AGRICULTURAL EXPERIMENT STATION
of the ALABAMA POLYTECHNIC INSTITUTE
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Advancing SOIL *and* WATER CONSERVATION THROUGH RESEARCH

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EARLY MAN considered soil, water, air, and fire to be the basic elements of life. Even in this atomic age, the essential nature of these same factors continues to be recognized. The disastrous effect of drought during the past 3 years and the pauperizing effects of severe wind and water erosion in many parts of the world emphasize the importance of soil and water conservation.

The early social organization in the rural South and the development of a marketing system for cotton that extended into almost every community meant that Alabama's agricultural economy, like that of most other states in the region, soon came to rest largely on cotton as the principal cash crop. Corn, on the other hand, was a subsistence crop grown for feed for work stock and family meat animals as well as food for the farm family. In the light of these facts, it is small wonder that many of the published reports of this Agricultural Experiment Station have dealt with cotton and corn fertilizers, variety tests, and rotations.

From such reports, it might be concluded that the early administrators and research workers at this Station were unmindful of the need for research of the type now known as soil and water conservation research. Nothing could be farther from the fact. Although the term "soil and water conservation" may not have been a part of their vocabulary, we have ample evidence that the pioneers responsible for our young Experiment Station were fully cognizant of the importance of maintaining and improving the productivity of the soil. Only 2 years after the Legislature provided for an experimental farm at Auburn in 1883, it created what we would now call a substation. This was the Canebrake Experiment Station at Uniontown. The function of this first "substation" was the study of forage crops adapted to the region; today we include such crops in most programs dealing with soil and water conservation. Furthermore, some of our first publications dealt with experiments with clovers and other close-growing crops rather than cotton and corn.

The late Professor J. F. Duggar conducted inoculation experiments on crimson clover and other legumes in the mid-1890's and is credited with having been one of the first workers in the United States to have experimented with "artificial cultures." This was an important step in the development of a research program looking toward the conservation and improvement of our soil resources.

It is important to remember that the early days of this Station were also the early days of research in soils and mineral nutrition. Hellriegel and Wilfarth had published their classical paper on the nitrogenous nutrition of legumes in 1888. With

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such a background, the "Old Rotation" was begun in 1896—a rotation that is said to be the oldest in the United States involving cotton. At first glance, it might be concluded that this experiment's sole objective was to study fertilizers for a rotation of cotton and corn. Actually, it was designed as a basic soil fertility experiment in which the economic crops, cotton and corn, were used as test crops and in which the new fundamental knowledge about legumes was employed. Symbiotic fixation of nitrogen was not the only factor to be taken into consideration in such an experiment, as the investigators soon discovered. On the plots in which cotton and vetch were grown in a continuous within-the-year rotation, the per-acre yield of seed cotton fell from an 813-pound average for the first 10-year period, 1896-1905, to a 575-pound average for the 4-year period of 1920-23. During this first 24-year period, the vetch in the rotation frequently failed, and from the investigators' notes it is evident that they attributed the failure to such things as winter freezes, fall droughts, and diseases.

In the interim, however, a great deal of information on the mineral requirement of legumes, particularly phosphate, was being accumulated in experiments, such as the Cullar's Rotation at Auburn and cooperative experiments with farmers throughout the State, both beginning about 1911.

When the late Dean M. J. Funchess became head of the Department of Agronomy and Soils in 1920, he revised the "Old Rotation" project to provide for more adequate amounts of phosphate and later for potash. A quotation from the record for 1921, "To increase the available phosphorus for the legumes and main crops, 400 pounds per acre of 16% superphosphate were applied to the west half of each plot before seeding to vetch," is illustrative of the revision. What were the results? Simply that the legumes now grew luxuriantly and the production of cotton and corn increased accordingly. On the plots producing cotton and vetch continuously, the per-acre yield of seed cotton, which had fallen from 813 pounds (1896-1905) to 575 pounds (1920-1923), rose to an average of 1,188 pounds for the next 4-year period and has continued at about that level. Reporting on this experiment recently, the late Dr. Franklin L. Davis wrote, "The yields produced on these plots in 1944, the forty-ninth year of continuous cotton, were 1,656 and 1,512 pounds of seed cotton per acre, respectively. This would indicate that the cotton as a crop does not deplete the soil or run it down excessively. The cultural practices of leaving the land bare through the winter and of not preventing erosion are responsible for the generally low fertility level of many soils on which cotton is grown."

This experiment, begun as a basic soil fertility study soon after the principle of symbiotic fixation of nitrogen was discovered and before the mineral requirements of legumes were fully understood, had a profound influence on the use of winter legumes as soil-improving and soil-conserving plants. Who can contradict the conclusion that the results of this longtime experiment have contributed to our knowledge of the importance of soil conservation?

Agricultural engineering at Auburn apparently grew out of recognition of the need for erosion control. In 1919, the late Director J. F. Duggar invited Professor M. L. Nichols to join our staff to work on soil erosion problems. One of his first recommendations was that a farm level be purchased for each county agent; the recommendation was approved. Soon after joining the staff, Professor Nichols cooperated with R. Y. Bailey in studying the value of kudzu as a filter crop. Both of these men continued their interest in erosion control problems during their residence at Auburn. The agricultural engineering staff developed homemade terrace drags and worked out systems of field layouts and terracing, which culminated in a channel-type terrace that long bore Professor Nichols' name. In 1929, the Agricultural Engineering Department constructed the erosion plots, consisting of a series of soil plots ranging from 0° to 20° in slope. On these plots, later augmented by the tilting plots, basic studies on soil erosion were conducted. Contributions to the early literature on soil and water conservation, such as Bulletin 245, "Sheet Erosion Studies on Cecil Clay," resulted from this research.

I have already mentioned that some of our earliest publications dealt with close-growing crops. A pasture fertilization experiment was begun at Auburn in the mid-1920's, and was the forerunner of our State-wide pasture project. Much information on sod culture resulted from this

work. The basic research reported in Bulletin 237, published July 1932, "Morphological, Greenhouse, and Chemical Studies of Black Belt Soils of Alabama," by Scarseth and the field experiments conducted by the late K. G. Baker at the Black Belt Substation provided the background information for converting a broad soil region from a depressed, eroded, row-crop economy to a progressive sod-crop, animal economy.

Another major contribution came from Fred Stewart's conclusion, substantiated by research, that crimson clover could be managed in such a way that early fall growth would result in fall and winter grazing. This work created widespread interest in the use of winter grazing crops and, irrespective of the forage species used, resulted in many thousands of acres of land being protected from winter erosion.

Beginning with establishment of the first plots in the Auburn Plantations in 1927, results of our forestry research have contributed greatly to the developing philosophy that good forestry practice results in financial return to the landowner and contributes to the conservation of soil and water resources. The pictorial record of the healing effects of a pine plantation on a gully in the Auburn forestry area during the past 25 years has impressed people with the relationship between forests and soil conservation.

Many of you alumni had your laboratory work in orchard management in the old rock pile orchard some 25 to 30 years ago and will remember the use of sod in that orchard. The value of sod culture in orchards was further studied in the old cooperative hillculture project, and a more comprehensive investigation is currently in progress at the Chilton Area Horticulture Substation near Clanton. In contrast to the severely eroded, clean cultivated peach orchards to be seen in several sections of the South, the only clean culture in the orchards at our horticulture substations is found in experimental plots where the several effects of clean and sod culture are being studied.

Drought periods of the past 3 years have dramatized the importance of water and of water conservation. The farm pond research at this station has brought world recognition to Professor H. S. Swingle and his associates. Although the principal objective of this project deals with pond management for fish production, the by-products of the research have contributed to our knowledge of small watershed yields, dam construction, evaporation losses during droughts, and other factors of importance to people interested in water conservation. Furthermore, personnel of the former Division of Research, Soil Conservation Service, worked cooperatively here and contributed to our knowledge in the field of hydrology.

These few examples are illustrative of the contributions that the research program of this institution has made in the field of soil and water conservation. Many additional examples could be cited. In this period of transition when the responsibility for research in soil and water conservation that was formerly conducted by a division of the Soil Conservation Service has been assumed by the Agricultural Research Service, I feel that a word of caution is in order. The caution is that we not base our conclusion as to the amount of soil and water conservation research being conducted by a state experiment station or a Federal agency on a simple examination of project titles. Had project titles been our only criterion, this talk would have been much shorter since few of the projects on which it is based had the words "soil and water conservation" in the titles. Two of our recent publications illustrate the point. One is entitled, "Top Soil and Pine Trees in Alabama's Piedmont" and the other, "Loss of Phosphorus by Erosion." The results and conclusions in both publications strongly support the principle of soil conservation; the first is a contribution from a project entitled "The Establishment, Growth, and Yield of Forest Plantations in Alabama," and the other is from a project entitled "Factors Affecting the Nature and Behavior of Native and Added Phosphates in Soils."

Our agricultural engineers are aware of the fact that mechanized farming makes conservation farming even more essential, but they also understand that machinery gives the farmer tools and power to do a job of conservation that he could not do before. Our engineers are continuing to study such mechanization aids to conservation as land smoothing and water disposal systems including various types of terraces.

Our plant breeders are attempting to develop improved strains of legumes and grasses for conservation and forage pur-

poses. In order to take advantage of the work of other plant breeders, our agronomists have a broad screening program in which they are testing new grasses and legumes for adaptation to our conditions. The plant breeders and animal and dairy husbandmen are cooperating in an effort to develop or find new plants that have desirable nutritive as well as agronomic characteristics.

Interest in irrigation is at a high point in Alabama as a result of the drought. Fortunately, our research workers did not wait until the drought occurred to begin some work in this field. Bulletin 276, "Value of Irrigation with Different Fertilizer Treatments for Vegetable Crops," by Ware and Johnson, was published in 1950. The demand for this bulletin was so great that the supply was exhausted by 1952 and a reprint was issued in February, 1953. Our research in irrigation has not been restricted to that dealing with horticultural crops. We have had a project in the Agricultural Engineering Department for a number of years. Some of you are familiar with the work that members of the agricultural engineering staff have done in cooperation with Soil Conservation Service and Agricultural Research Service personnel in conducting infiltration and permeability studies. We have a carefully designed pasture irrigation experiment at the Lower Coastal Plain Substation in which agronomists, agricultural engineers, and animal husbandmen are cooperating. We have some work on irrigation of alfalfa and other forage crops and on cotton and corn. We are fortunate that the Soil and Water Conservation Branch, Agricultural Research Service, is cooperating with us and have located the regional project dealing with basic irrigation research in Alabama. You may be interested that one reason for this project being located in Alabama is that the Soil Conservation Service and this Station have entered into an agreement making the old Soil Conservation Service Nursery at Thorsby, with its large fixed irrigation system, available to us. In addition to providing answers to current questions, these studies are the bases for development of an expanded research program that will meet future needs for irrigation information in the Southeast.

These are but examples of our research program designed to extend our knowledge in these fields of practical and economic importance. I will close with two words of caution. The first is that we must not be complacent and lull ourselves with the false belief that our research, education, or action programs are perfect. The second is that we must not become such avid advocates of the new that we substitute new and as yet unproved practices or plants for the old that have stood the test of research and time.

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