ADMINISTRATION AND POLICY--WHAT SCS WANTS FROM RESEARCH

Mr. Chairman, scientists, participants in this research planning workshop, and guests, I am pleased to be here. Dr. Wadleigh's welcome invitation stated, "There is no question in my mind that SCS faces its brightest opportunities in the years ahead in making great contributions to efficient farming, watershed protection, water management, pollution abatement, flood control, and general enhancement of environmental quality.

"We, in the Soil and Water Conservation Research Division want to be just as helpful as we can to your great mission."

These kind words are appreciated--and we know, too, that as in the past--the continued success of our work and yours depends greatly on highly cooperative efforts by many, many citizens...inside and outside of government.

I do want to say something later about the role we hope to serve in the Seventies. This perspective may aid in some of your discussions and decisions now and later.

We all are aware that conservation and conservation concepts are an everchanging thing in light of new technology and farming methods. Constant vigilance is required to shed the habits of yesteryear and bend with these rapidly changing times.

The conservation system, for instance, designed for the equipment and farming methods of the forties may not meet the needs of today. Farming is a complex operation. It is based on the best use of efficient machines

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Material used by Norman A. Berg, Associate Administrator, Soil Conservation Service, U. S. Department of Agriculture, Washington, D. C., for 1969 Research Planning Workshop of Agricultural Research Service at Skyland Lodge, Shenandoah National Park, Virginia, October 6, 1969.

and scientifically tailored materials to prepare the land, plant, mature a crop, and harvest it with the least amount of scarce labor. Machinery is becoming larger, faster, and more expensive. The eight-row planter and cultivator; the giant self-propelled combine; and the large vegetable and fruit harvesting machines require fields and conservation systems which lend themselves to efficient, high speed operations.

A conservation system, even though it may control erosion and runoff, or provide for orderly water management, is not acceptable if it does not provide for efficient use of costly modern equipment.

Basic principles of conservation learned through the years are still sound. These key principles are being woven into new systems of conservation to meet the needs of the modern land user.

Size and shape of fields are changed to better fit the farming methods. The topography in many cases is altered by land grading. This is done to permit installation of workable erosion control systems; to provide smoother fields for large equipment; to permit more uniform application of water, or more orderly removal of excess water. In some fruit and vegetable producing areas land grading is being performed to provide better air drainage for frost protection.

Adequate access roads and bridges are now an integral part of a conservation system to permit efficient movement of farming equipment and transporting of supplies and harvested crops.

New materials are integrated into conservation systems as they are developed and proved suitable for use. The day of automated irrigation ystems is here.

More use of fertilizers on crops and chemicals for insect and weed control are requiring changes in cropping methods and conservation systems. In many places surface water disposal systems are placed underground since herbicides and vegetated waterways may not be compatible.

The effect of conservation on improving the quality of the environment is becoming increasingly important. Conservation systems that reduce runoff and erosion also reduce the movement of sediment and other pollutants into our rivers and lakes.

Many of the standard conservation practices and techniques used on farm land, with slight adaptation, are playing an increasingly important role on lands used for other purposes. These include such things as control of erosion and sediment from urban areas, management of runoff and by-products from concentrated livestock operations and agricultural processing plants, and control of runoff from eroding road rights-of-way. All have a place in improving the environment, enhancing esthetic value, and making this Nation a better place for all citizens to work and live.

The modern conservationist and land user, therefore, must be ever alert and willing to adjust in these rapidly changing times.

Mr. Chairman, it is indeed timely that we assess again <u>what SCS wants from Research.</u>

The memorandum for updating research needs (Research Memorandum-2 (Rev. 2), August 16, 1968) restates Soil Conservation Service policy for requesting information from research agencies on major problems and opportunities related to conservation and use of soil, water, and related resources. It assigns responsibilities for (1) liaison with research

agencies, (2) identifying major conservation problems and opportunities that may be solved through research, (3) reviewing and analyzing research findings, and (4) distributing research information to field personnel.

The national report is to be completed by June 1, 1970 and each 5 years thereafter.

In addition, the recent reports dealing with National Programs of Research for:

1. Soil and Land Use, and

2. Environmental Quality--Pollution in Relation to Agriculture and Forestry will also aid greatly in helping to guide USDA and State research agencies in setting research priorities.

The Soil and Land Use Task Force assumed that our soil resources should be used to maintain a sustained high standard of living for the people in the U. S., as well as those in developing countries.

However, in assuming this responsibility, the group wisely was also concerned with urban, recreational, and other land uses that will meet the needs of the people without polluting our soil and water resources.

"Land belongs to a boundless family . . . some dead, a few living, and an untold number yet to be born," their report stated. It continues: "The unborn must be assured that there will be adequate resources for food production, for urban development, and for the many intangibles that make life richer...Use of the land involves both private and public interests. Today it is widely acknowledged that the public purpose is not being achieved satisfactorily."

Both as individuals and as agency representatives we will probably always press to satisfy increased demands and as soon as possible! Therefore, I asked several key people for ideas to consider for this discussion--(without a price tag)--budgets will certainly limit how much can be done. Their suggestions are in line with the task force reports--in fact, several of the men served as consultants. Thus, I won't repeat that excellent list of recommended research approaches. Neither do I want to prejudge the results of our current "Needs" study. With this background I will introduce some of our staff suggestions into the record at this point.

SOILS

The Soil Survey research needed to produce information for use for both in the United States and in foreign assistance programs include:

1. Sources of nitrogen in tropical soils

Why do some tropical soils seem to be well supplied with nitrogen and others lacking? If we knew where the nitrogen came from when it occurs, we might be able to augment natural supplies in deficient soils. The knowledge would be useful in our PASA work.

2. Significance of calcium deficiencies to plant root development and means of correction

Large areas of land in the South and some soils in the Midwest have too little calcium in the subsoil to permit deep rooting of cultivated plants or of trees. What amounts of calcium are essential for root growth, and how can we get calcium into the subsoil? Injection might be a possibility, but there are no machines to do the job.

EROSION

1. Erosion equation

Research has given us a good guide for predicting soil losses for much of the country east of the Rockies. This information is being used for planning systems to reduce soil losses from rainfall and wind.

We need this kind of information for the Western States, especially for erosion resulting from rainfall.

Another problem that needs additional study is the "R" in the water erosion equation in the Southern States. We wonder if the "500R" in the South is twice as erosive as a "250R" farther North?

2. Studies on various tillage practices

The increased use of many kinds of minimum tillage, especially in the Eastern part of the country, presents some new areas of research, such as (1) what are the effects of residues left on the surface on soil and plant environment; (2) what are the soil and water losses from various types of minimum tillage systems, i.e., No-til planter, Till planter, and the practice of no plowing, but using chisel plows in the fall and spring as is now being used extensively in Illinois.

Do we need to expand this concept of tillage to the vegetable farming, and in areas in the Great Plains where wind erosion is a hazard?

3. Terrace spacing

In using the Universal Erosion equation to determine terrace spacing, recognition must be given to modern cropping and residue management systems. The factors used when plow-plant or no plow methods are used give spacing, which in light of previous experience, now appears to be excessive. However,

experience shows that when the design storm runoff occurs, the residue may lose some of its effectiveness. This needs to be studied and proper adjustment factors developed for use in determining terrace spacing.

PLANT SCIENCES

1. Plant breeding

Continued attention is needed on the improvement of plants so that there will be better efficiency in the use of water and solar energy. This is especially important in the semiarid and subhumid sections of the country.

2. Production from grasses and legumes

We need a breakthrough in the yield of forage grasses and legumes similar to what has happened in corn, sorghums and small grains.

WATER

We feel that water research needs are adequately covered in two reports:

1. "Quality of The Environment"

2. "National Program of Research for Water and Watersheds"

I would like to review briefly with you items of first priority importance to our staff.

1. Maintaining and enhancing water quality

Water quality is an elusive term that defies exact definition in meaningful words. Water quality evaluation and standards must relate to the intended use. Research related to water quality must consider interactions and alternative uses of the resource as well as the consequences of specific management practices. Needs for research are spelled out in the report, "Quality of The Environment."

2. Water requirements of crops

Since our 1963 report, research has leaned toward the solar radiation method of determining evapotranspiration, and SCS will need your assistance to develop as soon as possible a fully operational procedure by which our field people may calculate consumptive use by this method. This would mean continuing the work outlined by Collins (SCS), Jensen (ARS), Robb (USBR) at Denver, July 24, 1969.

3. Urban and agricultural water interrelationships

Demands for water continue to become greater for a wide variety of uses, resulting increasingly in real or apparent conflicts between rural and urban interests. Effective watershed development has enhanced agricultural municipal, and industrial development. Planning would be enhanced, however, with better understanding of the interrelationships of recreation, urban-industrial, and agricultural water use, and water resources and economic growth.

4. Preserving and managing wetlands

It is estimated that the original area covered by wetlands in the U. S. approached 127 million acres. Due to drainage, filling and dredging, wetlands presently occupy about 70 million acres. Wetlands have potential value for a number of purposes--to produce crops, grow trees, provide wildlife habitat, offer recreation opportunities, and supplement deficient water supplies. Increasing pressure on use of wetlands is creating a critical need for better information on:

1. Hydrologic conditions

2. Soils characteristics

3. Vegetation

4. Guides to use alternatives and management

5. Economic and social evaluations

5. Synthesizing research efforts through systems analysis

Water resources development is related to other national development needs and should be viewed as a complete system covering the many uses of water--domestic, industrial, waste disposal, agricultural, natural beauty, forests, fisheries, wildlife, and transportation. Has research and analysis applicable to these uses dealt only with bits and pieces of the system? Should research:

1. Develop analytical models which characterize relationships between physical, chemical, biological, and social variables involved in water use and management?
2. Using such models, test outcomes of alternatives, assumptions, inputs, benefits, costs, and other aspects of water management plans?

HYDROLOGY

1. Water yield

There is need for information on factors which significantly influence the water yield of watersheds of all types and sizes; and for a practical procedure for accurately predicting onsite and downstream water yields. Items to be investigated would include all contributions, uses, and losses of water within a drainage basin such as groundwater contributions to streamflow, channel transmission losses, evaporation and seepage losses from storage, and the effects of the extent and disbribution of such

influences as soil type, vegetative and other covers, conservation practices and measures, and other physical features of a watershed.

2. Rates of runoff

A method is needed for estimating the rate and depth of runoff in ungaged forest and rangeland watersheds of the western United States and for unit source areas in Hawaii and Alaska. Research would involve relationships between precipitation and runoff. It should include study of such factors as kind of soil, vegetative and other covers, land use, conservation practices and measures, and engineering works.

3. Publication of hydrologic data

ARS and the Forest Service collect considerable hydrologic data in connection with their research. Although these data may be a by-product of the research effort, they provide a valuable source of basic hydrologic information that is needed by SCS. It is highly desirable that all hydrologic data collected be published annually in standard form.

4. Comments on needs listed in report of 1963 not yet satisfied

Considerable research has gone forward through the hydrograph laboratory at Beltsville on water yield. However, a final product has not yet been received. Extensive research has also been carried on for rates of runoff. The contributions to SCS have been provided slowly from almost all of the ARS research watersheds. However, no conclusive evidence has yet been presented to help improve our methods for estimating rates of runoff. However, recently we did receive a very timely and urgently needed report from the ARS Hydrograph Laboratory, comparing measured results with SCS estimating procedures.

ENVIRONMENTAL INFLUENCES

1. Pesticides

The whole spectrum of pesticide effects on animals, plants, soil environment, as well as groundwater, needs more intensive research as you so well know.

2. Animal waste disposal

Feeding of livestock and poultry in heavy concentrations has created huge problems of disposing of large amounts of animal wastes. Efficient and cheap disposal methods are needed. In the case of lagoons and disposal ditches, the design criteria must relate to climatic zones and the effects of such operation on soil and water must be known. We wonder also if sufficient work has been done on practical recycling the nutrients in crop production.

3. Municipal waste disposal

Areas for disposal of municipal, dry wastes are in some places becoming scarce. The chief method for disposal is still the sanitary landfill. This usually involves agricultural land. We need criteria for design, relation to soil, and the effect of such operations on soil and water. This is applicable to all resource areas.

SUGGESTIONS

In addition to these specific research needs, I would like to candidly suggest a few ideas dealing with relations and effectiveness of the joint efforts of SCS and ARS:

1. Clarification of research needs by SCS

We intend to consolidate and state the most pressing research needs. We will try to make the needs statements in such terms as to clearly

emphasize the operational, practical, applied nature of the desired results. This can be done and still not restrict the researcher unduly.

2. Liaison between SCS and ARS

There is continued need for strong liaison with ARS. Perhaps, for instance, we can improve our communications by more frequent close personal working contact between key ARS researchers and our RTSC specialists. By this means we may be clearer in our statements of need at the researchers "workbench" level at the critical time the research is being planned and conducted.

3. Applied research

Some of our divisions raised questions about the attention going to applied research. The engineering division wonders if a unit could be established in ARS similar to the Special Studies Branch in the Weather Bureau. Such a unit could pull "bits and pieces" of basic research into a useable conclusion that could be rapidly expanded to the country as a whole or to regional subdivisions. SCS conducts field trials and field evaluations, but the transition between basic research and field trials could be greatly strengthened in many subject areas of interest to us.

4. Reinstate issuance of "ABSTRACTS"

"ABSTRACTS of recent published material on Soil and Water Conservation" was last issued in September of 1967. The SCS feels the need for such information. I suggest that ARS and SCS jointly discuss this question further, including possible formats and frequencies under which the information should be developed and distributed.

We know now that the updated Conservation Needs Inventory will undoubtedly reflect that:

1. Great progress has been made in adjusting land use so that cropland is more nearly consistent with land capability. Nevertheless, some 22 million acres of land in crops are on lands unsuited for this use and should be converted to other uses. This is in Classes V-VIII.

2. The erosion problem on croplands has shifted so that the focus, and the urgency, is now on our best agricultural lands in the Corn Belt and Plains Regions.

3. Controlling erosion on these top quality croplands is increasingly difficult due to the growing intensification of cropping systems.

4. Progress in treating cropland with needed conservation practices has about reached the point where lands requiring re-treatment are about equal in extent each year to the lands newly treated.

5. Lands are being converted to urban uses at a rapid rate; but, in general, this is not a serious threat to agriculture except for certain of the very best (Class I) lands.

6. Our lands have the capability to grow an adequate food supply to sustain our growing population with a choice (like the present) diet for several decades ahead provided three conditions are met: needed land use adjustment are made; conservation treatment is adequate to prevent soil deterioration; and, agricultural technology continues to improve at about the present rate.

7. A threat to this rather rosy prospect is that agriculture-related pollution carried to our waters in the erosion-runoff process may prove to be intolerable to our society.

Now, briefly, on the role SCS should play in the Seventies. In mid-September our State Conservationists were challenged by SCS Administrator Kenneth E. Grant as follows:

"A Plan for The Seventies

"Now we are embarking on a new decade, a decade when change will accelerate, when problems will multiply, when pressures will mount relentlessly.

"Therefore, I am asking you to hold a state conservationists' meeting different from any we have held before.

"One difference is that instead of trying to solve present problems--however pressing and urgent--we intend to focus our full attention on what the Service should be doing in the next 10 years--the decade of the Seventies.

"I am aware, of course, that to develop a program for the Seventies, we need to review as objectively as possible the work we are doing now.

"In making this review, it will not be enough to defend an operation because we have been doing it for many years or because it provides so many jobs or because the men responsible for the operation are good friends of ours.

"The question is: Do we continue this activity? Do we go on doing it the same old way? Should we expand it or curtail it?

"Critical Examination of Programs

"Among the specimens we should put under the glass for critical scrutiny are individual farm and ranch conservation planning, all aspects of soil surveys, the Conservation Needs Inventory, technical assistance in establishment of conservation practices, watershed project planning and installation services, Great Plains contracting, ACP assistance, the RC&D program, and anything else we are doing. The more of a sacred cow the operation is, the more it probably needs a critical review.

"We also need to take a look at the many new areas in which SCS is being called upon to give technical assistance. I am talking about things like assistance to planning and zoning commissions; to land developers and tax-levying bodies; recreation developments; sediment reduction and water quality improvement; environmental improvement, and so on.

"We need to define these areas very clearly. We need to define the contribution we can make as an agency. We need to determine what resources we need to be of greater service, and whether we need additional legislative authority, and if so--how to justify that need. If we find that we lack the resources to do a necessary job, we have to figure out what we can stop doing so that we can divert funds to this new area of emphasis.

"Organizational Changes Possible

"Taking action in new areas and curtailing activities in old areas may well require some organizational changes. The way we are set up today is not a sacred cow, any more than our program activities. At the same time, we have to keep educating ourselves. Our technical expertise has to be up-to-date, and beyond that, enlarged and extended. But unless we are clear on what we intend to do in the coming decade, we can scarcely plan for an effective organization or for appropriate technical training.

"The key topics are inventory, planning, installation and maintenance of conservation measures, technology, and information and education.

"Here are the questions I would like for you to raise on each topic:

1. Do we still need to do it? If so, are we doing it the best way?

2. Is present authority adequate?

3. What will it cost? If more than we can now finance, how do we get additional funds?

4. What are the relationships and institutional arrangements involved? (e. g. SCD's, state government agencies, etc.)

5. What internal changes are needed, or should be studied in SCS?

6. What do we give up? Does it substitute for something we now do?"

The conference was highly successful and should provide valuable material for charting our course. The recommendations made by the State Conservationists do not necessarily become Service policy. However, each one gets careful study and a decision will be reached as to the best manner of implementation.

Outlines of objectives and actions the Service should pursue in the decade ahead indicate:

1. An expansion of inventory activities to provide better data, faster, on a wider variety of resource conditions, problems and opportunities. This would involve wide participation by other Federal agencies, State and local agencies and universities.

2. More technical competence in disciplines related to environmental quality, especially in such fields as ecology, landscape design and sanitary engineering. Our technical skills should also be used to measure program benefits--and we need to strengthen our liaison with educational institutions.

3. Conservation planning should receive added emphasis with priorities partially shifting Service help from individual land units to neighborhood, community, multi-county and regional environments. Selectivity, flexibility and simplicity are key words for future planning assistance. Only the most excellent working relations with conservation districts and other planning groups will minimize the problems of coordination.

4. Non-federal and private interests should increasingly provide a larger proportion of the help needed on conservation treatment installation work on single land units. A national program input is needed, however, to provide quality control and assure an adequate level of conservation work in critical areas. Conservation measures on projects and community-wide activities should be significantly accelerated.

5. Finally, the concerned agencies, with appropriate assistance, need to continually keep the resource conservation and environmental management problems and actions before the people of the Nation.

We now intend to develop a comprehensive, long-range program for SCS. We'll need the best brains available within and outside the Service. Whenever your mission and ours coincide, I recommend we continue our long-standing and most beneficial working relationships.

Best wishes for the future.