are involved in specifying drug and waste tolerance levels [**Agric. & Human Values** III(1&2), 1986]. SDW followers believe it is unrealistic to expect all people--by virtue of differences in their education and natural temperament--to be careful in the use of dangerous chemicals.[10] Further, accidents are a common part of human life.

Followers of SDW are concerned with the limited capacity of the earth's soil and water resources to assimilate ever greater quantities of waste products. To minimize potential growing human health hazards, they believe (1) waste generation should be minimized, (2) waste recycling should be maximized, and (3) standards for evaluating new drugs and regulating waste generation and disposal should be conservatively set (after ASAE, 1981; Burke, 1992; Chin and Kumarasivam, 1986; Hall, 1991; Jorgenson, 1989; Miller and Miller, 1990 and 1991; Mujeriego and Asano, 1991; Selke, 1990; Young, 1991).

SDW adherents believe that some people are especially sensitive to the presence of chemical residues in their food and water. Some have already arrived at their threshold

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[8]See (1) Winter, et al. (1990) for an analysis of chemicals in the human food chain; (2) **National Food Review (Econ. Res. Serv,, U.S. Dept. of Agric.)** [12(3), 1989] for a collection of articles on U.S. food safety; (3) Kramer (1990) for an examination of the consumer concerns with food safety; and (4) Sundlof (1989) for a comprehensive review of literature and recent U.S. experience concerning drugs and chemical residues in livestock.

[9]See Gianessi and Puffer (1991) for an illustrative discussion of the inadequacy of scientific and economic data in pesticide benefits analyses.

[10]Related concerns in human health are (1) protection of workers engaged in manufacturing and packaging pesticides against the toxicity of pesticides that they are handling and (2) the clear separation of pesticides from food and food related products in transportation and storage.

tolerance levels of chemical residues; others may soon arrive at their threshold levels, unless their exposure to "excessive" levels of chemical residues is reduced. SDW adherents commonly believe that consumers should be provided a market option of "synthetic chemical-free" food supplies.

Population growth a factor to be arrested?

MSW adherents have relatively modest or no concern with population growth (Kirkwood, 1992; Simon, 1990). They tend to view people as assets in economic development. "More people" means more human resources available to intensify the search for new technologies and to manage and implement new development programs. Larger populations are believed to bring economies-of-scale in production and consumption and to provide incentive for technological innovation and institutional change (Birdsall, 1989). Special political considerations may motivate certain nations to encourage relatively rapid population growth at particular points of time in their history.[11] Families that place a special value on being able to have children believe that, as long as they can afford to have additional children, they should not be restricted from having the children.

SDW adherents, on the other hand, are concerned about a growing imbalance between (1) the world's population and (2) the natural resources and ecosystem services required to adequately support life and protect man's health. While the world's population has tripled during this century alone, the world's stock of non-renewable resources is ever being depleted and the carrying capacity of the world ecosystem is essentially non-changing. SDW followers believe that responsible living at this juncture in man's history requires a slowing in the natural rate of population growth, though some struggle with possible policies to override individual personal preferences on family-size (after Devall and Sessions, 1985; Doyle, 1991; Repetto, 1985; Ridker, 1992; WCED, 1987).

Poor people responsible for their being in poverty?

The polar non-SDW view is that people in poverty are largely responsible for being in their state of poverty.[12] In the extreme, the poor are believed to not be particularly concerned about their depraved condition, spend money on unworthwhile things, and be too lazy to try to do anything about their lack of income/wealth.

SDW adherents, on the other hand, believe that poor people are poor largely because of circumstances beyond their control. Poor people's limited education keeps them from knowing

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[11]"Pro-life" people and those who believe that one of man's basic responsibilities is to procreate the earth are additional groups of people who are hesitant to place limits on natural population growth.

[12]This polar view has a looser connection to "modern science" than the other polar views presented in the paper.

about and keeping up-to-date on new economic opportunities. Poor people seldom have personal connections with those who decide on the allocation of resources and services intended to raise levels of personal income. As a result, they have less ready access to new income earning opportunities than their more well-to-do counterparts. At the same time, the elite are believed to often be positioned in such a way that they can "skim off," for themselves, the benefits of programs intended for the poor. Thus, people caught in the net of poverty often are in a vicious cycle (after Chambers, 1983).

Decision-making in people's public and private lives

Six pertinent issues in decision-making with traditional scientific versus sustainable development worldviews are summarized in Table 2. This presentation, as above, is in terms of polar MSW versus SDW positions.

Needs of current vs. future generations?

With MSW, people's decisions are based primarily on short-term economic and political considerations. In dealing with future time, i.e., with decisions that impact future generations, economists have traditionally used discounting methods to convert future benefit and cost streams to present values. In effect, it has been assumed that current generations (1) hold all rights over decisions on resource use and (2) should exploit use of the resources for their own benefit (Norgaard, 1992). A premium is given to achieving technical and economic efficiencies. Market prices are assumed to send appropriate and necessary signals for the allocation of resources.

In democratic countries, the recurring election process often tends to result in political decisions rather heavily based on short-term political efficacy. Authoritarian countries do "better" only if their rulers are aware of and give priority to strategies for long-term sustainable development.

In effect, then, decisions on resource use in most countries take into account the needs of the current generation of businessmen, public policy-makers, and politicians. For private individuals and civil servants, generation is defined in terms of the human reproductive process. For elected officials, however, generation is shorter, namely, their terms of office.

With SDW, decision-makers think a lot about the future which their children are likely to face. They try to envision and take into account the results of impending decisions on future generations. They are willing to make sacrifices for themselves if they believe that, by doing so, the long-term interests and welfare of their children and grandchildren can be advanced.[13]

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[13]The Brundtland Commission Report (WCED, 1987, 40) describes "sustainable development" as seeking "to meet the needs and aspirations of the present without compromising the ability to meet those of the future."

Table 2. Impacts of personal values and beliefs underlying "modern scientific" and "sustainable development" worldviews on decision-making.

Modern scientific worldview	Sustainable development worldview
Needs of current vs. future generations?	
Decisions are based primarily on short-term economic and political efficiency and efficacy	Decisions meet needs of both current and future generations
Current generation holds rights over decisions on resource use and exploiting the use of the resources for their own benefit	Reduced role of time discounting in economic project analysis, with joint attention to:
Decisions meet needs of current generation	* Short-term economic efficiency
	* Formation, maintenance, and transfer of assets to future generations
	* Meeting certain physical resource limits and standards
Economic growth vs. poverty alleviation?	
Economic growth is of paramount importance	There are limits to economic growth
"Trickle down" theory works	The poor have "co-equal" rights to the better off
Without economic growth, the sustained public delivery of special goods and services for the poor is infeasible	The poor both cause and reap negative repercussions from environmental degradation
	Special programs should be targeted to the poor
Centralized vs. localized development policies and programs?	
Maximize use of top-down decision-making by the political and administrative elite	Localized differences in resources, culture, and perceived needs are emphasized in planning
	* Capitalize on existing strengths of indigenous knowledge, technologies, and institutions
Decentralized programs are difficult to implement	* Results in sounder policies and programs
	* Ethically more appropriate
Okay to promote wide-spectrum, "proven" technologies throughout the world	Preserve biological diversity
	Emphasize localized self-sufficiency
Large-scale, specialized vs. smaller-scale, diversified enterprises?	
Per unit production costs are minimized with large-scale, specialized production enterprises	Enterprise diversification
* Fixed costs spread over more units of output	* Reduces ecological stresses and producer risks
* Pecuniary economies in buying inputs and selling outputs	* Brings benefits of enterprise synergism
* Narrow range of capital inputs required	* Maximizes use of wastes through recycling
* Concentrated management efforts	Limit waste generation to environmental assimilative capacity
Generation and disposal of wastes is not a particular problem to society	
Externally-purchased vs. internally-produced inputs?	
Intensified productivity requires use of many "modern" purchased inputs	Replace externally-purchased inputs with internally-produced inputs
Purchasing "modern" inputs often requires borrowed capital	Reduce financial risks arising from debt obligations
	Reduce dependence on fossil fuel energy sources
Individual component vs. holistic, systems-oriented research?	
Emphasis in science on individual component research, holding all things the same except one	Real-world production processes involve many complex interactions
Heavy reliance on mathematical and statistical analysis	Some holistic, systems-oriented, multidisciplinary research is required
Establishment of rather precise individual input-output "cause-effect" relationships	Knowledge obtained in rather particularistic and/or synthetic ways may be just as valid as knowledge gained through "traditional" formal mathematical and statistical analysis

Followers of SDW reduce the role of time discounting in economic project analysis. Their decisions involve joint attention to (1) short-term economic efficiency; (2) formation, maintenance, and transfer of assets to future generations; and (3) meeting certain physical resource limits and standards.[14]

SDW adherents undertake traditional economic analysis involving determination of short-term economic efficiencies and profitabilities. But the perspective surrounding use of traditional economic analysis is different. Economic analysis is used to complement other types of analysis, rather than to be the central sieve through which all other forms of reasoning must pass.

Explicit consideration is also given to the status of assets that will be passed on to future generations. Such considerations involve decisions to form, maintain, and transfer critical assets to succeeding generations so that those generations will inherit resources in at least as good a condition as when our current generation inherited its resources from our forefathers.

To accomplish such an intergenerational objective requires establishment of targeted minimum physical quantities of resources that must be retained or developed for passing on to the next generation. Setting such minimums is acknowledged to be rather arbitrary, but preferable to exclusively using a discounting process in which the value of net future benefits inevitably approaches zero. SDW adherents also establish minimum quality standards that must be maintained for critical natural resources (after Norgaard, 1992; Norton, 1989).

The successful incorporation of long-term perspectives in government and private business decisions depends on the existence of well-informed and "principled" decision-makers and clientele who are willing to accept short-term sacrifices to enable achievement of higher, long-term societal goals.

Economic growth vs. poverty alleviation?

Throughout the "modern" world today, and especially in our own country, economic growth is viewed as something almost sacred. Economic growth is viewed as sacred because of awareness of the tight interconnection between (1) the creation of additional jobs and business opportunities which places added incomes into the hands of the people and (2) national economic growth. Further, the discipline of economics explicitly emphasizes the importance of economic growth and implicitly takes the existing distribution of assets as given (Norgaard, 1992).

"Trickle down" thinking holds that, as economic growth takes place, an "invisible hand" automatically distributes the benefits of the growth widely throughout an economy, including to the poorest of the poor. According to "trickle down" views, the needs of the poor generally can

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[14]See D'Amato (1990), Gundling (1990), and Weiss (1990) for insightful discussions of legal considerations in the intergenerational transfer of environmental responsibilities.

be met as a byproduct of achieving economic growth, rather than depending on programs specially targeted to the poor.

If supplementary programs to bring economic and social uplift to poor people are to be established, however, the programs must be adequately funded. Often, such programs in Third World countries are initially funded with assistance from foreign aid. As time goes on, however, the foreign aid is gradually withdrawn. If the Third World country's economy is not growing over time so as to generate added income to fund those programs, the programs can no longer be continued. Thus, economic growth is perceived as a necessary condition to fund special programs targeted to the poorest of the poor (WCED, 1987).

SDW adherents believe there are limits to economic growth. While they recognize that achievement of economic growth is directly connected to possibilities for eradicating poverty, they do not accord a status of "sacredness" to economic growth (Daly, 1991; Meadows, 1977; Meadows, et al., 1972; Rees, 1984). "Too rapid" growth of the economy and increases in personal consumption can create critical personal and family stresses and strains. Further, when the limits of the generative and assimilative capacities of the ecosystem are approached, rapid economic growth inevitably brings ecological and environmental stresses (after Tobey, 1989).

Implicit in the operation of all countries, no matter whether democratic or not, is a natural tendency for the economic elite to play dominant roles in political and business decisions. Without efforts to override such natural forces, the poor can never expect to gain in position relative to the elite. Yet, by what criterion is it valid to say that the poor are of any less human value than the elite? SDW adherents argue that the poor have just as much right to benefit from political and business decisions as the economic elite do (after Allen, et al., 1991; Chambers, 1983). Their rights need to be met both intragenerationally and intergenerationally (Crosson, 1986).

Especially in Third World countries, the poor cause environmental degradation. The poor rely heavily on firewood and low-grade coal for fuel, thereby intensifying air pollution. Poor people often can't afford to install adequate sanitation facilities, with a result that they exacerbate problems of water pollution. Many poor people are shifting cultivators. As population grows, shifting cultivators are forced to go ever higher up the sides of steep hills in search of land to cultivate and firewood to burn. Natural ecosystems are disturbed; soil erosion ensues (after Bromley, 1986; Burki, 1990; Moldenhauer, et al., 1991; Tobey, 1989; Weiss, 1990).

At the same time, the poor are commonly recipients of industrial and other types of pollution and resource degradation (Colby, 1990). For example, in the Third World, poor people commonly live in or near coastal areas. Their livelihoods are often based on fisheries, related food resources, firewood, chemicals, and thatching materials obtained from coastal mangrove areas. With economic development, however, mangroves are commonly converted to agricultural, industrial, and urban uses. To illustrate, coastal areas are often particularly attractive logistically and economically as sites for infrastructure (e.g., ports, refineries) and

aquaculture development. Coastal resort development, particularly on tropical islands with coral reefs, has expanded rapidly. These economic development activities disturb local ecosystem equilibria, interfere with poor people continuing to be able to earn their livelihoods from the coastal resources, and degrade the water resource upon which the poor people depend for drinking, clothes washing, and other household uses (Taylor, 1992; WRI, 1992).

In the face of circumstances such as these, SDW adherents advocate targeting of special programs to the poor. They believe the "trickle down" phenomenon, by itself, cannot be relied upon--within a reasonable period of time--to bring adequate economic gains to the poor. Rather, special programs must be designed and implemented to deliver critical economic and social services to the poor (Ahluwalia, 1990; World Bank, 1990).

Centralized vs. localized development policies and programs?

MSW adherents are comfortable with approaches in development that are relatively centralized in scope and planned from the top-down. The political and administrative elite in a country are believed to know best how to formulate pertinent and soundly-conceived development policies and programs. Much additional effort would be required if input from the people-at-large was to be solicited and incorporated into national development plans.

If development programs are differentiated by region, a much more extensive administrative machinery is required to design and implement the programs. Resource requirements to organize, fund, and monitor decentralized programs are generally greater than resources to implement simpler, common programs for wide geographic areas.

A common MSW strategy, leading to the Green Revolution in wheat and rice and more recently with other crops as well, has been development of high yielding varieties with widespread adaptability (Pinstrup-Andersen and Hazell, 1985). The multiplication and distribution to producers of a few wide-spectrum varieties is more efficient than the multiplication and distribution of a larger number of varieties, each with a narrow range of adaptation.

SDW adherents see weaknesses in the effectiveness and appropriateness of top-down determined and administered policies and programs. They believe that resources, culture, and perceived needs vary much from place to place. The extra efforts required to secure grass-roots input in the development of locally differentiated policies and programs have more than compensating payoffs (after Berry, 1990; Chambers, 1990; Ekins, 1992; Flora, 1990a; French and Schmidt, 1985; Ghai and Vivian, 1992; Korten, 1987; Korten and Klauss, 1984).

According to SDW, man respects and taps the strengths in current location-specific institutional and cultural situations. He takes into careful account indigenous knowledge,[15] unique factor scarcities, and strengths in indigenous technologies and institutions before determining technological paths to pursue. The paths eventually adopted vary from region to region, in response to regional variations in indigenous resources.[16]

Such differentiated development approaches more effectively address unique, critical localized needs and take into account unique localized factor scarcities than more centralized approaches. Allowing more localized autonomy in designing and implementing programs also provides incentives for the more effective implementation of policies and programs (after Norgaard, 1988 and 1992).

Decentralized approaches to development permit a reflection in development policies and programs of the aspirations and perceptions of the people to be affected by the policies and programs. Such an approach to development is viewed to have special human/ethical value and, in the minds of some, to even be a basic right of those whose lives are to be impacted by development programs and policies.

SDW followers are concerned about the greatly narrowing genetic base for various food crops and forest species that has occurred during recent decades. They advocate establishment of germ plasm banks to preserve--for future generations--the very considerable genetic diversity originally found with most naturally occurring plant species. They also argue that plant and animal breeders should be particularly cautious to not unduly narrow the breadth of the natural genetic bases in their breeding programs (after Jackson, 1985; Merrick, 1990; WCED, 1987).

Some SDW adherents advocate development of self-sufficient regional areas, within country or among countries, depending on the size of individual countries and the nature of political relationships. The underlying rationale includes (1) minimizing dependence on others and (2) reducing the use of fossil fuel energy and other costs involved in the long-distance transportation of goods (Aiken, 1984; Mathur and Sdasyuk, 1991).[17]

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[15]See Bocco (1991), Hecht (1990), O'Brien and Flora (1992), and Pawluk, et al. (1992), and Warren (1991) for discussions of interconnections between indigenous knowledge and development.

[16]See de los Reyes and Jopillo (1986), IIMI (1989), and Uphoff (1986) for reports on farmer participation in the management of public irrigation systems in Asia.

[17]In a book nearly completed at his death, Robert Rodale described his plan for famine prevention in the world. The plan is an extreme form of regional self sufficiency: "the reestablishment of home gardening in Africa and other Third World areas pretty much encompasses all our solutions" (Rodale and McGrath, 1991, 216).

Large-scale, specialized vs. smaller-scale, diversified enterprises?

A hallmark characteristic of "modern" production technology, based on MSW, is large-scale production. Through specializing in one or only a limited number of enterprises, producers reap the "fruits" of economies-of-scale and associated "lowest possible" per-unit costs of production (Drache, 1976; Heady, 1976; Stanton, 1989).

A main reason why per-unit costs of output become less with large-scale, production is that total fixed costs of production can be spread over larger amounts of output. Further, advances in mechanical technology have often led to large-scale machinery for which per-unit costs of production are less (Johnson and Grabanski, 1989). Pecuniary economies in buying inputs and selling outputs can often be realized by larger-scale farms (Hallam, 1989). On specialized farms, capital inputs must be acquired for producing only a few, rather than many, enterprises. Higher levels of managerial expertise can sometimes be achieved if producers are able to concentrate their time and mental energy on only a few, rather than many, enterprises. This point has particular pertinence as production and marketing methods and processes become ever more complex (after Jensen, 1982).

The tendencies over recent decades, in many of the world's most intensive agricultural production areas, toward monocropping and elimination of diversified crop-livestock production systems are reflections of the MSW push toward large-scale enterprise specialization. In almost every country of the world, for example, poultry and pig production have become heavily "modernized," with most production via large-scale, highly specialized, confinement units of production.

SDW adherents look to enterprise diversification to (a) reduce ecological stresses and producer risks, (b) bring the benefits of enterprise synergism, and (c) maximize use of wastes through recycling (Berry, 1981; Flora, 1990a; Francis, 1988; Gliessman, 1990; Ikerd, 1990; Jackson, 1984 and 1985; Logsdon, 1984; Lovins, et al., 1984).

Natural habitats are characterized by the presence of multiple plant and animal species--each living in natural relation to the other. As agriculture production methods were first introduced in natural habitats, numbers of species were almost always reduced. In recent years especially, the trend toward species reduction has been accentuated in agricultural production centers throughout the world.[18] Accompanying the narrowing of species diversity is a loss in natural check and balance mechanisms, e.g., in respect to multiple plant species providing natural pest control. Producers who deliberately diversify enterprises are often able to restore critical balances similar to those in the natural ecosystem (after Altieri, 1985; Knezek, et al., 1988; Merrick, 1990; Simmons, 1989). Further, by not having their "eggs all in one basket," producers are able to reduce their production and financial risks.

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[18]Accompanying "modern" intensive agricultural production practices have also been losses of natural habitat, e.g., wetlands, woodlands, hedgerows (Mannion, 1991).

According to "synergism," the whole is equal to more than the sum of its individual parts. By carefully choosing combinations of enterprises, producers can take advantage of enterprise complementarities and supplementarities, and thereby reap the potential "fruits" of synergism.

Consider possible interactions between crop rotations and livestock, for example. Livestock add value to forages and other crops and recycle nutrients back to the soil through manure. Forage legumes add nitrogen to the soil, break grain crop pest cycles, and provide feed for livestock. Further, by including both crops and livestock on particular farms, producers can minimize the very substantial costs of transporting bulky forages and livestock wastes that otherwise would be required with farms specialized in only crop or livestock production. Thus, livestock without forage legumes in crop rotations may not be profitable on a particular farm; similarly, forage legume rotations without livestock may not be profitable. However, integrated livestock, forage legume crop rotation systems may be profitable (after Ikerd, 1990 and 1991).

By intercropping tall and short species of plants, canopies of protection are provided to the shorter growing plants and photosynthetic processes are enhanced due to the respective crops collectively receiving increased exposure to sunlight. Production complementarities can also be realized through introducing azolla, a nitrogen-fixing aquatic green manure crop, and fish in flood-irrigated paddy-rice fields (Cheng and Simpson, 1989; Wen and Pimentel, 1990).

A special case of enterprise interdependence involves the recycling of waste products. Livestock on farms in this part of the country, for example, are able to graze land unfit for tillage and consume feeds not fit for human consumption. In countries like China, organic wastes are an integral feature of tightly integrated crop-livestock-aquaculture-microbial production systems. Material recycling is accomplished through outputs from one enterprise becoming inputs for other enterprises. Biogas methane digesters are at the center of such material recycling. The principal inputs into the digesters are animal and human wastes and crop residues. Through anaerobic fermentation, the raw materials are more efficiently converted into energy/fertilizer/feed resources (namely, biogas methane and slurry-sludge) than if the raw manure and other organic waste products had been used directly (Cheng, et al., 1992; Qui, et al., 1990).

SDW adherents emphasize the importance of limiting amounts of wastes that can be generated by different types of industries and stored in various types of facilities. The NIMBY (not in my backyard) philosophy exists because of localized concerns about possible long-term soil, water, and air pollution from excessive waste deposition (Beck, 1992).[19]

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[19]See Hammer (1989) for a discussion of the use of constructed wetlands to treat municipal, industrial, and agricultural wastewater.

Externally-purchased vs. internally-produced inputs?

"Modern" MSW production methods involve heavy emphasis on the use of purchased inputs, e.g., synthetic fertilizers, pesticides, hybrid seeds, fuel, semen for artificial insemination, antibiotics, hormones (Ikerd, 1990). Fertilizer responsiveness has been a key selection criterion in plant breeding programs. Farmers who use fertilizer responsive varieties must use much fertilizer to take advantage of the yield potential inherent in high yielding varieties.

The rationale for irrigation development--involving intensive off-farm capital infrastructure and substantial cash operating costs--is attainment of higher per-acre yields and incomes. Hybrid varieties are often higher yielding than self-pollinated varieties, but hybrid seeds must be purchased from specialized hybrid seed producers. Antibiotics, rumen stimulants, and hormones--none of which can be home-produced--are an integral part of many modern livestock production systems.

Each of these approaches to intensify agricultural production requires out-of-pocket expenditures. Since relatively few farmers are able to completely self-finance the purchase of "modern" agricultural inputs, farmers following MSW practices are often forced to obtain production credit from private and public sources (Drache, 1985; McMillen, 1981). As long as economic conditions are favorable, farmers who obtain credit after careful screening and evaluation procedures are usually able to repay the credit. But when economic conditions on farms are unexpectedly unfavorable, as they were in the early 1980s in the USA, farmers can experience difficulties in repaying their loans and be forced into bankruptcy (Rosenblatt, 1990).

To overcome such problems, SDW adherents advocate the substitution of internally-produced inputs for externally-purchased inputs (Rodale, 1988). Illustrative "natural on-farm produced resources" are (1) crop rotations, intercropping, and relay cropping to enhance soil fertility, control weeds, and maximize use of space and time; (2) livestock wastes, crop residues, and green manures to enhance soil fertility; (3) nitrogen collected from the air and recycled through nitrogen-fixing legumes; (4) minerals released from soil reserves and recycled; (5) water available to crops through special management practices to enhance soil moisture retention; (6) varieties selected for being resistant/tolerant to insects and diseases; (7) modified planting dates and other cultural practices; and (8) farm family management and labor.

Some current-day producers have been motivated to follow SDW practices primarily as a means of reducing financial risks arising from debt obligations. By substituting on-farm resources for purchased resources and down-sizing their farms, farmers' debt obligations can become less. Some SDW followers are willing to forego absolute top-yields or absolute minimum per-unit costs, if by doing so they can become less dependent on outside financial institutions (Berry, 1987; Freudenberger, 1982; Jackson, 1987; Logsdon, 1986).

One special benefit of SDW farmers home-producing larger proportions of their production inputs is a reduction in their dependence on fossil fuel energy resources. This point has particular relevance to internally-produced inputs that

replace synthetic fertilizers and pesticides whose manufacture requires much petroleum-based energy (Aiken, 1984; Crews, et al., 1991; Pimentel and Pimentel, 1989).

Individual component vs. holistic systems-oriented research?

The notion of introducing alternative levels for a variable(s) and holding constant the values of all other variables is fundamental to the "modern" MSW approach in research. Thus, in effect, MSW research tends to be individual component research. For example, in determining the optimum level of subtherapeutic (low-level continuous) feeding of antibiotics to fattening cattle, experiments are designed in which different levels of antibiotics are fed to different pens of cattle, but in which all other factors--e.g., other components of feed rations, cattle breed, initial cattle weight--are constant.

Through using appropriate experimental design procedures and statistical analysis, scientists can determine the relationship between level of subtherapeutic antibiotic use and cattle performance--as reflected, for example, in average daily weight gain or pounds of feed per pound of gain. Scientists can then make statements to the effect that each additional 10 mg/day of antibiotic fed results in an "X" increase in average daily gain, at a certain probability level. By comparing the added cost of each incremental level of antibiotics fed with the added production value resulting from the use of the additional antibiotics, the optimum level of antibiotic feeding can be determined, other things the same.

Such individual component, reductionist analysis is the "bread and butter" of MSW investigation. Resulting from this type of investigative approach can be a rather precise determination of the nature and extent of the association of one variable with another, other things the same.

While SDW scientists and farmers recognize merit in the MSW approach to science, they are troubled because most real-world production processes involve many complex interactions not capable of being handled through individual component scientific analysis. Within the parameters of controlled experimental design used to undertake research, results from single component research may be scientifically valid. But for gaining insight into decisions in complex real-world production situations, the results may not be valid (Widdowson, 1987).

To illustrate, SDW cattle feeders might agree that the performance of their fattening cattle would be impaired if they were to feed no antibiotics, holding all other management practices the same. But, they might also argue that no such production impairment would take place if they were to, not only feed no antibiotics, but also make compensating changes in other management practices, e.g., select cattle for disease resistance, avoid confinement feeding, feed only "organically" produced feedstuffs.

Successfully investigating such alternative packages of practices requires adoption of more holistic, systems approaches in research--in which attention is simultaneously given to alternative packages of practices rather than to individual practices. Multidisciplinary teams of researchers--

involving both the natural and social sciences--must be established to effectively undertake such research (Dobbs, 1987; Olson, 1992). Designing such research is inherently difficult. Such research inevitably involves additional costs and time to complete. Not all scientists function well in multidisciplinary teams.

Nevertheless, a research organization that devotes only a few or no resources to more holistically-oriented research inevitably overlooks some critical needs of society. Thus, SDW adherents argue for a balance in the allocation of research resources to (1) single component, disciplinary research and (2) more holistic, multidisciplinary research. Further, they argue for modifications in the professional reward system so that scientists who pursue multidisciplinary research are not penalized relative to their disciplinary counterparts in considerations for academic promotion and tenure (after Crouch, 1991; Edwards, 1987; Holt, 1988; Lockeretz, 1991; McRae, et al., 1989; Soule and Piper, 1992).

While society has benefitted from the specialized, disciplinary research that has been taught to and practiced by recent generations of academics, SDW adherents argue that we must avoid becoming entrapped by the idea that the only knowledge that may be considered valid is that gained through formal experimental, mathematical, and statistical analysis. Beer (1975, 121, 122, 165), for example, points out the limits to "analysis" in coming to grips with complex real-world systems problems:

> ... we need (an) approach that is the antithesis of analysis, namely, synthesis... We are all steeped in the analytic tradition. Essentially: take a living thing apart to discover what life is; you will not find a component called life--and behold the live thing is dead... If our only scientific tool is the analytic reduction of a system to its component parts, so that the very nature of the system itself as a viable entity is lost, so that its synergies are denatured, so that it is nothing but a bag of bits, then we do not deserve the name of scientist in the world of complex systems...

SDW adherents argue that researchers must not be exclusively preoccupied with analysis--in order that the end products of their scientific investigations can become more readily transferable to users. Synthesis and knowledge gained in rather particularistic ways--through multidisciplinary, case study, and systems science approaches--must be moved into positions of scientific creditability (Taylor, 1990).

21st Century challenge: Determine a "neo-modern science" approach to development

In reality, both the "modern scientific" and "sustainable development" worldviews have merits and demerits. The challenge facing our nation and nations throughout the world, as we enter the 21st Century, is to determine a "neo-modern science" approach to development that will embody the most appropriate possible blend of MSW and SDW values, beliefs, and decision-making perspectives concerning natural and human resource development and use.

The response to this challenge will depend on decisions that each of us make in our (1) private individual and family lives and (2) public service/policy-making/business lives.

I challenge readers to examine the rapidly growing body of literature on sustainable development in relation to your own inner values and beliefs. Determine those issues for which you adhere rather closely to one or the other of the polar MSW-SDW positions and those issues for which you are at some intermediate point on the MSW-SDW continuum. As you do this, generate dialogue concerning critical issues in natural and human resource development and use with your spouses and children. As you participate in this family process, the values and beliefs that your children will pass on to their children and that we all take into the work place will be impacted.

We also need to ask ourselves if the decisions that we are making in our own private and family lives and in our public service/policy-making/business roles are consistent with our deep inner values and beliefs? If not, we need to take steps to reconcile the decisions we are making at home and in the "market place" with our personal values and beliefs. The collective result of all people throughout the world participating in this introspective process will determine what indeed materializes as the 21st Century unfolds before us.

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