PRODUCTION PRESSURES AND RESEARCH PRIORITIES

Good morning.

In your discussions yesterday, you looked at the directions that conservation research programs will be taking. These directions, as you know, are determined primarily by specific needs. And these needs also dictate priorities.

If we were asked to point to the most important need in conservation research today, I think our selection would be nearly unanimous: a need to protect the resources that currently are being used intensively to achieve higher farm production. Some Americans fortunately worry mainly about eating too much--not about getting enough to eat. But for many other people around the world, life itself depends on boosting food production. Many countries are in a precarious position agriculturally. It has been estimated that about 450 million of the world's 3.8 billion people are malnourished. Their plight worsens with every setback in food production. Just two years ago, world food production declined for the first time in two decades, and recovery has been sluggish.

If the present situation is bad, the future looks grim.

Material for talk by Norman A. Berg, Associate Administrator, Soil Conservation Service, before the 29th Annual Convention of the National Association of Conservation Districts, Denver, Colorado, February 4, 1975

World population could climb to the 7-billion mark shortly after the turn of the century--with populations in the developing nations increasing at the most rapid pace. Unfortunately, those areas of the world with the highest birthrates are usually the most deficient in food production. Disproportionate population increases thus lead inevitably to disproportionate pressures on food supplies.

In recent months, it has become increasingly difficult for developed nations like the United States to help overcome food deficits in other areas of the world. Farmers' fertilizer supplies have become both inadequate and expensive. At the same time, energy problems have driven up the price of petroleum, making farm operations even more costly to conduct.

But the developing nations still look to the "haves"--particularly to the United States--for help in feeding their people. And our country, as you know, recently made a commitment to the concept of contributing to a badly needed world food reserve. So the pressures for higher food production here will likely continue for some time.

Production with Protection

The immediate effect of these demands has been that presently farmed lands are being cultivated more intensely, and some new lands are being brought into production. Normally, this would result in immediate production increases. But last year, this was not universally true. In the rush to produce more, some farmers neglected to observe necessary conservation practices on lands that were being brought back into crop production.

Combined with extraordinary and unexpected bad weather, it gave rise to a number of erosion warning signals.

This experience underscores a caution that was widely voiced at the time the full production effort was launched: that any attempt to raise production must be accompanied by an equally active attempt to conserve natural resources. Otherwise any production increases that are achieved cannot possibly be sustained. Areas that had problems last year were almost invariably those where farmers did not take effective conservation measures.

But many farmers have heeded the warnings. There is a new surge of interest in conservation measures like stubble mulching, minimum tillage, terracing, and field windbreaks. Farmers, it seems, are reasserting the attitude that "you take good care of the land and it will take care of you." This isn't surprising. Higher production and conservation have never been mutually exclusive goals. They are mutually supportive.

However, ~~much~~ nowhere of the rest of the world does not subscribe to this view. Some countries ~~that are~~ desperate for all-out food production now seem to be willing to risk damaging their resource base or polluting their environment in order to increase output. We can understand ~~and sympathize with~~ this attitude, but we cannot agree with it. Short-range, short-sighted solutions to production

With ~~a little~~ care and the use of appropriate technology, these countries can protect their resources while they are producing food. I am hopeful that, as we export technical research knowledge about agriculture to the developing nations, we will include our expertise in resource conservation and development. The application of conservation technology can have as much to do with increasing food production over the long term as improved seed or more effective pest control.

Developing New Technology

Developing the conservation technology is a major and continuing undertaking. Science can alter existing conservation plans dramatically. It can produce changes in the size or kind of equipment used, changes in the methods for treating or tilling soil, and changes in dozens of other farming operations. These changes, in turn, call for other adaptations of technology. Thus, research is a job that is never really done.

Probably the most significant technological changes come in response to current or anticipated needs. It is these needs, as I mentioned earlier, that set priorities in research planning.

As you know, the process of setting priorities isn't simple and clear cut. Today's agriculture is complex, and so is its technology. Science has modified natural soils--chemically, physically, and biologically. It has provided techniques for controlling large

In isolation, none of these things can produce really significant production gains. Each item must be placed in its proper context within a complete research-developed "system" for use of the land. For example, a researcher working with a unique kind of soil must combine this soil with a conglomerate of other things--including labor, materials, and management--to get the most effective results. More and more, this "systems" approach is being used in planning research programs and setting research priorities.

Achieving effective interaction among all of the elements in a production-conservation system is difficult. In fact, there could well be variations in results achieved when the same system is applied on different farms.

Educated guess This makes research planning extremely complex, and the Department is constantly looking for ways to insure that technology will be developed where it is most needed. Even now, our SCP procedures for determining research needs are under review. What we want to do is to get the basic responsibility for making these determinations closer to the operating level--specifically, closer to the TSC's and the State Conservationists. Local and regional determinations should be closely coordinated at the national level. So far, the mechanisms for doing this have not been completely refined.

However, there are three general needs for immediate research attention that I would like to discuss briefly:

--To increase farm production,

--To protect the environment, and

--To conserve available energy resources.

Increasing Farm Production

Conservation research can increase farm production by continuing to develop ways for using soil and water resources more efficiently. "More efficiently" means protecting these resources so effectively that they can be used over and over again.

Of course, conservation science has been charged with this general responsibility for some time. In light of the current need for higher production, though, science will have to take a more penetrating look at specific problems immediately.

Basic Soil Problems

One is a need to get reliable data about key soils. These data are badly needed for use in interpreting soil surveys, planning for soil drainage, and disposing of septic tank effluent.

Another need is to make specific determinations of what happens to agricultural chemicals in the soil--for example, what are the effects of herbicide applications on succeeding crops? Is there a threat of water pollution from use of nitrogen fertilizers? What effects do herbicides and pesticides have on the microbial populations in soil?

Soil Management

Research on soil management problems is particularly needed in developing specific cropping practices and in managing crop residues.

Management techniques that involve little or no tillage are growing in popularity with some American farmers. More intensive research is required to determine how adaptable these techniques are to a variety of crops and climates.

Mulch tillage that leaves crop residues on the surface has reduced soil erosion dramatically. It has also created problems. It delays germination of crop seeds, retards early seedling growth, and increases chances that mice and birds may eat the crop seed. Research must develop better techniques for reducing these hazards, as well as for controlling plant diseases in crop residue mulches. The disease problem has reached such proportions that some farmers are discontinuing stubble mulching.

Water Management

Research in the field of water management is especially critical, since higher production means an even greater strain on already limited water supplies. About 10 percent of total crop land in the United States is irrigated land; and in many places, the water table is receding faster than the rate of recharge. This could present some communities with a choice between water for people and water for

Research efforts can best be directed toward developing irrigation systems tailored to the quantity and quality of the available water supply, as well as to the crops, climate, soils, and topography involved. Also needed are criteria for better drainage systems and for techniques that prevent water losses from storage and conveyance structures.

Vegetation Management

Vegetation management, always a vital part of the total conservation effort, is assuming new importance with increases in consumption of livestock products. Demand for meat products--particularly for beef--is still on the rise in our country. Necessarily accompanying this rise in demand is a rise in livestock production, a trend which is raising concern for the adequacy of pasture, hayland, and rangeland.

Research has its job cut out for it. Among the many things it has to do is determine proper grazing criteria and find ways to increase yield and forage quality. Additional ecological studies of important range plants are also needed.

Still another pressing need is to make the best use of systems of grazing and feeding to improve both livestock production and resource conservation. Research needs to determine the best combinations of rangeland, hayland, pasture, and feed grain systems for

Inventorying Prime Farmland

Finally, in order to insure long-term success in achieving high production levels, more emphasis ought to be given to inventorying & rating the prime farmland. This is a necessary first step toward keeping such land available for future food production.

Protecting the Environment

Regarding environmental problems, it is well known that agriculture can contribute significantly to environmental pollution. & be polluted! Not only does agriculture produce a variety of potential contaminants--like animal wastes, eroded soil, fertilizers, and pesticides--but also agricultural wastes are among the most difficult kinds of pollutants to control. Furthermore, higher production is likely to increase the volume of these wastes unless special precautions are taken. This is a major problem now because many agricultural practices have changed little over the past few years, while regulation of air and water pollution has been getting tighter and tighter.

If research is to develop better ways for disposing of these contaminants, it will have to strike a balance somewhere between demands for a higher quality environment and demands for more consumer goods. Many pesticides and herbicides are known to have adverse environmental effects, but no one questions that these chemicals are needed to prevent agricultural pests from reducing crop yields. Excessive use of fertilizers is frequently cited as a cause of water quality difficulties, but no one would deny that these nutrients are absolutely essential to increased crop production.

Animal wastes can be a nuisance and a possible health problem, but no one has suggested that we reduce meat consumption in order to cut down the volume of these wastes.

So science will have to come up with some new or improved techniques that minimize environmental contamination while maximizing production. — (A certain sense - a "clean" env. is going to require trade-offs & will also require substantial energy.

Soil Pollution Control

One possibility is to make better use of soils in doing the job. Some soils have a tremendous capacity to absorb and neutralize various chemicals and contaminants such as sewage sludge, effluent, and agricultural wastes. This is a complex process, and research can tell us what we need to know about various aspects of it--such as the extent of this capacity in particular soils...the limits of a soil's buffering ability...and whether a soil retains, transmits, or neutralizes potential pollutants. We also need information on how well a soil retains this capacity over time.

Water Pollution Control

Equally important in achieving and maintaining high food production is water quality. All of the agricultural contaminants we have been discussing represent potential threats to water purity.

In the United States, sediment is by far the major water pollutant in terms of mass. Over 4 billion tons of sediment a year

Unless better procedures can be developed for predicting and measuring natural geologic erosion, the agricultural community may be suspected of creating pollution over which it has no control.

More research is needed to develop alternatives to presently-known erosion-control systems. For example, more work is needed to develop sound farming systems that will permit efficient use of large modern equipment on existing terraces. Otherwise the terraces--and their soil-holding ability--will be removed.

Another adverse effect on water quality is the deterioration of surface water due to excessive eutrophication. Plant nutrients, especially phosphate, are considered to be primarily responsible--and this suspicion is understandable. American farmers are now applying over 7 million metric tons of nitrogen and 2 million tons of phosphorus as chemical fertilizer to the land each year. Additional research is needed to identify the kinds of conservation measures necessary for minimizing pollution from nitrates, phosphates, and other agricultural chemicals. We also need to know how much of these materials occurs naturally in the soil and how much is generated by the normal decay of crops and wood products.

A third major threat to water quality is posed by animal waste disposal. Americans are now consuming about 24 billion pounds of beef each year, and the overall consumption trend is still upward. This means that somebody has to produce millions and millions of cattle. Thus, simple economics points to more and more concentrated feedlots that generate larger and larger volumes of animal wastes.

Research is needed to develop effective and economical methods and equipment for waste management under these conditions--not only for cattle, but also for swine and other meat animals. Among the immediate needs are specifications for sealing and lining aerobic lagoons and earthen storage facilities, and refinements for flushing systems involved in recycling the liquid portion of wastes.

Energy Conservation

Energy problems also have some implications for environmental quality. From the viewpoint of impact on food production, energy problems are as critical as environmental problems.

Our agriculture, as you know, is energy intensive. In farm production, American farmers use only about 3 percent of the total energy consumed in this country. This is a small percentage but a vital one--in last year's severe energy crunch, American farmers were allocated 100 percent of their fuel needs.

Severe and protracted energy problems, though, could well place a lid on the level of agricultural production in the future. One of the most ominous trouble spots could occur in the production of fertilizers. These materials are absolutely vital to increased production and to higher yields per acre. An estimated 30 to 40 percent of agricultural production is directly attributable to fertilizer use.

Energy is conspicuously involved in the production of all three major types of fertilizer. Nearly 90 percent of world nitrogen fertilizer production depends directly on natural gas or petroleum products.

Phosphate and potash fertilizers--both derived from mineral products--require petroleum and electric power in mining, extraction, and processing.

Shortages of these materials--and high price tags on the available supply--could hurt the less-developed countries of the world severely. New and improved varieties of wheat and rice--both generated by the "Green Revolution"--to give new hope to many countries--produce no more than traditional varieties unless fertilized and irrigated.

In this country, scarcity and high prices of nitrogen fertilizer could affect crops such as corn, wheat, and cotton that require large quantities of this plant nutrient.

Science is helping to overcome fertilizer problems by breeding crop varieties that use nitrogen more efficiently and by developing better ways to determine fertilizer needs and time applications. Already the Agricultural Research Service is working with SCS and the Extension Service to let farmers know how they can get the most out of the fertilizer available.

Shortages of petroleum for energy needs might also produce a sharp increase in coal and oil-shale mining. This, as you are well aware, can produce excess erosion, pollute water supplies, and create other problems. Because of the strong possibility that these mining operations will increase, a stronger research effort should be directed

Then, too, alternatives to petroleum as sources of energy will be examined closely:

--Solar energy

--Ethyl alcohol from fermentation of cereal grains

--Energy from agricultural wastes such as straw, corncobs, hulls, and shells

--Energy from animal waste byproducts

Normally, these materials would be too expensive. But shortages of coal, gas, and oil and increases in their costs might make the agricultural alternatives more attractive.

There are many other conservation research needs that could have an important impact on food production. There isn't time to discuss them all here. The needs that I have discussed relating to farm and ranch production, the environment, and energy are the ones that seem most critical right now.

Solutions will require intensive and sharply focused research efforts. Without such efforts, high production levels cannot be achieved and maintained..nor can natural resources be managed in such a way as to keep them available for continued use in the years ahead.

Conservation research is as necessary to the success of the total effort as production research. Agricultural scientists recognize this and are setting their priorities accordingly.