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The Seed Technology Story in Mississippi

D. H. Bunch

THE SEED TECHNOLOGY STORY IN MISSISSIPPI

H. Dean Bunch[1/]

Historically, in the area of crop science, large amounts of public money and effort have been expended in land grant institutions in the area of breeding. This is as it should have been, and today even more emphasis must be placed on this basic step in crop improvement. However, a look backward a few decades will show that there was no organized system of passing the fruits of breeding programs on to the farmer - the man for whom the breeding was done. As a result varieties were lost, mixed with inferior varieties, or did not get distributed far beyond the door of the experiment station.

In an attempt to make sure that farmers obtain varietally pure seed, Wisconsin, in 1913, started a field inspection system. Other states followed and from these efforts seed certification programs began. Foundation seed programs, usually within or in connection with the experiment station or extension division, were organized to provide the seed certification agencies with varietally pure seed stocks.

Concurrent with these efforts on the part of public institutions and certification agencies, was the development and expansion of private seed companies engaged in the breeding and distribution of their own varieties and hybrids.

During this period of the development of a seed industry, state and federal seed laws were established and developed through a series of changes, so that by 1939 the present Federal Seed Act was put into effect which requires proper labeling of interstate seed shipments. At the same time, state laws were enacted to set forth standards of seed quality in reference to physical impurities and viability of seed.

These developments in the seed industry, the stimulus of crop production during World War II, the exodus of labor from the farm to the city, the increased mechanization, and the high cost of labor and machinery on the farm, all started coming to a focus about 15 or 20 years ago.

To the man engaged in the seed business, whether in production, processing, or marketing, this meant that the farmer was becoming more discriminating in his tastes when it came to buying seed. He began taking greater interest in seeking out seed of improved varieties and hybrids: he began to be more cognizant of the potential germination of his planting seed,

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1/ Dr. Bunch is Agronomist and Professor, In Charge, Seed Technology Laboratory, Mississippi Agricultural Experiment Station, Mississippi State University, State College, Mississippi.

and the amount and kind of weed seeds present. (This trend has been increasing by leaps and bounds so that the day is almost past when just any kind of seed can be sold).

Where did this leave the seedsman? Here he was in the middle between breeding programs putting out new varieties, and farmers (supported by seed laws) demanding a clean bag of seed that would grow - fast. Here was the seedsman with inadequate equipment to clean his seed, yet at the same time beset by salesmen unfamiliar with their equipment. Here he was with conveying equipment grinding his seed to feed; buying and selling seed, the germination of which was declining faster than he could move it. In addition to these troubles he was having difficulty in the proper operation of his equipment, and in the safe handling and storage of seed because his personnel was not trained for the job.

It was against this background that representatives of the Mississippi Seedsmen's Association and the Southern Seedsmen's Association met to discuss the possibility of establishing a regional center for research and training in seeds. It was the opinion of these men that if a new improved variety of a crop were to make its intended contribution, the seed should be made available to the farmer (1) varietally pure, (2) of a high percentage viability, (3) free of noxious weed seeds, (4) in adequate quantities and (5) at a reasonable price. It was toward these goals that a research and training program was outlined and put into action.

The first action came when the Mississippi Legislature of 1948-50, at the request of the Experiment Station and the commercial seedsmen, appropriated $75,000 to initiate the project. Mississippi State provided the building (the south end of the Old Textile Building), thereby making it possible to spend the major portion of these appropriations for equipment and operations. Manufacturers of seed processing equipment, realizing the significance of the project, contributed large quantities of specialized equipment. In the beginning, Title II appropriations from the Agricultural Marketing Service, matched by state funds provided for research personnel, operational expenses and for additional equipment. Because it was established to serve the Southeast and because of the regional interest of seedsmen, the laboratory was known as the Southern Regional Seed Research Laboratory. In effect, however, financing and direction was always a Mississippi affair, therefore 4 or 5 years ago the name was changed to the Mississippi Seed Technology Laboratory. But by whatever name, it is considered to be one of the most complete facilities of its kind with the most complete seed science and technology training curriculum in the world.

The course of direction has shifted a few times since the facility was put into operation 13 years ago, but never the aim - the aim of supplying research information to help seedsmen supply our farmers with high quality seed; and the training of men and women for service in the various areas of seed production,

processing, testing, marketing and related areas.

The training curriculum is set up as a division of Agronomy. The basic courses are essentially the same as for Agronomy Crops. In addition, 7 "seed" courses (production, processing, testing and physiology) as well as additional courses in Agricultural Engineering and Business are required. Mr. Burns Welch of the Agricultural Engineering Department teaches 3 of the seed processing courses and is considered a member of the Laboratory staff.

The majority of research funds are administered directly to Seed Lab projects from the Director's Office from state sources, conventional federal-experiment station funds, contracts with seedsmen's groups, the Agricultural Marketing Service and the Agency for International Development.

The establishment of the Laboratory was a new venture. This is not to infer that no research and training was being done elsewhere. Subject matter in the broad field of seed technology is a part of certain crops, soils, horticulture, pathology, and entomology courses. Some seed testing research was being done as a sort of sideline in seed regulatory laboratories, and the agricultural engineers have provided information applicable to some extent, in their experimentations with the handling of grain. But the idea behind the Seed Technology program was to provide and develop a single facility where those problems dealing directly with seed could be given more detailed study.

New ideas don't just happen and new developments do not progress unaided. Just as there must be a source of energy for the photo-synthetic processes, so the new-envisioned seed research and training center had to have a source of energy. It is a dangerous undertaking for one to cite individuals who are responsible for the success (or failure for that matter) of a group action, because a word here or a single vote there by someone in the right place at the right time can change the course of history. Nevertheless, we shall mention a few who have played significant parts in the short history of the Laboratory.

On the part of the Southern Seedsmen's Association, Dr. Lane Wilson, Executive Vice-President, played an important part in early planning. Probably no single person in the seed industry of the South enjoys more esteemed admiration and trust from all segments - experiment stations, crop improvement associations, seed control people, and commercial seedsmen - than does Dr. Wilson. His personal interest and the interest of the group which he represented was influential during the developmental stage. Later he was instrumental in getting a Southern Seedsmen's Fellowship established at Mississippi State which helped two men obtain degrees, the speaker being one - and very grateful too for the assistance. Another man, who among seedsmen is probably the most cognizous for the need of research, has figured quite prominently in our program. Mr. Jim Sutherland, of McNairs Seed Company,

Laurinburg, North Carolina, when he was president of the S.S.A. persuaded that organization and the 13 State Seed Associations to put money in research at the Laboratory. We shall say more about this later.

Of the Mississippi seedsmen who contributed heart, mind, and energy to the realization of a seed center in Mississippi, none gave greater service than Noble Pace, seedsman then of Cleveland, now retired in Columbus. He and Charlie McNeil of the Mississippi Federated Cooperative were no doubt the leaders in selling the idea to the administration at the University and to the Legislature. There were others who contributed from this group, but Noble Pace is generally conceded to be the father of the idea.

From the beginning, the entire membership of the Mississippi Seedsmen's Association have given solid moral support, and in addition has provided scholarship awards for deserving students. To further show their appreciation the program committee always has representation from the Laboratory on the program of their annual meetings.

In the Experiment Station, firm support was given the project by Director Frank Welch, and direction was ably supplied by our late Mr. Pete Sanders, who was Research Coordinator at the time. Professor W. C. Howell, Head of Agricultural Engineering, had the responsibility of equipping the laboratory with seed processing machines. In addition to planning the layout of equipment, which included the remodeling of a portion of the building, he, along with Mr. Pace, had to convince key equipment manufacturers that it was good business to place equipment in the laboratory on a loan basis. This was an important and necessary job, since the appropriation was not ample to buy all of the equipment. The late Oby Easely of the Agricultural Engineering Department contributed greatly in the early stages through assistance in the installation of equipment and instruction of the first classes in the engineering phases.

These were the chief figures during the days when the Laboratory was getting fitted physically for operation. Various committees representing different areas of interest were appointed by the Director. Principal people involved here, I believe, included Dr. John Presley, then in Pathology; A. L. Hamner, Entomology; Dr. Joe Edmond, Horticulture; and the late Dr. R. C. Eckhardt, Peter Bennett and myself represented Agronomy.

Once in operation but long before the dust had settled, Dr. W. L. Giles, now Vice-President for Agriculture and Forestry at Mississippi State University, was placed in charge of the Laboratory program along with his other duties in forage crops. The late Dr. Si Marchbanks, who had the honor of earning the first PHD Degree at Mississippi State University, was added to the staff and was placed in charge of the physical plant and day to day operation, and the responsibility for some of the teaching load. Before Dr. Giles had really warmed up to the job he accepted the responsibilities as Superintendent of the

Delta Branch Experiment Station. Dr. Louis Wise, our present Dean of Agriculture, was then selected to replace Dr. Giles.

The story as it concerns people would not be complete without the mention of two men who have been staunch allies throughout this period while the Laboratory was having "growing pains", and up to the present day. Without the patience and forebearance of Mr. Henry Leveck, Director of the Experiment Station and Dr. C. Dale Hoover, Head of the Agronomy Department, the job of bringing the Laboratory to its present status would have been impossible. Financing a unique type of cooperative program with industry and the newness of the facility presented problems which required understanding and guidance which these men ably gave.

This is the background surrounding the organization and development of the Seed Technology program. What is the story in terms of action? Because of the shortage of staff and the relatively large amount of equipment, the first 5 or 6 years saw the emphasis chiefly on training and extension-type work among seedsmen. The amount of this type work has not decreased but with a more adequately-sized staff, research is playing a more important part each year. One of the aims of the Laboratory was to provide some training to persons already in the seed business. The annual Short Course for Seedsmen held each spring started as an offering for seed processors in the Southeastern states. However, for the past 8 or 9 years, producers, crop improvement people, analysts, and seedsmen from all areas of the industry have attended. A typical annual group of 175 represents 25-30 states and 2 or 3 countries. The Short Course is supported by enrollement fees and by the free and willing contribution of technical assistance supplied by the equipment manufacturers. The Mississippi Seed Improvement Association and the Mississippi Seedsmen's Association provide a chicken barbecue for the participants; Sawan, Inc. of Columbus has always given a big Southern style barbecue at Columbus; and the equipment manufacturers have contributed to the pleasure of the group by supplying doughnuts, coffee, cokes and assorted drinks.

These occasions have acquanited about 2500 seedsmen and other interested persons in the latest developments in the field of seed processing and testing. Several hundred additional persons are reached through the Proceedings which have been published the past 4 years. Further contact is made with seedsmen and farmers through the many problems which are continually presented to us and through the approximately 1500 persons who have visited the Laboratory in addition to those attending Short Courses.

As important as are the contact of short courses, visitors, and analysis of problems, we think that the major contribution of the Laboratory in this short time has been in our graduates, for we have been exceedingly fortunate to have had a high percentage of excellent students. The success

of the Laboratory as a training medium will in the long run depend upon the performance of these graduates in the field. The variety of positions which they as a group occupy give an indication of the opportunities in the general field of seed science and technology, and the ability of the Laboratory to supply them. By our last count, the 50 odd graduates (B.S., M.S., and Ph.D.) reside in the states of Arkansas, Louisiana, Tennessee, Kentucky, Virginia, North Carolina, Georgia, Illinois, Nebraska, Ohio, California, Washington, and about 1/3 of them here in Mississippi.

Some of the jobs include State Seed Analyst (in 2 states), Extension Seed Specialists (in 2 states), Manager of Foundation Seed Program (in 2 states), Crop Improvement Secretary, Crop Improvement Inspector, Agronomists in State Experiment Station closely connected with seed projects (several in this category). These jobs might be considered in the area of public work. Commercial firms have hired men for processing plant managers, farm managers, agronomists in charge of seed production, plant breeders, managers of grain elevators, salesmen, and manufacturers' agent of seed processing equipment. At least 2 men are in the business of chemicals and one in finance, but even those fields are close to seed.

The area of influence of the Seed Technology program has spread beyond the borders of this country in recent years. At the request of the Foreign Agricultural Service and the International Cooperation Administration (now called the Agency for International Development), the Laboratory started in the summer of 1956 to provide a 5 week concentrated course in seed improvement for agriculturists from other countries. This course is chiefly one in processing and testing, but also includes instruction in areas of foundation seed production, certification, drying, treating and storage. During the six years in which this course has operated, 90 men and women from 32 different countries have participated. These figures do not include international students who attend school under the regular curriculum.

Four years ago the Laboratory entered into a contract with ICA to supply further international training both inside and outside the U.S. As a result of this agreement, personnel of the Laboratory have traveled in 35 countries on surveys of seed problems, conducted training schools in Asia and South America, served as advisors to 4 regional seed improvement conferences in Latin America, Asia, and Africa, set up research studies in cooperation with Asian countries, designed seed processing plants, and seed testing laboratories, and supplied hundreds of copies of informative material and equipment brochures around the world.

The advantages of this contract to our domestic program lie in the fact that we have been able to increase the staff to help with our overall program and do some research which benefits Mississippi and the U.S. as

much as the cooperative countries. The increased budget has bolstered our home program by helping with salaries and overhead. In short, our local program has not been hurt, but rather aided by these additional responsibilities.

So much for the training aspects! What about research! In reality, research efforts have been and continue to be directed toward the solution of salient problems in this whole area of seed science and technology. Problems which confront the seed producer; the processor; the seedsman who handles, stores and markets seed; the seed analysts; and the law enforcement agencies in their efforts to provide the consumer with high quality seed - quality in every sense of the word. In addition, the research program is aimed to contribute some basic information about seeds - answers that may someday be very useful in practical application.

We shall not attempt to cover our entire list of research projects but we should like to cite enough cases to give you an idea of the type work in which we are engaged.

In the area of mechanical seed injury seed harvesting studies have shown the effect of cylinder speed on the amount of damage which may be incurred. Further, studies with different seed processing machines and conveyors have pointed out that seed moisture level greatly affects the amount of mechanical damage which may occur. These studies have also located potential danger spots in processing and handling as regards seed injury and have pointed out methods of alleviating some of the troubles. Scarification effects have been the object of several experiments. We are working now on the old problem of hulling lespedeza to determine if hulled lespedeza can be carried over without adverse results.

The nature of mechanical damage in seeds is not well understood. We know that damage should be kept at a minimum, but we also know that seeds must be handled, and handling necessarily causes injury to some extent. We know that seed moisture content affects the susceptibility of the seeds to injury. But there are many basic things we do not know. Therefore, detailed studies are underway, aimed at ascertaining how abrasions and impacts really affect the tissue systems - along with the resulting effects. These findings could lead to the development of equipment or methods of handling which would reduce this hazard.

The improvement of seed quality through mechanical processing is an important part of our research program, although much of it in the past has been on individual problems, submitted by seed producers and processors. We are expanding this phase of work with objectives to include the improvement of the quality of carryover seed by removing those seeds which have declined in germinative capacity. We also want to find out why some lots can be improved significantly, while others apparently cannot. Some of the answers we know -

but not all of them.

Another objective in this type of work is to improve the quality of currently-grown seed by removing immature, diseased and mechanically-damaged seed. This may sound rather like working over an old field, but the fact remains that a lot of stuff goes in the bag that doesn't belong there. Granted, part of the reasons are economic, still we believe there are opportunities here.

The improvement of seed quality by uniformily sizing the seeds within a lot has an important part in this general area of study. A few years ago, Mr. Andrews made a rather significant study in hybrid corn sizing that has proven to be the basis for experimental work of others in other locations, and has pointed toward possibilities in modification of corn planter plates.

Along similar lines are experiments in weed seed separations - one of the most important in the whole seed processing area and one of the most difficult. The greatest effort in this area at the present time is the development of methods to separate cockleburs from cottonseed, a result of mechanical harvesting. This work will be discussed on Thursday afternoon. The final solution may be the development of new methods or the modification of present equipment.

Since uniformity of seed lots are so important in marketing, seed blending and the development of seed blending equipment has been the nature of study under a contract with Agricultural Research Service the past three years. The report has been prepared and as soon as it is cleared by Washington, information will be available. Although the results will not shake up the industry, we believe that several significant points will come from the research.

At this point I would like to say that nearly all of the equipment used in the types of research mentioned here, as well as in certain other experiments, have been supplied by the manufacturers of such equipment on a long-time loan basis. What success we may have attained in the area of research, training in the regular curriculum and in short courses is due largely to the fine cooperation of such firms as A. T. Ferrell, Crippen, Simon-Carter, Oliver, W. A. Rice, Panogen, Gustafson, Hance, Sutton, Steele & Steele, Superior, Burrows, Seedburo, Erickson, John F. Grisez, Carpco, Dings, and Foresberg.

Better and faster methods of testing seed are under investigation. Under the direction of Dr. Delouche we have just concluded an investigation designed to explore a practical method by which seedsmen, farmers, and analysts can ascertain the viability of a seed lot in a matter of a few minutes or hours instead of in terms of days as required in a germination test. This project was supported by a grant from the Southern Seedsmen's Association to which each of the State Seedsmen's Associations in the 13 Southern states contributed. Dr. Delouche will elaborate on this work in just a few minutes. This is one of the best examples of cooperative effort between an industry and a land grant institution to provide the "margin of excellence" described by our president,

Dr. Colvard, as a necessity in land grant universities - when groups team up with a public institution to whip a particular problem.

Other research in the general seed testing and physiology area indicate the search for methods of effectively breaking dormancy in seeds - especially Bahiagrass and Johnsongrass - and to determine the causes if possible. It is hoped that findings could be applied both to testing in the laboratory and to field plantings. Charles Vaughan has made a significant contribution in studies which show the association of physical seed characteristics with their viability and vigor.

Other research is directed toward deterioration of seeds, what are the real processes and mechanisms involved as seed get weak and finally die. Dr. Delouche will discuss this further tomorrow, but this is a real problem. The American Seed Research Foundation is supplying limited funds to match those of the experiment station but an expanded program is needed.

We do not plan to make this a money-raising campaign - at this momemt at least - but we do have one project which we would like to initiate if we had some financial support. Since the problem is so closely to everyone handling seed, one might expect every seedsman and his trade organizations would rush in with open pocketbooks. This is a matter which deals with predicting the keeping quality or storability of individual seed lots. We would like to develop testing methods which would give you a reliable way of predicting how long a particular lot could be expected to remain viable and with high vigor under the conditions which the lot is likely to be subjected. With the troubles seed producers and seedsmen normally have during storage and marketing, no one can seriously doubt that such a test would be desirable. With concentrated effort, which can be supplied with sufficient support, we believe it can be done.

In experiments more closely related to seed production, Dr. Caldwell is project leader in a series of preharvest environmental studies in which the effect of irrigation, spacing, fertilization, and other factors were evaluated in reference to the effect on quality of cottonseed. This subject will be dealt with in some detail on Thursday. Accompanying such tests are maturation studies in cotton and the effect of pathogens on seed deterioration. Similar work with soybeans is planned.

In progress is a detailed study in cottonseed emergence in which the different types of processed seed is measured in terms of emergence. Here ginned, mechanically-delinted or acid-delinted cottonseed are planted in different type soils with varying moisture contents and at differing temperatures and the results noted.

Storage tests are of several types (1) the standard type in which seed are stored under given temperature and humidity conditions to ascertain preferred storage environments, (2) accelerated storage tests as a tool for

measuring effect of given treatments and (3) storage tests to determine hygroscopic equilibrium curves. In addition to laboratory storage experiments, we have cooperative tests in which bag manufacturers and hybrid corn seedsmen store their own corn in their own warehouses at differing moisture levels in different type bags to check the effect of these factors in a commercial operation. Still other tests involve the shipping overseas of different kinds of seed of varying degrees of moisture in a variety of bag types, with the analysis being conducted by cooperating foreign laboratories.

Now this is not all, but it should give you some idea of the nature of and scope of the research underway.

If you are particularly interested in a specific subject, we shall be happy to indicate the person with whom you may wish to talk with sometime during the week.

This then is our version of the Seed Technology Story in Mississippi to date. The program is young, its brief history exciting, its future promising. We are happy you are here to share a part of it.