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NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL
Washington, D. C.

Division of Biology and Agriculture
Agricultural Board

COMMITTEE ON PLANT AND CROP ECOLOGY

SUMMARY AND FINAL REPORT

The Committee on Plant and Crop Ecology was established in February 1952 under Office of Naval Research Contract N7 onr-29145, dated February 29, 1952 to June 30, 1952.

On June 16, 1952, the basis of the committee's support was expanded in a joint contract with the Office of Naval Research and the Air Force, whereby the Office of Naval Research increased its support to \$23,071 and the Air Force provided \$7,500, totaling \$30,571 for the period ending June 30, 1953.

On May 13, 1953, the joint Office of Naval Research-Air Force contract was extended to December 31, 1953, with an increased appropriation of \$12,929, bringing the total amount to \$43,500.

On January 25, 1954, the contract was again extended until March 31, 1954, in the amount of \$5,000, thus bringing the total cost of the Committee on Plant and Crop Ecology to \$48,500 from the date of its inception until its termination on March 31, 1954.

AIMS:

The purpose and general objectives of the Committee on Plant and Crop Ecology have been stated as follows:

"The National Research Council, through the Division of Biology and Agriculture, has recently been giving consideration to the place and importance of the field of plant and crop ecology in the broadest sense in relation to the national need. The fundamental aspects of this field call for research as well as correlation and integration of information among many separate biological and non-biological disciplines, including plant physiology, genetics, ecology, microbiology, entomology, soil science, geology, geography, meteorology, climatology, and agronomy. It is essential that these areas of study be utilized to the fullest extent in the furtherance of both immediate and long-time objectives.

"In order to obtain the broadest possible picture of the totality of conditions on which plant growth in nature depends, the Committee contemplates surveys in the following fields, among others, aerobiology, agroclimatology, conservation, crop geography, plant crop yields, and plant diseases and pests.

"It is the plan of the Committee to determine the nature and extent of current activities, governmental and non-governmental, to ascertain the degree of coordination between research groups and make the results of these surveys available to the scientists to whom they may be of importance.

"It considers its function to be primarily the integration of scattered information in the broad area of the plant sciences bearing on yield, which function calls for survey, evaluation, and recommendations..."

HISTORY OF COMMITTEE STRUCTURE AND ORGANIZATION:

The following subcommittees were established at the organizational meeting held on February 24, 1952: Aerobiology, Agroclimatology, Conservation, Crop Geography and Vegetation Analysis, Plant Crop Yields, and Plant Diseases and Pests. The general areas to be covered by these subcommittees and the central committee were outlined at that meeting; whereas the specific recommendations for subcommittee programs were made at the meeting of March 22-23, 1952. There was certain justifiable overlapping of interests between the subcommittees which required careful coordination and integration. To this end, intercommittee liaison was effected.

A meeting of the central committee was held on September 7, 1952; the actions of which included:

1. Endorsement of a written symposium covering all phases of trafficability - a classified volume and an unclassified volume.
2. Approval of the photo-interpretation project of the Subcommittee on Crop Geography and Vegetation Analysis.
3. Endorsement of a proposal draft to the Office of the Quartermaster General in support of the Survey of Vegetable Production Under Military Commands.
4. Approval of the resolution of the Subcommittee on Plant Diseases and Pests to the Food and Agriculture Organization of the United Nations, expressing gratification at the establishment of a world reporting service on insect pests and plant diseases.
5. A motion approving the proposed committee-sponsored quarterly letter, "The Plant Ecology Reporter," upon a trial basis, was seconded and carried.

On October 17, 1952, at a meeting of the Agricultural Board with the Governing Board of the Agricultural Research Institute, it was moved and carried to accept the Committee on Plant and Crop Ecology as a committee of the Agricultural Board. Subsequently, on April 1-2, 1953, the committee was represented at a joint meeting with the board and the institute, at which time its general scope of interest was outlined and reports were made with respect to subcommittee programs.

The committee structure has not been changed since its inception, although there have been changes in membership, including the resignation of Dr. Ralph E. Cleland as chairman in the fall of 1953. Dr. Samuel L. Meyer, Florida State University, was appointed chairman pending reorganization of the committee anticipated for January 1, 1954. Support for the new committee not having been obtained by that date, the life of the former committee was extended to March 31, 1954, during which period it was hoped that funds could be found to activate the new committee. The hoped-for support did not materialize, and the Committee on Plant and Crop Ecology was terminated on March 31, 1954.

SUBCOMMITTEES:

Aerobiology

The Committee on Aerobiology was organized as an independent committee of the Division of Biology and Agriculture prior to the establishment of the Committee on Plant and Crop Ecology. Since then it has also been regarded as a subcommittee of the latter.

In March 1952, the Subcommittee on Aerobiology defined its general aims as follows: (1) to promote the study of the properties and behavior of biological entities in the air; (2) to assist in the evaluation and development of sampling and analyzing techniques; (3) to make proposals and recommendations regarding pertinent fields of investigation and specific projects.

The primary objective of the subcommittee was to evaluate the possibility of intercontinental dissemination of air-borne disease-producing agents. Consideration was to be given to the incidental dissemination of pathogens through modern means of transportation, on baggage and on people themselves. The studies of the subcommittee were to supplement those of the Subcommittee on Plant Diseases and Pests by determining methods of entry into this country of certain foreign pathogens, allergens, and viruses, which could produce major plant disease problems.

In connection with the foregoing objective, the subcommittee held two classified meetings in an effort to determine the degree of interest of several Governmental agencies in cooperating in the study, with logistical and financial support. The first of these meetings, held at the Pentagon Building on December 4, 1953, was attended by representatives

of agencies with the necessary physical facilities for conducting the work. Definite interest was expressed, and there was general agreement that the project outlined was worthwhile.

A second meeting was called on February 16, 1954.

As a result of these meetings, the writer believes that a proposal submitted in the near future would receive favorable consideration and that the prerequisite logistical support would be forthcoming.

Agroclimatology

Since agroclimatology is not generally recognized as a distinct discipline, the Subcommittee on Agroclimatology set to work defining objectives and seeking the most desirable avenues of approach. Little research and less teaching have been given to the subject in spite of the importance of climate in the development of plants and crops.

In March 1952, a program with a number of specific recommendations was presented by the subcommittee and approved by the central committee. These concerned: (1) methodology and instrumentation; (2) phenology; (3) plant responses to individual climatic factors and relationship to integrated climate; (4) correlation of plants with climate as a whole; (5) land usage in relation to climate; and (6) weather forecasts in connection with crops.

Conservation

The Committee on Use and Care of Natural Resources has functioned as an independent committee of the Division of Biology and Agriculture, while also serving as a Subcommittee on Conservation of the Committee on Plant and Crop Ecology. Its objectives for plant conservation, stated in March 1952, concerned land use, soil and water conservation, forest management, range management, submarginal and non-arable lands, organic industrial wastes, and sample areas of natural vegetation.

A suggested book, tentatively titled "Conservation Problems and Solutions" was referred by mail to the committee members. Several members offered to contribute chapters, others urged that the manuscript be prepared by a single individual, and one at least questioned the need for such a book at this time. Meanwhile, one publisher offered to advance the cost of preparation if such a book is written by the chairman with advice from the committee.

In November 1952, a meeting was called at the request of The Ford Foundation to consider the gaps in research on conservation. Present were representatives of The Ford Foundation, consultants, committee members, and Dr. Weiss, Chairman of the Division of Biology and Agriculture, National Research Council. A series of valuable "briefs" of different aspects of conservation were presented. Recommendations of this

meeting included the following main points: (1) There is needed, as a first step, an adequate collection and organization of what is now known about natural resources and their conservation...; (2) There is need for authoritative, impartial information as to the merits of projects in the field of natural resources, since these inevitably involve conflicts of interest...; (3) All participants emphasized the need for continuing fundamental research, not restricted by immediate and practical considerations...; and (4) the specific projects which were suggested fall into a pattern taking the form of recommendations for the intensive study of three resources now inadequately understood - i.e., tropics, ocean, and grasslands - and of econometric appraisals of populations, needs, and resources.

Members of the committee participated in the planning of the program for the Mid-Century Conference on Resources for the Future, held in Washington, D. C., in December 1953; the above-mentioned briefs, which had been published as NRC Publication 288, "Present Needs for Research on the Use and Care of Natural Resources," were made available for use at the conference.

Crop Geography and Vegetation Analysis

Part I - General Statement

The objectives of the Subcommittee on Crop Geography and Vegetation Analysis, as the name suggests, fall chiefly into two separate categories: (1) crop geography, and (2) vegetation analysis and interpretation. The six main headings of the subcommittee's program outlined in March 1952 illustrate this dual interest: (1) photographic recognition and interpretation; (2) vegetation as an index to trafficability; (3) inventory description and mapping of vegetation cover; (4) evaluation of conditions of field crops; (5) regions of adaptation of varieties of field crops; and (6) geographical distribution of variability in the yields of field crops and analysis of hazards and factors limiting crop production. It was felt that research in the last area might help solve the important problem of the relation of field crop production to good land use.

During the past two years, the work on crop geography has focused on the recognition of diseases and rust conditions in small-grain fields (see Part II of this report). Vegetation analysis and trafficability have also received consideration as indicated in Part III of this report. One factor unifying both aspects of the subcommittee's work is the successful application of photo-interpretation techniques to disease recognition in field crops and to analyzing vegetation.

In view of the dual interests of the subcommittee, it was deemed advisable to alternate the chairmanship between these two distinct fields. Therefore, until his departure for a year's stay in Austria in the summer of 1952, Dr. K. H. W. Klages, whose interests primarily concern crop geography, was chairman of the subcommittee, after which Dr. R. N. Colwell, interested in the field of vegetation analysis, assumed the chairmanship.

Part II - Aerial Photographic Interpretation of Diseased and Healthy Cereal Crops

The subcommittee recognized an urgent need for a method to distinguish between diseased and healthy cereal crops by means of aerial photography. Consequently, it initiated such a project in the spring of 1952, with the full cooperation of: (1) U. S. Naval Air Stations at Oakland, California, and Jacksonville, Florida; (2) U. S. Naval Photographic-Interpretation Center; (3) Division of Optics and Metrology, National Bureau of Standards; (4) Division of Cereal Crops and Diseases, U. S. Department of Agriculture; (5) Division of Radiation and Organisms, Smithsonian Institution; (6) Department of Botany and Plant Pathology, Oklahoma A. & M. College; and (7) Plant Industry Station, U. S. Department of Agriculture, Fargo, North Dakota. As a result of this generous cooperation, the project to date has cost the committee less than \$3,000.

Results obtained in this study from its initiation in May 1952 through the last growing season in the summer and early fall of 1953 were most encouraging, as reported at two classified meetings, on November 13 and 20, 1953, respectively. Both of these meetings, attended chiefly by representatives from the military establishment and interested Government agencies, aroused an enthusiastic response and a keen desire to have the work continued during 1954 under open field conditions.

Part III - Beach Trafficability

Trafficability and its interpretation through aerial photographs assumed importance in the aims of the subcommittee as outlined in March 1952. Specific interest was expressed in: (1) using vegetation as an index to trafficability, and (2) determining trafficability of geographical areas and regions.

During the early part of 1952, inquiry on vegetation and its relation to trafficability was active and disclosed many potential sources of information; e.g., lumber companies, pulp and paper associations, private research organizations and institutions.

The subcommittee proposed, if funds were provided for the purpose, to: (1) analyze the pertinent literature with emphasis on ecological aspects of the problem; and (2) consolidate the information contained in the literature into a single, well-integrated document. This document would have indicated the present status of work relative to photo-interpretation of vegetation types and would have offered a series of generalizations, the validity of which could be tested in future research projects on the photo-interpretation of vegetation.

Plant Crop Yields

As a guide for its work, the Subcommittee on Plant Crop Yields, at its organizational meeting in March 1952, outlined the following general areas of action: (1) specific recommendations to the Congress and to

non-governmental organizations for pertinent research, and (2) compilation of existing data on plant crop yields and subsequent collation of such data. Basic research was felt to be essential in the problems of increased yield from forests, pasture and range lands, and agriculture.

In the past two years, consideration was given to two specific aspects of these objectives: (1) agricultural potential of the United States, and (2) vegetable production under military commands. Members of the central committee were concerned that rather than merely forecasting yields on the basis of those obtained in the past, research should be done on our agricultural potential, taking into consideration both the factors that limit good yields from the standpoint of crop potential, and the improvement of management.

Efforts of the executive office with respect to this subcommittee were devoted to initiating and attempting to stimulate interest in the need to survey vegetable production enterprises operated during World War II under military commands and the Foreign Economic Administration - U.S. Commercial Company program. Two meetings were held in order to bring together the administrative and technical, military and civilian views on the proposed subject.

Plant Diseases and Pests

The Subcommittee on Plant Diseases and Pests went on record at its organizational meeting in March 1952, deploring the over-emphasis on short-term "applied" research to the neglect of basic research. It also recommended more adequate research for a number of problems involving national defense.

Acting upon a resolution passed by the central committee, September 7, 1952, a resolution prepared by the subcommittee commending the Food and Agriculture Organization of the United Nations for its sponsorship of the International Plant Protection Convention was placed in the hands of the chairman of the Division of Biology and Agriculture for transmittal.

At a second meeting of the subcommittee, held September 30, 1952, a resolution was drafted in the interests of securing appropriate support to conduct research in foreign areas upon a critical list of diseases and pests which have been determined to be of paramount significance to the national welfare if introduced into this country. Later, at a joint meeting of the Committee on Plant and Crop Ecology with the Agricultural Board and the Governing Board of the Agricultural Research Institute on April 1-2, 1953, the resolution was modified and adopted by the Agricultural Board. Copies of a restricted version of the resolution were subsequently sent to appropriate agencies of the Government by the National Research Council. In addition, a number of non-classified informational copies of the resolution were distributed.

Very recently, the subcommittee has given consideration to the possibilities of preparing a world atlas of plant diseases and pests.

Exploratory discussions pertaining to the atlas were held with representatives of several Government agencies and the Battelle Memorial Institute. From this study may be obtained a partial answer to the question, "Will biological warfare succeed on crops?" An historical, dynamic approach is envisaged which would not necessarily require classification.

SURVEY OF GOVERNMENTAL PLANT SCIENCE RESEARCH:

In addition to the subcommittee activities mentioned above, in July 1953 the committee attempted to fulfill another of its stated objectives by initiating, through the office of its executive secretary, a survey of all Government-supported plant science research, with the intention of later expanding the survey to include plant-oriented research supported by institutions, foundations, and industry. This effort was rounded off by completing McBee Keysort cards for all plant science projects under contract between 1945-1954 with the Atomic Energy Commission, Office of Naval Research, U. S. Public Health Service, National Science Foundation, and scientific societies and foundations. It completes a survey of all U. S. Department of Agriculture plant science projects under the Point IV program. Data were also compiled on the department's overseas rubber projects, but the information was not transferred to the Keysort cards.

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August 4, 1954

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