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Progressive AGRICULTURE IN ARIZONA

PUBLISHED BY THE COLLEGE OF AGRICULTURE OF THE UNIVERSITY OF ARIZONA AT TUCSON

More than 100 Extension workers from 27 different states and 12 foreign countries were enrolled in the second annual Extension Winter School last Feb. 4-22, sponsored by the College of Agriculture of The University of Arizona.

Course work included such items as Agricultural Policy, taught by Dr. Wallace Barr of Ohio State University; Psychology for Extension Workers, by Dr. Ole A. Simley, University of Arizona; Agricultural Communications, by Ralph Reeder, Purdue University;

Working With Groups, taught by Edward V. Pope of the Federal Extension Service, Washington; 4-H Leadership Development, by Joe McAucliffe, also of the Federal Extension Service; and Extension Teaching Techniques, by Dr. Marden Broadbent of Utah State University.

In the picture above, Ernie Foster, second from left, an Arizona County Agent, shares "Extension Education Ideas" with, left to right, Miss Hazel Thompson, Forsyth, Mont.; Ahmad Nasser, field training instructor from Jordan; Mrs. Rella Butcher, Philippi, West Virginia; and Gilbert Matson of Payette, Idaho.

SEE YOUR COUNTY AGENT

"See your county agent."

This statement is made many times to those who ask for Arizona agricultural or home-economics information. Inquiries about agriculture and related industries, about youth programs, and about activities and programs for the home are constantly being referred to "the county agent" for specific and accurate information.

Who is "The County Agent"?

The County Agricultural Agent — or County Home Agent — is your local representative of The University of Arizona, the land-grant university for the state of Arizona. He or she is a member of the staff of The University of Arizona Cooperative Extension Service, which is one of the three branches of the College of Agriculture in each land-grant college. He is an agricultural leader. Or, in case of the Home Agent, she is a home-economics leader.

The County Agent is also an adviser in the fields of agriculture and home economics and related activities, including youth work. He is a local authority in both specific farm and home programs and activities, and in agriculture and home economics subjects on a broad scale.

There is a county extension office in each county of Arizona. Each office has at least one Agricultural Agent and one Home Agent in residence in the county. Many of the county offices in Arizona have a number of agents to serve local people effectively in the various subject-matter fields involved in agriculture, home economics, and youth programs.

The main objective of the county agent is service to Arizona residents in his county. Each agent is backed by the research resources of The University of Arizona College of Agriculture and School of Home Economics, and by similar resources in other colleges of the University here and in other states, and also from the United States Department of Agriculture. Each agent has special training for working with the people of this state in agricultural production, marketing and utilization, family living, youth development, community and resource development, and in the development of local leadership, both adult and youth.

Your County Agent also is a local resident of your county. His or her office is the "front door" to The University of Arizona. The county agent and home agent bring The University of Arizona into your own county wherever you live in the state of Arizona. He has in his office numerous state and federal publications for the use of Arizona residents.

Your county agent is active in local civic, church, and school affairs. He is likely to be a member of a local service club, a local church, and perhaps a member of a local school board. In other words, he is a part of your local community, and as such has the responsibility of serving you to the best of his ability.

So the phrase "See Your County Agent" is excellent advice. See your County Agent for information on the broadest area relating to agriculture and home economics.

Here are the addresses of the county extension offices where your County Agricultural Agents and County Home Agents are located in each county of the state:

Casa Grande	**City-County Bldg.**
Duncan	**Francis Bldg.**
Flagstaff	**Court House**
Globe	**Court House**
Holbrook	**County Fairgrounds**
Kingman	**County Welfare Bldg.**
Nogales	**Court House Annex**
Phoenix	**1201 West Madison**
Prescott	**Court House**
Safford	**Armory**
St. Johns	**Court House**
Tucson	**112 West Pennington**
Willcox	**Railroad Street**
Yuma	**1047 Fourth Avenue**

Harold E. Myers

Dean
College of Agriculture
and
School of Home Economics

Al Face of Yuma Heads Brangus Assn.

Al Face, cattle superintendent for the Bruce Church Ranches at Yuma, was elected president of the International Brangus Breeders Assn., when it met at Phoenix. Face formerly was county extension agent in Yuma County.

The new president said he would depend heavily on strong state Brangus associations to bolster the breed's progress this year. There are state associations in Texas, Oklahoma, Florida, Arkansas, Kansas, Missouri, Ohio, Illinois, Iowa, Nebraska, Minnesota, Wisconsin, South Dakota, California, Arizona, New Mexico, Nevada and in Canada.

Featured speaker at the convention was Dr. Carl B. Roubicek of The University of Arizona's Department of Animal Science. He emphasized that the fat-lean ratio of a beef carcass can definitely be improved by the addition of about one-half or slightly less than half Brahman blood to the English breeds.

He also said there is more difference in meat flavor and texture caused by age and feeding conditions than is caused by difference in breed.

In This Issue

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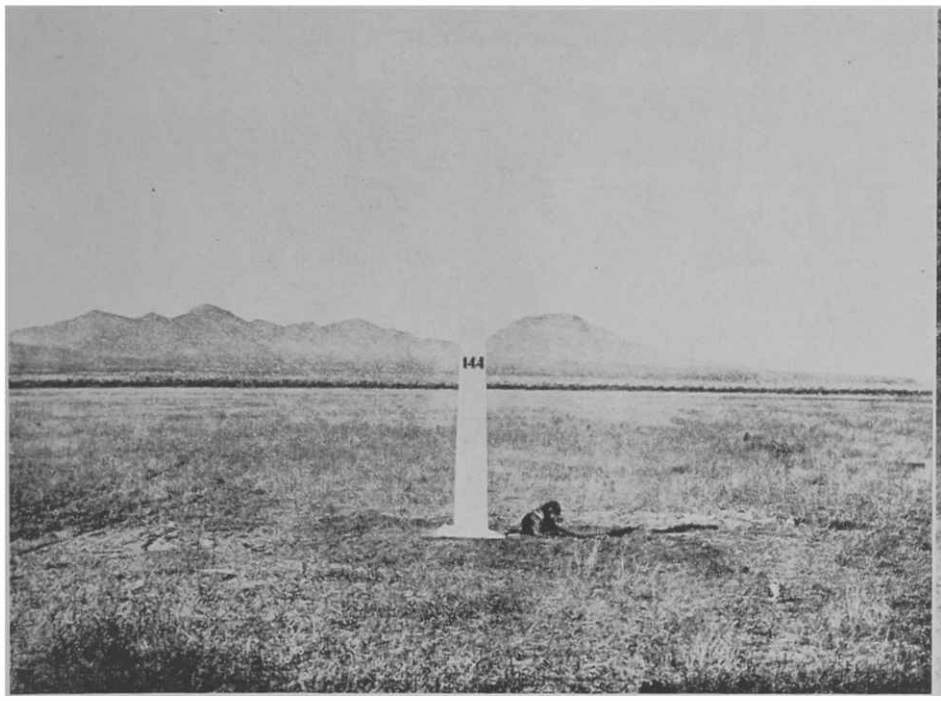
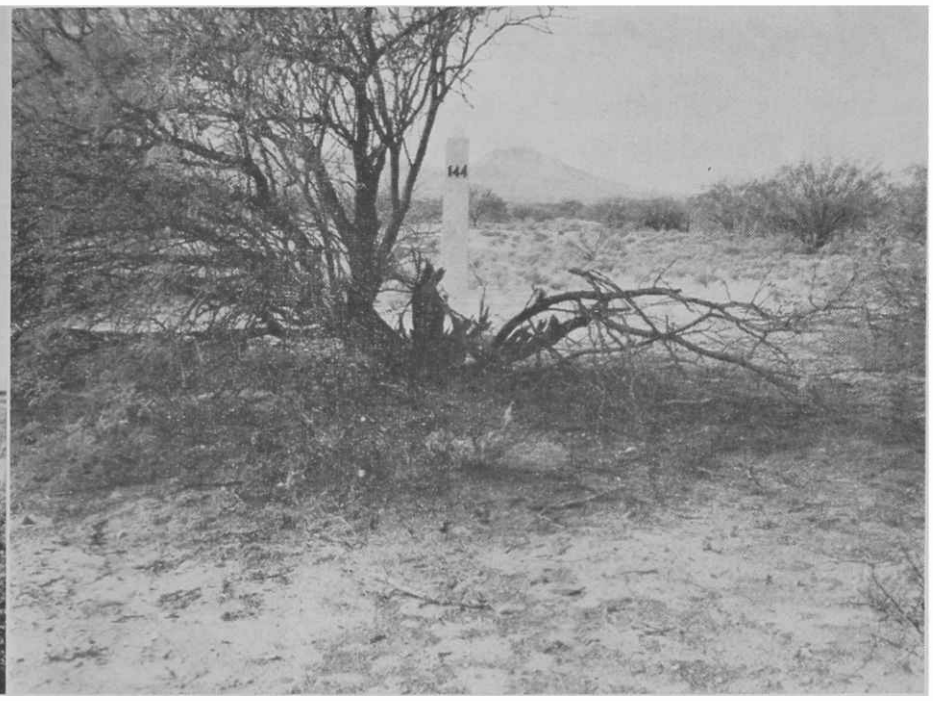
TOO MANY COWS - - - NOT ENOUGH MATCHES





Range vegetation does change, although too slowly to be evident to most of us. The eye and memory of man cannot view contrast when it is measured in decades and centuries.

Dr. R. R. Humphrey, professor of Range Management in this college, has used the camera to remedy man's shortsightedness. Bob Humphrey uses repeat photographs of exactly the same area.

In the two photos above, Dr. Humphrey shows the changes which have taken place over a 70-year period on the U.S.-Mexico boundary in the southeastern corner of the Papago Indian Reservation.

The photo at left, of Boundary Marker 144, was taken in 1893. The photo at right, from almost exactly the same spot was taken in 1963 — just 70 years later. (Object at right of marker, in the earlier photo, is the photographer's dog.)

"In the earlier picture," points out Prof. Humphrey, "the only mesquites were along Valshni Wash, which appears as a dark streak in the distant background. Grasses made up most of the vegetation.

"Today there are no grasses; only mesquite, burroweed and a few cholla cactus," says Humphrey. He has searched early army records and reports that "antelope were once so numerous in this area as to constitute a valuable source of meat for the soldiers. One can readily visualize this as an antelope habitat in 1893, but not today."

Why this change? The answer seems to lie in too many cattle and too few fires, says the Range Management professor. He points out that grazing removed the grasses that once served as fuel for fires that presumably kept the mesquites under control.

Cattle, grazing along the wash, distributed mesquite seeds over the entire area in their manure, and these — in the absence of fire — germinated and took root in the fertile soil.

"The rest is history," says Humphrey, "the history of millions of acres of similar rangeland in the Southwest."

May

2—Annual Cattle Feeders Day, Tucson

3—Annual Poultry Industry Day, U of A Poultry Research Center, Tucson

June

3-7 —17th Town and Country Life Conference, U of A Campus

10-15—State 4-H Junior Leader Laboratory, Prescott

July

29-31—State 4-H Roundup, U of A Campus

August

1-2 —State 4-H Roundup, U of A Campus

14-16—Annual Arizona FFA Leadership Conference, U of A Campus

'62 Arizona Cotton Crop Was Up 7%

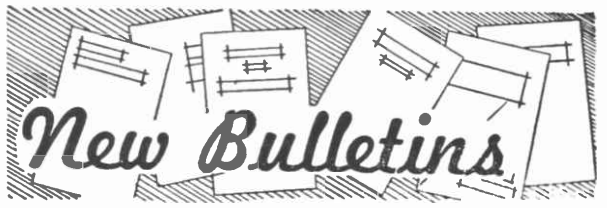
Arizona's 1962 cotton crop was up nearly 7 per cent from the previous year. The 1962 crop is expected to be approximately 858,000 bales when the tally is completed. The final figure on the 1961 crop was 828,000 bales.

The increased production resulted from increases in both harvested acreage and yields per acre. About 25 per cent of the acreage was skip-row planted and contributed to the increased yields.

Arizona again led the nation in yields of both upland and American-Egyptian cotton. The leading states in per-acre yields of upland cotton were: Arizona, 1,114; California, 1,082; New Mexico, 689; Missouri, 583; Mississippi, 515.

The yields on American-Egyptian cotton were: Arizona, 569; Texas, 495; New Mexico, 415.

Lower prices for both lint and seed partially offset the increased production.



Bulletins

A-24—Sprinkler Irrigation (reprint of former Bulletin 250)

A-26—Protect the Cotton Plant from Insect Injury (replaces "Cotton Insect Control")

A-27—Gypsum and Sulfur-bearing Amendments for Arizona Soils

During the vegetable crop year of 1961-62, 58,179 carlot equivalents of vegetables and melons were shipped from Arizona. Total value of production was $80,100,000 compared to $67,700,000 or an 18 per cent increase over the 1960-61 income. This increase is the result of higher value of production for broccoli, cabbage, cauliflower, celery, winter and spring lettuce, and onions. These increases were partially offset by lower values for all melon crops, carrots, and late fall lettuce.

Seed Certification Thirty Years Old

Robert Dennis

The Arizona Crop Improvement Association was formed thirty years ago. It is appropriate on this anniversary to review the seed certification movement in the United States and in Arizona.

The Arizona Crop Improvement Association, like those in other states, is a non-profit organization of growers whose objective is to make available genetically uniform and high quality seed. In all states where this objective is achieved there is a close cooperative relationship with the Land-Grant College, the U. S. Department of Agriculture, private breeders, and commercial seed firms.

Seed Program 75 Years Old

Field crop varieties have been developed by agricultural experiment stations for about 75 years. The first varieties were made available to the public by giving seed to leading farmers. These farmers increased the seed and gave a portion of the increase to their neighbors.

Growers observed the performance of the new release and reported yields to the breeder. Results of these tests were used much the same as extension test demonstrations are used today. This method of increasing and introducing a new variety was satisfactory in some cases, but often it was not.

Contamination from foreign pollen sometimes was a problem. Often the new variety was renamed and sold by unscrupulous dealers. High germination and purity standards were difficult to maintain. The agricultural leaders of that time realized there was need for a better system for increase and release of new varieties.

Field Inspections Begin

The first efforts in the direction of seed certification were those by experiment station workers of the Land-Grant Colleges and Universities. Wisconsin initiated inspections of seed fields in 1913. A pure seed association was organized in Maricopa County, Arizona, in 1914, at the time of the introduction of Pima cotton. Montana established a seed inspection program in 1915. Other states followed quickly with similar programs. All but five of the states now have seed certifying agencies.

Dr. Dennis is an Extension Agronomist.

STATE FAIR exhibit of Arizona Crop Improvement Association. Note prominence given to certified seed tag, symbol of quality.

Arizona growers were among the first in the nation to recognize the importance of an organized cooperative effort to make quality seed available to all. Numerous groups were formed to facilitate the production and marketing of pure seed.

The Arizona Crop Improvement Association was formed June 2, 1933, in a meeting of the officers of the Chilean Alfalfa Seed Growers Association, the Maricopa County Farm Bureau Pure Seed Association, and the Yuma County Pure Seed Association, in the County Agent's office at Yuma.

An Historic Meeting

Present at this important conference were Sam Wallace, president of the State Farm Bureau; William Walton, president of the Buckeye Farm Bureau; Laurides Anderson, president, Chilean Alfalfa Seed Growers Association; Wayne Wright, president of Yuma County Pure Seed Association; A. D. Cox, manager of Yuma County Farm Bureau Marketing Association; G. E. Blackledge, Yuma County Agricultural Agent; and University of Arizona representatives H. N. Watenpaugh, Extension Agronomist, and Ian A. Briggs, Research Agronomist. The first officers elected were William Walton, Palo Verde, president; Wayne Wright, Roll, vice-president; and Mrs. Martha Boggs, Phoenix, treasurer.

The Arizona Crop Improvement Association, now officially recognized by state law as the state's official seed certification agency, has served growers of field crops in Arizona well. Through the years its representatives have authorized the use of the certified label on many varieties of seed. By 1960 some 180 Arizona growers were producing 27,500 acres of seed crops for certification. In 1962, alfalfa, barley, cotton, millet, oats, safflower, sorghum, wheat, and several specialty crops were certified.

Several states exceed Arizona in acres of seed inspected for certification. However, only a few states have a greater percentage of their total cropland used for the production of certified seed.

Has Full Time Secretary

Operation of the Crop Improvement Association in Arizona is supervised by directors elected by growers who produce seed in Cochise, Maricopa, Pima, Pinal and Yuma counties. Harold Jacka has served as secretary-treasurer of the Arizona association since January 1, 1947. He developed an official handbook, first published in 1949. Mr. Jacka works closely with Experiment Station and Extension Service workers, with growers, and with members of the seed trade.

Each year has brought new challenges and opportunities for seed certification agencies. In recent years many new varieties have been produced by commercial breeders. Arizona was one of the first states to extend certification to privately developed hybrids and varieties. About twice as many different hybrids and varieties were certified in 1960 as in 1950.

A current problem of all certification agencies is maintenance of rigid quality standards for seed, which generally is sold without the benefit of elaborate advertising programs. The need to use pure seed of the best adapted varieties is just as important in 1963 as in 1933, when agricultural leaders of the day first met in Yuma to form the Arizona Crop Improvement Association.

UA Team Approach Seeking Better Bermudagrass Turf

Steve Fazio

Establishment and maintenance of turfgrass is an important industry in Arizona. Turfgrass in golf courses, parks and home lawns comprises about 50,000 acres.

However, more important than the total acreage is the fact that it is grown by so many people. Nearly half a million Arizona home owners, citizens who also use parks and golf courses and playgrounds, have a definite stake in bermudagrass improvement, as compared to no more than 5,000 Arizonans growing any other "crop."

High temperature, low humidity and soil conditions peculiar to the semi-arid Southwest result in a variety of problems. A mild winter climate stresses the desirability of an all-year turfgrass or improvement in overseeding methods and materials.

Studies Began 10 Years Ago

Persons in various departments of this College of Agriculture have for years worked to solve turfgrass problems. The Horticulture Department initiated a research program about 10 years ago and sponsored the annual Turf Conference in cooperation with the Golf Course Superintendents Association for a number of years. Concluding that a team approach to many of these problems would be advantageous, a research committee was created in 1959 consisting of members from the Departments of Horticulture, Plant Pathology, Agronomy, Agricultural Chemistry and Soils and Entomology.

Although the work of the research committee is supported mainly by university funds and facilities, contributions from interested persons and groups have been helpful. The Arizona Golf Course Superintendents Association made several donations early in the development of the program and has recently voted an additional contribution. Part of the program has been supported from grants received from bermudagrass seed growers, seed companies and from individual country clubs.

Chemical companies have been generous with materials and one has made a cash grant. These contributions are used for purchases of equipment, supplies and labor not possible from the budgets of the various departments. The Tucson City Parks and Recreational Department has furnished established turfgrass areas for experimental use and has maintained the test plots.

Brought Here From India

Common bermudagrass (*Cynodon dactylon*) was introduced into the United States from India many years ago and it became one of the best adapted grasses for turf use in the Southwest. Its ability to withstand adverse conditions and neglect has made it a popular grass for golf courses and for home yards.

Observation of lawns indicates that management of bermudagrass has not been favorable, and fails to maintain vigorous growth and good color. Common bermudagrass is an attractive lawn when given care bestowed on other turf varieties.

Bermuda lawns infested with weeds reveal the result of improper management. Lack of fertilizer, or improper application, has been responsible for many weed patches in lawns. Bermudagrass requires a constant and adequate supply of nitrogen to maintain vigorous growth.

An application of ammonium sulfate in late fall just prior to the frost season, at the rate of 1½ to 2 pounds per 100 square feet is recommended. Another application at the same rate should be applied in early spring when the new growth emerges. These two applications will help bermudagrass to grow vigorously. Need for additional nitrogen during the growing season can be determined by observing the growth and color of the grass.

Mow It Short and Often

Mowing plays an important role in the ability of bermudagrass to grow vigorously. A properly maintained bermuda lawn requires frequent mowing during the period of high temperatures and low humidity. Allowing a bermuda lawn to grow two to three inches in height between mowings results in sunburning the foliage which developed near the base, by exposing this tender growth to a sudden change in light intensity. Setting the mower at a desired height and then mowing the grass whenever it grows half to three-quarters of an inch will prevent the damaging effect of sunburning.

Irrigation of bermuda lawns is another management practice which, when neglected, results in uneven growth and sunburning. Poor management will increase weed control problems. An experienced person can often detect a water stress in bermuda by a change of foliage color. The appearance of a dark, blue-green color in bermuda shows water stress. If this is allowed to continue for several hours, sunburning may result.

Water stress may result when sprinklers do not cover the entire surface, or when the interval between irrigations is too long. Variability of soils and climatic conditions makes it difficult to water lawns on a definite time schedule. Examination of soil moisture and the lawn color, or the use of soil tensiometers, are the best indicators in determining water needs.

The bermudagrass eriophyid mite has been quite destructive in recent years in bermuda lawns. Damage is more pronounced in grass that has not been kept in a vigorous condition. Management practices play an important role in keeping the mite infestation to a minimum. A healthy, vigorous lawn has a better ability to withstand weeds, insects and

(Continued on Next Page)

The author is an associate horticulturist.

Yuma Brangus Tops Gain-Test Trials

Nearly three-quarters of the 76 bulls entered in the recently completed gain-grade test of the Arizona Beef Cattle Improvement Station met or exceeded all requirements.

The bulls were tested at The University of Arizona River Road Farm in Tucson by personnel of The U of A animal science department. Requirements were that the bulls gain at least 2.3 pounds per day, grade choice or higher, and have a minimum adjusted yearling weight of 825 pounds.

These are practical goals for a good growing ration, according to Dr. Bruce R. Taylor, head of The U of A animal science department.

The tested animals were ranked on an index, with an average bull receiving a score of 100. Above-average bulls are ranked above 100; below-average bulls below 100.

Top animal in the test group was bred and entered by the Yuma Valley Cattle Company. The Brangus bull was the high-index bull (119) and the highest-gaining bull (3.58 pounds per day).

The second-high index bull, with a score of 116, was bred and entered by the Cowden Livestock Company of Phoenix. The Hereford bull, which gained 3.12 pounds per day and graded fancy, was sold to the Vaca Ranch of Patagonia for $2,100 at the station sale.

The average rate of gain for all bulls was 2.51 pounds per day. Their average grade was middle choice and their average adjusted yearling weight was 893 pounds. The 76 bulls that finished the test included two Angus, eight Brangus, three Charbray, five Santa Gertrudis, two Shorthorns, and 56 Herefords. A total of 23 bulls failed to meet the three requirements for approval.

Even Mr. K Has to Bow to U.S. Farmers

"Farming is everybody's business. It's the biggest business in America — and the only one to which even Khrushchev tips his hat.

"It's a $38 billion-a-year industry that affects our taxes, our foreign policy, our housewives' budgets and our eating habits."

So says Kenneth Scheibel, who for 12 years has covered farm news from Washington for the Gannett papers and is now starting a weekly column, "Washington Farm Beat," for North American Newspaper Alliance.

Our readers will wish to watch their daily newspaper for this NANA 700-word weekly farm column issued for Monday publication.

(Continued from Previous Page)

diseases than one under stress. Any management practice which lowers the vigor of the grass will make it more vulnerable to mite infestation.

Telltale Tufted Look

A mite-infested bermuda turf will develop a tufted growth with numerous small leaf blades. Brown spots will be evident after mowing. Chemical control of the mite with diazinon can be accomplished if applied when the mites are first noticed. Delaying treatment until damage is severe results in a weakened stand of grass and recovery will be slow. If mites are present, extra attention should be given to fertilization, watering and mowing in order to create a more favorable environment for recovery of the lawn area.

Winter dormancy of bermudagrass is one of the main objections to its use as a turf grass. This thermo-dormancy is offset by overseeding the lawn area with one of the many cool season grasses in late fall. Tests are being made to determine the adaptability of bents, bluegrass, fescues and others, compared to the traditional standby, annual ryegrass, for overseeding.

Overseeding bermudagrass in early fall prior to its dormant period has created a problem of preventing further growth after it has been overseeded with a cool season grass. Growth retardants are being used effectively on bermuda prior to seeding to control its growth during this warm period.

Hybrid strains and selections of bermuda grass are being tested for their adaptability to withstand our climatic conditions in the Southwest. They are also being evaluated for their texture and use in golf courses and home yards.

Agriculture and the Common Market

"All parents tell their children about the piggies," says Dr. Conrad F. Joyner, University of Arizona associate professor of government, "but dilemmas arising out of the creation of the European Common Market (ECM) make it possible to tell the story in a new way."

This little piggy went to the Common Market.

This little piggy stayed home in Iowa.

This little piggy wished he were roast beef.

This little piggy didn't know what he was.

This little piggy cried "wee, wee, wee, I can't find my home."

"We find in the world today the paradox of agricultural abundance in some areas in contrast to over-all scarcity," says Dr. Joyner. Technical advances and fertile land make some areas more productive than others yet the rising birth rate and lower infant mortality rate have caused a scarcity of food.

Tariffs and other barriers discourage distribution from the more productive areas to those less fortunate.

The traditional economic solution to these problems is a free world market in which each country produces what it is best suited to, imports what it needs and exports its surplus.

In the long run (theoretically) everything would balance out.

The European Common Market is supposedly moving towards this type of free world market.

Differences between the agricultural situation in the Common Market and that in the United States will create dilemmas. Some of the differences he points out, are that the United States farmer is more efficient, that the Common Market must import some of its agricultural products and that despite aids, farmers in Common Market countries have a lower income than those here.

In the European Common Market there are 180 million acres under agricultural production; in the United States there are 300 million acres.

In the ECM there are 900 million farms; in the United States there are 3.7 million farms. We have abandoned the 12, 15, 17 and 18 acre farms that still exist in abundance in Europe, Dr. Joyner notes.

In the ECM there are 12.5 million male farm workers; in the United States there are only half that many.

The goal of the ECM is to solve some of the problems inherent in the European agricultural situation.

In moving towards a solution these aims have been stated:

1. To attempt to balance supply and demand, not only within the market but also as it relates to the rest of the world.
2. To provide a fair income to the farmer.
3. To stabilize agricultural markets by providing a price the farmer can depend upon.
4. To insure a fair deal to the consumer.

How do these aims affect us? The United States sells $5 billion worth of products to the Common Market. Of these, $1.2 billion are agricultural products, more specifically grains, pork, poultry and eggs. We cannot lose this trade without drastic effect, says Dr. Joyner.

Therefore, he feels, we must maintain bargaining with the Common Market. If we are not successful, we will have serious problems for our own agriculture.

Dr. Joyner concludes that the United States may have been instrumental in creating something that it does not know how to handle.

Editor's Note: This summary of Dr. Joyner's talk, before the League of Women Voters' foreign economic policy workshop here, was written by Susan Szekely of The Tucson Daily Citizen staff.

Arizona Farm Income $512 1/2 Million in '62

Arizona farmers received a record income of $512,588,000 in cash receipts last year, 9 per cent above the 1961 figure.

The U.S. Department of Agriculture said crops accounted for most of the receipts with a total return of $324,688,000, up 12 per cent from 1961.

Up 3 per cent at $182,575,000 were cash receipts from livestock and livestock products.

Cotton lint and cottonseed earned more than half the crop income. Government payments to Arizona farmers in 1962 totaled $5,325,000, an increase of $40,000 from the preceding year.

The government payments are not included among cash receipts totals.

El ganado vacuno de carne debe seleccionarse de un tipo que alcance pronto su edad adulta, recio, y, que, bajo condiciones adecuadas, a la edad de los 12 a 18 meses llegue a pesar de 320 a 450 kg. Conviene escoger una raza que se adapte mejor a las condiciones locales. La preferencia personal debe ser una consideración muy importante al escoger una raza.—TIERRA

Fishes in ditches are a help to farmers in Arizona's Buckeye Valley where a tropical species, tilapia, were planted in canals last year. The fish feed on warm water algae which slows water movement. The state has now planted 2,000 tilapia in the Roosevelt Irrigation District.

Plant Spacing of Pima Cotton

Carl V. Feaster, E. L. Turcotte and R. E. Briggs

The proper within-row spacing of cotton plants for optimum performance of the crop is of vital importance to the cotton grower. Plant spacing greatly influences the type of growth of the cotton plant.

If plants are closely spaced in the row, the stalks are small and spindly, fruiting branches are short, and the crop consists largely of bolls located near the main stalk, with the lowest bolls set relatively high on the plant. Wide spacing results in a branching type growth with long fruiting branches that begin to form relatively low on the plant.

Peebles, Den Hartog, and Pressley[1] and Leding and Cotton[2] conducted within-row spacing experiments with Pima cotton (*Gossypium barbadense* L.) in Arizona and New Mexico, respectively, between 1950 and 1952. They included Pima 32 and several similar experimental strains in their tests. Peebles *et al* found that close plant spacing of 2 to 6 inches, compared to a wide spacing of 12 to 16 inches, increased lint yield by an average of 12.9 per cent, and that earliness (percentage of first pick) was nearly 15 per cent greater at the 6-inch than at 12- to 16-inch spacings.

At a 4-inch spacing, earliness was less than 5 per cent above the mean for the 12- to 16-inch spacings. Leding and Cotton reported that in New Mexico appreciable yield differences occurred in favor of spaced plants, with a 12-inch spacing appearing to give the best all-round results. They compared spacings of 18, 12 and 6 inches and unthinned (approximately 3.3 plants per foot). Between-row spacing in the Arizona tests was 36 inches and in New Mexico 40 inches.

Different at Different Places

The apparent lack of agreement in the results of these two groups of workers in regard to recommended within-row spacings could be due to environmental conditions. Differences in altitude (approximately 1200 to 1400 feet for the Arizona tests and 3800 feet for the tests in New Mexico) contributed much to the varied growing conditions.

The present study was undertaken to determine the response of the current commercial varieties of Pima (Pima S-1 and Pima S-2) to different within-row plant spacings under varying environmental conditions.

In 1960, Pima S-1 and Pima S-2 were grown at Tempe and Safford with the following within-row spacings: unthinned (planting rate approximately 20 pounds per acre resulting in a 3-inch average spacing), 6, 12, 18, 24 and 30 inches. The spacing between rows was 40 inches at Tempe and 38 inches at Safford. The altitude at Tempe is approximately 1,200 feet and approximately 3,000 feet at Safford.

In 1961 a similar test was grown only at Tempe. The 1962 tests with only Pima S-2 included the following spacings: unthinned (average spacing 3 inches), 6, 9, 12, 15 and 18 inches. The 1962 tests were grown at Tempe and Safford.

Check Several Items

The effect of plant spacing was determined for each of the following characteristics: lint yield per acre, per cent first pick, plant height, boll size, lint per cent, fiber length, fiber strength and fiber fineness.

YIELD OF LINT PER ACRE.—In 1960 at Tempe, the 6-inch spacing for both varieties resulted in highest yields and the loss in yield from no thinning as compared to 6-inch spacing was highly significant (Table I). Also there was an increasing loss in yield as spacing was increased from 12 to 30 inches. At Safford the 6-inch spacing gave the highest yield for Pima S-2 and the 12-inch spacing for Pima S-1, and there was no significant yield reduction from no thinning when compared to the 6-inch spacing for either variety. Spacing in excess of 6 inches for Pima S-2 and 12 inches for Pima S-1 resulted in a loss in yield when compared to the spacing giving the maximum yield

(Continued on Next Page)

Table I. Effect of spacing on yield and earliness of Pima S-1 and Pima S-2 at Tempe, 1960-61, and Safford, 1960.

Spacing	*Variety*	*Tempe, 1960*		*Safford, 1960*		*Tempe, 1961*	
		Pounds lint/acre	*Per cent 1st pick*	*Pounds lint/acre*	*Per cent 1st pick*	*Pounds lint/acre*	*Per cent 1st pick*
No thin	S-1	517	51	1164	74	795	46
	S-2	743	68	1251	81	935	56
6-inch	S-1	714	59	1195	79	821	54
	S-2	891	73	1304	82	1044	61
12-inch	S-1	647	61	1258	75	873	56
	S-2	811	71	1280	78	1068	65
18-inch	S-1	620	55	1215	75	818	48
	S-2	764	69	1255	76	1037	56
24-inch	S-1	512	54	1150	70	765	47
	S-2	704	66	1120	69	1014	51
30-inch	S-1	472	54	1084	69	714	44
	S-2	618	60	1099	67	906	48

Dr. Feaster is a research agronomist and Dr. Turcotte a research geneticist in the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, at The University of Arizona Cotton Research Center, Tempe, Ariz. Dr. Briggs is an associate agronomist in the Department of Agronomy, University of Arizona, Tucson.

[1]R. H. Peebles, G. T. Den Hartog and E. H. Pressley; Effect of Spacing on Some Agronomic and Fiber Characteristics of Irrigated Cotton. U.S.D.A. Technical Bulletin No. 1140, June 1956.

[2]A. R. Leding and John R. Cotton; Spacing Experiments with American-Egyptian Cotton in New Mexico. New Mexico Agricultural Experiment Station Press Bulletin 1083. April 1953.

(Continued from Previous Page)

for each variety — the wider spacings giving the greater losses.

In 1961 at Tempe, maximum yield for each variety was obtained at the 12-inch spacing. Although yields from the different spacings were not significantly different, there was a gradual increase in yield from the unthinned to the 12-inch spacing and then a gradual decrease through the 30-inch spacing. The results deviate slightly from those in 1960, when the maximum yield at Tempe was obtained from the 6-inch spacing and the loss of yield from unthinned as compared to 6 inches was highly significant.

Table II. Effect of spacing on yield and earliness of Pima S-2 at Tempe and Safford, 1962.

	Tempe		*Safford*	
Spacing	*Pounds lint/acre*	*Per cent 1st pick*	*Pounds lint/acre*	*Per cent 1st pick*
No thin	969	84	942	67
6-inch	905	89	929	73
9-inch	816	87	921	75
12-inch	738	88	837	74
15-inch	690	82	762	70
18-inch	664	82	779	64

Tests With S-2 Only

In 1962, 9- and 15-inch spacings were substituted for the wider, relatively unproductive spacings of 24 and 30 inches (Table II). Pima S-2 was the only variety grown, since the relative reactions of Pima S-1 and Pima S-2 to different spacings were similar in 1960 and 1961. The 1962 season, as contrasted to 1960 and 1961, was conducive to earlier boll set and this in turn resulted in a more favorable yield response from the unthinned cotton. In closely spaced cotton, low fruiting branches usually do not develop, and the first boll generally appears so high on the plant that yield is reduced.

The 3-inch spacing did not produce this effect at either location in 1962. At Tempe the unthinned plants yielded significantly above those at the 6-inch spacing, while at Safford the unthinned plants yielded slightly but not significantly above those at the 6-inch spacing. There was a general trend for lower yields with wider spacings at both locations.

In these tests over a 3-year period, cotton was grown under diverse conditions due to altitude influence and years. It may be expected that the results were not entirely consistent. It does appear, however, that a within-row spacing of approximately 6 inches will be satisfactory under most conditions.

3 Inches Close Enough

In these tests the unthinned plots were planted at approximately 20 pounds per acre, which gave a stand with approximately a 3-inch spacing. The only real yield reduction from not thinning was experienced at Tempe in 1960. Thinning, however, seems extremely desirable if planting rates result in plants appreciably closer than 3 inches. Plants too closely spaced have a poor bottom set and may become tall, top-heavy and lodged. This condition often results in yield reduction which is more pronounced in some seasons than in others.

EARLINESS.—Maximum earliness (per cent first pick) was obtained from the 6- to 12-inch spacings, with lateness associated with either closer or wider spacings. Close spacing exerts two opposing effects on crop maturity. The closely spaced plants have short fruiting branches so that the crop consists primarily of bolls located near the main stalk. Plants of this type tend to mature earlier, because the time interval of flower formation is much shorter between first nodes of the successive fruiting branches than between successive nodes on a given fruiting branch. On the other hand, low flowers in closely spaced cotton generally do not develop, and the first boll appears higher on the plant, thus delaying development and maturity of the crop.

Extremely wide spacing also has a delaying effect on crop maturity, because bolls are set on long fruiting branches. The time interval between flower appearances on a given fruiting branch is about twice as long as the interval between flower development at the first nodes of successive fruiting branches. Spacing of approximately 6 inches seems to give the optimum combination of flower formation for maximum earliness.

PLANT HEIGHT. — Shorter plants are generally obtained with wider spacings; however, within the range of spacings conducive to maximum yields, height differences are minor. Height responses are closely associated with bottom set as poor bottom set tends to result in taller plants.

Lint Per Cent Not Affected

BOLL SIZE.—Boll size differences were observed in only one of the five tests. In this test, smaller bolls were obtained with closer spacing.

LINT PER CENT.—Lint per cent was not significantly influenced by spacing.

FIBER LENGTH.—Three of the five tests showed significant effects of spacing on fiber length. Generally the longest fiber was obtained from the spacings which gave optimum yield performance.

FIBER STRENGTH. — Two of the tests showed significant effects of spacing on fiber strength. In these tests weaker fiber was associated with the close spacing. However, there generally was no appreciable difference in strength within the range of spacings giving maximum yields.

FIBER FINENESS.—Spacing had a significant influence on fineness in two of the five tests. In these the closer spacings gave the finest fiber.

Affects Yield, Earliness

Yield, earliness, and type of growth of cotton are appreciably affected by plant spacing. There are minor effects on boll and fiber properties. However, these differences are not appreciable within the range of spacings for maximum yield. Spacings between 3 and 6 inches seem most desirable, as these spacings tended to give optimum performance of the cotton plant in terms of yield, earliness, desirable plant type and fiber properties.

Unthinned plants (approximately 3-inch spacing) gave excellent results in the 1962 season when environmental conditions were conducive to a good bottom set. In 1960, particularly at Tempe, when the season was less favorable to a good bottom set, the 6-inch spacing was more desirable.

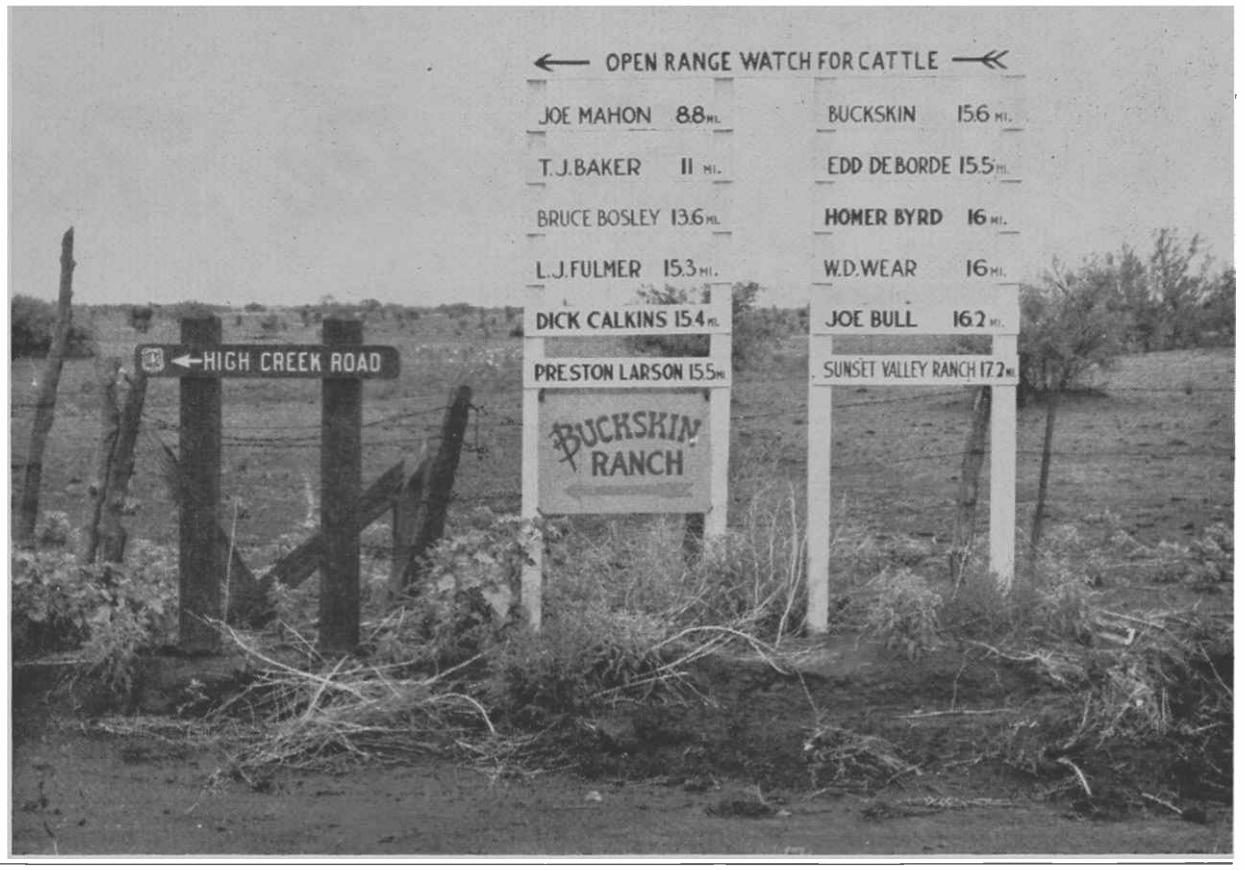
Probably you were well aware of National Farm-City Week in November. But did you know it had its origin right here in Arizona? Yes, it was in 1952 that the late Kenneth McMichen of Goodyear Farms, then serving as district chairman of the Kiwanis agricultural committee, proposed such a week to "foster better relationships between farm and city people." It was in 1955 when, as the idea kept spreading, Kiwanis International formally made this a national event.

WHERE, OH WHERE?

In each issue PROGRESSIVE AGRICULTURE will publish a picture of an Arizona view, one which cannot be confused with any other. At right is the first such picture. Just for the fun of it, we'd like our readers to search their memory of back trails to see if they can identify the scene.

Here is the first one. How many of you readers know where this group of ranch signs stand, obviously at a road intersection?

If you don't know, turn to Page 13 and get the answer.



Cotton Experts Keep Anxious Watch On Weevils in Sonora

The possibility of the boll weevil moving from Mexico into cotton growing areas of Arizona is very definite, an entomologist told the Western Cotton Production Conference at Phoenix this spring.

Dr. H. G. Johnston of the National Cotton Council, Memphis, stated no one can say, with any degree of assurance, that the boll weevil in northern Sonora will or will not be able to survive in cotton fields in the Santa Cruz Valley or in the Salt River Valley.

"But at the rate it has spread over the entire Caborca area during the past six years, and the close similarity of much of this area to cotton areas in Arizona, it certainly should be placed in the category of a very definite threat," Dr. Johnston explained.

Dr. Johnston stated that today there are at least two biologically different boll weevil strains — one adapted to a humid, rainfall climate and another to a dry, hot, desert climate. Substantial evidence exists the eastern strain is not capable of surviving in western cotton areas.

The story is different with the western strain, however.

In the Caborca area, where production has expanded greatly since World War II, boll weevils were first found in 1956. In six years it had spread over the entire area. Two years ago, weevils were found in the Magdalena vicinity.

A U. S. Department of Agriculture survey in 1962 revealed estimated losses of one bale or more per acre in many of the fields. Of vital concern to Arizona and California growers, Dr. Johnston said, is that infested fields at Agua Caliente are no more than 30 miles from Arizona cotton north of Nogales and the infestation at La Solina is about 140 miles from the San Luis-Yuma area on the Colorado River.

As a result of the survey, the U. S. Department of Agriculture and Mexican officials conducted a spray program last fall. A complete evaluation cannot be made until early this summer, but preliminary results look encouraging, Dr. Johnston explained.

Boll weevils were found at Delicias in 1950 and the Presidio Valley of Texas in 1953. In three years, they had spread over the entire valley, and serious damage was done in some fields the second year. The entomologist said that since 1957 extensive control schedules have been followed, and costs up to $45 per acre have been reported by growers.

By 1961 weevils had spread up the Rio Grande Valley some 150 miles. A cooperative project was initiated to apply insecticides to all the infested area from just above the Presidio Valley to the lower end of the El Paso Valley.

Cooperating were the National Cotton Council, U.S.D.A., Texas Experiment Station and State Department of Agriculture, and the Mexican government.

Results have been most encouraging, Dr. Johnston reported, and chances are good weevils will be eliminated from this area.

Dr. Johnston told the growers that lots of additional information is needed concerning western boll weevils and that research now under way by the U. S. Department of Agriculture and The University of Arizona should provide some of the needed answers.

Cochise County
KAWT, Douglas—Check local listings.
KHIL, Willcox — Mon. thru Fri., 7:45 a.m.

Coconino County
KCLS, Flagstaff — Tues. and Thurs., 8:20 a.m.
KGLS, Flagstaff (Home Agent) — Thurs., 9:45 a.m.
KPGE, Page — Fri., 2:30 p.m.

Graham County
KATO, Safford — Sat., 9:30 a.m.

Maricopa County
KTAR, Phoenix — Mon. thru Sat., 5:30 a.m.
KUPD, Phoenix — Mon. thru Sat., 5:30 a.m. and 12:25 p.m.
KPHO, Phoenix — Mon. (cotton report) 12:40 p.m.; Thurs. (dairy and livestock report) 12:40 p.m.

Navajo County
KDJI, Holbrook — Tues., 12:45 p.m.

Pinal County
KPIN, Casa Grande — Mon. thru Sat., 6:55 a.m.; Mon. and Fri., 9:30 a.m.; Tues., Thurs. and Sat., 12:20 p.m.; Fri., 5:00 p.m.; Sat., 7:00 a.m.

Santa Cruz County
KNOG, Nogales — Mon., 6:30 a.m.

Yavapai County
KYCO, Prescott — Mon., Wed. and Fri., 5:55 p.m.
KNOT, Prescott — Mon., Wed. and Fri., 5:35 a.m.

Yuma County
KVOY, Yuma — Mon. thru Fri., 5:45 a.m.
KYUM, Yuma — Mon. thru Fri., 6:25 a.m.

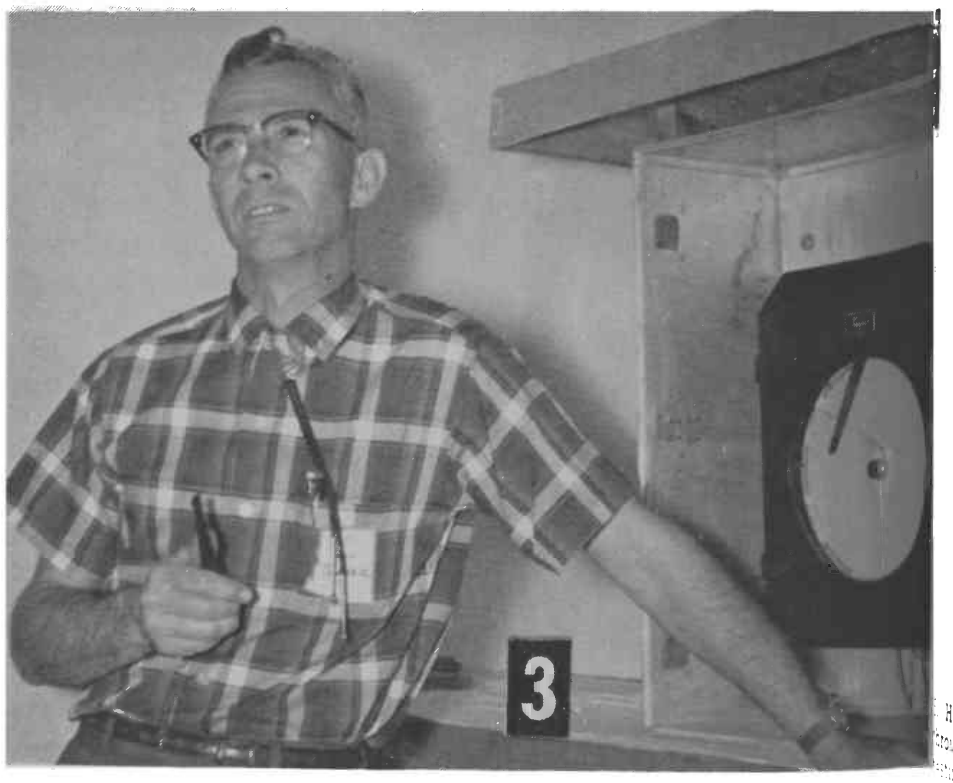
Science Teachers Are

1. SUPT. TURNER, at right, explains the make-up of the College of Agriculture, with its Resident Teaching, Extension Service, Experiment Station and School of Home Economics. Allan Halderman, Extension Agricultural Engineer, at left, helps hold the explanatory chart.

High school pupils of today are apt have an old-fashioned — and incorrect- impression of modern agriculture and th research tools useful to that agriculture, say Dr. Fred Turner, superintendent of the Safford Experiment Station.

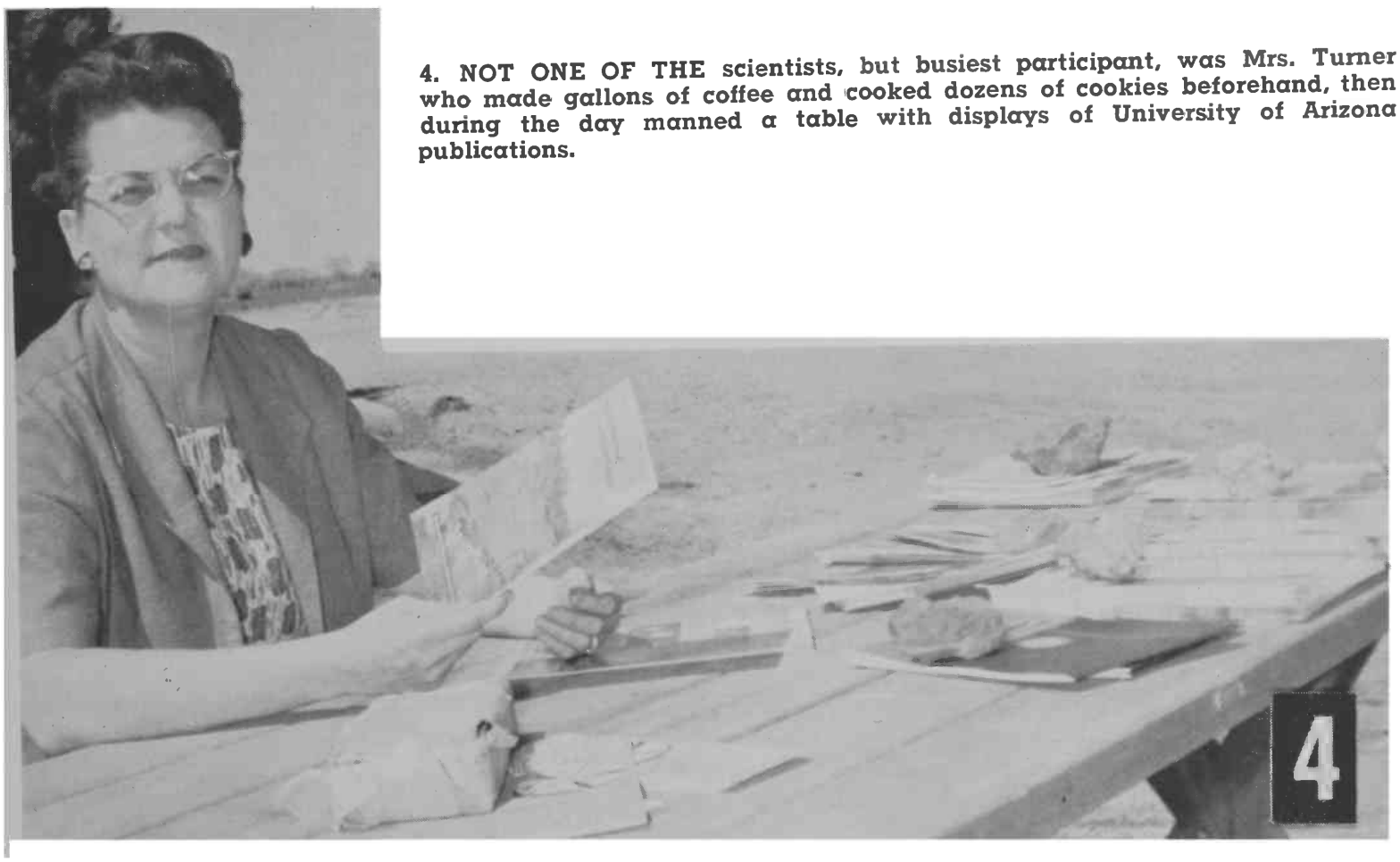
So on a beautiful Saturday in late March Fred Turner and his University of Arizona colleagues played host to high school sci ence teachers from Graham County. It wa an impressive and instructive affair, prob ably first of several demonstrations designed to introduce more and more groups to mod ern agriculture's research aids.

2. SHOWN BELOW is part of the group of interested teachers looking at a neutron probe, a measuring device for soil moisture. Charles Busch, associate professor in the Department of Agricultural Engineering at the University, is in foreground, explaining how the device works.

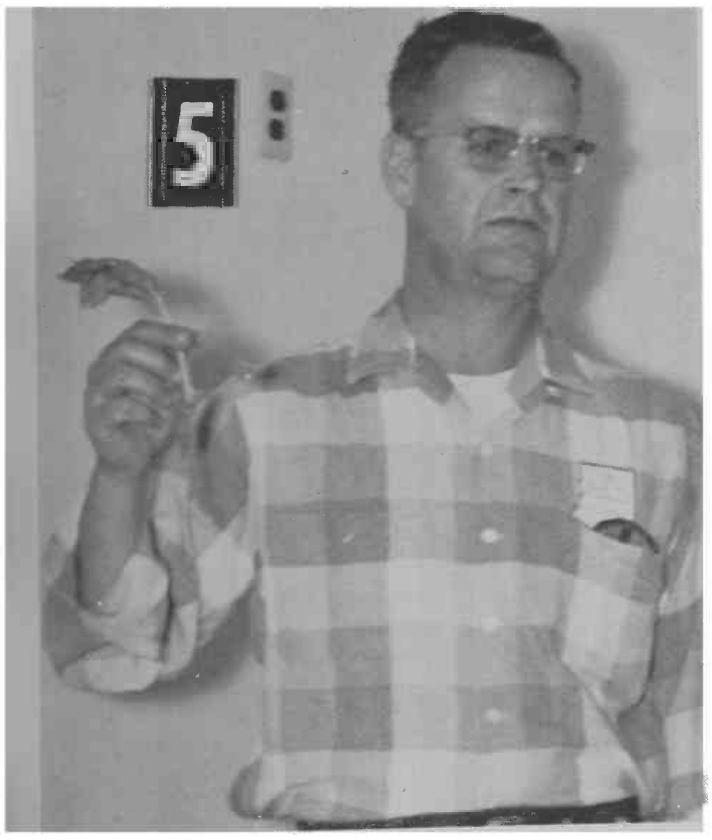


3. CLIMATE IS IMPORTANT to crops in many ways, explains Dr. Turner, as he discusses the dial of a temperature-recording instrument.

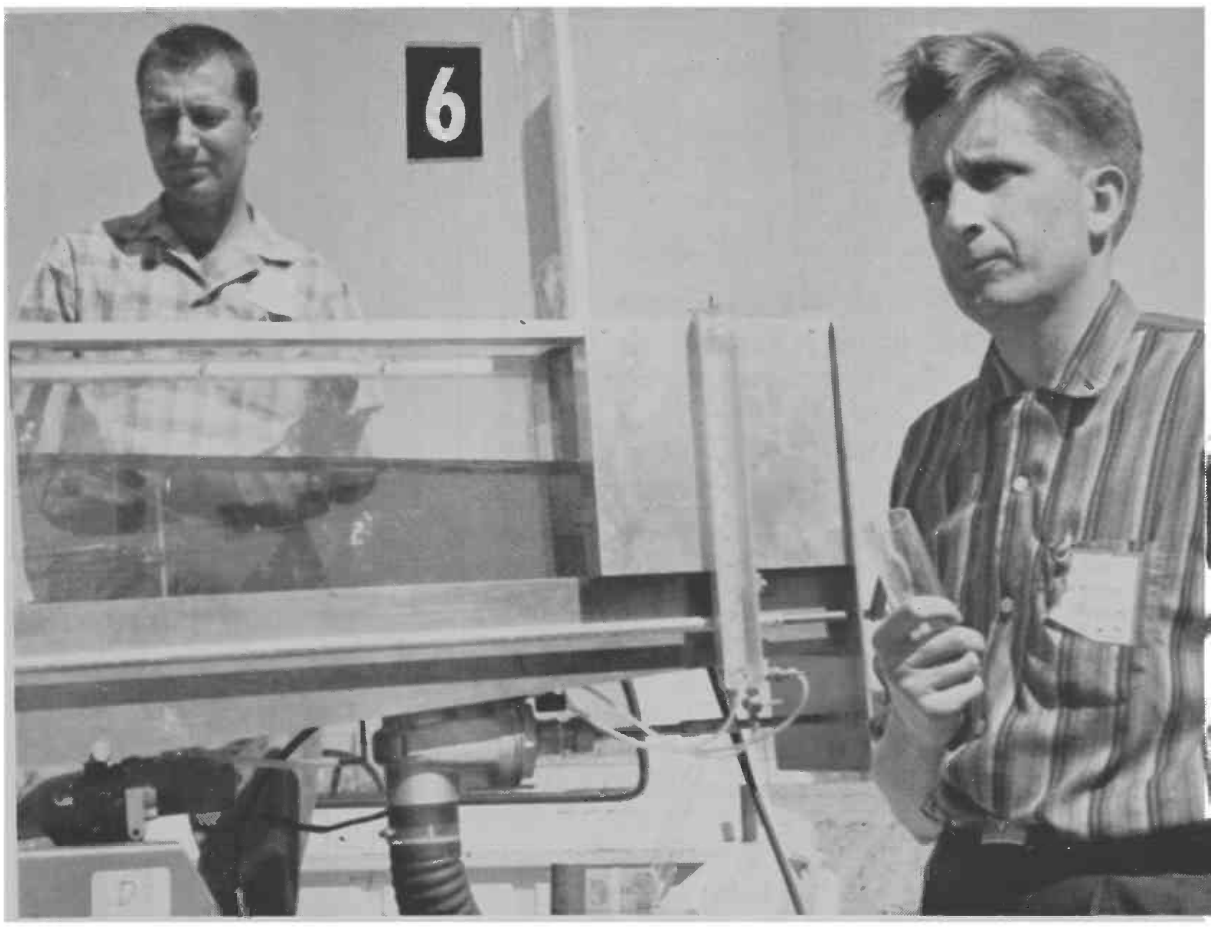
...sts of Safford Station



4. NOT ONE OF THE scientists, but busiest participant, was Mrs. Turner who made gallons of coffee and cooked dozens of cookies beforehand, then during the day manned a table with displays of University of Arizona publications.



5. HUNGRY PLANTS can tell their needs through the relatively new device of tissue testing, explains Dr. Lyman Amburgey, soils specialist in the UA Extension Service.



6. MOST ATTRACTIVE DISPLAY (excepting for the cookies) was this mobile hydraulic flume, mounted on a pickup truck. Fitted with a water pump and a number of variable baffles and inclines, it illustrated how flowing water would vary its flow under different conditions. Dr. Busch, at right, explains the machine while Mr. Halderman, his Extension Service colleague, mans the upper reaches of the mechanical ditch.

More Food and Drink (Nitrogen and Water) Boost Flax Yields

E. B. Jackson, D. D. Rubis and Fred Carasso

A little extra nitrogen and water on a crop of flax can increase gross returns as much as $42 per acre. This is the conclusion drawn from an experiment conducted on The University of Arizona Experimental Farm in the Yuma Valley in 1962.

Eight nitrogen and two irrigation treatments were imposed upon a field of New River flax planted Dec. 7, 1961. Nitrogen rates of 0, 75, 150 and 225 pounds per acre were applied in both single and split applications. The field was irrigated uniformly until April 27, when irrigation was terminated on half of the plots. The other half received four more irrigations during May and June, with the last one on June 21.

Based on $3 Price

The $42 figure is based on an average increase of 14 bushels per acre at an average price of $3 per bushel. This is the current quotation to farmers at Yuma.

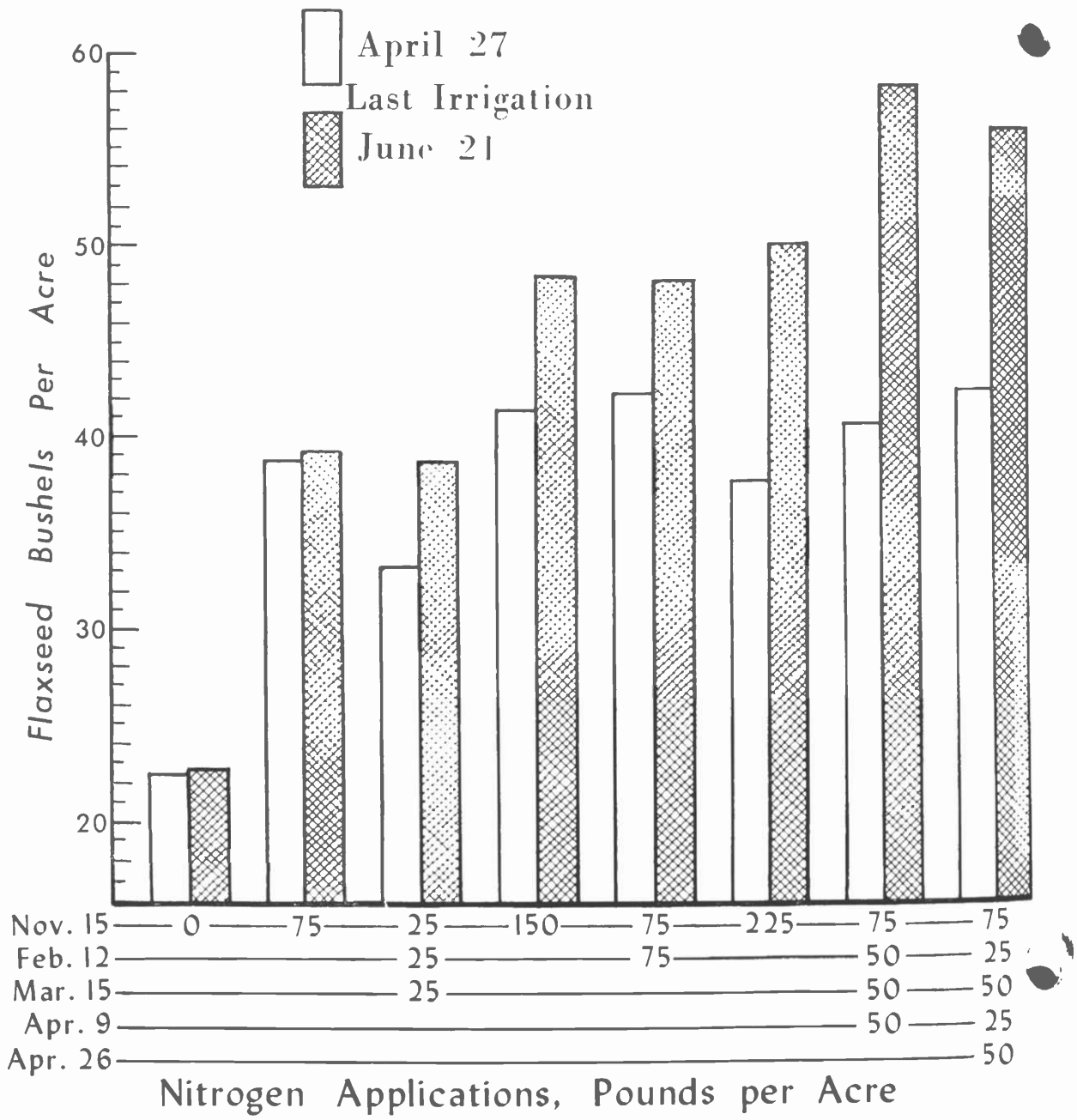
The increased yields resulted from a second and even a third blooming period brought on by the addition of nitrogen and moisture during the first two blooming periods. The fact that both nitrogen and moisture are necessary at this time is shown by the graph in Figure 1. This graph also shows that at a low level of nitrogen, the late irrigations were of limited benefit in increasing yields. On the other hand, high levels of nitrogen were ineffective when the irrigation was terminated early. It is also shown in Figure 1 that when a total of 225 pounds of nitrogen was applied, split applications properly timed were more effective than a single application.

A look at the table on page 13 will show that the nitrogen treatments had a small effect on per cent of oil in the seed, with a slight reduction at the high nitrogen levels. In spite of this slight reduction in per cent of oil, the highest yield of oil per acre was obtained at the highest nitrogen levels as shown in Figure 2. These results show that timely nitrogen

(Continued on Next Page)

Similar experiments at the Mesa Branch Station conducted by D. D. Rubis and Rex Thompson over a two-year period showed that timely irrigation and nitrogen applications resulted in yields over 60 bushels per acre. In 1962 four extra irrigations in May and June and 40 pounds of nitrogen per acre resulted in an increase of over 17 bushels per acre.

Figure 1



Dr. Jackson and Dr. Rubis are both Associate Agronomists and Mr. Carasso is an Assistant in Research in Agronomy. Dr. Jackson and Mr. Carasso are both stationed at the Yuma Branch Station.

Acknowledgment is made to Dr. H. F. Kreizinger of the Department of Agricultural Chemistry and Soils for his part in planning the experiment.

(Continued from Previous Page)

applications and irrigations can be very effective in increasing yields of flax.

Repeated Bloom Periods

This characteristic of the Imperial and New River varieties to go into a second and even third bloom period has been bred into these varieties. Varieties grown in Arizona 10 to 15 years ago did not possess this characteristic and were managed like small grains. However, today growers using proper fertilizer and irrigation practices have an opportunity for greatly increased flax yields.

The principle involved in producing a second and third bloom period or, as is often the case, a continuous blooming period, is dependent on timely applications of nitrogen and maintenance of adequate soil moisture. By adding nitrogen at the time of full bloom, or near the end of a blooming period, new vegetative growth is initiated in the leaf axils. This new branching then produces a new blooming period. If adequate moisture is not maintained the flax plant will become "hot" and go into final maturity with no extra blooming. Feeling the flax plants to determine whether they are cool is a good method to determine the need for an irrigation.

MYSTERY PICTURE

The mystery picture on Page 9, a fence corner set of ranch listings, is on the Sunset Valley Road. It is just west of Bonita, which in turn is just beyond Fort Grant.

It is about 24 miles west of the turnoff of the Fort Grant road, where it leaves Highway 666, between Willcox and Safford.

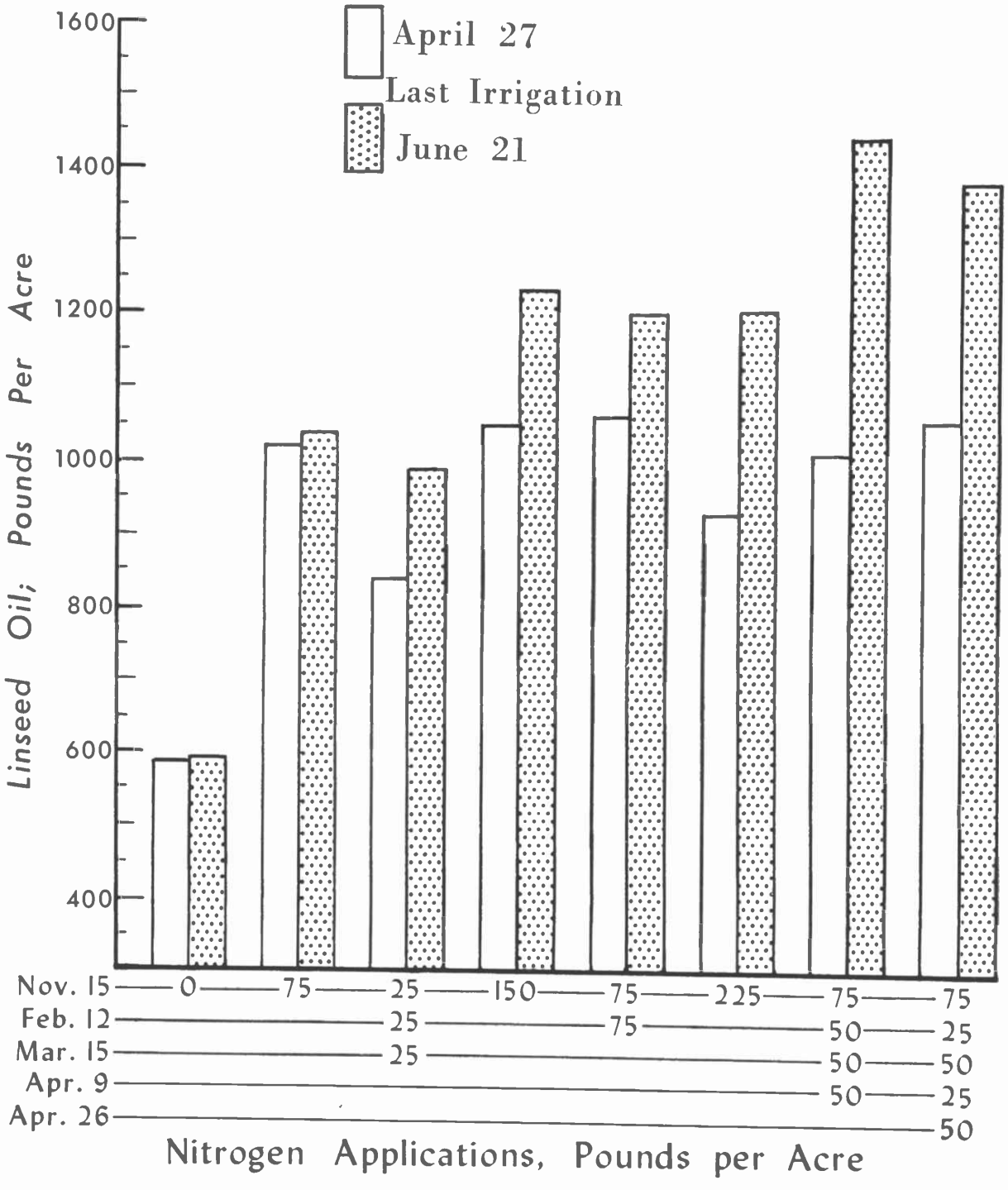
La alimentacion artificial de becerras con leche entera no presenta mayores problemas, excepto lo elevado del costo de la leche. Se recomienda que la becerra pase 2 ó 3 días con la madre para que tenga acceso libre al calostro. Sin embargo en el caso de vacas muy cariñosas con sus crías, con sangre cebú o criolla, es preferible separar inmediatamente las crías o apenas han mamado la primera vez y continuando dando los calostros en balde.—TIERRA

The sex life of coyotes is under scrutiny by Don Balser, a Fish and Wildlife Service scientist in Denver. What he seeks is a chemosterilant which will prevent coyotes from having pups. The idea isn't as far-fetched as it sounds, because a coyote female comes into heat only once, perhaps twice a year, for 10-day periods. Balser's plan is to "bait" her during breeding season and prevent conception.

Per cent oil content of flax seed grown under different irrigation and nitrogen treatments. Yuma Valley Branch Station, 1961-62.

	Nitrogen treatments, pounds per acre							
Nov. 15	0	75	25	150	75	225	75	75
Feb. 12			25		75		50	25
Mar. 15			25				50	50
Apr. 9							50	25
Apr. 26								50
Last Irrigation April 27	46.5	47.0	44.9	45.0	44.7	43.7	44.2	44.1
Last Irrigation June 21	46.4	47.1	45.3	44.4	44.5	43.1	44.1	43.7

Figure 2



Our esteemed friend on The Minneapolis Tribune, Will Jones, points out: "If a Midwest farmer sits on his porch in his undershirt he's a slob; if a Southwestern farmer sits out in his patio in Bermuda shorts it's called 'gracious living.'"

If University of Arizona Holsteins get that dreamy Hawaiian look, you can blame it on a new feeding experiment. Cargill, Inc., has donated 2500 pounds of coconut oil meal and 400 pounds of coconut oil to the Dairy Science Department. This will be used in feeding experiments to determine the nutritive value of coconut oil meal and oil for dairy cattle.

The Case of the Missing Citrus

Ross M. Allen

If a man has a $13,000 per year job he expects his pay checks to show a gross total of that amount. However, if the gross total is only $7,850, even before taxes, he knows something is wrong and does something about it.

When an Arizona industry has a potential gross income of $13,279,625 but receives only $7,844,095 per year, the thousands of industry members are not taking home their full pay check.

As startling as they may seem, the figures quoted above show the potential and actual returns for the Arizona citrus industry for 1962. The computations are based on the actual bearing acreage (trees 8 years old or older) for each type of citrus: oranges, grapefruit, lemons, and tangerines.

Actual yields and average returns per field box are calculated for each crop. These are compared with the potential yields and returns — which is what the industry could get if losses from diseases, physiological disorders, detrimental environmental influences and faulty cultural procedures could be averted completely.

Dr. Allen is an associate plant pathologist at the Yuma Branch Experiment Stations.

$5½ Million Loss

Let's look at the figures in Table I. The difference between actual crop value, $7,844,095, and the potential value, $13,279,625, means that $5,435,530 has been lost somewhere along the line. Somehow, 41 per cent of the industry pay check has simply vanished. Perhaps a little detective work will expose the culprits.

Table II lists some of the various causes which have brought about this $5½ million loss. The percentage taken by each of them — fungi, viruses, nematodes, disorders and frost, has been estimated by University of Arizona citrus specialists. This percentage can be converted easily into the dollar value of lost or damaged citrus.

This table also shows that the known culprits have taken more loot from some crop areas than from others. Valencia and sweet orange income has been reduced by 31 per cent — amounting to a hefty $1,623,650. Navel oranges lost 31 per cent or $1,176,440; white grapefruit, 25

(Continued on Next Page)

Table I. Comparison of current actual and potential annual production returns from Arizona citrus varieties.

Variety	*Bearing Acreage*[1]	*Actual Yield Field Boxes/A*[2]	*Average Return per Field Box*[3]	*Actual Crop Value*[4] *Per Acre*	*Actual Crop Value*[4] *Total*	*Potential Yield Field Boxes/A*[5]	*Potential Crop Value*[6] *Per Acre*	*Potential Crop Value*[6] *Total*	*Dollar Value Lost for Various Causes*[7]
Valencia Oranges	4,009	320	$2.25	$720.00	$2,886,480	500	$1,125	$ 4,510,125	$1,623,645
Sweet Oranges	1,074	320	2.00	640.00	687,360	500	1,000	1,074,000	386,640
Navel Oranges	4,600	140	2.75	385.00	1,771,000	300	825	3,795,000	2,024,000
White Grapefruit	5,131	750	.20	150.00	769,650	1000	200	1,026,200	256,550
Red Grapefruit	426	750	.55	412.50	175,725	1000	550	234,300	58,575
Lemons	2,766	640	.75	480.00	1,327,680	1000	750	2,074,500	746,820
Tangerines	377	200	3.00	600.00	226,200	500	1,500	565,500	339,300
	17,335				$7,844,095			$13,279,625	$5,435,530

[1]Acreage data based on Hilgeman, R. H., and C. W. Van Horn, 1955. Citrus Growing in Arizona. Ariz. Agr. Exp. Sta. Bulletin 258 (Revised). Modified by additional data, June 1962, from Orange and Grapefruit Prorate Offices and Sunkist Exchange to account for acreage subdivided in the Salt River Valley.

[2]Estimates based on packing house data and yield records of Branch Citrus Experiment Stations at Tempe and Yuma.

[3]Average returns are estimates based on limited information from packing houses in Yuma and Salt River Valley and on returns received by Tempe Citrus Station.

[4]Calculated on basis of returns from acreage at least 8 years old.

[5]Potential yield estimates based on specific knowledge of selected bearing acreage of the several varieties where detrimental effects of diseases, pests, weather, and cultural malpractices are nearly minimal. Estimates are regarded as conservative in all categories.

[6]Based on present average return per field box.

[7]Difference between "Actual" and "Potential" crop values. Causes include horticultural and pathological problems.

(Continued from Previous Page)

per cent or $256,540; red grapefruit, 25 per cent or $58,550; lemons, 17 per cent or $352,660; and tangerines, 33 per cent, for a loss of $186,610. It is readily apparent that the diseases and parasites are truly big time operators.

Virus Loss $1 Million

When the UA Plant Pathology Department scientists finished assigning the culprits into causal groups, the results are reported in Table III. The fungi and nematodes account for $304,140 and $621,540, respectively. The viruses managed to get away with the largest amount, $1,200,450. Physiological disorders, granulation and frost took a large share, $439,420, $306,980 and $781,920, respectively.

These causes total only $3,654,450 of the citrus loss. There still exists the difference between $3.6 million (Table III) and the $5.4 million reported lost (Table I). We believe the missing $1,781,080 can be attributed to such physical causes as faulty irrigation, nutritional deficiencies, root-stock problems, salt problems, poor drainage, pruning difficulties, weed competition and minor other unidentified causes.

A new enemy of citrus, tristeza virus, possibly has been dipping into the cash drawer, too, but the amount lost cannot be reported at this time.

UA Scientists Working On It

What is being done about these things which pare away $5½ million from Arizona's annual citrus income? In the College of Agriculture, the Departments of Plant Pathology and Horticulture are very much aware of this multiple problem. The viruses (tristeza, psorosis, xyloporosis, exocortis, Stubborn Disease, and a few others) are being subjected to an extensive (and very expensive) virus indexing program at the Yuma Branch Citrus Station.

Work on the Arizona Budwood Improvement Program is being pushed by UA and USDA plant scientists. These workers have imported more than 50 good citrus varieties to check virus diseases and rootstock problems. The fungi are being attacked through experiments on Phytophthora root rot, Rio Grande Gummosis, Dry Root Rot and Hendersonula rot.

Granulation, irrigation, nutritional deficiencies, frost injury and pruning are being worked over by the Horticulture Department. Nematodes are being checked by UA and USDA scientists. Increased usage of nematocides and wind machines help curb nematodes and frost injury. A few of the lesser criminals, though still on the loose research-wise, are still on the "wanted list."

Needs Bigger Police Force

And so we come to the final chapter of "The Case of the Missing Citrus." The Arizona citrus industry is being robbed of 5.5 millions of dollars each year. Certain thieves have been apprehended

(Continued on Next Page)

Table II. Estimated annual production losses from Arizona citrus groves, eight or more years old, due to diseases and other conditions.

Disease or Condition	*Valencia and Sweet Oranges*		*Navel Oranges*		*White Grapefruit*		*Red Grapefruit*		*Lemons*		*Tangerines*	
	Esti-mated Per cent Loss[1]	*Thousands of Dollars Loss*[2]	*Esti-mated Per cent Loss*	*Thousands of Dollars Loss*	*Esti-mated Per cent Loss*	*Thousands of Dollars Loss*	*Esti-mated Per cent Loss*	*Thousands of Dollars Loss*	*Esti-mated Per cent Loss*	*Thousands of Dollars Loss*	*Esti-mated Per cent Loss*	*Thousands of Dollars Loss*
Root rot fungi	1.0	55.84	1.0	37.95	2.0	20.52	2.0	4.69	1.0	20.74	—	—
Psorosis virus	3.0	167.52	3.0	113.85	5.0	51.31	5.0	11.71	—	—	—	—
Xyloporosis-Cachexia	1.5	83.76	1.5	56.92	1.0	10.26	1.0	2.34	1.5	31.12	5.0	28.28
Stubborn Disease	4.5	251.28	10.0	379.50	1.0	10.26	1.0	2.34	—	—	—	—
Rio Grande Gummosis	—	—	—	—	1.0	10.26	1.0	2.34	—	—	—	—
Nematodes	5.0	279.20	5.0	189.75	5.0	51.31	5.0	11.71	3.5	72.61	3.0	16.96
Mesophyll Collapse	1.0	55.84	1.0	37.95	1.0	10.26	1.0	2.34	—	—	—	—
Alternaria rot-fungus	—	—	4.0	151.80	—	—	—	—	—	—	—	—
Splitting-physiological	1.0	55.84	1.5	56.92	—	—	—	—	—	—	—	—
Breakdown-physiological	2.0	111.68	2.0	75.90	0.5	5.13	0.5	1.17	1.0	20.74	1.0	5.65
Granulation	2.0	111.68	2.0	75.90	0.5	5.13	0.5	1.17	—	—	20.0	113.10
Freeze Injury	10.0	451.01[3]	—	—	8.0	82.10	8.0	18.74	10.0	207.45	4.0	22.62
	31.0	1,623.65	31.0	1,176.44	25.0	256.54	25.0	58.55	17.0	352.66	33.0	186.61

[1]Based on averaged reports by several citrus specialists. Adjusted by acreage for districts. Figures adapted from typewritten report by R. H. Hilgeman to H. L. Keil, U.S.D.A., dated May 9, 1962.

[2]Losses calculated from "Potential Crop Values" shown in Table 1.

[3]Valencia oranges only.

Table III. Annual production losses from Arizona citrus groves, eight or more years old, according to causal groups. (Expressed in thousands of dollars.)

Causal Group[1]	*Sweet and Valencia Oranges*	*Navel Oranges*	*White Grapefruit*	*Red Grapefruit*	*Lemons*	*Tangerines*	*Total*
Fungi (Items 1, 5, 8)	55.84	189.75	30.78	7.03	20.74	—	304.14
Viruses (Items 2, 3, 4)	502.56	550.27	71.83	16.39	31.12	28.28	1,200.45
Physiological (Items 7, 9, 10)	223.36	170.77	15.39	3.51	20.74	5.65	439.42
Nematodes (Item 6)	279.20	189.75	51.31	11.71	72.61	16.96	621.54
Unknown (Granulation) (Item 11)	111.68	75.90	5.13	1.17	—	113.10	306.98
Environmental (Item 12)	451.01*	—	82.10	18.74	207.45	22.62	781.92
	1,623.65	1,176.44	256.54	58.55	352.66	186.61	3,654.45

[1]Groupings are from following listed diseases or conditions:

1. Root rot fungi
2. Psorosis virus
3. Xyloporosis-cachexia virus
4. Stubborn disease virus
5. Rio Grande Gummosis fungus
6. Nematodes
7. Mesophyll collapse — physiological
8. Alternaria rot fungus
9. Splitting — physiological
10. Stem-end or rind breakdown — physiological
11. Granulation — cause unknown
12. Freeze injury

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and are being questioned by lawmen of several departments of the UA College of Agriculture and by USDA scientists. The criminal elements, fungi and viruses, of the citrus disease mob are netting an annual haul of $1,504,590. The disease research force combatting these criminals had an operating budget, exclusive of salaries, of $12,600 for fiscal year 1962. This budget is only .8 of 1 per cent of the citrus loss. It would appear that a larger budget would be a wise investment.

Cotton's Hunger Can Be Measured, Says T. C. Tucker

Cotton plants can tell farmers whether they are hungry for more nitrogen or are receiving enough for a successful crop.

This advanced technique was presented before the Western Cotton Production Conference at Phoenix last March by Dr. T. C. Tucker, professor of agricultural chemistry and soils at The University of Arizona.

The method he outlined was analysis of stems from the cotton plant's leaves, and he said it was more effective if used in connection with soil testing to cover the whole season.

Stem analysis, or petiole analysis, is done by collecting 25 or 30 of the stems that connect the leaf to the stalk, then sending these stems to a laboratory to find out the nitrate nitrogen level. The samples are first collected when young squares begin to appear, then every two weeks until early August.

Dr. Tucker said farmers should select stems from the youngest mature leaf from the sample plants. Usually, this would be the third or fourth leaf from the top of the plant, he said.

Soil readings are taken before the squares start forming so the nitrogen in the soil can be adjusted early in the season. The stem readings then take over when the plant starts squaring.

"If the soil nitrate level is between 20 and 30 parts per million, nitrogen fertilizer will not be needed before petiole analysis data can be used . . .," he told his audience.

As cotton plants get older and near the fruiting stage, it's desirable to let the nitrogen level decline some, he pointed out. Levels desired in the various stages for Arizona conditions are: 15,000 to 18,000 parts nitrate nitrogen per million when first squares form; 12,000 to 14,000 parts per million when flowering begins; 6,000 to 10,000 parts per million as the first bolls form; and 4,000 parts per million at the time the first bolls are opening. All of this information can be gained from analysis of the stems so the fertilizer program can be adjusted to obtain these desired concentrations of nitrate nitrogen.

Dr. Tucker emphasized that petiole analysis is most valuable when used with soil analysis for nitrate nitrogen, then he told what the analysis system could NOT do.

"These tools cannot be used to increase the maximum yield possible or to correct any factor limiting yield that is not nutritional. Therefore, the most effective use of these tools will not always increase yields. They can aid only in insuring that adequate nitrogen is available for the maximum yield possible under existing conditions. In many cases, the only benefit that the grower can derive from the use of these tools is the assurance that the nitrogen fertilizer program was adequate and that excessive fertilizer was not used," he said.

3 UA Men Honored By Veterinarians

Three University of Arizona animal pathologists have been named honorary members of the Southern Arizona Veterinary Medicine Association.

Those honored were Dr. Richard H. Diven, Dr. Leonard W. Dewhirst and Robert J. Trautman. None is a veterinarian.

"Although these men are not veterinarians, they have worked so closely with our association and are so familiar with our problems that we felt they deserved honorary membership," said Dr. Lloyd Orsborn, Tucson veterinarian and spokesman for the association.

FORAGE SORGHUMS

When to Plant in the Mesa Area

Robert L. Voigt

How can I get the most for my money? This is a familiar question in agriculture just as in any business. Personnel in sorghum investigations at The University of Arizona are continually trying to help answer this question for Arizona farmers.

A "date-of-planting" test was conducted at the Mesa Experiment Station in 1960 to check for optimum dates of

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The author is an assistant professor of Plant Breeding and assistant plant breeder in the Agricultural Experiment Station in charge of sorghum investigations, both Grain and Forage.

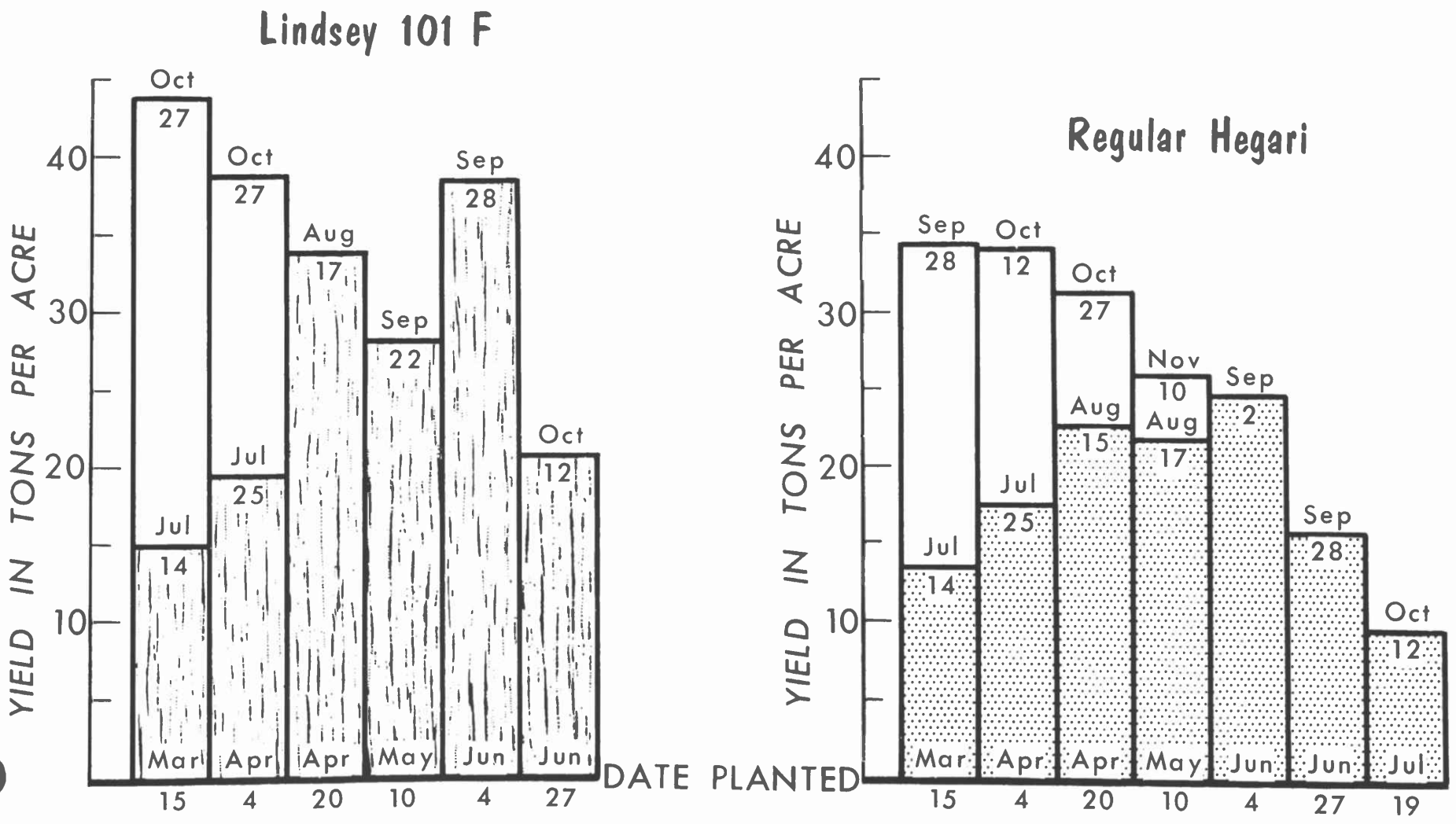
Table 1. Shown below are calculated daily growth rates in tons per acre by dates of planting of two silage sorghums.

LINDSEY 101F

Date Planted	*Days to Cut*	*Yield in T./A.*	*Growth Rate in T./A. Per Day*
March 15	121	14.86	.123
April 4	112	18.47	.165
April 20	119	33.40	.281
May 10	135	27.69	.205
June 4	116	37.42	.323
June 27	107	20.69	.193

REGULAR HEGARI

Date Planted	*Days to Cut*	*Yield in T./A.*	*Growth Rate in T./A. Per Day*
March 15	121	13.45	.111
April 4	112	17.56	.157
April 20	117	22.43	.192
May 10	99	21.70	.220
June 4	90	24.46	.272
June 27	93	15.30	.165
July 19	85	9.03	.106



YIELDS IN TONS per acre of silage from Regular Hegari and Lindsey 101 F, planted about every three weeks at Mesa in 1960. Figures adjusted for 30 per cent dry matter. The shaded portions of these columns show yield and date of first cutting; unshaded is yield and date of second harvest.

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planting of forage sorghums. Highest yield (tons per acre) was assumed to indicate the most desirable period to plant. These results, although for only one year, showed a great difference in tonnage of forage produced at different dates of planting in the Mesa area.

Used Two Varieties

Two different forage sorghums were used: Regular Hegari, a commonly grown variety, and Lindsey 101 F, a commercial hybrid which was well adapted to the area. Plantings were made about every three weeks beginning on March 15. Yields in tons of fresh silage per acre have been adjusted at 30 per cent dry matter for comparison and are given in our graph. All harvests were made as near to soft dough stage of grain development as possible which correlates reasonably close to the 30 per cent dry matter stage that is desired by most feeders.

The total seasonal yield is measured by the full height of the bars, with the shaded portions indicating the first cut from each planting date. The total yield for the season is, of course, highest for the earliest planting date and decreases for both varieties with progressively later planting dates. The selection of a proper planting date can be just as important in obtaining high production as is proper choice of a variety or hybrid seed.

It is important to learn from these data what is the best time to plant to get the highest yield of silage from a single cutting. This is important to the Arizona farmer who may have a tight crop rotation schedule on his land, and wishes to make each crop return the most for his money.

First of June is Best

The highest single cut yield was obtained with the June 4 planting date. This indicates that in the Salt River Valley area the latter part of May or the first part of June is generally the best planting date for forage sorghums to get the most tonnage. Much smaller yields result from either earlier or later plantings. Farmers should realize that there is no one high yield from a particular recommended variety or hybrid.

'Rate of Gain' Sorghumwise

Some more interesting data were obtained by dividing the total yield in tons per acre by the number of days it took to grow the crop for each date of planting. This rate in tons per acre per day of silage is much like the rate of gain per day in beef cattle. Table I shows a peak daily growth rate for the June 4 planting. The hybrid Lindsey 101F shows a higher rate for most dates than the standard variety Regular Hegari. Here, again, the use of a hybrid is little different than selecting a type of feeder cattle that will give you the highest daily gains.

Earliness Means Protein

The quality of forage harvested (TDN) as measured by laboratory analyses for digestible laboratory nutrients (DLN) and protein show some interesting trends. In Table II are given the per cent DLN and per cent protein on a dry matter basis for each cutting by date of planting. Note the higher per cent DLN and lower per cent protein for all second cuttings when compared to first cuttings. Also there was a general continuous decline in per cent protein as the season progressed.

Sorghum is quite responsive to photoperiodic effects and temperature in its growth rate, and temperature may also have a pronounced effect on the chemical composition of a plant. A study now under way seeks to determine response of sorghum genotypes at various altitudes (temperatures) and the same day lengths. Already this study is beginning to yield some interesting results. This study will be reported upon as soon as there are sufficient results to warrant conclusions helpful to farmers.

Table II. Per cent digestible laboratory nutrients and per cent protein of two silage sorghums by date of planting and cutting.

LINDSEY 101F

	First Cutting		*Second Cutting*	
Date Planted	*% DLN*	*% Protein*	*% DLN*	*% Protein*
March 15	74.5	7.79	75.0	3.19
April 4	67.0	5.33	78.0	3.34
April 20	63.0	6.30		
May 10	72.5	5.19		
June 4	67.5	4.93		
June 27	66.0	3.71		

REGULAR HEGARI

	First Cutting		*Second Cutting*	
Date Planted	*% DLN*	*% Protein*	*% DLN*	*% Protein*
March 15	73.5	7.41	75.0	4.57
April 4	68.5	5.54	78.5	4.57
April 20	69.5	6.97	78.0	4.37
May 10	68.5	6.20	73.5	4.70
June 4	70.5	4.80		
June 27	80.5	4.57		
July 19	77.0	3.24		

Arizona Active in 'Service to Youth'

Arizona continued as an active participant in the "Service to Youth" programs of the National 4-H Club Foundation last year, according to the foundation's annual report just published.

The foundation handles the international farm youth exchange program, operates the national 4-H center in Washington, D. C., trains professional workers and conducts experimental projects and studies.

Arizona took part in the youth exchange program by playing host to John J. Park of England. Park was the guest of two Arizona families — Mr. and Mrs. John Heward of Holbrook and Mr. and Mrs. D. L. Scott of Morenci.

Arizona also sent Mrs. Audrey M. Davis, home agent in Mohave County, to the annual National Workshop in Human Development and Human Relations Training.

Listed among the financial sponsors of the foundation's programs was the United Dairymen of Arizona, Tempe.

Thomas M. Ware, a native of Globe and president of International Minerals and Chemical Corp., Skokie, Ill., was named to the National 4-H Sponsors Council, an executive group that advises on the financial development of the program of the foundation.

For Saving Surface Water Supplies

MONOMOLECULAR FILM REDUCES EVAPORATION

C. Brent Cluff and Howard Goldstein

Of all the world's natural resources, water is one of the most basic to man's survival. In the arid regions of the world, water is in very short supply. As the population increases the strain on available supplies is becoming more acute.

One very important source of agricultural water in many arid regions is the farmer's or rancher's individual pond. The value of this water is multiplied many times in isolated areas where other water sources are unavailable. Conservation of this water is of critical importance. In many of these areas, the evaporation loss may amount to as much as six vertical feet of water per year. Not only is this water lost, but the water left behind is of lower quality because of the concentration of dissolved salts.

Evaporation Inhibiters

Water that ordinarily would be lost to evaporation can be saved by applying a material that will form a monomolecular film on the surface of the water. Films of the fatty alcohols, hexadecanol and octadecanol, have proven most successful. These alcohols have a long carbon chain molecule, one end of which is attracted to water, the other end being repelled by water.

These attracting and repelling forces cause the long alcohol molecules to stand perpendicular to the surface of the water in a monomolecular film. The thickness of this monomolecular layer is approximately one ten-millionth of an inch.

Films of these materials are not toxic to animals or plants. They offer no appreciable resistance to oxygen or carbon dioxide diffusion, yet they have high ability to suppress evaporation of water. The theoretical amount of this material necessary to form a monolayer on water is quite small (0.08 lb./acre).

Even at a cost of about 50 cents a pound for the material, the economics of evaporation suppression by this method are quite promising. In laboratory experiments using four-feet diameter pans these films were able to conserve as much as 65 per cent of the water normally lost to evaporation.

Savings Up to 30 Per Cent

The Australians were the first to try using the hexadecanol monolayer to prevent or suppress evaporation on reservoirs back in 1952. They reported that they obtained up to 30 per cent savings on small reservoirs by dispensing the hexadecanol in flake form from gauze floats.

The Australian results interested various governmental research agencies in the United States where testing of monolayers on reservoirs began around 1955. Various estimates of the cost of saving water in large reservoirs have been made. These range from $4.50 to $300 per acre foot.

There is no question that the monolayer film will reduce evaporation. The problem is trying to maintain a film coverage so as to maximize savings with a minimum cost of water saved. Factors which break up or destroy the film coverage are wind, bacteria and sunlight. Of these, wind seems to be the most important, because if a wind is blowing the film will not remain on the water long enough to be destroyed by sunlight and bacteria. Since the evaporation rate is very high during periods of wind, continuous application of the material is necessary if maximum savings are to be obtained.

Can Be in Many Forms

The various physical forms of fatty alcohols that can be applied are: (1) powder, (2) solid, (3) molten, (4) solution, (5) emulsion or slurry, and (6) flakes. Of these forms, powders, solutions (in hot weather), and emulsions seem to be giving the best results.

Molten hexadecanol can be sprayed through a nozzle to form a powder but the equipment involved makes it impractical for small ponds. On the other hand, the use of solvents may prove to be practical on a small pond because of the relatively cheap equipment required. However, it would not be practical on a larger reservoir where cost of the solvent would be prohibitive. Thus, method and cost of application depend on the size of the reservoir. The type of dispensing equipment suitable for a large reservoir probably would not be economically feasible for stock ponds.

In July 1961, the Institute of Water Utilization of The University of Arizona entered into a contract with the U. S. Bureau of Reclamation to find the best combination of the various chain lengths of fatty alcohols, the best physical state to use, and the best apparatus to use for stock ponds and reservoirs under 10 acres in size.

'Film' Pond and Check

For field testing purposes, duplicate ponds 53 by 78 feet in size were built and lined with vinyl plastic to prevent seepage. A stilling well and a hook gage at each pond is used to measure change in water storage. The testing procedure calls for applying the film on one pond and comparing the water loss with that from the untreated pond.

To date, screened rafts with flakes of hexadecanol inside have been used with little or no savings. Solid material in the form of doughnuts have also been tried with no savings. Powder has been applied three times daily, resulting in savings of 6 to 10 per cent. A self-feeding grinder-duster, which is a scaled down version of the one the Australians developed, has been built.

The grinder-duster consists of a small six volt motor and a wire brush, with a feed system where the hexadecanol is fed into the grinder, using a weight and pulley system. By using this duster, we have completely covered a 1½ acre lake within a matter of minutes with a film of maximum cover. However, it may prove to be impossible to keep a pond covered dispensing from only one or two points during high winds.

Solutions using common white gasoline as a solvent have been tested, using a simple dispensing apparatus which utilizes the difference in specific densities between white gasoline and water. A bottle containing fatty alcohol dissolved in white gasoline is placed on the bottom of the reservoir and coming out of the bottle are two glass tubes. One tube extends to the bottom of the bottle. This tube allows the water to enter. The fatty alcohol in solution will float to the top of the bottle and will be forced out the plastic tubes leading to the surface. These tubes lead to wind vanes on the ponds

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Mr. Cluff is a research associate and Mr. Goldstein a research assistant, both on the staff of the Institute of Water Utilization within the College of Agriculture.

What YOU Can Do

Donald V. Robertson

"Ask not what your country can do for you. Ask what you can do for your country."

All hearts were stirred by this challenge voiced by President Kennedy in his inaugural address. All ears waited to hear what needed doing. All responsible citizens searched for a way to help their country.

Americans responded in different ways to the challenge. Some joined the army. Some volunteered for the Peace Corps. Some became active in community affairs. But most still wait for instruction as to the best way they can serve their country.

To those who wait, we have a suggestion: Do your best.

By doing your best you can help combat a doctrine that is fast engulfing America -- a doctrine more dangerous than Communism or Fascism or anarchy -- the doctrine of Good Enough.

The mechanic who does a half-way job (it's good enough), the manufacturer who uses shoddy parts in his product (they're good enough), the scientist who is satisfied with slipshod, inexact research (it's good enough), the student who plays and loafs and gets barely passing grades (they're good enough), all are unwitting participants in this silent conspiracy of mediocrity. Unless it is reversed, this conspiracy, this unconscious treason, can make America second class more quickly and more surely than conspiracies that deliberately work for America's destruction.

But the conspiracy of mediocrity can be reversed. Each person need only do the best he can. He may not achieve perfection in his job; few are capable of it and circumstances do not often allow it. But he must conscientiously strive for perfection.

Only by doing his best can a person realize his greatest potential as a citizen, an employee, and an individual.

So to serve your country, to serve your employer, to serve yourself: Do your best.

Editor's Note: The above was written by Donald V. Robertson, publications editor in the Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md. It was included in a writing assignment given University of Arizona and USDA personnel in Tucson a few months ago. We felt it deserved a wider audience.

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that keep the material applied into the wind.

Using this apparatus, savings of from 15 to 20 per cent were obtained. Before additional tests could be made in the fall of 1962, the temperature began to drop below 60°F. at night. This caused the alcohol to precipitate out of solution, which plugged up the dispensers. Further tests made in the laboratory showed that the solubility of alcohol in white gasoline was very temperature dependent and not practical when temperatures dropped below 60°F.

Next — Emulsions

Because of this unforeseen development, testing with solutions was stopped. Emulsions were tried next. Various types of emulsifiers and alcohol concentrations have been tried. A stable emulsion containing as high as 10 per cent alcohol, which can be fed by gravity through a quarter inch plastic tube, has been used. Emulsions of various concentrations of alcohol and emulsifying agents will be tested further. To date savings of water as high as 30 per cent have been obtained using a 10 per cent concentration of alcohol, feeding the emulsion continuously by gravity.

Although there needs to be a lot of additional research done to determine the optimum physical form and the best means of dispensing the monolayer, it now appears that emulsions fed through a gravity feed system are the most promising, at least as far as small reservoirs and stock ponds are concerned. Most of the remaining time in this project will be spent in testing emulsions.