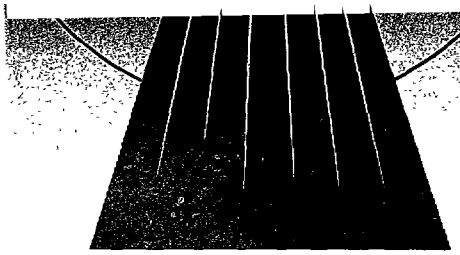

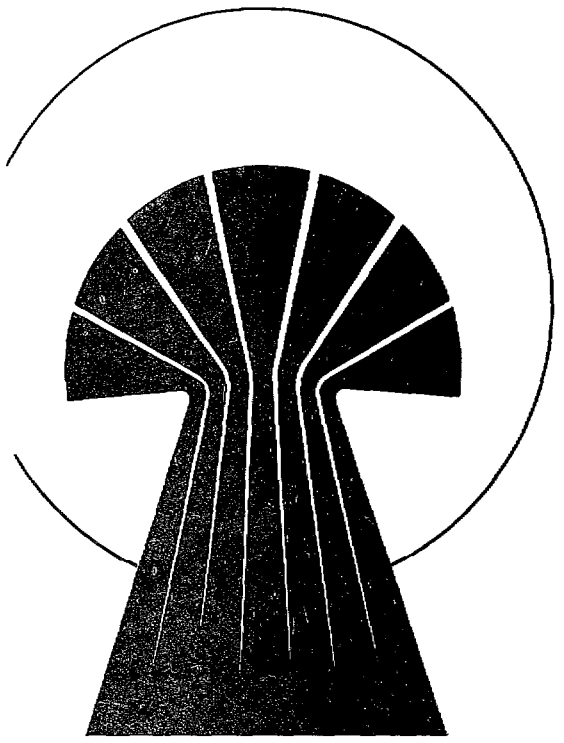

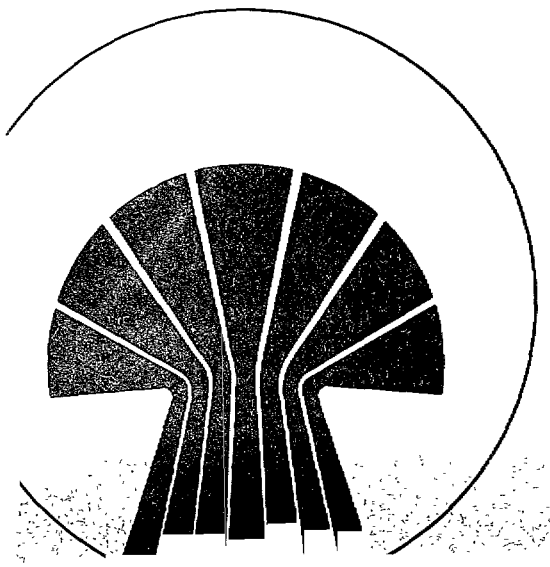

FOOD

IN THE FUTURE--

Proceedings of a Planning Symposium

UNITED STATES GENERAL ACCOUNTING OFFICE 1981

FOREWORD

This volume contains texts of remarks by speakers at the 1981 U.S. General Accounting Office Planning Symposium on Food in the Future. The symposium took place May 5 and 6, 1981, in Washington, D.C., sponsored by the Food Policy Analysis and Coordination Group of the Community and Economic Development Division.

As an agency involved in program evaluations, periodically GAO, and we in the Community and Economic Development Division, pause to reconsider where we are headed in our efforts to provide useful information to the Congress, the agencies, and the general public. Symposia are one means by which we do this. Because food is vital to our health and well-being, the U.S. economy, and international relations, GAO has identified this important issue area for special attention.

We asked symposium speakers to share their personal views of what is likely to be important in the next 18 months and beyond in food programs and in food policy. The resulting richness of thought, from diverse industry, academic, and Government perspectives, both instructs and stimulates. Naturally, however, the thoughts presented in this volume are the speakers' own, not necessarily those of GAO.

Henry Eschwege

Henry Eschwege
Director
Community and Economic
Development Division

Contents

ABBREVIATIONS

GAO	U.S. General Accounting Office
GNP	Gross National Product
FNS	Food and Nutrition Service, U.S. Department of Agriculture
RDA	Recommended Dietary Allowance
USDA	U.S. Department of Agriculture
WIC	Special Supplemental Food Program for Women, Infants, and Children

The Honorable Richard E. Lyng

MAKING U.S. FOOD POLICY DECISIONS NOW AND IN THE FUTURE

THE HONORABLE RICHARD E. LYNG is Deputy Secretary of Agriculture. Mr. Lyng led the Reagan Agriculture Transition Team and was cochairman of the Reagan-Bush Farm and Food Campaign. He was sworn in as Deputy Secretary of Agriculture in February 1981. Mr. Lyng has been in Washington, D.C., since 1969 as Assistant Secretary of Agriculture and as President of the American Meat Institute. His varied career also includes accomplishments in private business and State government. Until 1967, Mr. Lyng was President of the Ed J. Lyng Company, Inc., in California, a family seed and bean production and processing company. From 1967 to 1969, Mr. Lyng was Director of the California State Department of Agriculture.

In the passageway that connects USDA's Administration Building with the South Building, there hangs the portrait of a very distinguished Secretary of Agriculture--James Wilson, legislator, educator, and scientist.

James Wilson served as Secretary under three Presidents--McKinley, Theodore Roosevelt, and Taft. His 16 years as Secretary make him the longest-serving Cabinet member in American history.

It's certainly fitting that Secretary Wilson's portrait is placed in a passageway connecting the Administration Building to USDA's other buildings. For Wilson never once lost sight of the fact that the fundamental work of the Department takes place in its research and educational units. As Secretary, he often visited scientists in their labs. He observed their work, encouraged their efforts, and placed a heavy emphasis on individual creativity. The 16 years of his administration were devoted to transforming USDA into a research and educational giant working on behalf of the American agricultural community.

Those of us who are now at USDA intend to draw some inspiration from James Wilson:

--It's not that Secretary John Block wants to rival Secretary Wilson's staying power--I suspect he will be satisfied with something less than 16 years in office.

--It's not that Secretary Block, or I, or any of our assistant secretaries pretend to have the degree of scientific expertise to which James Wilson could lay claim in his day.

--But of one thing I assure you: Secretary Block and our whole team deeply appreciate all the USDA biochemists,

geneticists, entomologists, veterinarians, agronomists, economists, statisticians, and other specialists who are hard at work trying to ensure the continued prosperity of American agriculture. We intend to put ourselves at the service of these experts. We are determined to provide an administrative climate in which their efforts will be increasingly productive.

Of course, USDA has no monopoly on expertise. What USDA can do is obviously only one part of what America must do. The role which academia and the private sector are playing, and will continue to play, is of overwhelming significance.

Let's hope that the cooperation and healthy competition among all the experts will save us from the kind of myopia to which even the visionary James Wilson was liable. For despite his emphasis on scientific research, and despite his famous statement that "the future holds many important discoveries still to be made," Secretary Wilson displayed very little patience with that newfangled invention, the automobile. He begrudgingly allowed one to be purchased for USDA's Beltsville farm--but only on the condition that it was not to be a precedent for others.

Now just try to imagine what life would be like without trucks, without tractors, without almost everything we've come to regard as farm machinery. Wayne Rasmussen, our departmental historian, has made some calculations: To achieve 1976's farm production using 1916 methods, we'd need a mere 61 million horses and mules and some 31 million farm workers.

All of us relish the opportunity provided by today's GAO-sponsored symposium. Today's symposium, like USDA's annual Agricultural Outlook Conference, provides a forum in which we can step back for awhile and rethink our premises--a forum in which we can consider the directions which American agricultural policy should take as we move into the eighties. And I hope that, as representatives of government, academia, and the private sector, we will leave today's meeting with a clearer sense of our respective roles in the years ahead.

Some things seem to me axiomatic about the eighties. World demand for agricultural products will continue to grow significantly. The U.S. role in meeting that demand will become even more pivotal. And the sooner trade barriers are relaxed, the

sooner will the U.S. be able to put its great comparative advantage in agriculture at the service of the world. [1/]

The Reagan administration will combat inflation. Accordingly, we're bullish on America. And it's our position that, if other governments also fight inflation, the world economic outlook during the eighties will be brighter than many have predicted.

Even those who are pessimistic about world economic growth forecast near-record annual rates of growth of 2.5 to 2.7 percent in world demand for agricultural products. The increases in the volume of agricultural products demanded would be 25 to 50 percent larger than the increases of the seventies. Population growth might slow down in the eighties. However, increases in per capita caloric requirements associated with improved diets and changing age composition will actually have a positive impact on the rate of growth in demand. Even a low 1.79 world population growth rate implies an annual increase in the number of people to be fed to over 83 million by 1985--an annual increase equal in size to the population of Bangladesh. This 83 million figure compares with a 75 million annual increase in the mid-seventies.

Thus, even in quite conservative estimates about economic and population growth, the world demand for agricultural products will increase greatly during the eighties. Personally, I think the actual demand during the eighties will be higher than these conservative estimates. The countries of southern Europe--Greece, Spain, and Portugal--will want to improve their diets. The centrally planned economies are also committed to improving diets and will be in the market for feed grains and oilseeds. The middle-income countries of North Africa, the Middle East, and East Asia will likely decide to expand their food imports by wider margins. And even very small per capita increases in consumption in China and South Asia--whose combined populations represent about 51 percent of the world's population--will translate into enormous increases in demand.

This ever-growing world demand for agricultural products means that trends which have made the U.S. the world's predominant agricultural exporter will accelerate during the eighties.

[1/GAO Note: "Comparative advantage is a general principle explaining the condition under which mutually profitable trade between two economic regions can arise. A comparative advantage arises when because of different endowments of natural resources, capital, population, etc., the ratios between the production costs of a series of commodities in one country are different from the same ratios in another country. The first country enjoys a comparative advantage in those commodities having the lowest ratios..." Erwin Esser Nemmers, Dictionary of Economics and Business (Totowa, New Jersey: Littlefield, Adams, and Co., 1978), p. 93.]

Many areas of the world are not producing, and simply cannot produce, as much as they are consuming or would like to consume:

--During the seventies, the foreign production/consumption gap for wheat and coarse grains increased at a pace of 7 million tons a year.

--During the seventies the U.S. accounted for 51 percent of the increases in world wheat exports and for about 89 percent of the increase in coarse grain exports. We're now at a point where we supply a full 43 percent of the world wheat exports, about 71 percent of the coarse grain exports, and 84 percent of the soybean exports.

These are the trends that will accelerate. Even though I'm sure of that, I wouldn't predict the exact figures or percentages. I only point out that some USDA analysts argue that, despite any foreign increases in productivity, by 1985 the world outside the U.S. will depend on us for 15 percent of its agricultural products--compared with 2 percent in the early fifties and 11 percent in the late seventies.

Inevitably, then, as supplies tighten, the world will call upon America's comparative advantage in agriculture to prove itself. The administration has signaled that the age of persistent, large U.S. surpluses is over. And while target prices and deficiency payments to farmers may have been appropriate to times of considerable surplus, it's our belief that without such payments, market forces will suffice to spur American farmers to greater, remunerative productivity.

This brings me to a related point. It's been forecast that, by the end of the decade, America will have considerable leverage over the prices of agricultural products. Certainly, America wants to profit from its agriculture--the huge deficit in our nonagricultural trade leaves us no other choice. Yet it will be better for all concerned--for foreign nations as well as for ourselves--if trade barriers to American exports are reduced <u>now</u>. In this way American farmers will not have to cope with large variability in demand during the early eighties. In this way American farmers will have incentive to pace up the investment that will put the productive potential of our U.S. soil at the service of the whole globe. In this way the real price of food for the world community will be kept as low as possible.

In order to ensure the needed increases in productivity, and to guarantee the continued profitability of American agriculture, Secretary Block has placed a new, heightened emphasis on agricultural research. We've requested an increase in USDA's research budget.

At USDA we will cooperate with the States and regions in research that benefits <u>all</u> farmers. We intend to increase yields, spur soil conservation, and make the wisest use of our water supplies. We want to improve the condition of our livestock. We

will continue to provide farmers with essential information on the use and effects of fertilizers, pesticides, and herbicides. We are developing technology that will maintain the quality, and increase the volume, of our exports. And we will make every attempt to gain greater access for American agricultural scientists to foreign research specimens and sources.

As science advances, the distinction between agriculturally related and nonagricultural research is harder to draw. Innovations in the pharmaceutical, chemical, or energy industries will have an enormous impact on American farmers and processors. Mr. Katsuhiro Utada, recently named president of the Japanese firm Ajinomoto, has predicted that the concept of food will gradually change--that the boundaries which distinguish food from medicine will begin to yield. Ajinomoto has already used its amino acid technology to produce and market a product in this vein.

At USDA we intend to keep abreast of the research currents and developments--of the "emerging trends"--in the private sector and academia. American agriculture must be well positioned to cope with whatever innovations science may bring.

The increasing demand for our exports will involve new strains on the transportation system. Roads, bridges, interior waterways, railroads, terminals, docks, and harbors will all need attention if we are to be able to keep up with the demand for our farm products. The present administration is well aware that transportation needs for the late eighties and into the nineties must be anticipated in advance.

To state it simply, our national needs will require that we move aggressively both to open up new markets and to reduce domestic and foreign barriers to our agricultural exports.

The private sector has expended great energy opening up markets abroad. Creating demand requires much patience and persistence--it can take years just to familiarize people in the less-developed countries with the techniques of storage, handling, baking, packaging, and so forth. This administration will try to provide our agricultural attaches and counselors with the tools to continue to support such private sector initiatives.

Over the years, Public Law 480 [the Agricultural Trade Development and Assistance Act of 1954] efforts, by acquainting foreign people with our commodities, have helped create markets for our agricultural products. In giving Public Law 480 assistance, the U.S. has observed the principle that such assistance shouldn't encroach on the traditional export markets of other nations.

As we look out to the eighties, the view at USDA remains the quite old-fashioned view that nations, like people, should labor at those things they do best. America wants to put its comparative advantage in agriculture at the service of mankind; and we

will respect the right of other nations to trade freely those products in which they have a comparative advantage. The sooner barriers to our agricultural exports are removed, the less expensive will be the real price of food at the end of the decade and during the nineties. There's hardly any better service we can do for the less-developed countries than holding down the real price of the food imports they are bound to require.

So here's an outline of some of the important factors we must keep firmly in mind as we develop and implement U.S. food policies. The Government role is a major one but must not be allowed to dominate or excessively regulate. Our role should be to stimulate. The agriculture potential is tremendous today, just as it was when Agriculture Secretary James Wilson, in 1913, said, "The future holds many important discoveries still to be made."

One can easily wonder if the pace of change during the next 68 years will be as fast as in the years since he made that statement. I suspect we can no more guess accurately at what lies ahead than could Wilson, but that the discoveries ahead will be even more revolutionary.

Johanna Dwyer, D. Sc.

THE GOALS OF CONSUMPTION POLICY

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INTRODUCTION

I want to establish at the outset that my remarks are my own and do not represent the views or opinions of my hospital, my university, or any other individual or institution I am associated with. After some brief remarks on the goals of consumption policy, I'd like to touch very briefly on five issues suggested by the symposium organizers which involve consumption and which are likely to receive considerable future discussion:

--changing food needs and how to meet them;

--food deficiencies,

--nutrition standards,

--food safety, and finally

--food information.

GOALS OF CONSUMPTION POLICY

The history of consumption policy is instructive as a background for discussions of what future issues are likely to arise. I will attempt to summarize the views of Paarlberg (1980) and Daft (1981) on food and agricultural policy and how the issue of consumption has been addressed, and then summarize some views of the current situation.

Historical aspects

Paarlberg (1980) recently summarized food and agricultural policy by tracing the successive missions of the U.S. Department of Agriculture. According to him, USDA's original mission was to engage in research and education on behalf of farm people to help them increase production and to improve efficiency. In 1933 a second mission was adopted to deal with excess farm sector productive capacity, which had resulted in severe price deflation. This mission included the regulation of farm production to raise prices farmers received, and the establishment of agricultural commodity programs. In the 1960's a third USDA mission emerged, which Paarlberg describes as an effort to transfer income and resources to those considered disadvantaged, who without Federal assistance would presumably be in severe economic and nutritional difficulty.

Daft (1981) argues that until the 19th century, U.S. agricultural policy revolved around the opening up of the West and land settlement. Gradually, the functioning of commodity markets and the furthering of agriculture research, teaching, and service found a role. By the 1920's the entire system of land-grant colleges, agricultural experiment stations, and agricultural extension programs was in place. The Depression led to programs aimed at stabilizing and supporting farm product markets, and farm prices and incomes.

Only since the 1960's have consumer interests as well as farm production concerns received much USDA attention, though how such interests should fit with nutritional considerations still remains an unresolved issue. Nevertheless, Daft (1981) believes that over the past half century the major goals of American food and agricultural policy have been more or less constant: (1) support farm prices and income, (2) stabilize agricultural markets, (3) attend to consumer health and safety, (4) improve the overall standard of living, (5) conserve soil and water, (6) promote exports, and (7) provide humanitarian aid. Goals are to be accomplished at minimum costs, with minimum Government interference in decisionmaking and maximum use of market forces to guide resource allocation. Emphases have varied so that one or more have dominated at a given time. Daft sees these emphases being determined more by the pressures of the moment and fine-tuning of previous experience than by divergent political philosophies.

Current policies

According to Daft (1981), the food and agricultural policies which will emerge in the next few years will include four major elements: (1) to rely increasingly on market forces that seek to protect against instability, (2) to avoid the problems of sharply falling farm prices and farm incomes which have plagued the agricultural sector off and on over the past few years, (3) to prevent rapid inflation of farm production costs and sagging farm incomes, and (4) to protect against world food uncertainty, which generates very rapid and wide farm price swings.

Do consumer-oriented goals belong in food and agricultural policy?

Over the past decade or two, some of the nutritional aspects of food and agricultural policy have received increasing, although timid, attention. In contrast, domestic food assistance for low-income consumers has become an established part of that policy, and linked to the Nation's income-maintenance policy (Daft, 1981).

A cynical observer of people and institutions in our Nation's Capital recently remarked that, "In Washington some grow and some swell." Is the gradual broadening of the food and agricultural policy agenda to include nutrition, consumers, and domestic food assistance over the past years an example of growth due to the increasing complexity of our food system, and political realities? Or is it simply another example of Parkinson's Law and mushroom growth in Government? This question is critical if we are to consider the goals of consumption policy, since the consumer is a relatively late arrival.

I assert that it would be a mistake to throw the consumption- and nutrition-emphasis "baby" at the food policy table out with the budgetary table scraps in the 1980's. Like most babies, this latest "mission" of USDA has grown rapidly and has sometimes adopted rather rambunctious habits, causing concern among older, more mature family members. But rather than banish the baby entirely because of its lack of table manners, I think the answer is etiquette training. After all, USDA is the people's department--all of the people, not just farm people--and therefore we should all be represented at the table where agricultural and food policy is made. Therefore, I believe that consumption policy goals should include consideration of nutritional health in the broad sense--domestic food assistance, food safety, and food prices, as well as international nutrition considerations, food export, and trade policy.

Why consumer-oriented goals belong

Good reasons exist for including consumer-oriented goals in agricultural and food policy. Schuh (1981) recently contended that agricultural legislation directed only to producers can no longer get through the Congress. In most congressional districts there are more people on food programs than on farm programs. He refreshes our memory about the politics of passage for the 1973 and 1977 farm bills, both of which required coalitions wider than that of farmers alone. He suggests that coalitions of farmers, consumers, and other groups are also likely to be necessary to assure the 1981 bill's passage.

Schuh also sees a continued USDA concern for both consumers and producers as the best hope for sustaining strong export performance and a coherent agricultural policy. The goal would be to achieve a reasonable export growth rate without imposing an excessive burden on American consumers from high food prices.

In spite of the recent cutbacks proposed in the new administration's budget, domestic food assistance is still a USDA budget Goliath. These programs are designed to upgrade the diets of low-income people. Schuh believes that the food stamp program has played a role in enabling our country to avoid price policies which discriminate against agriculture and low-income consumers. He contends that price-support programs which helped keep farm prices above what they otherwise would have been, would not have worked in the absence of a food stamp program protecting low-income groups. He asserts that this food stamp program role is still important today and that it should remain in USDA so that a cohesive food and agricultural policy can be forged. The other alternative--direct Government intervention to lower the price of food to the urban disadvantaged--is somewhat less palatable.

Changing food needs and how to meet them

If the conference organizers had asked me to speak about nutrient needs, some 40-odd of which we human beings require on a regular basis, I would have been much more comfortable than with the topic they gave me, which was food needs. From a nutritional standpoint, specific foods are not essential to health, although they may seem to be from the cultural, personal preference, or ecological perspective. Taking this rather broad meaning of the word "need" and assuming that in popular parlance it is synonymous with demand, it would be legitimate to say that perceived food needs vary greatly both within and across populations. Nutrient needs and recommendations vary less, according to such factors as age, state of health, and the like. Consumers often regard their favorite foods as being absolutely essential to their nutritional health and react violently when they are not available. They believe their health and well-being, not just their preferences, are being affected.

The basic point is that food needs do not exist in the physiological sense although they are very real in the psychological sense. It is better to refer to this as food demand. Food demand is influenced most by economic factors such as income, prices, and the like, by personal preferences, and by information- and education-related efforts.

This last factor which influences demand (education and information) is crucial from the nutrition educator's standpoint and needs to be highlighted as it is another issue which is likely to be hotly disputed in the future.

In societies such as ours, changes in public food demand must occur before changes in the country's food production policies. It is neither desirable nor possible to dictate to people what they should eat, particularly because scientific proof of the link between different dietary components and health continues to be a contentious subject (Whitehead, 1979). Health education about food therefore plays a critical role. Such education should, in the words of Whitehead (1979),

"not disguise the shortcomings of present knowledge * * * but at the same time give positive guidance as to what would be the most judicious thing for people to actually do. It is clearly also important that there should not be other forces vigorously subverting the contents of the education programs, such as commercial advertising practices. This is one of the reasons why it is of crucial importance that commercial interests are involved in policy debates and in the formulation of the ultimate plan of action. It is not too much to hope that they would be able to adjust their publicity and marketing practices so that these were generally in line with public education policies."

From the standpoint of achieving a well-balanced diet, some foods or combinations of foods make it easier. Today, a large percentage of the food supply consists of pre-prepared foods and those which are formulated from food constituents to consumer preference and, one hopes, nutritional considerations. Thus our choices are no longer confined to the basic staples of yesteryear. This provides us with both challenges and potential problems from the nutritionist's perspective, since food guides developed in times when much of what we ate was "basic" may no longer be relevant to describing the nutritional characteristics of newer foods.

Given this rationale, in mapping strategies for meeting changing food demand the issues become: (1) Should we work for a food and consumption policy which assures efficient production, distribution, and marketing of wholesome, safe, inexpensive, and nutritious food which people like and will eat? (2) Should we adopt more limited objectives? (3) Should we actively inform people about what they are eating from the nutritional as well as from other standpoints, providing guidance so they can make informed choices, or not?

Clearly the policy decisions which are made in a rich country are not the same as those which are appropriate in a poor country. Nor, for that matter, are consumption policy goals. In highly industrialized countries the lifestyle is such that goals such as avoiding overeating, eating less fat, and the like make sense for almost everyone. In poor countries almost everyone needs to get enough to eat, to eat more fat, and to eat energy-rich foods. Therefore, it would seem that food production goals in these two environments would differ a good deal.

FOOD DEFICIENCIES

This brings me to the second point I was asked to talk about--food deficiencies. Again, the organizers of this conference and the nutritionists of the country are at odds on semantics. Human beings do not have needs for specific foods. But they do need the nutrients which come packaged in foods. That

is to say, the health value of diets depends upon nutrients, not on any specific food commodity mix. However, to be practical, people do get used to certain foods and "raise cain" if they can't get them at a reasonable price. When nutrients are presented in food consumers don't like, or in ones they are unfamiliar with, the first prerequisite to nutrition--consumption--is violated. Therefore, it makes little sense to assume that one can ignore food consumption and food demand patterns if one is a nutritionist even if nutritionally well-balanced diets can be formulated.

Now, if we turn to the question of nutrient deficiencies among the population--or perhaps better phrased, nutrient shortfalls from the Recommended Dietary Allowances (RDAs)--some do exist. The most notable are probably iron and, in areas where the water supply is not fluoridated, fluorides. These particular shortfalls are apparent across all income groups. They appear to be related more to energy intake and physiological state (as with iron lacks which become especially apparent at certain times of life or during pregnancy) or to other factors like location (as with fluorides). Other nutrient shortfalls are more closely associated with socioeconomic status. Examples here include vitamin A and ascorbic acid. Fortunately for most of the micronutrient shortfalls, evidence of risk is much more common than outright deficiencies; only iron deficiency anemia is widely prevalent. Mean intakes of energy-yielding nutrients are also considerably below the RDAs for certain groups. These shortfalls appear to be more associated with a sedentary lifestyle (and thus low energy intakes) than they are with income.

Progress made over the last decade and a half in improving access to nutritious food is considerable, especially on behalf of our poorest citizens, and the food programs can take some of the credit. However, one is struck by the paucity of solid program evaluations from the nutritional perspective and the lack of program integration with nutrition education efforts. This has continued now in three different administrations. It remains to be seen what the new administration will do on this.

NUTRITION STANDARDS

Another issue likely to be widely debated in the next few years is nutrition recommendations or guidelines to be used in consumption policy considerations. Recommendations vary by the assumptions employed, purposes, issues covered, and whether the focus is on nutrients or foods.

Guiding principles used by those addressing consumption policy concerns inevitably will vary from time to time, since they are simply estimates reflecting scientific knowledge, as well as economic and political realities. No "standard" is suitable for all times and places. Inevitably, difficulties arise when nutrient recommendations such as the RDA are used as

standards since they rapidly become outdated. Difficulties also arise when specific food patterns typical of meals at one time become fixed in administrative law as standards for other times when lifestyles change.

No set of recommendations is perfect because our underlying state of nutrition knowledge is imperfect. Moreover, none of the currently used recommendations is designed for individuals although usually individuals, not groups, seek dietary guidance. The recommendations are based on data which are applicable to groups. For any given individual, we rarely know what minimum average nutrient requirements are, what other factors are present which predispose them to risk, or, for that matter, the nutrient level excessive for them. Therefore, whether we are discussing recommendations addressed primarily to achieving nutrient sufficiency or those addressing potential adverse effects from extreme nutrient intakes, we can only discuss group probabilities.

This point leads to another issue likely to be controversial in the next few years--the associations between diet and pathology. The problem of appropriate models is critical. Nutrition scientists have usually assumed that the relationships fit a linear model, but there is little to buttress the contention that this is correct. The association may be an exponential one, like that presumed to exist between overweight and mortality, or again, it may be an asymptotic relationship. Finally, a whole range of models with different slopes may need to be employed.

The implications of our ignorance with respect to models for these associations are considerable for nutrition information and education efforts. If the linear model is correct, many need guidance. If the exponential model is correct, fewer need guidance or information so that they can restrict their intakes. Unfortunately, we do not know that the exponential model is the right one.

Given our present state of knowledge, some advocate mass measures such as the dietary guidelines, other advocate special measures such as screening through the health care system, and still a third group believes that nothing is necessary. The most appropriate mix of approaches will surely continue to be debated in the future.

FOOD SAFETY

Another set of issues to be very hotly discussed in the next few years are those surrounding food safety.

I have already mentioned the problem of mathematical models for possible pathology associated with nutrients. The problems of appropriate methods for risk assessment in other species and the models which are used to extrapolate from high doses in animals to the potential effects of chronic low dose exposure in man are also considerable and as yet unresolved. Models

currently being considered for food constituents vary by several hundred-thousandfold in the dose which is judged to have a significant effect.

Even if agreement is achieved on testing and on models with additional study, other practical problems exist. Even though risks may be assessed in a standardized way in future, it may be necessary to regulate these risks differently, as is currently the case.

The other great issue is the question of socially acceptable risks for some substances, such as food additives, which are judged to be toxic in that they are carcinogenic in experimental animals. As we all know, presently the law requires that these not be added to foods, although naturally occurring toxicants with the same effect may be permitted. The Congress's moratorium on saccharin will expire soon. This whole matter is likely to be widely discussed as action is taken to extend the moratorium or otherwise deal with this problem.

We all know that socially acceptable risks--that is, the risks society is willing to permit--vary from country to country and from one time in history to another, and regulatory policy varies accordingly. However, we must also remember that what is a socially acceptable risk to one person may not be acceptable to another. Some kind of information is likely to be necessary regardless of future regulatory policy.

Depending upon the models used for estimating risk or inferring safety, and the implicit or explicit weighing of benefits, social judgments about safety and usefulness are going to be made. The whole issue of how and what trade-offs should be made, and whether benefits other than health benefits should count in these equations, will receive attention.

I believe that any substance which has previously been approved by regulatory authorities and which later becomes suspect from the standpoint of our present regulations creates very special problems. Industries have grown up around products which contain these constituents. Consumers have grown accustomed to them. Better ways have to be found to cope with the dual objectives of increasing food safety and decreasing impacts of changes on affected groups.

FOOD INFORMATION

My last topic is the question of food information. People who talk about this today may see this as solutions to food-safety-related dilemmas, to nutrition education, consumer economics, or other problems.

Food safety and freedom of choice are much discussed, and many groups are now trying to find ways that consumers can be

informed about socially acceptable risks as an alternative to regulation. Others find this alternative unpalatable.

Nutrient labeling, especially of type and amount of fat, carbohydrate and cholesterol, sodium, calories, and other key nutrients, seems, except for sodium labeling, to be on the back burner these days, but at some point will likely heat up again. The issue of food grading and revisions in grading to favor less fatty meats is another information-related issue which is not widely discussed but probably will be again. Color and flavor labeling may also come back into debate soon.

Economically related issues, such as unit pricing, net weight, and computerized checkouts with prices on shelves instead of on individual items, also are quiescent but likely to come back into debate at some time.

Finally, nutrition information and education about diets as a whole, rather than individual food items, and who should do it are questions. Especially, the role of Government is likely to be debated.

Food policy

Government food policy analysts (Lee, 1981) appear to be more aware of the need to order priorities around the ultimate goal of assuring the population's nutritional well-being than they were even a decade ago. One such analysis sees these as being accomplished, in order of priority, as follows:

1. Security of the food supply, to be achieved by assuring adequate supplies of safe and wholesome food.

2. Accessibility of food by all segments of the population, by providing an effective food distribution system, reasonable food prices, and assuring the nutritional well-being of those unable to purchase food from their own resources.

3. An economically healthy and viable food production system.

4. Prudent use of food production resources.

5. Equitable distribution of economic rewards and power between the food system and other components of the larger economy, among stages and components of the food system, and among participants within each stage of the food system.

6. Access to market and consumer information, including consumer access to information to assure informed choices regarding nutrition, health, and economic value when

buying food, and market and price information for food producers.

7. A food system and performance consistent with other national goals and policies, such as economic opportunity for individuals; an economic structure preserving flexibility for the future; minimum regulatory burden on participants; and consistency with other national goals, such as energy policy and anti-inflation policy.

Contrast these priorities with seven principles enunciated by a previous Assistant Secretary of Agriculture, Carol Tucker Foreman (1980). In her view the greatest problem facing the Government in the 1980's is high food prices. She believes that the challenge will be to take advantage of rising demand for food at home and abroad while mitigating the domestic distributional consequences of rising prices. Seven principles to help do this were suggested. They include: (1) adequate food production while husbanding natural resources, (2) assuring price stability, (3) use of food as an instrument of trade and foreign policy, (4) an efficient and fair structure for agriculture at home, (5) domestic assistance to provide all segments of society with adequate diets at reasonable prices, (6) reasonable regulation, and (7) improving the state of our technology base. High food prices and pressures to reduce Government spending are likely to subject agriculture production programs to the same scrutiny that the food distribution and food assistance programs have received lately. Moreover, she warns that as food prices go up, the public is likely to demand a higher quality product and more information to prove that quality is high. At the same time, regulatory efforts which are proposed on the basis of potential health and safety risks are likely to receive a good deal of scrutiny and will have to compete with other concerns, such as the effects on prices or on the size of Government.

The degree to which these two observers share the same priorities is striking, although their rank order is not always similar. No doubt elsewhere in this symposium we will hear the views of decisionmakers in the new administration. As a nutritionist, I hope that they give these issues high priority and that the strides which have been made over the last decade continue throughout the 1980's.

CONCLUSION

In conclusion, I think that the goals of consumption policy must be nutritionally oriented in the broadest sense of the word, including concerns about food and nutrition, dietary information, food safety, food supply, and food assistance. International food and nutrition, which are beyond the scope of what I have discussed here, are also important considerations. Moreover, the various diet aspects which interact with other factors to affect

health and disease need to be stressed in health policies. Such a broad, interlinking consumption policy must have a strong base in food policy or it is likely to falter. Education and welfare as well as health policy dimensions must also be considered as consumption policy is formulated.

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Margaret O'K. Glavin

FOOD ASSISTANCE--THE CHANGING FEDERAL GOVERNMENT ROLE

MRS. MARGARET O'K. GLAVIN is the Deputy Administrator for Special Nutrition Programs at the Food and Nutrition Service, U.S. Department of Agriculture. Mrs. Glavin has been with the Food and Nutrition Service since 1968. From 1978 to 1980, she was the Director of the School Programs Division. As Deputy Administrator, Mrs. Glavin is involved with school lunch and breakfast, child care, summer feeding, and food distribution programs, as well as the Supplemental Feeding Program for Women, Infants, and Children.

The basic question posed by this symposium, as I understand it, is the direction of food policy in this country. I should first indicate that--probably not unlike all new administrations--the current administration's food policy is slowly evolving. Front stage to all policy development in the first 100 days of the new administration has obviously been the overall fiscal policy agenda--budget and taxes.

But I think it is fair to conclude that the fundamental purpose of the Department of Agriculture has not changed radically relative to food policy. That is, it will continue to remain the mission of the Department to ensure that there will be an adequate, safe, nutritionally balanced, and reasonably priced food supply, equitably available to all Americans. It would appear to me that a major thrust of today's food policy receiving heated debate in the context of overall fiscal policy is the availability of food to low-income Americans. My comments will be limited to those programs administered by the Food and Nutrition Service. I should quickly add, however, that a food assistance policy cannot divorce itself of overall fiscal, health, and general income-maintenance policies. If we are truly to develop a sound food assistance policy, we will find ourselves, without question, immersed in the overall issue of what level of national resources--measured by a number of factors including income and in-kind resources--should be made available to low-income households. Stimulating the real growth in national wealth can only further the goal of providing not only constant but even a potential increase in transferable resources in the future to needy groups both here and abroad.

Like many other social assistance programs, programs providing food assistance are currently undergoing serious scrutiny

by the administration, the Congress, and the public. This scrutiny often appears to focus entirely on the cost implications of policy and service delivery changes. There is, I feel, a more fundamental reassessment and reevaluation going on which is coupled with but distinct from the concern over cost. I would like to present some thoughts on the considerations which have led to the changes proposed by this administration. This examination will also provide further insight into the direction these programs might take in the future.

The food programs administered by the Department of Agriculture have grown tremendously since their inception, especially in the last decade. In 1970, the National School Lunch Program provided 3.5 billion meals; in 1980, the program had expanded to 4.4 billion meals. Federal expenditures for the program increased even more significantly. In 1970, the Federal expenditures were $299 million; in 1980, expenditures exceeded $2.29 billion.

In 1970, food stamp benefits were available in only half of the Nation's counties; by 1975, food stamps had become a nationwide entitlement. Between 1970 and 1980, food stamp participation increased five-fold. In 1970, an average of 4 million persons participated each month; in 1980, 21 million persons participated on average each month.

The food programs are not only changing in terms of their size but are continuously evolving in terms of their scope and effect.

The earliest food programs of the Department of Agriculture were set up as socially useful ways of disposing of agricultural commodities purchased under price-support programs. As the public and policymakers came to recognize nutritional needs among certain groups within the population, these commodity distribution programs became more oriented toward filling perceived dietary gaps. The food stamp program was created in an effort to improve the diets of low-income households by increasing their food buying power. The early school lunch program was expanded to include cash assistance to schools, and a new array of programs aimed at providing nutritious meals to children in a variety of settings was added. These program changes moved the focus of these programs from commodity disposal to nutritional support.

Within the child nutrition programs, which include the school lunch and breakfast programs, and a number of special programs providing meals to children in other institutional settings, as well as programs targeted to certain high-risk groups, the nutritional focus has remained the primary orientation. Recognizing the importance of diet on physical and mental development and performance, these programs have ultimately evolved requirements that cause program meals to meet basic levels of daily recommended allowances for specific nutrients. For example, lunch is designed

to meet approximately one-third of the Recommended Dietary Allowances. In this way the physiological conditions promoting the learning situation are optimized.

The WIC program, in particular, is a good example of a program with a strong nutrition orientation. WIC, or the Special Supplemental Food Program for Women, Infants, and Children as it is technically called, is designed to promote the health of pregnant women, infants, and young children by providing selected highly nutritious foods, nutrition education, and referrals to health facilities.

The WIC Program serves high-risk individuals at especially vulnerable periods in their life cycle--during pregnancy, infancy, and early childhood. The careful targeting of benefits and the multifaceted intervention create a high probability that the program will have a significant impact on the nutritional status of participants. The evidence from recent studies does in fact show that the WIC program is having a positive and significant impact on program participants. Data from several large-scale studies have shown that participation in the WIC program is associated with a positive and significant increase in birth weight and a reduction in the incidence of low-birth-weight infants born to women who participate in WIC. Low birth weight is currently the eighth leading cause of death in the U.S.

In contrast to the strong nutritional focus of programs such as WIC, the food stamp program currently has a dual orientation, focusing on both the nutritional needs and the lack of income of households at and near the poverty level. Food stamp benefits are provided in the form of coupons redeemable only for food, and the amount of benefits is based on the cost of a diet which will sustain a household at a basic level of nutrition adequacy. Nonetheless, the food stamp program is evolving toward a program which primarily supplements the income of poor households.

FNS (the Food and Nutrition Service) currently estimates that of every dollar of food stamp benefits provided to recipients, about 35 cents goes to increased food purchases, and the remainder substitutes for income the household already spends on food, thus freeing these funds for nonfood purchases.

The focus of the food stamp program on income supplementation has been strengthened by recent program modifications, such as the elimination of the purchase requirement (EPR). EPR, as it has come to be known, removed the requirement that households tie up a certain amount of their own income in food stamps in order to receive additional free food stamps. Thus, under EPR, households are no longer required to spend at a level which provides a nutritious diet. The Department is currently analyzing available data to determine the actual impact of EPR on food purchasing patterns.

I do not mean to create a dichotomy between the nutrition and income-supplementation aspects of the food stamp program. We know that, at certain low-income levels, an increase in unconstrained household income will lead to an increase in the amount spent for food. However, it is useful in examining the administration's proposals for the food stamp program to keep in mind this orientation toward income supplementation, which I believe will become more evident in the future.

The new administration has taken a serious look at the purposes and directions of all the Federal food assistance programs. Given the economic constraints which we as a Nation are facing today, it is evident that we cannot try to be all things to all people. When program costs must be constrained and in many cases reduced, it is important that the basic purposes of the program are maintained. I would like to discuss the proposals which have been submitted by the administration for the food assistance programs in the context of the conceptual framework I have presented here.

The administration's proposals concerning the food stamp program recognize its evolving focus on supplementing the income of low-income households. For example, eligibility for food stamps has been tied even more directly to a household's overall level of income by using a flat gross-income limit rather than using a net income which is adjusted to take account of a household's other consumption needs. In addition, the use of the previous month's income rather than an estimate of future income more accurately reflects a household's actual income level, although it may reduce the speed with which the system can respond to changes in income. Here again, a capability for quick response is not as crucial in a program which is no longer designed primarily to fill a pressing food need.

On the other hand, the administration's proposals concerning the child nutrition programs emphasize their primary purpose as mechanisms to enhance the nutritional status of participants. Program benefits will be targeted to low-income children, the only group for which we can demonstrate that the programs produce a real improvement in nutritional status. Program benefits in the meal reimbursement programs will no longer be available for non-needy children. For example, in the National School Lunch Program, low-income children will continue to receive free meals, but schools will no longer receive Federal subsidies designed to lower the price of the meal to non-needy children.

Another area I wish to stress is the management of the programs. No program, no matter how well intended or soundly developed, can be effective if the program is poorly or improperly administered. Program benefits must be provided to the intended target population; management resources, whether time, energy, or dollars, must be effectively and efficiently used to maximize the delivery benefits. In an effort to ensure program consistency

between localities, States, and regions, a massive system of people and paper has been established. This system must be reassessed in an effort to streamline program operations without compromising the accuracy and equity of program functioning. This administration is committed to a review of program requirements in an effort to allow State and local governments maximum flexibility in the delivery of program benefits.

In summary, I would like to stress three points. First, this is a period of limited program resources. The difficulties experienced in the economy at large will not permit unrestrained growth of food assistance programs such as has been experienced in recent years. Second, program managers and redirection resulting from fiscal and ideological factors must preserve the essential intent of the programs. This programmatic integrity can only be accomplished through a careful analysis of the history and evolution of the purpose, operations, and management of the programs. Third, these program changes must be accomplished in an atmosphere of managerial efficiency and program effectiveness.

Ned W. Dearborn

THE GLOBAL 2000 REPORT--ITS IMPLICATIONS FOR FOOD IN OUR FUTURE

NED W. DEARBORN was the member of the Global 2000 study staff who had primary responsibility for analyzing the forecasting methodologies which underlie the projections presented in the "Global 2000 Report to the President." The resulting analysis is contained in the report. Mr. Dearborn's impromptu comments were solicited and offered on an informal basis and do not necessarily represent the views of any other individual or organization.

The Global 2000 study was undertaken in response to a directive in 1977 by President Carter, as part of his environmental message [Environmental Message to the Congress, May 23, 1977]. The study had two purposes. The first was to project probable changes in the world's population, natural resources, and environment through the end of the century. The second was to provide a foundation for U.S. longer range planning.

Dr. Jerry Barney was the study Director. It was his insight that the two-part format meant that the study staff should not only obtain a set of "magic numbers," but also use the process of obtaining those numbers to better understand where the numbers came from and what the Government's models are like. In short, the staff would look at the real foundation of planning, which isn't the numbers themselves but the underlying sets of assumptions of our major policymakers of which the models are just an outward, visible sign.

STUDY METHODOLOGY

How was the study conducted? Over 12 agencies participated in the Global 2000 study, and over $1 million dollars was spent. The Council on Environmental Quality and the State Department had lead responsibility. Although it was originally planned as a 1-year study, exigencies caused it to be a 3-year study, and yet it did come to fruition. Over 200,000 copies of the three-volume report have now been distributed all over the world, and a task force response has come through, too.

What were the probable changes that we were charged with looking at? First of all, population, natural resources, and environment are all biophysical trend projections. The study did not look closely at the economic implications of these trends.

Nor did the study closely assess the socio-political problems that might arise in the future due to those trends. The study's focus was purposely limited.

As a result, the study tends to have a cheerier note than a less-narrow analysis might indicate. For example, there are no major catastrophes in terms of wars or setbacks to the national economic system. No major changes in relationships between North-South trading, and no major climatic or weather catastrophes, blight, plagues, or the like. We knew historically that such things occurred but that they occurred in an unpredictable way and would skew any projection that tried to take explicit account of them. It's worth noting the optimistic biases that this omission gives.

Federal agencies' projection methodologies were used. There may, in the study staff's view, have been better models, better sets of numbers for the particular problem we were assigned. This is true in part because projecting long-term global trends on a mutually consistent basis was not a task that the Federal Government had addressed before. There have been numerous task forces which have looked one way or another at either population or minerals or the environment, but to treat them on an integrated global basis over the long term was a first-time effort, the culmination of increasing steps in that direction over the last century.

The nature of the Federal methodologies that we used dictated the method. Population and GNP were separate stand-alone projections. The population projection came from the Bureau of the Census, and the GNP from the World Bank. The Federal Government doesn't have a way of developing its own global GNP projections. These projections were then required as inputs to the natural resource models, and the natural resource consumption projection patterns were required in order to generate the environment models. So it had to happen sequentially.

When we put the first study volume together, we synthesized conclusions about food, for example, that came not only from the food chapter but also from the environment chapters and other chapters that touched on food. We included an update of the original population and GNP projections to get the views of the people who wrote them as to how they might be changed by what had happened since they were formulated in 1977. Caveats pointing out the extent to which closure had not been achieved, and the extent to which the various methodologies used contained inherent biases, are contained in the first study volume.

That was the first part of our mandate--projections. The second part of our mandate was to look at the foundation for planning itself. There is an appendix to the study which looks at the historical context in which these methodologies and models have been developed over the years. It's a frank one that lists many of the political ups and downs. We also undertook to study in detail the underlying assumptions and methods of the different

methodologies. This is a rare Government report in that the whole last half of it is concerned with showing the limitations of the numbers that are published in the first half. It contains its own documentation.

We not only looked at the Government models but, as a calibration check, also went to long-term global models outside of the Government. The external models are really long-term models. Although we think of Global 2000 as a long-term study from the Government standpoint, stopping in the year 2000 avoids seeing many of the things that these other studies have seen happening in the first one to three decades of the next century. There's a story about a man falling off a very high building passing someone on the third floor, who asks how he is. He says, "Everything's great so far." You run into that problem when you stop at the year 2000. We also suggested a number of ways in which some of the obvious problems that we identified might be improved through greater Government attention and interaction--steps the White House might take.

The only kind of consistency that we really tried for was to get the inputs of one model to match the outputs of the others. What we ended up with, in my personal view, is rather like a ship sailing out into the night with very imperfect radar. We see massive threatening shapes out there, but they don't have very good definition at this point. The general trends which we found were confirmed by the collateral models and have been confirmed by repeated studies by the various agencies involved. That is not a true measure of certainty, but it does give some degree of confidence in the study's general thrust. The Government is rather like an oil tanker. We have billion dollar programs that are, at least in part, directed by the computer models and studies we used--justified, argued, and debated on. It seems incredible with billion dollar programs floating on these that we should continue to make due with inadequate radar.

STUDY FINDINGS

What did we find? In brief, we found population growth, according to the experts, will be virtually constant to the end of the century. It goes from 1.8 to 1.7 percent per year in the very last 5-year group. This means world population is projected to increase roughly 50 percent between 1975, the general base year of the study, and the year 2000. That's an enormous increase.

We found that growth and natural resource consumption will exceed population growth, which is not surprising. Of course, as that happens we'll see more and more strain on the carrying capacity of the environment. We found that many of the projections for how much food and energy would be produced did not take into account the degradation of the basic producing assets, as in the case of food or water. Each sector tended to assume its own unlimited capacity of land or capital to use. In short,

the projections are likely to be less adverse than reality if action isn't taken to change the trends.

What were the final conclusions of the study? That in the year 2000 we will have to deal with a world which will be more crowded, more polluted, and in many ways poorer despite greater aggregrate wealth. Less stable ecologically, more vulnerable to disruptions than the world we live in today. This is horrifying. The projections show the exacerbation of effects to be occurring just before the year 2000. In short, we're not on a linear trend where gradually things will get worse and worse. Instead, things will get very bad very quickly.

The first conclusions involve the horrors. The second conclusion is that, based on these horrors, the Government needs better radar. It is absurd that we have billion dollar programs, and such small budgets for channeling where they go.

Food outlook

To briefly review what the study said about food. The key assumptions of the study with regard to technology and investment were set by the individual agencies which did the projections. The Department of Agriculture assumed a simple trend extrapolation of the Green Revolution of the last 10 or 20 years going on into the future. It's not technologically biased. They picked the numbers and the numbers were a continuation of optimistic trends. Agriculture assumed that massive public and private investment in the agricultural sector would occur that would open up new crop yield possibilities. For example, less-developed countries' (LDCs') crop production is projected to go up 125 percent over the 25-year period. Agriculture used a 30-year period for the base for this. That growth is stimulated by a doubling of real food prices, the opposite of what is currently predicted.

In response to the doubling of food prices, total world food production was supposed to double. However, with the 50 percent increase in population, it comes to less than 15 percent in per capita food consumption, with great regional disparity. An awful lot of that food production, for example, is going into feed grains for meat, which, of course, reduces what effectively gets to people. The study shows per capita food consumption measured in calories to be virtually unchanging in many of the LDCs, and in some cases actually declining over the period. There was no accounting for just exactly where the moneys would come from in foreign trade to pay for the food imports that are optimistically projected now by the Department. In some regions, per capita consumption is stationary or declines.

THE METHOD IS THE MESSAGE

What do we learn methodologically? The food projections are significantly inconsistent with the population, GNP, environment,

and other projections. The population projection, for example, assumed a major decline in fertility rates. The fertility rate dropped 40 percent in Bangladesh, for one. It is assumed that there will be increasing general economic and social welfare throughout the world during this period. That's directly contradicted by both the per capita GNP projections and the per capita food projections, which indicate fertility rates would be higher. The GNP projections assumed falling real prices of food and much less demand on the part of the LDCs for world food trade than the food model did. They can't both be right.

Projection inconsistencies are due in large part to the bureaucratic division of responsibility among the agencies. It's not that people in general are deliberately trying to use inconsistent numbers. It's that there is no institutional entity within the executive branch that's charged with getting these numbers straight, or even with noting whether they're straight or not. I would hope that GAO might think of a role it could play with regard to that, either urging the executive branch to worry about these things or, if possible, taking responsibility itself. If these inconsistencies between agencies' "radar" are to be resolved, there needs to be a major new institutional commitment somewhere. Concomitant with that commitment has to be a recognition that it's going to cost money and take time and not be a simple thing to do. It's not a one-time thing to come up with a set of better projections. What's needed is a process to continously be improving the basis under which projections are made. While that happens on a scattered basis in the different agencies, there's nothing that brings the whole together. The inconsistencies are significant and still are not fully resolved.

Visibility needed

The task force report which followed up the Global 2000 study recommends a number of things be done to put things right. Even with better management control in Government, many of the studies in food certainly rely on imperfect data and uncertain relationships which are imprecisely defined. Not only in nutrition, but elsewhere, a great deal of knowledge exists that needs to be gathered.

The last point that I want to raise here is the lack of visibility for what we found. There was an interesting article by Patricia Roberts Harris in the New York Times recently, in which she challenged the intellectual community--and I include all analysts in that--to stand up and be counted when someone says that an analysis is "phony," when someone says that the numbers have no merit, yet offers totally new numbers without any particular justification. Those people who are professionally responsible for such things should say, "Hey, wait a minute. We have this analysis. Why don't we use it as a starting point? Let's look at it item by item and see what's right and see what's wrong with it."

Mrs. Harris is right. There has been very little attention given since the Global 2000 study to one of its major findings, which is that the President of the United States is presently unable to obtain a consistent set of projections, never mind accurate, from his various departments. How is it possible for the White House not to be concerned about that, not to want to do something about it? We have new people on board now. No doubt the new administration will be concerned about the problem if it comes to its attention.

We require some mechanism for giving the problem--this important report finding--more visibility. I think that there is an important potential GAO role in focusing the new administration's attention on this problem. I hope GAO accepts the challenge.

As an immediate example of the problems inconsistency gives rise to, this morning Deputy Secretary of Agriculture Lyng, during his question and answer session, essentially agreed with the Global 2000 Report's projections of future world production and consumption patterns, except that the projections he used assumed that real food prices will decline. The Global 2000 Report, the projections of which were also developed by USDA using its own analytic methodologies, projects a doubling of real food prices.

An outside observer, perhaps GAO, could ask the following kinds of questions: What data elements, parameters, and structural elements of USDA's models were used to arrive at such different conclusions? What item-by-item substitutions could be made based on analytic evidence? What are the new results of the model, and can these results be independently evaluated?

David A. Fulton

"MANUFACTURING" FOOD--THE RELATIONSHIP OF GOVERNMENT TO THE AGRICULTURAL INDUSTRY BEYOND THE FARM GATE

DAVID A. FULTON is Vice President for Government Affairs for Farmland Industries, Inc, a major Midwestern, farmer-owned cooperative. Mr. Fulton joined Farmland Industries in 1963 and since then has held positions of increasing responsibility, ranging from feed plant manager to executive director of Co-op Sales Support and Development. Mr. Fulton, a graduate of Iowa State University, was promoted to Vice President for Government Affairs in September 1979.

I appreciate very much the invitation to talk to this distinguished group about trends, problems, and opportunities facing our industrialized and complex food and agribusiness system.

My comments this morning will be directed toward legislative and regulatory trends which could result in increased productivity and marketing efficiencies in the food industry.

I am sure everyone here today would agree that increased productivity benefits consumers as much as farmers--and, of course, strengthens our Nation's internationally important agribusiness industry.

Therefore, my comments will focus on four general areas which we feel could be paramount in the eyes of our legislators as they take up the business of the 97th Congress.

They are deregulation; a review of interagency relationships; concentration in the food industry; and last, accelerated involvement in the Government process by agribusiness.

DEREGULATION

An appropriate way to begin a discussion of future trends in relations between Government and the food industry beyond the farm gate, is to focus on deregulation. The deregulation movement started by President Ford, carried on by Carter, sharply accelerated by President Reagan, and vigorously supported by many in Congress almost certainly will be directed toward the food industry in the next few years.

I have always thought that the term "deregulation" was misleading. To deregulate suggests a termination of regulations, but that almost never happens. What we are really talking about is less regulation, or regulation of a different character. Certainly this is the case with the food industry. Government is not going to get out of the business of regulating the food business. But it is reasonable to expect a great deal of debate in the next few years about food regulations and how they might be changed to reduce the administrative burden and the cost of regulation.

It is too early to predict exactly where we will wind up. I imagine that there will be a great deal more debate than action. This is due, in part, because the regulations that affect the food industry do not lend themselves to the kind of sweeping changes that Congress has made in regulations relating to transportation, for example. It is also the case that there are a number of counter pressures at work. The public will, and should, be concerned for safety and health regulations. Furthermore, the trend toward greater complexity in the food industry could certainly invite added, versus less, Government observation. Nevertheless, one would expect at least some marginal changes in the years ahead.

Health and safety

No one in the food industry, from farmer to processor to retailer, wants to abandon the goal of assuring consumers healthful, wholesome, and safe food. Certainly the farmer has a direct, personal economic interest in maintaining consumer confidence in farm products. But in recent years, there has been a growning concern that a number of regulations are too rigid, that there is insufficient administrative flexibility. This concern has grown as our ability to detect potential hazards, however insignificant, continues to outstrip our capacity to prove definite cause-and-effect relationships.

Thus, seemingly every day, we are advised of potential new hazards, such as the potential link between coffee and pancreatic cancer, the frying of bacon and generation of nitrosamines, and on and on. Everything seems potentially suspect.

This has led to a growing concern that we must develop a more effective system of distinguishing between significant risk and mere speculation. And that we must have a better way of determining the trade-off between risk and benefits. In other words, we need a more workable system of risk assessment which allows us to make regulatory decisions on a more flexible, realistic basis than on simply an all-or-nothing, black-or-white basis, as is often now the case.

Delaney Amendment

The Delaney Amendment is a case in point. The amendment bans any substance with the minutest trace of carcinogens and has been

the subject of controversy for a number of years. Legislation to modify the amendment was introduced during the last Congress, but no action was taken. However, it appears that the Congress this year or next will take a much more thorough look at this issue and, quite possibly, adopt new legislation. A number of bills have already been introduced. Others are being developed.

We fully recognize, of course, that this is a delicate and challenging issue. As Senator Lugar, Chairman of the Agricultural Research and General Legislation Subcommittee, recently stated, "the American public wants food safety, but the public also wants the greater degree of common sense in the execution of food regulations." The political and technical challenge is to weave these two themes together in effective legislation which will establish new standards that will give regulators more flexibility in determining risks. No one argues that we should take risks when human safety is concerned, but we do need better procedures for determining what is a significant risk.

It appears that GAO will be increasingly involved in this whole area of risk assessment and food safety as the Congress struggles with the challenge of coming up with what Senator Lugar calls a new common-sense procedure for balancing and weighing risks and benefits and reaching administrative decisions acceptable to consumers and industry.

Nutrition

During the Carter administration, the Federal Government began to take an advocacy role in regard to dietary standards. This approach had a number of strong advocates on the Hill. It appears that while the Reagan administration will continue to carry on research programs in this area, it will be far less aggressive in pushing dietary guidelines. Because of the new makeup on the Hill, one would expect less pressure from the Congress on this issue. Likewise, Secretary Block has already indicated that there will be no new labeling regulations, unless it can be proven that they are cost effective and clearly beneficial to the consuming public.

REVIEW OF THE INTERAGENCY RELATIONSHIPS

I believe that the deregulation movement will also lead to an extensive review of the duplication, inconsistencies, and contradictions among regulatory agencies. We believe that if we are to improve productivity in agribusiness, we would foresee the need for careful evaluation of the role of numerous agencies which interact with agribusiness. Here is a short scenario which reflects this thought.

A grain elevator is operating in Kansas with the doors and windows open. They pass the safety inspection. They are cited for air pollution. They close the windows and doors. They now comply

with air pollution standards, but are cited for hazardous working conditions. They install a dust control system on the unloading pit to comply; they are cited for dust accumulation in the head house where electric motors are operating. They vent the head house to comply. Again, they are cited for air pollution from the head house. They close the vent and install explosion-proof motors in the head house. They are finally in complete compliance. A grain elevator leg malfunctions, sparks the concentrated dust, and explodes the elevator.

This rather vivid example of interaction between two agencies is but one of a number of areas which could call for congressional review in order to increase our marketing efficiency.

We see, more and more, the need for an evaluation of the country's interagency coordination. At Farmland, we have spent 3-1/2 years, working with over 25 agencies, to obtain local, State, and Federal permits to mine phosphate rock in Florida.

Even within certain agencies, the various inspectors assigned to oversee a project can cause major losses in efficiency. For example two identical grain-handling facilities are designed and operated within the same State. Each is inspected by different individuals from the same Government agency. They are cited for different violations. One inspector states the elevator he looked at did not comply with the electrical code but did comply with safety codes. The other inspector states that the elevator he looked at was just the reverse. Finally, after exhaustive research and expense, it may be determined through legal sources that both elevators complied on all accounts, on one account, or on neither. We have experienced, over the years, all possible combinations.

CONCENTRATION IN THE FOOD INDUSTRY

Agribusiness, in general, deserves good marks for its achievements. We consistently produce a large quantity of high-quality food. Americans spend a relatively low percentage of their income for food. These achievements are largely unmatched in other countries of the world. American agriculture is highly efficient, and consumers have benefited.

The level of concentration varies considerably in food manufacturing but is quite high in certain product areas such as the sugar industry, both cane and beet; cereals; wet corn milling; flour, cookie, and cracker manufacturing. Some of the food companies have integrated agricultural production. It appears the concentration is increasing. Economists are giving more attention to the economic power of food marketing firms and problems that can arise. Considerable public attention has been directed to several of the faster growing organizations in the food industry.

One well-known company, in addition to its extensive grain trading operations, is in such fields as corn milling, animal

feeds, chemicals, soybean processing, cattle feeding, flour processing, and poultry processing and recently acquired the United States' second largest meatpacker. Presently, this organization is reported to account for 25 percent of the U.S. grain exports.

Another fast grower is Iowa Beef Processors (IBP). From its start in 1961, it has passed Swift, Armour, Wilson, and Cudahy in beef business. Its record of growth in the beef-packing industry is well known. IBP has been an innovator in a business marked by resistance to change. It has adopted new methods of slaughter, and the fabrication of carcass into cuts. IBP has taken a hard line with labor, an important point, because meatpacking is a labor-intensive business. It has retained most of its earnings for low capital cost growth. Of course, even though concentration may be conducive to marketing efficiencies, it can be of concern to farmers in those areas where there may be only one buyer for their cattle.

Most of the large, diversified agribusiness firms are strong in international as well as domestic markets. I think this typifies my earlier statement that agriculture now truly has been internationalized. Our grain business is uniquely structured with exports controlled largely by just four firms. Grain export is one of the most important facts of life in the U.S. because of its leading role as a positive producer of foreign exchange. The fact that it is highly concentrated and so little is known about the major exporting companies is a matter of growing national concern. We have heard a hue and cry from U.S. farm circles for farmers to enter the grain export field through their cooperatives. In future years there will be greater pressure to expand exports of farm commodities.

Concentration very well can lead to increased productivity and efficiency within the food industry. However, if it goes too far, it can impact on both the farmer's price received and the cost to the consumer. Knowing these trends, we feel Congress will continue to be very sensitive to marketing concentrations within the food industry.

ACCELERATED INVOLVEMENT IN THE GOVERNMENT PROCESS BY AGRIBUSINESS

The last prerequisite for increasing marketing efficiency within the food marketing system centers around increased involvement in the Government by agribusiness.

We feel the role of agribusiness in the legislative process will increase significantly in the next few years. The seventies were characterized by the organization of Government affairs, and public affairs, functions in many agribusiness firms. Many did not zero in on specific areas to work with our legislators until late in the seventies. During this past decade, it was the purpose of the Government affairs function to "react" to legislation and

concentrate on the immediate issues. Most agribusiness companies limited themselves to responding to issues directly impacting on their operations. Therefore, I think we are safe in characterizing the decade of the seventies as "reactive" when it comes to involvement with Congress.

The decade of the eighties will see a maturing of the Government affairs functions within agribusiness. I would foresee that more and more companies will be willing to work in coalitions and with Government to achieve their objectives. The agribusiness tone in the eighties will move from a reactive to a "proactive" mode.

SUMMARY

The continued positive actions by the United States General Accounting Office to reveal the facts as they relate to legislation and regulations as they would impact on agribusiness beyond the farm gate, can play a most important role in assuring that our Nation maintains our most valuable agricultural base.

We all have an obligation, not only to keep our Nation's farmers the most productive in the world, but to assure that Americans continue to have available the very highest quality food at prices unequaled anywhere in the world.

Leo V. Mayer, Ph. D.

FARM PRODUCTIVITY--BALANCING TECHNOLOGICAL, FARM, AND SOCIAL GOALS

DR. LEO V. MAYER is a Senior Specialist for Agriculture at the Congressional Research Service in Washington, D.C. Before joining CRS, Dr. Mayer served as Senior Staff Economist with the Council of Economic Advisors at the White House. From 1967 until 1972, he was an Associate Professor of Economics and Associate Director of the Center for Agricultural and Economic Development at Iowa State University. He has co-authored three books on issues related to food and agricultural policy, as well as a number of bulletins and journal articles. Dr. Mayer has lectured in Mexico, Chile, Brazil, Surinam, Guyana, Trinidad, Barbados, and India under the auspices of the U.S. Information Agency.

Farming is one of the oldest activities carried on by man. But it is one of the newest in terms of the application of science and technology. This is true even in the United States where the groundwork for scientific and technological methods of farming was laid more than 100 years ago. It was a half century later, however, before payoffs became evident to public investments like the land grants of 1862 that established State colleges of agriculture, the Federal funds appropriated in 1887 that supported the establishment of State agricultural experiment stations, and the funding of Federal-State extension services authorized in 1914.

Until these investments began to pay off, around 1930, agricultural output had increased because farmers used more inputs. After that, output increased because the inputs farmers used became more productive. The increases in output after 1930 were so rapid, in fact, that for the next half century the Nation was more concerned about too much farm output rather than too little.

Now, as we enter the 1980's, concern over food shortages has returned, especially worldwide. Projections of world food requirements by the U.S. Department of Agriculture imply that demand will outpace supplies of food in most years for the foreseeable future. 1/ Projections like these, along with other supporting trends, are raising public interest in farm productivity

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1/ Iowa State University Economics Newsletter. December 1980.

and interest in budgetary items like agricultural research and soil conservation.

The experience of the past century--with the rise of surpluses after 1920 and the reoccurrence of shortages after 1970--is interesting from another viewpoint. It raises at least the possibility that a cycle exists, something over half a century long, that interrelates technology, population, and food supplies. Of course, it will take another half century to determine if there is such a cycle; that is, it may take at least another half century for food conditions to reverse, perhaps sometime around the year 2030, when current population planning programs and international agricultural research efforts may finally begin to show results. Population size may begin to stabilize in the developed countries by then (see table 1), if present projections turn out to be correct, and slow visibly in the developing countries in the next half century. If this occurs, food production might consistently exceed the immediate needs of markets, and the "techno-po-od" (technology-population-food) cycle, if it exists, would lead to surplus food conditions. In that event, policymakers would again face problems reminiscent of the past half century.

TABLE 1

Type of country	Population 1978 (millions)	Growth rate 1970-78 (percent)	Population proj. 2000 (millions)	Stationary population Year reached	Stationary population Size (millions)
Low Income	1,294	2.2	2,050	2150	4,074
Middle Income	873	2.4	1,409	2095	2,599
Industrialized	668	0.7	736	2025	774
Oil Exporting	60	3.2	104	2095	203
Central Plan	1,352	1.4	1,730	2070	2,121
World	4,247	1.8	6,029	2110	9,771

Source: The World Bank, 1980 World Development Report, Washington, August 1980.

Having glanced at the world food/population situation, which is my way of illustrating that farm productivity is an issue with worldwide ramifications, I want to return to the domestic food scene. In this more restricted context, farm productivity is an issue that some of us view with rose-colored glasses, having spent our professional lives in an era when the critical food issues were repeatedly what to do with too much food and what to do about

farm prices that were too low. For many of us, the newer concerns over slower gains in farm productivity and growing world food demand come almost as a relief, rather than as a warning. The harsh reality of a world with too little food will come, if it does, only after a decade or two of experience with that set of problems.

In fact, it isn't only food balances that many of us view through rose-colored glasses. It extends to the broader issue of science, education, technological innovation, and farm productivity. I was reminded of this recently as I read a paper given by my former Department Chairman at Iowa State University. 1/ At the opening-day faculty convocation last fall, he gave a brief review of the history of higher education and made several points that are worth remembering. I quote:

> "(1) The concept of progress is a relatively new idea viewed in the context of the long history of mankind. College faculties and administrators in the 18th century, who for the most part perceived their mission as saving souls, were slow to embrace any concept of progress. The men in the ivory tower, and they were men, exhibited little or no concern for raising the quality of humankind's existence during his sojourn on earth.
>
> "(2) Toward the end of the 18th century when the Jeffersonian notion of a government by the people had really taken hold, colleges and faculties remained enamored of Greek, Latin, Mathematics and Moral Philosophy and resisted efforts to broaden the curriculum.
>
> "(3) A remarkable group of men, e.g. Ezra Cornell, J. S. Pillsbury, John Hopkins, and Asa Packer, none of them college graduates, all intellectuals, and all rebels against the academic establishment of the day, saw the relevance of education to life in a democracy. Beginning in the mid-1800s, they led the the movement toward broadening the scope of curricula to include useful subjects--law, medicine, engineering, accounting, science--and lent their influence and gave their time and money to the cause. The educational establishment went along, although reluctantly, because then as now money talked. Faculty and its members heard particularly clearly the language of money following 1865, because they had just emerged from the civil war years, a period during which they had not eaten well.

1/ Global Food Assessment, 1980, Foreign Economics Report No. 159 (U.S. Department of Agriculture, July 1980).

"(4)Engineering was the first practical discipline to crash the walls surrounding the old guard classicists. Even though agriculture employed 75 percent of the work force, engineering was promoted by men with the influence and money to break the strong barriers to entry which had been erected by the faculty traditionalists. Asa Parker, a wealthy canalboat operator, gave money in 1863 to found Lehigh University, which was to be a nonsectarian university specializing in science and engineering. Lehigh was located within 15 miles of Lafayette University where the faculty responded by petitioning for a curriculum which did not require Greek or Latin and included emphasis on science.

"(5) The Morrill Act providing for land grant universities was passed in 1862. Passage of the legislation did not come easily. A similar measure under the sponsorship of Justin Morrill (another leader without a college education) had passed Congress but was vetoed by President Buchanan in 1857. The 1862 Act specified that any state accepting the grant of land was required to use it for 'the endowment, support and maintenance of at least one college where the leading objective shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts.* * *'"

It would be difficult today for most of us to imagine the environment in which education took place a century and a half ago. My former colleague at Iowa State suggested his students and staff would have found it unacceptable.

"The [educational] environment was simply too repressive. Certainly the instruction provided was * * * not designed to free the mind but to discipline and channel it. The emphasis was never on free inquiry but always on conformity."

In a very real sense, the emphasis on conformity also pervaded farming. Techniques for growing crops and raising livestock were handed down from generation to generation. Farm families practiced what they knew. Experience was the key because there was little understanding of how plants grew or why they responded to natural forces like sunlight or manure. The world of technological innovation was as foreign to those who lived before 1850 as a world without technological innovation would be to us today.

Thus, when one speaks of a scientific agriculture, he speaks of the last century. When one speaks of technological innovation, he speaks of the past half century. And when one speaks of any of

these things, he should remember they arose after the birth of a new Nation called the United States. This may have been only happenstance, but if we remember that, we may better understand why so many for so long thought this Nation so special.

Perhaps I have wandered too far afield in my discussion of farm productivity. The fact is, and the point I wanted to make is, that we are the fortunate generation. We can take for granted the immense scientific base that now underpins our agricultural sector. We have scientific laboratories that stretch across the Nation. International research centers dot the world map. Students cross national and international borders to study. New technology has spread to developing nations where someone coined the descriptive term "Green Revolution." Whether that "revolution" will be adequate to meet the force of population and income growth in the next half century is another question, and one that we should keep before our policymaking community.

In the United States, where a strong scientific base can be taken for granted and our major responsibility is to maintain and improve it, farm productivity continues to rise despite expressions of concern by technical scientists. Those concerns, over plateauing productivity, are difficult to evaluate because so many factors affect and determine farm productivity.

Take crop yields for example. It is always difficult to ascertain whether crop yields are following the same trend from year to year, rising faster, or slower. The difficulty arises because weather and other factors cause significant year-to-year variations in crop yields. While the impact of weather is partially overcome by using techniques like multiple-year averages (e.g., an average of 1969, 1970, and 1971 for 1970) for comparing different points in time, that still leaves us with uncertainty about changes in the most recent years.

Thus, for example, we cannot be certain if the lower crop yields in 1980 were solely weather-related or also represented some slowing in the rate of technological innovation. Only later, perhaps a year or two from now, can we view 1980 properly, and then we will be wondering about 1981 and 1982.

If we look at the yield figures for the past decade (table 2), we find yield increases for all major crops. Wheat yields averaged 2 bushels an acre higher in 1980 than in 1970, corn 18 bushels higher, soybeans 5 bushels, and cotton 42 pounds per acre. For wheat and corn, the increases were smaller than for previous decades, but soybeans and cotton were higher. It's difficult to conclude very much about farm productivity from this mixed set of statistics.

TABLE 2

Years (3-year ave.)	U.S. crop yields: changes by decades since 1920			
	Wheat	Corn	Soybeans	Cotton
	(Bushels per harvested acre)			(lbs/acre)
1920 - 1930	+1.5	-5.1	+2.5	+15.9
1930 - 1940	+1.9	+6.4	+4.6	+63.2
1940 - 1950	+0.3	+14.2	+3.2	+32.6
1950 - 1960	+8.2	+19.0	+2.4	+175.0
1960 - 1970	+8.0	+25.4	+3.2	-11.7
1970 - 1980	+2.0	+18.2	+5.4	+42.3

Source: U.S. Department of Agriculture, Agricultural Statistics. February 1981.

Of course, output per acre of land is only one measure of productivity in agriculture. There are many others. One is pounds of feed required for each pound of meat produced. Here the record (shown in table 3) is less positive. Only broilers, turkeys, and eggs require significantly less feed to produce a given amount of output today than in 1940. Other major commodities, like beef and pork, have gone in the other direction, with more feed used per unit of meat. Part of this diminished efficiency is probably the result of speeding up the fattening process. The most recent increases in feed consumption rates may be associated with Federal prohibitions on the growth hormone di-ethyl-stibesterol--DES.

The rather bleak record in feed conversion rates for the major meat animals raises questions about the focus of animal research over the past several decades. One might wonder aloud about the goals animal researchers had in mind. Of course, the most significant discovery, the growth hormone di-ethyl-stibesterol, was prohibited from use because it was suspected of being carcinogenic. But one might also wonder about expenditures on other items like breeding programs and whether funds spent were directed at efficiency of production or perhaps for too long were directed at less useful goals like genetic purity or the general appearance of meat animals.

TABLE 3

Year (3-year averages)	Units of all feeds consumed per units of production					
	Milk per cwt.	Beef per cwt.	Pork per cwt.	Broilers per cwt.	Turkeys per cwt.	Eggs per 100
	(pounds of feed, measured in corn equivalent)					
1940 (2-yr. ave.)	108	975	530	473	723	61
1950	112	959	537	374	569	61
1960	117	1,025	587	293	572	54
1970	109	1,120	584	253	513	57
1978 (2-yr. ave.)	107	1,398	659	228	404	56

Source: U.S. Department of Agriculture, Agricultural Statistics, 1962, 1972, and 1980.

Another measure of farm productivity is the hours of labor required per unit of output. Here the results are so impressive that they almost seem like science fiction. The hours of labor required for production of every major farm commodity have declined to a fraction of the amounts required early in the present century. Part of this improved productivity came from the addition of capital items like inorganic fertilizers which raised crop yields per acre and, since little more labor was required for application, also raised output per manhour. Or turning the measure around as illustrated in table 4, fertilizers reduced the hours of labor required to produce a given amount of crops.

Fertilizer was not the only source of improvement, however, a conclusion illustrated by the dramatic drop in hours of labor required for livestock production (table 4). Clearly, in both livestock and crop production, big gains came from the introduction of machinery that made each worker more productive. In nearly every case, with the exception of crops like fruits and vegetables that remain relatively labor-intensive, the gains have been startling, a testimonial to the benefits of adding capital to labor in production.

TABLE 4

Years	Hours of labor required per units of production							
	Corn 100 bu.	Wheat 100 bu.	Soybeans 100 bu.	Cotton bale	Milk cwt.	Beef cwt.	Pork cwt.	Broilers cwt.
	.....(hours).....							
1915-19	132	98	143	299	3.7	4.5	3.6	9.4
1925-29	115	74	126	268	3.3	4.3	3.3	9.4
1935-39	108	67	64	209	3.4	4.2	3.2	8.5
1945-49	53	34	41	146	2.6	4.0	3.0	5.1
1955-59	20	17	23	74	1.7	3.2	2.4	1.3
1965-69	7	11	19	30	0.9	2.1	1.4	0.5
1975-79	4	9	12	8	0.4	1.4	0.5	0.1

Source: U.S. Department of Agriculture, Agricultural Statistics, 1980.

Finally, let me mention the most widely used measure of farm productivity, the comparison of the total amount of inputs used to produce total farm output. This measure, calculated as a ratio of indexes by the Department of Agriculture and shown in table 5, is often considered to be an overall measure of the impact of education, research, and innovation on agriculture production.

A close look at input-output relationships for agriculture for the past half century indicates again that productivity in agriculture began to improve dramatically after 1930. Of the two potential sources of improved productivity, fewer inputs or more output, the improvement came primarily from increases in total farm output. Farm output more than doubled between 1930 and 1980. On the input side, overall change has not been very significant. Total inputs used in farming actually increased 6 percent between 1930 and 1980 with all of that increase occurring in the past decade. Hidden in these figures, however, is an immense restructuring of inputs used in farm production. Total hours of farm labor have diminished, machinery use has grown, fertilizer use has increased dramatically, and only the quantity of land used for agricultural purposes has remained relatively stable.

TABLE 5

Year (3-year averages)	Indexes (1967 = 100)			Percent change from previous decade
	Output	Inputs	Productivity (output/input)	
1920	48	96	50	0
1930	54	101	53	+6.0
1940	60	99	60	+13.8
1950	75	105	71	+18.3
1960	90	101	89	+25.8
1970	104	101	105	+18.0
1980 (est.)	126	107	118	+12.4

Source: U.S. Department of Agriculture, Economic Indicators of the Farm Sector: Production and Efficiency Statistics, 1979, Statistical Bulletin No. 65, 1981.

The major change in input use has been the well-documented expansion of capital inputs. The total amount of capital surrounding each person working in agriculture has increased until today, each farm worker, on average, has at his command about $250,000 of capital inputs (table 6). About three-fourths of this is accounted for by land. However, the amount of capital tied up in machinery has also grown, from $3.1 billion in 1940 to $94.3 billion in 1980. In 1940, each farm worker had only $282 of machinery to work with; in 1980, this figure had grown to $25,507 per worker. Part of this increase, of course, comes about because of inflation and part because the number of workers has declined. The decline in workers, shown in table 6, is as dramatic as the increase in capital values.

TABLE 6

Year	Farm employment			Farm capital			Capital per worker
	Total	Family	Hired	Total (note a)	Real estate	Livestock & machinery	
	....(000 omitted)....			.....(billions).....			
1920	13,432	10,041	3,391	b/N.A.	N.A.	N.A.	N.A.
1930	12,497	9,307	3,190	N.A.	N.A.	N.A.	N.A.
1940	10,979	8,300	2,697	$ 53.0	$ 33.6	$ 8.1	$ 4,827
1950	9,342	7,252	2,090	130.7	75.3	24.1	13,990
1960	7,057	5,172	1,885	203.8	130.2	37.9	28,879
1970	4,523	3,348	1,175	314.9	215.8	55.8	69,622
1980	3,697	2,397	1,301	920.0	671.2	155.5	248,850

a/ Includes, in addition to real estate and livestock and machinery, personal financial assets, the value of stored crops, and household furnishings.
b/ N.A. - not available.

Source: U.S. Department of Agriculture, Agricultural Statistics, 1957 & 1980.

One could probably spend a lot more time going into the details of why overall farm productivity has grown so much. There are other reasons besides items like fertilizer and more capital inputs. For example, one often forgotten cause is human capital formation, the technical term often used to describe the higher level of education and training that has evolved on American farms over the past several decades. Certainly, the fact that farm managers today are trained to use highly technical inputs in crop production, to set up feed rations that are balanced for livestock production, and to plan marketing and the use of credit in an economically appropriate manner contributes to the overall efficiency and productivity of American agriculture.

Perhaps a more useful issue, though, is to discuss the overall impact of farm productivity on the Nation, its workers, consumers, and taxpayers. This issue involves measuring the benefits that accrue to increasing farm productivity and determining who receives those benefits. One question is, how to measure the benefits from increases in farm productivity? There are fairly complicated methods for doing so but the public understanding of such estimates is often inversely related to the complexity of the methods.

A less-complicated method of examining the results of farm productivity is to look at trends in food costs, farm income, and Federal budgetary costs over the past several decades. Those trends provide some indications of gains or losses to the affected groups.

Farm income figures, shown in table 7 for the period from 1930 up to 1980, suggest that some of the gains from increases in farm productivity have been retained by farmers over the years. The per capita incomes of farm families have increased both in absolute terms and as a percentage of nonfarm incomes. While these are 3-year averages, data for individual years shows some years when the per capita incomes of farm families have exceeded that of nonfarm families. Even on average, though, per capita incomes of farm families have reached near comparability with nonfarm families. This is true even though there are obvious income pressures on some farms that are leading them to discontinue operations.

TABLE 7

Year (3-year averages)	Farmers		Consumers		Taxpayers	
	Income per capita	Farm as a % of nonfarm income	Annual food costs	Percent of income	Annual budget costs	Percent of net farm income
					(millions)	
1930	a/$ 208	a/$37.9	$ 42	23.6	a/$ 432	a/10.4
1940	270	38.6	131	21.7	677	13.2
1950	862	59.6	323	23.6	251	1.8
1960	1,079	53.4	386	19.9	959	8.4
1970	2,525	74.4	579	17.0	3,552	24.7
1980	b/6,406	b/95.2	b/1,118	b/16.5	b/2,075	b/ 8.3

a/3-year average for 1934, 1935, and 1936.
b/3-year average for 1977, 1978, and 1979.

Source: U.S. Department of Agriculture.

The data on consumer food costs in table 7 also illustrates gains for consumers from increases in farm productivity. In a half century, food has become more expensive in dollar terms, but it has declined as a percent of disposable personal income. Even in the past decade, when food costs have increased at a very rapid rate, incomes have still grown slightly faster. Today, the average consumer spends 16.5 percent of income on food, although the variation around that average is quite sizable.

A final measure of farm productivity is its impact on budget costs for Federal farm programs. These programs protect farmers against sudden increases in farm output or declines in overseas markets. The costs of these programs have grown over the years in dollar terms, although as a percent of net farm income, there is little trend evident. Farm families have gained from these programs, but the gains have generally not raised farm family incomes above a parity with nonfarm families. Without the programs, economic conditions on farms would have been less acceptable and off-farm migration would likely have been faster. I should hasten

to add that the agricultural adjustment problems that arose out of increases in farm productivity are far more complex than I will describe here. Massive amounts were written on that issue during the 1950's and 1960's which is available for review to one interested in that issue. 1/

As one views the historical trends in farm income, food costs, and Federal farm budget costs, there is strong evidence to support the view that both producers and consumers have gained from the vast improvements in farm productivity. Of course, the data also shows that some of the gains to producers have come from the long succession of farm programs.

Whether the distribution of gains from farm productivity among the different claimants has been equitable is an unanswerable question. Most farm families would argue that too little of the gains have come to them. Many consumers would argue that food costs have gone up too much. And some taxpayers would contend that Federal payments to farmers have been too large. There is, in the final analysis, no way to determine the ideal distribution of the gains that accrue to improved farm productivity. Obviously, as long as taxpayers foot part of the bill for creating new technology through public research institutions, some of the gain must go to them in the form of reduced food costs.

In operational terms, the issue of an equitable distribution of the gains from farm productivity boils down to the long-discussed issue of establishing the proper level of prices to be paid for farm commodities. Higher farm commodity prices benefit the farm producer and transfer more of the gain from any improved productivity to him. Lower prices transfer the gain to the middlemen or on to consumers.

The proper level of farm prices is an issue that has been argued over in an unending fashion since the first Federal farm program was established back in 1929. The arguments will not end here. The necessity of eating and the economic pressures inherent in operating farms will keep this issue before the public for the foreseeable future.

We should not, however, allow the extended argument over the proper level of farm prices to deflect us from an appreciation for the massive gains that accrue to all of us from improved farm productivity. It is on this point that I would like to close, and I would like to do so by returning to the points made by my former colleague at Iowa State University. Progress is a relatively new idea for mankind, measured against his long history on

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1/ Problems and Policies of American Agriculture (Iowa State University Center for Agricultural Adjustment, Iowa State University Press, 1959).

this planet. Even the institutions which today have major responsibility for bringing forth new ideas in support of progress were not always so oriented. Further, many of today's educational institutions are inclined to look for "safe" areas of study that do not create unsettling effects among the citizenry and among political leaders.

The bottom line is that research and innovation is destabilizing to a society. This became so clear in the United States in the 1950's and 1960's when improved farm productivity brought with it one of the most massive migrations in history. Farm families migrated from farms to small towns and then on toward the cities of our Nation. Our cities today still reflect much of what generally was an influx of untrained and poorly educated workers.

This is the other side of farm productivity. It poses social pressures that are not easily solved. Other nations, the European Community is one example, have chosen not to allow the full effects of farm mechanization and other improved production methods to impact on their agricultures. The results are a larger proportion of their population on farms and a higher percent of their spendable income required for food, with less left over for purchase of other consumer goods.

In the United States, we chose to take a different path. This choice probably can be labeled as deliberate. It was not unapparent to policymakers over the years that allowing farm prices slowly to decline would force many farm families out of agriculture. The policy choice was either to allow labor-saving technology to be utilized and the gains to be passed along to consumers, or to protect farm labor against labor-saving machinery and hold food prices at higher levels.

The choice was to do a little of both, with commodity price supports set at levels to partially protect farmers and generally ineffective controls on farm production that allowed supplies to push down on food prices. The farm programs gave a measure of protection to farm families, especially those adopting new supply-increasing technologies, and a measure of gain to food consumers. Whether the division was ideal is probably best left to historians to decide a decade or two from now.

What we can say with more certainty is that we are the fortunate generation, the generation that has available the marvelous gains that have accrued to agricultural research over the decades. This is one of the great legacies of our American heritage. And it is one we should keep in mind each time we examine the broad array of Federal programs for agricultural research, education, and extension. Otherwise, future generations may not share in our good fortune.

Pierre Crosson, Ph. D.

IS THERE A CRISIS IN AGRICULTURAL INPUTS?

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INTRODUCTION

There is much evidence that in the 1970's the condition of American agriculture switched from one of chronic surplus to one of recurrent if not chronic scarcity. Over the course of the decade, prices received by farmers rose 17 percent relative to the Consumer Price Index (CPI). In the 1950's and again in the 1960's, farm prices fell relative to the CPI. Prices of key inputs--fertilizer, energy, and land--also rose relative to the CPI in the 1970's. For fertilizer and energy this was a sharp reversal of price behavior in the 1950's and 1960's. Land prices, measured by the capitalized value of rents, declined relative to the CPI in the 1950's but began to rise in the 1960's.

Evidence regarding unpaid costs of agricultural production, that is, damages to soil and water resources resulting from erosion and use of agricultural chemicals, is less clear. However, a plausible argument can be made that erosion damages rose for two reasons. (1) The increase in harvested cropland from 289 million acres in 1972 to 346 million acres in 1980 must have increased erosion, both in total and on a per-acre basis, since much of the additional land was more likely to erode than land already in production. (2) The relatively high crop prices and rising land prices after 1972 gave farmers incentive to use the land more intensively. Many of them therefore abandoned soil conservation practices, e.g., windbreaks or crop rotations, which required less-intensive use of the land.

Does this behavior in the 1970's of product and input prices and of environmental costs constitute a crisis? The answer is not clear. What makes a crisis is a matter of judgment and of the perspective from which judgments are made. The perspective I take, since I am not a farmer, is the national interest in maintaining a productive, low-cost agriculture. From that perspective my judgment is that experience with agricultural product and input prices and with environmental costs does not indicate a crisis. It may indicate a problem, however, depending upon one's judgment about future trends in prices and costs. My judgment is that real prices of key agricultural inputs--fertilizer, energy, land, and water--are likely to rise over the next decade or so and that productivity growth probably will not keep pace. The implication is rising real economic costs of agricultural production. In addition, erosion damages, both off-farm in impaired water quality and on-farm in reduced productivity of the land, may rise. The reason is that meeting rising demand for agricultural output will require tens of millions of additional acres of cropland. However, I do not expect significantly increased damage to the environment from fertilizer and insecticides. The prospect for herbicide damage is less clear, but on present evidence this does not appear to be a major threat.

The prospect that real economic and environmental costs of agricultural production will rise is cause for concern. From the end of World War II until the early 1970's, real economic costs fell. (The behavior of environmental costs is not clear.) This made a major contribution to the impressive overall performance of the American economy in this period. Not the least of this was the maintenance of a relatively stable price level. With no increase in the commitment of resources to agriculture, the Nation was able to meet the increased demands of its own people as well as rapidly rising demand from abroad. The prospect of rising real economic and environmental costs places all this at hazard. Instead of a stimulus to the economy, agriculture would become a drag. Instead of restraining inflation, agriculture would feed it. This prospect, therefore, is troublesome. We must seek to understand it as a first step toward averting it, or at least reducing its negative impact on the national welfare.

NATURE OF THE PROBLEM

The prospect for rising costs is based on three fundamental trends facing U.S. agriculture: (1) rising demand, especially for export, for wheat, feedgrains, and soybeans, (2) rising real prices of fertilizer, energy, water, and land, (3) lagging technological advance, indicating productivity growth slower than the growth in input prices.

Rising demand

The most dynamic element in the growth of demand is foreign demand. Domestic demand responds primarily to growth in population

and per capita income. Population growth is less than 1 percent annually, and the income elasticity of demand is so low that additional income provides little stimulus to demand at the farm gate. Production of ethanol for combination with gasoline to yield gasohol will increase the demand for corn. However, without subsidy gasohol is not competitive with gasoline, and within 10 years or so coal will likely be a more economical source of liquid fuel than grain (Sanderson, 1981). Because of these disadvantages, it appears unlikely that ethanol production will increase beyond 2-4 billion gallons (O'Brien, 1981; Abel, 1981). This would add 20 million to 40 million metric tons to demand for corn. By contrast, exports of corn are projected to increase some 100 million metric tons from 1980 to 2010 (Crosson and Brubaker, 1980). Projections for wheat, feedgrains, and soybeans are in table 1.

The projected growth in production of these crops from 1978-80 to 2010 is 1.8 percent annually, substantially less than growth in the 1970's (3.8 percent per year from 1969-71 to 1978-80). The projections thus are moderate by comparison with recent experience. They nevertheless imply rising real economic and environmental costs of production because of prospective trends in real input prices and technology.

TABLE 1

U.S. Production, Consumption, and Exports of Grains and Soybeans (million metric tons)

	1978-80	2010
Wheat		
Production	57.0	98
Consumption	19.9	28
Exports	37.1	70
Feedgrains		
Production	219.3	354
Consumption	150.8	187
Exports	68.5	167
Soybeans		
Production	54.0	120
Consumption	24.0	44
Exports	30.0	76

Sources: 1978/80 USDA (Jan.-Feb., 1981). Consumption includes the change in stocks. 2010 Crosson and Brubaker (1980).

Input prices

From the end of World War II to the early 1970's, real prices of key land-saving inputs--energy, fertilizer, and water--fell. This decline, coupled with Government policies encouraging farmers to hold land out of production, induced farmers to adopt land-saving technologies. The result was an unprecedented increase in crop yields (2.8 percent annually from 1951-55 to 1972). After 1972 real energy and fertilizer prices rose, and farmers moved toward the land-using end of the spectrum of technologies. Harvested cropland rose about 55 million acres from 1972 to 1980, and the rate of yield increase declined to about 1 percent per year.

Most observers now expect real energy prices to rise over the next several decades (Schurr, et al.). This will tend to increase the cost of nitrogen fertilizer, a very energy-intensive commodity. Studies at the World Bank suggest that fertilizer prices will rise also because of rising cost of building new fertilizer plants. Higher energy prices will make water for irrigation more expensive because so much irrigation is with water pumped from underground. Costs of irrigation in the Western States are likely to rise also because of increasing demands for water for nonagricultural uses.

Trends in technology

If real prices of fertilizer, energy, and water in fact rise, farmers will continue to favor technologies from the land-using end of the spectrum. The implication is that yield growth will look more like it did in the 1970's (low) than in the preceding couple of decades (high). Among those who accept this view of yield prospects there still is much room for differences about the precise amount of yield growth. My projection for wheat, feedgrains, and soybeans combined is for somewhat slower growth than in the 1970's. Given the projected increase in production, the yield projection implies that the demand for land for grains and soybeans would increase 75 to 85 million acres from 1978-80 to 2010. Allowing for shifts to these crops of some land now in lower valued crops, such as hay, the net increase in demand for cropland would be some 60 to 70 million acres by 2010.

Our present cropland base of 413 million acres (Soil Conservation Service (SCS), 1980) is fully utilized. The additional land demanded in 2010 would have to come from land now in pasture, forests, and range. According to the SCS, in 1977 there were some 125 million acres of such land with high-to-medium potential for conversion to crops, which would appear adequate to meet the projected increase in demand. The appearance is deceiving, however. Each year some land now in crops or with potential for crops is converted to irreversible nonagricultural uses. Between 1967 and 1975 these conversions were at the rate of roughly 900,000 acres per year (Boxley, 1981). The rate of conversion may slow somewhat because one of the main sources of nonagricultural demand

for land from 1967-75 was the interstate highway program, which now is complete. To allow for this I assume that conversions of cropland and potential cropland to nonagricultural use will be 25-30 million acres from 1977 to 2010. The total increase in demand for cropland or potential cropland thus would be these acres plus the 60 to 70 million needed for crop production. Against this increase in demand the 125 million acres of potential cropland identified by the SCS no longer looks very large.

I expect, in fact, that the real economic costs of agricultural land would rise if demand increases on the order of 85 to 100 million acres. Much of the additional land is less suited to crops than land now in production, so costs of land preparation likely would increase. In addition, the reduction of land in pasture, forest, and range probably would raise the opportunity cost of the land in those uses.

With real prices of fertilizer, energy, water, and land rising, the economic costs of agricultural production will rise unless total productivity increases fast enough to offset the increase in input prices. If the 1970's is a guide, this will not happen. In that decade real prices of fertilizer, energy, and land rose in excess of 2 percent per year. Total productivity increased only about 1 percent annually. I expect technologies to eventually become available which will accelerate the rate of productivity growth, but their arrival is not imminent. Absent such technologies, the real economic cost of agricultural production is likely to increase.

Continuation of present trends in technology also threatens rising environmental costs, particularly those resulting from erosion. Work done at Iowa State University for Resources for the Future (RFF) indicates that expansion of cropland by 60 to 70 million acres would increase erosion by water from about 1.9 billion tons in 1977 to 3.5 billion tons in 2010. On a per-acre basis erosion would increase from 4.7 tons per year to 7.4 tons, well above the 5-ton limit set by the SCS as consistent with long-run maintenance of the productivity of the land. A water quality model developed at RFF indicates that erosion on the projected scale would almost double the sediment delivered to the Nation's rivers, lakes, and reservoirs.

The increased damage from the projected erosion, both off-the-farm in impaired water quality and on-the-farm in reduced productivity, cannot be accurately estimated. The projected increase in erosion is so large, however, that it almost surely implies an increase in damages.

WHAT IS TO BE DONE?

The prospective increase in economic and environmental costs of production reflects trends in demand, input prices, and technology. If the increase is averted or reduced it will be

because one or more of these trends is more favorable than I have projected them. For purposes of discussion I assume that more favorable trends will not emerge unless public policies are developed which make it happen.

Affecting demand

Since the major element in the expansion of demand is exports, it is important to consider whether we could or should slow their growth. Quantitative restrictions, such as an embargo, clearly are unpopular with farmers and with the present administration. And with good reason. Although we might wish to slow the growth of exports, foreign markets clearly will continue to be of major importance to U.S. agriculture. Imposition of embargoes threatens this interest by damaging our reputation as a reliable supplier. There is a strong case in principle for imposing a tax on agricultural commodities to reflect now-uncompensated environmental damages, such as those resulting from erosion. Such a tax, by increasing prices, would slow the growth of demand. It appears to me, however, that there are some important practical obstacles to such a tax. All farmers producing the taxed commodities would be disadvantaged by the reduction in demand, but not all farmers contribute to the environmental damages which provide the rationale for the tax. Most of the erosion from cropland, for example, is caused by a relatively small number of farmers. Penalizing all for damages caused by a few would be seen as inequitable. It likely would generate strong political opposition to the tax and would be difficult to defend.

Demand for corn will grow because of increasing ethanol capacity. Here, it seems to me, is an area in which we should re-think our policy. Gasohol, the ethanol-gasoline mixture, is competitive with gasoline only because the Federal gasoline tax of 4 cents per gallon, and various State gasoline taxes as well, are waived on gasohol. Because gasohol is a blend of 10 percent ethanol with 90 percent gasoline, waiving the Federal tax gives a 40 cents per gallon subsidy to ethanol. Forgiving State taxes adds to this. If the prospect is for rising real costs of agricultural production because demand increases faster than supply, does it make sense to subsidize a component of demand?

On balance it appears to me that with the exception of removing the ethanol subsidy, the ability of policy to restrain the growth of demand in ways consistent with our other interests is limited.

The same is true with respect to prices of energy, fertilizer, and water. The expectation that these prices will rise takes into account policies to stimulate conservation and develop alternative sources of supply. Even successful employment of these policies will not likely prevent real prices of these inputs from rising.

Affecting technology

The development of high-yielding technologies which substitute other sources of energy, nutrients, and water for fossil fuels, inorganic fertilizer (especially nitrogen), and irrigation would alleviate and possibly offset altogether the effects of higher prices of these inputs. Improvements in photosynthesis in main crops would substitute the Sun's energy for fossil sources, and development of the capacity of corn to biologically fix nitrogen would reduce reliance on inorganic nitrogen.

Widespread adoption of so-called organic farming would have the same effect, but there are serious limitations to this alternative. Organic farming supplies plant needs for nitrogen by use of animal manure and rotation of a main crop, like corn, with a legume which fixes nitrogen biologically. A study of organic farming by the U.S. Department of Agriculture concluded that organic farming on a large scale would not be economically competitive with current conventional practices. There were two principal reasons: (1) The supply of manure and other organic wastes is small relative to total plant demands for nitrogen, and the average cost of transporting the organic materials mounts rapidly with distance. (2) Compared with continuous corn or a corn-soybean rotation, organic farming keeps a relatively large proportion of land in a low-valued use, e.g., alfalfa or meadow.

The USDA acknowledges that organic farming has potential for an expanding role in American agriculture but does not expect it to substitute in a major way for conventional methods.

Development of new plant varieties better able to withstand water stress would in effect substitute for irrigation water. More careful monitoring of soil moisture conditions in relation to water needs of crops would permit more sparing and more appropriately timed applications of irrigation water. This practice substitutes knowledge, labor, and capital (e.g., soil moisture measuring devices, computer terminals linking the farmer to advisory services) for water.

Widespread adoption of these sorts of technologies would go far, perhaps all the way, toward staving off the effects of rising prices of energy, fertilizers, water, and land. Improved photosynthesis and biological nitrogen fixation probably have the greatest potential for increasing production at lower cost, but economical technologies embodying improvements in these processes evidently lie many years, perhaps several decades, in the future. In both cases fundamental scientific work remains to be done.

There appear to be nearer term gains from increased investment in research to extend the economic limits of conservation tillage. Conservation tillage means a variety of tillage practices with three common characteristics: (1) they rely on some instrument other than the moldboard plow to prepare the land for planting,

(2) compared to conventional tillage they rely more on herbicides and less on cultivation to control weeds, (3) they leave enough crop residue on the soil surface to significantly reduce erosion.

Costs with conservation tillage are 5 to 10 percent less than with conventional tillage because savings in labor and fuel more than offset higher costs for herbicides (Crosson, 1981). Yields with conservation tillage compare favorably with those of conventional tillage on well-drained soils, where weeds can be adequately controlled with herbicides and wherever the growing season is not too short (as it is in the northern tier of States). These conditions are widely enough met that conservation tillage has spread rapidly in the last 15 years and now is used on roughly one-quarter of the Nation's cropland.

From society's standpoint, however, the attraction of conservation tillage is not its economic advantages relative to conventional tillage. As noted, these are not striking. The great advantage of conservation tillage is on erosive soils. The crop residues left on the soil surface absorb much of the energy of falling rain and of runoff, as well as of wind, thus greatly reducing erosion compared to conventional tillage of the same soils.

Conservation tillage, therefore, has great promise as a technology for reducing the erosion damages that appear likely if the acreage in crops increases as projected above. Research to extend the economic limits of conservation tillage would seem to offer high payoff. In particular, development of seeds more resistant to diseases fostered by moist soils, shorter season crop varieties, and more effective herbicides, especially for use against perennial weeds, would make it possible for farmers to adopt conservation tillage in areas where the technology now is not economical.

By emphasizing research on conservation tillage as a strategy for dealing with the erosion problem, I do not mean to suggest that more could not be done with traditional erosion control programs. Cost-sharing and other inducements to farmers to build terraces, plow on the contour, put in windbreaks and grass waterways, and so on, clearly have a place. More novel approaches, such as that emphasizing cross-compliance, also merit attention. (Cross-compliance requires that a farmer agree to adopt certain erosion control practices in exchange for receiving benefits from other programs, e.g., price supports.) The effectiveness of both traditional and more novel programs could be greatly increased if they were carefully targeted on the relatively few farmers causing most of the erosion.

However, I think it questionable whether these programs would be adequate to deal with the erosion problem if it emerges on the scale I have projected. Achieving effective control through cost-sharing programs likely would be very expensive. The cost would

be high in large part because in the projected scenario real crop prices are high and rising, giving farmers strong incentive to use the land intensively, thus weakening the appeal of erosion control practices. High crop prices also would undercut cross-compliance programs since with prices high, price-support programs lose relevance.

A strategy to control erosion indirectly through research to extend the economic limits of conservation tillage avoids these difficulties. It creates a situation in which farmers adopt conservation tillage in their own economic interest, with erosion control a social benefit on the side. Of course, the cost of the research to achieve this result would have to be compared with the cost of alternative erosion control programs. My guess is that the research strategy would compare favorably.

SUMMARY AND CONCLUSION

Present trends in demand, input prices, and technology suggest that real economic and environmental costs of agricultural production will rise. We can somewhat reduce the pressure of rising demand by removing subsidies to gasohol production, but attempts to place quantitative limits on exports, the most dynamic element in demand, likely would be inconsistent with our deep interest in fostering a more open international trading system for agricultural commodities. A commodity tax to reflect currently uncovered environmental costs would be sound in principle but likely to face serious difficulties in implementation.

Similarly, we can devise policies which will restrain the rise of real prices of energy, fertilizer, and irrigation water, but we probably cannot prevent an increase altogether.

The most promising strategy may be to develop new technologies embodying high-yielding substitutes for fossil energy, inorganic fertilizer, and irrigation water. These technologies would restrain, and perhaps prevent, the rise in real economic costs of production. In addition they would ease the erosion problem by making it possible to concentrate production on the better, less-erosive land.

Research to extend the economic limits of conservation tillage also appears to offer high payoff in reduced erosion, although it would not likely do much to restrain the rise of economic costs.

There is a substantial lag between the initial research to develop a new technology and its payoff on the farmer's field. A research-based policy, therefore, will not give quick results. We should not expect it to prevent rising economic and environmental costs over the next decade. Carefully conceived and well financed, however, such a policy undertaken now likely could bring those costs under control before the end of the century. Technological advance is the great extender of the natural resource base. It has done this well for us in the past. It will do so again if we give it a proper chance.

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Food In The Future: General Accounting Office

Planning Symposium

May 5 and 6, 1981

U.S. GAO Management Development Training Center

1010 Wisconsin Ave.

Georgetown

May 5 - CONSUMPTION

Morning

8:30- 9:00--Registration
9:00- 9:45--Introduction to the Symposium, Henry Eschwege, Director, Community and Economic Development Division
--Making U.S. Food Policy Decisions Now and in the Future - The Honorable Richard E. Lyng, Deputy Secretary of Agriculture
9:45-10:00--Welcome - Brian Crowley, Senior Associate Director, Community and Economic Development Division
10:00-10:15--Coffee
10:15-11:00--The Goals of Consumption Policy - Johanna Dwyer, D.Sc., Robert Wood Johnson Health Policy Fellow, Institute of Medicine, National Academy of Sciences
11:00-11:45--Food Assistance--The Changing Role of the Federal Government - Margaret O'K. Glavin, Deputy Administrator for Special Nutrition Programs, Food and Nutrition Service, U.S. Department of Agriculture
11:45- 1:30--Lunch

Afternoon

1:30- 2:30--The Global 2000 Report--Its Implications for Food in Our Future - Ned W. Dearborn, Member of the staff, Global 2000 Study

2:30- 4:00--WORKSHOPS

Conference Room A

CONSUMPTION AND NUTRITION

Panelists

Mahlon A. Burnette III, Ph.D., Executive Officer, National Nutrition Consortium
Luise Light, Ed.D., Head, Dietary Guidance and Nutrition Education Research Staff, Science and Education Administration, U.S. Department of Agriculture
Grace L. Ostenso, Ph.D., Science Consultant, Committee on Science and Technology, U.S. House of Representatives
Moderator: Roger Flann, U.S. General Accounting Office
Recorder: Tom Kai, U.S. General Accounting Office

Conference Room B

SYSTEMS

Panelists:

Marvin Kornbluh, Specialist, Information Science and Futures Research, Congressional Research Service
Medard Gabel, Director, The Cornucopia Project, Rodale Press, Inc.
John M. Richardson, Jr., Ph.D., Professor of International Affairs and Applied Systems Analysis, School of International Service, American University
Moderator: Hal Wallach, U.S. General Accounting Office
Recorder: Todd Weiss, U.S. General Accounting Office

Conference Room C

FOOD ASSISTANCE HERE AND ABROAD

Panelists:

Gerald S. J. Cassidy, Partner, Schlossberg - Cassidy and Associates, Inc.
Michael Moran, Special Advisor for External Affairs, Interamerican Institute for Cooperation on Agriculture
Moderator: John Gellner, U.S. General Accounting Office
Recorder: Charlie Hessler, U.S. General Accounting Office

May 6 - PRODUCTION

Morning

8:30- 9:30--"Manufacturing" Food--The Relationship of Government to the Agricultural Industry Beyond the Farm Gate - David A. Fulton, Vice President for Government Affairs, Farmland Industries, Inc.
9:30- 9:45--Coffee
9:45-10:30--Farm Productivity--Balancing Technological, Business and Social Goals - Leo Mayer, Ph.D., Senior Agriculture Specialist, Congressional Research Service
10:30-11:45--Managing the Crisis in Agricultural Inputs - Pierre Crosson, Senior Fellow, Resources For The Future, Inc.
11:45- 1:30--Lunch

Afternoon

1:30- 2:30--WORKSHOPS

Conference Room A

MANUFACTURING: PROCESSING AND DISTRIBUTION

Panelists:

James May, Vice President for Public Affairs, Grocery Manufacturers of America, Inc.
Daniel I. Padberg, Ph.D., Head, Department of Agricultural Economics, University of Illinois
Russell C. Parker, Staff Economist, Bureau of Economics, Federal Trade Commission
Moderator: Ralph Lamoreaux, U.S. General Accounting Office
Recorder: Emi Nakamura, U.S. General Accounting Office

Conference Room B

FARM SITUATION

Panelists:

Lyle P. Schertz, Ph.D., Agricultural Economist, Economics and Statistics Service, U.S. Department of Agriculture
Joe Beldon, Consultant, National Rural Center
George W. Coffman, Agricultural Economist, Economics and Statistics Service, U.S. Department of Agriculture
Peter M. Emerson, Ph.D., Principal Analyst, Congressional Budget Office
Moderator: Keith Fultz, U.S. General Accounting Office
Recorder: Dale Wolden, U.S. General Accounting Office

Conference Room C

INPUTS

Panelists:

Robert F. Boxley, Chief, Land Branch, Economics and Statistics Service, U.S. Department of Agriculture
Bruce A. Ross-Sheriff, Project Director, Food and Renewable Resources Program, Office of Technology Assessment
Moderator: Ed Schaefer, U.S. General Accounting Office
Recorder: Mike Gilbert, U.S. General Accounting Office

3:00- 4:00--Special topics

Conference Room A

AGRICULTURAL RESEARCH AND DEVELOPMENT

Panelists:

Molly Frantz, Budget Examiner, Agriculture Branch, Office of Management and Budget
Thomas E. Adams, Jr., Staff Consultant, Committee on Agriculture, U.S. House of Representatives
Omer J. Kelly, Ph.D., Consultant, Office of Technology Assessment
Moderator: Walt Hess, U.S. General Accounting Office
Recorder: Jack Brock, U.S. General Accounting Office

Conference Room B

AGRIBUSINESS AND TRADE

Panelists:

Kelly Harrison, Ph.D., Executive Vice President, Jack Zwick Associates
Richard Gilmore, Owner and Director, Gilmore International Consulting
George Anthan, Washington Correspondent, Des Moines Register
Moderator: Jerry Killian, U.S. General Accounting Office
Recorder: Neil Conklin, U.S. General Accounting Office

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