CHARTER FOR THE SOUTHEASTERN PLANT ENVIRONMENT LABORATORIES --

North Carolina State University Unit

1. Title: Southeastern Plant Environment Laboratories - North Carolina State University Unit

2. Authority for establishment and date established:

The concept of the Southeastern Plant Environment Laboratories was developed in 1962 by faculty members of North Carolina State University and Duke University because of common interests in controlled environmental facilities. Also, in 1962 North Carolina State University received a grant of $750,000 from the Z. Smith Reynolds Foundation of Winston-Salem for construction of a controlled environment facility for research on tobacco. This grant stimulated an incentive to construct a phytotron large enough to accommodate research on plants other than tobacco. In order to facilitate cooperative efforts, the administrations of Duke University and North Carolina State University entered into an agreement to establish a Phytotron Board consisting of five members appointed by the administrative officers of the two institutions. The agreement stipulated that two members were to be selected from each university with a Chairman from either university. The members of the Phytotron Board supervised the planning, funding, and construction of the phytotron. In addition, the Board was charged with the responsibility of coordinating the operation of the two units, one at North Carolina State University and the other at Duke University.

In October 1962 the Phytotron Board obtained a planning grant of $40,500 from the National Science Foundation to study the feasibility of a two-unit phytotron. The members of the Board were faced with three major problems, the financing of a phytotron, its design, and its location. Important changes in viewpoint concerning engineering and construction of growth chambers occurred since the erection of the Earhart Laboratory in 1948. For example, plant growth chambers were beginning to be constructed as separate units rather than as integral parts of the building since reliable refrigeration equipment of intermediate capacity was available.

The problem of location was particularly important because there were three alternatives with respect to placement. These were: (1) locate the phytotron on one campus, (2) locate units on each campus, or (3) locate the phytotron in the Research Triangle Park, approximately midway between the two campuses. After more than a year of study, the Phytotron Board and the faculties of the two universities concluded that the needs of scientists and graduate students would be served most effectively by building two integrated units, one at North Carolina State University and the other at Duke University.

In early October of 1963 the Phytotron Board submitted to the National Science Foundation a proposal for a two-unit phytotron, the Duke unit to cost $1,854,221, all from the Foundation; the North Carolina State University unit to cost $2,058,288 of which $750,000 would be paid from the Z. Smith Reynolds grant. Following considerable deliberation, representatives of the National Science Foundation agreed to support the two-unit concept to the extent of approximately $2,250,000. The first grant was made June 26, 1964, followed by a press conference on June 29. By early 1965 the estimated cost of the two units had risen to about $4,300,000 which was more than the estimate in the original 1963 proposal. A part of this increase resulted from a sudden esculation in construction costs in the Raleigh-Durham area, part from an increase in space required by the engineers, and part from the fact that certain features omitted in 1964 to reduce the budget proved to be indispensable. Representatives of the National Science Foundation agreed to cover half of the increase in costs if Duke University and North Carolina State University would provide the other half. The two universities agreed to this proposal and matching funds were obtained.

The formal dedication was held on May 10, 1968. By July 1968 both units were, for all practical purposes, in full operation climaxing approximately six years of cooperative efforts on the part of faculty members from the two universities. The increased interest in environment and environmental problems made the completion of the Southeastern Plant Environmental Laboratories even more important and timely than was expected when the concept was developed.

3. Mission and how units support institutional mission:

Scientists are aware of the increasing need for controlling environmental conditions in many of their research studies. Control of environment is needed for two reasons: (1) to provide experimental material grown under reproducible conditions and (2) to study the effects of variations in the principal environmental factors on plant growth.

Plants grown under field conditions or in standard greenhouses often are subject to wide fluctuations of temperature, light and moisture which makes it difficult or impossible to interpret the effects of an individual factor. By providing reproducible conditions of day and night temperatures, photoperiods and humidities, it is possible for researchers to investigate the effects of important climatic variables on plants in an orderly fashion and evaluate the relative importance of the various factors with a precision not obtainable under natural conditions.

Phytotrons provide a means of extending research horizons into a basic understanding of plant growth and plant growth processes by permitting a succession of experiments throughout the entire year as well as providing for the simultaneous imposition of climatic variables. This offers an opportunity for more efficient utilization of the talents of the professional staff and their graduate students by providing a tool for improving the precision of plant science studies. The availability of the phytotron is also a strong stimulant to graduate training in plant sciences

and is attractive to students interested in pursuing research in population dynamics as influenced by environment, genetics, reaction of progenies to environmental extremes, effects of environmental stress on the biochemistry growth processes, mineral nutrition, and disease and insect resistance of plants.

4. Administrative placement and title of chief administrative officer:

The operation of the North Carolina State University unit of the Southeastern Plant Environment Laboratories is administered by a Director who is a member of the faculty of the North Carolina Agricultural Research Service. He is advised by a committee consisting of other staff members who are deeply concerned with the type of research conducted in the phytotron. The Director and two other faculty members of the North Carolina Agricultural Research Service serve on the five-man Phytotron Board which was established to coordinate activities of the North Carolina State University and Duke University units. The Director of the North Carolina State University phytotron unit reports directly to the administrative office of the North Carolina Agricultural Research Service.

SUPPLEMENTARY DATA

SOUTHEASTERN PLANT ENVIRONMENT LABORATORIES --
North Carolina State University Unit

5. Name of individual currently chief administrative officer:

Dr. R. J. Downs

6. Staff and budget data:

(a) Characteristics of primary staff:

Department	EPA Personnel Head Count	SPA Personnel Head Count
Phytotron	2.0	8.5

(b) Total expenditures for last three fiscal years by source:

Source of Funds	FY 75-76	FY 76-77	FY 77-78
State Appropriations	$110,305	$142,442	$169,816
Federal Appropriations	--	--	14,239
Miscellaneous Receipts	14,948	3,719	6,153
Grants and Contracts	57,711	81,268	57,613
Total	$182,964	$227,429	$247,821

7. Brief statement of further plans:

The two phytotron units of the Southeastern Plant Environment Laboratories offer a unique opportunity to scientists to carry out environmental research with a minimum amount of effort and cost. No capital investment is required and little of the investigator's time is required because routine care of the plants during an experiment is provided by the phytotron staff. In most instances the investigator needs to be present only to supervise setting up the experiment, provide special treatments, and make his measurements and harvest. Some special treatments can be handled by the phytotron staff if sufficient instructions are provided.

Operating policies are determined by the Phytotron Board composed of representatives of the two universities. Overall problems of financing and operation and questions concerning the most effective allocation of space for outside investigators are handled by the Board. On each campus an advisory committee consults with the Director on problems such as the assignment of priorities for experiments by resident researchers.

The Phytotron Board encourages the widest possible range of research consistent with the basic principle of a phytotron which is to provide a wide range of environmental conditions. An important criterion in

determining priorities for space is the need for simultaneous use of a number of environmental conditions.

The features of the plant growth chambers include the following:

(1) Flexibility in construction. The chambers are built of sections of insulated aluminum panel and can be dismantled or rebuilt in different dimensions if necessary.

(2) Separate individually cooled light caps. This feature aids in maintaining uniform light output. Furthermore, the light caps can be easily removed if it becomes desirable to use a new type of light source.

(3) Uniformity of temperature and light, both horizontally and vertically. Uniform temperatures throughout the chambers are maintained by rapid downward flow of air. The solid bank of lamps in the reflective surface of the walls maintains a high level of light intensity from the top to the bottom of the chamber and increases uniformity in the plant growing area.

(4) Arrangement of chambers. The backs of the chambers are situated against a service corridor which contains the transformers and choke coils for lamps, the circulating pumps and the utility lines. This arrangement frees plant growing and working space from machinery and enables workmen to make repairs with relative ease.

In addition, the two units have a considerable amount of special equipment, including infrared gas analyzers, equipment for measuring light intensity and relative humidity, anemometers, freeze dry equipment, and multi-point recorders. Both units have shops equipped with power and hand tools. In addition, each unit has certain distinct facilities in accordance with the type of studies being conducted. The North Carolina State University unit has seed germinators and special facilities for studying various kinds of light sources. Engineers within the North Carolina State University unit are continually making changes and modifications within the facility to best meet the needs of scientists conducting experiments within the unit.