

PROGRESSIVE



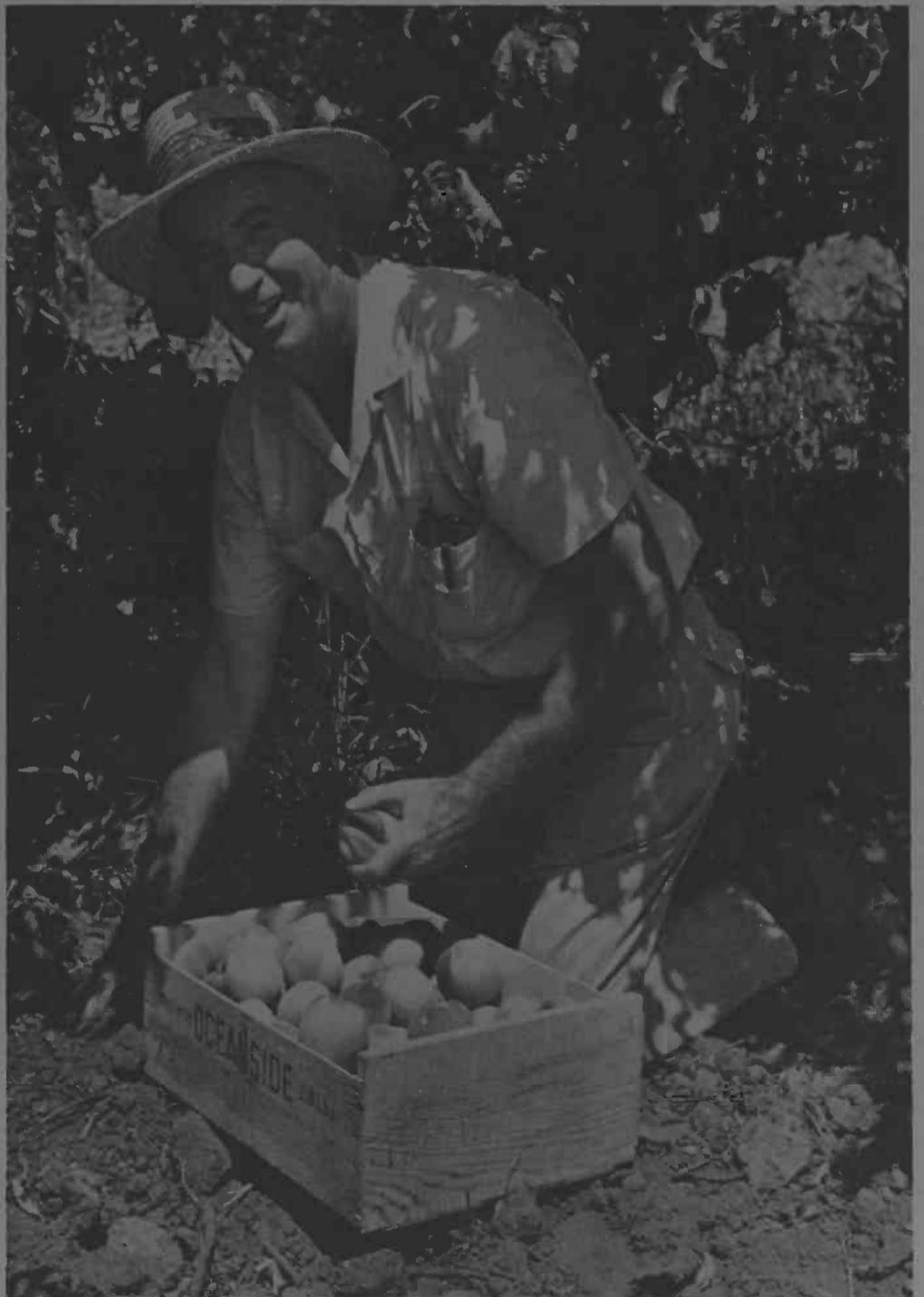
# *agriculture in arizona*

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

MARCH — APRIL

1966

Vol. XVIII No. 2



# AN EXTENSION ISSUE

This is an unusual issue of PROGRESSIVE AGRICULTURE, different from any which have preceded it during the past 17 years.

This issue is largely an "Extension Issue," with an overwhelming proportion of articles by and about Extension workers in this college.

Originally, PROGRESSIVE AGRICULTURE relied heavily on research reports for its content. Gradually the direction changed, to make it a magazine representing all facets of this College of Agriculture — resident teaching, research and extension. This time, somewhat by chance but also by choice, the Extension offerings make up a large share of the magazine.

We are happy to see this prominence given to Extension. Today, the survival of much of the world is based on increasing food production. That, in turn, has been given worldwide impetus through "Exporting the Land-Grant college idea to needy nations throughout the world."

Most amazing to these peoples in other lands is Extension, the idea that as soon as valuable new things are learned (through research) they are taken directly to those who can make practical use of that new knowledge. Research is only part of the production line which produces food and fiber and a better life.

The old world idea was different. Wise men learned things, through the centuries, and in writings passed their knowledge on to other wise men. The learned scholar stayed in his cloistered cell, aloof from the common people. Great founts of knowledge existed side by side with abject poverty and ignorance.

Exporting the Land-Grant idea — including Extension — is changing that. And in changing it, in bettering the living and increasing the knowledge of the whole people, it is helping bring about economic and political stability, edging a little farther forward toward that ultimate goal of a world at peace, with happy people plentifully fed and amply clothed.

*Harold E. Myers*

Dean  
College of Agriculture  
and  
School of Home Economics

## PROGRESSIVE AGRICULTURE IN ARIZONA

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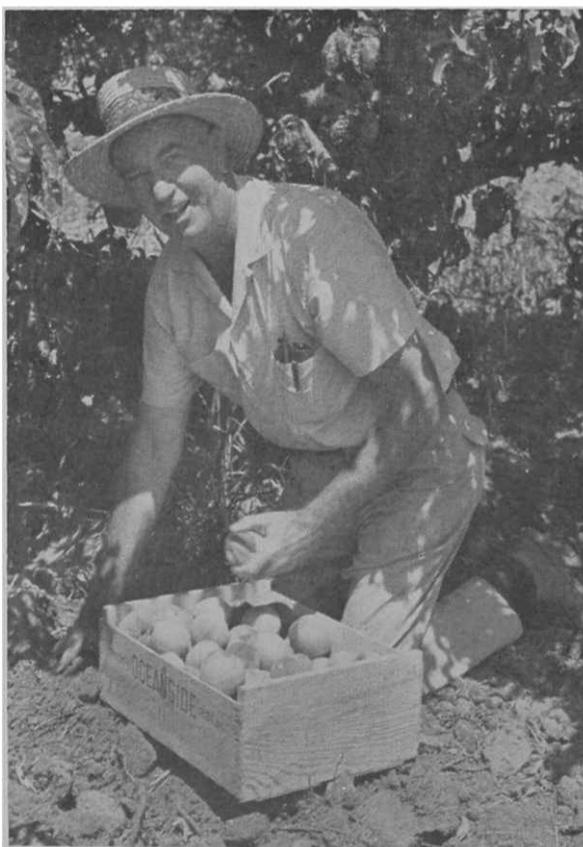
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### Our Cover Picture



Maybe everybody who owns a tree in Arizona doesn't know Harvey Tate, but the exceptions are few. For some

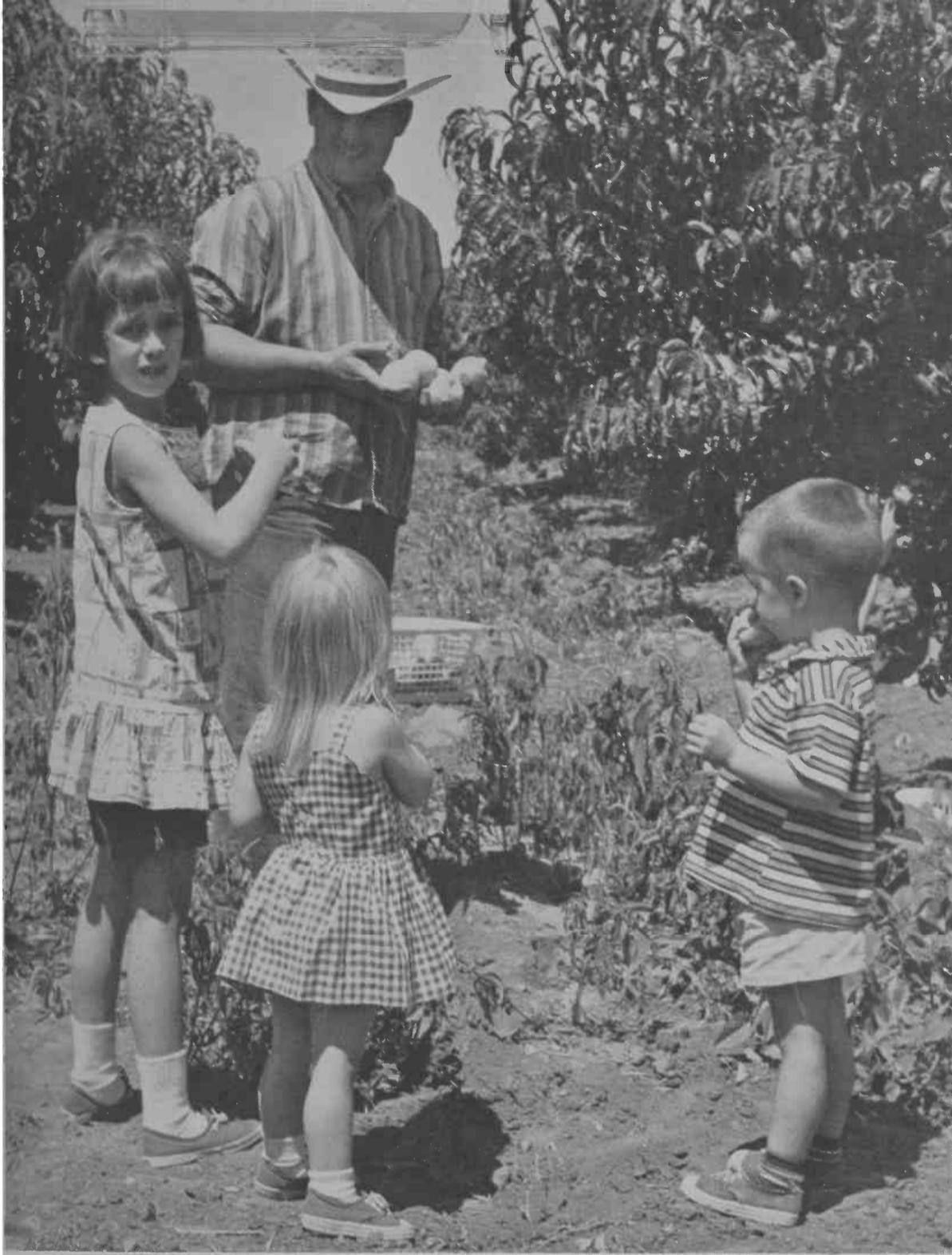
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30 years Extension Horticulturist Harvey Tate has been the friend of trees, shrubs, flowers — and people — throughout Arizona.

His gracious manner, his understandable discussions, his knowledge and love of the subject matter, all have combined to make him one of the best known and most warmly greeted University of Arizona visitors who serve the agriculture and the homes of Arizonans.

Our cover picture ties in with the cover story, in which Harvey Tate tells about a Sulphur Springs Valley peach orchard and the owners who have devised a novel and most successful method of harvesting their luscious crop.



**DADDY'S LITTLE HELPERS** get more peaches in themselves and on themselves ← than they do in the basket, but it is a healthful, happy day for all, so what's the difference!



**THEIR LAST CARTON** isn't quite full as they "weigh in," but these two girl friends had a happy, hair-strewn day, enough fresh fruit for their families, and healthful exercise.

## "Pick 'em Yourself" — A Peachy Family Outing

By Harvey F. Tate

*Some Arizona farmers are making a good living growing crops and using only a minimum of labor to harvest them.*

Extension Horticulturist Tate is a veteran staff member, for 30 years giving valuable counseling regarding fruit trees, ornamentals, flowers and lawns to farmers, orchardists and home owners in Arizona.

What is happening in Arizona today is a marketing of tree fruits by the customers themselves, profitable to the growers and enabling hundreds of families to enjoy the highest quality tree-ripened fruit at a very reasonable price.

Most of this pick-'em-yourself fruit growing is in the southeastern part of the state, in Cochise County. County and state extension and research personnel from The U of A College of Agriculture have been helpful to these fruit growers, as they experimented with varieties and cultural practices.

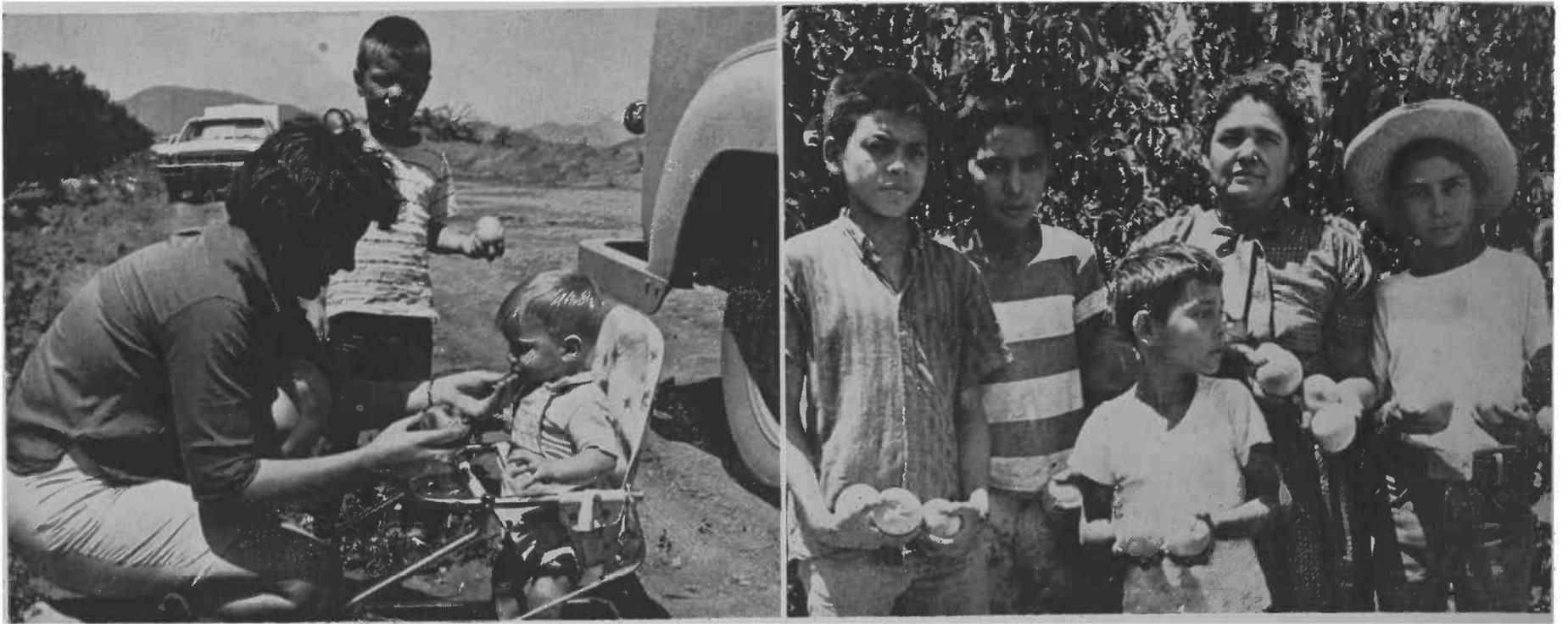
### Grizzle Orchards Typical

Lewis Grizzle, with orchards near Elfrida, in the Sulphur Springs Valley, has one of the larger orchards, over 70 acres. This includes about 55 acres of peaches, 10 of apricots and 6 of plums. Trees are spaced 20 x 20 feet, permitting between-row disking to keep out weeds and grass. Good quality water, from pump irrigation, is applied every couple weeks during the growing season via furrow irrigation. Nitrogen fertilizer is applied as needed.

Varieties are selected and planted so the harvesting season can be extended through the summer. The apricots come first, in mid-June, then the peach and plum varieties (and second pickings) extend the ripening season into September. Peach varieties, in order of ripening, have a gay ring to their names — Cardinal, Dixie Red, Golden Jubilee, Red Haven, Hale Haven, Veteran, Sullivan Elberta, Early Elberta, Elberta, Hale, Rio Oso, Gem, and closing the season in September is Lizzie.

During the season, Mr. Grizzle and his helpers direct a steady stream of

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**EVEN THE TINIEST** little helper enjoys fresh tree-ripened and sun kissed Arizona peaches (left). And a family of agile boys (right) is an effective labor force in the orchard.

autos to the portions of the orchards where ripe fruit is ready for picking. Under a lawn umbrella in the Grizzle dooryard, with an improvised desk (a peach box, naturally!) next to a small platform scale, Mrs. Grizzle checks the customers as they leave, receiving payment as the boxes of fruit are weighed out.

### Alerted by Radio

Current price at the orchard for peaches, bulk of the sales, was seven cents a pound this past summer. The grower is paid in full for the crop the moment it is harvested, and the fruit is a great boon to the housewives at McNeal, Tombstone, Douglas, Willcox, Courtland, Benson and other communities. Most of the customers come from these nearby communities. Radio bulletins from Douglas and other points keep potential customers informed as to what kinds of fruit are available, or if there is no fruit and customers should wait a few days.

The picking itself usually is a family affair, husbands and wives, wives and teenage children, all pitching in. Many small children go along for the day, as mother gets an outing for herself, delicious food to serve immediately or can or freeze for future use, a big saving in the family budget, and no fee paid to a baby sitter.

Mr. Grizzle prunes his trees to about a six foot height, so picking can be done from the ground. Thus no ladders are used and there is little damage from broken branches. The customer furnishes his own boxes and picks his own fruit. An employee, who directs cars of customers to the ripened rows of the orchard, also keeps an eye out for any destruction.



**UNDER THEIR SUNSHADE**, with scales and peach-crate table, Mr. and Mrs. Grizzle wait for customers to weigh in after picking.

### A Spirit of Camaraderie

Actually, that is at a minimum. In fact, the striking impression one gets is of a leisurely, good-humored, informal rural get-together, like a country picnic back in the old days. You almost expect someone to make a neighborly offer of a glass of cold buttermilk or a golden fried chicken leg. There is good-natured talk going on, small children happily dropping more fresh peach on their clothing than inside their mouths, and at the checkout scale the customers admire each other's peaches, or com-

ment on the beauty of the orchard or the need for rain.

The story of the Grizzle orchard goes back more than half a century ago, when Henry Grizzle, a fine gentleman and pioneer of the old school, settled in the Sulphur Springs Valley a few miles from where his son's orchard is now. Henry Grizzle started with an apple orchard, clear back in 1910. At a water tower along the railroad, there in the valley, he saw two peach trees and noted how they thrived. Peach pits tossed aside by a brakeman at that watering tank were probably the origin of this thriving stone fruit industry of today.

Lewis Grizzle's first orchards were started in 1935, and three decades have seen constant and wise study and experimentation with varieties and cultural methods. The good Courtland loam soil has made a happy home for the trees, and experience has proven when and how much to irrigate and fertilize.

### Learning by Doing

Early nursery trees came from Maryland and other eastern states, but current purchases largely are bought from California, with insistence on the S-37 nematode-resistant rootstock. University of Arizona personnel have done some pruning work with the Grizzle trees, learning the methods best adapted to the orchard and area. Thinning work also has received attention from U of A extension and research workers.

The Grizzle orchards seem to thrive

(Continued on Next Page)



**AND SURE ENOUGH**, here comes the customer — Extension Specialist Tate, who picks his peaches, weighs in and pays up like all the other customers. Peaches aren't a big item in Arizona's agriculture, but ideal climate and a ready market indicate possibility of growth in this orchard industry which is a boon to producers and consumers alike.

(Continued from Previous Page)

under the intelligent care they get. About the only ailment to guard against is brown rot, controlled by a spray of Captan fungicide during the fruiting season. The frost-hazard season in that lush valley is from early November to early May, so frost protection must be provided in the spring, after the tender spring growth has begun and frost is still a threat.

Oil burner cans, placed between trees and lighted on frost-threatening nights, are the insurance against frost damage. Older plantings are removed when their useful life has diminished, and a few acres of young trees are planted annually as replacements and additions. The trees come into production at three years and will bear for 15 years profitably. All trees are cut back each year to control growth to a size which the housewife, her sister-in-law and their older youngsters can pick easily.

#### Part of Complete Farm Plan

Fruit orchards as part of a larger farming scheme — Lewis Grizzle has some cotton and cattle, too — can be an extra source of income if managed efficiently by owners who know and like the orchard business.

There are other commercial deciduous fruit orchards in Graham, Yavapai, Coconino, Navajo and Apache Counties. However, none are as large as the Grizzle Orchard. The excellent

## 30 Years a Beeman, Woodrow Retires

At the close of 1965, Dr. Alan W. Woodrow retired from the United States Department of Agriculture. For over 30 years he conducted research on bees as an apiculturist in what is now the Apiculture Research Branch of the Entomology Research Division.

Dr. Woodrow was awarded the Ph.D. degree by Cornell University in 1935 just before he started his government career at the Bee Disease Laboratory, Laramie, Wyoming. There he studied the resistance of honey bees to American foulbrood, making significant contributions to the knowledge of the mechanism by which the bacteria infect the larval bee.

During World War II, he was transferred to the Davis, Calif., Bee

fruit from these orchards finds a ready local or nearby market. To make a success of growing fruit, one must have a "knack" with, or understanding of, trees to make them yield good crops year after year.

Research Laboratory where he studied insecticide poisoning of bees, production of honey and beeswax, and the storage of pollen.

In 1946 he was placed in charge of bee research at the Red Clover Pollination Laboratory at Columbus, Ohio, where he studied the pollination requirements of red clover. When that station was closed in 1953, Dr. Woodrow joined the staff of the Bee Research Laboratory here at Tucson.

At Tucson his primary objective has been the study of the behavior of bees in collecting foods, including materials attractive to bees. In addition, he has worked on the water requirements of honey bees under desert conditions, and has made valuable contributions to the work of the laboratory in the areas of pollination and effects of pesticides on bees.

His research on materials attractive and repellent to honey bees resulted in the development of a new technique utilizing propionic anhydride to drive bees out of honey supers. Dr. Woodrow shares a patent on this, and was awarded the highly-prized Certificate of Merit from USDA for his work on propionic anhydride.

Dr. Woodrow has also held a faculty appointment as professor in the University of Arizona's Entomology Department, where he teaches a very popular course on the honey bee.

Since his retirement Dr. Woodrow is continuing his work on attractants and repellents at the USDA Bee Research Laboratory and is also writing for publication some of the data he has accumulated over the past few years.

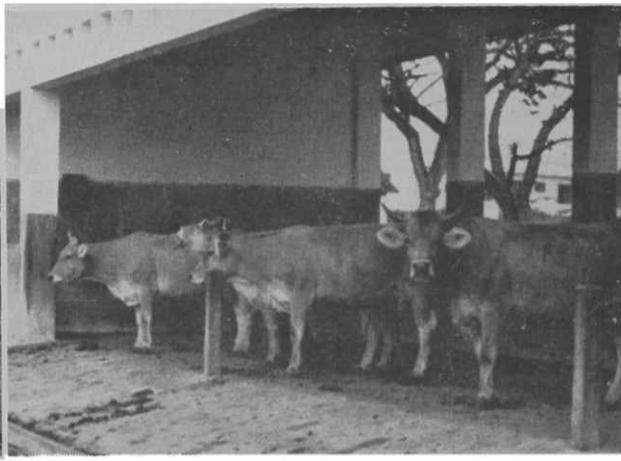
Dr. Woodrow is a Fellow of the American Association for the Advancement of Science and a member of Sigma Xi, American Institute of Biological Sciences, Arizona Academy of Science, Bee Research Association, and Association for Study of Animal Behavior.

#### FOR DOGS TO TIP OVER!

Americans have the best fed garbage cans in the world. The average household in this country discards about 200 calories of edible foods per day for each member of the family.

#### AGRICULTURE MAKES JOBS

It takes six million people in industry to provide the supplies farmers use for production and family living, reports the U.S. Department of Agriculture.



# Feed Storage Facilities Would Boost Livestock In Northeastern Brazil

By William J. Saba

*To a native Arizonan, vegetation in the Fortaleza area looks quite lush and green, but as one travels 20 or so miles into the interior, conditions become drier. Annual rainfall in Ceará is around 25 inches with a range of 20 to 70 inches.*

The state of Ceará generally has six to eight months of dry weather, followed by a four to six month rainy season. This problem, coupled with the fact that there are little or no storage facilities for feeds, presents a perplexing problem for the average fazendeiro, or rancher.

## Beef Has Brahma Blood

Average "feeder steers" of the northeast are predominantly of Brahma ancestry, all bulls, and of varied conformation. Because of belief that an animal must have its full growth be-

fore it can be fed or slaughtered, average age of a typical "feeder steer" is five years.

Most of the feedlots are located in population centers, and approximately 90 percent of the meat is sold immediately after slaughter. Many of the beef animals are raised in the interior, and are driven or shipped in railroad cars, sometimes a trip of two or more days. Road conditions do not favor trucking of live beef.

Basic feed ingredients available are mandioca, cottonseed meal (20 percent protein), bran, corn, sorghum (not always available), and various grasses, elephant grass predominating. Both the tubers and stems of the mandioca plant are used, the tubers being quite high in starch. A typical ration consists of 25 percent cottonseed meal, 25 percent mandioca (stems or tubers or both), 15 percent bran or corn and 35 percent grass. Some sugar cane tops are also fed, if available.

## Put On 90-Day Feed

Feeding is on a limited basis except for grass, and many times straight cottonseed meal is fed. The animals are fed 90 days prior to slaughter. Quoted daily gains run between half a pound and four pounds.

Due to human competition for calories, it is quite expensive to feed cattle in Ceará on concentrates, and many of the feeders say they are losing money. With some improvisations

**THREE VIEWS OF livestock in Ceará.** At left, feeder cattle typical of the area. These animals have been on feed about 40 days. Note predominance of Brahma breeding; center, Brown Swiss dairy herd at University of Ceará. At right, typical small poultry farm flock of hens. Note excellent quality of these laying hens.

in management, animal age and feeding practices, more profit could be gained. For example, a grass fattening program would be feasible, using the offspring of low producing dairy stock crossed with Brahma bulls, in order to raise milk-fed calves.

There are many dairy herds in Fortaleza, some consisting of two or three animals and others of two or three hundred. One I had a chance to visit was quite impressive. The cows were of Brahma-Holstein cross, because most of the dairy farmers here feel they need the Brahma blood. Milk production averaged about 15 liters per day.

At the time we visited this fazenda, 80 cows were being milked. Excellent management and feeding practices were evident. It was interesting to learn that they were making silage. No dairies we visited are yet utilizing machine milking. Twenty percent of the dairies in Ceará belong to a cooperative, and all milk going into the milk shed is pasteurized. The other 80 percent is sold by private treaty or in the markets.

## Need Concentrates For Swine

There is a great deal of interest in swine production here, but because of human competition for calories, high grain rations are prohibitively expensive. Protein supplements, such as meat meal, also are expensive and of poor quality. A partial solution may be establishment of a suitable legume beneath the many hectares of coconut palm groves in Ceará. Most of these groves are in high moisture

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Bill Saba is the newest member of The University of Arizona's agricultural team at the University of Ceará, in northeastern Brazil. As an animal nutritionist, he fills a wide gap in the team. His early impressions, given here, show that he already has considerable grasp and great interest in this assignment.

## Current Officers of Agricultural Council



The Agricultural Council is made up of officers of all groups and organizations of students within this College of Agriculture. Phil Ogden, of the Watershed Management staff, is faculty adviser and coordinator for the group.

In the photo above are, front row, left to right:

Lucy Wing, ASUA senator; Cheryl Wild, Block and Bridle; Pat Gassert, secretary and also Beta Theta representative; Jim Brock, president of the council; Meredith Weltmer, Forestry Club; Fred Amator, Crops & Soils Club; Joe McQuistion, Ag. Engineering Club, and Roger

Kanerva, Aggie House.

Second row — Jerry Goodman, Range Management; Richard Hawkinson, Alpha Zeta; Gary Stone, Block & Bridle; Allen Bayles, Dairy Science, and Danny Anderson, Alpha Gamma Rho.

Third row — Ronald Rovey, treasurer and representative from Aggie House; Jerry Hawkes, Range Management; Guy Pense, Alpha Tau Alpha; Mike Chrisman, ASUA senator; Wayne Stuhr, Ag. Engineering, and John Hart, Crops & Soils.

(Continued from Previous Page)

areas, or under irrigation, and could thus serve a dual purpose.

The University of Ceará has an excellent poultry setup. Much work has been done in the south of Brazil in poultry research, and several excellent strains have been introduced from the U. S. Hy Liners are used extensively in Ceará, and are of excellent quality.

Egg production varies, probably due to protein variations in the feed. Meat quality is excellent, with broilers being produced in 70 to 90 days. Some of the rations fed are produced commercially and are expensive, but most of the poultry farms I have visited are well managed and are making a profit.

### May Add Storage Facilities

The University of Ceará has completed building a feed mill, and most

of the equipment for preparing and mixing rations has been installed. It soon will be in operation, making possible various feeding trials.

It is my belief that the greatest problem facing the Cearense livestock producer is lack of availability and storage of feeds. Ceará has a tremendous potential for forage production, both irrigated and dry-land, and when it is developed, livestock production will thrive.

Large volumes of runoff in normally dry stream channels, as occurred in Arizona last December, prompt many Arizonans to ask, "Why doesn't somebody do something about all that water running away from us?" With the diminishing groundwater resources of Arizona a constant reminder, the question is logical.

## *What Happens to Flood Runoff?*

By W. G. Matlock



FIGURE 1, above, shows a typical desert stream channel with uniform coarse sands.

Before attempting to "do something" with these admittedly large quantities of water, a better knowledge of what happens to the runoff water is necessary.

The coarse sandy beds of many of Arizona's intermittent streams have long been recognized as a prime location for natural recharge to the groundwater reservoir (Figure 1). Many people have seen the phenomenon of a disappearing stream, such as one usually resulting in the spring from snowmelt in the higher mountain ranges. The clear, calm flow of such a stream may leave the mountains with a discharge of some consequence, only to diminish gradually and disappear completely within a few miles. This is an excellent source of natural recharge.

### **But Heavy Flow . . . ?**

But what of the large, violent flood flows from summer thunderstorms or prolonged winter rainfall (Figure 2)? What happens to this water which is usually heavily laden with debris and particles of fine silt and clay? Does any of it reach the groundwater body? Why don't we impound this water in reservoirs so that it can be used immediately, or be permitted to soak into the ground more effectively? What about artificial recharge of these flood flows?

These questions are not new; they have been asked repeatedly for many years. However, there are many  
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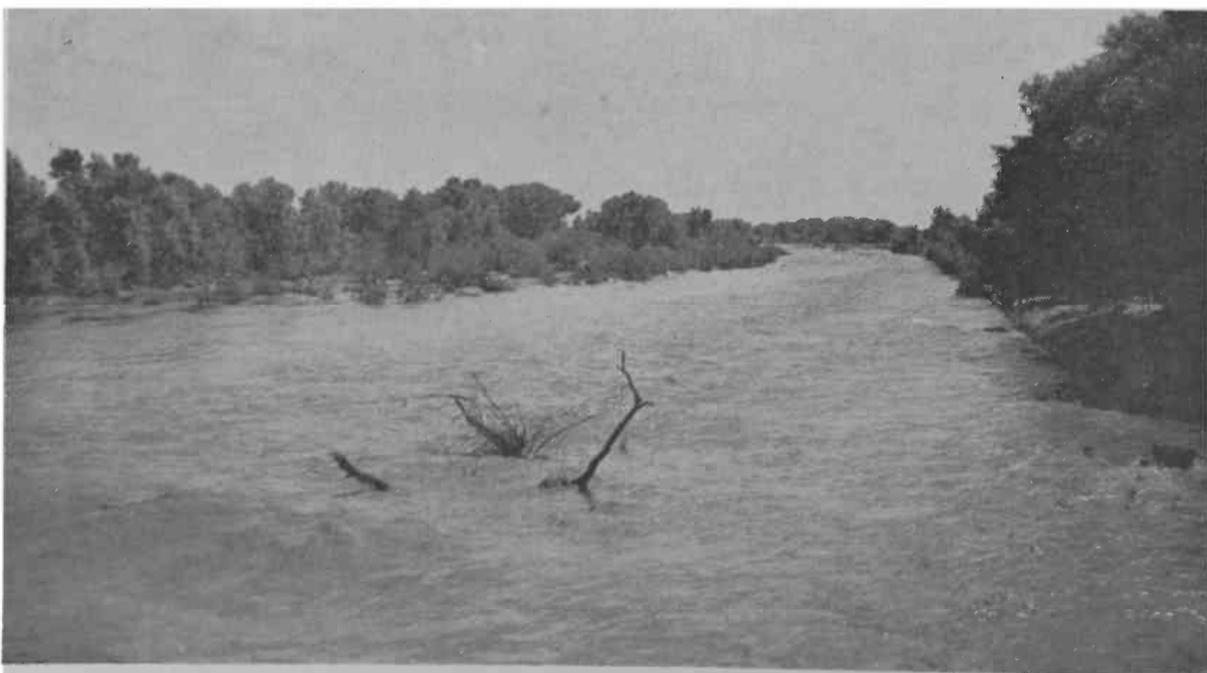


FIGURE 2, below, shows flood flow in the Santa Cruz River, looking up stream from the Congress Street bridge, Tucson.

The author is a member of the staff of the Department of Agricultural Engineering.

(Continued from Previous Page)

problems connected with the study of anything so intermittent and so violent as the floods raging down the sandy stream channels. Some of the sediment-laden flood waters are recharged, but the exact amount is difficult to measure. The tremendous debris and sediment load of flash floods and the shifting sands of the bed make gaging these flows of doubtful accuracy.

Furthermore, small ungaged side channels frequently contribute sizable quantities of water to the main flow. Sometimes the flow doesn't extend all the way between existing gaging stations. Flood flows are not very dependable either. They seldom occur during daylight hours on normal working days but often late at night, on Sundays or holidays.

### Many Factors Involved

Some of the problems are associated with the variability of desert hydrology. The rainfall that ought to result in a deluge might cause only a trickle, while a seemingly insignificant shower produces a sizable flood. The source of the flood waters, magnitude and duration of flow, and condition of the bed sediments all play a part in determining the suspended sediment content of the water at a particular location. Infiltration rates are also affected by the bed material characteristics, which vary with distance from the mountains and the past history of a particular stream channel. Coarser bed materials are usually found near the mountains, with a gradation to finer materials downstream.

To help answer some of the questions about runoff water and consequent natural recharge, a laboratory flume study was made to determine the relationships of flow velocity, suspended sediment content, and infiltration rates. A closely controlled environment for the investigation of these relationships was provided by the 100-foot tilting bed flume shown in Figure 3.

In the flume a 6-inch sand bed was placed on a perforated plate above a drain channel. Water was then pumped through a recirculating system and over the sand. Infiltrating water was collected and measured in the drain channel. Flow velocity and suspended sediment content could be individually varied by adjusting the slope of the flume and discharge rate, or by adding sediment to the water being circulated.

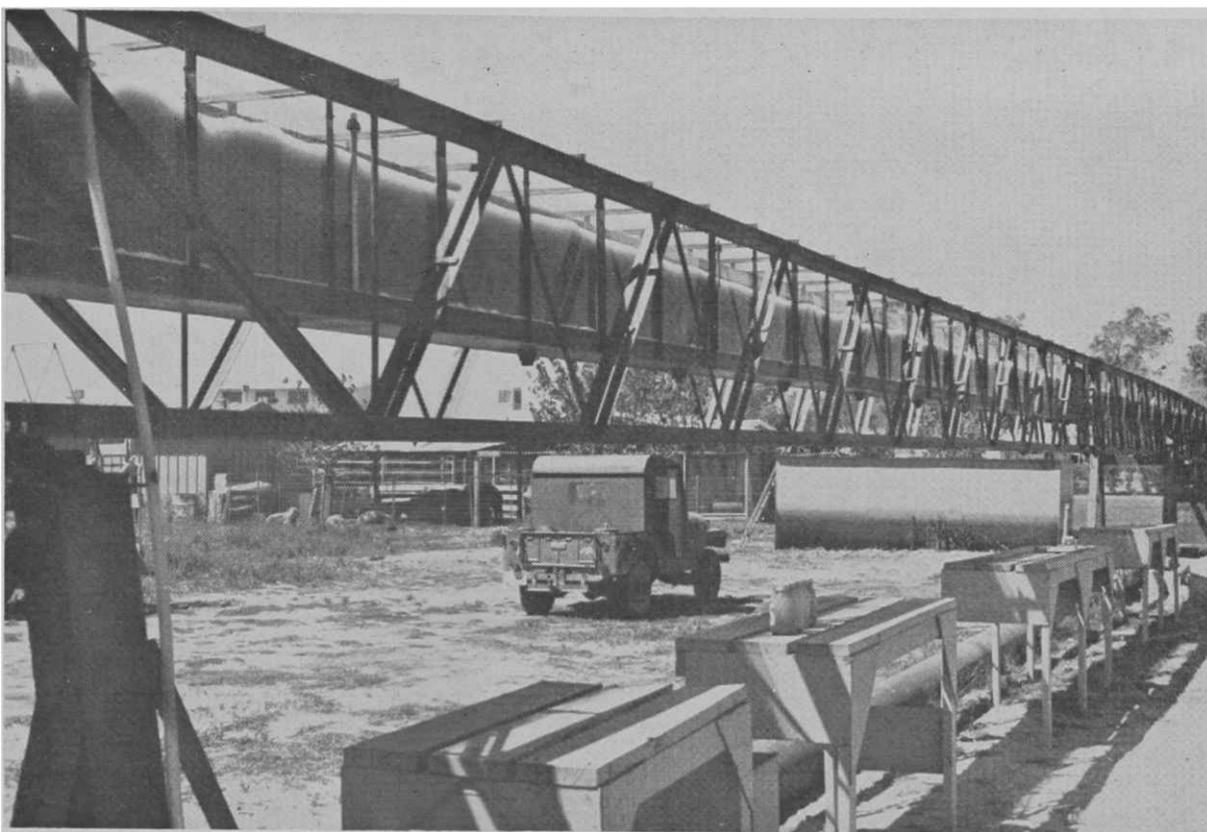


FIGURE 3, above, shows view of the 100-foot tilting bed flume.

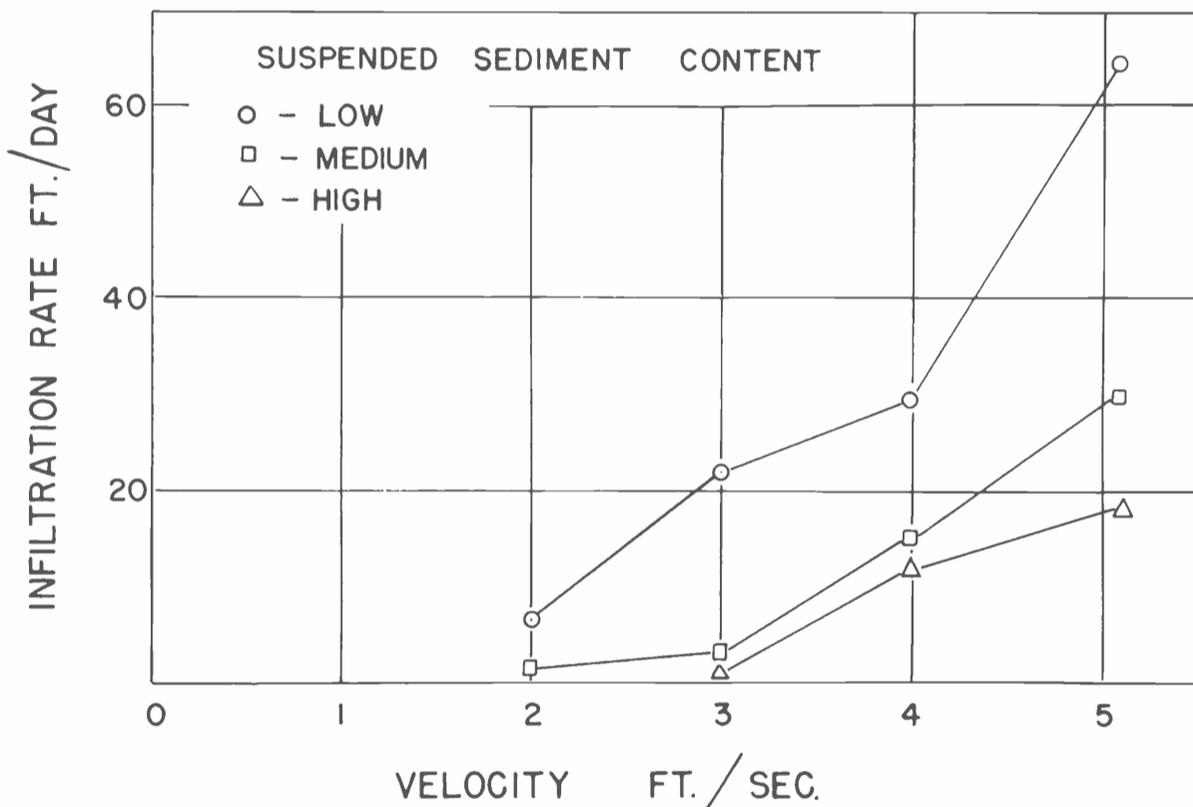


FIGURE 4. Infiltration rate versus velocity for different amounts of suspended sediment.

### How Much Sediment?

A series of experiments designed to test flow characteristics has disclosed the nature of their interrelationship (Figure 4). Infiltration rates varied directly with flow velocity in the range from 2 to 5 feet per second as a consequence of bed sediment movement and particle rearrangement. Greater velocities maintained a larger suspended sediment content, particularly of finer particles, and thereby created a less compacted, more permeable surface layer on the bed.

Adding a suspended sediment load to clear water resulted in an immediate and dramatic reduction in infiltration rate at all velocities tested. Further increase in the suspended sediment content caused a continued decrease in infiltration rate. Relatively high infiltration rates were obtained with velocities below two feet per second for clear water, but immediate bed sealing started with the addition of a meager quantity of silt to the water.

Periodic examination of the bed  
(Continued on Next Page)

## U of A Team "Agriculture USA" TV Winners



These students from The University of Arizona won an "Agriculture USA" contest on nutrition in NBC's television studios at Burbank, Calif., and will appear on TV stations throughout the nation this year.

With their championship trophy are, left to right, Richard Morrison, 18, son of Mr. and Mrs. Marvin Morrison of Gilbert; Cheryl Wild, 21, daughter of Mr. and Mrs. Oscar Wild, Goleta, Calif.; and Mike Chrisman, 21, son of Mr. and Mrs. Ira J. Chrisman, Visalia, Calif.

In Arizona, the taped show is scheduled for showing over the NBC TV station in Phoenix on March 19. Chrisman is a senior majoring in agronomy; Morrison is a freshman majoring in agricultural economics, and Miss Wild is a senior majoring in animal science.

(Continued on Next Page)

materials was made through the plexiglass channel wall. Observations revealed some subsurface layering of fine materials and the formation of a compact layer at the bed surface. Any changes that took place in the bed material did so over a finite period of time. Furthermore, a sediment load could not be carried by the flow without changing bed composition.

### Impounding Cuts Filtration

Results of this study can be used to answer some of the questions about runoff waters in desert stream channels. Because the stream channels do provide excellent locations for recharge, as much of the runoff as possible should be permitted to flow in the channels. Impounding the water in the river channel, however, would permit fine material carried by the

flow to settle out and reduce the infiltration rate, with eventual bed sealing.

Storing water in reservoirs adjacent to the channel, to reduce the suspended sediment content, and then releasing the water to the channel at controlled velocities could maximize infiltration rates. Velocities of sufficient magnitude to insure bed movement could be maintained, and discharge rates could be selected to utilize the entire width of the channel for infiltration. During the intervals between floods, a channel maintenance program could be initiated to remove plant growth and silt deposits and thus improve the infiltration potential.

Ultimate disposition of the water that infiltrates in stream channels has not been thoroughly investigated. Part goes to the main body of the groundwater reservoir, but some of the water

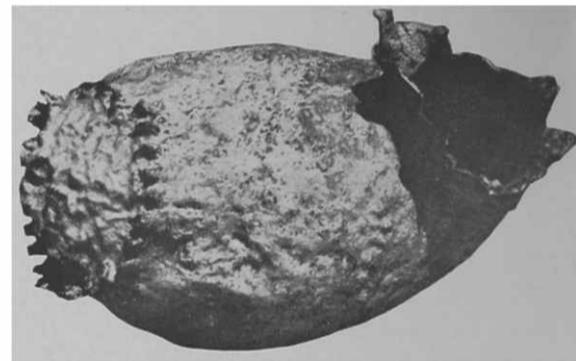
## Extension Fraternity Names George E. Hull

Dr. George E. Hull, director of The University of Arizona's Agricultural Extension Service, has been named vice president of the grand council of Epsilon Sigma Phi, honorary fraternity for extension leaders. New president of the national organization is Dr. W. E. Skelton, assistant director of extension at Virginia Polytechnic Institute at Blacksburg, Va.

Director Hull has a record of 20 years with agricultural extension, starting in his native state of Oklahoma as an assistant county agent in Pawnee County. He has B.S. and M.S. degrees from Oklahoma State University and a Ph.D. from the University of Wisconsin.

He came to The University of Arizona in 1960.

## OUR MYSTERY PICTURE



What is this? It is fairly prevalent in southern Arizona, although seldom seen. It took our office naturalist, Al Hesselberg, to procure this one for our photo. If you're the kind who gives up easily, turn to Page 13 for the answer.

is lost by evaporation from the wetted stream bed, or by transpiration of water-loving plants in or along the channel.

### Much Being Learned

Much remains to be learned about flood recharge and other aspects of arid zone hydrology, but research progress in this field has been encouraging. The pressure of increased population, together with a decreasing water supply, has stimulated much research and will continue to do so, hopefully providing answers to the problems of supplying water for continued growth in Arizona and other thirsty areas.

# Bermudagrass Salt Tolerance Is Aid in Recovering Saline Areas



By Robert Dennis

When John Sears first went to Graham County as county agent in 1953, he noticed several small unproductive pastures in and near Safford. Some of these "pastures" weren't much more than bare exercise lots for livestock.

Investigation showed that these barren spots, without grass, were areas where both the soil and the irrigation water applied to it were heavy with sodium and other salts.

John Sears began experimenting with different grasses, trying to find a salt-tolerant grass which could be established on these barren spots. The most promising was Coastal bermudagrass. Sprigs for planting Coastal bermudagrass (rhizomes, stolons, and other plant parts) were obtained

from The University of Arizona's Branch Experiment Station at Safford.

One of the test demonstration areas was photographed last fall. John is shown in the photo above, with Don Overton, son of Boyd Overton on whose farm one of the test plots is located. Don said that two acres of Coastal bermudagrass provided pasture forage for 50 ewes and their lambs last year.

All types and varieties of bermudagrass are salt tolerant. In an Apache County test, County Agent Leonard Isaacson found that Midland, a cold tolerant type of bermudagrass, excelled in salt tolerance. Other tests have shown that Arizona Common and the giant types have nearly as much salt tolerance as Coastal or Midland. These varieties also may be established with seed. Most of the nation's supply of bermudagrass seed is produced in Yuma county.

A mimeograph publication concerning the use of bermudagrass for forage is available from The University of Arizona or from your local county agent.

Dr. Dennis is Extension Agronomist in this college.



## Cochise County

KAWT, Douglas—6:15 a.m. Mon. through Fri.

KHIL, Willcox — Mon. thru Fri., 6 a.m.

## Coconino County

KCLS, Flagstaff—Tues. and Thurs., 8:20 a.m.

KCLS, Flagstaff (Home Agent) — Wed., 9:45 a.m.

KPGE, Page — Fri., 2:30 p.m.

## Gila County

KIKO, Globe-Miami  
Monday, 12:45 p.m.

## Graham County

KATO, Safford — Sat., 9:30 a.m.  
Mon. thru Fri., 12:45 p.m. (daily)

## Maricopa County

KTAR, Phoenix — Mon. thru Fri., 5:55 a.m.

KOY, Phoenix — Tues. thru Sat., 5:40 a.m.

KOY, Phoenix — Sunday Garden Club of The Air, 8:35 a.m.

KPHO, Phoenix — Mon., Cotton Report, 12:40 p.m.

KPHO, Phoenix — Thurs., Dairy and Livestock Report, 12:40 p.m.

KUPD, Phoenix — Mon. thru Fri., 5:30 a.m. and 12:30 p.m.

## Mohave County

KAAA, Kingman—Mon., 1:15 p.m.  
(Extension Home Economist)

## Navajo County

KDJI, Holbrook — Tues., 12:45 to 1 p.m.

KINO, Winslow — Sat., 9:45-10:00 a.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.

## Yavapai County

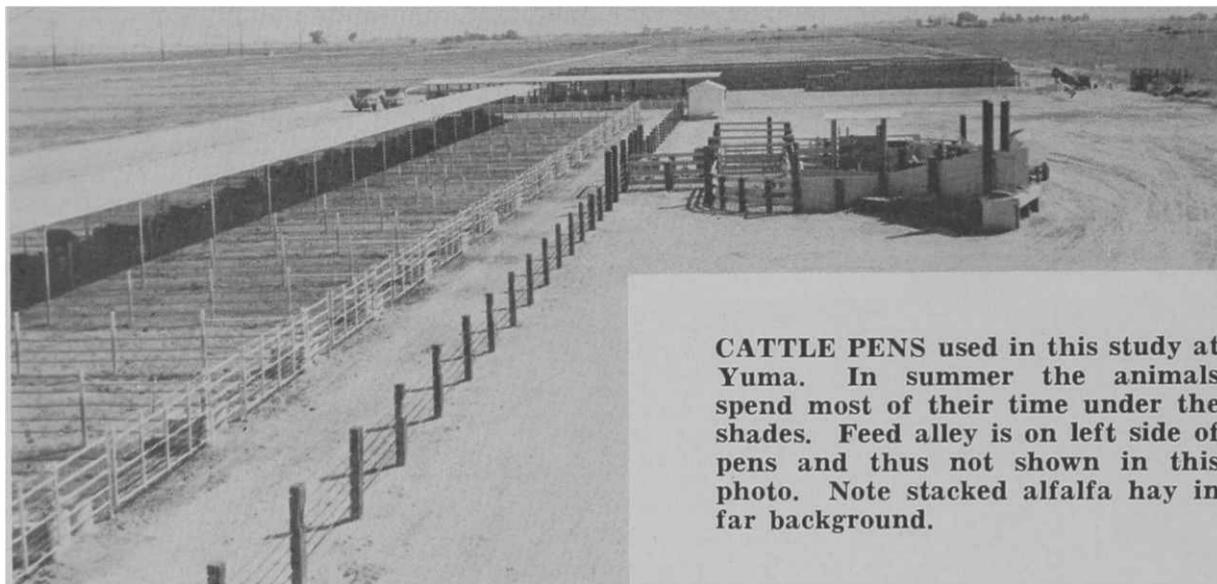
KYCA, Prescott — Mon., Wed., Thurs. and Fri., 4:15 p.m.

KNOT, Prescott — Mon., Wed. and Fri., 6:25 a.m.

## Yuma County

KVOY, Yuma — Mon. thru Fri., 5:45 a.m.

KYUM, Yuma — Mon. thru Fri., 6:25 a.m.; 10:05 a.m., Sat.



CATTLE PENS used in this study at Yuma. In summer the animals spend most of their time under the shades. Feed alley is on left side of pens and thus not shown in this photo. Note stacked alfalfa hay in far background.

## Gain, Feed Intake and Feed Requirement of Steer Calves on Hay and Haylage — Summary of Three Experiments

Item	Hay	Haylage
No. steers	56	56
Average days on feed	94	94
Average initial wt., lb.	444	440
Average daily gain, lb.	1.72	1.46
Average daily feed (hay basis) lb.	16.0	15.3
Feed required/100 lb. gain, lb.	955	1080

# HAYLAGE STUDIES AT YUMA

By W. H. Hale

*More than 250,000 tons of alfalfa hay is produced annually in Yuma County, Ariz. Some 42,000 acres were cut for hay in 1964. A portion of this is sold in California and some in other parts of Arizona. The remainder is fed locally.*

The alfalfa hay in the Yuma area is of excellent quality and, of course, harvested without rain. Very few leaves are lost during proper harvesting. Generally, the hay averages over 16 percent protein on a 10 percent moisture basis, has a low crude fiber content, and contains approximately 55 to 60 percent total digestible nutrients. The usual total digestible nutrient value given for alfalfa grown in other areas of the United States is 50 percent.

### A Natural For Feeders

Due to the large production of high quality alfalfa, cattle feeders in the Yuma area have been interested in its utilization in a program for growing steer calves, especially during the warm summer months when the performance of fattening steers is sometimes less than ideal.

With initial weight of approximately 400 pounds, a feeding period of 140 to 175 days is required to obtain the

200 to 250-pound gain per steer. The daily gain during this period will usually average 1.50 to 1.75 pounds with 1000 to 1100 pounds of hay required to produce 100 pounds of gain. The hay is usually fed as ground baled hay, but a few operators prefer dry field chopped hay. The feeders in the growing program would like a system of harvesting and/or feeding that would improve both performance and feed efficiency of the growing calves, and thereby increase the return per ton of hay — if such is possible.

Beginning in the summer of 1962, a series of growing trials was initiated at the Yuma Experiment Station to study methods of improving performance with growing steers fed ground baled alfalfa hay.

One of the areas investigated was the feeding value of alfalfa when stored in airtight glass-lined silos. Forage can be stored in this type of structure when the forage contains 40 to 50 percent moisture as compared to the usual 70 percent in other silos. A 14 x 40 ft. Harvestore silo was made available for this work.

### Is Sweet and Palatable

Fermentation is restricted, and the product taken from the unit has a sweet odor and is apparently very palatable to cattle. With tests conducted in the Midwest, dry matter consumption was higher with low-moisture forage silage (haylage) than with conventional silage.

Due to the construction of the Harvestore, the unit does not have to be emptied in order to be refilled. The top portion of the unit can be filled while the feed in the bottom portion is accessible by means of a bottom unloader. This report contains the results of three trials conducted during the summers of 1963, 1964 and 1965 at the Yuma Branch Experiment Station.

### Comparative Trials Begun

The hay and haylage were harvested from alternate borders in the same field. The alfalfa was approximately 40 percent bloom stage at the time of harvesting. The baled hay was stacked in the open with a Haro-bed bale stacker. The hay prior to feeding was ground through a Miller mill with a standard hay screen. The alfalfa used for haylage was wilted in the field until it contained approximately 50 percent moisture, chopped to 1/2-inch lengths with a Gehl forage chopper, then stored in the Harvestore for three weeks prior to feeding.

During the first two years the unit was filled with one cutting of forage and the feeding trial conducted until the unit was emptied. During the 1965 study the unit was refilled twice during the feeding period. As the results of the feeding trials between the three years were similar, they are presented as a three year summary.

The steer calves used for each  
(Continued on Next Page)

Dr. Hale is a member of the staff of the Department of Animal Science.



(Continued from Previous Page)

year's study originated in Texas and were fed ground alfalfa hay on arrival at the Yuma Station until the initiation of the experiment. All calves were branded, neck chained, sprayed with CoRal, and in some cases castrated and dehorned.

### Gains Less on Haylage

The results of the three year study are presented in the table at the left. Daily gain on the haylage was 15 percent less than on the ground baled alfalfa hay. Feed intake of the haylage on a hay basis was slightly less than on the hay, but the small difference in feed intake would appear not to account for the marked difference in gains observed between the two treatments. Feed requirement on the hay ration was 955 pounds as compared to 1080 on the haylage ration. Thirteen percent more feed was required on the haylage than on the hay to produce 100 pounds of gain.

Feed intake data suggest that the haylage was highly palatable, and visual appraisal indicated a very desirable product. An interesting observation was the brown color of the fecal material from the steers receiving haylage which resulted in the surface of the pen having a distinct off-brown color. The brown color of the manure may have been due to a reaction between the alfalfa protein and/or nonprotein nitrogen with the soluble carbohydrates and/or crude fiber. This reaction is known to occur in the presence of moisture at temperatures above 122° F. (50°C.).

Daytime temperatures at Yuma during the period of the two studies were well over 100° F. and the material taken from the Harvestore was very warm. No doubt an enormous amount of heat was absorbed daily by the structure and the haylage. Temperature measurements in the haylage during the summer of 1964-

**LIVESTOCK RESEARCH at Yuma is aided by this complete feed mill, with facilities for grinding, mixing and storage. Note the big dark blue Harvestore silo in background.**

65 showed maximum temperatures of 150° F. (60° C.). These temperatures are sufficiently high to cause the browning effect seen in the feces. The reaction which caused the browning of the feces may have reduced the digestibility of the haylage components involved.

### Indicates Lessened Digestibility

Digestion trials have been conducted to determine what chemical changes occurred in the haylage during storage. The unthrifty appearance of the steers suggested decreased digestibility of the haylage protein.

One of the treatments included during the 1965 growing trial but not discussed was the addition of 1½ pounds of cottonseed meal daily per steer to the haylage ration. The daily gain of the haylage plus cottonseed meal was 1.38 pounds as compared to 1.20 on straight haylage. These results suggest protein damage to the haylage during storage. Corresponding feed requirements on the two treatments on a hay basis were 1098 pounds, (including cottonseed meal) as compared to 1240 pounds, respectively. The cottonseed meal also improved feed efficiency.

It is hoped that the digestion trial will supply at least some of the questions concerning the apparent poor utilization of the haylage in the experiments conducted at the Yuma Experiment Station.

In 1963, Oakie feeder calves returned \$41.62 per ton of hay when feeder gains were valued at \$22.50 per 100 pounds. In 1964, the return per ton of hay was \$52.26 when feeder gains were valued at \$19.50 per 100 pounds. In 1963, the alfalfa hay had a market value of \$30 per ton and in 1964 the value was \$22.

## Cytogeneticist Ramage Gets Well-Earned Praise

A major seed house, Northrup King, salutes a University of Arizona and USDA agronomist in a page advertisement in a recent issue of "Crops and Soils." The advertisement, with a half page picture of Dr. R. T. Ramage, salutes a "Chromosome Engineer (who) Sows Seeds of Plenty."

It quotes Tom's belief that "The key to greater crop production for a growing population is now in the hands of chromosome engineers."

The UA-USDA geneticist is a recognized "chromosome engineer" in his own right, with his accomplishments in pushing toward a hybrid barley through genetic restructuring. Tom's stocks of translocations and tertiary trisomics are now being made available to plant breeders throughout the country.

Dr. Ramage believes that the big increases in grain production — up 30 percent or more over current yields — will come about through hybrids, with their improved quality, greater yielding ability, better resistance to hazards.

Those of us who know and work with Tom Ramage, knowing him as a friend and companion as well as co-worker, look at this well-earned publicity proudly, unable to say anything more original than "It couldn't happen to a nicer guy!"

## Interesting Mystery Picture "Saguaro Shoe"

The mystery picture on Page 10 is the "Saguaro shoe," taken from a dying Saguaro cactus. As you look about the desert, you'll see the holes in Saguaro trunks, made by the Gila Woodpecker. Soon other birds find these handy hiding places, and some nest in them, notably the little Elf Owl.

The Saguaro, like many plants and animals, has the ability to manufacture scar tissue to cover an injury, and soon this hole is sealed up to prevent further invasion of the plant tissue.

The scar tissue is very strong, so that the entire sealed area, the color and size of a football although irregular in size and opening, can be removed when the plant is dead.

In the photo, the black portion at right is the opening — the only part one would see if looking at the Saguaro itself.

# Legal Quota System Governs Sugar

By Robert A. Young

With establishment of a sugar beet processing facility near Chandler, sugar again will be produced commercially in Arizona in 1967, for the first time since 1920.

Sugar commerce in the United States is probably subject to more federal regulation than any other agricultural commodity, and an understanding of the industry is not complete without knowledge of the origin and nature of the federal laws governing it. In view of the rekindled interest in sugar in Arizona, we will describe briefly the background and general provisions of federal policy relating to production and trade in sugar and sugar products.

The substance which is called "sugar" in everyday parlance is termed "sucrose" in more technical contexts. The only commercially important sources of sucrose are the roots of the sugar beet and the stalks of the sugar cane. The refined products resulting from the extraction of sugar from either source are chemically identical.

## Background of Sugar Laws

The basis for the complexity and pervasiveness of federal legislation relating to the sugar trade is found in conflicting Congressional policy goals and the existence of some hard economic facts. First, from the beginnings of the domestic sugar industry in the nineteenth century, Congress has designed sugar policy to encourage a domestic sugar industry of a size sufficient to satisfy emergency needs for this commodity in the event of international disturbances.

Secondly, as the extra territorial interests of the United States expanded in the late nineteenth century (particularly in the aftermath of the Spanish-American War), the effects of United States policies on certain other countries and territories whose primary export product was sugar (such as Cuba, the Philippines, Puerto Rico and Hawaii) became important considerations in policy decisions in the Congress. However, these often conflicting policy goals were confronted by the economic fact of abundant world supplies of low cost sugar (particularly from cane sugar-producing areas in the tropics) which prevented the establishment of a domestic industry without some sort of government protection.

## Lowered Tariff Bars

These conflicts were initially resolved with a system of tariffs or charges on sugar imports which maintained prices within the United States high enough to protect the domestic industry. The interests of producing areas, such as Cuba and the Philippines, were taken care of by special reduced tariffs. As a consequence, little sugar entered the United States except from those countries receiving tariff preference.

However, the tariff system could not satisfy both policy goals after the collapse in demand for sugar which had accompanied the depression of the 1930's. Several increases in tariffs had failed to stem imports, while the prices received for sugar in Cuba were also disastrously

low and political unrest threatened there. The present sugar legislation owes its origin to the Jones-Costigan Act of 1934, which replaced the tariffs with a system of import quotas and production quotas for processing firms in the United States. With some changes in detail, essentially this same mechanism for maintaining a favorable and stable price for the domestic sector, and providing a market for selected friendly nations, remains in effect at present.

## Operation of the Sugar Act

The present law is known as the "Sugar Act of 1948" and it has been amended and extended several times. In late 1965 it was again amended and extended through 1971. Its major provisions include:

*Total quantity of sugar to be marketed* — The Secretary of Agriculture late each year determines the quantity of sugar to be marketed in the succeeding year. The quantity is to be such as to result in prices which are "not excessive to consumers nor too low to protect the welfare of domestic producers."

*Supply quotas for domestic and foreign producing areas* — The secretary establishes supply quotas for domestic and foreign producing areas. The legislation has spelled out the precise formula by which these are to be distributed. For example, the quota for 1965 allocated about 60 percent of the total estimated consumption of 9.3 million tons among the domestic beet and cane areas and the balance to 32 foreign nations. The domestic beet sugar industry has the largest single share, 28.5 percent of the total, while the onshore domestic cane areas (Florida and Louisiana) and the offshore domestic cane areas (Hawaii, Puerto Rico) have production quotas amounting to 10 and 22 percent, respectively. The Philippines is the largest foreign supplier, accounting for 12 percent of the total quota, while the 30 other countries (primarily Mexico, the Dominican Republic, Brazil and Peru) among them account for the remaining 27 percent.

## Cuba's Share Cancelled

Strained political relations between the United States and Cuba have caused some changes in the latter country's quota allotments. During the previous Cuban regimes, substantially all of the United States sugar needs were provided by the domestic areas, the Philippines and Cuba. Since the break in diplomatic relations between Cuba and the United States, Cuba's former share, which was about one-third of the total quota, has been allocated among a rather large number of friendly nations. The recent amendments provide that about 50 percent of that part of the market not assigned to the domestic areas and the Philippines be reserved for Cuba until such time as that country's quota can be restored on resumption of diplomatic relations.

*Establishing marketing allotments* — If a domestic

(Continued on Next Page)

## Experiment Station Technical Bulletins Which Are Available

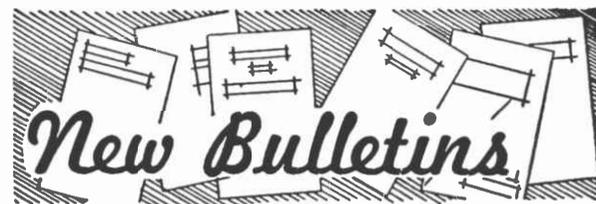
An entire bulletin series, designed for an audience of technical workers, scientists in other states and nations, and for county agents, is published by the Experiment Station in this College of Agriculture.

Many of the titles may be of interest to some of our readers. If you see a title which sounds interesting, mail your request to the experiment station editor, College of Agriculture, University of Arizona, Tucson.

Titles currently available are listed here:

Bull. No.	Title
112.	Soil Properties Contributing to Citrus Chlorosis As Revealed by Seedling Tests.
114.	Honeybee Losses as Related to Crop Dusting with Arsenicals.
115.	The Effect of Moisture Content, Field Exposure, and Processing On the Spinning Value of Arizona Upland Cotton.
116.	Nutrient Interrelations in Lime-Induced Chlorosis as Revealed by Seedling Tests and Field Experiments.
117.	A Study of Lime-Induced Chlorosis in Arizona Orchards.
118.	Boron as a Factor in Arizona's Agriculture.
119.	The Effect of Ginning on the Spinning Quality of Arizona Cotton.
122.	Absorption of Gypsum by Semi-arid Soils.
123.	Utilization of Phosphorus From Barley Residues in Calcareous Soils.

125. The Salinity Problem: Safford Expt. Farm Lab Studies.
128. Effect of Kind of Phosphate Fertilizer and Method of Placement on Phosphorus Absorption by Crops Grown on Arizona Calcareous Soils.
129. The Influence of Soil Aggregate Stabilizers on Stand Composition and Yield of Crops on Calcareous Soils of Southern Arizona.
130. The Uptake of Radiostrontium by Certain Type Crops From Calcareous Soils.
131. Polysulfides as Soil Conditioners.
132. The Syrphid Flies Associated with Arizona Crops.
133. The Reduviids and Nabids Associated with Arizona Crops.
135. The Dipazonise Associated with Arizona Crops.
139. Melissodes Bees in Arizona Cotton Fields.
140. Pentamids Associated with Arizona Crops.
141. Arizona Milk Production Costs.
142. Marketing Mexican Cattle in the United States.
143. Grass Improvement for the Southwest Relative to Drought Evaluation.
144. Cotton Gin Fires in Arizona, California and New Mexico.
145. Cotton Gin Insurance in Arizona, California and New Mexico.
146. Burroweed on Southern Arizona Rangelands.
147. Distribution & Host Plants of May Beetles in Arizona.
148. A Program - Controlled Environmental Plant-Growth Chamber.
150. Policy for United States Agricultural Export Surpluses Disposal.
151. Temperature Tables and Their Uses in Crop Production for 10 Stations in Southern Arizona.
153. Consumer Preference and Acceptance for Milk Varying in Fat and Solids-Not-Fat.
154. Farm Machinery Costs in the Western States.
156. Analysis of Carcass Grade and Weight Sales of Fat Cattle in Arizona and Southern California.



### Bulletins

- A-44 Arizona Agriculture 1966
- A-45 Vegetation of Arizona (Map)

### Folders

- 110 Sugar Beets in Arizona
- 111 Sugar Beets: Diseases
- 112 Sugar Beets: Weed Control
- 113 Sugar Beets: Irrigation
- 68(Revised) List of Available Publications from The College of Agriculture

- 157. Arizona Hay Price-Quality Relationships.
- 158. The Tetranychidae of Arizona (Acarina).
- 159. Grain Storage in Arizona.
- 160. Advertising Meat, Poultry & Fish at the Retail Level.
- 161. Political Interests in Agricultural Export Surplus Disposal Through Public Law 480.
- 162. Actual and Potential Evapotranspiration in Arizona.
- 163. The False Spider Mites of Arizona.
- 166. Lygus Bug Injury to Presquaring Cotton.
- 167. Distribution and Host Plants of Leaf-Cutter Bees in Arizona.
- 169. Consumptive Use of Water by Crops in Arizona.

(Continued from Previous Page)

area should have supplies in excess of quotas, a rush to sell might cause an unwarranted decline in price. In order to promote orderly marketing, the secretary may allocate the quota among processors in each area, based on past marketing history.

*Assignment of proportionate shares* — The secretary also may divide the quota for a domestic area among the farmers producing sugar beets or sugar cane. This allotment is known as a "proportionate share" and may be expressed in acres, tons of cane or beets, or tons of sugar. This provision adjusts each area's production to its marketing quota, and assures each farmer an equitable share of the distribution. The basis of the share is usually past history of production. Producers are not required to abide by the assigned share, but must do so in order to receive "conditional payments."

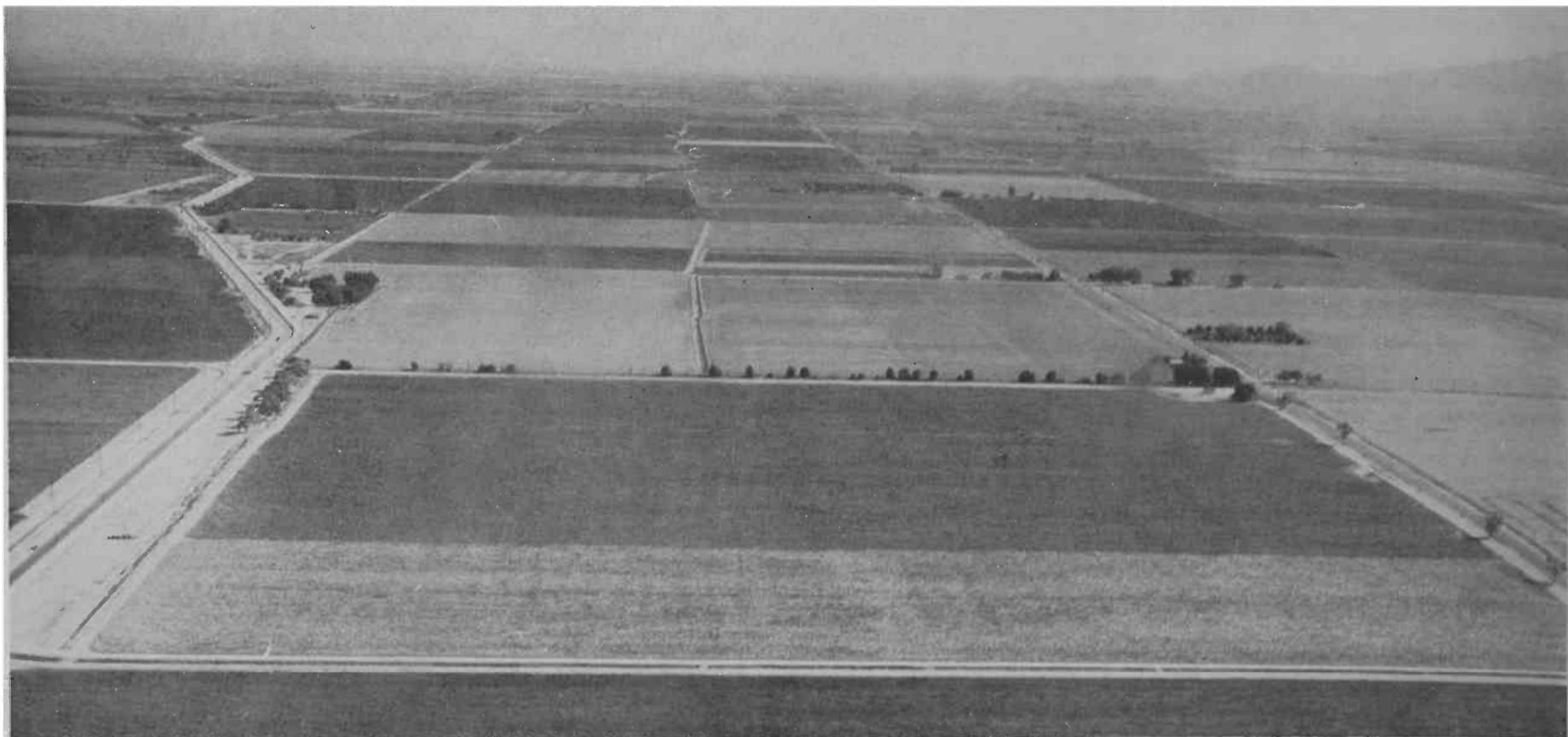
### Growers Share Benefits

*Other provisions* — In addition to the benefits of price maintenance and stabilization, the legislation as-

ures that growers will be able to share these gains. Growers' incomes are augmented by "conditional payments" which are made directly to the farmer at the basic rate of 80 cents per cwt. of sugar produced (about \$2.20 per ton of beets). To get these payments, the grower must comply with provisions of the law.

This system of controls on growers, processors, refiners and importers has functioned relatively effectively for over 30 years. One reason for this success is the fact that sugar is refined by a relatively small number of companies, making control of the quota system fairly simple. For example, offshore cane sugar enters the United States and is nearly all refined at eight ports of entry by less than a dozen refining firms, while beet sugar is manufactured by only eleven firms.

A study of the economics of producing sugar beets in Arizona has been issued by the U of A Agricultural Extension Service entitled "Sugar Beets: Estimated Costs and Returns." It is available at any county agricultural agent's office in Arizona. Persons interested should obtain a copy of this publication, and consult directly with their county ASCS office, which administers the program.



**FIELDS ARE LARGE** and intensively cropped in the Salt River Valley. To the left can be seen one of the many irriga-

tion canals which make crop production possible in this otherwise arid part of Arizona.

# MARICOPA COUNTY

**TABLE GRAPES ARE** increasing in importance as a cash crop in Maricopa County. Here, Charlie Condos of Arrowhead Ranch admires a cluster of Cardinal grapes.



**JOHN WIEHL** of Gilbert proudly shows the kind of cotton that can be grown in Maricopa County.





**THIS CONCRETE DITCH** lining machine, invented in Phoenix, is just one of many things developed to increase the efficiency of agriculture in the Salt River Valley.

## *Valley's Farm Income Yearly \$200 Million*

By Robert L. Halvorson

*The search for high adventure and precious metals brought the first settlers to Arizona. But by and large, it was the promise seen in the rich alluvial soil and mild climate of her valleys which induced them to stay and which has kept them coming.*

Most important and perhaps best known of these is the Salt River Valley lying within Maricopa County. Here, over the last hundred years, industrious farmers and ranchers have carved out an agricultural wonderland that each year pumps more than \$200 million into the economic veins of the state.

### **Valley Large and Rich**

It comes as a surprise to most people to learn that Maricopa County is one of the nation's most important agricultural areas. This is more easily understood, however, when you consider that Maricopa County is as large as the state of New Hampshire and also when you consider that it is served by one of the most efficient and successful water reclamation projects ever attempted, and it has a climate that permits the year-around production of crops.

According to the last census, approximately 500,000 acres or roughly 10 percent of the land in Maricopa County is under cultivation. This is almost half of the total number of acres under cultivation in the state. Indeed, it has been said that half of Arizona's agriculture, as well as half her people, can be found in Maricopa County.

Cotton, cattle, and fresh vegetables head the list of money earners. They bring in about 70 percent of the total

# AGRICULTURE

**CUT FLOWERS** are one of the more highly specialized and exotic crops for which the Salt River Valley has become famous. Here, a carton of stock is loaded aboard a plane for shipment by air freight to Chicago.





**MARCHING HOUSES** have failed to halt the expansion of agriculture in the Salt River Valley. Here, Virgil Merrill irrigates a new citrus grove near Queen Creek.



**COUNTY AGENT BOYCE Foerman** indicates how tall Sudan-grass will grow in the Salt River Valley.

(Continued from Previous Page)

agricultural income. Other important crops include alfalfa — up to seven cuttings per year — barley, grain sorghum, wheat, seed crops, and last but not least, citrus fruit and dairying.

### Heavy Cotton Yields

In Maricopa County, some 135,000 acres, or about a fourth of the irrigated cropland, is given over to the production of upland and extra-long staple cotton. Average yield approaches 1,100 pounds of lint to the acre, with yields of five bales and better often reported.

It has been estimated that at any one time in the course of a year only about 35,000 acres of cropland is given over to the production of lettuce and commercial vegetables. Despite this seemingly small amount of acreage, a significant share of the produce that goes into the nation's market basket comes from Maricopa County. During a short period in the fall, and again in spring, lettuce growers in and around the Phoenix area

Bob Halvorson, county agent with typewriter and camera as his working tools, was born in Wisconsin. He had two years of college at the University of Wisconsin, finished work for his degree in English at The University of Arizona in 1955, and that same year was appointed to the U of A Extension staff, going to Maricopa County. As county agent on the staff there, he has been reporting the marvels of Salt River Valley agriculture ever since. He is intense about his job, about the agriculture he reports upon, and he does that job with dedicated vigor and marked ability.

supply nearly all of that salad ingredient consumed in the nation.

### Menu For a Banquet!

In fact, Maricopa County produces complete meals in abundant variety. A sample menu of food — all produced within sight of the modern, high-rise buildings that dot the Phoenix skyline—might be: chilled grapefruit or cantaloupe, tossed green salad with scallions, olives, celery, or radishes; roast beef or leg-of-lamb with potatoes and broccoli or cabbage; milk; rolls and butter; and pecan or lemon meringue pie for dessert.

In all, more than 100 different agricultural commodities are produced in and around the Salt River Valley.

Upwards to 90 percent of all the milk consumed in the state also is produced in Maricopa County. The 250 dairymen in the county are among the most modern and efficient in the world. Pipeline milkers and stainless-steel cold-wall bulk storage tanks are the rule rather than the exception. Rations are formulated with scientific accuracy. Average herd size exceeds 150 cows, and average production per cow approaches 11,000 pounds of milk annually. This burgeoning dairy industry employs thousands and brings in nearly \$30 million each year.

### Where Cattle Grow Fat

Livestock and cattle feeding is even more important. At last count, Maricopa County had more than 100 modern feedlots capable of holding some 300,000 cattle. Each year, nearly 750,000 beef animals are "fed out" in the valley. Indeed, only since 1955 have people outnumbered cattle in

Maricopa County. There also are some 14 meat packing plants in the area, plus three tallow plants. Together, they employ more than 1,000 persons.

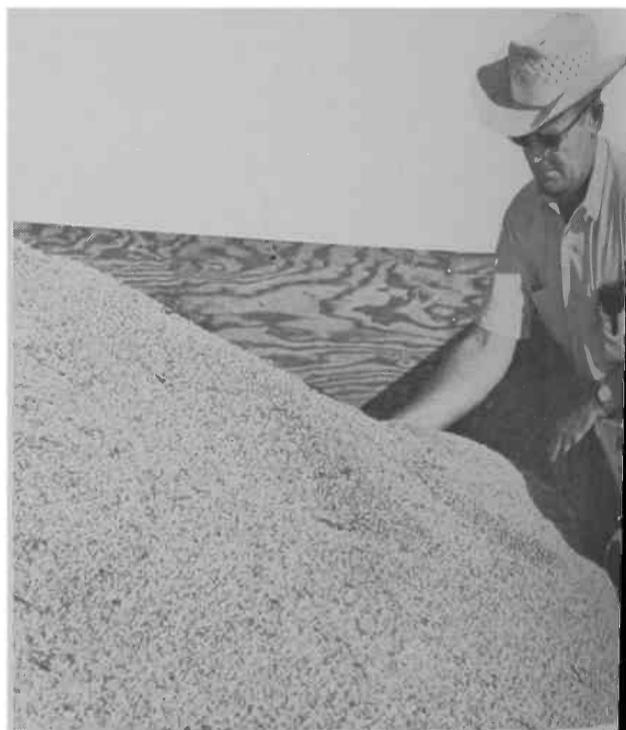
Maricopa County's poultrymen, vying with other agriculturists in efficiency, own a third of the state's laying hens and produce a third of the eggs produced for market in Arizona.

### Considerable Agribusiness

Needless to say, other industries closely allied to agriculture also abound. This includes 63 cotton gins, 4 oil mills, 15 citrus packing houses, 32 vegetable packing sheds, a dozen commercial feed mills, a score of agricultural chemical firms, not to men-

(Continued on Next Page)

**TOLLESON FARMER, Joe Sheely,** looks over some of the grain sorghum which he harvested in 1965. The crop averaged a phenomenal 11,051½ pounds of grain to the acre!



## New Book on Arid Lands

### Published by UA Press

"The Changing Mile," a new book based on University of Arizona studies of recent vegetation changes in the Southwest, has been published by the U of A Press.

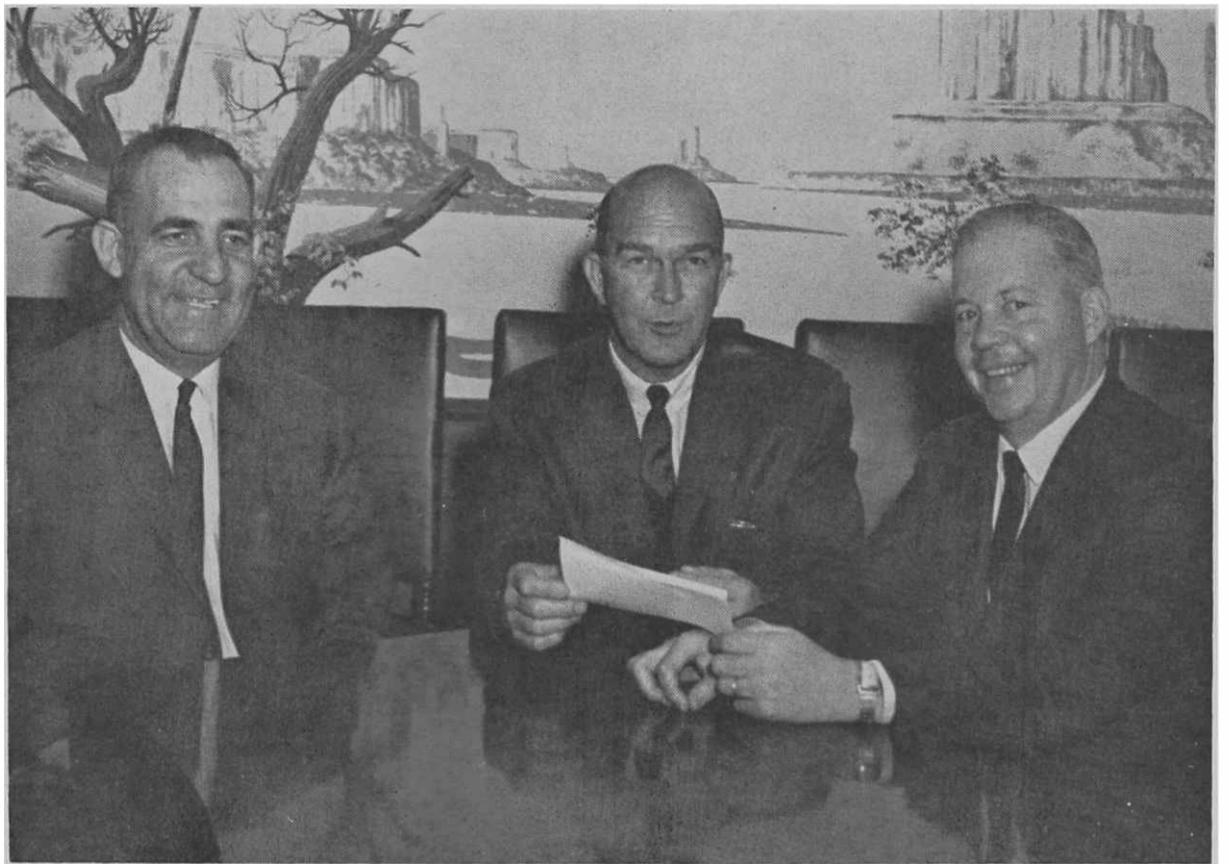
Authors of the 317-page book are Dr. James R. Hastings, UA associate professor of meteorology and research associate in the Institute of Atmospheric Physics, and Dr. Raymond M. Turner, U.S. Geological Survey botanist formerly of the UA faculty.

The new work offers surprising findings of extreme changes in vegetation which have occurred since the 1880's, and explores the respective parts played by man and climate in altering the face of the 40,000-square-mile desert region covered by the study. The desert region studied in southern Arizona and northwestern Mexico ranges from sea level to mile-high altitudes.

The book's highly readable text and more than 200 illustrations encourage readers to make valid interpretations regarding changes which have occurred. Shown on facing pages of the book are 97 pairs of matched photographs taken from exactly the same vantage point with as many as 85 years intervening.

The dramatic photo comparisons show such things as the death of oak forests, the invasion of mesquite trees

## Sears \$2,000 Check Aids 4-H Leader Training



A check for \$2,000 is handed by J. R. Metcalf, center, to Graham P. Wright, right, to aid the U of A program of 4-H leadership development throughout the state.

Metcalf, manager of the Sears Roebuck store in Tucson, is giving the fund on behalf of his company. Wright is state 4-H club leader in the U of A Extension Service. At left is Marvin D. "Swede" Johnson, U of A vice president for university relations.

This is the 11th year that Sears has made a \$2,000 contribution to this program in Arizona.

in large areas that formerly were grassy, and the disappearance of the saguaro cactus from certain areas.

Hastings, senior author of the work, credits numerous U of A, USGS, and other people for their contributions and assistance in preparing the book.

Regarding old photographs used in the work, he said: "We are indebted to the people who clicked a shutter at the time and place right for our purposes."

The book is available at all book stores.

(Continued from Previous Page)

tion trucking companies, farm credit institutions, implement dealers, and many more.

In short, agriculture is Maricopa County's most important and profitable natural resource. And despite marching rows of houses and unprecedented urban growth, it continues to be the backbone of the county's and the state's economy, and it still hasn't reached its peak potential.

### Five Research Centers

Even now, new crops and better ways of growing the old ones are being developed at one or another of the five agricultural experiment stations

which The University of Arizona and the U. S. Department of Agriculture maintain jointly in Maricopa County. These include one devoted to cotton research, another to citrus, a third to poultry, one to vegetable and forage crops, and one to basic research in water conservation.

In addition, farmers and ranchers themselves are busy searching for new and better ways to do things. Farming and ranching long ago ceased to be a way of life in the Salt River Valley. Highly capitalized and highly specialized, agriculture in Maricopa County is a business in every sense of the word, and likewise her farmers are businessmen in every sense of the word.

Problems have arisen, to be sure. Encroaching houses have pushed

farmers out into pump districts where the water is precious and often of poor quality. Restrictive sanitary regulations passed by local government agencies have forced cattle feeders and dairymen to relocate far out on the fringe. Land values in some sections of the valley have appreciated to the point to where a farmer no longer can afford not to sell.

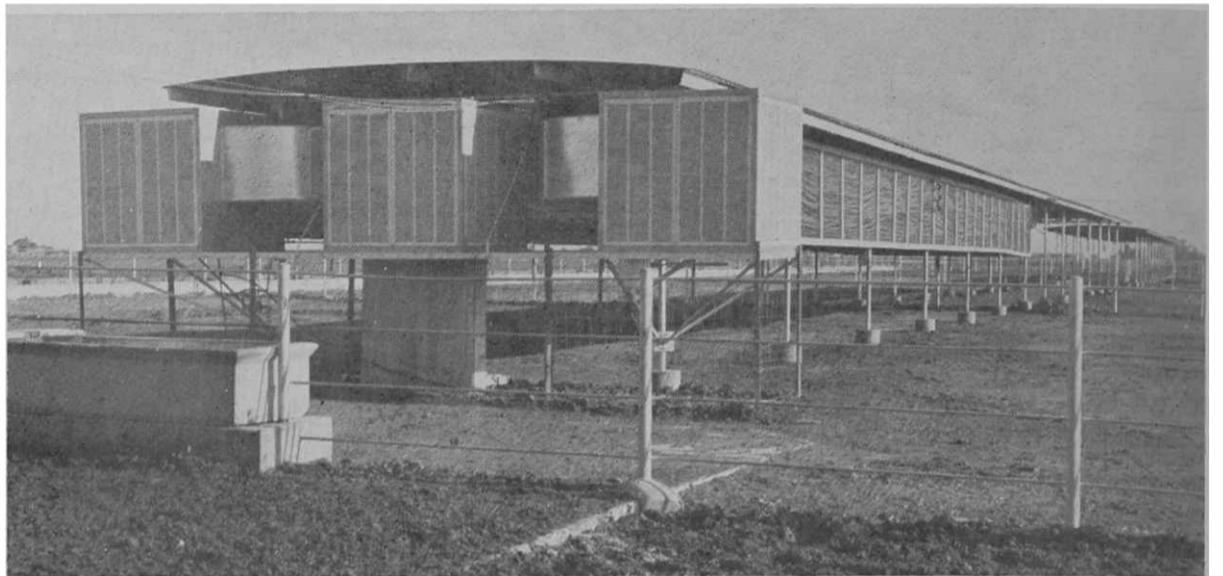
### Future Is Bright

Despite all of this, however, the future looks bright. Through the smog created as a result of urban development, it still is possible to see a future for agriculture in Maricopa County. In fact, if anything, it may be bigger and more important than it has been in the past.

Providing an evaporative-cooled environment for dairy cattle during the summer can markedly increase breeding efficiency and milk production. Not many cattle are given this plush treatment but in two years of testing at an Arizona dairy, 43 such privileged cows produced 6.5 percent more milk, besides responding with a breeding efficiency twice that of similar cows provided with conventional shade.

## COOLCOWS DO BETTER

By G. H. Stott and  
Frank Wiersma



END VIEW of shade area, showing the three large evaporative cooler units, which blow cooled air into the long plastic ducts.

Arizona dairymen are acutely aware that dairy cows are subject to temperature stress during summer months. When air temperatures rise above 80° F., animals begin to feel discomfort. This is especially true of a lactating cow where both feed digestion and milk production generate large quantities of heat.

The only source of heat dissipation is to the surroundings. When this gets warm, heat is generated faster than it is dissipated. The heat accumulation results in a rise in body temperature. Although 101° F. is normal for cattle, it is not uncommon for Arizona dairy cows to have rectal temperatures of 106° F. or 107° F. during hot days. This would prove fatal if it were not for relief through the cooler night temperatures.

### Breeding Efficiency Reduced

Naturally, when any cow is running a fever of this magnitude, she cannot produce at optimum levels. The total annual milk production from Arizona cows calving in June, July and August

has been reported to be 20 percent lower than that of cows calving during the cooler months. The loss in reproductive efficiency is even more serious. Carefully conducted experiments during summer months in Arizona indicate a drop in actual pregnancy in lactating cows at 40 days post-breeding from 60 percent down to 17 percent.

University of Arizona dairy scientists have been studying the physiological effects of heat stress for a number of years. One phase of their studies suggested that the damage to reproduction caused by high temperature occurred during a relatively short period immediately after breeding. This presented the possibility of combating the problem by placing cows in an ideal environment for a day or two at breeding time.

### Cooling Cows in Heat

To test this possibility, University of Arizona agricultural engineers designed and built at Dewer Dairy, near Mesa, a refrigerated enclosure to provide this temporary environment. The enclosure was similar to a small stanchion barn, but equipped to maintain a climate considered ideal for dairy cattle. The barn had room for six cows.

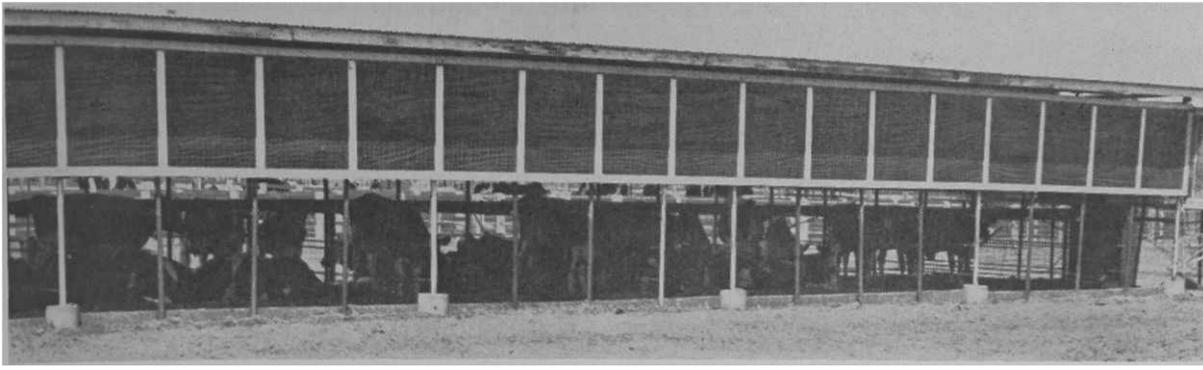
When the herdsman at Dewer spotted cows in estrus, he selected some at random to be temporarily confined in the barn and left the others to be handled according to their regular procedure. The cows selected for confinement were placed in the cool barn and, when their temperature was down to normal, were bred. This cooling period usually took six to eight hours. They were kept in this cool climate for periods varying from 24 to 200 hours. The objective was to learn if temporary relief from heat stress would improve breeding efficiency. If so, how long should the cow be confined to get results?

Although some improvement was observed during both of two years of testing, the increase was not sufficient to justify the cost of cooling plus the additional labor necessary for the special handling of the cattle. This failure to respond may indicate that short term relief is ineffective.

Pinpointing the cause of failure to respond favorably was confounded by an obvious nervousness and discontent in the cows. Placing them in the confinement of a strange building caused a disruption in their feeding and milking routine. Their free-

(Continued on Next Page)

G. H. Stott is head of the Dairy Science Department, Frank Wiersma a staff member in the Agricultural Engineering Department.



**BOVINE RESIDENTS** are cool and happy, under their air-cooled shade. Contented cows gave more milk.

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dom of movement enjoyed in the corral was exchanged for four walls and a stanchion. They were cool, but the abrupt change in environment was disturbing, and may have influenced their breeding response.

Since the refrigerated enclosure was only partially effective and therefore impractical, the engineers went back to the drawing board to design a more practical facility.

#### Coolers in Shade Area

The need for economy suggested evaporative cooling, and the management requirements suggested a free access facility located in the corral. These requirements were achieved by sacrificing the high level of climate control available in the refrigerated barn. A conventional shade at Dewer Dairy was equipped with three large evaporative coolers, each blowing air into a long collapsible plastic duct extending the length of the shade. Each duct had a 4-inch slot along the bottom providing continuous openings through which cool air was blown downward onto the backs of the cattle.

Peak temperatures under the cooled shade were 10° F. to 12° F. cooler than corresponding temperatures under a conventional shade. The continuous flow of air added substantially to cattle comfort. The cattle immediately accepted the facility and although initially curious, showed no apparent disturbance by the modifications.

#### Milk Production Rises

The response by the cattle to their improved summer climate was most encouraging. During June, July and August, they outproduced a similar group of cattle provided with conventional shades by four pounds of milk per day per cow. This represents an increase in gross income of almost

\$800 per year for one corral with 43 cows.

The reproductive benefits, more difficult to describe monetarily, were of equal or greater importance. Breeding efficiencies in the cooled group were maintained at a cool weather normal of 60 percent throughout the two summers of operation. The group without additional cooling averaged 35 percent.

Only one objectionable characteristic was apparent in the evaporative-cooled shade. The ground became wet and more difficult to maintain acceptable for good sanitation. The addition of free stalls solved this problem during the second year. However, there are hopes of designing less costly means of accomplishing this.

#### May Be Here To Stay

Future plans are to expand the present program in designing facilities that will cool dairy cattle most economically. As yet only the feasibility and effectiveness of cooling during the hot summer months has been determined. There is much yet to learn. Just as shades are in common use in dairies today, evaporative-cooling for cows during the summer may become equally common.

#### 'Synthetic' Grain Is Tested by Canadians

Triticale, the synthetic grain that has been getting attention around the country over the past few months, is still in a highly experimental stage of development at a Canadian experiment station according to agronomists.

Triticale is a cross between wheat and rye which was done at an experiment station at Manitoba. Preliminary research indicates the crop, if developed, could have a potential

## PRESIDENT PRAISES NATION'S FARMERS

"The American farmer in the last 30 years has advanced more in agricultural abundance and farm fertility than all the farmers in all the history of recorded time.

"One American farmer now feeds and clothes himself and 32 others besides — an achievement unmatched anywhere on earth.

"One man on the farm today does all the work that was performed by four in 1939. If this were not so, we would need 23 million farm workers to feed and clothe ourselves, instead of the 6.5 million we have.

"Thirty years ago, the city worker toiled 85 hours each month to feed his wife and children. Today he works less than half as long, and the food his family eats is both more appetizing and more nourishing.

"The miracle of American agriculture is thus an example to all the world's billions of the wisdom and the rewards of our democratic system. For more than a century, that system has encouraged development of the family farm and the free and independent farmer.

"Government has assisted land distribution. It has provided agricultural research and education. It has extended credit, and helped to stabilize prices. But the holding and working of the land has remained with the independent farmer in the basic American tradition.

"The preservation of that tradition has been the goal of all our farm policies of the last three decades."

(From the statement by President Lyndon B. Johnson, upon signing of the Food & Agriculture Act of 1965).

as a feed crop or possibly as a cash crop.

B. Charles Jenkins, research professor at the University of Manitoba, who has been working on the crop, says that as yet there is no grain available for release. Nor is there any seed available for experiment testing.

The Canadian researcher says seed will not be available for some time. Agronomists at South Dakota State University indicate the potential of the new crop for South Dakota producers cannot be determined until seed material is secured and the crop evaluated in a test plot program.



# Mesa-Sirsa, New Alfalfa For Southern Arizona

By M. H. Schonhorst, M. W. Nielson, P. D. Keener,  
R. K. Thompson, F. V. Lieberman, and A. W. Woodrow

*Mesa-Sirsa is a new alfalfa variety combining high forage and seed yield with improved resistance to the spotted alfalfa aphid and the downy mildew fungus. The variety was developed cooperatively by personnel of the Arizona Agricultural Experimental Station and the Entomology Research Division, U. S. Department of Agriculture.*

Mesa-Sirsa has been tested as strain SW-25, in cooperation with other members of the Southwest Alfalfa Group, at numerous locations in the irrigated desert valley areas of Arizona, California and Nevada.

M. H. Schonhorst is an agronomist, P. D. Keener a plant pathologist, and R. K. Thompson a research associate in agronomy, all of the Arizona Agricultural Experiment Station; Messrs. M. W. Nielson, F. V. Lieberman and A. W. Woodrow are personnel of the Entomology Research Division of the Agricultural Research Service, U. S. Department of Agriculture.

## Test 178 Strains

Development of Mesa-Sirsa began in the early spring of 1957 when all available alfalfas were collected and planted at The University of Arizona Mesa and Yuma Branch Experiment Stations, primarily to evaluate their reaction to the spotted alfalfa aphid, and adaptation to southern Arizona's desert climate.

This collection consisted of 178 different types of alfalfa, many of which were introductions from alfalfa-growing regions throughout the world. One of the most promising of these

STANDING IN a border-size plot of Mesa-Sirsa at the Mesa Branch Experiment Station is Rex Thompson, U of A research associate in Agronomy.

introductions was P.I. 235736, also designated Sirsa No. 9. It had been obtained by personnel of the New Crops Research Branch of the U. S. Department of Agriculture from a desert area of India called Sirsa. From this source, approximately 5,000 seedling plants were grown in 1958 and infested manually, when two or three inches tall, with a heavy population of spotted alfalfa aphids.

About 100 plants survived the preliminary screening test. They were then transplanted to the field for further aphid tests under caged conditions. Ultimately 13 plants were obtained which were highly resistant to the spotted aphid. These 13 selections were subsequently tested for reaction to pea aphids and the alfalfa seed chalcid. Four plants showed promise for resistance to pea aphids. One of these four, M-56-11 also had some resistance to the seed chalcid. These 13 are the parent plants of the new variety.

One of Mesa-Sirsa's striking features is the ability of its seedlings to survive exposure to both known biotypes of the spotted alfalfa aphid, *Therioaphis maculata*, Buckton (see Table 1).

**Table 1. Percent Survival<sup>1</sup> of Alfalfa Seedlings Exposed to Two Biotypes of the Spotted Alfalfa Aphid—Tucson, Arizona 1965**

Variety	Biotype	Biotype
	ENT A (%)	ENT B (%)
Mesa-Sirsa	78	87
Moapa	16	50
Sonora	28	55

<sup>1</sup> Average seedling survival from four replications. Seedlings in the ENT A test were exposed to aphids for 31 days, while in the ENT B test they were exposed to aphids for 24 days. ENT B is the predominant biotype found under field conditions.

Stand persistence of Mesa-Sirsa appears similar to that of Moapa, but

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**Table 2. Reaction of Mesa-Sirsa to the Downy Mildew Fungus in Comparison With Resistant and Susceptible Alfalfa Strains and Varieties at The University of Arizona Mesa Branch Station.**

Strain or Variety	Mildew rating <sup>1</sup>		Number and origin of parent plants
	Spring, 1964	Spring, 1965	
Moapa	4.5	3.5	9 clones, African
Sonora	3.3	2.5	13 clones, African
Mesa-Sirsa	2.0	1.8	13 clones, Sirsa #9
Ariz DC-1	2.3	1.5	2 Sonora, 2 Mesa-Sirsa
SW-17	0.5	1.2	1 Sonora, 1 Mesa-Sirsa

<sup>1</sup> Rating of zero indicates no evidence of downy mildew; rating of 5.0 indicates nearly 100% of the plants of the strain or variety were heavily infested and stunted. The 1964 rating was made on March 27; the 1965 data are the averages of two observations, March 1 and April 8, 1965.

**Table 3. Comparison of Weight (pounds) of "Oven-Dry" Hay Production from Three Experimental Alfalfas and Moapa for 1964 and 1965, at The University of Arizona Mesa Branch Station.**

Strain or Variety	Year of Production		Two-year total
	1964 (8 harvests)	1965 (7 harvests)	
Moapa	20,038	19,687	39,725*
Mesa-Sirsa	22,563	21,740	44,303
Ariz DC-1	22,234	20,968	43,202
SW-17	23,793	22,950	46,743

\*Total yield for two years of the check variety Moapa converted to hay with 12% moisture was 22.5 tons.

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superior to Sonora. Mesa-Sirsa also has an intermediate level of resistance to the downy mildew fungus *Peronospora trifoliorum*, de Bary. For comparative purposes, plants of Mesa-Sirsa are damaged less by downy mildew than plants of either Sonora or Moapa (see Table 2).

Mesa-Sirsa is similar to Sonora in late fall and early spring growth. At The University of Arizona's Mesa Branch Station, border-size plots were planted in the fall of 1963 to compare the performance of Mesa-Sirsa with Moapa. To date 15 cuttings of hay have been obtained, with Mesa-Sirsa producing approximately 11 percent more forage than Moapa (see Table 3).

Foundation (second generation) seed of Mesa-Sirsa has been planted at several locations in the southwestern alfalfa region to determine additional areas of potential use.

Certified seed will be available to growers in moderate supply later this year pending official release of the variety.

## Extension Veteran, Blackledge Retires

After 45 years on the Arizona scene, Blackie is retiring. As a gracious, able and very likable friend of agriculture, G. E. "Blackie" Blackledge has for more than four decades symbolized the best in agricultural extension — and the best of land-grant agricultural college cooperation with the area it serves. He retired last Dec. 31 from his post as Pima County Extension Agent.

Blackie is most proud of his role as the link between the research men of the U of A Agricultural Experiment Station and the farmers who till the soil. He has often been called "The farmer's man."

When fresh agricultural knowledge is gleaned from research, Blackie wants to know: "Will it work?" He finds out whether it works through use of demonstration plots set up through the cooperation of farmers and ranchers. The record shows that plenty of it has worked.



Among these demonstration plots are tests of new varieties of cotton, alfalfa and other crops, range re-seeding practices, new fertilization methods, herd improvement practices, insect control chemicals and weed-killers and the like.

This way, the farmers and ranchers can see the results for themselves and make up their own minds. Blackie has never believed in telling a man how to run his farm or ranch.

"Arizona farmers and ranchers are highly intelligent. Just see that they get the right information and they'll make the right decisions," said Blackie.

Blackie is a native of Delaware County, Ohio, but he has served agriculture in Arizona so long that friends find it hard to visualize him as ever having lived in another state.

First coming to Arizona as a U of A student in 1921, Blackie recalls that a streetcar then linked the campus with downtown Tucson by way of Third Street, but that he preferred to save his nickel and walk.

After receiving his bachelor of science degree in agriculture at Colorado A&M in 1923, Blackie returned to Arizona as a teacher of vocational agriculture in Greenlee County. He kept that job until he became Greenlee County Agent in 1926.

He was transferred to Yuma County as a county agent in May, 1931, and took time out to get his master's degree in agriculture at Colorado State University in 1940.

In 1944, he was transferred by the Extension Service to Pima County, where he served as county agent until his retirement December 31, 1965. For many years, he directed Extension work in both Pima and Santa Cruz Counties.

# RANGE RESEARCH STUDIES AT CANANEA

Arizona and Sonora are two states separated by a line which divides two countries. But this man-made line does not change Nature's dominant ecological conditions. These states have similar regions of desert grassland and mountains, with many plant and wildlife species and livestock types in common.

By Ramon Claveran A. and  
Donald Johnson

Production of adequate forage for animals, reduced range deterioration caused by woody range invaders, reduced livestock poisoning from poisonous plants, etc. are common goals in both of these states.

A combined effort between states to reach these goals undoubtedly will be a profitable approach to solve the problems involved, especially if research institutions are involved and well-defined programs are designed.

This idea inspired a meeting held at The University of Arizona last April. It was attended by a group representing The University of Sonora and headed by Mr. Luis Carlos Félix, Dean of the College of Agriculture. Other representatives from the University of Sonora were Prof. Donald Johnson, Prof. José Luis Serrano, and Mr. Luis Carrillo, Range Extensionist.

Representing The University of Arizona were Experiment Station Director Richard K. Frevert, Dr. Andrew L. McComb (Head of the Department of Watershed Management at that time), Dr. John H. Ehrenreich, Dr. Jack Stroehlein, Prof. Phil Ogden, and Mr. Ramon Claveran.

Cooperative range research projects between the Colleges of Agriculture of both Universities were discussed. Three study projects were approved, and the responsibilities for each project defined. The duration of the studies is for about 20 months. They all are being conducted in Northern Sonora, in the Cananea region on "La Cieneguita" Ranch owned by Mr. Andrés O. Córdova, cattleman and banker. The range research projects are the following:

1. *Effects of Fire in a Mesquite Population*

Most of the desert grassland area is depleted to

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Mr. Claveran is a graduate student in the Department of Watershed Management at The University of Arizona. He is a native of Aguascalientes, Mexico, studying in the United States on a Banco de Mexico scholarship. Mr. Johnson is Professor of Range Management at the College of Agriculture in the University of Sonora, at Hermosillo. He obtained his B.S. and M.S. degrees at The University of Arizona. Interestingly, therefore, The University of Arizona leader in this cooperative project is a Mexican, while the University of Sonora leader in the project is actually an Arizonan.



**MESQUITE-INVADIED** desert grassland in the study area. This is typical of much of Southern Arizona and Northern Sonora.



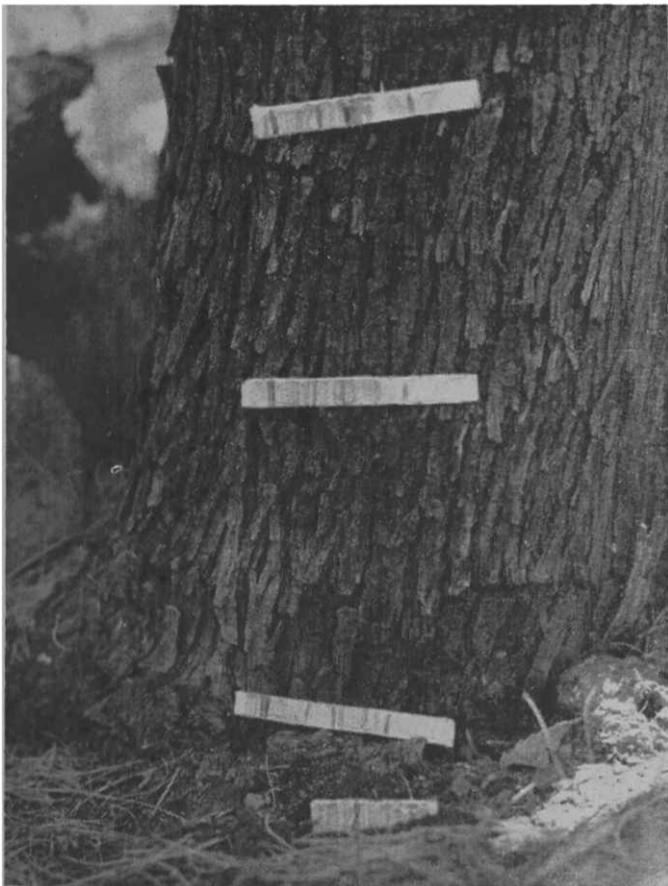
**THE FIRE ADVANCES** into dry grass and Mesquite trees.



**AFTER THE FIRE** has swept through. It is believed that grass roots are not injured, but Mesquite is sharply retarded.



**CONTRAST BETWEEN** burned area and adjoining control plot. Photo taken immediately after the fire.



**TAKING TEMPERATURE** of a tree. Note the set of pyrometers located at base, six inches and 12 inches up on the bark of the Mesquite tree. The pyrometer is also used to measure temperatures in nearby soil, as shown at base of photo.

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different degrees, and the forage production is several times under its potential. Desirable species have been displaced by invader plants which often are trees, shrubs, and semi-shrubs. Mesquite (*Prosopis juliflora* var. *velutina*) is perhaps the most important one.

Several factors have been described as the causes leading toward the depletion of natural grasslands. Overgrazing is pointed out as an important factor. Also, the role of fire on the desert grassland in the past and present has been discussed; but, unfortunately, there are not many experimental studies on this subject. It is assumed that in the past, periodic fires killed woody plants at higher rates than herbaceous ones.

Objectives of this study are to obtain data about fire damage to mesquite plants and to determine the maximum temperatures reached during the fire and its correlation with the amount of available fuel. The practical application of this study is to evaluate the possibilities of the use of fire as a tool to control woody vegetation under certain specific conditions. Mechanical and chemical methods are expensive and almost prohibitive in Mexico.

Eight plots were delimited and fenced in a typical desert grassland invaded by mesquite. Four plots were burned in early June. At this time, temperatures during the fire were recorded above and below ground surface by using replicated sets of chemical pyrometers. Weather conditions were also observed during the fire in order to obtain as much information as possible on factors influencing the fire behavior.

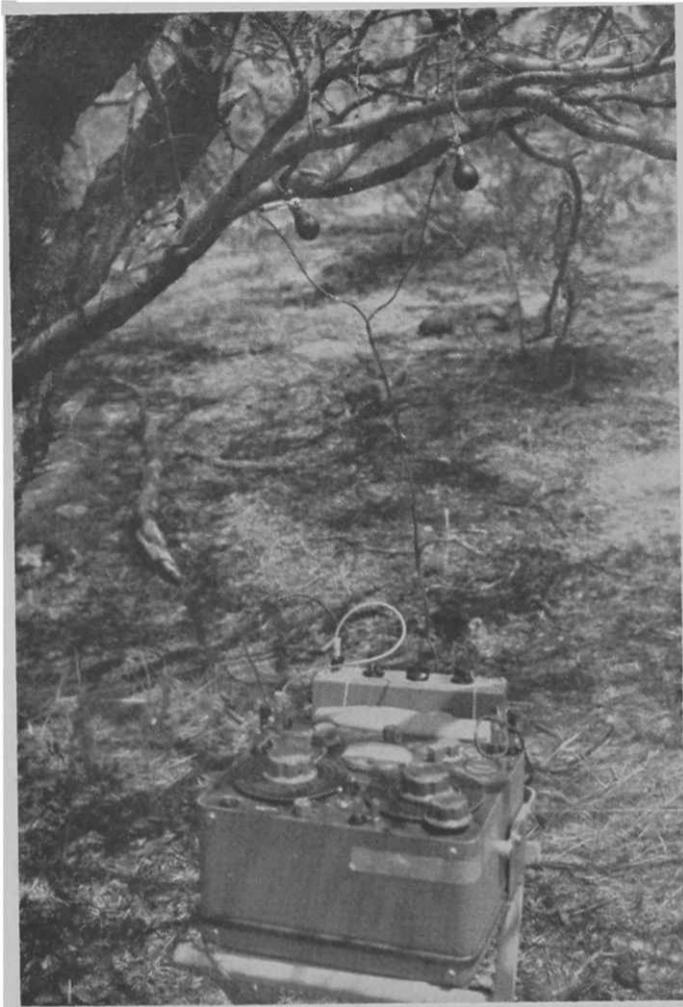
The day after the fire, the electrical resistance of branch tissue was recorded for each one of the 108 mesquite trees where temperatures and fuel were measured. Electrical resistance was determined in an attempt to evaluate the tissue damage by fire and correlate it with the observed temperatures caused by varying amounts of fuel. Results and conclusions will be available when the study terminates in July of this year. The principal investigator in this study is Ramon Claveran A.

## 2. *Effect of Fire on the Composition of the Herbaceous Cover and Soil Erosion Rates*

The effects of burning on herbaceous plants and also erosion rates are being studied to obtain an overall balance of positive and negative results from the use of fire in the desert grassland. Soil erosion caused by the rains falling on the unprotected soil surface is one of the most common objections to fire mentioned in the literature.

Vegetation composition and basal density were determined on the eight plots before the burning. Measurements were achieved by using the point-plot method along lines permanently located with steel stakes. Subsequent measurements will be accomplished later this spring. Permanent sample plots also were located in each plot, and soil level readings were measured before the fire and they will be repeated after the summer and winter rains.

The principal investigator of this project is Mr.



**ELECTRICAL BRIDGE** is used to determine electric resistance of a branch tissue of Mesquite as a means of evaluating damage to the plant caused by fire. Note wires extending to branches. Pins are inserted in the branches at 10 inch intervals.

quality of the natural forage is compensated by providing supplementary food to the animals on the range.

Fertilization experiments on desert grasslands have shown that herbage production and its quality have been improved, but sometimes such increments are not justified from the economic point of view. Apparently the available moisture is the principal factor limiting the effect of fertilizer.

Sacaton (*Sporobolus wrightii*) is a common grass in the desert grassland bottomlands. These sites receive higher moisture than the grassland of the mesas and slopes because of moisture concentration determined by the topographic conditions. Sacaton bottoms could be a suitable location for fertilization practices.

The objective of this experiment is to evaluate the effects of fertilization on a typical sacaton bottomland. Forage yield, its quality and cattle preference are being determined. Four levels of nitrogen (0, 50, 100, and 150 kg./hectarea) and two levels of phosphorus (0, and 100 kg./ha.) are being tested. Sacaton plants were cut to a standard height and treatments applied before the summer rains.

At the end of the summer rains, samples were obtained from each plot. Weights were recorded and chemical analyses will be performed in each University. After samples were collected, the fence was removed to provide free access to cattle. Utilization on each treatment plot will be made to determine animal preference.

The principal investigators of this study are Prof. Phil R. Ogden and Prof. Donald Johnson.

Technical supervision and guidance in the three studies of the program is provided by Dr. John H. Ehrenreich, Dr. Jack Stroehlein, Prof. Phil R. Ogden and Prof. Donald Johnson. Mr. Andrés O. Córdova is contributing to the research study by permitting the use of his land, paying the expenses of fencing both experimental areas, cutting the sacaton, and a general and unlimited cooperation and enthusiasm.

This is the first step of a cooperative range research program between two great Universities of two neighboring states and countries. The mutual beneficial results derived should make this a continuing program.

(Continued from Previous Page)

Eudoro Moreno, Range Specialist working for the Bank of Mexico in Sonora.

### 3. *Fertilization of a Bottom Land with Alkali Sacaton*

The livestock industry in Northern Sonora depends heavily on the forage produced in the desert grassland. Therefore, it is limited by the prevalent weather conditions. During the dry season, decreased quantity and



#### MARCH

1-2—Western Cotton Production Conference, Ramada Inn, Phoenix

3—Annual Bull Sale, Arizona Beef Cattle Improvement Station, Tucson

6-10—Western Regional 4-H Lead-

ers' Forum — Pacific Grove, California

19—FFA Field Day, U of A Campus

23-27—Southern Arizona International Livestock Show, Pima County Fair Grounds, Tucson

#### APRIL

15-17—Coronado Section, American Camping Association Annual Conference, Flagstaff

16—U of A 4-H Service Club Invitation Day for Senior Club

Members, U of A Campus

17-23—National 4-H Conference, Washington, D.C.

#### JUNE

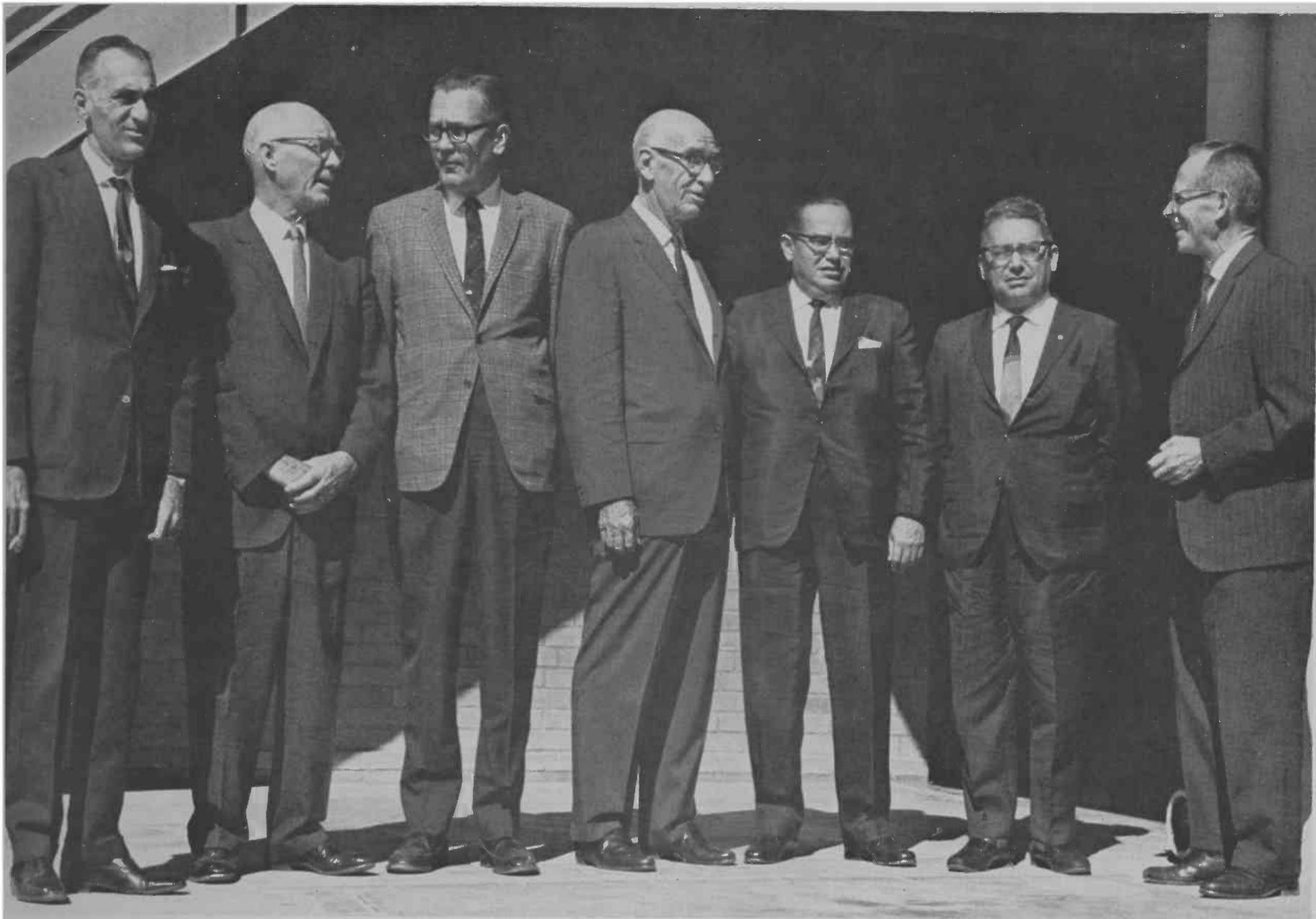
6-10—Town and Country Life Conference, U of A Campus

#### JULY

25-29—State 4-H Roundup, U of A Campus, Tucson

March-April

## Brazilians, Arizonans Confer on Program



Visitors from the University of Ceará, at Fortaleza in northeast Brazil, conferred in Tucson with members of the U of A College of Agriculture staff who are concerned with this university's AID contract, through which a group of agricultural scientists and extension specialists work with their Brazilian counterparts at the University of Ceará.

Posing for the photographer, left to right, are:

Dr. José Dario Soares of the University of Ceará; Prof. E. B. Stanley, longtime animal scien-

tist here and presently liaison man for the Brazil contract; Dr. R. K. Frevert, director of the U of A agricultural experiment station; Dr. W. J. Pistor, animal pathologist here and for the past two years chief of party of the U of A team at Fortaleza;

Dr. Vincente Lopés Gondim of the University of Ceará; Dr. Renato de A. Braga, also from the university at Fortaleza, and at extreme right, Dr. D. F. McAlister, head of the agronomy department and assistant experiment station director here, slated to replace Dr. Pistor in the second two-year phase of the U of A-U of Ceará program.

### IT'S GOOD, EARTHY LOGIC

At a meeting in Scottsdale recently, Vine Deloria Jr., a Sioux Indian from the Standing Rock Reservation, said "We fooled around for 200 years and let the white man take over this country. Now it's our turn, because they're going to the moon.

### AND ENJOYABLE, TOO

Watermelon is surprisingly nutritious. A 4x8 inch wedge — just a sample for a real watermelon eater — provides more than a third of the recommended dietary allowance of vitamin C and half the allowance for vitamin A, as well as good contribution of other vitamins and minerals.

### WE'RE ALL GETTING WETTER

Water use in the United States is growing at the rate of 25,000 gallons every minute, and is to jump from a daily rate of 359 billion gallons in 1965 to 453 billion gallons daily in 1975. About 10 percent of this goes into homes, nearly half goes for irrigation, and the other 40 percent is used by industry.

# SHALLOW STRIP TILLAGE IN SEEDBED PREPARATION

By K. R. Frost

Numerous tests on both field and vegetable crops by agronomists at The University of Arizona during 1962 and 1963 demonstrated the effectiveness of petroleum strip-mulches in improving early season germination and emergence. Early season stands often result in increased yields because of a lengthened growing season.

Effective application of petroleum emulsion requires a smooth soil surface which will result in development of a thin continuous film of petroleum at a minimum application rate. The reduction of cloddy and rough surfaces is necessary if emulsion performance and cost is to be physically and economically satisfactory.

## Soil Condition Differs

Strip seedbed preparation may be required in either moist or dry soils. Cotton is normally planted in soil moisture at or near field capacity. Initial field trials of strip tillage machines indicated that wet and dry seedbeds required quite different mechanical treatment for satisfactory pulverization. Strip tillers were developed for wet and dry soil preparation. In these units the strip tiller, tiller housing, adjustable vee-type clod pushers, seed furrow openers, seed hoppers and drops, seed press shoe, and convex zero-pressure smoothing press-wheel are combined into one assembly.

The tillage rotor for moist soils was designed for strip tillage. It consists of a spring-tined tiller 8 inches in diameter and is rotated at 700 to 900 r.p.m. in the forward-rolling direction. Reduction of clods is accomplished by impact and the pulverized soil is smoothed into place by the deflector plate. This tiller operates in the range of one to two inches in depth.

The spring-tined tiller had little effect in changing the size of aggregates of dry soil. The most effective device for dry soils was a 5-inch-

diameter grinder. This rotor was operated at 1200 to 1400 r.p.m. in a counter-rolling direction. Soil flows up and over the rotor and is pulverized by rubbing action against the shear plate. The pulverized soil flows out below and to the rear with respect to the shear plate and is de-

posited in a 1/2- to 3/4-inch layer.

This type of soil treatment has made it possible to develop satisfactory petroleum films at application rates of 8 to 10 gallons per acre per inch of band at 40-inch row spacing. Two-stage application of the petroleum emulsion has been found most effective for film development.

## Field Tests Are Made

Preliminary field testing of the strip-tiller system for petroleum emulsion treatment of cotton was conducted in 1964 in cooperation with the Agronomy Department. The spring-tined tiller or the grinder was used in these

(Continued on Next Page)

## Emergence of Cotton Plants per 100 Feet

Date of Planting	SHALLOW				DEEP		
	No Emulsion		No Emulsion		No Emulsion		No Emulsion
	Tiller- mulched	Un- mulched	Tiller- mulched	Un- mulched	Tiller- mulched	Un- mulched	Tiller- mulched
Wellton, Ariz. March 4, 1965	110			44			
Phoenix, Ariz. March 8, 1965	114	101	84		74	54	46
Phoenix, Ariz. March 26, 1965	184	176	137	103	170	176	93
Phoenix, Ariz. April 21, 1965	207		260	83	187	182	260

**TRACTOR MOUNTED strip-tillage machine planting two rows. Note asphalt-emulsion tank on front and black strip on soil surface at rear.**



The author is a professor in the Department of Agricultural Engineering.

# Cultivating Our Garden

By Arthur H. Beattie

**"EDITOR'S NOTE:** This is fourth and final portion of Dr. Beattie's beautiful address to the national honorary society for agriculture, Gamma Sigma Delta. Like the previous portions, this is an entity unto itself, and can be so enjoyed.

A little reading in the background of this land of ours informs us that the Papago did not wait idly for the summer rains to come. Under the direction of the medicine man, he participated in bringing them through the most important religious ceremony of the year. The Papago was an abstemious man, who carefully shook out and gathered the seeds of wild grasses and the beans of the mesquite bush.

The cactus of the desert, roasted under a fire, provided food for him. Fermented drinks (until the white man's example taught him otherwise) had no place in his life except for the annual rainmaking ceremony. It was not men such as these that Isaiah cursed, saying, "Woe unto them that are mighty to drink wine, and men of strength to mingle strong drink."

Like the cities of the Hebrews, after the years of wandering, Southern Arizona has known its share of "men of strength to mingle strong drink," but this was not true in the days when the Papago possessed the land. Drinking the fermented liquor made from the saguaro was reserved for the lengthy ceremonials whose object was to bring the summer rains.

These ceremonials offer an excellent example of the effective use of magic. The saguaro fruit did not ripen until the necessary heat to bring

the summer rains had developed, and the fermenting of the liquor required the higher humidity which is a forerunner of the rainy season. Thus the rituals were regularly successful, for normally the rain followed closely upon their performance. For magic to work, it must, of course, be closely tied to natural forces.

## Biblical Range Wars

The Papagos, before the coming of the white man, were not herdsmen. Today, however, Indians and whites raise cattle in our region. In a land of scant rainfall and sparse grass, vast areas are required for the grazing of flocks and herds, and the danger of overgrazing is a constant one. The most popular folk entertainment of our day — the TV Western — depicts with keen delight the gunfights of cowboys, but rarely suggests the underlying problems of the shortage of water and the necessity of preserving the range from overgrazing.

This, too, was a problem familiar to the Hebrews of patriarchal days. We who know the rangelands of the Southwest find understandable and enlightening the quarrels between Abram's men and those of Lot, and the separation of the two parties. "And Abram was very rich in cattle, in silver and in gold. And he went on his journeys from the south even to Beth-el. And Lot also, which went with Abram, had flocks, and herds, and tents. And the land was not able to bear them, that they might dwell together. And there was a strife between the herd men of Abram's cattle

and the herd men of Lot's cattle. . . . And Abram said unto Lot, "Let there be no strife I pray thee between me and thee, and between my herd men and thy herd men; for we be brethren. Is not the whole land before thee? separate thyself, I pray thee, from me; for if thou wilt take the left hand, then I will go to the right; or if thou depart to the right hand, then will I go to the left."

## "... Do Not Stagnate"

Reading for most of us makes the greatest single contribution toward the development of a full and rich inner life, but of course the arts are important also, and in the cultivation of our garden must not be neglected. The important thing is that we not stagnate, that we not content ourselves with a mere animal, or even vegetative, existence.

At times we may admire, even envy, the apparent placidity of certain animals. On that chill Visitors' Day on the campus I watched the magnificent, heavily meated Herefords put on display outside the west wall of the Student Union. That they had more dignity than many of the people who stopped to chatter around them, that they enjoyed a greater calm, was certain. Yet these were creatures bred to produce the greatest possible quantity of high quality beef for our tables.

Their placidity is a result of an absence of thought, of any concern for the world about them, that it would be folly for us to seek to emulate. Discontent is one of the most important traits of human nature; without it there would be no striving for improvement, no cultivation of our garden, no progress.

Walt Whitman in "Song of Myself" writes a fascinating passage expressing envy of the animal's lot. I think of it often, for the bovine life has a strong appeal, and there are in the verses in question certain phrases  
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tests depending on soil moisture conditions. In these tests, the petroleum emulsion had been applied at 70 to 80 gallons per acre in 8-inch bands on 40-inch centers. Plantings were made "to a stand" with no subsequent chopping. Some difficulty was experienced in maintaining proper seed depth. Germination was not good where seeds were shallower than 1-inch, but deeper placement was felt

to be practical under petroleum emulsion because of the soil temperatures developed.

In 1965, field tests were again made in cotton, and included strip-tillage, petroleum-emulsion, and strip-tillage with petroleum-emulsion as compared to conventional seedbeds. Also included were tests of planting depth under emulsion. These tests were conducted near Phoenix. Very early plantings were also conducted near Wellton on March 7. A fair stand was obtained although rows were overirrigated and two rains followed

which left soil in hard and cracked condition. A poor stand resulted from the germination on conventional seedbeds.

Our table shows results of four plantings in 1965 and indicates better stands with petroleum-emulsion applications and for strip-tillage mulched rows compared with non-mulched. The last planting (April 21) resulted in no advantage to the emulsion application as soil was sufficiently warmed to germinate seeds in all treatments.

# Bird-Tolerant Sorghums Boost Take-Home Yields

By Robert L. Voigt

*"The Arizona Farmer can have his cake and eat it too." It looks like he can have bird tolerance and high yield in the same hybrid grain sorghum.*

"Feeding your feathered friends may be fun — but it can be an expensive hobby for some Arizona farmers." An article was published over a year ago in *Progressive Agriculture* in Arizona, describing in some detail a hybrid grain sorghum, Georgia 615, and its advantages to Arizona agriculture because of its "bird-tolerant" characteristics. The bird damage situation is a problem that certainly

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is not decreasing in many agricultural areas in Arizona.

## Some Loss in Yield

Until recently, few bird-tolerant hybrid grain sorghums had been utilized here in Arizona. Some were tried in years past, but usually yielded somewhat less than the better adapted hybrids in situations where birds were not a problem. Previously it was necessary to sacrifice some yield when one selected a bird-tolerant hybrid to help insure some sort of a crop to harvest.

It looks now like we are almost able to "have our cake and eat it too," regarding yield and bird tolerance. The 1965 yield results of five bird-tolerant hybrids and four adapted but non-bird-tolerant entries suggests we now have high-yielding bird-tolerant hybrid grain sorghums in Arizona. Perhaps we no longer need always sacrifice yield for insurance against birds.

During the 1965 growing season, five hybrids with bird-tolerant char-



**BIRD DAMAGE** is evident in these heads of Regular Hegari, taken from a University of Arizona experimental field in October.

acteristics (Georgia 615, Georgia 609, Arkansas 614, Northrup King 273, and RS 617) and four hybrids lacking such attributes were yield-tested under conditions allowing severe bird damage at the Yuma, Mesa and Safford Branch Experiment Stations.

## No Damage at Marana

Sparrows and doves were the principal birds involved. A fourth test site on the Marana Experiment Farm was under conditions of no bird damage due to its location and surrounding grain sorghum acreage. These yield results are given in the adjoining table.

These five hybrids are ranked in order of average production at the

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that strike me as remarkably provocative. The poet writes:

I think I could turn and live with the animals, they're so placid and self-contained.

I stand and look at them long and long.

They do not sweat and whine about their condition,

They do not lie awake in the dark and weep for their sins,

They do not make me sick discussing their duty to God,

Not one is dissatisfied, not one is demented with the mania of owning things,

Not one kneels to another, nor to his kind that lived thousands of years ago,

Not one is respectable or unhappy over the whole earth.

However much he may admire certain stoic qualities of the animals, Whitman of course is not prepared to abandon the active life of the intellect to share their placidity. But in these lines he has admirably struck at certain of our follies which we can indeed correct. I particularly like the phrase "demented with the mania of owning things." It describes a

major malady of our day. I like, too, his joining the ideas of respectability (in a socially conventional sense) with frustration and unhappiness.

But Whitman is grossly exaggerating. The ruminations of bovines lead only to the digestion and assimilation of the nutritive elements in their fodder; what we call rumination in man is a totally different process which can, if one has genius, produce a poem like "Song of Myself."

## "Don't Be a Cabbage!"

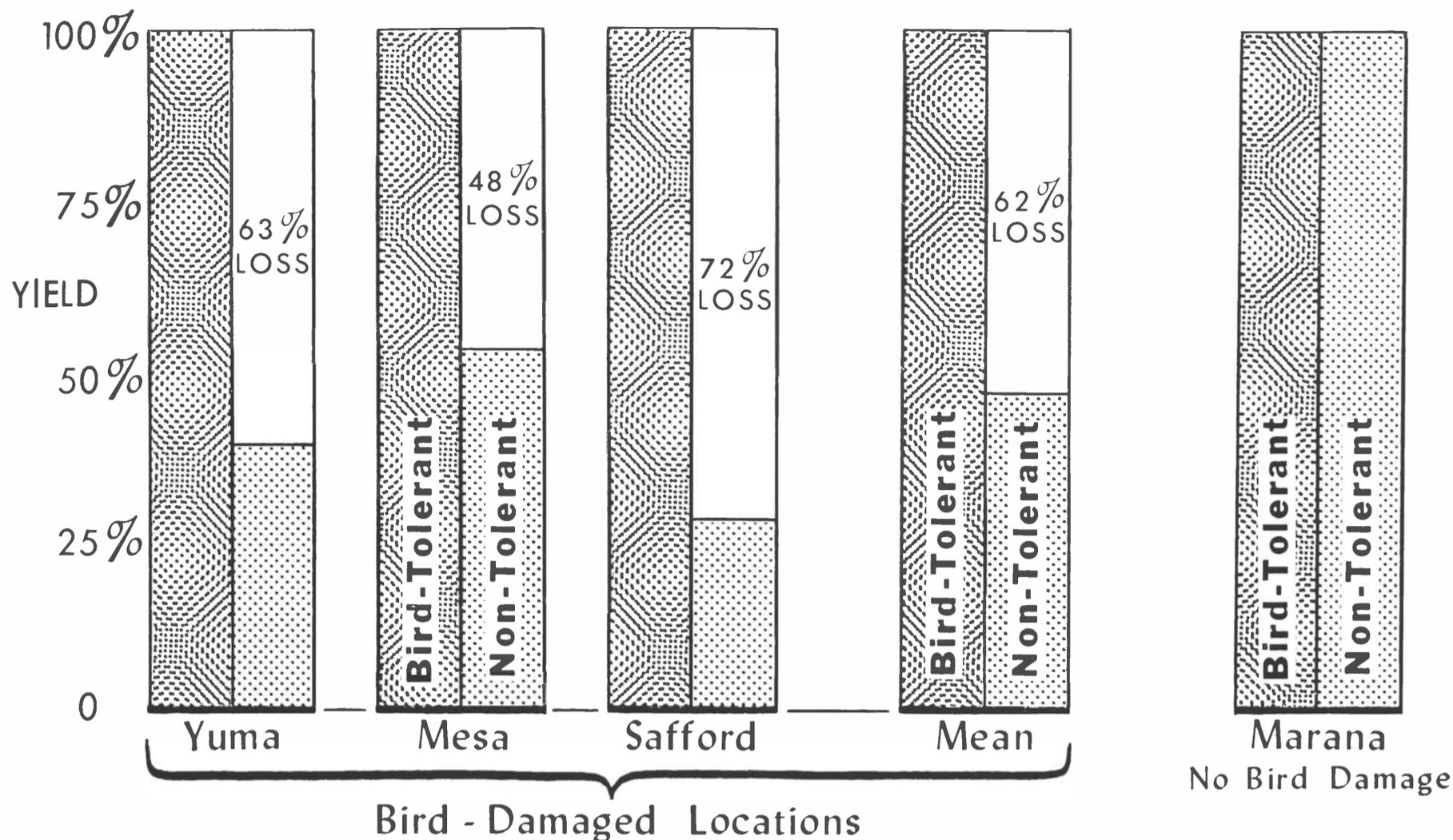
If the animal life is to be rejected by man, the merely vegetative existence must be even more vigorously rejected, no matter how pleasant it might seem at times to take root and grow without feeling, presumably without, or with a very limited, consciousness. Of all ways of life, the dull life of the cabbage is most to be spurned.

Years ago in a northern town a neighbor across the street from our place planted a whole garden of cabbages. He failed to harvest them before the winter snows, and in the spring the melting snow uncovered them. As the days grew longer and

the sun grew warmer, the air was filled with the foul odor of their corruption.

There are cabbages in all social groups — those who do nothing to promote progress but are content with their dull, petty vegetative existence. There are a few in the teaching profession. There are some in many academic organizations — though of course not in Gamma Sigma Delta. When I am tempted myself to vegetate, I recall the cabbages and how in time their heads grow soft and useless and they go to seed.

Don't be a cabbage. Indeed, I urge you to join me in seeking as we cultivate our garden to root out the human cabbages. They are more harmful than Russian thistle, or the pink boll worm, or sap-sucking aphids. I offer to you as a rallying cry in this campaign to extirpate the cabbages an old French proverb, which I have just now invented for the purpose. It runs, "Mieux vaut tete d'oeuf que tete de chou" — "Better an egghead than a cabbagehead."



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three test sites with bird problems. Note that Georgia 615 came out on top in the three-location average, but Arkansas 614 was tops at Marana. It is not difficult to pick out the five entries which show a high degree of bird tolerance.

Yields of the four other entries were greatly reduced by birds at three locations. Advance 14 ranked third in 1964 in a yield test of 56 entries at Marana, reflecting its good adaptation, yet it could not be expected to do its job when subjected to such bird damage. RS 610 is an old standard that is now somewhat inferior in yield to more recent releases. It also was badly eaten, as expected.

A valid direct comparison cannot be made between yields with no bird damage at Marana and yields with bird damage at the other three locations since bird damage losses would be confounded with location differences. In the table, by comparing the average yield of the five bird-tolerant entries at Marana with the four non-bird-tolerant entries, we note a 10 percent lower yield by the non-tolerant entries as a group. Since performance figures are usually relative among locations, we might assume that 90 percent of the loss by these four non-bird-tolerant entries as a group at each of the other three locations is due to bird damage.

**YIELD OF non-bird-tolerant grain sorghum hybrids, as a percent of yield of bird-tolerant hybrids at four locations in Arizona in 1965 (but corrected for location and yield differences) is shown in the graph above.**

**Revealed in Graph**

Losses due to bird damage, but corrected for location and "group" yield differences, are presented in the accompanying graph. In a separate yield test in 1965 at Marana, involving 88 commercial and public hybrid grain sorghums, three of these five bird-tolerant hybrid grain sorghums ranked in the *top five* according to

yield. This is the sort of information that helps assure us of yield together with bird tolerance.

What were the visible characteristics of these more bird-tolerant entries? They tended to have loose heads, long tight glumes over dark brown seed. The four less bird-tolerant entries had heads less loose or open, with short glumes over red-brown to light red seed. Head types are illustrated in the photo.

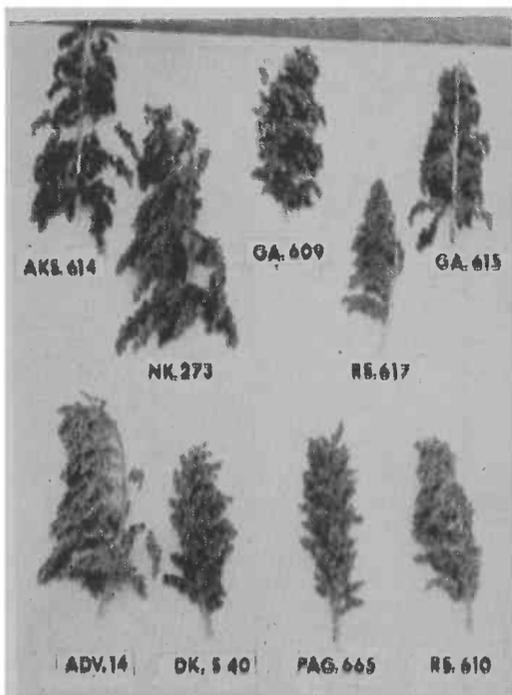
These five bird-tolerant hybrid grain sorghums are not the only ones

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**Grain Yields in Pounds per Acre of Five Selected Bird Tolerant Grain Sorghum Hybrids and Four Hybrids with Less Bird Tolerance Grown at Four Locations in Arizona.**

		LOCATION				No Bird Damage MARANA
		YUMA	Severe Bird Damage MESA	SAFFORD	MEAN	
<b>Five Bird-Tolerant Hybrid Grain Sorghums</b>						
Georgia	615	5799	4302	6957	5685	6933
Georgia	609	5015	4030	6018	5021	6162
Arkansas	614	5064	4029	5823	4972	7115
Northrup King	273	4770	4138	5914	4941	6756
RS	617	3651	3594	5490	4245	5482
	Mean	4860	4019	6040	4973	6490
<b>Four Non-Bird Tolerant Hybrid Grain Sorghums</b>						
DeKalb	S-40	2197	2668	665	1843	5122
PAG	665	680	1797	2178	1552	5704
Advance	14	1300	1198	814	1104	6541
RS	610	1005	1089	814	969	5926
	Mean	1296	1688	1118	1367	5823
Mean Difference in Pounds From Bird Tolerant Entries		-3564	-2331	-4922	-3606	-667 (10%)

## Professor Fuller Honors Student Fuller



GENERAL VIEW of head configurations of five bird-tolerant hybrid sorghums (top) and (lower row) four non-bird-tolerant hybrids.

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expected to be available to the Arizona farmer. Georgia 609 is no longer in production, but has been replaced by Georgia 615 with superior performance. DeKalb Seed Company has a bird-tolerant hybrid grain sorghum, BR-60, of which we did not receive sufficient seed to include in our tests. This information on bird tolerant entries will be of value to the Arizona farmer when he goes to his local seed dealer to order seed for 1966.

### Yields Are Rising

The Arizona average grain sorghum yield of 69 bushels per acre in 1964 ranked second in the United States, surpassed only by California. This was an 11.5 percent increase in yield for Arizona over the 1959-1963 five year average of 61.9 bushels per acre. The 1965 average Arizona yield is 70 bushels per acre, a 13.1 percent increase over the 1959-63 five year average.

This high yield may be attributed to several factors — better seed selection by the Arizona farmer, better cultural practices and even perhaps some better, more productive land involved in the 30 percent increase in grain sorghum acreage in the last two years. However, the selection of a bird-tolerant hybrid grain sorghum may be the best selection that some farmers can make in certain locations to best insure a higher yield.



Lawrence B. Fuller (left), senior majoring in Agricultural Chemistry & Soils, is shown receiving a \$200 check awarded by the National Plant Food Institute. Presenting the check is Dr. W. H. Fuller, head of the Agricultural Chemistry & Soils Department. (The department head is no relative of the student being honored).

As "Student Agricultural Chemist of 1965," Lawrence Fuller also received a gold key at the soils and fertilizer conference here in February.

Lawrence is son of Mr. and Mrs. LaVern Fuller of Mesa, who raise cotton, grains and sugar beets on their farm east of Mesa.