

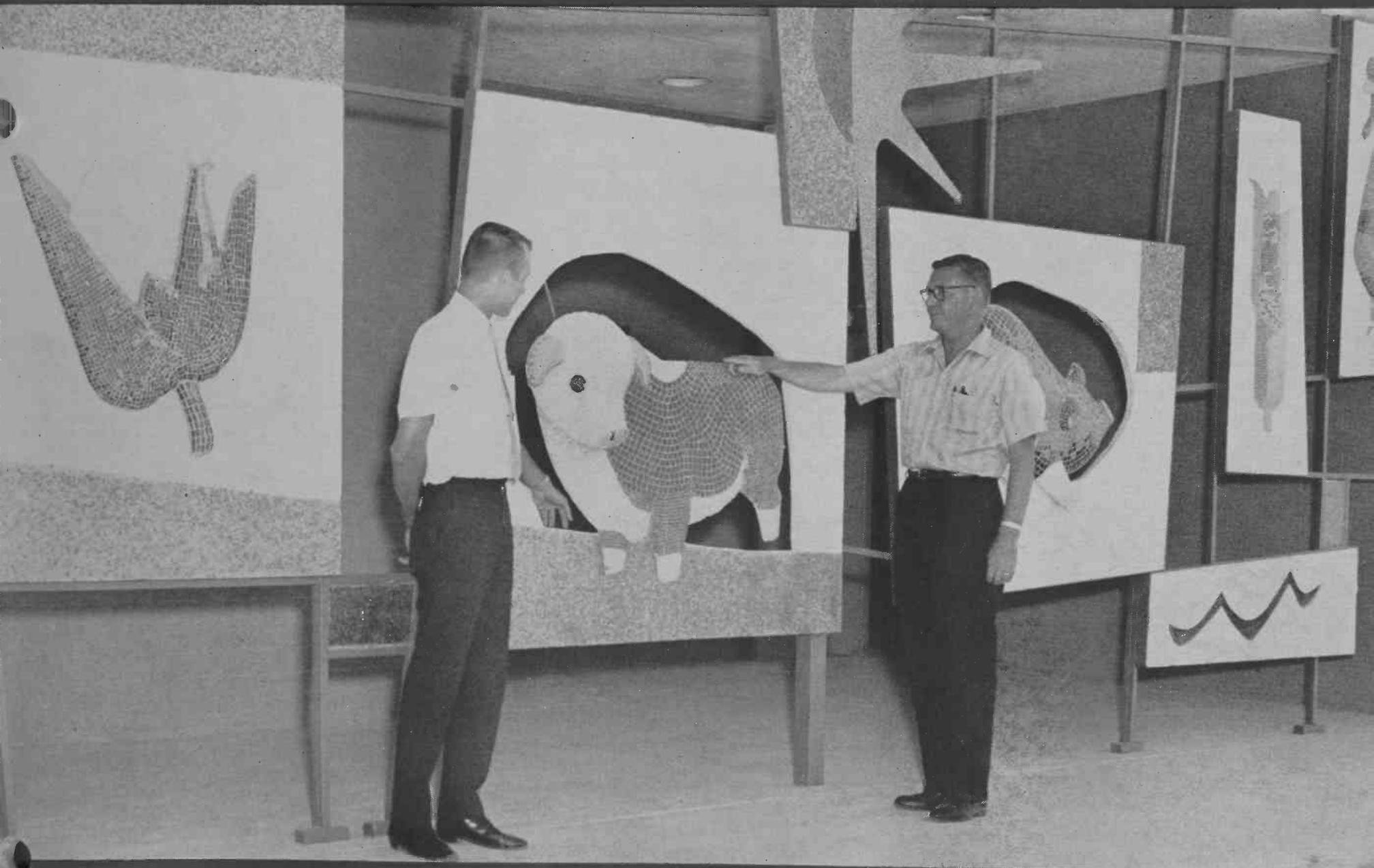
Progressive

NOVEMBER - DECEMBER  
Volume XV Number 6

# A AGRICULTURE

## IN ARIZONA

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



**READ ABOUT**

*frost on citrus . . . sugar-fed cotton . . . greenlee county  
phosphorus & cotton . . . milo for dairy cows . . . alfalfa*

# CAMPUS IS STATEWIDE

The University of Arizona is at Tucson. Branches of the Agricultural Experiment Station are in the Salt River Valley, and at Yuma, Safford and Marana. County Extension offices are in each of Arizona's 14 counties.

But that isn't all. On the edge of Santa Cruz County, in the shadow of Baboquiviri Mountain, an area of near-useless sparse range is bordered by a field where Boer Lovegrass grows tall and thick as a field of winter wheat.

In Yavapai County, boys and girls of 4-H Club age are vibrant with health, due to their great interest in a teenage nutrition project. Near Florence, in Pinal County, a farm boy is supporting himself in school because of a talent for welding, learned in vocational agriculture classes, a talent profitable for the youth and helpful to his neighbors.

In Coconino County fat Herefords are numerous in reclaimed rangeland which formerly was brushland fit only for rabbits and rattlesnakes. In Cochise County, as in others, homemakers from farms and small towns are learning new talents to make their homes more attractive and their families happier.

In Yuma County bermudagrass growers this year, for the first time, are marketing a state-certified standard bermudagrass seed crop.

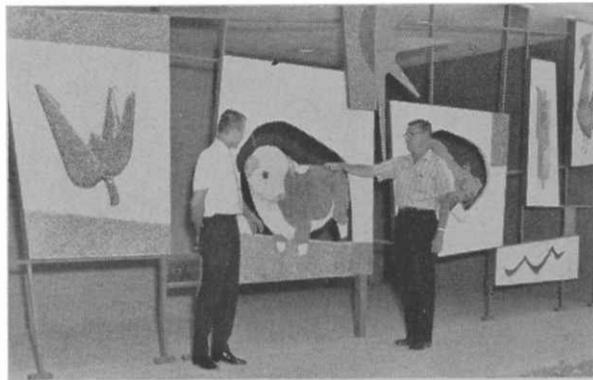
Agriculturally — as with many of its other far-flung activities — the campus of The University of Arizona stretches to New Mexico on the east, Utah on the north, California on the west and the Mexican state of Sonora on the south. And through the exchange of scientific information it reaches around the globe.

*Harold E. Myers*

HAROLD E. MYERS, *Dean*  
College of Agriculture  
and  
School of Home Economics

There are four major agricultural problems still to be solved in the U. S., says the Department of Agriculture. In a recently published 560-page autobiography of its first 100 years, the department lists them as: 1. Underconsumption by many Americans; 2. Agricultural overproduction; 3. Conservation and proper use of national resources — such as land, water and forests; 4. Placement, in other occupations, of farm and rural people uprooted by the technological revolution which the department admits it helped bring to farming.

## OUR COVER PICTURE



Our cover picture shows the artistic entrance to the new Vocational Agriculture building at Florence High School, in Pinal County.

Dale R. Gibson, right, superintendent of Florence High School, explains to David Parks, a beginning teacher of agriculture, the symbolism of the artwork at the entrance to the building.

Himself a former vocational agriculture teacher at Florence, Supt. Gibson has a keen interest in the school's vocational agriculture program.

The new building houses, in addition to regular classroom and shop space, an office, two storerooms and a covered area for instruction on large equipment. The program's facilities include a fenced compound for plant propagation, small animal care, and storage for machinery.

## PROGRESSIVE

## AGRICULTURE IN

## ARIZONA

Vol. XV No. 6  
November - December, 1963

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

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

Reprinting of articles, or use of information in *Progressive Agriculture in Arizona*, by newspapers and magazines is permitted, with credit.

Editor: John Burnham.

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



Sugar-Fed Cotton .....	3
When Frost Hits Citrus .....	4
Advice for Cattlemen .....	5
Milo For Dairy Rations .....	6
Our Mystery Picture .....	7
4H Horse Project Yields \$\$\$\$ .....	7
UA Making Water Study .....	7
Better Teenage Diets .....	7
Summer Irrigation of Alfalfa .....	8
Farm Radio Schedule .....	9
Bill Larsen Honored .....	9
Greenlee County Agriculture .....	10
Phosphorus and Cotton .....	12
Report From the Peace Corps .....	14
Grapes are Not for the Birds .....	15
Chemicals That Reclaim Soils .....	16
Is Wheat Vote Just a Start? .....	17
Progress in Pima .....	18
Farm Credit Needs Grow .....	19
Mystery Picture Answer .....	19
New Honey Uncapper Invented .....	20



### NOVEMBER

18-19—Landscape School for County Agents, U of A Campus, Tucson

18-22—Foods & Nutrition Conference, U of A Campus, Tucson

### DECEMBER

5-6—Forest Genetics Short Course, U of A Campus, Tucson

7—Angus Field Day (4-H & FFA) — U of A Campbell Ave. Farm — Tucson

10—Citrus Field Day, Yuma Expt. Station

14—Angus Field Day (4-H & FFA), ASU, Tempe

### JANUARY

24-25—5th Annual Arizona Pest Control Conference, Student Union Bldg., U of A Campus

### FEBRUARY

3-21—1964 Western Regional Extension Winter School, U of A Campus

11-12—Annual Soil Fertility & Fertilizer Conference, U of A Campus

12-13—Annual Insect Control Conference, U of A Campus

18—Arizona Cotton Growers Assn., Annual Meeting

*No, It is Not for Making Cotton Candy!*

# SUGAR-FED COTTON MAY BOOST YIELDS

Needling cotton plants with a sugar solution is one phase of a cotton improvement project directed by Dr. T. C. Tucker of The University of Arizona.

"And for heaven's sake," says genial Curt Tucker, "don't make any silly jokes about growing cotton candy." That joke has been made often enough to be a little tiresome to the serious research workers who hope they have entered a promising avenue of research.

At two locations this past summer, at the UA Cotton Research Center near Phoenix and on the Farmers Investment Company farm at Continental, south of Tucson, cotton plants have been "fed" with glucose and sucrose in a variety of ways.

## **An Intravenous Injection**

One has been by injections using a hypodermic needle. One has been by spraying the sweet sirupy liquid on the plants. A third is by attaching a tube from a bottle of sirup to the leaf stem (petiole) of the plant.

The material used is 10 per cent glucose or sucrose, plus a small amount of sulfanilamide to reduce contamination or infection by microorganisms, bacteria or fungi.

Working with Dr. Tucker, agricultural chemist in the College of Agriculture, are Dr. Bryant Gardner and Roy Rauschkolb. Work is being done with an Acala variety and with Delta Pine, both short staple cottons.

## **When It Needs Extra Food**

"Our reasoning," explains Dr. Tucker, "is that at the time of boll formation and boll filling, the plant has a heavy call for carbohydrates, and that the sugar solution furnishes carbohydrates in usable form. We are already furnishing plenty of nitrogen in the form of nitrate fertilizer, but the plant's intake of nitrogen through the roots is limited in proportion to available carbohydrates.

"If we can add carbohydrates, pos-

sibly the plant will use more of the available nitrogen, this intake of additional nutrients enabling the plant to produce more cotton."

The University of Arizona plant chemist notes that one of the problems of the cotton grower is how to produce more bolls and he hopes this artificial feeding of plants may throw light on the problem and lead to corrective measures.

Normally the plant fills the bolls its system has food for, then drops off the excess bolls or squares. Perhaps additional carbohydrate at a critical stage of growth — plus added uptake of nitrogen — could persuade the plant to hold onto those bolls and fill them. Likewise, additional plant food could cause a plant to put out new vegetative growth, new branches on which flowers could appear and ultimately additional bolls.

## **Bunch of Bottle Babies**

The research makes an odd appearance to the casual viewer, who sees rows of plants with bracketed bottles of liquid, feeding sugar water to the plants. Actually, says the project leader, the intravenous injections have not proven very successful, because in the drying warmth of a cotton field the hypodermic needles plugged up. The tube slipped over the petiole seems to work much better, but seems to stimulate plant growth only when there is plentiful moisture in the soil.

Glucose works better than sucrose, Tucker learned, and the tube-to-petiole treatment has produced more flowers, as compared to nearby untreated plots. There seems to be no varietal difference in this carbohydrate stimulation effect, he said.

The sugar-fed plants are watched closely, with new flowers tagged and counted as they appear, through weekly supervision by Rauschkolb, Gardner or Tucker.

Working through funds furnished by the Cotton Producers Institute, research branch of the National Cotton

## *A Thanksgiving Thought*

Last Thanksgiving a South Carolina Negro home agent did more in her circular letter than just explain how to roast a turkey. She began her letter this way:

"There are three ways of GIVING — grudge giving, duty giving and Thanksgiving.

"Grudge giving says 'I have to,' duty giving says 'I ought to' and Thanksgiving says 'I want to.'

"The first comes from constraint, the second from a sense of obligation, and the third from a full heart.

"Nothing much is conveyed in grudge giving since 'The gift without the giver is bare.' Something more happens in duty giving, but there is no song in it.

"Thanksgiving is an open gate into the love of God."

Those are wonderful sentiments, beautifully conveyed, and usable not only at this Thanksgiving season but throughout the year.

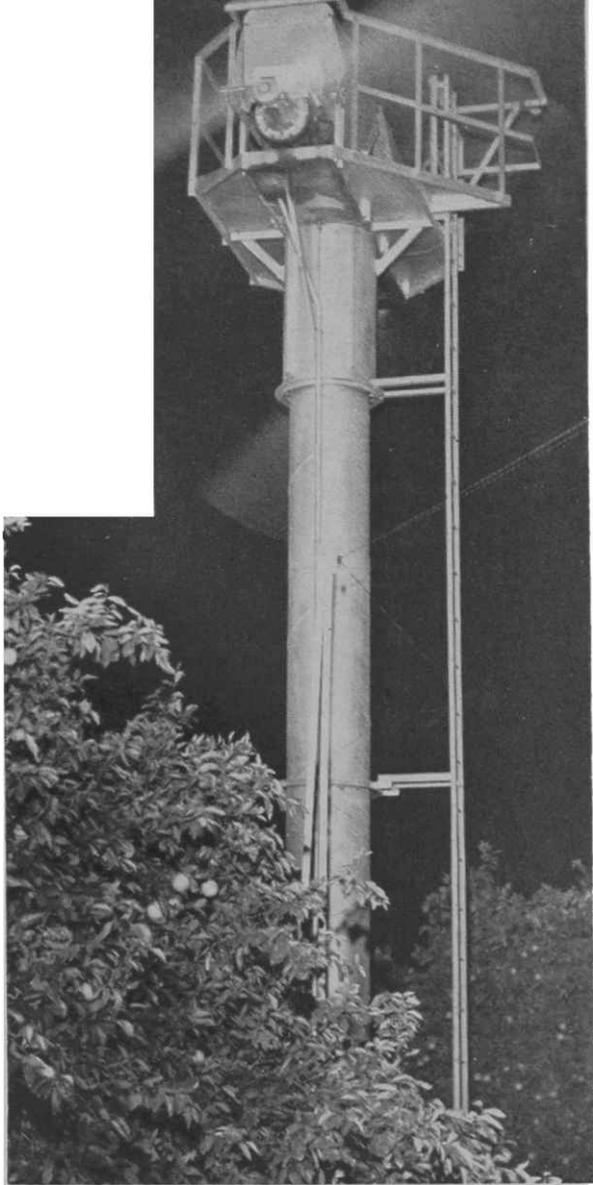
Council, Dr. Tucker actually is concerned with nitrogen metabolism, so the sugar-feeding research is but part of a much larger project. There is no idea that bottle feeding sugar to plants is practical, only the hope that the experiments might lead the way to practical application through genetic selection.

## **Has Practical Application**

If, for example, it is shown that additional carbohydrates, together with increased uptake of nitrogen, can stimulate growth, then perhaps plants which have inherent capacity to produce more than normal amounts of carbohydrates can be selected and new strains developed.

It is a familiar pattern of research, in an entirely different field but somewhat similar to Dr. Bruce Taylor's gain-test trials with young beef bulls, testing the capacity of an animal to make rapid and economical gains, so that those which excel in this capacity may be used to produce highly efficient progeny.

Meanwhile, Dr. Curt Tucker has a five year grant of funds to work with, excellent research facilities at Tucson, in the Salt River Valley and at Continental, and a scientist's combination of imagination and precise exactness which — he allows himself no more than cautious hope — may lead to a new golden age for Arizona, and the Nation's, cotton producers.



**PROPELLER-TYPE WIND machines are the first line of defense against freezing weather at the UA Citrus branch station. The blades circulate warmer air above ground level down and over the trees.**

Three measures, singly or together, generally have been used to moderate frost damage in Arizona citrus groves. These are: irrigation water, wind machines which operate airplane-type propeller blades, and petroleum-fueled orchard heaters.

Irrigation as a frost protection measure has been used for over 40 years, but wind machines and orchard heaters have only been in general use in Arizona during the past 10 years.

#### Many, Many Variables

Trying to gather information on the relative effectiveness of the three protection devices is difficult. Meteorological conditions differ between freezes. Temperatures may vary widely even within small areas, so that it is difficult to establish a "typical" control area for comparison.

Temperature records have been made at the 40-acre UA Citrus Experiment Station near Tempe during all freezing periods for the past 10 years.

The influence of wind machines, orchard heaters and irrigation water in moderating low temperatures was evaluated by frequently reading temperatures during the night from thermocouples and minimum registering thermometers and from thermograph chart records. An adjoining open field and upwind unprotected areas of the Experiment Station were used as control areas.

#### Crisp Autumn Helps

Observations over many years show that as trees are subjected to moderately cold temperatures of 28° to 32° for 2 to 7 hour periods after being below 35° F in the fall and early winter, they become "dormant" and can withstand colder temperatures without injury. In general, damage to orange trees over four years old does not occur until temperatures drop to around 27° F in November.

Dr. Hilgeman is Horticulturist and Superintendent of the U. of A. Citrus Experiment Station. Mr. Everling formerly Research Assistant and Mr. Dunlap, Research Associate.

A much more detailed report of this work appears as Ariz. Agricultural Experiment Station Journal Paper No. 836, published in Proceedings of the American Society for Horticultural Science.

By January this requirement is lowered to 23° F to 24° F. Injury to Valencia orange fruit having 12 percent soluble solids in January has not occurred as long as the air is above 25° F.

Accordingly, frost protection was provided only when temperatures were predicted to be below 28° F in November and below 26° F in January, and on nights when temperatures below these values occurred. Wind machines were started when temperatures ranged from 26° F to 32° F, depending upon the specific conditions for the night.

In the nine years between the winter of 1954-55 and 1962-63, frost protection has been provided on 58 nights. On 37 of these nights the temperature failed to drop to the critical stage. On seven nights the temperatures were slightly below the critical levels, indicating some possible value from the protection. On

(Continued on Next Page)

**CONSTANT REFILLING of the diesel oil heaters is necessary during nights of frost danger. N. A. Jordan, Citrus Station employee, fills the heaters from a mobile oil tank.**



# WHEN THE FROST IS ON THE CITRUS

**R. H. Hilgeman**

**C. E. Everling**

**and J. A. Dunlap**

(Continued from Previous Page)

10 nights temperatures were sufficiently below the critical level that there can be no doubt that the protection averted damage. On two nights in 1955 and two in 1963 the protection available markedly reduced damage, especially in certain areas of the grove, but was inadequate in preventing freezing of some fruit, as well as leaves and small twigs.

### Flood Irrigation Helps

Irrigation water at temperatures of 65° F to 70° F flooded over most of the soil, has repeatedly produced increases of two to three degrees of temperature. It is a dependable source of heat, but the area that can be flooded is limited by the available water supply. Irrigation, as frost protection, is most effective when it is applied during the coldest period of the night.

Effectiveness of wind machines is directly dependent upon existing meteorological conditions involving the velocity and temperature of the upper air. Under favorable conditions of less than three miles per hour wind drift, with upper air temperatures 6° F to 10° F warmer than at five feet in the grove, wind machines have raised temperatures to 4° to 6° F near the machine. A maximum gain of about 65% of the inversion can be expected near the machine. Gains 300 to 400 feet away from the machine depend upon wind drift conditions.

Return stack orchard heaters placed 15 per acre with one per tree on borders, have provided from 1.5° F to 2.0° F increase in temperature when operated with wind machines.

### It Was Cold Last January

On the extremely cold night of Jan. 13, 1963, temperatures dropped to 16.5° F in unprotected areas and to 23.5° at the 50 foot elevation. Four wind machines, spaced one for each 10 acres, were operated after 10 P.M. and orchard heaters at the rate of 15 per acre with one per tree on the border rows, were lit between 12 and 3 A.M. This equipment induced 2 to 3° F minimum protection at 100 feet upwind of the machine and a maximum increase of 5° to 6° F in about a 10 acre zone downwind from the machines. (EDITOR'S NOTE: Pictures accompanying this article were taken that cold night of last Jan. 13 by Charles Hilgeman, son of the Citrus Station superintendent.)

DR. ROBERT HILGEMAN, shown seated at right, below, compares temperature charts with Allen Dunlap. An electronic machine is capable of reporting simultaneously temperatures from 24 different points within the 40-acre orchard. The two men, poring over these records, can spot danger points and discuss best methods of using frost protection equipment.



In the warmest zones about 90 percent of the grapefruit was not frozen and about 55 percent of the Valencia oranges were slightly injured and passed state frost tolerance standards.

In the coldest upwind heated zone, temperatures dropped to 19° and were near 21° F for five hours. Here fruit was frozen within six feet of the heaters. Leaves were protected on the sides adjacent to the heaters, but froze on the opposite side of the tree. It is evident that many more heaters per acre will be required to assure ample protection during severe freezes.

## Offers Good Advice For Ariz. Cattlemen

By Abbie Keith

### in ARIZONA CATTLELOG

At the State Cattle Association Secretaries' meeting in Denver we heard many bits of information. Some were interesting; many are worrisome. One thing for sure, beef production is not a hit-and-miss business any more — it's more a "miss" business, unless great care and skill are used in the

operation, whether it be ranching or feeding, buying or selling cattle, slaughtering or merchandising the beef; it must be done practically and sensibly, with a satisfied consumer as the final factor.

Some recommendations that sounded good enough for any cattleman to follow included:

1. Increase the efficiency of your operation.
2. Decrease the average age of your cows by closer culling.
3. Increase your feed reserves, especially have extra feed, or extra cash reserves in the bank to buy feed if needed, so you won't have to dump cattle on the market.
4. Don't get in a situation where you are at the mercy of your banker.
5. Take an impartial view of your cow operation; look at it as you would if the outfit belonged to your neighbor.
6. Sell cows when they should go; keep a good young heifer for she will stand a drought better, and be easier to sell if you get in a bind.
7. Discourage speculative enthusiasm.

# For Use in Dairy Cow Rations

## WHY NOT MILO?

P. W. Riley, W. H. Brown and J. W. Stull

There are several factors which suggest that grain sorghum should be a useful feed for dairy cows in Arizona. Milo is usually more abundant than barley or corn; cost is lower and usually more uniform; and production cost in terms of water use is relatively low.

Laboratory analysis suggests that milo is comparable to barley and corn in nutritive values. It would appear, then, that we should find a fairly high proportion of milo in all of our Southwest dairy concentrate mixes. Yet some concentrate mixes contain no milo and those mixes which do contain it frequently have so little as to make its economic contribution negligible.

### Many Reasons Cited

Various reasons have been cited for wariness about using milo in dairy concentrates. Low palatability is frequently mentioned.

Some dairymen want no milo in their concentrates, and others have no objection to the use of high percentages of it. Indications from beef feeding studies suggest that it is not as good a feed in some respects as barley. Lack of detailed information as to its feeding value in up-to-date feeding and milking operations contributes to uneasiness about its use.

A series of studies has been started which should eventually clarify the usefulness of milo in our dairy feeds. These should provide indications as to the way to prepare milo for feeding, the palatability of the various forms, and the ability of milo to support milk production in typical Southwest feeding regimes. The overall aim is to reduce the dairyman's feed cost without sacrificing any part of the feeding program.

### Prepare 4 Feed Mixtures

The first trial of the series has been completed. In this trial four concentrate mixes, each identically prepared, were compared. Each mixture contained five percent molasses to aid in making a satisfactory hard pellet out of the ground grains. The grain mixtures were: (A) all milo; (B)  $\frac{2}{3}$  milo,  $\frac{1}{3}$  barley; (C)  $\frac{1}{2}$  milo,  $\frac{1}{2}$  barley; (D) all barley.

No other ingredient was used in the grain. Good quality alfalfa hay was fed to all cows as 60 percent of the ration by weight, the other 40 percent being made up of one of the experimental grain rations. Twenty-four cows were used in a double reversal trial, so that each mixture was compared against the others.

Results of this experiment, comparing milo to barley, have shown that in general one supports the production of milk as well as the other. They also show that the cows consumed both milo and barley with equal relish at all levels offered. As this was of major concern at the outset of the experiment, it is one of the most significant findings. Without high palatability, any other observations would be ineffective.

There were no significant differences between the mixes in their ability to affect body weight, the percentage of fat or SNF of the milk, or the total pounds of milk produced. One mixture (C) caused a small but significant depression in the protein content of milk.

### Milo Raised Butterfat

Even though there were no significant differences in the percent fat of the milk, it is of note that there was a trend, with increasing amounts of milo causing slight increases in the percentage of fat.

Other researchers have developed the concept that acetate-propionate production by the rumen contents plays a major role in controlling whether the energy of the diet finds its way into milk fat or body fat deposition. Increases in acetate relative to propionate tend to be reflected in increases in fat content of the milk, while increases in propionate relative to acetate tend to be reflected in increased tendencies to lay down body fat.

It has also been shown that most of the change in butterfat, affected by the change in the ratios between acetate and propionate, takes place in the short chain acid fraction. Thus an increase in propionate in the rumen causes a decrease in percentage of fat in the milk and a decrease in the short chain acids of the fat. This was substantiated in this experiment, since it was shown that as the proportion of barley increased in the ration, propionate increased in the rumen fluids, milk fat decreased and the short chain acids of the fat decreased.

Other researchers have shown that barley is superior to milo for fattening animals. This work has shown them nearly identical for the production of milk. It is felt that this is explainable because of the differences in the proportions of acetate and propionate produced by the two diets and their effect on the production of body fat and milk fat.

### No Final Recommendations

It would be premature to make recommendations concerning the feeding of milo to dairy cattle on the basis of this trial, except with regard to palatability. Clearly, milo can be prepared in such a way as to be eaten by dairy cattle.

These mixes were not meant to be complete dairy supplemental feeds. The barley and milo were compared in as simple an experiment as was considered useful. Future trials will include studies of changes in preparation of the grains, and the mixing of protein and perhaps other ingredients with them in suitable amounts.

The current trial suggests that on the basis of useful nutrients, milo may be one of the Southwest dairyman's best buys.

The co-authors are members of the Department of Dairy Science.

## Where Was This Mystery Picture Taken ?



*Of course you recognize the building in the background. After all, you see it every day. But when was the picture taken? When was this building so surrounded by desert growth. Well, you'll just have to turn to Page 19 for the answer.*

## UA Agric. Scientists Making Water Study

As man bores deeper and deeper into the earth for the precious source of life — water — the need for knowing the cost of pumping irrigation water grows and grows.

Nowhere is this more true than in Arizona, where water is the major limiting factor in agricultural production. Unless water costs are known, agricultural profits cannot be calculated with precision.

This is the compelling reason for a project now being carried on cooperatively by two University of Arizona departments, Agricultural Economics and Agricultural Engineering, and the Bureau of Reclamation of the U. S. Department of Interior.

Key university men in the project are Dr. M. M. Kelso and Dr. A. G. Nelson of Agricultural Economics and Dr. C. D. Busch of Agricultural Engineering.

They are seeking the answers to these questions:

What are the costs of pumping irrigation water in the various irrigated areas of central Arizona? What are the current costs? What are the estimated future costs?

## Teenage Ariz. Groups Boost Better Diets

Teen-agers rank lower than any other age group in the family as far as being nutritionally well fed is concerned, but they are doing something about it in Arizona.

They are making conscious efforts to improve their diets, says Miss June C. Gibbs, extension nutritionist at The University of Arizona.

“Ten of the 14 counties of Arizona had one or more programs on teen-age nutrition during 1962. Eighteen county extension workers were trained in the field of improving teen-age nutrition in one statewide workshop,” she reports.

In addition, there have been 92 food and nutrition leaders as well as 24 junior leaders and 36 others given additional training in this important subject of teen-age nutrition.

Miss Gibbs adds that teen-age nutrition has been combined with all of the major activities of the 4-H food and nutrition program.

“Interest has increased in this to such an extent that many of the community clubs, project clubs and county activities are requesting speakers, information, films, etc., on teen-age nutrition for their programs,” she says.

## Horse Project Yields Pleasure and Profits

Carol Walker of Skull Valley, up in Yavapai County, has the recipe for profitable fun — raising, showing and racing quarter horses. She is proof of the fact that a 4-H horse project can be a money maker.

She was 13 when she began the project. Now, at 18, she has earned enough “horse money” to pay her way through college.

The daughter of Mr. and Mrs. George S. (Sonny) Walker of the Bar U Bar Ranch in Skull Valley, Carol started riding almost before she began walking. Today, according to County Agent Alvin Allen, she is one of the top horsewomen in Arizona.

Miss Walker began riding in competition when she was nine, winning several horse show awards. Then she acquired Surely Oh, a great-great

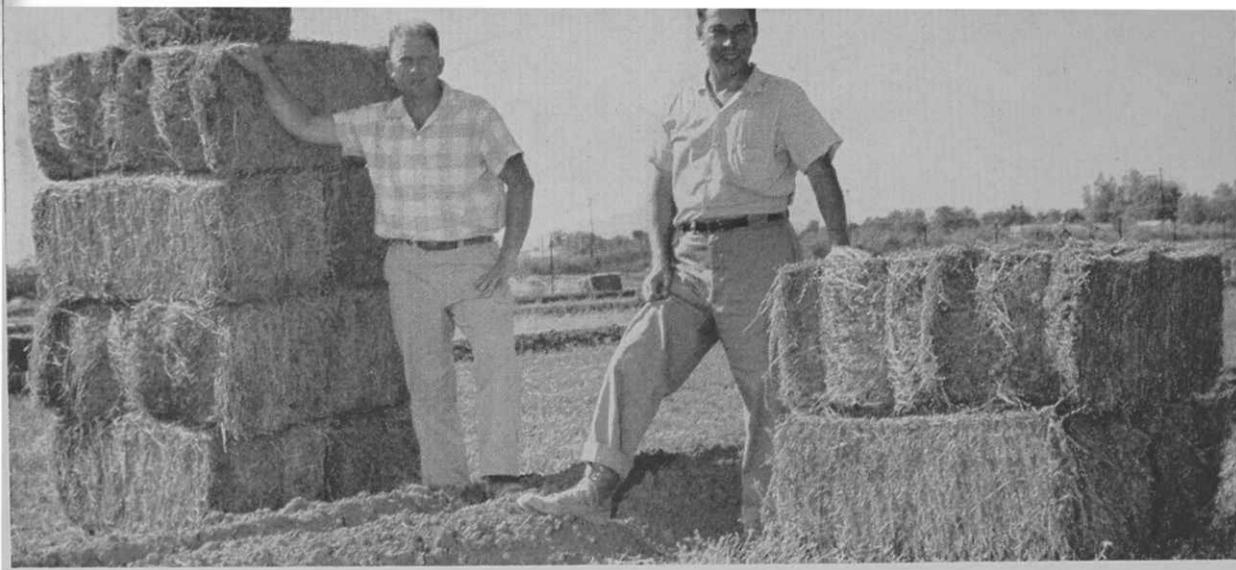


**CAROL WALKER and Surely Oh, her 4-H mare which has been richly profitable in pleasure and money.**

granddaughter of famed Man of War. Surely Oh, given as a colt to Carol, began the girl's 4-H project.

Tired of the ribbon and cup routine of horse shows, Carol entered Surely Oh in quarter horse races where the mare has won, to date, over \$4,000. With part of her winnings, Carol bought cattle last year and later sold them at a profit.

The next problem, says the prosperous young horsewoman, is to find a sire suitable to mate with Surely Oh, so the mare's great bloodlines can be carried on to another generation. Besides, Carol likes to raise and break colts.



R. K. THOMPSON, at left, and Dr. M. H. Schonhorst, right, observe comparable yields of hay from summer-irrigated and non-summer irrigated plots. Piles of bales are from the fifth cutting in 1959.

# DOES IT PAY TO IRRIGATE ALFALFA IN THE SUMMER?

M. H. Schonhorst, R. K. Thompson, and R. E. Dennis

Alfalfa in southern Arizona frequently is not irrigated during July and August. This practice induces the plants to go dormant. Alfalfa is not irrigated during this time because of the demands for water by other crops and as a measure to control the growth of summer annual weeds in the alfalfa.

A test was made at the Mesa Branch Experiment Station during the period 1959 to 1962 to study the effect of induced summer dormancy on hay yields and persistence of stand of Moapa alfalfa.

## Given Phosphate Fertilizer

A uniform application of 200 pounds per acre of  $P_2O_5$  was disked into the soil during seedbed preparation. In addition, annual applications of 100 pounds of  $P_2O_5$  per acre were made to all plots in January each year thereafter.

The 24 borders used for the test were planted January 15, 1959. A buffer border 33 feet wide was used between the plots for the two levels of irrigation. This permitted application of water to summer irrigated plots without influencing results obtained on nonsummer irrigated plots.

Cuttings were made when 10 to 25 percent of the plants were flowering.

Dr. Schonhorst is an Associate Professor of Agronomy, directing alfalfa studies; Rex Thompson is a Research Associate in Agronomy, stationed at the Mesa Branch Station, and Dr. Dennis is an Agronomist in the Agricultural Extension Service.

In the spring, fall and winter when temperatures were cooler and day lengths shorter little flowering occurred. During this time cuttings were made when shoot and bud re-growth at the crown of the plants had reached approximately two inches in height.

## Cut With Equal Frequency

Seven cuttings were made during the first, and nine during the second

and third years of this study. Both summer irrigated and nonsummer irrigated plots were cut the same number of times each year. However, the nonsummer irrigated plots usually produced less than one-fourth ton per acre for the two midsummer cuttings.

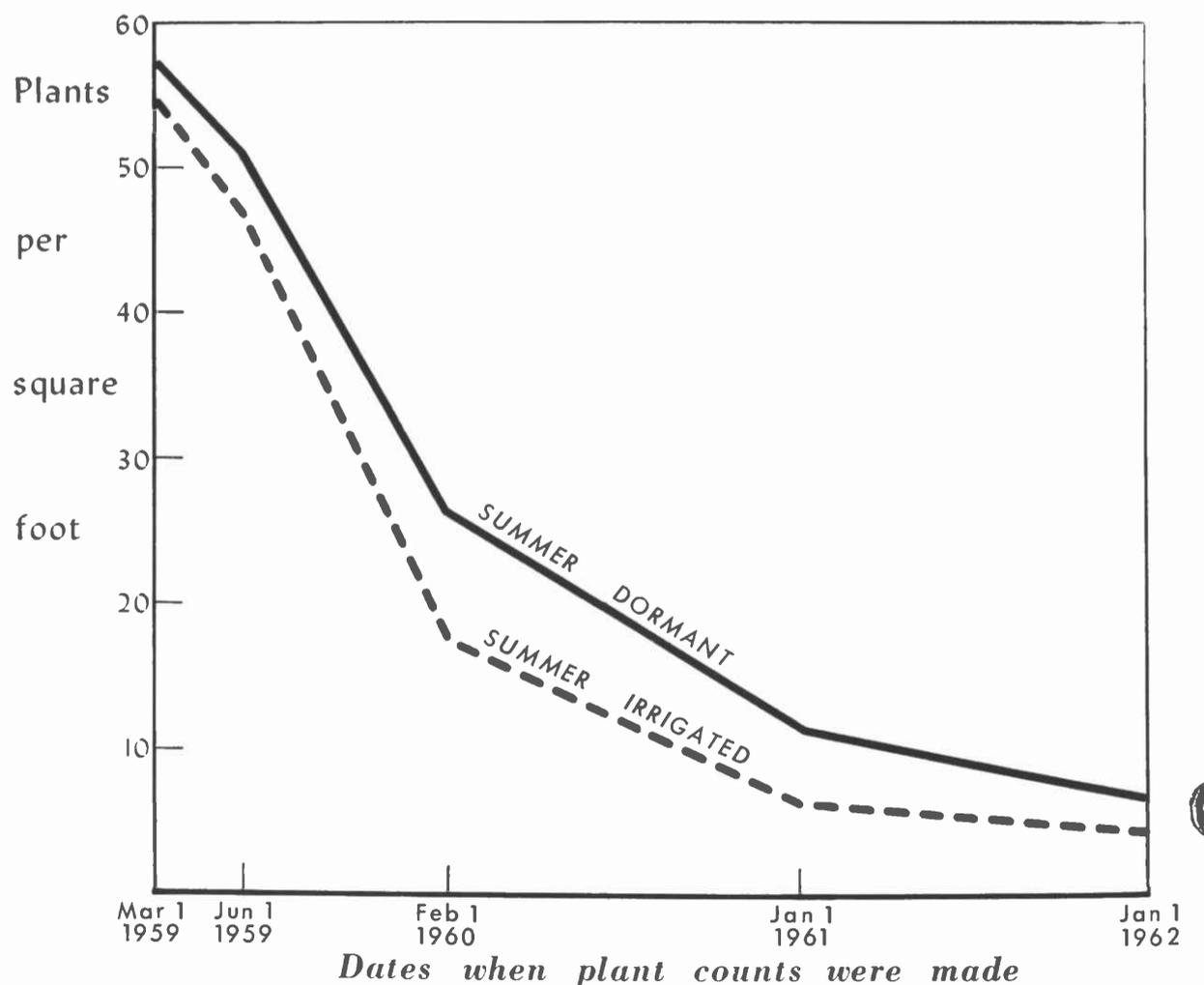
Rains which fell during the summer dormancy period of 1960 and 1961 favored the nonirrigated plots. In some instances, these rains followed shortly after irrigation and caused the summer irrigated plots to receive excessive moisture.

Summer irrigated plots received about six and one-half acre feet and nonsummer irrigated plots about five acre feet of irrigation water per acre each year. An average of 14 irrigations was applied to the summer irrigated and 10 irrigations to the nonsummer irrigated plots each year.

## Difference Is Slight

Alfalfa plants irrigated during the summer produced more forage each year than those not irrigated. However, during the second and third years, yield increases for the summer

(Continued on Next Page)



(Continued from Previous Page)

irrigated plots were only about half a ton per acre greater than from plots not receiving summer irrigation.

Data in the table below show the amount of baled hay produced for both irrigation treatments. Summer irrigated plots produced slightly less than eight tons the first, 12 tons the second and 10 tons the third year, with an average production of 10 tons of air dried baled hay per acre per year. Non-summer irrigated plots produced 6.9 tons the first, 11.5 the second and 9.5 the third year, with an average production of 9.3 tons of air dried baled hay per acre per year.

In the spring and early summer of 1962, four harvests were made prior to the termination of the study. During this time the over-all average yield was nearly 3.9 tons per acre for both irrigation treatments. During the corresponding period for 1960 and 1961, the average yields were 6.6 and 5.2 tons per acre respectively.

### Study Decline in Stands

To find out how much the stand declined in both summer irrigated and non-summer irrigated plots, plant counts were made on five different dates, as shown in the accompanying graph. On March 1, 1959, two months after planting, there were 57 plants per square foot in the summer dormant and 55 in the nonsummer dormant plots. Three years later the number of plants had dropped to seven for the summer nonirrigated and four per square foot for the summer irrigated plots.

During the first year of production there were no summer annual weeds in either the summer irrigated or non-summer irrigated plots. However, with the decline of plant population during the second and third years, weed infestation occurred in those plots receiving summer irrigation.

### Hay production (pounds) of Moapa alfalfa on summer dormant and summer irrigated plots, 1959 to 1961.

Year	Yield		
	Summer Dormant	Summer Irrigated	Difference
1959	13,829	15,861	2032
1960	22,942	23,957	1015
1961	19,025	20,198	1173
<b>Average</b>	<b>18,598</b>	<b>20,005</b>	<b>1407</b>

Irrigation of Moapa alfalfa during the summer, without a period of in-



### Cochise County

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

KHIL, Willcox — Mon. thru Fri., 2 p.m.

### Coconino County

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

KGLS, Flagstaff (Home Agent) — Thurs., 9:45 a.m.

KPGE, Page — Fri., 2:30 p.m.

### Graham County

KATO, Safford — Sat., 9:30 a.m.

### Maricopa County

KTAR, Phoenix — Mon. thru Sat., 5:30 a.m.

KUPD, Phoenix — Mon. thru Sat., 5:30 a.m. and 12:25 p.m.

KPHO, Phoenix — Mon. (cotton report) 12:40 p.m.; Thurs. (dairy and livestock report) 12:40 p.m.

### Navajo County

KDJI, Holbrook — Tues., 1:00 to 1:15 p.m.

### Pinal County

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

### Santa Cruz County

KNOG, Nogales — Mon., 6:30 a.m.

### Yavapai County

KYCO, Prescott — Mon., Wed. and Fri., 5:55 p.m.

KNOT, Prescott — Mon., Wed. and Fri., 5:35 a.m.

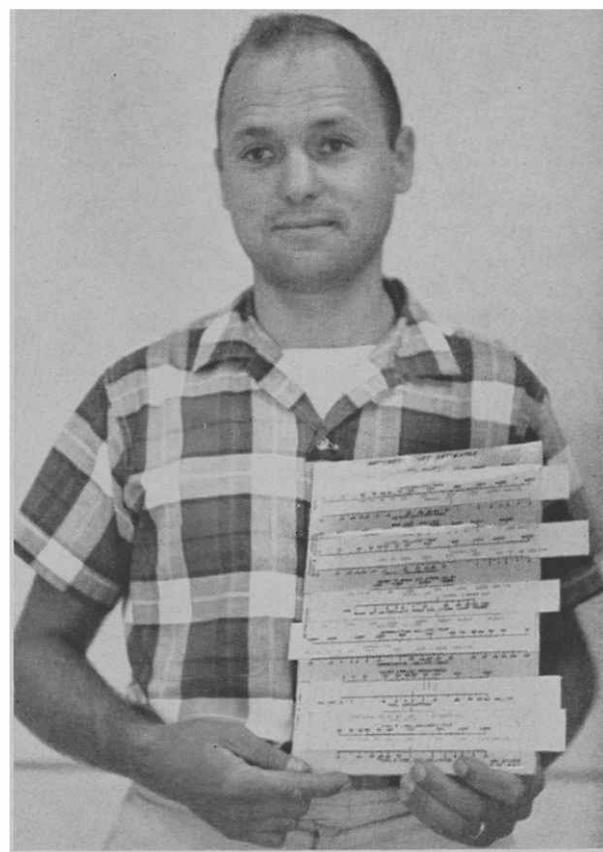
### Yuma County

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

KYUM, Yuma — Mon. thru Fri., 6:25 a.m.

duced dormancy, increased yield of hay by about one ton per acre during the year of establishment. Yield increases from summer irrigation during the second and third years were about half a ton of hay per acre per year. Summer irrigated plots received about one and one-half acre feet more irrigation water per acre per year than those not summer irrigated.

## Larsen Wins Award For Cost-Computer



Holding some of the intricate slide rule devices which he has designed is William E. Larsen, extension farm machinery engineer with The University of Arizona.

At the annual meeting of the American Association of Agricultural Engineers a blue ribbon award was given Larsen for this entry.

The intricate computing system makes it possible for a farmer to estimate closely the cost of different types of machine operations — plowing, cultivating, field chopping of green feed, filling silo, land leveling, cotton harvesting, etc.

From such computations a farmer may quickly estimate which of variable choices is best for him, either quickest, cheapest or utilizing machinery which he owns.

## Five-Sixths of Arizona Isn't Privately Owned

Of Arizona's 72.7 million acres, 31 million are in federal ownership, 8.7 million in state and 12.6 million in private ownership. Also, Indian lands account for over 19 million acres. They can't be called "public" because they are private, tribal holdings.

Nearly 25 million acres of federal land are under lease to stock growers in Arizona. So is much of the state's public acreage.

# AGRICULTURE IN GREENLEE

**EDITOR'S NOTE:** This is first in a series of county stories, describing the agriculture and agricultural history of Arizona counties. Each will be written by the County Agent, or prepared under his direction. Next issue we'll learn about Graham County's agriculture, as told by County Agent John Sears.

## Ernest A. Foster

With modern farming methods everywhere in evidence, Greenlee County's agriculture would not appear unique to the casual observer. The most outstanding differences, however, are probably the result of situational or historical circumstances. Water availability has apparently always been a limiting factor in agricultural progress, and the search for it has left more of an imprint than the search for precious metals.

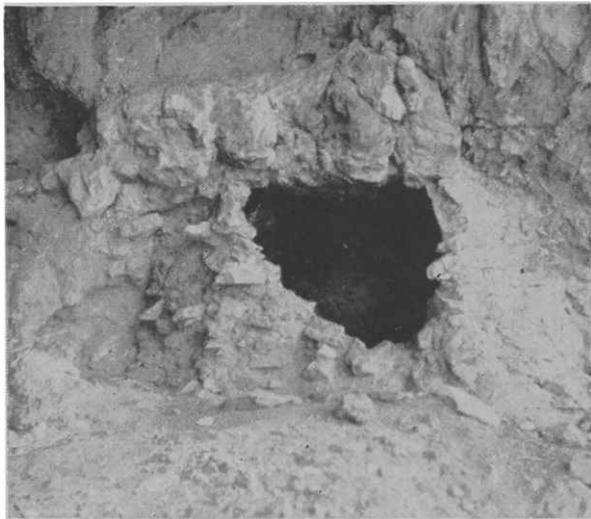
### Mostly Grazing Lands

Of the approximately 1,199,360 acre area of Greenlee County, only about 6,000 are in cultivation. Less than five percent of the county is privately owned, the rest being State and Federal lands, most of which is



**UNIQUE PUMPING** system, said to have been used in the early days near Clifton, Ariz.

Mr. Foster is County Agricultural Agent in Greenlee County, with offices at Duncan. Visting him, one immediately learns two things — that Ernie Foster likes Greenlee County and its people, and that this warm, informal friendliness is reflected in Greenlee County's feeling toward its County Agent.

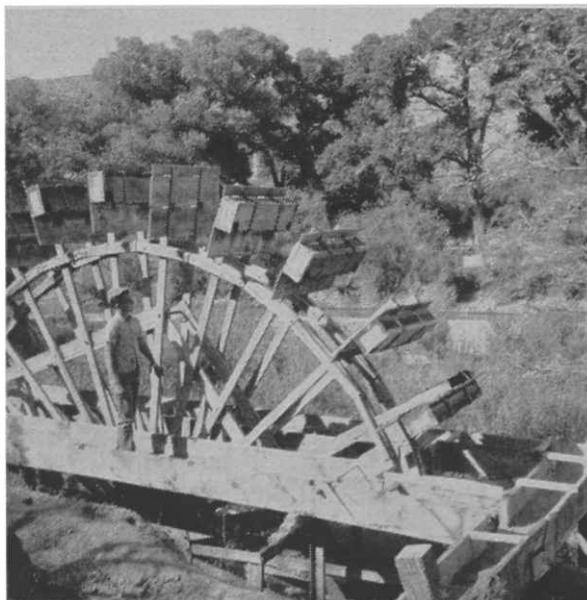


**EARLY RESIDENTS** of Greenlee County, the pre-historic Indians, lived in cliff dwellings, such as this one on the upper Gila River near Duncan.

used for cattle grazing by permit holders.

Production of beef cattle and short staple cotton are the two major agricultural enterprises in Greenlee County. Principal farm crops are cotton, alfalfa, grain sorghum, barley, and corn. Some vegetables are grown commercially, but most are marketed locally, with the exception of melons.

Of the cultivated land, nearly all is irrigated and is mostly confined to



**NEAL ROBERTS** of Duncan inspects an ancient water wheel which once was used to lift water from the Gila River into an irrigation canal near Clifton. This old structure still stands, although not in operational condition.

the southern part of the county within the Duncan Basin.

### Aboriginal Agriculture

Remains of old pueblos, cliff dwellings, and metate holes indicate that Indians once practiced agriculture along the upper Gila River region. Cliff dwellings along dry wash tributaries many miles inland from the Gila River also bear evidence that these once were running streams, capable of sustaining life.

The Duncan Basin is known as a natural structural trough that extends



**A COUNTY AGENT'S** news letter of centuries ago? Indian writing such as this is found in abundance on cliffs along the upper Gila River.

northwest from the vicinity of Lordsburg, New Mexico, to the vicinity of Guthrie, Arizona. The Gila River enters this trough about 10 miles east of the town of Duncan and flows northwest through the lower end of the trough.

The eastern margin of the Duncan Basin begins a few miles upstream from the Arizona-New Mexico state line. This basin terminates on the west, about a mile upstream from the junction of the Gila and San Francisco rivers, where the two mountain ranges

# GREENLEE COUNTY

## Don't Lose Water At Lower End of Field

You can get more out of irrigation water by reducing the runoff at the lower end of the field, says Allan D. Halderman, extension agricultural engineer with The University of Arizona.

He said it is common for more irrigation water than is needed to be put on fields. Much is lost through runoff, some of which could be saved. Labor requirements are greater but the water may be more important.

Some loss can be prevented by reducing the rate of flow, once the water has reached the end of the furrow. Then more water has a chance to soak into the soil, instead of running off.

Halderman says a soil probe or auger is needed to learn how deep the water is penetrating, whether in a flower bed, lawn or field. The depth of penetration needed depends on the root system of the crop.

## Extension Specialist Finds Horse Popular

Machines may be replacing the horse down on the farm, but the noble equine is far from leaving the scene.

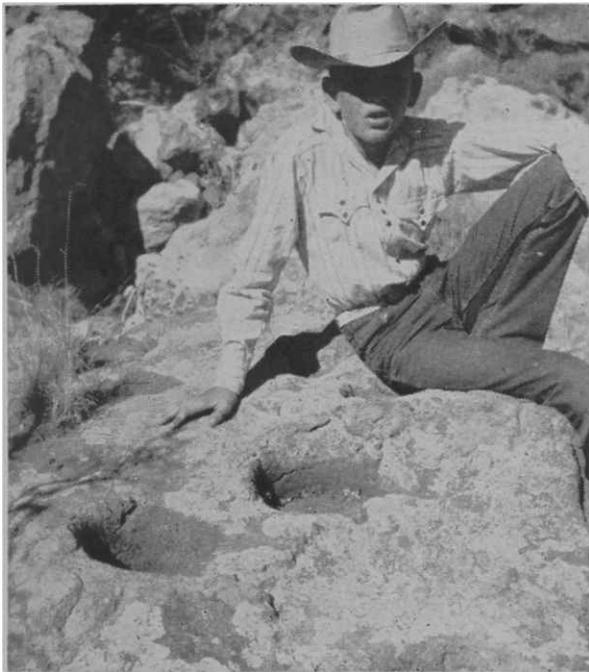
Robbed of his grubby work chores, the horse has imbedded himself more solidly than ever in the hearts of boys and girls both on and off the farm.

This is reflected in 4-H club work in Arizona, according to Albert Lane, extension livestock specialist with The University of Arizona. He says the 4-H horse project is rated first among agricultural projects chosen by Arizona's boys and girls.

"The Extension Service can be proud of its key role in seeing this project develop in four or five years from a handful of poorly kept, poorly trained and usable horses to several hundred trained and usable horses that are the key to developing responsibility in boys and girls and teaching them the satisfactions of doing a job well and competing with other young people," said Lane.

Lane noted that through statewide leader training meetings and a new series of four work books on horse management, caring and feeding, the Extension Service has taken the lead in developing 4-H horse projects.

He also pointed out that the horse is gaining ground in the cities as well as in rural areas. The project has had its greatest growth in the fringes of the urban areas, primarily Phoenix and Tucson.



WAYNE ATTAWAY, inquisitive Duncan 4-H'er, takes a breather beside old metate holes in boulder near cliff dwellings. This early version of the mortar and pestle was used for grinding corn or mesquite beans.



TODAY, HOWEVER, modern irrigation wells with gasoline or electric motors have replaced most of the surface water irrigation which relied on the undependable Gila River.

irrigation in the basin as early as 1900. This water probably was obtained generally by centrifugal pumps from dug wells, though several other home-made contrivances were also used for pumping or lifting water. Surface water is sometimes diverted from the river into canals by the use of rock, cable and brush, or gravel dams.

Since the Duncan Basin is located on the margin of the cotton belt (elevation 3,600 feet), only short season varieties can be produced. As a result of this, only New Mexico 1517 is produced in Greenlee County. This cotton is marketed through El Paso outlets.



INTERESTING home - made irrigation structures may be found along most any of the old canal systems in Greenlee County.

converge. The basin is enclosed by the Steeple Rock Mountains on the northeast and the Peloncillo Mountains on the southwest. These mountain ranges effectively confine ground water within the sedimentary materials of the Duncan Basin. The basin is approximately 37 miles long and varies from five to nine miles in width, having a drainage area of about 680 square miles.

Ground water analyses from the Duncan Basin show ranges in total solids from 250 to 5,000 parts per million. The higher concentrations generally are found in wells nearest the upstream end of the basin. According to studies made by the U. S. Geological Survey Department, recharge-discharge relationships between flow in the Gila River and ground water in the Recent Alluvium appear to be in a state of dynamic equilibrium.

### Mostly Pump Irrigation

Most of the irrigation in Greenlee County is from wells, supplemented by surface water from rivers when the flow is adequate. Records indicate that ground water was used for

# Phosphorus and Cotton

## True Story Revealed by Radio-Activity

Wallace H. Fuller  
and T. C. Tucker

The research compares the uptake of phosphorus by cotton from two Nitric-phosphate fertilizers of different phosphorus water solubilities and aqueous phosphoric acid as related to **stage** of the plant growth at the **time** of application.

Although considerable emphasis has been placed on the availability to crops of various kinds of phosphate fertilizers, particularly with respect to water solubility, little study has been initiated relating the uptake of phosphates of different water solubilities with stage of growth on calcareous soils.

More specifically, relatively little is known about uptake of phosphorus by cotton as related to application at different stages of growth, when the phosphate is intimately associated with nitrogen as exemplified by the nitricphosphates.

Studies by Fuller in Arizona in 1950 on calcareous soils showed that the phosphorus from four different sources—*superphosphate*, *ammonium phosphate*, *aqueous phosphoric acid*, and *calcium metaphosphate*—was not absorbed proportionately from early and late applications made to cotton.

It appeared that the *least* water-soluble sources were proportionately *more effective if applied early* in the plant's growth and the *most* soluble sources were *proportionately more effectively absorbed when applied late*. Because of these tendencies and because ammonium phosphate reacted somewhat differently from N-free phosphate fertilizers when applied at

Dr. Fuller is head of the Department of Agricultural Chemistry. Dr. Tucker is professor of Agricultural Chemistry and Soils.

Appreciations are extended to the USDA, ARS, Beltsville, Md. for manufacturing the radiophosphorus fertilizers and to California Chemical Company for financial assistance.

the two different stages of growth to cotton, another experiment was designed to study these variables more closely, again using radiophosphate fertilizers for positive tracing the fate of the P in fertilizer added to soils.

### EXPERIMENTAL PLAN

#### Sources of fertilizer manufactured with radiophosphorus:

Nitricphosphate: 20-20-0 about 16% WSP

Nitricphosphate: 20-20-0 about 45% WSP

H<sub>3</sub>PO<sub>4</sub> + NH<sub>4</sub>NO<sub>3</sub>: 20-20-0 100% WSP

#### Rates of application:

0, 20 and 60 lbs. P per acre basis (Multiply P by 2.29 to get P<sub>2</sub>O<sub>5</sub> values).

#### Stages of growth at application:

	Date
Seedling emergence	4/19
First bloom	6/21
First fully developed bolls	7/19

#### Plot Layout:

Plots were four rows wide and 45 feet long.

They were established in triplicate

#### Soil:

The soil type was *Adelanto clay loam*, a calcareous soil of pH 7.8

(Continued on Next Page)

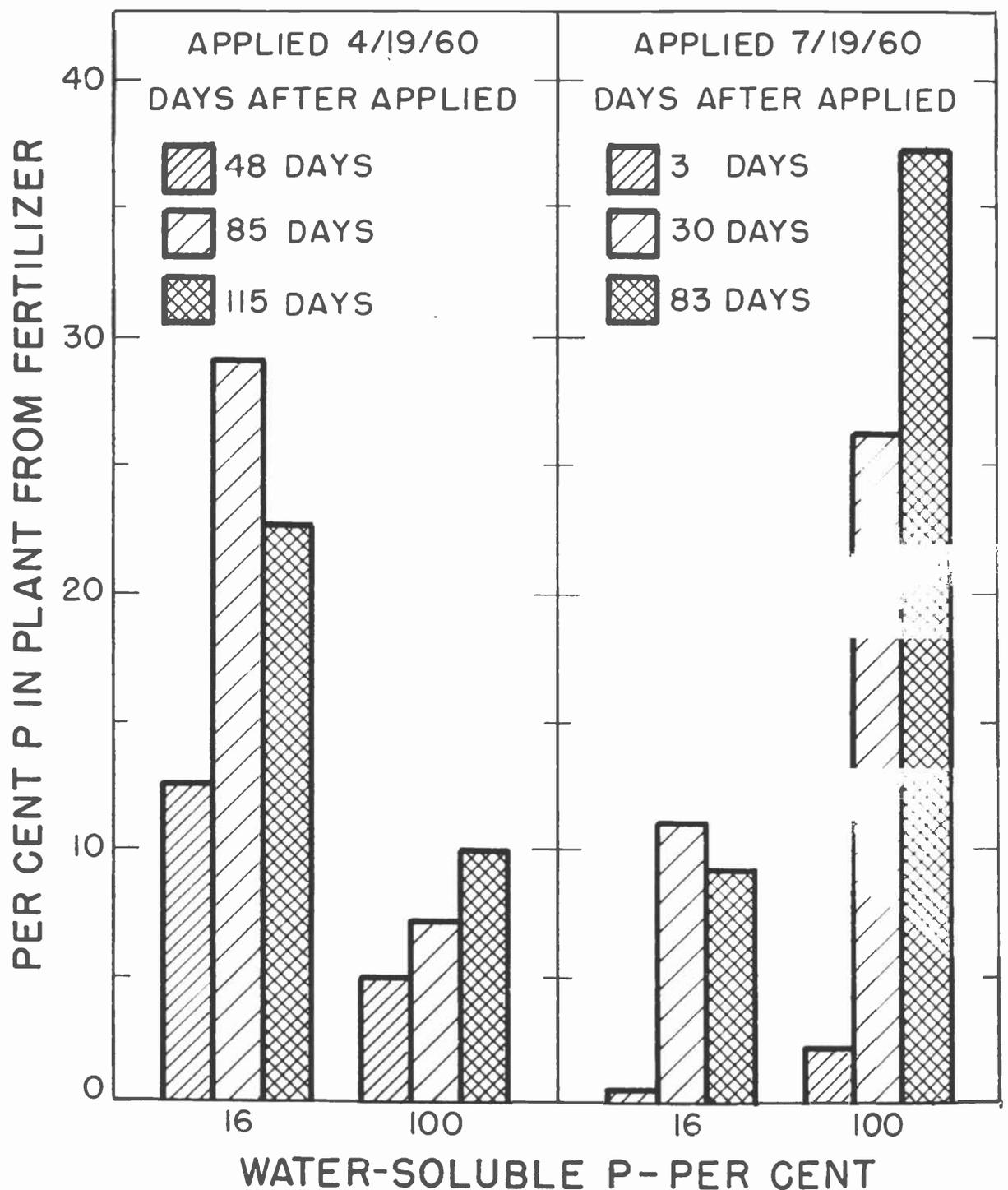


FIGURE 1:— UPTAKE OF FERTILIZER P BY COTTON FROM ADELANTO C. L. AS AFFECTED BY: (a) STAGE OF GROWTH AT TIME OF APPLICATION, (b) LENGTH OF TIME AFTER APPLICATION, (c) WATER SOLUBILITY OF P IN FERTILIZER. APPLICATION AT RATE OF 60 LB. P/A.

### Placement:

The fertilizers were applied in a band to one side of each row of cotton about 6 inches away and 6 inches deep. The soils were irrigated immediately after fertilizer applications.

### Sampling:

Samples of the uppermost full-grown petiole and leaf blade were taken at two-week intervals until the radioactivity was too low for reliable measurements and analyzed for total and radiophosphorus.

## RESULTS

### TOTAL PHOSPHORUS ABSORPTION:

The total phosphorus content of the cotton as indicated by the P in the leaf and petioles did not change with the rate of fertilizer applications at any sampling date. However, there was a general decline of a high of about 0.29% P on June 21 at all rates to a low of about 0.19 on October 10.

The fact that the rate of fertilizer application did not influence significantly the total P content of the plant part sampled is fortunate since it allows a comparison of the fertilizers when the plants were not stressed differently for phosphorus during the season and permitted a more accurate comparison on a basis of "amounts of P in the plant derived from the fertilizer."

### UPTAKE OF FERTILIZER P:

The uptake of fertilizer P by cotton from Adelanto clay loam was found to be influenced by:

1. Stage of growth at time of application.
2. Length of time after application.
3. Water solubility of the phosphorus in the fertilizer.

Since all the data cannot be presented, only representative examples will be given.

By comparing the sets of bars in the left half of Fig. 1, it is obvious that the 16% water-soluble P fertilizer was taken up to a greater extent than the 100% water-soluble P material at all dates.

By comparing the sets of bars in the right half of Fig. 1, the reverse is true. The 100% water-soluble P fertilizer was taken up to a greater extent than the 16% WSP material.

Figure 2 compares the uptake of fertilizer P by cotton as an average of all 6 sampling dates and 3 replications at 3 dates of application for 3 different fertilizers of 16, 45 and 100% water-

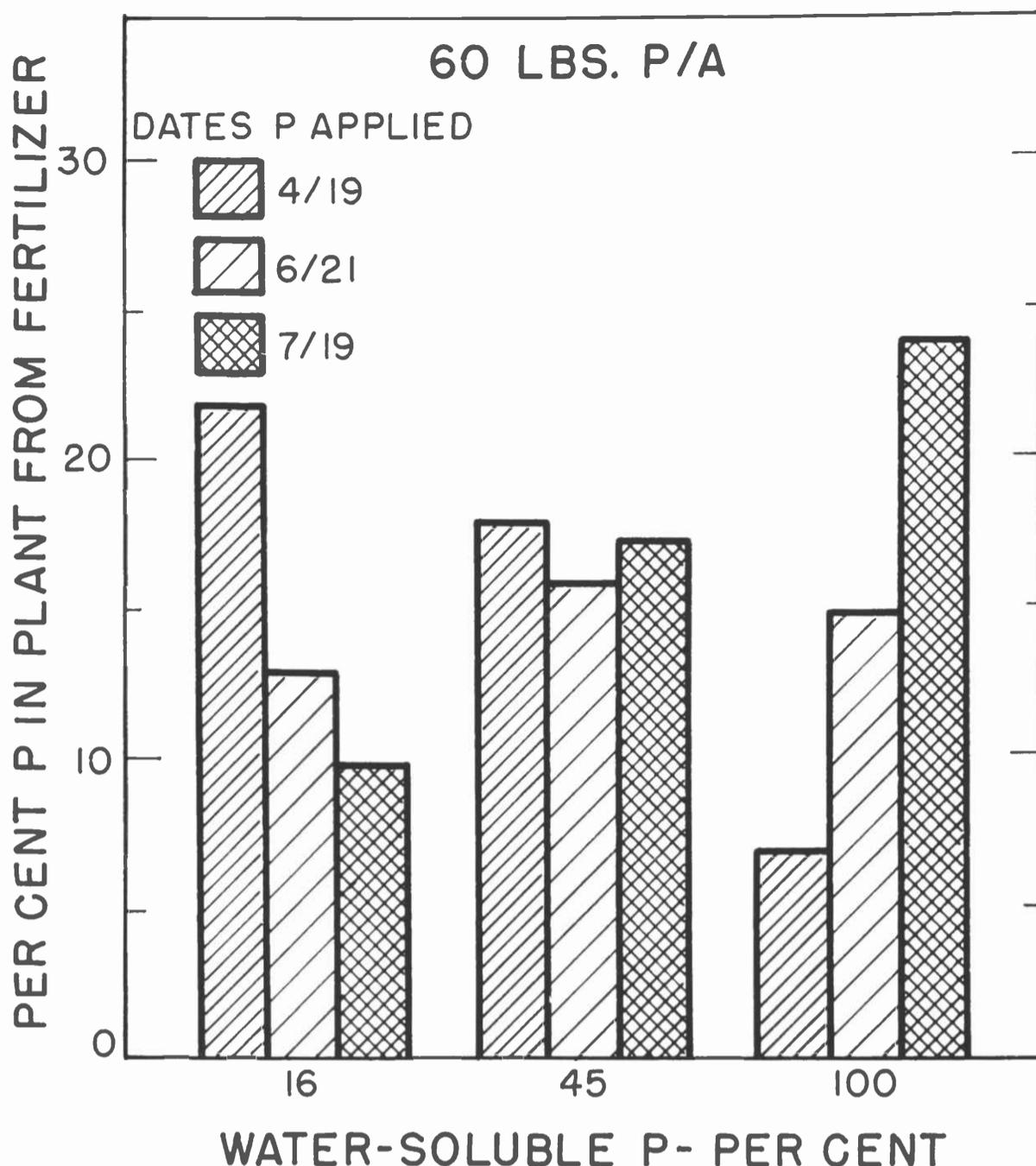


FIGURE 2:- THE UPTAKE OF FERTILIZER PHOSPHORUS BY COTTON FROM A CALCAREOUS SOIL AS AFFECTED BY STAGE OF GROWTH AT TIME OF APPLICATION AND WATER SOLUBILITY OF P IN THE FERTILIZER. MEAN OF ALL SAMPLING DATES AND 3 REPLICATES.

soluble P at a rate of 60 lbs. P per acre (137.4 lbs.  $P_2O_5$  basis).

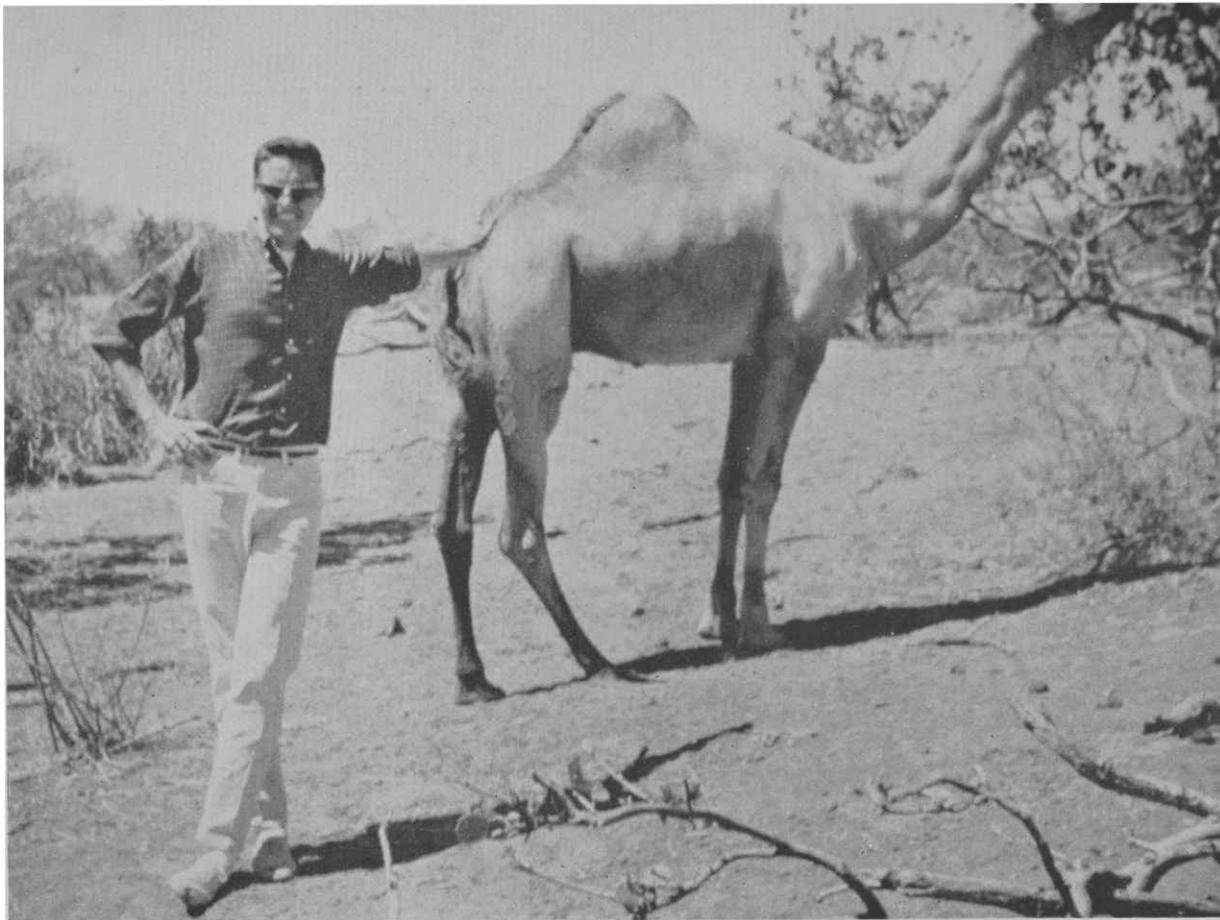
Again it is apparent that the least water-soluble phosphorus fertilizer (16%) is most effective at the first application date and the most soluble P (100%) most effective at the later dates. The 45% WSP material is intermediate.

### COTTON YIELD:

There was no significant difference in yield of cotton lint as a result of addition of phosphate fertilizer at any of the 3 levels (0, 20 or 60 lbs./A of P). The soil appeared to be well supplied with available P.

### WHY THESE RESULTS:

The reason for the interaction in effectiveness of the fertilizers of different water-soluble phosphorus with stage of growth of cotton is not fully known. It appears, however, that there is a soil-root-fertilizer relationship whereby early in the growth of the plant a limited amount of P is demanded by the small plant with a limited root system. In more mature plants, with more extensive root systems, the plant competes better for soluble P from the fertilizer that has reacted with the soil.



*Marc Clausen, One of our Aggie Grads, Sends a*  
**Report From the Peace Corps**

**Marc E. Clausen**

At the time of our departure from the United States in September, 1962, this, the Ethiopian No. 1 project, was the largest contingent ever sent overseas at one time by the Peace Corps. We number about 280 school teachers, and range in age from 20 to 65 years.

We are located in the oldest empire on the African continent. Ethiopia is one and one-third times larger than the state of Texas. A constitutional monarchy descended from ancient Hamite and Semite tribes, Ethiopia has been ruled since 1930 by Emperor Haile Selassie I. Of the population

Marc Clausen, son of Mr. and Mrs. R. W. Clausen of Tucson, graduated from this College of Agriculture in the spring of 1962, leaving that fall for Africa as a Peace Corps member. This account of his work written to his mother, has been given us to share with former classmates and others.

Marc, while at the University, was active in 4-H, president of the 4-H Service Club, president of Alpha Gamma Rho Agricultural Fraternity and member of Alpha Tau Alpha, Agricultural Education Fraternity.

In addition to his regular teaching at Dessie, he is teaching English to adults in the evening and has, with the other Peace Corpsmen, adopted six homeless teenage Ethiopian boys to feed, clothe, house and educate.

of 22 million, more than half is Coptic Christian and one-fifth is Moslem.

**High and Beautiful**

I am stationed in the north central part of Ethiopia, in the third largest settlement in the empire. The village of Dessie is situated high on the west rim of the "Rift Valley," and rises from the floor of the valley some 6,000 feet in less than 20 kilometers by road. Our elevation is almost 10,000 feet, providing a panoramic view of rugged natural African beauty.

Dessie is rather typical of Ethiopian settlements, with a piazza that serves as the slow-motion heart of the village, a reminder of past Italian colonialism. Arab merchant shops abound and serve as the "business district." Dessie is snuggled against the base of majestic Mt. Tossa, a sheer mountain face that rises another 2,000 feet over Dessie. We are located in what is known as the "WOINA DEGA" temperate zone, with temperatures ranging from 50 to 85 degrees, providing one of the most comfortable and desirable areas in the whole empire. Very few insects here.

Dessie is a picturesque area, populated by tribes of Amharas, Gallas, Arabs and we "feringes" or foreigners. The people are in general a handsome lot, with brown skin, fine features and strong, lithe bodies. Traditional costume consists of a long, white (sheath-

THE ATTITUDE POSSESSED BY AN old time horseman or mule skinner, looks like a dangerous position. Maybe Marc just has confidence in the livestock.

like) garment known as a "shama." This is worn much like the sarape of our Mexican neighbors, by both men and women. Most people are barefoot, except those of higher economic standing.

They are a busy people, always hurrying to and fro. The women scurry here and there, with large clay water jugs on their backs. The men can be seen driving donkeys or mules, laden with hay or some product to be sold in the market place. They are always happy, with peals of laughter ringing loudly. A poverty-stricken people by our standards, yet in their own world they are quite joyous.

**All 18 in One School**

There are 18 American Peace Corps teachers here in Dessie, all teaching in the one secondary school in this province. Our school is the one new comprehensive school in the country, with a program that will permit students to study possible future vocations in teacher training, academic, commercial, technical and agriculture. It is with the latter course of study that I am directly concerned, as I am the agriculture teacher in the school. There did not exist a course of agricultural study here until we arrived in Dessie in September, 1962. I was told by our Ethiopian headmaster to "ESTABLISH AND DEVELOP AN AGRICULTURAL PROGRAM." With no books or tools or any other equipment, this charge proved to be quite a challenge!!

I have over 200 students enrolled in agriculture, which makes the largest of any of the five courses offered. The students range in age from 14 to 20 years old, and come from varied backgrounds. Ethiopia is a country that has a subsistence farming economy, so most of the population has at one time or another been subjected to some phase of farming.

Most are receptive to instruction, but when still tied to superstition and ancient principles of agricultural production, find it most difficult to fully accept and believe what I teach and say. Therefore attempting to teach modern principles of agricultural production to a people who believe that cows that wear charms will give more milk, that black sheep are evil, and that a setting hen must be set in the direction of the Mecca, often proves to be frustrating but never dull.

**To be continued**

# GRAPES

*are not for the*

# BIRDS

**J. R. Kuykendall**

*For all of their beauty, birds are considered by fruit growers a pest and a menace.*

Nothing can be more exasperating than to spend considerable time, money and effort to produce a beautiful crop of grapes and to find at harvest time that many clusters are spoiled by small bird pecks. Likewise the horticulturist, although as a biologist he appreciates the value of birds in their place, can become discouraged at seeing birds eat up valuable research data.

For several years we have been attempting to study grape berry development in relation to applications of various growth regulator chemicals such as gibberellin. In attempting to allow fruit to develop to maturity it has been necessary to protect grape clusters by enclosing them in perforated paper bags, or in covers made of cheesecloth.

## Covers Not the Answer

Any cover of this sort tends to delay ripening of the fruit and prevents normal berry color development. And, no matter how carefully such covers are attached to the clusters, the birds do manage to find ways of damaging some of the "protected" berries. It appears that the only way to prevent bird damage to grape crops is to keep the birds entirely away from the vines.

A number of methods have been tried aimed at scaring birds away from vineyards. Automatic carbide guns and recordings of bird distress calls work for a while until the birds become accustomed to such noises. Electrical shocking devices and the use of poisoned grain unfortunately

Dr. Kuykendall is an Associate Horticulturist.



**STUDENTS AND professors worked together in stretching the netting over supports in the experimental vineyard.**

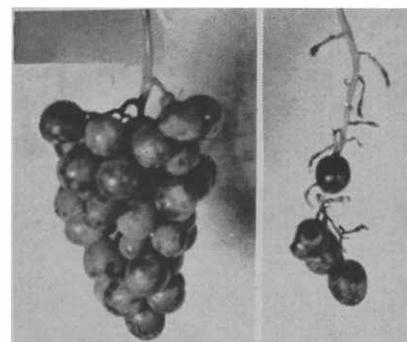
have a lethal effect on all birds — good and bad.

Cages are used to confine birds, and likewise can be used to exclude birds from areas where their presence is not desirable. At the University's Campbell Avenue Farm in Tucson a new experimental vineyard, about half an acre in area, has recently been enclosed with "bird netting" to exclude birds from the vines.

## Not For Large Units

From a commercial standpoint, the cost of protecting a large vineyard with the type of installation illustrated here would be prohibitive. However, this same "bird netting" is being used commercially in the East and Midwest to protect such crops as blueberries and blackberries. The installation at the Campbell Avenue Farm does illustrate the effort being made, and the cost, to insure accurate research data from our grape vines.

These grapevines are spaced eight feet apart in rows which are 12 feet apart. Each vine has been trained to its own grape stake. Between every other vine is an eight-foot-high, 4" x 4" redwood post to which are attached the trellis cross arms and wires 5½ feet above ground level. Across the tops of the posts in the di-



**THESE TWO BUNCHES of grapes would be the same, excepting that the one at the right was exposed to bird damage, while the full bunch was protected in a paper sack.**

rection of the vine rows a Number 12 support wire was fastened. Barbed wire was nailed across the rows as a means of fastening and securing the bird netting.

The bird netting is a light weight nylon cord woven to give one-inch square openings. It is very similar to a light weight, one-inch mesh fish netting. We received from the manufacturer a continuous hank of material which is supposed to stretch to an 18 foot width. Installation involved pulling the hank across the support wires, stretching the material out and fastening the edges of the netting to the barbed wire.

## Attached to the Ground

Along the sides of the "bird cage" the edges of the netting strips were sewn together and the ends of the strips pegged to the ground on the outer edges of the vineyard. Four foot braces on the posts of the outer rows enabled the extension of the netting four feet beyond the vines. Wood frame gates at the ends of the planting are covered with netting and are installed so that they can be raised to allow tractors and spray equipment to be operated within the enclosure.

In a couple of places where we stretched the netting too tight, the pegs fastening the ends of the netting to the ground were eventually pulled loose. A few birds did get into the enclosure through such openings, but they did very little damage to the grape crop. Additional netting is on hand to use for patching any holes which might develop.

It is expected that with reasonable care this enclosure will protect our grape crops for four or five years before the netting will have to be replaced. The first crop of grapes produced by these vines in the bird cage was of excellent quality and quantity.

# SULFUR-BEARING CHEMICALS

## For Reclaiming Arizona Soils

Lyman R. Amburgey

Sulfur-bearing chemical amendments have been used for many years on alkaline soils in reclamation and soil management. Amendments such as gypsum, sulfur, sulfuric acid, sulfur dioxide, calcium poly-sulfide, and iron sulfate all provide soluble calcium to the soil solution.

Gypsum is most often used because it is lowest in price. It occurs as a naturally deposited mineral in two forms in Arizona. Gypsite occurs as a powder or as small grains scattered throughout the soil mass. Gypsum occurs as a crystalline or rock form which is mined for agricultural and industrial purposes.

The presence of excess sodium in soils and irrigation water requires the use of a calcium yielding amendment. Excess sodium in a soil causes sealing or dispersion. This change in soil physical condition is a serious problem because it restricts the intake and movement of water and air into the soil.

### Also Requires Leaching

Certain sulfur-bearing soil amendments assist in reclaiming soils containing excess sodium by providing soluble calcium for exchange purposes. However, effective leaching must be achieved following application of amendments for reclamation.

The main purpose in adding sulfur-bearing amendments to the soil is to provide or make available soluble calcium. Both the soil solution and irrigation waters supply an abundance of sulfur for plant growth either as sulfate ( $\text{SO}_4^{--}$ ) or other forms. Calcium, on the other hand, is present mostly as an insoluble compound. The sulfur-bearing amendments either supply the necessary *soluble* calcium to maintain good soil tilth directly, or they indirectly make native soil calcium soluble by chemical action.

Continued use of irrigation water containing an excess of sodium in-

Dr. Amburgey is Extension Soils Specialist.

creases the accumulation of this harmful element in the soil. The calcium-supplying amendments may be added to irrigation water in some cases to offset this deleterious effect. If the sodium from poor quality water continues to accumulate and cause a serious soil problem it may be dealt with by adding the amendments directly to the soil.

### Must Get Rid of Sodium

Alkali (sodic) soils contain 15 percent or more exchangeable sodium. This excess sodium must be replaced by soluble calcium. The reaction for this process is: gypsum + alkali (sodic) soil  $\rightarrow$  calcium soil + sodium sulfate. Sodium sulfate, a soluble sodium salt, must be leached out of the soil before beneficial results may be achieved. The addition of gypsum to irrigation water will counteract a high per cent sodium, thus providing a higher quality water.

The addition of gypsum or any other chemical salt increases the total soluble salt content in the soil or irrigation water. However, the net effect in the soil may be a reduction in soluble salts because leaching is improved. Leaching to remove salts is essential to the reclamation process.

### Know Your Soil

The use of chemical soil amendments is governed by several factors.

*First*, the physical condition in the soil must show a positive need for the amendment. The glamour of any practice will not insure satisfactory results.

*Second*, the decision as to what chemical amendment to use is influenced by cost, and again by the situation in the soil. Soils containing an abundance of calcium, as most Arizona soils do, lend themselves to the use of sulfur-bearing amendments. Inadequate amounts of *soluble* calcium in the soil make it necessary to use these amendments.

*Third*, quality of the amendment must be considered. Quality factors include solubility, fineness, purity,

The reader's attention is drawn to a new bulletin, A-27, entitled "Gypsum and Sulfur-Bearing Amendments for Arizona Soils," recently published by this college. Authors are Dr. Wallace H. Fuller, head of the Department of Agricultural Chemistry and Soils, and Dr. Howard E. Ray, Extension Cotton Specialist, with assistance of Dr. Amburgey. This bulletin may be obtained from your local County Agent's office.

and so forth. Fineness is considered as influencing both rate and extent of reaction. The finer the particle size of gypsum, for example, the greater is its value as a soil amendment.

*Fourth*, there is the question of how much of the material to use. The soil and water testing laboratory at the University of Arizona will test soils to determine the gypsum requirement, and irrigation waters to evaluate the percent sodium. These analyses assist in determining how much gypsum to use and, in the case of soils, this can be converted to the amount of other sulfur-bearing amendments needed.

*Finally*, method of application of the materials may influence selection and use. Soil applications appear to be the most effective method. As with fertilizers, applications in irrigation water are no more effective than the effectiveness of the irrigation itself.

Water penetration problems usually occur in spots. These are the very spots that get the least of the amendment when it is applied in the water. Solubility of materials in water also influences selection and use. For example, gypsum has a low solubility, making its application to the soil much more practical.

### Use Only if Needed

Gypsum and other sulfur-bearing soil amendments should be used only when soil conditions or water quality indicate a need for them. Used properly when they are needed, these materials can be most beneficial. However, if they are improperly used or used when conditions do not warrant such use, they will be ineffective and the problem will remain.

# WHEAT VOTE

*Is It Just a Beginning?*

Arizona wheat growers overwhelmingly rejected high government price supports and more restrictive production controls for their 1964 wheat crop, in the national wheat referendum last May.

More than three-fourths of the 714 Arizona wheat growers who voted cast "no" ballots, against continuing the high price support of about \$2 per bushel for Arizona wheat. The price support now in effect for the 1964 crop is about \$1.25.

## Never Filled Allotments

Dr. George Campbell, Extension Economist in this college, tells us that "Most Arizona farmers have not, in recent years, planted their full wheat allotments. In the three years 1960-62 they actually planted less than two-thirds of their allotments," he said.

He continues: "Arizona's wheat allotment for 1964 is slightly over 37,000 acres. With the drop of support prices from \$2 to \$1.25 per bushel, Arizona farmers probably will plant less than 20,000 acres of wheat in 1964.

"Since wheat never has been a major crop in Arizona, there will be very little loss of net farm income for most Arizona farmers as a result of the lowered support price," notes Dr. Campbell.

## Simple Majority by 15

In the voting last May, a simple majority of over 50 percent — but not the required two-thirds majority — was indicated in 15 of the 47 states with wheat allotments, indicating that at least half the farmers in those states favored continued supports and controls.

Strangely, these 15 included not only some of the larger wheat states — Minnesota, Missouri, Montana, Nebraska, North Dakota and South Dakota — but also a group of southern states, including Alabama, Georgia, Kentucky, North Carolina, South Carolina and Tennessee. Other pro-support votes came from Wisconsin and Iowa in the Midwest, and out of

New England a 75 percent pro-support vote from Maine, although that represented only 32 wheat growers in a state which grows more potatoes in one (Aroostook) county than wheat in the entire state.

The only vote that counted for supports — votes of more than 66% percent favorable — came from five southern states — Georgia, Kentucky, North Carolina, South Carolina and Tennessee, and from the aforementioned state of Maine. None of the six is a substantial wheat state.

Nationally, the vote of slightly less than 1,500,000 wheat growers was 47.79 percent for supports, about 20 percent under the needed two-thirds majority.

"The 'no' vote did not do away with the government wheat program," says Campbell. "Since 1938 Congress has provided an alternative to

acreage allotments and marketing quotas, to be effective if marketing quotas are not approved. That alternative program will be in effect in 1964, unless substitute legislation is passed," says the economist.

## Reflects "Free Market" Sentiment

As for Arizona, Dr. Campbell believes the anti-price support vote reflects a viewpoint also applicable to price supports and controls on cotton growing. Most farmers who grow some wheat are also, and primarily, cotton farmers, and nearly all cotton growers in the state are on record as preferring less controls on the cotton they grow.

"It would be to the economic advantage of most Arizona cotton growers to have somewhat lower support prices and larger acreage allotments," says Campbell. He believes, too, that the wheat vote reflected general farmer sentiment against tighter controls, not only on those crops now under government price supports, but also the extension of controls to other crops presently without any controls.

"And," concludes Campbell, "if a wheat referendum vote is held next year, Arizona farmers again will vote against it."

## Nigerian Welcomed to UA Agric. College



From throughout the world, students came last September to The University of Arizona. Greeting Daniel Eboh, right, from Nigeria, is Dean of Agriculture Harold E. Myers and, left, Miss Katie Kohlstaedt, senior in the College of Agriculture.

# PROGRESS IN PIMA

*Pima, Arizona, isn't a crossroads town — there isn't even a crossroads there. It is a small community in Western Graham County, sitting along the sides of Highway 70 between Safford and Globe.*

*It is a town which, perhaps, could quietly die, but it doesn't choose to die. That is because of the people in Pima, and the people in the surrounding countryside, who are lending their energies and ideas — and seeking help and ideas of agencies designed for such things — in an effort to make Pima live and grow.*

*Not only to grow in size, but also in beauty, and in cultural richness, and in the happiness of the people. There is a bank in Arizona whose slogan tells you it is the bank "Where people make the difference."*

*Likewise, Pima, because of its people, is a village different from a thousand others. That is why the story of the town and its people, their accomplishments and their hopes, is a story worth telling.*

In May of 1962 the newly formed Pima, Ariz., Chamber of Commerce began to look closely at problems and opportunities of western Graham County, where the village of Pima is located.

Chamber members asked John Sears, Graham county extension agent, and Max Wilson, county FHA supervisor, to meet with the chamber to discuss ideas for progress of the area. Last May these men met with Dr. Kenneth Olson of the Agricultural Extension Service of The University of Arizona.



## First a Study of Potential

Ideas on development of the area were exchanged, and the Pima people then began a progressive approach to improving Western Graham County.

First they asked for the help of the U of A Extension Service in determining the resource development potential for the area. Dr. Clarence Edmond of the Extension Service, who specializes in resource development work, began working with the Pima group in the summer of 1962. With his help, the Pima chamber is starting a resource survey in western Graham County. Results will be used to guide future projects.



**YEARS AGO, PIMA had a bank, housed in a sturdy brick corner building. When modern transportation made it feasible to bank at larger towns, Pima had a prominent building to use. Residents, using their own labor, have renovated the building and filled it with most interesting historical artifacts, thus adding an attractive museum to their resurging community.**

**IN LAVISH ROADSIDE signs, Pima boasts that it is "the home of Pima cotton." Many new signs invite the tourist to stop awhile in this beautiful Gila Valley community.**

Earlier a survey of recreational attractions in the area had been made by Vearl Cluff, president of the Chamber of Commerce at Pima, and by Wesley Morris, an SCS supervisor in the area, assisted by Dr. Edmond.

These three agreed that many sites in the area had great recreational potential, but financing would be a problem. Cluff's Ranch, with its large cottonwoods and water, appeared especially attractive.

## A Natural Amphitheater

Red Knolls, an ideal outside theater area, offers an excellent place for plays and pageants. The acoustics are excellent and stage facilities could be easily arranged. In the past, this site has been the home of several plays by the Junior College at Thatcher.

As a follow-up of the recreational survey, the chamber asked the U.S. Forest Service and the Arizona Game and Fish Commission for help in developing the area.

The U.S. Forest Service was asked to complete a road down the west end of Mt. Graham, so people visiting the mountain would be able to see the beauty of the western part of the mountain and also avoid backtracking down the east side. The

(Continued on Next Page)

## 50 Bulls Entered in UA Gain-Test Trials

Fifty high quality bulls have been entered in the third annual U of A gain test-grading period for animals from Arizona registered herds.

"The quality of the bulls is definitely up, although numbers entered are slightly less than in other years," said Dr. Bruce Taylor, head of the Animal Science Department.

The bulls, entered by 17 breeders, are now at the university's River Road Farm. The test period began October 14 and will close February 21, 1964.

"How each bull gains during the period of 130 days is our best indicator of his ability to sire calves with similar gaining potential," said Dr. Taylor.

There will be an auction of the bulls next February 24. However, owners have a choice whether to sell in the auction, to retain the animals in their own herds or sell by private sale. Only those bulls which meet or exceed all requirements for gain, yearling weight and grade are eligible to sell as Arizona gain tested-graded bulls.

Forty-four of this year's 50 entries are Herefords. Five are Brangus,

and one Angus. Visitors are welcome to the testing station at any time. The testing station is located at the corner of River Road and Dodge Boulevard in Tucson. The annual testing originated three years ago when the late Mrs. Helen S. Corcoran donated the land for the project.

Three of the bulls in this year's program were entered by R. F. Burnett and Sons of Elfrida, three by Cowden Livestock Company of Phoenix, three by Coppertone Hereford Ranch of Thatcher, one by Ben F. Edwards of Cochise, three by Elgin Hereford Ranch of Elgin, three by Heady-Ashburn Ranch of Patagonia.

Also, two by Hopper Hereford Ranch of Springerville, five by I V Bar Ranch of Bisbee, four by Las Delicias Ranch of Tucson, two by Las Vegas Ranch of Prescott, two by Long Meadow Ranch of Prescott, one by Merry Meadow Ranch of Tucson, three by Santa Rita Ranch of Sahuarita.

There also are two entered by Gunnar Thude of Springerville, three by Thurber Hereford Ranch of Sonoita, two by The University of Arizona, and five by Yuma Valley Cattle Company of Yuma.

E. Ray Cowden of Phoenix is advisory committee chairman for the

## Mystery Picture Answer

You're right. That picture on Page 7 is of Old Main, right in the center of The University of Arizona campus.

But when was the picture taken? Nope, you're wrong. It was not taken "years and years ago" as you thought, because of the dense surrounding growth.

No, that picture was taken very recently, taken by Dr. Walker Bryan, veteran plant breeder and father of the long staple cotton breeding program in the Southwest. But his photography is somewhat tricky.

What he did was to take a picture of Old Main from out near the Cherry Street entrance to the campus, using a telescopic lens and thus compressing the desert growth and eliminating the grassed mall between the natural growth and the building.

However, if you still wish to believe "that picture *must* have been taken in 1909," it probably *did* look like that in 1909. We weren't here then, to prove you right or wrong.

---

tests. On the committee with him are Henry Boice of Tucson, Ernest Chilson of Winslow, Ernest Browning of Willcox and Floyd Newcomer of Yuma.

---

(Continued from Previous Page)

Forest Service is interested in building the 26 miles of road, but estimates that it would not be completed for several years.

The Chamber of Commerce asked the State Game and Fish Commission and the State Parks Board to study desirability of creating a state park at the foot of Mt. Graham, six miles south of Pima. This would be in the scenic Cluff's Ranch area. No decision has yet been reached by the Parks Board.

When Dr. Edmond first visited Pima a year ago, he told Chamber of Commerce members that one could not tell when he entered Pima — there were no signs indicating the town's name.

Such a criticism is no longer valid. The chamber and merchants have been active, and now the town boasts large attractive signs at both ends of town, welcoming travelers to stop in Pima, "The Home of Pima Cotton".

In addition to these signs, Pima merchants have erected 16 uniform 4 x 8 foot signs on the west end of

town, advertising local businesses and asking travelers to "Stop in Pima".

### New Civic Museum Opened

A clean-up, paint-up and beautifying project has resulted in a face-lifting in some of the older homes. Vearl Cluff says, "Many new homes are being built here by newcomers as well as present residents." Part of the new interest in homes in the area may be due to the widening of Center Street last summer and installation of 16 new street lights.

Chamber members and other interested citizens, working with scrub brushes and paint brushes and carpentry tools, took an old bank building and converted it into an attractive new Eastern Arizona Museum, which opened last July 24, date of the Annual Pioneer Celebration. The museum is housed in a large corner building which is attractive to home folks and tourists.

The museum contains Indian artifacts and also pioneer utensils recalling early history of eastern Arizona. Pioneers, Indians and prehistoric animals are featured. Of special interest is an elephant tusk

and a camel's jawbone from excavations 15 miles from Pima.

Another project for the area is a TV relay station to be erected three miles north of Pima if the FCC approves the project.

### Improvement is Rural, Too

Vearl Cluff insists that interest in improvement is not limited to the confines of the village itself. He says that much land leveling and farm improvement is going on in the area, and he concludes, "We can boast of having some of the most beautiful farms in the world."

The projects completed and contemplated, sparked by the Pima Chamber of Commerce and other interested citizens, and with the help of state and federal agencies, are showing results. Pima looks better and is a better place in which to live. Just one year has shown much progress, and more will be accomplished in the next three or four years. Meanwhile the people of the little community of Pima and in western Graham County will continue to find worthwhile ways to develop their own resources.

# Honeycomb Uncapper Invented

By USDA Bee Scientist Here



A machine which uncaps honeycombs twice as fast as any device now in use and cheaper, too, has earned a public service patent for its inventor.

The inventor is Charles D. Owens of the U. S. Department of Agriculture. He developed the machine in Tucson in cooperation with the Uni-

versity of Arizona Agricultural Experiment Station.

Owens says his machine uncaps 20 combs a minute, and eliminates the extra step of separating the wax from the honey, required in manual operation.

Samuel E. McGregor, of the U. S. Department of Agriculture bee culture laboratory at the university's experiment farm in Tucson, explained the honey-gathering problem and the workings of the uncapping machine this way:

Honeybees fill the cells in their combs with honey, then cap them with wax to hold the honey in the comb. This capping must be removed or punctured before the honey can be extracted.

Beekeepers have been uncapping honeycombs, one at a time, by slicing off the wax with an electrically heated knife. A worker can uncap only eight or 10 combs a minute. Wax unavoidably mixes with the extracted honey and must be separated later.

In using the uncapping machine, an operator passes the honeycombs between a pair of heated, aluminum rolls with teeth that punch holes in the wax capping. These rollers operate continuously and uncap both sides of the comb at one time.

Each roller, three inches in diameter and 17 inches long, has more than 6,313 metal teeth. Heating the rollers to 120 degrees or higher prevents the wax and honey from sticking to them. The rollers are designed to uncap a standard 17-inch honeycomb.

After the comb is uncapped, and the honey is extracted, either a second pair of rollers or a set of metal fingers roughens the wax surface so that the comb may be reused.