FALL 1960

Vol. XII No. 3

Progressive

AGRICULTURE IN ARIZONA

In This Issue — Additional Articles About

RESEARCH ACCOMPLISHMENTS

Our Cover Picture

County Agents Take Research to Farmers

As part of the College of Agriculture "team" at the University of Arizona, county agents in each county of the state bring the campus and the laboratory right

to the farm. In the photo above, John Heward (right) and County Agent Amos H. Underwood look over a sign on Heward's farm near Holbrook where a cooperative research and demonstration program is under way.

In this program, alfalfa varieties and fertilizer treatments are being studied. Cooperating in this test in addition to Mr. Heward and the county agent, are the extension and experiment station agronomists and soils scientists as well as the National Plant Food Institute. The program was developed last fall at the request of Navajo county farmers.

Other similar types of "research on the farm" programs are underway throughout the northern part of the state and in other areas as well. In addition to the alfalfa test, a corn test is being conducted in Navajo county; irrigated pastures, corn hybrids, sorghum and corn forage tests in Yavapai county; corn and sorghums in Coconino county; Bermuda grass, barley varieties, sorghum seed production and varieties in Mohave county; and small grains, forage sorghums, and alta fescue in Apache county.

All of these tests, as well as others located on farms and at the University's many experiment stations throughout the state, have as their objective the solution to pressing farm problems — and the demonstration of how such solutions can be put into effect on a practical basis.

Through active cooperation of all interested parties, real progress is being made on a variety of specific and sometimes very complex situations where they exist—right on the farm.

The Outmoded Sign

The sign beside the doorway was old and faded: OLAF OLSEN — BLACKSMITHING & HORSE SHOEING. We saw that sign every day, as we walked past the shop to school, back in our midwest childhood.

Forty years ago there was the sound and smell of horses being shod. There was the activity of shaping and fitting the steel rim to the felly of a wagon wheel, the sharpening of plow points, making of runners for bob sleds. Olaf Olsen, a youngster from Denmark, was a genius and an indispensable man in our community.

Olaf is still there, although the horses, the farm wagons and bob sleds are gone. Olaf has a flair for making intricate parts for the modern farm machinery used today. There is no delay in the harvest to wait for parts because, "Olaf can fix it, do a good job quickly, so we can get back in the field right away."

Olaf, these past few years when a younger man takes much of the load, has also revealed an artistic skill in wrought iron work. Homes on the better streets boast stair rails and decorative porch supports attesting his sense of strength, beauty and utility. Olaf is still indispensable, though the horse-drawn days are gone.

Oddly, the sign remains the same, either through accident or sentiment we do not know. Scarcely readable now, it still attests to the skill of "OLAF OLSEN —BLACKSMITHING & HORSE SHOEING."

Perhaps we, in this business of education and scientific research, are somewhat like Olaf, that skilled craftsman of our home town. We still carry the label of "College of Agriculture," although courses of study, laboratory techniques, modern equipment, new realms of science, preparation for new professional fields of activity, all have been changed vastly in recent years. Like Olaf, we've been just too busy to change the sign by the window.

Actually, this College of Agriculture can prepare a young person for hundreds of important, interesting, highly paid vocations, of which farming and ranching are only a part. Likewise, the soils laboratory, the water research laboratories, the chemistry laboratories, the field trials at branch experiment stations throughout the state, all have been transformed in recent years by the new techniques, new learning and new devices which meet the needs of a new day.

We can train a young man, in this College of Agriculture, to be a valued realty officer in a bank, a foreign service career employee, a fabrics research scientist for the textile industry, a research chemist for the farm chemical industry, or editor of a farm magazine. Name a hundred other interesting, modern, socially useful occupations and we'll tell you how we train for them, too.

The term "College of Agriculture" has historical substance, dating from the time when a new land and growing population required trained men to develop the resources of soil, plants and animals. Nor do we, today, neglect for an instant the importance of these basic needs of any civilization.

But, like Olaf, we have responded to the new needs of a new day, developing new talents so that, like he, we may always be useful to the community we serve.

Harold E. Myers

Dean

College of Agriculture and
School of Home Economics

In This Issue

Measuring the Water Given Off by Plants

David R. Kincaid

If you were asked to name the biggest single problem facing the Southwest today, what would your answer be? Many of you probably would not think of water, because plenty of good water appears when we open the valve, and we have grown to take it for granted. Nonetheless, maintaining an adequate supply of water for crop production, domestic use, manufacturing, etc., is and will be increasingly the biggest problem our rapidly developing Southwest has to solve.

There are several possible sources of water — pumping from the Colorado River, desalting Pacific Ocean water, seeding clouds to produce rain, and increasing water production of our forest and rangeland watersheds. The last possibility is the most promising. It is safe to say that less than ten per cent of the rain that falls ever reaches a reservoir or valley water-table. If we want to increase this percentage a little, we must study our watersheds.

Lost Through the Leaves

It is well known that plants use tremendous amounts of water. Perhaps half of the water lost from a watershed is evaporated from the leaves of plants — a process called transpiration. We know that some types of plants transpire greater quantities of water than others.

The College of Agriculture's Watershed Management department is studying different plants to determine not only which plants transpire the greatest quantities of water, but what environmental influences affect transpiration the most. Is it the intensity of radiant energy from the sun? Is it the amount of water vapor already present in the air? Is the temperature of the air or the leaves important? What effect does the wind have? How much influence is exerted by the soil as it becomes drier because water is being removed? All these factors play a part in transpiration, but their relative importance is not clearly understood.

To help answer some of these questions, an experimental device was built. It consists essentially of a plexiglas chamber equipped with an electric instrument that measures humidity very accurately — a hygrometer. When the chamber is placed over a plant, the hygrometer measures the increase in humidity as the plant throws off water vapor. By measuring an increase of two or three per cent relative humidity, we can get the amount of water given off by the plant without disturbing its environment.

Measuring Is Tricky Business

These measurements cannot be made continuously, because if the plant were left in the chamber, it would go on transpiring until the humidity in the chamber approached 100 per cent. It is obvious that evaporation into a wet atmosphere is less than into a dry one, and our measured transpiration rate would be lower than it is in the field.

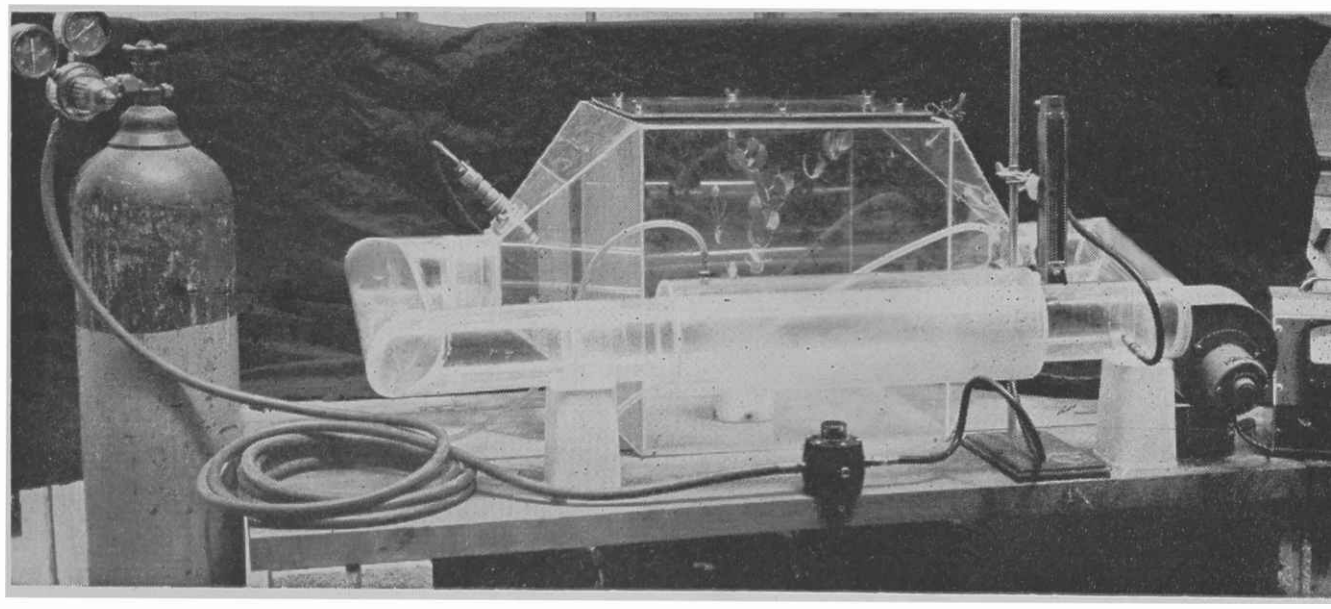
To make continuous measurements of transpiration we circulate the same air around and around through the chamber with the blower shown in the lower right corner of the picture. We measure the humidity with the hygrometer (the instrument in the lower right side of the picture. It is attached by a cable to the sensing element in the left side of the chamber). By adding dry air from the tank to the circulating stream of air, we offset the water given off by the plant and maintain constant humidity. A jacket of cold water around the air-stream keeps the temperature constant as well. With this set-up, transpiration can be measured for long periods of time.

By measuring transpiration rates when all factors are kept constant except one, we can measure the influence of one factor at a time.

Complex — But Important

Unraveling the close inter-related factors that affect transpiration is a complex task, but it is the key to understanding the process as a whole. And understanding transpiration is important, because the more we know about it, the more accurately we can predict where vegetation changes on a watershed can increase the yield of forage and clear water without erosion.

BELOW, a view of the intricately constructed plexiglas chamber in which the transpiration rate of a young jojoba plant is being measured.



Mr. Kincaid is a Research Assistant in the Department of Watershed Management.

AT LEFT, note how drill-strip winter pasture plots were set up to enable harvesting with a regular mowing machine.

Oats For Winter Forage Production

R. K. Thompson and A. D. Day

Arizona livestock farmers are interested in a winter pasture crop that will produce an abundance of vegetative growth over a long grazing period. Livestock farmers also desire a winter forage crop that will produce high yields of green-chopped feed and hay. Mild winters in southern Arizona are conducive to the growth of barley, oats and wheat for winter pasture, green-chopped feed, and hay. This is a report of an evaluation of the forage potential of oats in southern Arizona.

The oats in these forage studies were planted at the Mesa Branch Experiment Station in early December and grown for pasture, green-chopped feed and hay. Experiments were made to study the forage production of oats when grown during the 1955-56 winter months under irrigation. Three tests were involved: simulated pasture, green-chopped feed, and hay. In the 1956-57 season another simulated pasture experiment was conducted.

Study Four Varieties

Four varieties were used — Markton, California Red, Palestine, and Colorado White. Markton is a "yellow oat" that has been popular in Arizona for winter pasture, green-chopped feed and hay.

Farmers commonly express the opinion that oats with a semiprostrate growth habit produce more forage than erect types. Since California Red is semiprostrate in its early stages of growth, it was included in these experiments. Palestine has consistantly produced high yields of grain in Arizona.

There is not definite information as to the origin of Colorado White oats. The use of this variety by Salt River Valley farmers and the probability that this was a northern introduction prompted its inclusion.

Favor Rotational Grazing

The effect of clipping to simulate grazing at different stages of plant growth on the subsequent regrowth was studied in the 1955-56 season. Results indicated that for uniform and sustained vegetative growth, oats should be rotationally grazed at the onset of the jointing stage. All of the pasture experiments received 150 pounds of elemental nitrogen per acre and irrigation water was applied as needed. At harvest, the forage contained from 80 to 85 per cent moisture in all tests.

During the winter of 1955-56 all four oat varieties were grown for pasture, green-chopped feed and hay. In these tests, the clippings were made by hand approximately two and one-half inches above the ground. The green pasture forage harvested at the onset of the jointing stage of plant growth yielded from 15.0 to 18.5 tons per acre. California Red was the highest yielding variety. Although California Red produced a higher yield than Markton, the period of vegetative growth was very short. Markton produced a more uniform growth throughout the pasture season and was considered the most desirable for winter pasture.

Only three varieties — Markton, Palestine, and California Red — were grown for pasture forage during the 1956 and 1957 season. The plots were rotationally clipped at the onset of the jointing stage of growth with a regular mowing machine two and one-half inches above the ground. Average pasture yields ranged from 17.8 to 23.4 tons of green forage per acre. Again Markton produced the most uniform growth and was the most desirable winter pasture oat of the varieties tested.

Green-chopped Feed

When oats were harvested as green-chopped feed, they yielded from 19.5 to 31.5 tons of green forage per acre. Markton produced the most green-chopped feed and Palestine the least. The forage was harvested at the late-heading stage of plant growth and contained from 80 to 85 per cent moisture.

The average yields of oat hay ranged from 7.6 to 8.9 tons of air-dry forage per acre. The air-dry hay contained from 15 to 18 per cent moisture. Harvests were made at the medium-dough stage of plant growth. In the hay test, Markton was the highest yielding variety.

Markton Most Desirable

Of the four oat varieties tested, Markton was the most desirable in all three categories — for winter pasture, green-chopped feed and hay production because it produced the most uniform growth throughout the pasture season and more green-chopped feed and hay than other varieties tested.

R. K. Thompson is a Research Associate in Agronomy at the Mesa Branch Experiment Station, and A. D. Day is an Agronomist in the Department of Agronomy, University of Arizona, Tucson.

Tune In

Cochise County
KAWT, Douglas—Mon. and Wed., 6:55 a.m.
KAPR, Douglas—Sat., 12:15 p.m.

Coconino County
KCLS, Flagstaff—Tues. and Thurs., 8:20 a.m.
KCLS, Flagstaff (Home Agent) — Thurs., 9:45 a.m.
KVNA, Flagstaff—Mon. thru Friday, 12:15 p.m.

Graham County
KGLU, Safford—Sat., 9:00 a.m.

Maricopa County
KRUX, Phoenix — Mon. thru Sat., 5:55 a.m.
KTAR, Phoenix—Thurs., 12:45 p.m.
KOY, Phoenix—Sun., 8:45 a.m.

Pinal County
AGRICULTURAL
KPIN, Casa Grande—Daily except Thurs., 6:40 a.m., Mon. and Fri. 9:35 a.m.
KCKY, Coolidge — Mon. through Fri., 6:35 a.m.
HOME ECONOMICS
KCKY, Coolidge — Mon. through Fri., 7:30 a.m.

Yavapai County
KYCA, Prescott — Mon., Wed., and Fri., 6:10 p.m.
KNOT, Prescott — Mon., Wed., and Fri., 6:45 a.m.

Yuma County
KYUM, Yuma—Mon. thru Fri., 6:35 a.m.
KVOY, Yuma—Mon. thru Fri., 12:35 p.m.

El Programa Mexicana

A weekly farm and home program broadcast in Spanish by Stations KEVT, Tucson; KVOY, Yuma; XEXW, Nogales; and XEFH at Agua Prieta.

Hybrids Trigger Rebirth

Of State Sorghum Industry

"In 1955, a 100 foot row was planted . . .".

That is exactly how hybrid sorghums started in Arizona. All the pioneer work was with grain sorghum until 1959. The renaissance of the sorghum industry in Arizona came with the hybrids. Sorghums were not new but the hybrids were, and this became the epoch milestone in their history in Arizona. Three small plantings, two by the University of Arizona and one by a commercial company, became the embryo of the rapidly growing industry as it is known today.

A few ounces of male sterile seed were furnished to Harold E. Jacka, Secretary, Arizona Crop Improvement Association, by a friend from a neighboring state. Mr. Jacka divided the lot, planting part of it in Maricopa county, and having County Agent Carmy Page plant the rest in Cochise county. The commercial company trial was made near Mesa. Of the three plantings, only the Cochise county planting set seed. Dr. Lee S. Stith, the newly employed sorghum breeder at the University of Arizona, immediately seized on this finding as a possible answer to the question of whether hybrid sorghum seed could be produced in Arizona.

Begin Two Phase Program

In 1956 the University of Arizona and the Crop Improvement Association embarked on a two phase sorghum program; production of hybrid seed and use of hybrids for feed purposes. The commercial company selling hybrids in the state at that time and the university distributed free of charge to farmers most of the hybrid seed grown for feed purposes that year, to encourage their trial in the state.

In fostering the production of hybrid seed as an industry in the state, Dr. Stith planted a three acre production block of what is now RS650 on the John Bretz, Jr. farm in the Kansas Settlement near Willcox. Seed set again was favorable, nearly 100 per cent as in 1955, and this gave promise of an industry.

Commercial organizations were supporting the industry very strongly also, evidenced by Northrup King and Company moving their breeding program to Phoenix, and Advance Seed and Grain Company making a trial planting of some 600 acres near Gila Bend. This first sizable attempt at production failed, due to an unexpected freeze in October of that year.

This article has no single author, but was prepared by the members of the Plant Breeding Department.

In 1957 commercial companies all moved toward the Willcox area. Advance Seed and Grain Company planted some 550 acres of seed increase fields and Mr. Bretz increased his planting to 120 acres. The Arizona Crop Improvement Association also took an unprecedented step in that certification was granted to closed pedigree hybrids (commercial) for the first time in the history of crop improvement associations.

Industry Aided Distribution

In the development of the use of hybrids for feed purposes, industry again distributed a large number of samples over the state. The university research program was expanded to test hybrids in the six southern counties of the state. The change was well under way, with hybrids having replaced nearly 10 per cent of the acreage formerly using standard varieties.

Things looked better in 1958. The University of Arizona program expanded to most of the northern counties with test plots. The Arizona Crop Improvement Association certified some 1400 acres of hybrid seed in the state. Commercial seed companies increased their seed production acreage considerably. Three commercial companies began pushing the sale of hybrid seed and some 50 per cent of the sorghum acreage in Arizona was planted to hybrids.

A winter growout of hybrid seed, to test purity and germination, was made in 1957 at Culiacan, Sinaloa, Mexico. This first growout was a cooperative try between the University of Arizona, the Arizona Crop Improvement Association and a commercial company. This was a success. In December of that year another winter growout at Culiacan included some 12 acres.

Acreage Increased in 1959

Commercial sorghum acreage increased in 1959 in the state, 80 per cent of that acreage planted to hybrid seed. Hybrid seed production was again expanded and some 6,000 acres were grown with 2,800 being certified. The winter growout in Mexico was increased to 38 acres.

Dr. Robert L. Voigt, newly employed sorghum breeder, took over the hybrid forage sorghum phase of the sorghum program being carried on by the university. In 1960 the sorghum industry is still growing. The industry began in 1920 with hegari as the principal variety. Arizona assumed the position of a ranking seed export state, then lapsed, and now once again has emerged as a hybrid seed producing state.

Landscape Horticulture Makes Arizona Beautiful

Leland Burkhart

Landscape horticulture includes the appropriate use of trees, shrubs, flowers, and turfs. Lawns are basic for home landscaping; palms for bold tropical effects; citrus trees as evergreens with fruit for the patio; shade trees, both evergreen and deciduous, for fruit and shade; shrubs for flowering, fruit, color, and tropical effects; roses for all home gardens; vines and ground covers for texture and color; flowering bedding plants, bulbs and herbaceous perennials for all seasons; and cacti and succulents for desert effects.

One of the earliest projects in landscape materials developed by University of Arizona horticulturists concerned eucalyptus introductions from Australia. This stimulated much interest in the southwestern states, resulting in many eucalyptus plantings in parks, private grounds and rural areas. Eucalyptus species were the dominating trees at the Boyce Thompson Southwestern Arboretum near Superior. Recently, there has been developed a mist system for propagating of eucalyptus cuttings at the University of Arizona. This method of vegetative propagation offers much promise in the development of clonal lines of superior strains of eucalyptus.

Pioneered With Many Species

In Arizona, additional pioneer work was conducted in connection with other introduced shade trees including mulberry, Rhus lancea, carob, loquat, Aleppo pine; and dual purpose trees including palm, pecan, olive, citrus, apricot and flowering peaches and plums. The Rhus lancea was introduced from South Africa and has proven well adapted as an evergreen shade tree for southern Arizona. Seed of this species was made available to nurseries by the University of Arizona.

Pecans have proven very popular for shade and nuts in urban and rural areas. Research horticulturists have developed methods of correcting zinc deficiency and have provided information on superior varieties for the appropriate irrigated areas of the state.

The search for native shade tree plant materials during the early pioneering period of the Arizona territory was important for cooling homesteads and making homes more livable before the advent of coolers. Many of the introduced trees were subject to alkali injury and other limiting factors for growth.

Outstanding native trees found suitable for shade purposes in landscaping Arizona homes and parks include the Arizona ash, male cottonwood, blue Palo Verde, Arizona sycamore, ponderosa pine and the native black walnut. A recent plant introduction for landscape purposes is prostrate white lantana from Mexico.

Making Bermuda Thrive

In the development of Arizona landscaping, Bermuda grass proved well adapted for lawns and other turf uses in southern Arizona. Horticulturists have shown the importance of appropriate nitrogen fertilization, watering, and mowing. The experimental use of maleic hydrazide on Bermuda grass has proven effective in management applications in golf courses of Arizona and other southern states. In co-operation with the Tucson City Parks Department, university horticulturists have found that Tifgreen Bermuda is the best adapted of the fine hybrid strains for southern Arizona. This new strain is being used extensively for golf course turf in the state.

Activities of the University of Arizona horticulturists include origin and programming of the annual Arizona Turf Conferences. The annual Arizona Nurserymen's Short Courses were also originated by university horticulturists. Successful development of mist propagation at the University of Arizona has attracted many nurserymen sufficiently to make their own installations.

The variety testing program of various trees and shrubs at the branch experiment stations has aided nurserymen in making available to the public appropriate landscape plant materials. In co-operation with the Tucson City Parks Department, the university has recently developed an extensive rose testing garden.

It's Big Business

We have an annual $100 million urban horticultural industry in Arizona, and this is rapidly expanding due to increased urbanization. The landscape attractiveness of the state is recognized as an important feature in connection with the tourist industry. Increased action is being taken to improve the landscaping of homes, parks and parkways, school grounds, college and university campuses, athletic fields, golf courses, business and industrial sites, highway landscaping, and government grounds.

More than 300 persons from all parts of the state participated in the recent Landscape Design Conference requested by the Arizona Federation of Garden Clubs and presented by the University of Arizona, in co-operation with the Arizona Association of Nurserymen and the landscape architects, parks executives and suppliers. UA horticulturists have also provided leadership in the annual Southwest Shade Tree Conferences. The 1960 meeting was held on the university campus.

Dr. Burkhart is head of the Department of Horticulture.

Progressive Agriculture IN ARIZONA

Vol. XII No. 3

Oct., Nov., Dec., 1960

Published quarterly by the College of Agriculture, University of Arizona, Tucson, Arizona, Harold E. Myers, dean.

Entered as second-class matter March 1, 1949, at the post office at Tucson, Arizona, under the act of August 24, 1912.

Editor: John Burnham

Editorial Board Members: Howard R. Baker, Extension Service; Mitchell G. Vavich, Experiment Station; Russell W. Cline, Resident Instruction; Mildred R. Jensen, School of Home Economics; Richard K. Frevert, chairman; Joe McClelland, ex-officio.

Arizona farmers, ranchmen and homemakers may have their names placed on the mailing list to receive **Progressive Agriculture** at no cost by sending a request to the College of Agriculture, University of Arizona, Tucson, Arizona.

Cotton Growers Aid Research Cost

E. H. Pressley

In 1948 the first commercial increase field of a new variety of upland cotton, A-44, which had been developed by the Plant Breeding Department was grown. All of the seed from this field was planted in 1949. At the same time, 1948, small increase fields of two other newly developel varieties, A-28 and A-33, were grown. A new variety of American Egyptian, Pima-32 developed by the USDA at Sacaton, was also ready for increase.

At this time Arizona had no organization which could increase this seed for general use throughout the state. It could not be done by the experiment station or the U. S. Department of Agriculture. It became evident that the cotton industry needed an organization which could take seed from the breeders, maintain its purity, and increase it in quantity for commercial distribution.

The following paragraph is quoted from the "Story of Arizona Seed Development" published in 1960 by the Arizona Cotton Planting Seed Distributors, Inc.:

"In February of 1949, representatives from the cotton growing industry, the Agricultural Experiment Station, U. of A., and the U. S. Field Station at Sacaton met, and, after studying both California and New Mexico pure seed organizations, worked out a plan for an Arizona Association. With the help of the Arizona Cooperative Cotton Growers Association, articles of incorporation and by-laws were written, and the financing for the new organization was arranged. The ginning industry supplied legal assistance and agreed to finance the new seed organization until it could stand on its own feet. The new organization was then incorporated as "Arizona Cotton Planting Seed Distributors."

Get Good Seed to Growers

The function of this non-profit organization has always been to make available to the cotton growers planting seed of the highest quality of recommended varieties at the lowest possible cost. In the 11 years of its existence, the following upland varieties have been handled: Acala 44, Acala 28, Acala 33, Acala 124 and Acala 44 WR, all of which were developed by the Plant Breeding Department of the University of Arizona Agricultural Experiment Station. For various reasons, several of these varieties have passed out of the picture. American Egyptian varieties handled during the same period are Pima 32 developed by the USDA at Sacaton and Pima S-1 developed by the Plant Breeding Department of the Arizona Agricultural Experiment Station.

In the early 1950's it became apparent that the U. S. Cotton Field Station at Sacaton would be closed to further breeding and research on cotton. Leaders of the state's cotton industry were very much disturbed over the probability that the services of the personnel located at Sacaton would be lost to the state. The manager and board of directors of the Seed Distributors conceived the idea of purchasing and deeding to the University of Arizona a farm for the establishment of a Cotton Research Center where both U. S. Department of Agriculture and state personnel working with cotton could be located.

Checkoff for Research Fund

By adding a comparatively small amount to the price of each ton of planting seed sold through the organization, a research fund was established. With this research fund the board of directors of the Cotton Seed Distributors purchased a 265 acre farm on East Broadway between 40th and 48th Streets near Phoenix and deeded it to the University of Arizona. With appropriations received from the Legislature and further financial assistance from the Seed Distributors, an office and laboratory building was constructed as well as an Agricultural Engineering shop, a gin room and a storage building. The U. S. Department of Agriculture provided greenhouses and furnished laboratories with the necessary equipment.

Through their contributions to the research fund, Arizona cotton growers who have purchased their planting seed, both long and short staple, through the Cotton Seed Distributors have made possible this research facility second to none in the entire cotton belt.

Wide Field of Research

Laboratories and greenhouses are available for basic studies in genetics, plant physiology, plant pathology, nematology and fiber technology. Land is available for a wide variety of field investigations including variety and strain testing, breeding of new varieties, production methods, irrigation, fertilization, weed control and disease and insect control for both upland and American Egyptian cottons.

BELOW, The Arizona Maid of Cotton, Miss Janet Cooper, cuts the ribbon at dedication of the new Research Center. She is flanked by UA President Harvill, ARS Administrator Byron Shaw, University regents and leading cotton growers.

Dr. Pressley, head of the Plant Breeding Department, has been a member of the University of Arizona staff for more than 40 years. He enjoys a world reputation as a breeder of short staple cotton.

The Story of

Soils Research

T. F. Buehrer

Scientific soil management in Arizona had its beginning with establishment of the Agricultural Experiment Station in 1891. Up to that time information on the nature, behavior and management of arid soils of Arizona was very limited. Hence it was necessary to accumulate a body of reliable information through research on both the irrigated and non-irrigated soils of Arizona before intelligent recommendations concerning their management could be made.

Much of the research necessarily was of a "basic" nature, aiming to establish the principles or laws underlying soil behavior, and to learn the reasons for crop responses to soil treatment in the field. Many field studies were made, and are still being made, to demonstrate the practical application of these principles.

Impressive Publication Record

Between 1891 and 1960 the Department of Agricultural Chemistry and Soils published 71 technical bulletins, mostly on soils, 28 "general" bulletins, 10 mimeographed reports, a number of extension circulars, and about 160 articles in scientific journals, most of which dealt with problems peculiar to soil management in Arizona.

The first work in agricultural chemistry and soils was started in 1895 by R. H. Forbes, the first chemist in the Agricultural Experiment Station. It was a soil survey of the Salt River Valley area, published in 1898, in response to numerous requests from farmers and immigrants in the State.

Research was next conducted on the damaging effects of copper mine flotation tailings, being discharged into the upper Gila River, upon crops in the Duncan, Solomonville, Safford and other areas in the valley. Forbes showed that these sediments caused the otherwise productive soils to become impervious to water. This condition, together with the presence of soluble copper and alkali salts in the water, seriously reduced the yield of alfalfa and other crops. The results obtained in these studies provided evidence for court settlement of a controversy of long standing between the farmers and mining companies. It resulted in settling basins being installed to remove the sediments prior to discharge of the water into the river.

OPENING the first container of radioactive elements shipped into Arizona for research purposes is Dr. W. H. Fuller, head of the Department of Agricultural Chemistry and Soils. This event, in 1949, marked the first use of atomic energy as a research tool in Arizona.

Reclaiming Alkaline and Saline Soil

Reclamation of highly alkaline and saline sodium soils received early attention by Vinson and Catlin who found that adding sulfuric acid to irrigation water, as well as the ancient practice of applying gypsum directly to the land followed by heavy leaching, was effective. It is now standard practice to apply gypsum to the land if the exchangeable sodium percentage is high.

Previous studies on the use of gypsum in soil reclamation had shown the necessity of understanding the cation exchange relationships of desert soils. Research in this field demonstrated that sodium-clay,

(Continued on Next Page)

Dr. Buehrer will soon complete 40 years of teaching and research in the university's Department of Agricultural Chemistry and Soils. Known as an outstanding classroom teacher in soils, Dr. Buehrer has also directed cooperative activities with agricultural students in other lands.

(Continued from Previous Page)

rather than sodium carbonate, was the primary cause of high alkalinity and breakdown of the aggregated condition through dispersion. Conversion of sodium-clay to calcium clay reduces alkalinity and dispersion and favors aggregation. McGeorge developed a procedure for determining the "gypsum requirement" of a soil similar to the "line requirement" of acid soils.

McGeorge also studied the cation exchange properties of soil organic matter, showing that the addition of organic matter, especially to sandy soils, increased the cation exchange capacity, thus holding plant nutrients against leaching during irrigation.

Soil Fertility Studies

Extensive studies have been made on the levels of nitrogen, available phosphorus and potassium in Arizona soils, and the factors that affect their availability. Nitrogen was found to be the most deficient element.

Phosphorus is usually present in fairly large amounts, even in virgin soils. Because of the fact that most cultivated soils under irrigation are calcareous, the phosphate may be of a low degree of availability. The conditions affecting soil phosphate availability have been studied in great detail by chemical, greenhouse, and controlled pot methods and radiotracer techniques. Considerable amounts of organic phosphate were found in desert soils by Fuller.

Since high alkalinity and soil calcium are the primary factors causing reversion to less available forms, McGeorge recommended the use of acidulated fertilizers to keep the phosphate available. As a result, some mixed fertilizers are formulated to contain both sulfur and organic wastes such as animal manures, sawdust or sewage sludge, which decompose under microbial action to form acidic substances.

McGeorge in extensive studies on soil potassium, found that the majority of Arizona soils cultivated under irrigation contain unusually high amounts of available (exchangeable) potassium, in most cases sufficient for many years of cropping. As a result, potassium fertilizer is not ordinarily necessary except on soils of long cropping history or for crops of high potassium requirement where exceptionally high yields or quality are desired. Most mixed fertilizers sold in Arizona are not formulated to contain potash.

Numerous field investigations have been made on the fertilization of lettuce, alfalfa, cotton, grain crops and citrus to determine the effects of kind of fertilizer, rate of application, placement and time of application upon yield and composition of the crop. The results have been published as station bulletins.

Designed Standard Lettuce Bed

One investigation of far-reaching interest related to the design of the most favorable bed for lettuce production to reduce damage resulting from high concentrations of soluble salts rising to the top of the bed by capillarity, as well as to increase the efficiency of irrigation and the fertilizer applied. The result was a flat bed with two rows of lettuce planted along the side, about 22 inches apart. This type of bed is standard practice in lettuce production in Arizona today.

In a study of chlorosis in citrus and deciduous fruit trees, McGeorge found that it was lime-induced, as in calcareous soils both iron and manganese are of low availability. Factors contributing to it were found to be poor drainage and soil aeration, calcium carbonate alkalinity, and high pH value of the soils.

McGeorge recommended (a) the use of acid soil correctives, (b) injecting ferric citrate into the trunks of the trees, or (c) spraying the leaves with iron or manganese solutions. For the soil, use of cover crops and mulching was recommended to improve drainage. The technique of using iron citrate solutions as a spray was also successfully used on sorghums and other field crops where iron, due to high calcium carbonate content in the soil, becomes insoluble.

Radioactive Tracer Research

The first use of atomic energy in Arizona as a research tool was begun in 1949 by W. H. Fuller. Grants from the agricultural chemicals industry and contracts from the U. S. Atomic Energy Commission made possible, in our Department of Agricultural Chemistry and Soils, of one of the finest atomic energy laboratories in the west. Here were tools for evaluating the utilization of nutrients in crop residues by succeeding crops, when the residues are incorporated in field soils. Now research has developed basic principles regarding the competitive uptake of calcium from its various forms in the soil.

Problems involved in the evaluation of phosphate fertilizers, such as kind of phosphate applied, particle size, placement, time of application and dosage, have been studied with radiophosphorus as a tracer. Other basic studies on radioactive iron, calcium and iodine have been initiated.

Soil Structure and Aggregation

The micro-aggregated condition of arid soils, dispersion of colloidal clay, compaction, existence of hardpans, and low organic matter content, are responsible for poor aeration and water movement in many of our cultivated soils. McGeorge studied this problem from the standpoint of what happens to the aggregates when the soil is mechanically worked at different moisture contents.

He recommended that in field practice the land should not be cultivated nor mechanically worked, nor should cattle be allowed to graze while the soil is at or near its "sticky" point. That is, while it is most plastic. When this precaution is observed, and the soil treated with gypsum and/or organic matter, the aggregated condition of the soil can be maintained. Studies by Buehrer indicated that puddling reduces the amount of available moisture in such soils.

Soil Surveys Made

The department has for many years cooperated in carrying out soil surveys in the cultivated areas of the state. The first such survey in 1895-98 by Forbes has been followed by others, so that to date 18 areas in different parts of the state have been mapped and reports describing the soil types, crop adaptations, chemical and mechanical composition, and other factors affecting the productivity of the land have been published. In all, 186 soil series have been identified and correlated, and 3,046,000 acres of land have been mapped.

Evaluating Water Quality

This department has made thousands of analyses of water from numerous wells and surface water supplies throughout the state. The first bulletin on the "Ground Water Resources of Arizona" appeared in 1926 and a later one in 1949 by Smith, et al. These bulletins have been in great demand.

The department has also cooperated in research on a problem of health, the cause of "mottled enamel", a defect of human teeth. The cause of the defect was discovered in 1934 by Dr. M. C. Smith, and found to be due to fluorides in drinking water. A concentration as low as 1.0 ppm will cause this defect if drinking water or milk containing it is given to children during early childhood while their teeth are erupting. Areas of occurrence of this defect were found chiefly in the valleys of the Gila, Salt, and Little Colorado Rivers.

Trade names used in this magazine do not endorse products named nor imply criticism of similar ones not mentioned.

Citrus Important Arizona Product

R. H. Hilgeman

According to early reports, the Arizona citrus industry started in the mid 1890's with the planting of about 500 acres by development companies north and northeast of Phoenix. During these early years horticultural personnel at the University of Arizona changed frequently and usually only one man was available for teaching and research. A systematic citrus research program on university farms was not started until June 1920, when five acres of grapefruit were planted at the newly acquired Yuma Mesa farm.

Research in the Salt River Valley, which began with bud certification in 1919, was expanded in 1930 by stationing staff members permanently in the valley to conduct fertilizer, irrigation and frost protection work co-operatively with growers. In 1943 the citrus growers gave the university the 40 acre Citrus Branch Station in Tempe to provide facilities for protracted experiments.

Learning Need for Nitrogen

The first experiment started in 1923 on the Yuma Mesa Citrus Station studied fertilization of young grapefruit trees. It soon became evident that nitrogen was required and that commercial nitrogen was a better source than manure.

This test and subsequent experiments demonstrated that phosphorus and potassium fertilization was not needed when muddy Colorado river water was used. Recently, it has been shown, with Eureka lemon growing on Rough lemon root, that phosphorus increased production on trees growing on newly reclaimed desert land irrigated with desilted water.

Excessive nitrogen fertilization of young trees caused the development of large, coarse fruit. Experiments between 1938 to 1942 demonstrated that fruit quality could be improved by applying nitrogen in the winter and spring and growing nitrogen-consuming cover crops in the summer. In old trees these effects were less marked.

Dr. Hilgeman is horticulturist and superintendent of the Experiment Station's Citrus Research Station in the Salt River Valley.

Tests In Salt River Valley

Co-operative fertilizer tests in the Salt River Valley started in 1930. Subsequent tests have revealed that manure was a good source of nitrogen and that phosphorous and potassium were not required. In loam soils in that area nitrogen fertilization has not spectacularly improved growth, as occurred at Yuma.

Analyses of citrus leaves show that at Yuma, where nitrogen leaches quickly from the sandy soil, the nitrogen content of the citrus leaves is reduced rapidly after nitrogen is withheld. On the other hand, in the heavy, fertile Salt River Valley soils, high nitrogen in leaves is maintained for several years after nitrogen fertilization is stopped.

Early Irrigation Trials

Experiments to determine water requirements, which began in 1929, showed that when all the soil occupied by the root system is kept moist, maximum tree and fruit growth occur. However, in many soils this procedure interferes with the iron uptake so the leaves become yellow and twig dieback occurs. To correct such conditions the soil must be allowed to dry between irrigations part of each year. Highest yields with healthy trees have resulted from high soil moisture in the spring and low in the fall.

Introductions of the major varieties of citrus were started in 1920 and stopped in 1930. Since 1955, through cooperation of the personnel at the U.S. Department of Agriculture Subtropical Field Station at Indio, Calif., who have certified trees free of Tristeza virus, budwood from 28 varieties or nucellar strains of citrus have been introduced. Over 1600 trees have been planted at the University of Arizona stations and with growers who also have received over 60,000 buds.

Rootstock investigations, which began in 1939 with a comparison of sour orange and Rough lemon at Yuma, demonstrated the superior growth and productivity of the Rough lemon in the sandy Yuma soils. Almost all trees planted near Yuma since 1948 have been on this root. In the Salt River Valley, tests started in 1952 with 22 different rootstocks have failed to show any new rootstock superior to the sour orange, the common rootstock in use for the past 65 years.

Climate Studies Made

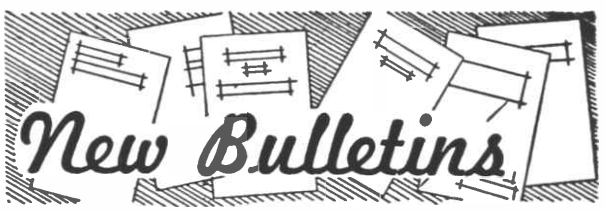
Observations after the 1913 freeze, when temperatures dropped to 11° F., indicated that citrus trees in Arizona were capable of withstanding extremely low temperatures.

Following the 1937 freeze continuous data on temperature inversion between 5 and 50 foot elevations have revealed average inversion to be 7° F. on nights below 26° F. This information stimulated the installation of wind machines during the past six years. Large machines have increased temperatures about 60 percent of the inversion near the machine and about 20 to 30 percent 350 feet downdrift. Heaters or irrigation water each have raised temperatures 2-3° F., so that during severe freezes several heat sources can all be utilized.

Trimming the Oldsters

As trees grow older production problems change. Tall trees crowded together are difficult to pick and production may be declining. Experiments recently started to test pruning tops and sides of trees indicate tree size can be moderately reduced without seriously reducing yields.

BELOW, wind machine in orchard at the University of Arizona's Citrus Research Station in the Salt River Valley.



These new U of A publications are available at your county agent's office. Phone or write your agent for a copy.

CIRCULARS

280—Freezing Fruits and Vegetables for Better Meals

259 (Revised)—Beef in the Family Menu

180 (Revised)—Staystitching Makes Sewing Easier

FOLDERS

68 (Revised)—List of Available Farm and Home Publications

86—Clothes for the Places You Go

Teaching Men To Teach Boys

R. W. Cline

PRACTICE TEACHING, in the field as well as in the classroom, prepares future vocational agriculture teachers for all phases of their varied work.

Although farming and ranching have always been major enterprises in the economy of Arizona, organized programs of education in these areas are largely a product of the past forty years. Agricultural instruction in the secondary schools began in 1917 when the legislature accepted the provisions of the Smith-Hughes Act, which provided federal funds for instruction in agriculture of less than college grade.

Since the beginning of vocational agriculture, the College of Agriculture at the University of Arizona has given an educational service in addition to the regular activities in research, extension and college teaching of subject matter in agriculture. This work includes the preservice preparation of teachers for employment in secondary schools or related educational service and follow-up, or in-service education through on-the-job programs and graduate study on the campus.

College Trains Personnel

Since the College of Agriculture, like land grant colleges in other states, supplies the teachers and state administrative personnel for vocational agriculture in Arizona (including the Future Farmers of America) the educational outcomes of this program are an indirect product of the college.

Prior to the school year 1927-28 most of the teacher education was conducted as itinerant service. In 1940 graduate study programs were developed for the master's degree with a major in the Department of Agricultural Education. The main responsibility of this department is to provide a supply of qualified teachers for Arizona high schools. Most of the graduates enter this field.

Due, however, to their broad basic preparation in agriculture and education, many eventually enter various related occupations. At present 85 per cent of the agriculture teachers in Arizona high schools have completed college courses at the University of Arizona, and 60 per cent have obtained degrees from this institution.

Most Go Into Teaching

Present vocations of recent graduates in Agricultural Education find 27 teaching vocational agriculture, all but one in Arizona; 12 teaching non-agricultural subjects in high school; 12 in agriculture-related business; 6 farming and ranching; 4 in professional agriculture, such as a veterinarian, U. S. Department of Agriculture and similar professional jobs; 3 in educational administration; 3 doing graduate study; 2 each teaching vocational agriculture in college, in foreign agricultural service, in county extension work, in military service and in non-agricultural professions.

In 1917-18, five of the 30 high schools in the state at that time offered instruction in agriculture with a total enrollment of 112 students. In 1959-60 some 36 of the 92 public high schools in Arizona have departments of vocational agriculture with a total of 47 teachers and enrollment of approximately 1,800 students. The following summary of accomplishments is justified on the basis of observations and evaluation studies in communities served by this instruction during the past 40 years.

Has Many Values

1. Students obtain insights concerning vocational opportunities and educational requirements in agriculture and related fields.

2. Through instruction involving farming programs, students develop initiative and effective managerial abilities in the use of time, money, and other resources.

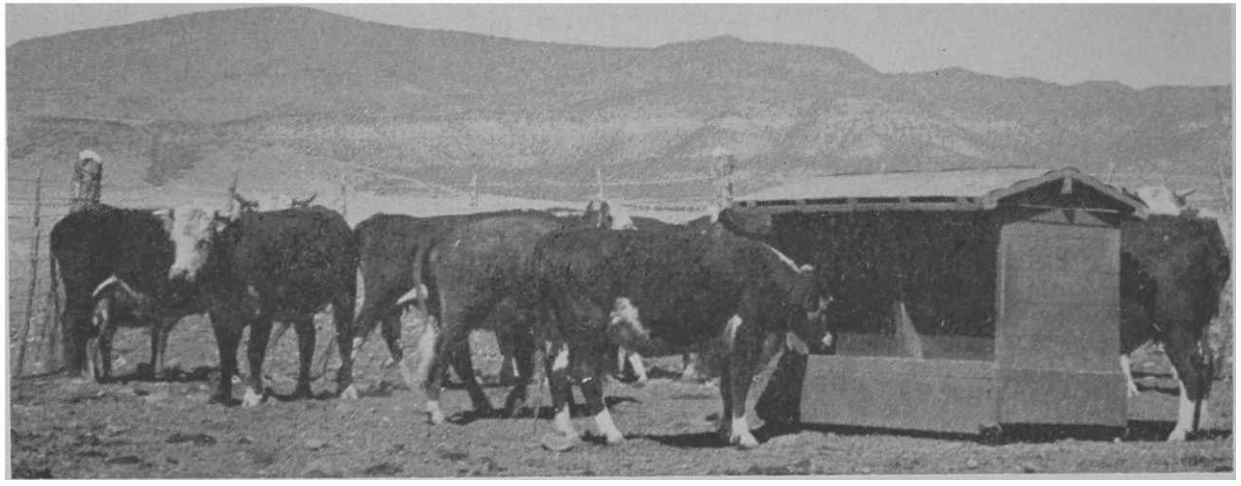
3. Financial returns from farming operations conducted as a part of the instruction help the students become established in farming and to finance a college education. Arizona students last year earned from their farming programs a total of $365,976 and had a total of $841,514 invested in farming.

Keeps Them In School

4. The practical and interesting instruction, including Future Farmer activities, serves to keep students in high school and to stimulate and prepare them for college.

5. A broad range of educational experience, in addition to agriculture, prepares students for effective roles of leadership and participation in public affairs.

Dr. Cline is head of the Department of Agricultural Education.



BOTH the closed self feeder, top, and the open trough, below, are used in Arizona for feeding the salt-feed supplement on the range.

Salt-Feed Mix Regulates Intake Of Supplements

E. B. Stanley and W. J. Pistor

Salt is being mixed with cottonseed meal and other feed concentrates by Arizona ranchers and self-fed to range cattle. It is used in this ingenious manner to restrict to a desired level, consumption of the feed with which it is mixed. In much of the range area it is impractical to provide feed regularly each day to needy stock. This self-regulating salt-feed mixture can be made readily and continuously available to stock when the range forage declines below adequate levels.

Outright misgivings greeted the first reports of this unorthodox practice. Considerable speculation among stockmen and scientific personnel alike concerning the subsequent effect on animal health of continued excess salt ingestion led to a study of this problem by the University of Arizona.

Water Must Be Available

Tests gave reliable evidence that a high salt diet during pregnancy and subsequent lactation has no harmful effect upon the cows or their calves. It was found that high salt intake must be accompanied with a corresponding increase in water consumption.

Death losses due to "salt poisoning" have been reported. Most of these cases occur on ranges with little water or where the ranchers utilize native forage at some distance from available water by feeding the supplement. If, at the time the salt is given, the water is also restricted, a relatively small amount of salt will be fatal. The kidneys cannot eliminate salt at a rate higher than 2.4 per cent NaCl. This means that water must be consumed so that the salt absorbed can be eliminated.

The advent of self-feeding salt-feed concentrate mixtures to grazing cattle marks an eventful development in livestock production, particularly in the western range country. Grass and other native vegetation in this area are the sole feed resources of a very material segment of our beef cattle and sheep population. Despite its invaluable use for this purpose, reliance upon herbage vegetation constitutes a major problem of the cattle ranching industry. The greatest difficulty to cope with in this regard is the unpredictable nature and irregularity of the feed supply. A constantly changing nutrient content adds to the complexity of this prevailing condition.

Supplemental Safeguard

Adoption of the self-feeding method to range and pasture practices has served to provide a supplemental feed in the necessary amount and quality to adequately satisfy the normal animal requirements. Most salt-feed mixtures used on southwestern ranges contain approximately 30 per cent or less salt. By reducing or elevating the salt content, the daily consumption of the mixture can be varied.

Cottonseed meal or cake has served an important role as a range supplement feed. It was the logical choice to use with salt. In addition to needed protein, it provides both phosphorus and readily available energy-producing nutrients.

Factors other than protein and phosphorus may be lacking under poor range conditions. Some of these may be vitamin A, trace minerals and the necessary nutrients for proper rumen fermentation. These deficiencies can be supplied by incorporating alfalfa meal, trace minerals and grain or molasses in the salt-cottonseed meal mixture.

Use Portable Self-Feeders

Covered self-feeder containers with trough attachments, portable, and of 1000 to 1500-pound capacity are in rather common use. Open troughs are less expensive, though feed is subjected to spoilage and loss from blowing.

Arizona cattlemen, by demonstrating the effective use of salt for making nutritionally balanced feeds readily available to range stock, have made it possible to promote the continuous growth of young stock and achieve a more efficient use of range feed.

Veteran members of the College of Agriculture staff, Dr. Pistor and Prof. Stanley together represent 66 years of service to the livestock industry of Arizona. Dr. Pistor is head of the Department of Animal Pathology, Prof. Stanley a member of the Department of Animal Science.

OCTOBER

1- 2—Cochise County Fair. Douglas
1- 2—Greenlee County Fair. Duncan
5—Annual Cotton Field Day Cotton Research Center.
6—Mohave County Fair. Kingman
12—Dairy Field Day. Tucson
14—Cotton Field Day. Yuma Branch Station
19-20—Annual Meeting of Western Veg. Growers Assoc., Las Vegas
21—Annual Fall Field Day. Mesa Branch Station
31—Arizona State Fair. Phoenix

NOVEMBER

1-12—Arizona State Fair. Phoenix
2—Citrus Field Day. U of A Citrus Station, Phoenix
17-18—Arizona Turf Conference. Students Union Bldg., U of A Campus, Tucson
18—Citrus Field Day. Yuma
18-24—Farm-City Week
26-30—National 4-H Club Congress. Chicago

DECEMBER

10—Junior 4-H & FFA Judging Field Day. Sponsored by the Arizona Angus Assn., UA Campbell Ave. Farm, Tucson

Extension Takes Research to the Farmers

J. W. Pou

Back in 1895, green fields surrounded the newly established capital of the young Territory of Arizona. Nearly 100,000 acres of the vast Salt River Valley were then watered by irrigation. The more enterprising people in both agriculture and business perceived the need for information that would guide farmers in improving their methods of production.

Agricultural Talkfest in 1895

This idea culminated in an agricultural convention in Phoenix October 18-19, 1895, sponsored by the Phoenix Board of Trade. Here members of the staff of the Agricultural Experiment Station of the University of Arizona exchanged ideas and experiences with farmers.

This meeting of scientists and producers of agricultural commodities might be considered the beginning of a formative program in Agricultural extension work by the College of Agriculture of the University of Arizona.

Farmer's institutes were started by the College of Agriculture in 1896. These were in the forms of schools varying in length from one to several days in a community. Institute meetings were held in the more important agricultural areas of the state. So popular were farmer's institutes that this type of extension work continued for 18 years, until the Agricultural Extension Service was established in 1914.

Extension On Wheels

In 1912, and for the two years following, Farmer's Institutes were supplemented by demonstration trains. These consisted of a train of several railroad baggage cars in which were exhibits of various types and breeds of live farm animals, farm and horticultural crops, and exhibits pertaining to the farm home. The demonstration train has been identified as the placing of the College of Agriculture on wheels and taking it to the people of the state.

IN THE EARLY DAYS new ideas in agriculture and homemaking went to Arizona farmers via the demonstration train, shown here at a siding stop in 1913.

Under the provisions of the federal Smith-Lever Act, the Agricultural Extension Service became one of the three divisions of the College of Agriculture July 1, 1914. In its first year the extension staff consisted of a superintendent (later changed to director), a leader of boys and girls club work, a livestock specialist and two agricultural agents, one in Cochise and the other in Maricopa county.

Today the staff includes an administrative staff of six, a specialist staff of 23, 35 agricultural agents and 17 home agents. All 14 counties of the state are now served by county extension offices.

Teaching On a Wide Scale

Although operating largely off the campus, extension is teaching in the broadest sense of the word. It involves work with people who differ in age, educational status, interest, levels of living and culture. It converts research results into farming and homemaking practices.

Its principal objective is extending the welfare and happiness of rural people through local leadership by means of doing, showing and demonstrating. The philosophy of extension is based on helping people to help themselves.

In 1914-15 there were only 450,000 acres of cultivated land in Arizona. In 1960 there are 1,259,000 acres cultivated, an increase of over 180 per cent since the Cooperative Extension Service was established. As a result of the combination of agricultural science and the art of farming, the annual increase per acre from Arizona farms has been considerably greater relatively than the increase in the area of cultivated land.

Dr. Pou is Director of the Agricultural Extension Service in the College of Agriculture.

The Story of

PIMA S-1

To achieve his goal of combining quality and high yields into a single long staple cotton variety, Dr. W. E. Bryan made a series of complex crosses using four different varieties of cotton, three long staple varieties *(G. barbadense)* and one short staple or upland variety *(G. hirsutum)*. In other words, interspecific hybridization. The diagram shows the multiple crosses involved in the development of Pima S-1.

Best In Long Staple

Pima S-1, which evolved through this cycle of multiple hybridization, back crosses and selections, is considered the finest spinning cotton in the world. Obviously, it has inherited its high "spinnability" from the long staple parents. Pima S-1 is also the best yielding long staple cotton in the world. The high yielding genes, no doubt, came from the upland parent.

This significant break-through, combining quality of *G. barbadense* and high yields of *G. hirsutum,* is a milestone in cotton breeding. Many breeders have postulated this combination on paper before, but no one has been able to put it into application. Dr. Bryan's methodology proved the feasibility of interspecific hybridization in cotton.

Dr. Bryan's methodology was based on the hypothesis that favorable chromosomal translocation can be more readily achieved by "constant crossing with selection" to keep the material in a continuing turmoil of heterozygosity, thereby increasing the probability of chromosome breakage and translocation. Pima S-1, the end product and result of this breeding method, has proved the point.

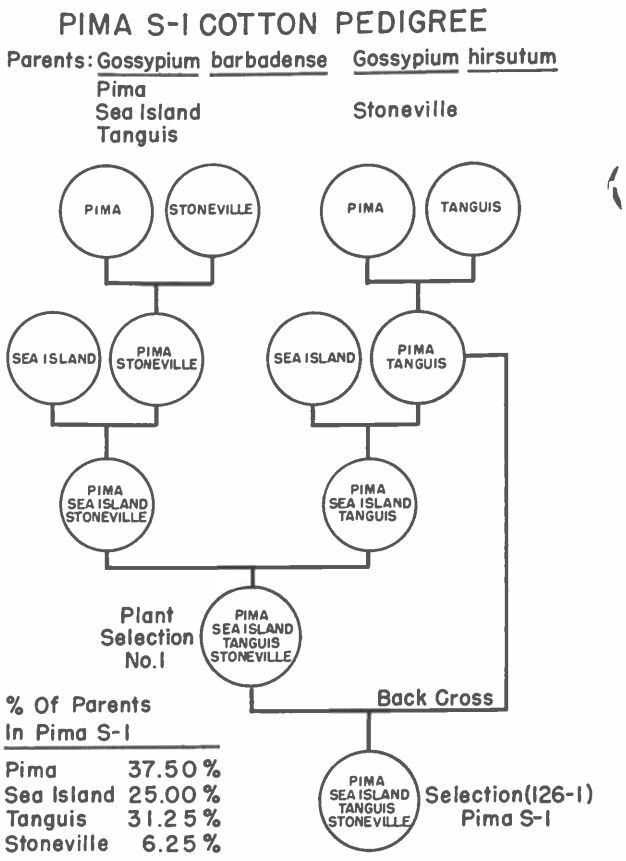
New Record Yields, Too

Pima S-1 actually took the ceiling off on one-bale-per-acre yields in Arizona and pushed it over two bales per acre. There are many 2½ and three bales per acre yields reported in Arizona. These high yields have been achieved while maintaining quality, thus opening up new horizons in long staple cotton breeding.

The story of Pima S-1 is not complete without knowing a little of the history of long staple cotton in the United States. Long staple Egyptian cotton was first introduced into the United States in the early twentieth century. Following a long trial period of acclimation, it was found that Arizona and the Southwest were best suited to grow this type of quality cotton.

Dr. T. H. Kearney and Dr. R. H. Peebles of the U. S. Department of Agriculture, stationed at the Sacaton Field Station, were largely responsible for developing some of the early varieties, such as Yuma and Pima. These were good varieties and Pima 32 later superseded them and was the commercial variety grown until 1952. But the long staple cotton industry was just plodding along on fairly good yields and acceptable quality, nothing spectacular, until the release of Pima S-1.

DR. BRYAN in a field of his Pima S-1 cotton at a University of Arizona research farm.



Standard Variety Today

Today, Pima S-1 is the only variety of long staple cotton grown in Arizona, New Mexico, Texas and California. The high quality of Pima S-1 cotton made it possible to market this cotton under the trade name of "Supima" by the Supima Association of America, an organization of long staple cotton growers. By smart advertising and promotion, Supima cotton has become a new word in cotton quality and fashion.

New Long Staple, Pima S-2, Released

The Crops Research Division of the U. S. Department of Agriculture, together with state experiment stations of Arizona, New Mexico and Texas, have just announced release of a new American-Egyptian cotton variety named Pima S-2. It was developed by USDA and experiment stations of the three states named above.

Pima S-2 is a selection from a cross made in 1951 by the late R. H. Peebles between Pima S-1, the current commercial variety, and Pima 3-79, a sibling of Pima 32.

R. H. Peebles and B. M. Waddle at the U. S. Field Station, Sacaton, Ariz., and later B. M. Waddle and C. V. Feaster at the University of Arizona Cotton Research Center, conducted the research studies which resulted in development of the new variety. Its release follows several years of testing.

Contribution from the Department of Plant Breeding.

Pressley's Tester Boon To Industry

The Pressley Index, to cotton men, is synonymous with fiber strength. Breeders, growers, ginners, buyers, millers, spinners and even brokers throughout the world daily depend on the Pressley Strength Tester to evaluate cotton as needed in their segment of the industry.

What is the tester and why is it so important?

Traditionally, cotton had been bought and sold on the basis of staple length and grade, and on the basis of these two standards, lint cotton was channeled into a given market. Cotton mill men and spinners were quick to realize that differences existed between cotton from various environments, and between varieties grown within a given environment.

Industry Was Aware of Need

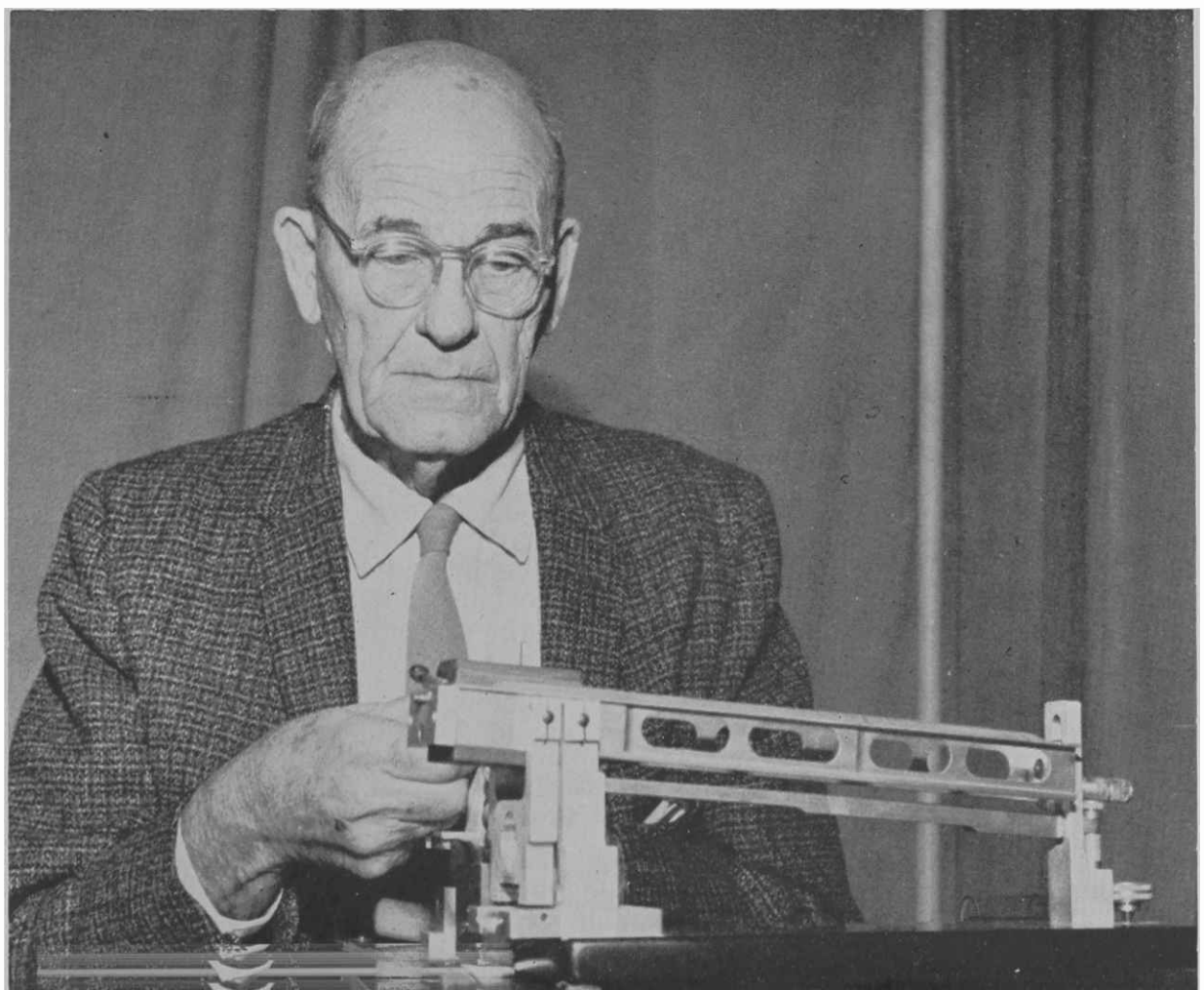
Recognition of fiber differences stimulated ideas for a measurement of some kind, so advantage could be taken of these properties: Area or point classing, and personal stapling of each bale by the purchaser, was used to insure getting the kind of cotton fiber that was needed. The breeder also had to handle each sample personally to be able to make comparison for selections to keep or increase.

Arizona's veteran cotton breeder, Dr. E. H. Pressley, together with other breeders, recognized this need for some objective method of predicting spinnability. Quoting Dr. Pressley, "We just were not getting any place, so the tester had to come." In 1939, experimental work was begun to develop a machine to measure strength of cotton fibers rapidly and objectively.

Dr. Pressley conceived the idea of a scale with a beam balance. This scale could be used to directly determine the number of pounds required to break a ribbon of fibers much as a breeder would in a crude way break by hand to estimate comparative strengths of the selections. Dr. Pressley and a master machinist, Joseph M. Doebrich, worked together on the idea and the machine became a reality in 1942. The machine has changed little in design and nothing in principle since it was built.

Prior to development of the Pressley machine, the Chandler Bundle Breaker was used with satisfactory results. However, the determinations were very slow, thus limiting its use.

VETERAN cotton breeder, Dr. E. H. Pressley, shown here with the machine he invented, and which has been a boon to cotton growers, buyers and millmen.



Many Questions to Answer

Building the Pressley machine was not easy. Many problems had to be answered such as (1) type of weight to be used and calibrated against what standard, (2) width, thickness, and length of ribbon to be used and how the ribbon was to be prepared, and (3) how accuracy could be combined with speed of operation.

A machine was built with a moving weight to travel on an inclined beam, the beam being held in place until a ribbon of fibers breaks, letting the weight fall. How to stop the weight without slippage so the reading would be repeatable and accurate? A clamp had to be devised to hold the fibers so they would not slip under stress and also be easy to use. Dozens of sets were made, redesigned and modified before one was satisfactory.

Such mechanical problems were met and solved during the three year development period and a machine perfected that could measure 100 samples in an eight hour period as compared to 8 to 10 samples using the Chandler method. This new strength machine increased the number of samples that could be tested daily to 12 times the previous production levels and with greater accuracy.

Is Amazingly Accurate

The machine is accurate and gives repeatable results. The correlation coefficient between fiber strength measured by the machine and the actual yarn strength as determined by spinning tests was .935 for all samples spun in 1959.

"The machine will primarily be used by breeders, since they will be making comparisons between selections. I can't otherwise see too much of a demand for it," was the opinion expressed by Dr. Pressley in reference to the use of the tester. The machine was never patented but the impact of this strength machine far exceeded the modest opinion of its inventor.

More than 900 Pressley testers are in use today in cotton laboratories and by cotton breeders throughout the world. Nine hundred machines actually means that practically everyone or every organization interested in cotton has a machine at their disposal.

Selecting Fiber For Its Use

The cotton breeders used the tester to develop the quality Acala cottons of the west, but industry uses it to channel the cottons to the right market. A denim clothes manufacturer needs one kind of cotton and the shirt manufacturer had an entirely different requirement. The strength information permits the purchaser to give the mill man what he needs to make the yarn of a given quality. The Pressley strength tester helps the cotton buyer locate the fiber possessing the desired level of strength.

Range & Watershed Management

Range management as an **art** has been practiced for many years by progressive Arizona ranchers. However, in more recent times, the **science** and **art** of range management have advanced in Arizona by graduates trained by the University of Arizona, and the importance of sound grass-agriculture is being emphasized by more and more range operators.

D. G. Wilson

In the early history of the Agricultural Experiment Station, such men as Prof. J. J. Thornber and Dr. H. L. Schantz contributed greatly to our knowledge of range plants — their distribution, water consumption and other valuable aspects. Range investigations were conducted under the auspices of the Department of Botany and graduates were known as range ecologists. This term did not fully imply their training as range managers, but in no way minimized their capabilities. Several of this group are now engaged in positions of high responsibility with the Agricultural Research Service, Bureau of Indian Affairs and with private industry.

Wide Area of Opportunity

Since 1954, our students have been granted degrees in range management and have been placed in a wide variety of vocations in both state and federal land administering agencies, such as the Bureau of Land Management, United States Forest Service and the State Land Department. In addition, many of our range management graduates are employed by the Soil Conservation Service and the Bureau of Indian Affairs, assisting stockmen in planning more efficient management of their grazing lands.

Present day range management studies are being conducted by four staff members and several graduate students. Among the areas of investigation are major problems in noxious plant control, range reseeding, range ecology, range fertilization and poisonous plants. Many publications on range plants and range conditions have been released by the Agricultural Experiment Station.

Close cooperation is maintained with research workers in the Agricultural Research Service and with the Research Centers of the Rocky Mountain Forest and Range Experiment Station. The university staff has also taken a very active part in the affairs of the Arizona Section of the American Society of Range Management, a professional society designed to promote sound range management.

Seeking the Best Grasses

The University of Arizona Plant Materials Center at Tucson is engaged in the testing and increase of forage species of potential value on Arizona rangelands. Close cooperation with the Soil Conservation Service allows for the rapid dissemination of information through Soil Conservation Districts to the ranchers.

In 1958, the range management staff was transferred from the Department of Agronomy and Range Management to serve as the nucleus of the new Department of Watershed Management. This newly formed department is continuing activities in teaching and research in range management as well as instruction in watershed management.

Research in watershed management is being initiated in cooperation with the personnel of several federal agencies to determine various aspects of watershed vegetation manipulation and other practices, such as prescribed burning in the ponderosa pine zone. Forest ecology and the management of second-growth stands of ponderosa pine are also being investigated.

Extension education activities of the Department of Watershed Management were greatly intensified in the fall of 1959 by the addition of a watershed management specialist to the staff of the Agricultural Extension Service. A very active program is in progress at present.

TRAINING in range and watershed management includes field trips where students learn practical application of their classroom instruction.

The author is an associate professor in the Department of Watershed Management.