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# OUTLOOK

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IDEAS FOR THE FUTURE FROM HUDSON INSTITUTE

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*Conservationists and farmers, traditional antagonists, now demonstrate a remarkable degree of consensus: improving productivity and sustainability of agriculture on existing farmland is urgent for the survival of both wildlife and mankind.*

## DO WE WANT FOOD, FORESTS, OR WILDLIFE?

### THE SYDNEY ZOO DEBATE

Dennis T. Avery



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**Outlook:  
Ideas for the Future  
from Hudson Institute**

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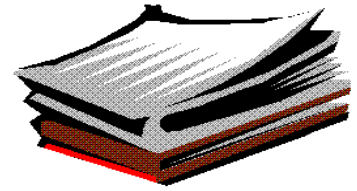
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# SUMMARY



- *This paper presents edited remarks from a debate held at the Taronga Zoo in Sydney, Australia, which brought together conservationists and farmers to discuss the challenge they must resolve together—conserving wildlands in a more populous, affluent world.*
- *The three participants, though representing usually disparate positions, demonstrated a remarkable degree of consensus about how to resolve the dilemma of choosing which goal to emphasize: food, forests, or wildlife. The three agreed that the world's population will indeed increase, that agricultural productivity has greatly increased since the 1950s, and that improving the productivity and sustainability of agriculture on existing farmland is urgent. They differed, however, on the methods by which to accomplish that goal.*
- *Dennis T. Avery, of the Center for Global Food Issues at Hudson Institute, considered three possible answers to the food/land dilemma: cutting population growth, creating huge numbers of vegetarians, and raising world crop yields. Believing that the first two have virtually no chance of occurring, Avery argued that the only possible way to feed a population that will be 50 percent larger and more affluent, demanding more meat, milk, and eggs, is to increase yields through high-yield farming techniques and with the help of developing technologies on the best farmland currently in production. Creating economic incentives, particularly by reforming trade and farm subsidy policies, would increase world food output.*
- *Jim Downey of the Australian Conservation Foundation and Ray Nias of the World Wildlife Fund/Australia represented the conservationist viewpoint. They acknowledged the crucial role of agricultural productivity in saving wildlands and wildlife but envisioned somewhat different ways of improving the productivity and sustainability of the world's farmland.*
- *Downey called for a mix of measures including slowing population growth; increasing agricultural research in organic, biodynamic, and permaculture farming; reducing pesticide use through integrated pest management; improving efficiency of water use; and expanding agroforestry and mixed farming, among others.*
- *Nias saw the challenge as optimizing the use of land, chemicals, energy, and modified organisms in a way that maximizes food production and minimizes environmental impact. He called for a valuation of natural assets and capital for land use planning, low inputs of fossil fuels, more organic fertilizers, biological pest control, and agroforestry.*

***The Sydney Zoo debate may herald the arrival of a more realistic and productive alliance for the environment, in which agriculturalists and conservationists cooperate to preserve wildlife habitat by maximizing output on the land we cultivate. Indeed, there is no other realistic option.***

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# DO WE WANT FOOD, FORESTS, OR WILDLIFE?

## THE SYDNEY ZOO DEBATE

BY DENNIS T. AVERY

Conservationists and farmers have spent most of the past thirty years talking past each other. Conservationists speak wistfully of a world that might have fewer people, perhaps with less affluence. Farmers speak righteously of combating hunger. These positions do nothing to protect the environment in a world that clearly will have more people eating more food.

Recently, however, both sides did come together, debating directly and on the record the challenge they must resolve together—the challenge of conserving wildlands in a more populous, affluent world.

The remarkable thing about the debate was the degree of consensus about how to resolve the dilemma of choosing which goal to emphasize: food, forests, or wildlife.

This paper presents edited remarks from that debate, which was held—fittingly—at the Taronga Zoo in Sydney, Australia, which is dedicated to the appreciation of wildlife, on October 17, 1996. Each speaker was given seven minutes to summarize his position. The debaters were

- Dennis T. Avery, Director of Global Food Issues for Hudson Institute;
- Jim Downey, Executive Director of the Australian Conservation Foundation, Australia's largest conservation organization; and
- Ray Nias, Conservation Director of the World Wildlife Fund/Australia.

The debate was sponsored by AVCARE, the Australian association for crop protection and animal health. Copies of the complete transcript are available from Hudson Institute and from AVCARE.

### RESOLVING THE DILEMMA

DENNIS T. AVERY, HUDSON INSTITUTE

I appreciate the willingness of so many knowledgeable people to come here today and discuss how best to save the world's wildlife. We often ask the question, "How will the world feed nine or ten billion people?" The real question is, "How will we save the wildlife when nine or ten billion people are feeding themselves?"

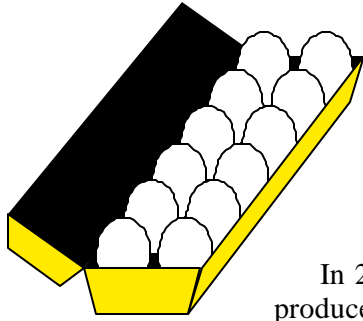
Fortunately, the brakes were set on the population growth train in the 1960s, when better medical care and high-yielding seeds began to offer Third World parents real assurance that their first children would live. As a result, births per woman in the Third World have already come three-fourths of the way to population stability, essentially in one generation.

The cities of the world now take 1.5 percent of the globe's land area; if we reach a peak of nine billion people in 2050, they will live on approximately 3.5 percent of the land, treat their sewage, and invest in clean energy.

The threat to the environment then will come primarily if it takes too much land to produce the food and forest products for so

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—Dennis Avery



*High-yield conservation is already saving ten million square miles of wildlands from the plow of the low-yield farmer. It has not only given us increased productivity, it has given us the most sustainable farming in human history.*

—Dennis Avery

many people. Thanks to the Green Revolution (the huge increase in agricultural productivity that began in the 1950s), we have not taken additional land for food production in the years since 1960, which is why we have been able to keep one-third of the world's land surface in forests.

In 2050, however, the world will have to produce nearly three times its current food output, because there is no overall trend toward vegetarianism in world food consumption. All over the world, in fact, people are obtaining higher incomes and demanding increasing quantities of high-quality protein—especially meat, milk, and eggs—with significant impact on the environment:

- China has been increasing its meat consumption by 10 percent per year for the last five years.
- India is getting one-third of the fodder for its 400 million dairy animals by stripping leaves and branches from its forests.
- Indonesia has been clearing tropical forest lands to grow low-yielding soybeans for chicken feed.

All of this is unsustainable.

In addition, the forest-product demand in 2050 is likely to be approximately ten times as great as it is today—unless we use more steel and concrete per capita.

It is no wonder that wildlife conservationists are urgently concerned.

As a representative of modern agriculture, I want to tell wildlife conservationists and the public that there is apparently a safe, sustainable, proven way out of this dilemma: high-yield conservation. Note the following:

- If we triple the yields again on the world's existing farmland, we will not need to take additional wild lands for food production.
- If we take 5 percent of the current wild forest area and plant it to cloned, tissue-cultured, fast-growing, high-yield trees, we can apparently produce all the needed forest products without anything more than management logging of the rest of the wild environment.
- If we triple agriculture's water

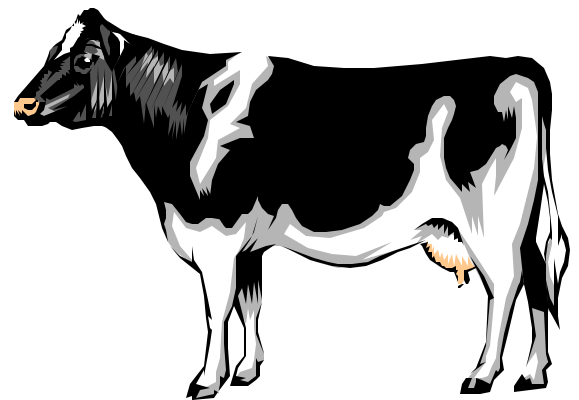
efficiency by substituting sprinklers and plastic pipe for wasteful flood irrigation, there will be enough water to support the larger agriculture output, and we will be able to prevent the salinization of agricultural land.

- If we eliminate international trade barriers on farm and forest products, we can use the world's best and best-suited land, wherever it is located, to produce our farm and forest products.

High-yield conservation is already saving ten million square miles of wildlands from the plow of the low-yield farmer. If we dedicated ourselves to low-yield organic or traditional farming, by the year 2050 we should expect to be cropping not the current six million square miles of the earth's surface, but twenty-six or thirty-six million square miles. We would thus plow down entire continents worth of wildlife just to avoid using high-yield farm inputs.

High-yield conservation has not only given us increased productivity, it has given us the most sustainable farming in human history. When we triple the yields on the best farmland, we automatically reduce the soil erosion per ton of food by two-thirds. Since 1970, the chemists have invented herbicides, and the farmers have invented conservation tillage. Conservation tillage is reducing soil erosion per acre by another 65 to 95 percent while encouraging growth of soil bacteria and earthworm populations and creating better soil tilth and soil health.

Modern farming is saving wildlands and soil with hybrid seeds, irrigation, and better and safer pesticides. In the future, we hope to use still-safer systems featuring biotech-



nology, integrated pest and crop management, and even better animal health medicines. We hope to save more wildlands through precision farming, in which we use global satellites and microprocessors to farm yard-by-yard rather than in 160-acre blocks.

Today, at the Sydney Zoo, which celebrates wildlife and wild species, I call on the world's conservationists and farmers, its people and its governments, to unite in the final, critical campaign to beat both hunger and the threats to world wildlife—through the only visible, proven strategy available. That strategy is high-yield conservation: high farm yields, high forest yields, high water efficiency, and free trade in farm and forest products.

We must resolve the dilemma between human opportunity and wildlife conservation in the only way possible—by having both.

The high yield strategy will require additional public investments in research into high-yield, sustainable farming techniques. It will involve careful, effective regulation of farm inputs—but with the full appreciation that those inputs are helping save millions of square miles of wildlife while reducing human cancer rates (by encouraging consumption of fruits and vegetables, a proven cancer-reduction factor). The high-yield strategy also means encouraging the creation of well-managed high-yield forests, and we will have to start developing them soon because it will take twenty to thirty years for them to grow. And that strategy urgently requires free trade in farm products, because it is the only mechanism that can enable us to use the world's



best farmland to the fullest regardless of where it is located.

The wildlife conservation movement has already shown rare courage in standing up for wildlife before a hungry world. I hope that it can now show equal courage in backing high-yield conservation for an affluent world.

### A MIX OF MEASURES

**JIM DOWNEY, AUSTRALIAN CONSERVATION FOUNDATION**

Based on what I just heard from Dennis, I have to say that we probably agree on most things. However, it does make a difference how we get to high-yield farming.

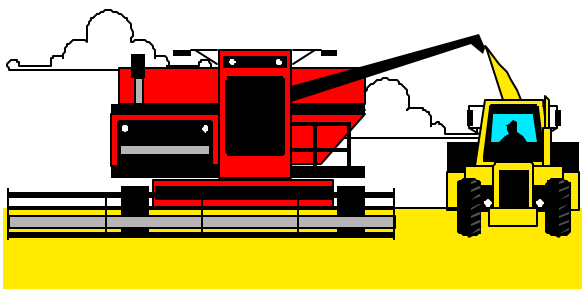
There are three elements to this debate: population, the rate of food production, and environmental degradation. Our contention is that all three can be addressed, but each will require new ways of doing things.

Yes, there is enough food to feed the world. Yes, food production has increased dramatically since 1950. However, I think the real question is whether we are facing a food crisis. We believe the jury is still out on that question, with environmental degradation causing the doubt.

Indisputably, the growth in food production has slowed. According to the United Nations Food and Agriculture Organization, the rate of growth dropped between the 1960s (3 percent) and the 1980s (2.2 percent), and is expected to drop still further by

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—Jim Downey



the year 2000, to 1.8 percent. In addition, growth in grain yield per hectare has been only 1 percent per year since 1984, compared to 3 percent in the 1950-84 period. That drop in growth suggests that we have a food crisis.

One of the answers, from the conservationist's point of view, is definitely to address the projected rate of population growth. However, I agree with Dennis that the opportunity to do anything about population growth between now and 2030 is gone. Really the question is population growth beyond the year 2030.

In looking at this question of the food crisis, I will draw on Lester Brown's work at the Worldwatch Institute. Already, an estimated 800 million people in the world are undernourished, and Brown says that grain production is now growing at 12 million tons a year, versus 29 million tons in the 1950-84 period. Beef and mutton production are already imposing substantial degradation on the world's range lands. Brown expects little growth globally in beef and mutton production other than intensification through feedlots. And of course the world's seafood catch has dropped from 19 kilograms per capita to 11 kg. per capita since 1986.

Brown says that environmental degradation of farming resources has increased. He fears that the advances in science and technology we have seen in the postwar era can no longer be counted on to increase food production as it will need to increase in the years ahead. This view is also supported by a number of eminent organizations including the U.S. National Academy of Sciences and the

Royal Society of London.

One other wild card in the equation is the global availability of water, which has dropped from 16,000 cubic meters per unit of food production to 6,000 cubic meters in the last thirty to forty years.

So our first contention is that population growth must be slowed. Programs such as family planning, raising the status of women, and reducing poverty are already working in a number of countries.

Second, we must halt the degradation of the natural systems on which agriculture depends.

Third, we must boost investment in research for sustainable agriculture. I think one of the most alarming trends we have seen in the last twenty years is the drop in investment in that research.

If we accept that there are substantial difficulties in expanding livestock and seafood production, the question then becomes how rapidly we can expand grain production. It can only be expanded by one of two methods: using more land, or using the land we are already using in better and more sustainable ways. There is no undiscovered American Midwest to bring into production. I fear that the additional available land which can be brought in is likely to be more than offset by having to give up severely degraded land and by the conversion of more land into nonfarm uses.

In our view, improving the productivity and sustainability of agriculture on existing farmland is therefore urgent. It is our most pressing issue in the whole debate.



Moreover, we are concerned that some of the environmental consequences of the way we have farmed for the last fifty to one-hundred years indicate that we must change our methods. For example, birds are in decline around the world. Half the world's rainfall is on land already being used for industry, domestic use, or agriculture. As a result, many aquifers are not recharging. Soil depletion is running at twenty-four billion tons per year. Three-quarters of all arid lands are in a state of desertification. Global warming is being worsened by land clearing and deforestation. Species extinctions are now estimated to be occurring at one-hundred times the rate when man first appeared on the planet. In Australia, there are no vegetation types that remain undisturbed. The health of our rivers has declined dramatically.

Our immediate suggestions include a dramatic increase in agricultural research, especially for organic, biodynamic, and permaculture farming. We suggest a reduction in pesticide use through integrated pest management, and the industry is heading that way. We want a reversal of the practice of suppressing knowledge and creativity by powerful vested interests. We must improve the efficiency of water use. We need research into yield-enhancing technologies for improved livestock types, crop varieties, and hybrids. We will need moratoriums on harvesting of some fish species, to permit recovery of wild stocks.

We must also reassess food distribution, with consequent reductions in food waste. We need an expansion of agroforestry. We need more mixed farming, and more agriculture that suits local circumstances. (For example, the developing world has lots of labor but not much cash with which to buy inputs.)

In other words, we are proposing a mix of measures, and many of them have suffered from a lack of research.

This is not, in our view, an either/or debate. We concede that organic, biodynamic, and permaculture farming will not be the total answer, but they will be as important and legiti-

mate in the mix as anything else. Environmental degradation dictates that we become more creative and look for new solutions.

## SENSITIVITY AND CARE

RAY NIAS, WORLD WILDLIFE FUND

Each year, an additional ninety-three million people need to be fed. At the moment, however, there is only about one-tenth of a hectare of cropland per person, and cultivated land takes up 11 percent of the world's surface.

Attempts to increase food production are occurring through the intensification of agriculture, through increased energy and chemical inputs, and by the use of genetically modified plants and animals. In the wetter parts of the world, agricultural expansion is occurring through deforestation, particularly in the humid tropics. Expansion of agriculture is occurring also in the drier parts of the world, particularly through the use of irrigation.

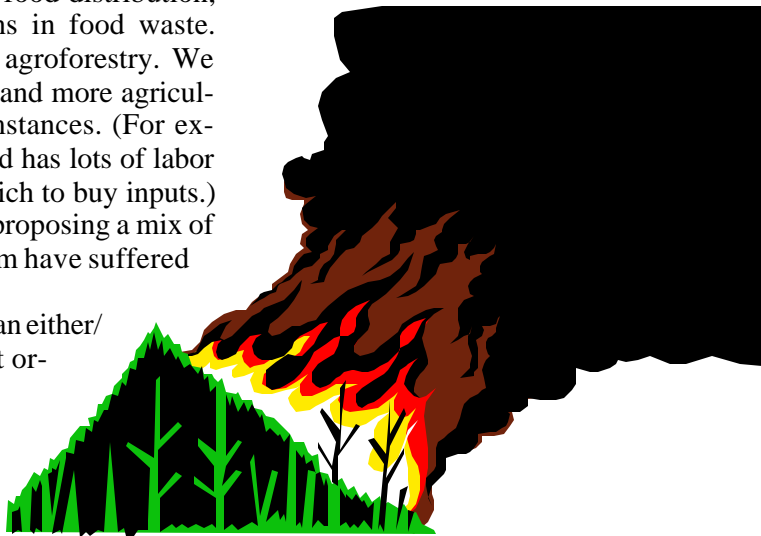
Each of these methods of increasing food production has the potential for major environmental impact.

The challenge is to optimize the use of land, chemicals, energy, and modified organisms in a way that maximizes food production and minimizes the environmental impact.

Agricultural land is being lost to degra-

*We concede that organic, biodynamic, and permaculture farming will not be the total answer, but they will be as important and legitimate in the mix as anything else. Environmental degradation dictates that we become more creative and look for new solutions.*

—Jim Downey



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*Sustainable agriculture would be characterized by long-term stability and minimal environmental impact. Sustainable systems would have low inputs of fossil fuels, with perhaps a higher and more complex labor input.*

—Ray Nias

dation and urban development. In wetter environments, water erosion is the most serious problem, as steeper slopes are cleared of their forest cover. In semi-arid environments, including Australia, cropping and grazing of fragile and drought-prone soils is leading to desertification. Therefore, the limits to agricultural expansion are already being reached in many parts of the world.

In countries with extensive natural forest, we believe that it is essential to limit agricultural expansion if other land uses are to continue, including conservation, maintenance of indigenous peoples' lifestyles, and forestry.

The World Resources Institute suggests that irrigated land is being lost to salinity as rapidly as new irrigation areas are being developed. In the wheat belt of Western Australia, salinity is increasing rapidly, and about one-third of the area is potentially affected by salinity.

Good quality soils and adequate water are limited resources, and land-use planning is enormously contentious. Cotton growers and graziers disagree about water allocation in the Murray-Darling Basin. In the Sydney and Brisbane regions, good quality agricultural land is continually being lost to urban development. Rural subdivisions now extend along the whole coasts of New South Wales and Queensland. There are almost no national parks or protected forests covering prime agricultural land that once held the most productive forests. In our view, the only sensible solution is an integrated approach to land-use planning and modification of agriculture practices to achieve the principles of ecologically sustainable development.

Underpinning this process must be a fundamental realignment of the economic system, and principally the valuation of natural resources. Without a real valuation of natural assets and capital, there can be no sensible land use planning. If the depletion of natural capital, biodiversity, soils, and water continues to be excluded from economic calculations, these resources will continue to be lost in the face of short-term economic objectives.

The challenge for sustainable agriculture

is to produce more food from the same or fewer inputs. The inputs include crop varieties, soil and mineral assets, water, energy, and the chemicals to maintain soil fertility and control weeds and pests.

High-input agriculture has often been criticized because it leads in many cases to environmental degradation, low economic stability, and (ironically) overproduction. Modern agriculture is dependent on monocultures of annual species that are susceptible to shocks from weather, pests, and price fluctuations. High output is maintained by high inputs—of energy, chemicals, new varieties, etc. It is characterized by high levels of fossil fuel inputs and inorganic fertilizers, high soil disturbance, low crop diversity, and dependence on annual crops.

Sustainable agriculture would be characterized by long-term stability and minimal environmental impact. Sustainable systems would have low inputs of fossil fuels, with perhaps a higher and more complex labor input. They would rely more on organic fertilizers and have lower soil disturbance and higher crop diversity. They would feature more stable control of pests through more reliance on biological control. A much greater percentage of the nutrients would be recycled. And, of course, the integration of animals and the importance of agroforestry would be higher in sustainable systems.

However, to meet growing world food demand while retaining these and other important cultural and environmental assets, agriculture in the developing world will have to shift away from reliance on opening new lands through deforestation and irrigation. In the developed countries, agriculture cannot continue to rely on ever-increasing inputs of energy, chemicals, and water.

In our view, both these models of agriculture are inherently unsustainable.

The developing world will require fundamental land reform and more efficient agricultural practices, making use of natural biodiversity and traditional methods where these achieve good results.

In the developed world, sustainable farming systems will need to be developed that reduce reliance on single crops and increasing inputs.

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Somewhere between these two flawed models of agriculture is one that might be sustainable. This sustainable agriculture should mimic the characteristics of natural ecosystems, particularly in their resilience and stability. It will, however, need to be far more productive than the sort of low-yield, low-input agriculture that is characteristic of much of the developing world. But this must be achieved, in our view, by the very selective and careful use of chemicals and energy inputs, and careful selection of genetic material.

We believe that the jury is still out on free trade and its impact, particularly so long as it fails to account for the value of natural assets and the depletion of natural capital.

It is the sensitivity and care with which we increase agricultural productivity that concerns us. It is how you get to high-yield agriculture that is the concern.

## MOVING TOWARD CONSENSUS: THE IMPLICATIONS OF THE ZOO DEBATE

COMMENT BY DENNIS T. AVERY

The most important outcome of the Sydney Zoo debate is that both agriculturists and conservationists recognized that *the world must get more food from its existing farmlands in the decades just ahead*, to preserve wildlands against a major expansion of low-yield farming.

Until now, the case for high-yield farming has been focused on benefits to people. But the Sydney debaters agreed that the world will lose huge tracts of wildlife to food production in the next few decades—unless we can satisfy the appetites of the projected population through higher farm output per acre. Higher yields are thus even more important than lower food costs and reduced pesticide use.

Second in importance, the debaters agreed unanimously that the world must invest more heavily in research to achieve higher farm yields. The debate participants put different emphases on the various research approaches, but all agreed that higher yields are critically important to conservation. Higher yields are

also vital in preserving other valued resources, including wildlife on land at the margins of cultivated fields, and land for indigenous communities.

None of the debaters decried the food production gains achieved in recent years, and none contended that the additional food has caused higher population growth. (In fact, the countries that have raised their crop yields most rapidly have also tended to make rapid progress in bringing down their birth rates.)

### SETTING RESEARCH PRIORITIES

The debate also indicated a general agreement that *any* promising avenue for achieving sustainably higher yields should be explored, be it chemical, biological, organic, or biotechnological. The key to determining the priorities for future research is the potential for higher yields.

The world's agricultural research goals have been badly fragmented in recent years, with mainstream farmers seeking lower production costs, conservationists trying to get rid of pesticides, and organic farmers demanding research to validate their belief in the virtues of "all-natural" farming systems. These conflicting goals have nearly immobilized the research effort.

Research funding has also suffered because of the "farm surpluses" produced (and isolated) in rich countries that offered their farmers high price supports. Free trade in farm products would end that distraction.

The good news from Sydney is that both farmers and conservationists might now be able to go to their institutions—the U.S. Congress, the German Bundestag, the World Bank, and the like—with agreement on the need for more farm research to raise farm output per acre and do so sustainably.

If farmers and conservationists agree on such a higher-yield agenda, there is a strong likelihood that it can be achieved. The trained cadre of scientists, engineers, extension specialists, and other key professionals, though smaller than it should be, is still available to rebuild the momentum of re-

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—Ray Nias



*Most of the world-wide increase in grain production is apparently sustainable. It was engendered in large part by the return of diverted cropland in the U.S. and the European Union and higher price incentives to farmers all over the world.*

—Dennis Avery

search lost during the past several years.

Almost as important will be the effect on government policies around the world. If farm and conservation interests present regulators with a unified position advocating development of higher yields to save wildlands, a more positive climate for high-yield farming can be created quickly. Regulatory constraints could be focused more precisely on real threats to human health and environmental preservation. Clumsy or counterproductive policies—such as Europe's current drive to cut pesticide use in half without regard to that policy's deleterious effect on yields, soil erosion, and total cancer risk—could be replaced by policies aimed directly at safe and sustainable high yields.

(Conversely, the debate seemed to *lower* the priority for research and policies that would *not* raise yields.)

#### LEAVING BROWN BEHIND

Lester Brown's writings figured prominently, and fittingly, in the Sydney Zoo debate. Brown has played a major role in blocking conservationists' recognition that high-yield farming is critically important in saving wildlands. Though virtually all his predictions of famine, soil erosion, and pesticide-driven wildlife losses have been proven wrong, they have been disseminated widely and have put a publicly acceptable face on activist opposition to high-yield farm inputs.

Brown's 1996 forecasts of increasing world food scarcity seem to be proving wrong with record speed. Jim Downey noted Brown's point that world grain production had recently been increasing at only twelve million tons per year, down sharply from increases of twenty-nine million tons per year in previous decades. Farmers in 1996, however, increased the world's grain production by more than *sixty million tons* over the previous year. The world's 1997 grain crop is also projected to be very large.

Most of the increase is apparently sustainable. It was engendered in large part by the return of diverted cropland in the U.S. and

the European Union and higher price incentives to farmers all over the world. The price incentives may have been particularly important in China, where grain output increased by twenty million tons over last year's record crop. Once again, we have found that world food output has been constrained largely by restraints on effective demand (trade barriers, farm subsidy policies, and limited consumer incomes) rather than by any absolute natural limits on production.

Brown's pessimism has really been an excuse, not a reason, for rejecting high-yield conservation. From the beginning of the great population surge of the past half-century or so, the world has had only three possible answers to the food/land dilemma:

1. **Cutting population growth.** The world is already doing all that can humanely be done to reduce population growth, and succeeding. That is why Third World fertility rates have fallen by three-fourths in thirty-five years. But even that radical decline does not obviate the need for more food output to feed a population that will be 50 percent larger and perhaps twice as affluent in 2050.
2. **Creating huge numbers of vegetarians.** Advocates have had no success whatever in creating more vegetarians. There has never in world history been a society that voluntarily went without meat, milk, and other sources of high-quality protein. The current world trend, in fact, is in the other direction, toward higher consumption of meat, milk, and eggs in the Third World countries as they become affluent.
3. **Raising world crop yields.** The Green Revolution has prevented enormous human suffering. Asia would unquestionably already have suffered massive famines without the higher yields. Moreover, the Green Revolution is a major environmental triumph: it has prevented the huge losses of wildlands and wildlife that would have resulted from the famines.

Even if the world does not fully triple its farm



yields in the next half-century, it should be able to fulfill most of the increase in demand from existing farmland. The 1996 crop year demonstrated that we can achieve further major increases in farm yields. There is much room for extending the best current technologies to fields where they are not yet used, in China, India, Brazil, Zaire, Sudan, and many other countries. There are important opportunities to extend irrigation, through new dams in places such as Turkey and Nepal and through substituting water-efficient sprinkler and tube irrigation for wasteful flood irrigation throughout most of the world's irrigated lands. There is considerable potential for increasing yields on the land already producing the world's highest yields—through further plant breeding and through biotechnology that adds stress tolerance, disease resistance, and pest resistance.

Even a 50 percent gain in output from existing farmlands would save millions of square miles of wildlife habitat.

The Sydney debaters all rejected what seems to be the Brown posture—that we should not even try to increase farm yields because it might not work and would thus only distract us from population management.

The debate's realism about population growth was heartening. The Australian Conservation Foundation specifically recognized that no new population suppression strategy will make an impact before 2030. That leaves high-yield conservation as the key to wildlands conservation for at least the next thirty years.

#### **INTEGRATING ECONOMY AND ENVIRONMENT**

All three principals in the Sydney Zoo debate also agreed that the world needs to integrate environmental values more fully into its economic systems. It is important, however, not to gloss over the difficulty of doing so. The major problem is that different people put far different values on natural resources. Asking hypothetical questions, as some "studies" have done, does not narrow the range of valuations very effectively.

To demonstrate the real-world problem, the environmental movement itself has refused to concede any credit to high-yield

farmers for the ten million square miles of wildlife saved from the plow by use of hybrid seeds and pesticides. During the question period at the zoo debate, I asked Dr. Nias to put a value on one square mile of wildlands, so that farmers could claim their environmental credit. He could not, of course, provide a single, all-encompassing value, because the worth of various particular square miles of "wildlands" can vary enormously depending on their particular characteristics and biodiversity and their relative scarcity.

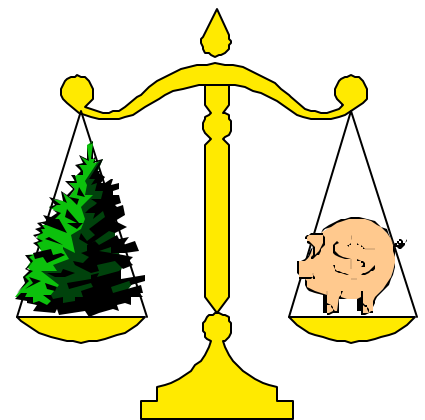
We were somewhat disappointed by the World Wildlife Fund representative's continuing insistence on having the farm fields of the future look more like forests (with perennial crops, organic fertilizers, and high levels of biodiversity within the cultivated fields). It may be too much to demand that the fields of 2040 look like forests if it is the high yields from those fields that leave room for the *real* forests. In the latter part of the next century, biotechnology may actually be able to deliver fields that look like forests, but that hardly seems possible in the next forty-five years. Trying to achieve forest-like fields in the short term would only distract from efforts to improve yields, which are more effective and important.

Nor does there seem to be any major conservation value in demanding that farming be done without fossil fuels. In America, farming accounts for only 2 percent of the fossil fuels used, and the percentage is even smaller in most other countries. Wildlands plowed down for biofuels are gone just as irretrievably as if they had been plowed down for food grains. Farming has always used the same energy systems as the general economy. Unless research on global warming documents a need for the entire world economy to shift away from fossil fuels, farming should continue to use them too.

The World Wildlife Fund's desire to make maximum use of biological systems to achieve

*It is important not to gloss over the difficulty of assessing environmental values. The major problem is that different people put far different values on natural resources.*

—Dennis Avery



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higher yields is valid and warranted. To date, however, the available biological systems have been anything but stable, and too often they have been the least effective of the high-yield farmer's tools. Perhaps future research will produce more effective biological inputs.

Still, the debate seemed to indicate a broader agreement that conservationists need to put a higher priority on pursuing high farm yields during the critical first decades of the next century, with hopes of eliminating fossil fuels and pesticides relegated to second place and the longer term.

The Sydney Zoo debate may herald the arrival of a more realistic and productive alliance—for the environment—between agriculturists and conservationists during the last big surge in world food demand which will occur over the next forty-five years. The agriculturists conceded the validity and importance of conservation goals. The conservationists acknowledged the importance of

productive agriculture—not just in feeding people but in saving massive amounts of wildlife habitat.

Neither side had any other realistic option, nor is there any more time to delay.

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