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IN THIS ISSUE - *San Carlos Cattle Project . . . Teaching-Counseling Service . . . Brazil Report . . . Dairying . . . Agricultural Surpluses . . . Cotton Rust . . . Citrus History*

THOSE EXTRA SERVICES

Most people know, in a general way, that this College of Agriculture and School of Home Economics have three chief divisions — Resident Teaching, the Agricultural Experiment Station, and the Cooperative Extension Service.

Few people, however, are aware of the numerous and varied service activities emanating from this college — activities which serve individuals and groups of persons throughout Arizona.

Dairy technologists devise a method for homogenizing cottage cheese to make a cocktail dip — a new product for an Arizona dairy company.

A range specialist rides over leased public lands with the leasee and the representative of the agency which leases those lands, helping to adjudicate the question of grazing fees — and thereby saving the cost, time and anguish of a court trial.

A soil and water chemist gives important court testimony in the interstate water case, bolstered by evidence gathered by other University of Arizona scientists, testimony important to the Arizona case.

An animal pathologist on our staff, called by a practicing veterinarian, assists in the examination of a sick animal and in making the diagnosis and recommendations which may avert a communicable disease invasion disastrous to many livestock owners.

An entomologist is called by a worried cotton grower, identifies a hitherto scarce insect pest and recommends controls which will save the crop.

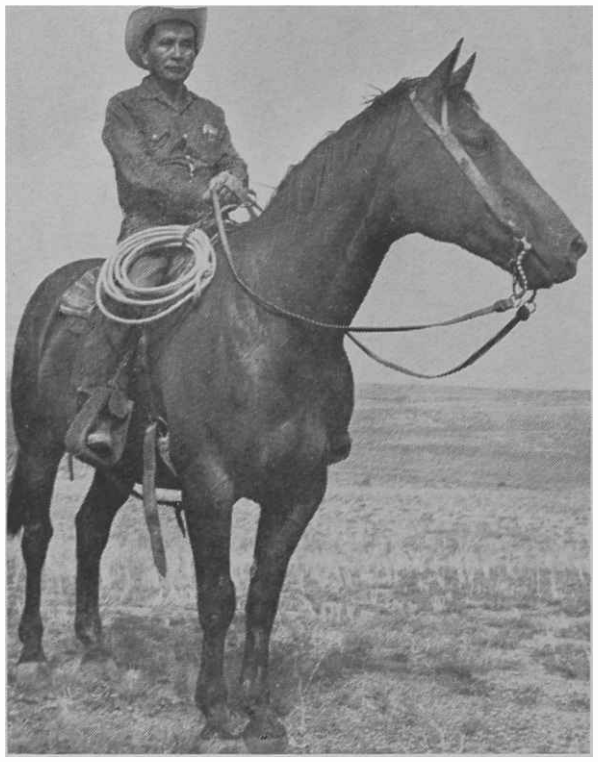
An irrigation engineer makes water surveys in several areas of the state, of great help to local officials and the populace in all those communities.

The list could go on and on, showing how these "service" activities — usually carried on in addition to the usual work load — benefit communities and people in every corner of this state.

Harold E. Myers

Dean
College of Agriculture
and
School of Home Economics

OUR COVER PICTURE



In most of its activities, especially extension and research, this College of Agriculture leans heavily upon the helpful cooperation of many Arizona citizens.

The tremendous livestock research project on the San Carlos Apache Indian Reservation, completing 10 successful years and now being expanded, would not have "got off the ground" excepting for the cheerful, untiring cooperation of George Stevens, manager of the tribe's registered herd.

As a sideline to frequent trips to Arsenic Tubs (see following pages) many staff members from this college have learned to know Mr. Stevens and his fine family as the best of friends. We are proud to have George Stevens, mounted on his bay roping horse, brighten the cover of this issue of PROGRESSIVE AGRICULTURE.

TRACTORS KILL 5 EVERY DAY

Five persons die daily in tractor accidents. And, strangely enough, most tractor accidents where the tractors tip over occur on level land. Working on hillsides and in ditches requires a great deal of caution but operators apparently get more careless on level land.

Over 1,500 Americans are killed each year in tractor accidents. Two-thirds of the mishaps happened when a tractor tipped over. Over half the victims are under 20 years of age and many are children under four years old.

IN THIS ISSUE

PROGRESSIVE AGRICULTURE IN ARIZONA

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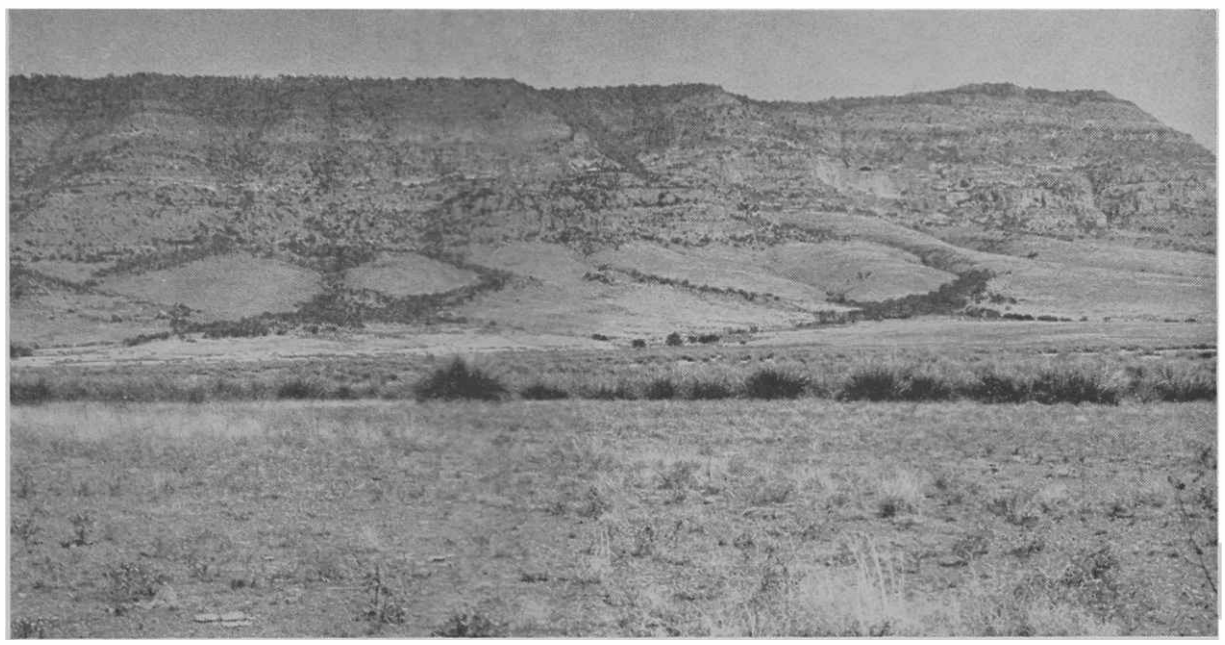
SAN CARLOS APACHE CATTLE STUDY IS BEING EXPANDED

One of the largest "large animal" research projects in the history of the world is 10 years old — and expanding.

That project is the cooperative study in which the San Carlos Apache Tribe, The University of Arizona and the U. S. Department of Agriculture combine in a performance testing program of the San Carlos herd of purebred Hereford beef cattle.

The idea for the project came in 1955, when Thomas S. Shiya, then general manager of San Carlos tribal affairs, approached Dr. C. B. Roubicek, head of the USDA Beef Cattle Breeding Research Center at Denver, and Dr. O. F. Pahnish of The University of Arizona.

The San Carlos purebred herd, explained Tom, is made up of more than 600 Hereford cows, serving as "seed stock" for high quality young bulls to serve the general tribal herd of 12,000 to 18,000 head, which roams some 1,640,000 acres of tribal lands in east central Arizona. Why not use that purebred herd for research purposes and also apply those research findings to the benefit of the tribe and all Apache-owned cattle?



ARSENIC TUBS, 45 miles back from the highway, looks northward toward the Mogollon Rim. These bajadas are rich in early Indian artifacts — and also in rattlesnakes.

TYPICAL BUNCH OF young purebred Hereford bulls at Arsenic Tubs, brought in for the semi-annual inspection.

Indian Officials Approve

The idea was approved by George Stevens, manager of the tribal registered herd, and by Tom Dodge, superintendent of the San Carlos Agency.

Dr. Roubicek, at about this time, left the federal beef breeding research work at Denver and joined the Animal Science Department staff at The University of Arizona, in charge of livestock research work. He saw great promise in the San Carlos project and encouraged University of Arizona participation.

He and Shiya agreed on the details of starting a performance testing program, with the motive of increasing beef production, raising the currently inadequate calving rates, keeping adequate records, and using bulls which would throw a large calf crop of animals which had quick gaining ability and desirable conformation.

Tom and Carl talked it over: "You lead the way," said the tribal business manager to the animal scientist, "and we'll follow."

Everyone Pitched In

"Actually," recalls Dr. Roubicek, "it wasn't a case of anybody following anybody — we all just pitched in and went at the job together. The Department of the Interior, the tribal council of San Carlos, the U. S. Department of Agriculture with its pure-

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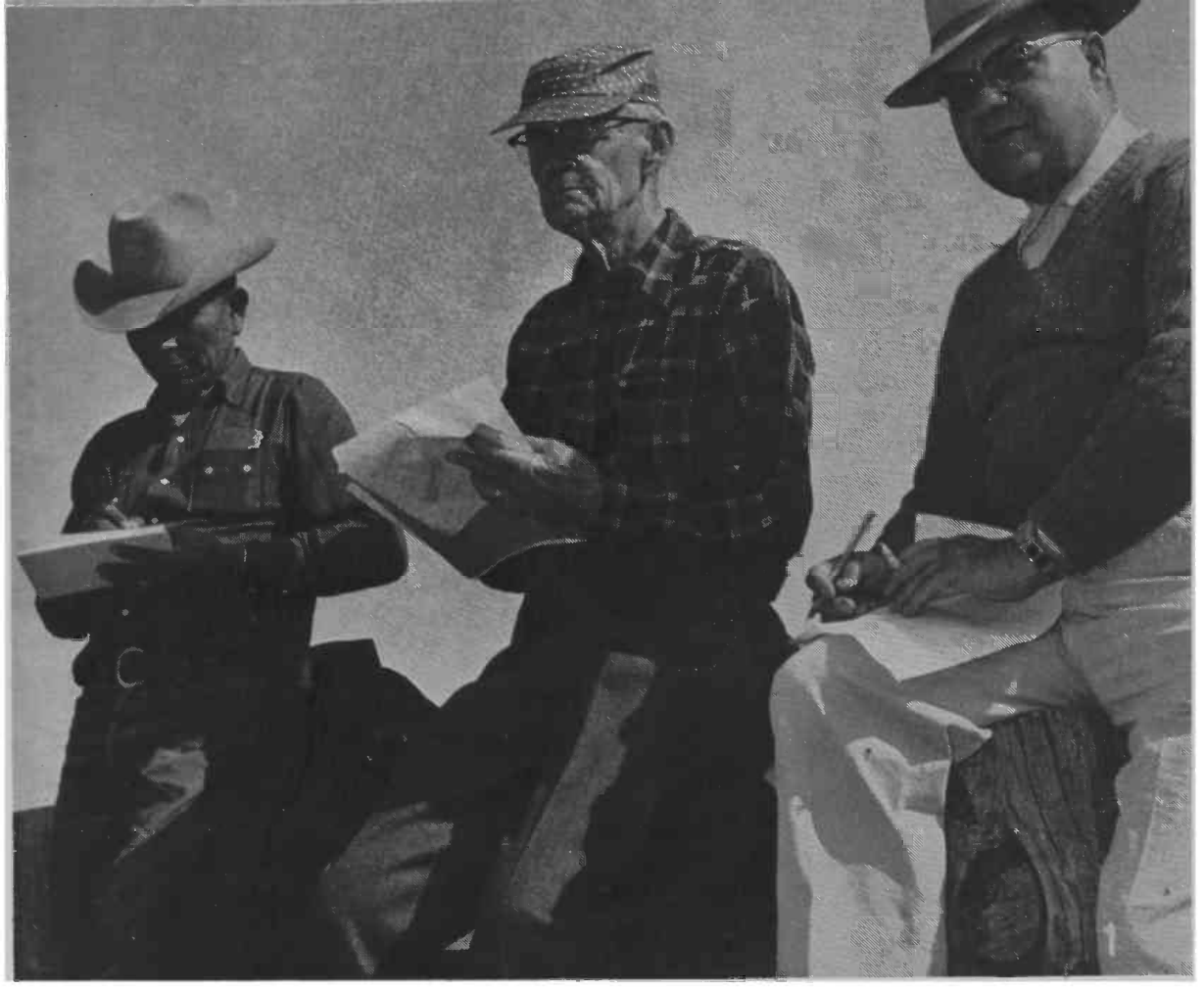

EVALUATING ANIMALS in the corral are, left to right, George Stevens, Dr. Quisenberry and R. T. Clark. The visual examination came after each animal was released from the squeeze.

San Carlos Project

(Continued from Previous Page)

bred bull stud up at Miles City, Montana, the Bureau of Land Management which laid out pastures, the Indians themselves who did a formidable job of fencing breeding pastures — all worked together in a tremendous harmony of cooperation."

As for the results, The University of Arizona College of Agriculture would have a rich store of research data, an outdoor laboratory of vast scope, while the San Carlos Tribe would have access to the data, intended to improve the performance of their cattle.

First of all, there were 25 separate breeding pastures fenced, each pasture 650 to 700 acres. The BLM decided where the pastures would go (at Arsenic Tubs, headquarters for the herd manager) and the Apache Tribal Council did the fencing and provided water.

Obtain Miles City Bulls

Breaking precedent, the USDA Miles City Station made performance-tested bulls available for use in the San Carlos purebred herd. The first six Miles City bulls were purchased by the tribe in 1955 and used the spring of 1956. Cooperating at this point, in addition to those named earlier, were J. Richard Quisenberry, superintendent of the federal station at Miles City, and the late R. T. Clark, who was then coordinator of beef cattle research at the Denver office for USDA.

Sires used on the purebred herd that spring of 1956 included the six from Miles City, some animals purchased from various registered herds, and a few bulls from San Carlos with performance records, for a total of 18.

University of Arizona participants, at the start, included Dr. O. F. Pahnish and Dr. Roubicek, although a considerable group of staff members and graduate students took part, in ensuing years, in the semi-annual survey of the herd.

The purebred sires were assigned 30 to 35 cows each, each sire and harem in its own breeding pasture. The pastures are used annually, May to mid-July, to include the calving season. For the rest of the year these pastures are rested to allow regrowth of forage.

Had Unique Advantages

Besides being one of the largest "large animal" (as contrasted to research with guinea pigs, hamsters, white mice or fowls) research projects in the world, the San Carlos project had unique assets of its own. First of all, there was no culling until animals were over two years of age, and no castrating. This allowed research on a "complete population," instead of a selected population from which certain animals had been culled.

Secondly, this experiment took place in a vast area where year-around grazing took place, a place where pasturage and pasturing could be judged without the interruptions of barn feeding, winter yarding, or supplemental feeding. The registered herd alone has 90,000 acres of rangeland, fenced off from other reservation lands. Excellent cooperation of tribal officials and individual Indians was continued under direction of Charles Rives, the new superintendent.

A Variety of Tests

Each March and November the group of animal scientists from The University of Arizona would go to the reservation, take the winding mountain road back to Arsenic Tubs, and there for two or three days:

1. **Take weights and visual grades of calves. After the first year that included yearlings, for a total of around 600 head.**
2. **Make a liver biopsy, to determine vitamin A storage (or lack of carotene).**
3. **Get blood samples for a wide range of tests — glucose, phosphorus, hemoglobin count, etc.**
4. **Obtain feces samples, in order to make a count of internal parasites.**
5. **Finally, as the animal is released from the squeeze, make a general grading as to appearance, conformation, type, etc.**

Active over the years in this semi-annual examination of hundreds of young animals has been Albert Lane, University of Arizona Extension ani-

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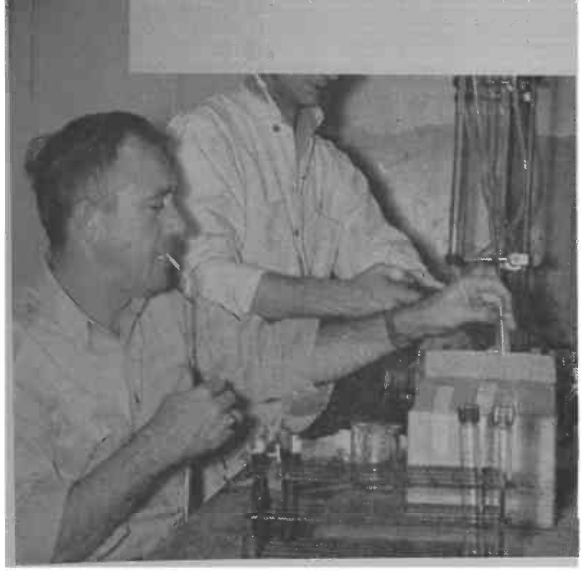
DR. FLOYD PAHNISH takes the weights as animals walk onto the scale before approaching the squeeze, where blood, liver and feces samples are taken.



IN THE MAKESHIFT "laboratory" adjoining the corrals, Bill Hale and Dick Taylor work on blood samples.

San Carlos Project

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mal husbandman. Taking the feces samples and later examining them in the laboratory at Tucson has been Dr. L. W. Dewhirst of The University of Arizona Department of Animal Pathology. Active, too, has been Dr. Raymond Reed, head of that department.

The work at Arsenic Tubs, in its beautiful mountain-framed wild surroundings, has been the exciting and colorful portion of the work. The cowboy meals prepared by Apache cooks, the living outdoors, the sweating and the freezing, the animal urgency of hundreds of Herefords milling in the corrals and being prodded into the chutes — all that has a certain zest. But the work which makes this all meaningful has been that which came later — the long hours of laboratory drudgery, sifting and evaluating the findings.

There were, in the Department of Animal Science alone, more than 10,000 laboratory analyses annually.

GETTING HIS number. The record keeping must be accurate if the data are to mean anything.

Additional are the parasite classifications and counts made by Dr. Dewhirst. The data are placed on IBM cards, quickly available.

Range is Studied, Too

A part of the project, yet not directly a part of it, has been the taking of grass samples by Bureau of Land Management workers. Various portions of the vast rangeland have been studied, grass species noted, poisonous plants observed and destroyed, seasonal evaluations made of range condition.

Now, a decade after the project began, it has widened to include studies in other states. With a U. S. Department of Agriculture grant and continued cooperation of University and Indian personnel, performance-tested Hereford sires from other states will be introduced to the San Carlos purebred cow herd. Production records of progeny will be obtained.

The sires themselves will be evaluated to learn if they perform as well at San Carlos as they did at home. Animals from the Agricultural Experiment Stations at Wyoming, New Mexico, Montana, Nevada, Utah and Colorado will enter the picture. Semen from these bulls will be used on commercial herds in Oregon, Wyoming and Hawaii.

After weaning, half of the bull calves from the San Carlos purebred herd will be placed on feedlot tests at Tucson, to see if there is similarity or disparity between gaining ability on the range and in the feedlot. The other half of this young bull crop will stay on the San Carlos range.

Heredity and Environment

Through switching of sires and semen between states, where feed conditions and climate have many differences, there will be opportunity to learn if a bull which has a good performance record under one set of conditions can do comparably well under other conditions.

Will the genetic factors which make beef cattle perform well on the cold mountainsides of Wyoming and Montana make these animals — or their progeny — perform equally well in the humid heat of Louisiana, or the bland climate and with the strange livestock diets of Hawaii?

Research is a road without an end, and those directing the San Carlos cattle project are already planning new variations to find new information. Dr. Roubicek foresees more stress on reproductive ability in sires and fertility in dams, because the size

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FILTRATING BLOOD SAMPLES. At San Carlos the air is brisk in the open air makeshift laboratory in March and November, so the flannel shirt and hunter's cap worn by Dr. Roubicek are not an affectation. All research samples are returned to Tucson for further evaluation and recording.

Cultivating Our Garden

By Arthur H. Beattie

EDITOR'S NOTE: This is second portion of the talk given by Dr. Beattie before the members of Gamma Sigma Delta, honorary society for agriculture. Dr. Beattie is professor of Romance Languages and Director of The University of Arizona's Honors Program.

* * * * * *

If cultivating our garden means improving the physical environment in which we live, it also means improving the social and the moral environment. To combat poverty, to fight ignorance and superstition, to work for the creation of a healthier world, are all ways of cultivating our garden.

There are no distant peoples in the world today, and no problems that do not touch us. We must be concerned with our own neighborhood and our own town, and we must do what we can to make them centers of healthy activity. But we must recognize that the racial problems of New York or of Selma, Alabama, vitally affect us and that we cannot hold ourselves aloof from famine in India, disease in Ghana, squalor in the slums of Rio, or tyranny in Budapest.

We Each Can Do Something

It is rare that you and I as private citizens can do very much individually to improve the lot of even our closest neighbors, not to mention those who live in distant lands. Yet here this evening are agriculturists who have contributed to increasing the food supply and improving the economy of peoples of the Near and Middle East, of Mexico, and of Brazil. They have made major contributions to the cultivating of this garden of ours which is the entire world.

But each of us in his own way, in his professional work as teacher or researcher, and in his day by day dealings with others, can practice the cultivating of our garden which consists in making life a little more pleasant, or a little more readily bearable, for those about us. It does not take a Dr. Seagrave or an Albert Schweitzer to achieve this, for quite small gestures of helpfulness or encouragement, simple expressions of fellowship or sympathy, unpremeditated demonstrations of human trust, an attitude of respect toward our fellow men, are significant steps toward the broader goal.

If cultivating our garden involves a concern for protecting and embellishing our physical environment, and an effort to improve the lot of mankind by an understanding attitude and a sympathetic cooperation with others, its major element is, in my opinion, an unceasing devotion to our own intellectual and spiritual growth.

We remain incomplete human beings if we ever allow our thirst for knowledge and understanding to be appeased, and if we permit any of our intellectual and esthetic capacities to be uncultivated. There is a verse from Proverbs which I like to quote in discussing our Honors Program. It is the injunction, "Now wisdom is the principal thing; therefore get wisdom; but with all thy getting, get understanding." This seems to me to suggest what should be the aim of the intellectual life.

As some of you well know from experience, we seek in our Honors Program to broaden the intellectual and artistic capacities of freshmen and sophomore students admitted to it. In the conversations with participants which take place during Honors interviews, and through the Frontiers of Knowledge discussions, we encourage both depth and breadth in their studies and their extracurricular activities. My own field of specialization is in language and literature, but I should feel even more inadequately equipped than I now do for life in the complex world of today if I had not managed to acquire at least a nodding acquaintance with several of the natural, physical, and social sciences.

We cannot be universal scholars like those happy men of the Renaissance (we might choose Leonardo da Vinci, Francis Bacon, and Francois Rabelais as examples) who were experts in virtually every field of knowledge of their day. We must, if we are to be scholars, become specialists in a quite restricted branch of an already narrow discipline. But this narrowness must be counter-balanced, if we are not to lose our humanity, by a great breadth of less profound knowledge.

We do encounter people who lack intellectual curiosity and seek to shut out from their experience everything that does not contribute directly and immediately to their professional objective. We have admitted to the Honors Program an occasional student so narrowly committed to his vocational objective as a mechanical engineer, a veterinary surgeon, or a professional musician that he has resolutely resisted efforts to encourage him to gain a broad view of knowledge in the sciences, the humanities, and the arts in general. The student in the humanities who will not make an effort to acquaint himself with scientific thinking and with new scientific discoveries, or the student in an applied science curriculum who thinks it a total waste of time to enrich his inner life through litera-

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of the calf crop is one index of beef cattle profit.

Supplemental feeding has a useful place in Arizona desert grassland ranges, and such feeding might well be introduced as a new feature in this work. Separate pastures for the yearling heifers, to give them a good nutritional start, may be tried.

Effect of Sparse Vitamin A

The work of semen testing and use of breeding pastures has already shown great improvement in the calving rate. Increased attention will be given to vitamin A deficiencies. San Carlos ranges have had their fourth straight year of drought, and the shortage of green forage and available carotene is beginning to hurt, noticable in poorer calving rates and lack of vigor in the calves.

"We're noticing from our laboratory tests of blood and liver tissue that there is a tremendous 'year effect' which indicates how the animal's general well being is affected by adverse range conditions," says Dr. Roubicek.

An interesting supplement — adverse conditions, whether they are extremes of cold, or heat, poor quality of forage or scarcity of feed — seem to affect the females much less than the males.

BLUE COMB
(Pullet Disease)

By James J. Sheldon

The grooming of healthy replacement pullets for the laying house is the first step in any economically sound commercial laying operation.

With this as a major consideration, every poultryman must exercise all possible control of diseases common to the growing period. Blue comb or pullet disease is just one of the diseases that occur in this period but can be responsible for serious economic loss if not recognized early and treated correctly as soon as possible.

What is Blue Comb?

Blue comb or pullet disease of chickens is most often seen in birds from 15 to 25 weeks of age. A large portion of an apparently healthy flock develops a sudden affliction which is characterized by a lack of appetite, listlessness, sudden deaths, often some diarrhea, a sharp drop in production in laying birds and darkening of the comb (hence the name "blue comb") in a few of the affected birds.

The definite cause of this condition is still not known. Some investigators feel that a virus may be the major factor, while others attribute the condition to various groups of bacteria. The important contributing causes associated with any outbreak of pullet disease are dehydration, recent problems with other diseases, and the stress of initial laying in this age group. These factors are responsible for the severity of the disease as well as the long disease course associated with some outbreaks.

Dr. Sheldon, a doctor of veterinary medicine, is an associate professor in the Department of Animal Pathology.

Clinical Picture Observed

The disease is most common during the hot months of the summer and fall, but can occur at other times of year associated with stress. Any stress condition during hot months increases the chances of an outbreak. Fifteen to 70 percent of previously apparently healthy flock may show listlessness and lack of appetite reflected by lowered total food consumption. A whitish diarrhea in most instances gradually increases in severity. A serious drop in egg production occurs. Water consumption increases as more birds develop symptoms every day.

The birds affected first are often those that appear most thrifty and in good flesh. Some birds develop a distended sour crop and a few show darkening of the comb, shrivelled legs and sunken eyes, indicating increased dehydration. Total flock involvement is rarely over 30 percent, but in some instances 70 to 80 percent of the birds may be affected.

Deaths are sudden, but if correct treatment is instituted, mortality rarely goes over one to two percent. Even with treatment the disease often lasts one to two weeks but with a high percent of apparent recovery. Some flocks that seem to recover early still lag in egg production for several weeks, and in some birds a partial moult may be noted.

Changes in Affected Birds

It is apparent with non-specific symptoms such as these that accurate disease diagnosis is important to prevent confusion with other disease processes. The most characteristic findings are a blue shrunken comb, distended and sour crop, some thickening of the intestinal wall, yolk contents free in the abdominal cavity, and a palè chalky color to the pancreas. These may not be present in all birds, and all of the above may not be observed in the same bird. This emphasizes the need for examination of more than one of the affected birds.

Fowl cholera and coccidiosis are the two conditions most often confused with blue comb. The tissue changes, lowered food consumption, increased water consumption, and sharp, rapid drop in egg production are not typical of fowl cholera, while the characteristics of the type of dropping, and tissue changes help rule out coccidiosis. Laboratory confirmation of the disease is important to exclude these and other possible conditions.

Treat at Early Stages

Favorable response has been observed in the field from a wide variety of therapuetic measures, if applied in the early stages. In most instances the widely used epsom salt flushing procedure is not beneficial and aggravates the dehydration already present in many of the birds. Good results have been obtained by using two percent molasses in the water, or in a mash with rolled oats and bran, given on alternate days for two to three hour periods three times per day. Neomycin sulfate, tetracycline, bacitracin, and streptomycin have all shown to have some benefit. Neomycin and supplemental medication is currently widely accepted for treatment.

The medication chosen can be administered in either the feed or water, but due to the depressed appetite observed in many affected birds, the water route is usually preferred. Vitamin supplementation in an abundance of clean, readily available water, and cool well ventilated quarters will help shorten the course of blue comb disease and speed return to production.

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ture, music, or drama, does not at all measure up to our ideal of the Honors student. Specialization carried too far leads to a warped development of the mind and personality. Honors students, in cultivating their inner garden, should seek to grow there in a harmonious whole both useful and nourishing vegetables, and esthetically satisfying flowers, even though the latter may seem to have no market value. Indeed, the unmarketable products of our study are frequently from any sound human viewpoint, the most rewarding and the most important — and we never know at what unforeseen moment they may suddenly acquire great practicality.

There is among outstanding Honors students one common element which is readily distinguishable — an interest in reading and a considerable breadth of reading already acquired before entering college. Absence of this background can of course be corrected subsequently, but possession of it is a decided asset. Reading is of great importance in the cultivation of the mind.

This is not the time for me to speak at length of the benefits of an intelligently planned program of reading. I wish to mention, however, that reading has three major values. It can acquaint us with distant times and distant lands, and I consider the historical perspective and the knowledge of other peoples it can bring us indispensable in broadening our horizons. It can open our eyes to the world about us, and permit us to understand what we might otherwise have seen with unheeding and uncomprehending eyes. And finally it can give us a look into our own being and let us know ourselves a little better.

(To Be Continued)

COTTON RUST EPIDEMIC OF 1965

By Lester M. Blank, Arlen D. Davison and R. B. Streets

Southwestern cotton rust has been known in Arizona for over 40 years, being relatively mild in most years but occurring in damaging intensity in occasional years. The 1965 season appears to be a record one in both distribution and intensity of damage in certain areas.

The rust fungus has two host plants, cotton and gramagrass. During any given year it is present for 10 to 11 months on grama and returns to cotton for a 4 to 6 week period in July and August.

The movement from grama to cotton is associated with, and dependent upon, showery weather followed by periods of high relative humidity. Under such conditions the over-wintered spores on grama germinate to produce tiny spores which may drift for miles through humid air before coming to rest on moist leaves of cotton.

Infects Upon Contact

Infection occurs immediately and the fungus is safely established within the tissues of the cotton host. Pinpoint-sized lesions are evident on the leaf within 4 to 5 days and these rapidly increase in size and become orange-red in color. There is no spread from cotton to cotton, and the orange spores produced so abundantly on the under side of cotton leaves serve only to return the fungus to grama.

When moist conditions continue into September and October, there is a considerable grass-to-grass spread of the rust before it goes into the overwintering stage. A favorable condition for an outbreak of rust is provided when 1) cotton is grown in the vicinity of infected grama and 2) showery weather occurs in July and August.

To understand the causes of the serious outbreak of 1965 it is necessary to consider the 1964 season, also, for it was one of the prime factors contributing to the 1965 outbreak. Rust was present in 1964 on cotton in Santa Cruz, Pima, Pinal, Graham, Greenlee and Cochise counties in minor to moderate amounts, but there were adequate spores to provide for movement of the rust from cotton to grama.

The 1964 season was one of the most favorable in many years for growth of grama grass in southern Arizona, and the grass-to-grass spread of the rust fungus was extensive. For example, the overwintering stage on grama was found as far as seven miles from the nearest cotton fields in the Continental area, Pima county. Surveys during the winter of 1964-1965 disclosed a heavy buildup of inoculum on grama in certain areas. This information was brought to the attention of cotton growers in Pima, Santa Cruz and Cochise counties by the Agricultural Extension Service,

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BELOW, COTTON LEAVES damaged by rust. Infection of this intensity results in reduced food manufacture and premature shedding of bracts, bolls and leaves.

Dr. Blank is Research Pathologist in the U. S. Department of Agriculture's Agricultural Research Service stationed at The University of Arizona Cotton Research Center, Tempe; Dr. Davison is Extension Plant Pathologist of the Agricultural Extension Service and Dr. R. B. Streets is Professor of Plant Pathology at Tucson.

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and control measures were recommended.

The potential hazard of an outbreak of rust became a reality in July and August, 1965, when summer rains occurred in average or above-average frequency in localized areas. Rainfall was recorded on 14 days in July at the Tumacacori reporting station, on 7 days at Sahuarita, and on 12 days at a location northwest of Elfrida. Usually occurring as late afternoon or evening rains, these provided many nights with high relative humidity, and with temperatures favorable for production and dispersal of the infective spores.

This resulted in frequent and heavy movement of spores from the 1964 grama, and very extensive infection of the cotton tissues. In contrast, at a test-plot location in the Avra Valley rainfall occurred on but three dates in July, and only a trace of rust developed. Showery periods and high humidity are required not only for production and dispersal of infective spores from the grama grass, but also for the production of new grama and for return of the rust from cotton to grama.

10 Years of Research

Research directed toward the control of cotton rust has been under way for the past 10 years in laboratory, greenhouse, and field experiments. In laboratory studies we have learned much concerning the temperature and moisture requirements for germination of the rust spores, and for infection of cotton. In greenhouse screening trials, almost a hundred fungicides have been tested for their effectiveness in controlling the rust fungus. These were applied as sprays either before or after the cotton plants were exposed to the infective spores from overwintered grama.

The better fungicides have been continued into field trials for final evaluation. Many fungicides were completely ineffective, while others gave partial to good control. However, none of the fungicides was effective when applied *after* infection by the rust fungus had occurred.

The most effective fungicide for field control is zineb, zinc ethylenebis (dithiocarbamate), a 75 percent wettable powder. This is used at the rate of two pounds per 40 gallons of water per acre, plus a spreader-sticker additive. Ground-rig application at this gallonage per acre is recommended in order to obtain the necessary coverage of the plants. Plane applications at lower gallonages per acre have been only partially successful, due to the lack of coverage of plants with the protective fungicide, and dust applications by plane or ground-rig are ineffective.

Apply Before Rains Start

The first application of the protectant fungicide is recommended for early July, just ahead of the average date of onset of summer rains. Two additional applications are recommended at 10 to 14 day intervals, thus giving effective protection until near the middle of August. The cost of materials and applications by ground-rig equipment is about $11 to $12 total per acre for the three applications. In a field test in the Continental area in 1964, under conditions of moderately severe rust, the zineb treated plots gave a yield increase of 40 percent over that of the untreated plots. This increase in yield paid the cost of treatment many times over.

The question has been raised as to what we face in regard to a rust outbreak in 1966, and the question cannot be answered at this time. It will depend upon 1) how much rust inoculum is developed on the current crop of grama grass and 2) on the rainfall situation which will prevail next summer. The first condition can and will be determined by surveys of the amount of the overwintering stage on the grama grass, while the second condition will not be known until next summer.

Our Mystery Picture is Seasonal

Where is this highway marker?

Actually, this is an easy one to guess, but we chose it because it seems to have a seasonal ring.

If you turn to Page 18 you'll get the answer — as if you don't already know.

BAD FOR THE BUGS

Agriculture department scientists report they're working on experiments which could lead to commercial use of a new non-chemical tool for controlling insects.

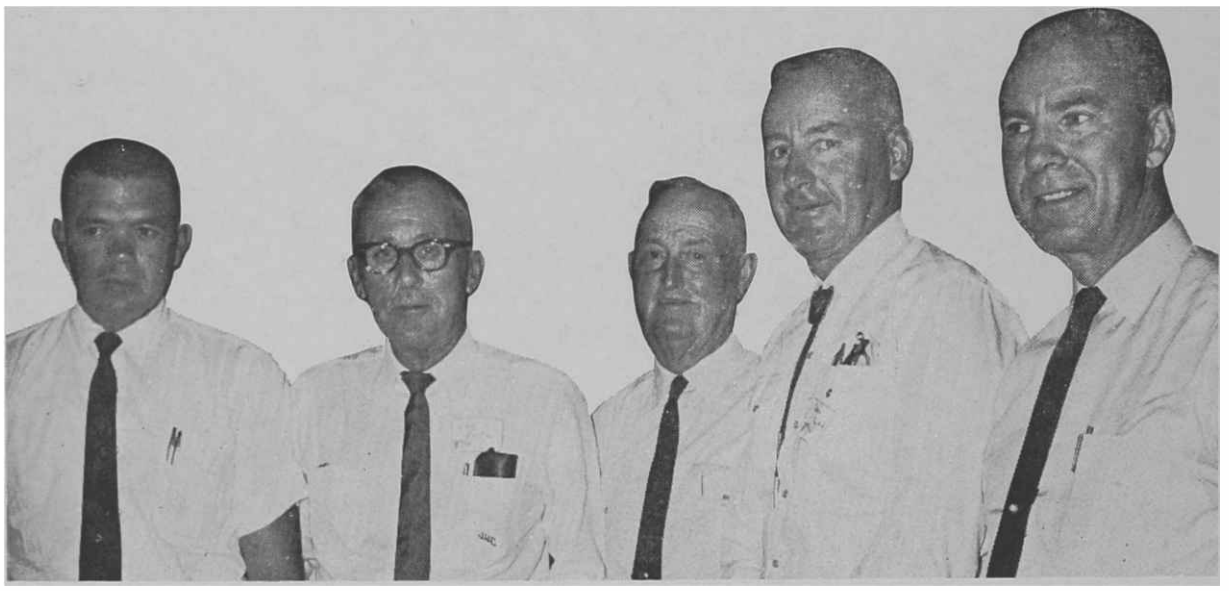
The tool is an insect virus. Research workers have developed practical means of producing a virus which controls the corn earworm; (which also is the cotton bollworm).

Experiments with the virus have indicated it produces effective insect control. The next step will be a series of experiments to make sure the virus is not dangerous to humans.

No danger to humans is expected, because the virus involved occurs naturally on insects in field crops, and no infections have ever been reported among humans or animals, or among any other insects except the one pest which the virus attacks.

The target pest is called both the corn earworm, and the cotton bollworm.

Beef Talk at Springerville



Picking the cool climate of Springerville - Eagar, the Arizona Cattle Growers Association and the Arizona Section of the American Society of Range Management had their summer meetings combined, with a three-day session full of good solid meat for both body and mind.

Dan Clarke of Tucson, head of the research and education committee for the Cattle Growers, was chairman of the panel pictured above, representing all phases of the livestock industry.

Left to right, Joe Blair of Cowden Livestock Co., Phoenix; Joe Entz, chairman of the Arizona Cattle Feeders, from Spur Feedyards, Phoenix; Ernest Browning, Willcox, past president of the Cattle Growers; Dan Clarke, cattleman and agricultural loan officer for a bank we'll not mention because we don't want to give the S. A. B. any free publicity, and at extreme right, Blaine Liljenquist, Washington, D. C., president and general manager of the Western States Meat Packers Assn.

The panel ably handled the assigned subject, Producing Meat for the Market.

The Range Management Society portion of the meetings covered such subjects as noxious plant removal, range reseeding, rotation - deferred grazing, nutritional makeup of Arizona range forage, reseeding experiences with various introduced grasses and seed production of such grasses.

The Cattle Growers listened to discussions of breeding to increase ranch production, estrus synchronization, pregnancy testing, artificial insemination, meeting market demands, and breeding for profit.

New Rootstocks Used In Yuma Citrus Trials

By D. R. Rodney

New rootstocks are being introduced into the Yuma County citrus picture and will be tested at the Yuma Branch of The University of Arizona Agricultural Experiment Station.

For the past 15 years, practically all citrus planted in the county has been on Rough Lemon rootstocks. This was justified on the basis that Rough Lemon, as a rootstock, was well adapted to the sandy soils of the Yuma and Wellton Mesas where the planting was taking place. Previous to this period, a large percentage of the citrus on the Yuma Mesa and elsewhere in Arizona was grown on Sour Orange rootstocks.

The need for new rootstock information is recognized now because citrus is being planted on a considerable acreage in the Yuma Valley where the soil is a sandy loam or heavier. In this case Rough Lemon may not have the advantages that have been observed on the sandy mesa. It has been shown in Arizona and other citrus producing areas that trees on some other rootstocks produce fruit with better quality characteristics than those produced by trees on Rough Lemon. Therefore, if some of these other rootstocks are found to be adapted to the valley soils, fruit of a superior quality may be produced.

Dr. Rodney, a horticulturist, is stationed at the Yuma Mesa (Citrus) Branch Experiment Station at Yuma.

Soil, Too, Has Changed

There are also several hundred acres of old citrus plantings on the Yuma Mesa which have up to six inches of silt accumulated on top of the sand, as a result of irrigating in the early years when the Colorado River carried silt. It is expected that some of this acreage may be replanted in the next few years and here, again, some rootstock other than Rough Lemon may prove to be the better choice.

To obtain the needed information, Marsh Grapefruit, Fairchild Tangerine, and Orlando Tangelo trees are being grown on 14 different rootstocks. The trees will be transplanted to two different locations, one being a sandy loam soil on the Experiment Station farm in the Yuma Valley, and the other being a block of old, silted soil on the Yuma Mesa Citrus Station.

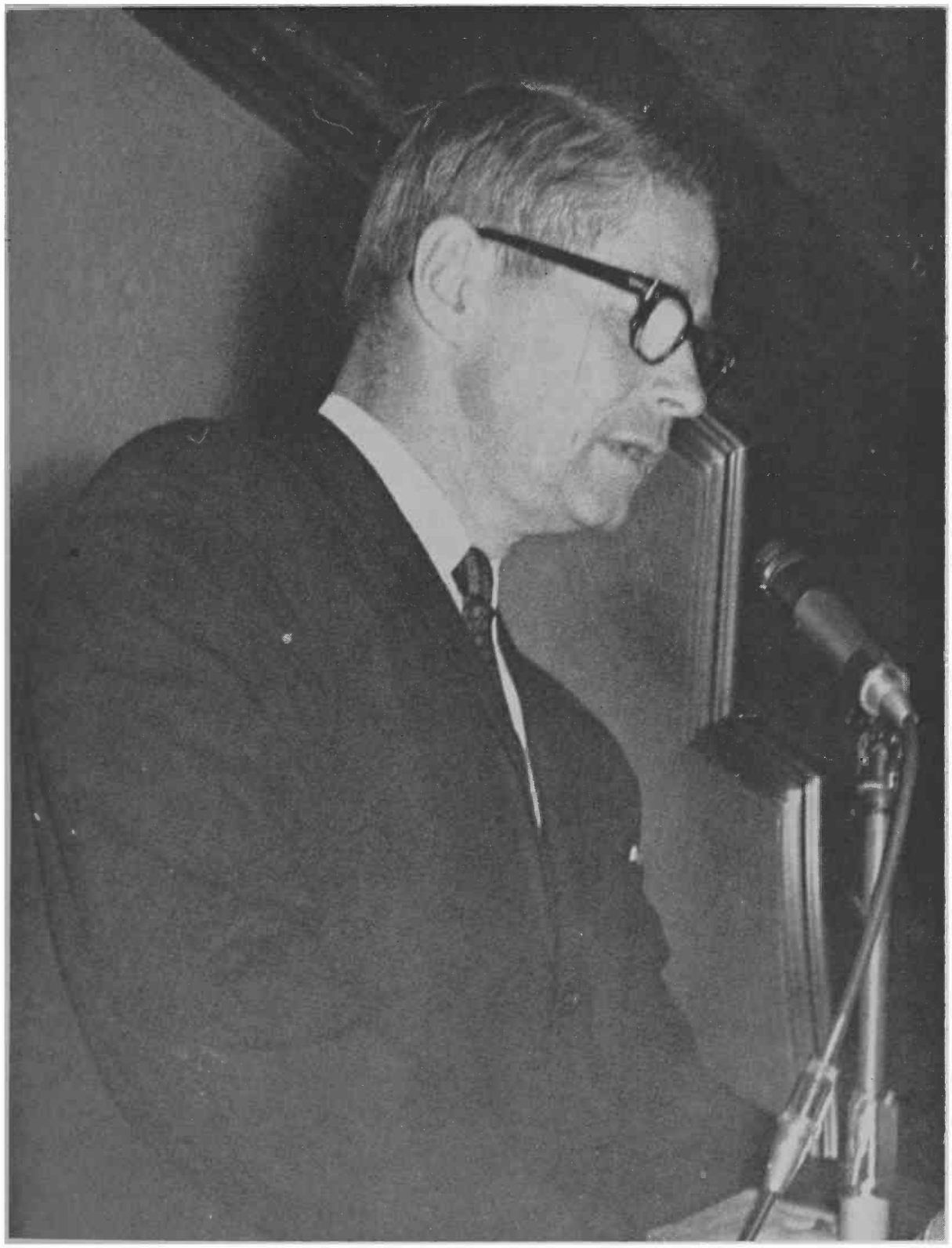
Personnel participating in the project in addition to the author are Dr. R. H. Hilgeman, T. A. Hales, and R. L. Vomocil of the Department of Horticulture; Dr. R. M. Allen and H. H. McDonald of the Plant Pathology Department, and Dr. J. B. Carpenter, Pathologist with the U.S.D.A. Date and Citrus Station, Indio, California.

New Rootstocks on Trial

The rootstocks being tested include some that are used commercially in other citrus producing areas and to some extent in Arizona, such as Troyer Citrange, Cleopatra Mandarin, Citrus Macrophylla, Palestine Lime, and Citrumelo. Others included are less well known, such as Batangas, Carrizo and Savage Citranges, Ichang Pummelo, Taiwanica, Volkameriana, Rangpur Lime, and Citrangor. Also included for comparisons are the old standard rootstocks, Rough Lemon and Sour Orange.

These rootstocks cover a wide range in regard to their vigor, resistance to virus and fungus diseases, and the quality of fruit produced. This increases the chances that some of them will be found to be adapted to the Yuma Valley and silted Mesa soils. It is hoped that some will have good vigor and productivity, with better disease resistance and fruit quality than the rootstocks used in the past.

"Agriculture Important"---Freeman



"Because it involves a comparatively small part of the total population, because its accomplishments have been pretty much taken for granted, there has been a tendency to overlook the contributions of the people of agriculture — in Arizona and the other states — to the nation's spectacular economic growth. Furthermore, there has been — and still is — little appreciation of how important it is, not only to the farmer but to the entire nation, that agriculture should hold full partnership in the benefits of our prosperous economy."

—Secretary of Agriculture Orville L. Freeman, speaking in Tucson June 26, 1965.

Tune In

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.

HOME ECONOMICS- RUSSIAN STYLE

By Ruth C. Hall

A 10-day visit to any country is not sufficient to qualify one as an expert, but only as an observer. My comments, therefore, will not be qualified by deep study or searching analysis. I trust, however, that they will be of interest.

We spent two days, on our trip this past summer, in Leningrad, three in Kiev and five in Moscow. We took a professional interest in the foods, the clothing, the stores and the home furnishings.

At a permanent exhibit of many Soviet-made products in Moscow there was an entire pavilion devoted to consumer products. There were displays of knitted garments, primarily, and also some shoes. The knitted garments were quite attractive in both color and design — at least they appeared to be, from the models we saw.

The Better Shoes Are Expensive

These knitted garments were for both adults and children. No prices were quoted. There were, however, prices quoted on the shoes. At one place we saw quite stylish women's shoes quoted at 35 rubles — twice what the average Russian worker makes per month. Obviously wives of the working people do not buy shoes in that price range.

We also looked at the kinds of fabrics available in Russian stores. We did not know, of course, whether Russian women make many of their own clothes, but fabrics by the yard — rather, by the meter — were available in some of the dollar stores and also in Gum's Department Store, as well as at one of the shopping centers we visited.

This cloth on display was of very poor quality and not the kind that any of us would buy to bring home as indicative of a new design, new texture, or even as an attractive piece of fabric to sew. In fact, the quality was so poor that we had no interest in it whatsoever.

Seek the Yankee Dollar

I should explain what these "dollar stores" are. Apparently this is a new innovation, coming on the Russian scene within the past two years. Because the Russians are eager for American dollar exchange, they have developed this device of special stores catering to the tourists. These stores sell at competitive prices, well below what the Russians themselves must pay in their own stores.

The dollar stores are spotted to catch tourist eyes — small display cases in the intourist hotels, at airports, and at advantageous spots within the city. One dollar store we saw was accessible only to tourists, and was spotted away from the center of the city and near our intourist hotel.

Goods displayed in the dollar stores are quite nice. Displays included the fur hats and caps which one might wear in Siberia but also, I'm told, are worn in the northeastern region of the United States. Phonograph records in these stores are priced reasonably. I bought a stereo record of Cossack dances for $2.22. There are jewelry counters with the amber you see offered for sale throughout Russia, enameled bracelets, lacquered wooden bowls and canisters made in the Ukraine, and some imported goods from Japan.

Costs More in Russian Stores

Interestingly, the same goods sold in the dollar stores also are sold in stores available to the Russians, but in the dollar stores the prices are much lower. A lacquered bowl in the dollar store cost me 38 cents, and I found the identical item in Gum's priced at 60 cents. I did similar "comparison shopping" with other items and always found this same price discrepancy.

Styles of clothing the Russian women wear are just not very attractive. They wear very simply cut garments which hang from the shoulders and really do not fit as we would consider it necessary for a dress to fit. Designs of the fabrics frequently are flowers of different sizes, and there is very little detail in the cut of the garments or in their construction. By our standards they simply are not stylish.

Shoes and purses are equally undistinguished. Sweaters are worn by most of the Russian women in the summer. It rained a lot when we were there and, interestingly, Russian raincoats are very much like our own — probably the most attractive item of clothing we saw in Russia. They do not wear rubbers or overshoes during rainstorms — just slosh around in their shoes, which take a considerable beating from the weather.

Dairy Display Not Immaculate

Food products are distributed from stands along the streets, although there are some food stores, as we understand them, in the center of Moscow. For example, we saw one dairy store where cheeses and milk and butter or margarine were sold to the public. It did not observe our standards of cleanliness.

Russian women carry net bags for shopping, and one can observe the day's purchases protruding through the netting — potatoes, bread, cabbages, onions and cucumbers. Shopping once or twice a week, as we understand it, would be impossible in Russia, for the Soviet kitchen has little storage space and usually no refrigerator. However, it is necessary to shop daily to get to stores when items are available, so lack of kitchen storage space is probably no handicap.

Food offered to us in restaurants varied greatly from place to place. The best food we found was in Kiev, while the poorest was in Leningrad, and Moscow restaurant fare was somewhere between.

Permeated With Sunflower Oil

Russians use a sunflower seed oil which has a very unpleasant odor, but they seem to fry nearly everything in this oil — meats, potatoes, vegetables and sauces. As a result, everything seems to smell like the sunflower seed oil, which is not conducive to enjoyment of restaurant meals.

One dish we did especially enjoy was called "chicken Kiev," served to us only in Kiev. It looks like a veal

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Dr. Hall, director of the School of Home Economics, is president of the American Home Economics Assn., and made this European tour under sponsorship of that organization.

NOVEMBER

5-14—Arizona State Fair, Phoenix

16-18—Agricultural Plastics Conference, Phoenix

DECEMBER

4—Angus Field Day, UA Farms, Tucson

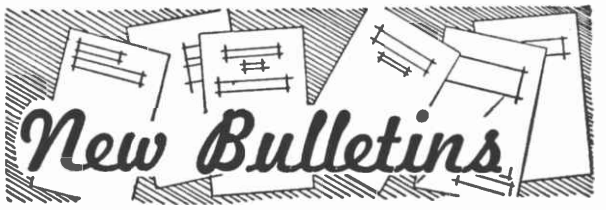
1966

JANUARY

4-8—Arizona National Livestock Show, Phoenix

FEBRUARY

9-10—Soil Fertility, Fertilizer and Insect Control Conference, U of A Campus, Tucson



Cir. 288 Horse Feeding

A-41 How to Make a Plastered Water Storage Tank

A-42 Basic Concepts of Nitrogen, Phosphorus,and Potassium in Calcareous Soils

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bird and has a great deal of butter on the inside, which tends to spew out when you cut into the meat. However, the flavor is delicious. Also, in Kiev, we encountered a kind of Russian cottage cheese pancake which was served with sour cream and a little sugar. This was delicious.

The other foods served to us along the way consisted always of, for lunch, an appetizer — generally raw fish — then a soup which frequently was made of cabbage. The main course was usually some meat and two vegetables, often cabbage or cucumbers, potatoes or canned peas. Then came the dessert, which frequently included chocolate. This chocolate, though, is not smooth like that we enjoyed in the Scandinavian countries, but is granular and very sweet. Russian food we ate in restaurants was, generally speaking, very poor in flavor and preparation.

Fish is Served Frequently

Much raw fish was served to us at all our stops in Russia. This frequently was salmon or a white fish which I didn't recognize. Of course, there always was caviar, sometimes good and sometimes not so good. There always was an abundance of dark sourdough bread which I liked very much. They stacked plates with this sourdough bread on one side and on the other side placed a relatively light rye bread which, I suppose, they consider to be white bread. Toast was made by drying the bread completely in an oven without really making it look toasted when it was served.

When we visited the Soviet Women's Committee we tried to explain about the profession of home economics. This they simply did not understand because, I believe, they have no background in which to fit such a profession. After we had explained the kinds of jobs which home economists in this country are engaged in — dietetics, secondary education, county home agents, nutritionists, fashion consultants, college teaching, child guidance and counselling, etc — one Russian woman arose and said that whenever they wanted to explain to people in general about food, they simply called in a cook and had him tell the women in a given housing development how to prepare food.

As one of our U. S. group inquired about nutrition, the speaker commented that everything was very nutritious because, after all, it was in Russia. From this we gathered that they knew very little about home economics and perhaps even less about nutrition. As far as home management and child development and similar areas of study are concerned, they really had no background from which to even discuss such activities academically.

Apartment is Spartan and Sparse

We visited one Russian home, the tenth floor apartment of a widowed member of the Soviet Women's Committee. The woman who lived there was the widow of a famous Russian geochemist who at one time had been decorated by the British government. The apartment consisted of one room used as living-dining room and two bedrooms, one for the woman and the other for her son. There was also a small kitchen, its only "table" a wooden leaf which raised up from the cabinet. There was a small refrigerator, although in the "model" apartment we saw in the permanent exhibit in Kiev there was no refrigerator.

I believe the most difficult problem of the Russian people is distribution. For example, there were many fruits and vegetables available in Kiev, but one doesn't see many of them in Moscow or Leningrad.

There are no paved wide highways, such as our own, in the Soviet Union. The roads we traveled were very narrow cobblestone highways which work havoc on vehicles. While in the U.S. we can send refrigerated truckloads of fresh vegetables, fruits and meat all over our country and throughout the year, that simply is not possible in Russia because of the inadequate highway system. Besides, I doubt if they have refrigerated trucks, either.

Trying to Overcome Housing Shortage

The large amount of building going on in Russia today shows how the country is trying to provide the people with the housing and goods which they need and demand. But they still have far to go before coming even close to our own free market economy. The housing shortage is still acute. Even our intourist guide, indoctrinated to tell us only the best about her country, said that she and her husband share an apartment with his parents, while also sharing a kitchen with six other families and the bath with eight others. Our questions about when the housing spurt would catch up with demand never received satisfactory answers.

In Kiev we saw a Russian wedding in a wedding palace which pushes couples into the bonds of matrimony on an assembly line basis. The day we visited there, some 41 weddings were performed. It costs three rubles (a ruble is $1.11 our money) for the ceremony and license. The rings are of two designs and the couple chooses the design it prefers. After the ceremony which we attended we were invited to the room where a reception took place, and where we joined the Soviet guests in toasting the young couple in pink champagne.

The Russian ballet is as exquisite as any we had seen. We saw two ballets, Swan Lake and Cinderella, and in both of them the staging, costumes and dancing were exceptional. Next, in gay Stockholm and the Scandinavian countryside, we saw dramatic proof, by comparison, of the tremendous influence which a political system has on the way people live.

There Has Been So Much Emphasis in Recent Years on Science and Research, That It is Well to Remember That One Major Area of College Activity Has Not Been Neglected — In Fact It Has Been Strengthened — and That is . . . .

TEACHING AND COUNSELING THE COLLEGE STUDENT

By Darrel S. Metcalfe

Our big universities are doing such exciting wonders in research that some people may wonder whether the student is getting the attention he needs.
I assure you, he is.

COUNSELING STUDENTS in our College of Agriculture is a person-to-person activity. Each student is treated as an individual, and his course work is selected just for him, to fit his background, needs, ambitions and capabilities. Here Terence Taylor of Yuma (center) has encouragement from Director Metcalfe (left) and Dr. Donald E. Ray, as Taylor studies a University of Arizona catalog.

At The University of Arizona, College of Agriculture, we try never to lose sight of the fact that teaching and counseling of students still constitutes the heart of any great university. Though far less heralded, this basic work is getting more and more attention from the faculty.

Our Finest Product

I believe I can speak for the entire faculty in saying that the product of which our institution is most proud is the graduating student who is well trained and spiritually, culturally and socially prepared to cope with the complex problems of our civilization.

We are fully aware of the responsibility of helping direct the lives of America's leaders of tomorrow, and we strive to do the very best job that we can possibly do.

Still, we are never really satisfied with the job which we are doing.

Each year a committee in our College of Agriculture studies our curriculum. Should new courses be added? Old ones dropped? Do some courses need revisions? Have we left a single stone unturned in our search for new ways of turning out a better agricultural graduate?

Last July a special committee was appointed to make a two year study in depth of our curriculum. All avenues of possible improvement will be pursued.

Dr. Metcalfe is Director of Resident Instruction and Assistant Director of the Agricultural Experiment Station, both in the College of Agriculture.

It's a World of Change

We constantly remind ourselves that today's world changes rapidly. Just as new knowledge out-dates old knowledge, new teaching and counseling techniques may out-date old ones. Today's sleek, new model is destined for tomorrow's junk heap. A professional man can get behind the times so fast these days that he can never rest easy. He must never stop studying and learning. His mind must continue to grow. With these circumstances we are fortunate, indeed, that the human mind is the only known container which increases in capacity as you put more and more into it.

What often is overlooked is that teaching and research are not opponents. True, they compete for the professor's time, but a good faculty member does both and finds that each complements the other. New knowledge gleaned from research by the Agricultural Experiment Station is quickly transferred to the classroom, better preparing students for the stiff competition of jet-age agriculture and agribusiness.

Conversely, the research professor solidifies his knowledge and gains inspiration from classroom teaching. Furthermore, students take part in research, gaining knowledge that often goes far beyond the textbooks.

Extending New Knowledge

Also, through the Agricultural Extension Service there is a two-way flow of information between the College of Agriculture and Arizona's farmers and ranchers. New knowledge is quickly applied on the farm and ranch, and the problems of the farmers and ranchers are quickly taken to the laboratory and university farms for research. Information from this arrangement also is taken to the classroom, giving agricultural students practical knowledge of actual farm and ranch operations.

Teaching benefits as a result of the college's research and extension activities.

Aiding the Bewildered

Realistic counseling sometimes saves students who may become confused in the complexities of modern career requirements. The college can

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point to many cases where this has happened.

Actually, counseling is the responsibility of every staff member, either formal or informal. It is our hope that no student fails because of lack of good counseling, and that counseling gives students an opportunity to obtain a college education, grow spiritually, culturally and socially, and to assume leadership and accept responsibility.

It is the counselor's duty to encourage students to become well adjusted human beings as well as good students. Through the system of having advisers assigned to students, staff members can give students the individual counseling they need.

Counseling Begins Early

Every student who enters the College receives a personal letter from the Director of Resident Instruction as soon as he is admitted to the College. He receives another letter in August.

Advising begins before registration in the fall. All new students meet the staff and other new students in a meeting during Orientation Week.

Although each student is assigned an adviser when he enters the college, the student need not declare his major until the end of his sophomore year. When this happens, the student is assigned an adviser in the department he has chosen, and that adviser usually continues in that capacity during the remainder of the student's college career. This gives the student the advantage of having an adviser with special knowledge of his chosen field.

Student advisers may or may not have scheduled hours, but they are always available to students who wish either to walk into the office or to make an appointment.

In addition to academic counseling, advisers do personal counseling. But when matters come up for which the regular advisers are not trained, the student is referred to specialists in the University Counseling Bureau.

Friendships Which Last

Warm friendships which continue long after graduation often develop between students and advisers. It is not unusual to see advisers near the head of the list when students send out wedding invitations.

Sometimes the counselor solves a student's problem simply by referring to the University catalogue to see what courses he needs for the career he wishes to pursue. At other times, the counselor's most effective tool is simply to be a good listener.

All of the latest techniques, including visual aids and demonstration materials, are made available to make teaching as efficient as possible.

Classes quite often make trips on campus, in the community, and in the state while studying certain courses.

Faculty members who excel in teaching receive recognition and salary increases just as those do who do outstanding work in research and Extension.

Helping Find the Way

To make sure that students understand our college, all freshmen are required to take a special course called "Introduction to Agriculture." This is a one-unit course in which university and college regulations are discussed, along with career opportunities available in agriculture.

High scholastic standards are promoted by encouraging superior students to take part in the Honors Program and the Honorary Agricultural Fraternities. Alpha Zeta and Gamma Sigma Delta, encourage good scholarship and so recognize it.

To develop leadership, the students have an Agricultural Council composed of junior and senior representatives from the various agricultural clubs in the college.

Within the college there is the Student-Faculty Relations Committee, composed of 10 undergraduate students, one graduate student, and three staff members representing the various disciplines. This enables the students and staff to discuss mutual problems for the benefit of all.

Advisers often counsel with parents who come to the campus or who write or call concerning their children. On "Parents' Day," many parents come to the campus and visit with the departments and administration.

Even after the students leave the college and go their separate ways, our interest continues. An Agriculture Newsletter is published twice a year. And the student-professor, advisee-adviser relationship continues as the new graduate goes out into the world.

For the older man, back in classroom and laboratory, is still the counselor, writing letters of reference and recommendation, advising the graduate which of several job offers has greatest promise for sturdy professional growth. And when later on the graduate changes employment, buys or manages another ranch, makes any professional decision of major importance, he is apt first to sit down and pen a letter: "Dear Professor . . . I'd like to ask your advice about . . ."

Frank Todd, Bee Man With USDA 34 Years, Retiring

The many friends of Frank E. Todd will be interested to learn that he retired from government service last Oct. 1, after more than 34 years with the U.S. Department of Agriculture. His entire career with USDA has been devoted to research on honey bees.

During and previous to this time, Mr. Todd has traveled extensively all over the world. He has made many valuable contributions in the fields of pollination, bee nutrition, bee diseases and other studies, so that today he is a recognized national and international authority on honey bees.

From 1949 to 1961 Mr. Todd was stationed on the campus of The University of Arizona, where he was in charge of the Southwestern Bee Culture Laboratory of the U. S. Department of Agriculture.

During his residence in Arizona Mr. Todd frequently cooperated with the research staff of The University of Arizona Agricultural Experiment Station in various investigations involving the use of honey bees for pollination of important agricultural crops. Between 1951 and 1961 he also taught Entomology course 114, "The Honey Bee," to large classes of interested students from the College of Agriculture and other colleges within The University of Arizona.

Mr. Todd left Arizona in 1961 to become Chief of the Apiculture Research Branch, Entomology Research Division, Agricultural Research Service, USDA, Beltsville, Md. In this capacity he has contributed materially to the improvement of Apicultural Science on a national level. In Arizona, he will be remembered for his efforts in behalf of the new USDA research laboratory at Tucson for work in apiculture and other agricultural sciences, for which ground was broken last August.

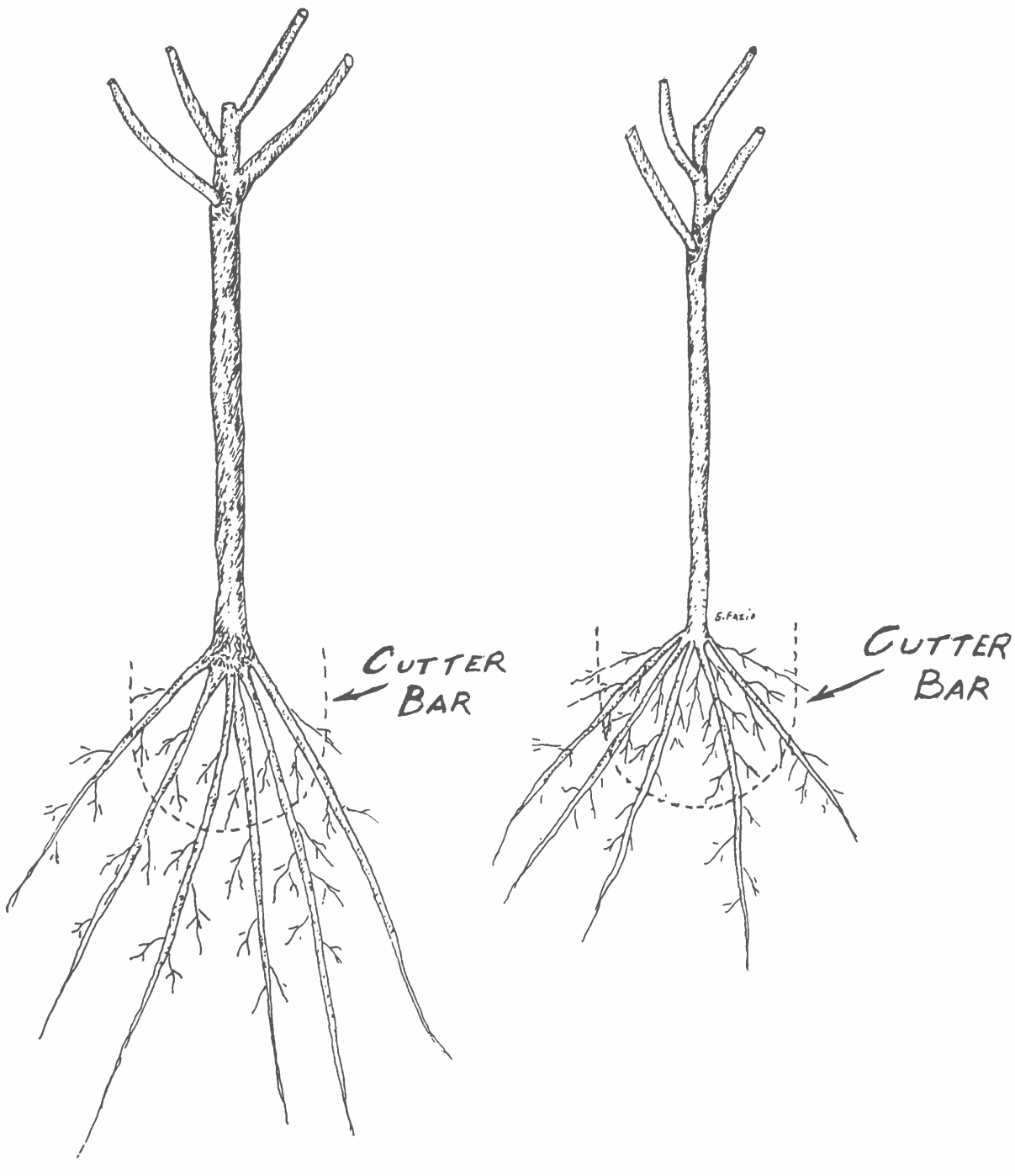
With Barerooted Plants Success or Failure Depends Upon You

By Steve Fazio

Deciduous plants (those which shed their leaves during winter) such as fruit trees, roses and shade trees, are available at nurseries during the winter months as "barerooted plants."

Nursery stock sold under this classification indicates a method used in digging and selling plants to the consumer. Barerooted simply means that plants are dug from the growing grounds without soil around the roots. Not all plants can be handled by this method. It is limited to those which are capable of producing new root hairs (Feeder Roots) in a very short period of time and also those which shed their leaves during the winter months.

Chosen by students "Professor of the Year" because of his great ability to make subject matter both understandable and interesting, Mr. Fazio is acting head of the Department of Horticulture.



SMALLER BAREROOTED shade trees often have a proportionately larger volume of roots if the same size cutter bar was ← used as on the larger tree. Having more roots in proportion to its size, the smaller tree will recover more rapidly than will the larger tree.

Evergreens Must Be Balled

Evergreen plants (green leaves on the plant all year) are generally sold with a ball of soil which encompasses a large portion of the root system. (Balled and Burlapped) This treatment is used for several reasons — many evergreens do not regenerate new root hairs if they are dug barerooted, and as a result they will make slow recovery or eventually will die. Many of our coniferous evergreens are not pruned after they are dug from the growing grounds in order to preserve their interesting forms. The use of the balled and burlapped method permits moving these plants without pruning, since most of the root system is encased in the ball of soil.

Poor recovery of deciduous shrubs and trees is attributed to many factors and most of these can be eliminated by observing a few precautions.

Some deciduous plants are sold to customers with the entire top portion remaining intact; not pruned. Approximately 50 percent of this growth should be pruned off to compensate for approximately the same amount of root pruning which occurred during the digging process. Most nurserymen will perform this task for the customer if he requests this service.

Extremely large deciduous fruit and shade trees may be dug with an implement of a given size. If this instrument is used for large as well as for small trees, it means that the smaller trees will have a large volume of roots in comparison to the larger tree, and recovery will be more rapid.

Transplant When Dormant

Deciduous plants are dug from the growing grounds shortly after they shed their leaves and are in a dormant condition. They are shipped to local nurseries where they are placed in a "healing-in pit." This pit contains sand, sawdust or peat moss and it serves as a temporary storage area until the plants are sold. Late in the season, when the buds of these plants begin to swell, the nurseryman will plant them in metal containers with soil.

The gardener should purchase

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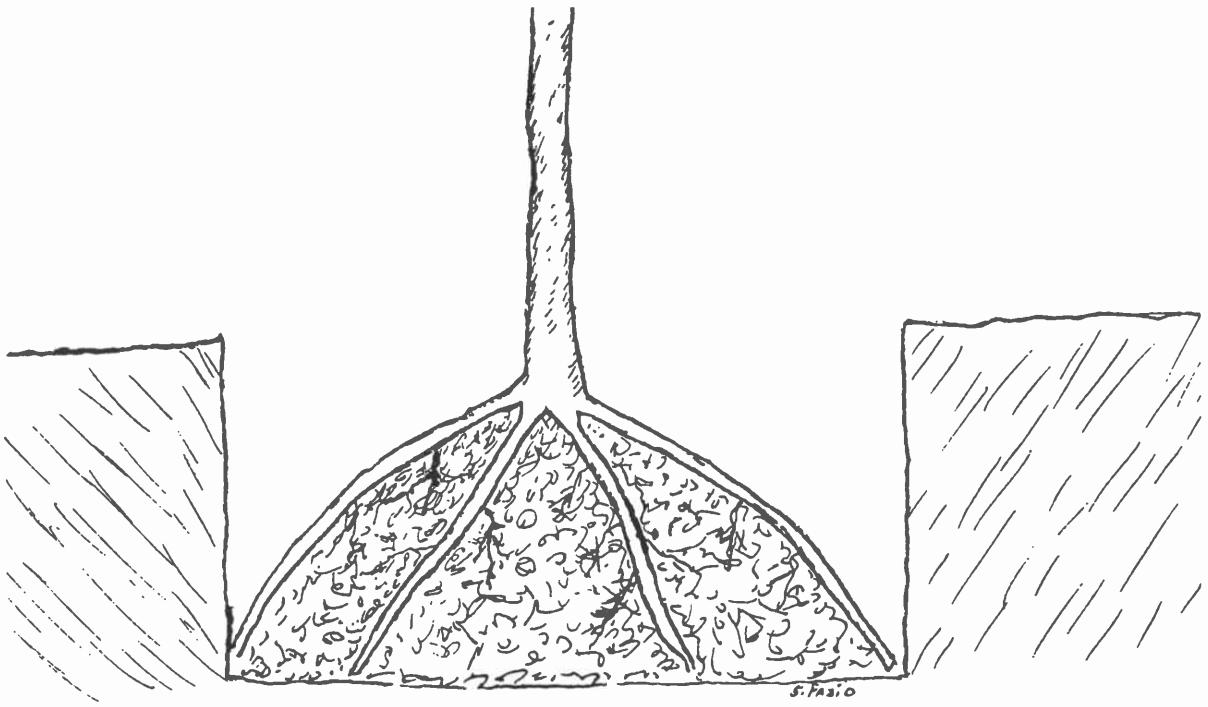

MOUNDING THE SOIL in the center of the tree hole permits even distribution of roots and eliminates the air holes which could permit the roots to dry out.

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barerooted plants immediately after they are received by the nurseryman. Root hairs will develop on these dormant plants in late spring and these will be stripped when they are removed from the "healing-in pit." The loss of these root hairs will result in slower recovery of the plants after they are planted. If these root hairs are permitted to develop after the trees or shrubs have been planted in their permanent sites, recovery will be rapid.

Transporting barerooted stock from the nursery to the permanent planting site requires care. The roots of the plants should be wrapped in damp straw, wood shaving or similar material to prevent drying of the roots. Never allow the roots of the plants to be exposed to wind and sun when transporting them home.

Dig Tree Hole FIRST!

Always have the tree hole prepared before purchasing barerooted plants. If this is not always possible, then place the root system in a tub of water or wrap the roots in several layers of burlap sacks, moistened at frequent intervals.

Manure mixed with soil at the time of planting and placed around the root system may result in burning if the manure is not thoroughly decomposed. If organic matter is needed just prior to planting, peat moss should be used as a substitute.

Use of mineral fertilizers immediately after planting can cause injury. It is best to delay application until after the plants leaf out, and then use small quantities at first.

When setting plants in the hole, always mound the soil into a pyramid shape and spread the roots out evenly. This mound of soil will prevent cramping of the roots when the soil is shoveled back into the hole.

In Case of Frost . . .

Unusually late spring frosts will injure the buds of trees and shrubs causing a delay in the emergence of new leaves. If this should result and the delay extends into warm weather, whitewash should be applied to the trunk and scaffold branch area to prevent sunburning.

Deciduous plants recover rapidly if they are handled properly!

Needed--One Bee Per 100 Flowers

Cantaloup growers have long associated frequent bee pollinations of individual flowers with high fruit yield, but they didn't know — until now — how many bee visits per flower were necessary for greatest melon production.

ARS entomologists S. E. McGregor and M. D. Levin, working at the Federal Honey Bee Laboratory in Tucson, and University of Arizona horticulturist R. E. Foster at the U of A Branch Experiment Station, Mesa, kept careful track of visits paid by bees to perfect flowers (those with both male and female parts, capable of developing fruit).

They correlated the number of visits with the percentages of fruit set and marketability of the melons produced. They then determined the ratio of bees to flowers needed to insure maximum yield of high grade fruit: at least one bee for every 100 flowers.

The researchers bagged some flowers to exclude bees, exposed others to specific number of bee visits, and allowed still others to remain exposed throughout the day. Then after 15 days they inspected 618 perfect flowers. Of 73 bagged flowers, only one developed into a marketable melon; of 107 left exposed all day, 24 saleable fruits were produced.

The scientists controlled bee visits — from 1 to 18 — to 438 flowers. Of 325 flowers that were shed without setting fruit, bee visits averaged 6.3 times. Flowers that set fruit, but developed into culls later, had been visited 8.2 times, and flowers that produced high-grade melons, 9.1 times.

Ideally, each perfect flower should receive at least 12 visits, the scientists say. Not only is there then greater likelihood of fruit production, the fruit will also weigh more.

In hotter, drier areas like Yuma, the researchers observed that cantaloup flowers may be receptive to pollination only for very brief periods of time — in some cases perhaps only minutes. Thus a high bee population will help to insure sufficient visits during receptive periods.

The investigators recommend that bee colonies be placed in the cantaloup fields in places where the ratio of bees to flowers is less than 1 to 100, so that each perfect flower (1 in 10) may receive the 12 visits needed for maximum production.

ARF AND MEOW

Fido and his feline friends have become an important part of the nation's economy, official records disclose. Pet owners in the United States bought something like 3.3 billion pounds of commercial dog and cat food through the nation's grocery stores in 1964. This gave the pet food industry a sales volume of about $500 million.

It's Called SONORA

At Last, a Commercial Release Of an Improved Black Gramagrass

By L. Neal Wright

Naming and release of a variety of black gramagrass, *Bouteloua eriopoda,* is jointly announced by the Department of Agronomy of The University of Arizona, and the Crops Research Division, U. S. Department of Agriculture. This is the first improved black gramagrass variety to be released for commercial seed production and use.

Black gramagrass is a major range grass species in Arizona, New Mexico, southwestern Texas, and the northern states of Mexico. Additionally, black gramagrass is an important forage grass in parts of Oklahoma, Colorado, Utah, Nevada, and California. Much of the area of major importance has been designated the Sonoran desert. Because black gramagrass is native, and occurs abundantly, over a wide altitudinal range of this semiarid to arid grassland area, the new variety is named Sonora.

An Excellent Range Grass

Black gramagrass possesses many desirable characteristics, making it an outstanding range grass. Black gramagrass is a long-lived perennial that can be maintained on the range. Its drouth tolerance is exceptional, this characteristic effectively demonstrated through all growth stages. It is a dependable forage plant, with ability to perform well under grazing.

The grass is characteristically nutritious at all times of the year. In comparison with other range species, the winter and spring nutritional values make black gramagrass outstanding. It is a palatable forage and highly relished throughout the year. The grass is a natural source of reserve feed, since ungrazed stems remain green and nutritious for two or more seasons.

Black gramagrass also has soil protection qualities which are most desirable, since the stem joints take root and provide soil protection as well as a means for spreading and revegetation.

One characteristic limiting the widespread use of black gramagrass for range seeding has been its extremely poor and unreliable seed-setting capabilities. Thus, a major objective of the research leading to release of Sonora black gramagrass was to maintain the many desirable characteristics while also improving seed production and forage characteristics.

Based on progeny performance, 12 selected clones constitute the synthetic variety, Sonora. All clonal entries are diploid (2n = 20) and reproduce sexually. Performance data of Sonora black gramagrass compared to the Flagstaff collection are presented in the adjoining table. Sonora is outstanding for leafiness, vigor, forage production, vegetative spread, components of seed-set, and seed production when compared with the Flagstaff collection.

The variety has been released on the basis of the following classes of seed: breeder, foundation, and certified. The registered class will not be used. Breeder seed will be maintained by Crops Research Division of ARS at Tucson. Foundation seed production and distribution for commercial production will be handled through the Arizona Crop Improvement Assn., which has offices in this College of Agriculture. Limited supplies of commercially produced seed should be available in 1966.

This is a contribution from the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, and of the Department of Agronomy, University of Arizona. The author is a Research Agronomist with USDA — ARS, and Professor of Agronomy in this university.

Sonora Black Gramagrass Progeny Evaluation for Seed and Forage Yield, and Components of Seed Yield.

Entry	*Seed yield (gms.)*	*Forage Yield*		*Spikes per inflor. (no.)*	*Florets per spike (no.)*	*Seed per spike (no.)*	*Seed-set (%)*
		green (lbs.)	*air-dry (lbs.)*				
34	19.2	2.1	1.7	4.1	12.6	9.5	75.3
71	18.3	2.1	1.5	3.4	11.5	8.7	75.9
69	18.2	1.9	1.4	3.9	13.2	10.3	78.4
56	15.4	1.8	1.4	4.1	13.4	10.9	81.6
33	15.2	1.9	1.5	4.0	10.9	8.5	77.9
43	12.7	1.8	1.3	4.2	13.3	10.5	79.3
40	12.5	1.4	1.0	4.4	14.2	11.3	79.4
15	12.2	1.2	0.6	4.8	14.3	11.0	77.5
54	11.8	1.4	1.1	3.7	12.4	10.1	80.9
63	11.8	1.4	1.1	4.0	11.5	9.2	79.6
51	11.5	1.6	1.3	3.8	13.2	10.6	80.6
76	11.4	1.1	0.9	4.6	12.1	9.4	77.6
Syn.	15.6	1.8	1.4	4.1	12.7	10.0	78.7
Flagstaff	2.9	0.37	0.23	3.9	12.5	10.8	80.1

In Arizona "Christmas" Is Here All Year Long

This is the time when we all look forward to Christmas, but the highway marker pictured on Page 9 looks toward Christmas all year long — meaning the tiny mining town of Christmas, Arizona.

The sign is on Highway 77, between Winkelman and Globe, as you "take the high road" in driving from Tucson to that Gila County seat.

Like most of Arizona, it is a setting of nature's grandeur — deep canyons, swift-flowing rivers (in season) and rugged mountains serrated against the deep blue of the desert sky. We suggest that road for a Sunday drive.

BETTER COMMUNICATION

It's the Lubricant We Need To Ease Our Living Together

By Carol Doty

Bridging the communication gap between generations is being recognized by American families as a significant challenge. For wholesome, practical, affectionate or secure relationships to exist there must be communication.

In the first century and a half of our nation's history, families were too occupied with the business of providing food, clothing and shelter, and preserving their available tangible resources for difficult days, to concern themselves with psychological and emotional needs.

There Were Chores to Do

Children of the family were useful and essential parts of the effort to provide the daily needs. They were forever busy and aware of their importance as part of the family work force. There was little need to worry about asking Dad for the family car, or discussing the extension of the curfew hour.

When working near or with a parent, in the house or in the field, there was ample time to discuss things of importance, such as how to carry out the duties of the day. A hard day's labor consumed the energy and the time needed to discuss personal and emotional problems.

That era is past. Urban living separates the adults of the family for most of the day. Husband and wife live their days in entirely different environments. Children are not needed to do household or farming tasks. Often the children themselves are the first to recognize, and be uncomfortable about, the fact that they are members of the family but not working partners, as was true of an earlier age. (One has only to watch youngsters, in their clumsy and inept efforts to help daddy wash the car or clean the swimming pool, to note this youthful urge to be helpful and needed).

Today's American family has more leisure, and with leisure comes time and opportunity to think of the pleasant and unpleasant aspects of family life. The middle class family of today — that is, most of us — has moved beyond the point where meeting the day's bare physical necessities took every moment of physical and mental ability. With leisure comes time to explore psychological and emotional needs.

Groups — Not Families

Urban — and even rural — living today emphasizes group activities rather than family activities. Today each member of the family has his own interest group — swimming, youth club, tap dancing, Spanish lessons, hobbies class, baton twirling, music lessons, riding lessons, PTA, bridge and canasta clubs, and social dancing. This segmenting of families has, of itself, helped break down the communication within the family.

This breakdown was pointed up by Arizona homemakers, planning their "family living" program, as they expressed their own concerns: "We cannot get our children to talk with and confide in us." "Why does mother always have to be the go-between for fathers and children?" "It is difficult to have time and privacy for close relationships when we have a husband and several children all demanding our attention at once." "Perhaps we are afraid to talk truthfully, yet easily, with our children." "Parents

(Continued on Next Page)

The author is Home Economics Specialist in human development and human relations.

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and children really need to know each other better, to study the needs and attitudes of each other."

It was amazing to us, last summer when 4-H members met at The University of Arizona, to learn that the chief concern of these young people was not boy-girl relationships, but parent-child relationships. In fact, one could venture that the parental relationships actually cause young people more concern and grief than do their social relationships within their own age group.

Parents, too, may be in for a surprise. It is easy and natural for parents, in this world, where public and private schools take on much of the role of counseling, to believe that the teenager does not depend on his parent as he should, or did in generations past. The falsity of this view is proven by the young people themselves, in their wistful concerns expressed in counseling and discussion sessions.

Need Parental Backing

During such discussions, teenagers express their desire to please their parents in all areas of their behavior. They are greatly concerned when their parents do not praise their successes, and fail to trust them in social predicaments. They are concerned because the values which they are developing are sometimes in conflict with parental values. Value conflicts create guilt in many teenagers, even as parents feel the young people are willfully challenging their values. In truth, young people must challenge the values of their parents in order to develop values of their own.

Back of many parent-child maladjustments rests the old problem of lack of communication. The lines of communication between parent and child break down. Children, feeling they must strike out toward their own code of values, avoid the hazard of rebuke by not talking to parents. Parents, frustrated by that age old problem of "what the younger generation is coming to," often feel inadequate to talk with their children. Thus, the line of communication is broken.

After awhile the fairly easy frustration of silence seems preferable to the challenge of discussion. Between child and parent, between husband and wife, it just seems easier to go along from day to day, not seeking to resolve unmentioned conflicts by conversation. Each member of the family becomes conditioned to the easy escape of avoiding challenging communication, or candid discussion of problems and conduct.

Another error is the attitude of the tyrant-parent, the "I've delivered my opinion and the issue is closed" sort of dogmatic assertion which leaves no room for reasonable discussion. The parent puts up the barrier and Junior cannot breach it.

Some Conflict is Helpful

Of course, no family has good communication all the time. None of us has angelic moods 24 hours a day, day after day. Actually, a sharp, emotional argument ofttimes is needed, like a summer storm, to clear the air. Such conflicts actually may be constructive. Things which have needed saying have finally been put into words. Finally there is meaning found in the quotation, "Peace is not the absence of conflict, but the successful resolving of conflict."

Perhaps a few guidelines for family communication are in order:

1. Show understanding. Understanding does not mean over-indulgence. The over-indulgent parent actually may not care intensely for his child. Indulgence beyond reason may indicate the guilty conscience of a parent who is aware of his own failing. (No children are so showered with gifts as those rich little waifs left with a housekeeper while the parents vacation or wind the questing road from one divorce to another). Understanding means firm, thoughtful limits which are understood by other members of the family. They may reflect a family compromise, but they seem fair to the family members.

2. Feel confident about yourself. A parent who likes and feels sure of himself is equipped to accept conflicts in values, and still is able to stick by a comfortable but firm "no" if he believes it necessary. This parent will also have a better relationship with his marriage partner if he possesses self-understanding and confidence.

3. Have an open mind. A parent who is comfortable with himself is not disturbed greatly if his child tells him something that he would rather not hear. The parent can avoid shaming the child, and at the same time, guide him toward a sense of social responsibility.

Get Off That Pedestal

4. Allow a child to experience some of the limitations of his parent. A child expects his parents never to err, and the parent responds by trying to seem perfect in the child's eyes. For communication and respect to exist, to avoid an inevitable letdown, the parent cannot and should not remain on a pedestal. He must allow the child to see and know the parent's unwise decisions, personal limitations — and also the parent's unfulfilled dreams.

Many a child grows up a knot of frustration and doubt because of his innate knowledge that he cannot possibly live up to the image and expectations of the parent who remains on a pedestal. Often filled with hopelessness, he refuses to try.

5. Both child and parent must be receptive, willing to listen. If parent to parent, parent to child, communication is honest and patient, many problems will never occur.

6. Let the teenager set up a few rules for himself. He might be more strict with himself than his parents would be with him. Remember, in a few years he will be running his own life, and he needs practice in making rules, adhering to them, establishing and living up to a code of values. Also, the person who sets up his own rules is more apt to observe them, as a matter of pride.

7. Allow some time every day alone with each other member of the family. Only five minutes will make a difference in improving family communication. We point to a successful family relationship where the teenage daughter goes to "early session" schools in Tucson, coming home an hour or two earlier than her two brothers. While other mothers were fuming about split sessions, this mother wisely said, "Well, in our family it works out well. When Mary comes home early the two of us, in the house alone, have an hour every day for just plain woman talk." Reciprocally, the father and sons tinker with machines, carpentry and auto repairs in a far corner of the premises reserved solely for "the men folks of the family."

Price of Gregariousness

One of the fees man pays for living in groups — nations, communities and families — is conflict, and conflict itself is part of growth. But better communications — between parent and child, between members of communities and even nations — can help resolve conflict, and lead to mutual understanding and maturity.

HOW SWEET IT ISN'T

The value of the 1964 sugar beet crop in the United States was $278 million, down $7 million from the 1963 crop, reports the U. S. Department of Agriculture. Value of the 1964 sugar cane crop was put at $101 million compared with $142 million for 1963.

HISTORY OF CITRUS IN ARIZONA

"Although little attention has been paid to oranges, yet orange trees loaded down with excellent fruit in the gardens of Phoenix show that climate and soil are well adapted to their culture" reported Territorial Governor Tritle in October 1885.

By R. H. Hilgeman

Soon thereafter, in 1887, the first commercial orange grove in the Salt River Valley was planted by W. J. Murphy[1] near Camelback Mountain below the Arizona Canal. By 1888, other growers and development companies had started and 22,000 trees were planted. Grapefruit growing began in 1894, with the planting of 20 acres on the Clayson ranch on McDowell Road.

By 1900, when possibly 800 to 1,000 acres of citrus had been planted, marketing problems developed. It is reported that fruit was fed to hogs and some trees were abandoned or died for lack of water during the drought years of 1899 to 1903.

640 Acres by 1907

In 1907, J. Elliot Coit, horticulturist at The University of Arizona, visited all groves and found 641 acres, planted chiefly to Washington Navel oranges with an estimated yield of 110 cars.

Possibly 600 acres survived the 12° to 16° F. temperatures of the 1913 freeze. Thereafter, planting gradually increased until 1925. Then large yearly increases brought the total to 20,022 acres in 1934 of which about 64 percent were grapefruit. A decrease in fruit prices stopped further planting. Some groves were pulled out and subdivided, so that about 18,000 acres remained in 1949. Since then many old groves have been subdivided for homesites, but new plantings near the perimeter of the valley have been made, so that 14,786 acres were present in 1962. About 56 percent were oranges and only 28 percent were grapefruit. New acreage has consisted chiefly of oranges and tangerines.

First Yuma Planting in '92

Citrus growing at Yuma started with the planting of 20 acres on the mesa, just south of the city by H. W. Blaisdell, in 1892. Little further planting was done until the Reclamation Service completed the canals and pumps to supply water to the area. Between 1920 and 1932, about 1,300 acres were planted with 81 percent to grapefruit. New plantings of oranges and lemons brought the total to 1,954 acres in 1949.

The reclamation of additional land on the mesa and in the Wellton area after World War II provided opportunities for new groves. By 1962 the acreage had increased to 17,600, with about 6,000 acres of lemons and 9,000 acres of Valencia oranges. Extensive planting of Valencias continues at present.

Marked changes in the varieties of fruit planted have occurred over the years. Early plantings were chiefly Navel oranges and between 1920 to 1932 grapefruit predominated. Lemons were emphasized between 1950 and 1957, and since then Valencia orange and tangerine type fruit. These changes generally have reflected the income from each variety during the planting period.

In the early years fruit was marketed chiefly through private packing houses. In 1919, the Arizona Fruit and Storage Company was formed through the efforts of I. De R. Miller, its first manager, George H. Libby and others. By 1924, it had become the Arizona Citrus Growers, a cooperative, and they were celebrating the completion of a packing house in Phoenix, with F. W. Avery as president. This organization continues to serve the industry with enlarged facilities on West Camelback Road.

In recent years several large growers have built their own packing houses near their groves. Since 1952 harvesting of fruit has been changing from picking in field boxes to trailers and pallet boxes.

With Trees Come Pests

Early importations of citrus trees from Florida and California were infested with insect pests. To prevent further introduction of such trees, the Arizona Horticulture Commission was created by the Territorial Legislature in 1909, with Foster Rockwell its first chairman and Dr. A. W. Morrill the State Entomologist. In 1933 maturity standards and frost tolerance limitations for fruit shipped outside the state were added to the fruit and vegetable standardization laws under the control of J. M. Foote, supervisor. Marketing problems became acute in the late '30's, which resulted in establishment of federal and state marketing programs still in effect.

Citrus research started at the newly established USDA Testing and Demonstration Gardens at Sacaton with the planting in February, 1908, of 10 new citrange varieties, developed by Dr. W. T. Swingle. Arizona Agricultural Experiment Station citrus research started in 1920 with the planting of five acres of grapefruit on the Yuma Mesa Experiment Farm. This program was soon enlarged to include variety tests, fertilizer and irrigation experiments. In recent years research has included pathological investigations and rootstock trials.

Wide Area of Research

Research in the Salt River Valley began in 1930 when research personnel were stationed in the valley and cooperative grower tests of fertilizers, irrigation, grapefruit maturity and frost protection were undertaken. In 1943 the Citrus Branch Station at Tempe was given to The University of Arizona by the growers, and long term fertilizer, irrigation, frost protection, rootstock and variety tests were initiated.

Severe freezes in '13, '37, '49, '50, '62 and '63 have caused extensive fruit losses, but large well cared for trees were not seriously damaged. Yields of oranges and grapefruit have been higher than average in the year following the freeze.

The citrus industry in Arizona has alternated between rapid increases in acreage during periods of high prices for fruit followed by loss of acreage when prices were low. The last 20 years have been marked by increasing acreage. How much longer will it continue?

Dr. "Bob" Hilgeman, horticulturist and superintendent of the U of A Citrus Branch Experiment Station in the Salt River Valley, is an authority on the industry in this state and recognized as such by men in the industry.

[1] A definite record of this planting has not been established. It is generally accepted that W. J. Murphy made the first planting of about 15 acres. Circumstantial evidence indicates it was planted in 1887.

DAIRY TREND

Bigger Units, Better Cows

By Raymond O. P. Farrish

Dairy farms are becoming larger, production per cow is rising, and the number of dairy farms is decreasing. These interrelated trends are evident throughout the United States as well as in the Southwest. In Arizona, the trends are more pronounced.

Two Underlying Factors

Two economic factors have been responsible for much of the tendency toward larger and more productive dairy operations. The first has been the existence of economies of scale in dairy farming. The second has been the economies associated with higher producing animals. These factors explain much of the trends witnessed to date and suggest some possible future changes.

As early as 1958, researchers in the Department of Agricultural Economics of The University of Arizona reported the existence of economies of scale in Arizona dairy operations. Results of a survey conducted that year showed average costs of producing 100 pounds of milk decreased from $7.18 to $5.30 when herd size increased from 33 to 214 cows (Table 1). The magnitude of these economies provided a strong incentive for Arizona dairymen to increase herd size. Over the 10 year period 1955-64, the average size herd on DHIA test rose more than 130 percent (see Chart 1).

The 1958 survey also showed that high-producing cows, on average, produced milk more efficiently than their lower-producing sisters. Herds with average production per cow of over 10,000 pounds produced milk at less than half the cost of herds with a 5,000 pound average (Table 2).

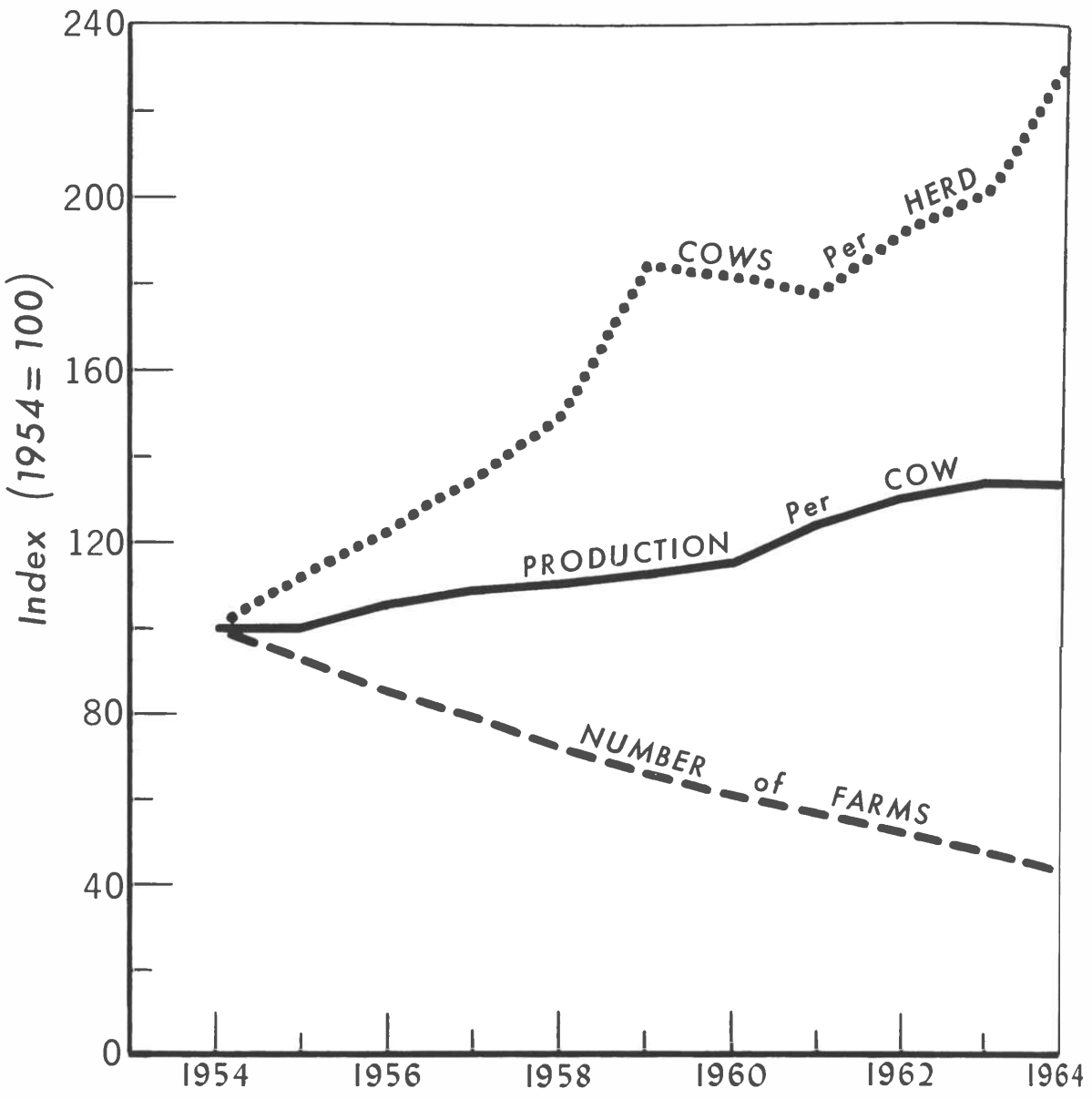

CHART 1 — Index number of cows per herd and production per cow for herds on DHIA test. Also, number of farms reporting milk cows; Arizona, 1954-64.

Table 1. Effect of Herd Size on Average Cost of Producing 100 Pounds of Milk; Arizona, 1958

Herd Size (No. cows)	*Costs per cwt.*
33	$7.18
49	6.81
87	6.40
214	5.30

Source: L. J. Moran and W. R. Greene, *Arizona Milk Production Costs,* Technical Bulletin 141, Agricultural Experiment Station, The University of Arizona, Tucson (June 1960).

Table 2. Effect of Production per Cow on Average Cost of Producing 100 Pounds of Milk, Arizona 1958

Production per Cow	*Cost per cwt.*
5,313	$10.05
7,405	7.19
8,955	5.08
10,941	4.56

Source: Same as Table 1.

Production Went Up

The result was predictable. Through increased culling and greater use of the DHIA testing service, dairymen continued to increase production per cow. By 1964, herds on DHIA test attained an output of 12,570 pounds per cow (see Chart 1). On a statewide average, Arizona climbed from 9th to 2nd among the states in milk production per cow.

The increased efficiency of milk production has been a major factor in preventing retail prices of milk from rising more rapidly than they have. Over the past 10 years, for example, retail prices of milk in Phoenix have risen from 22.3 cents to 25.8 cents per quart. The increase undoubtedly would have been greater except for the fact that the average price received by farmers declined from $5.33 to $5.04 per cwt. over the same period (see Chart 2).

Future Implications

The same two factors, larger herds and greater output per cow, likely will

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Dr. Farrish is marketing specialist with the Agricultural Extension Service.

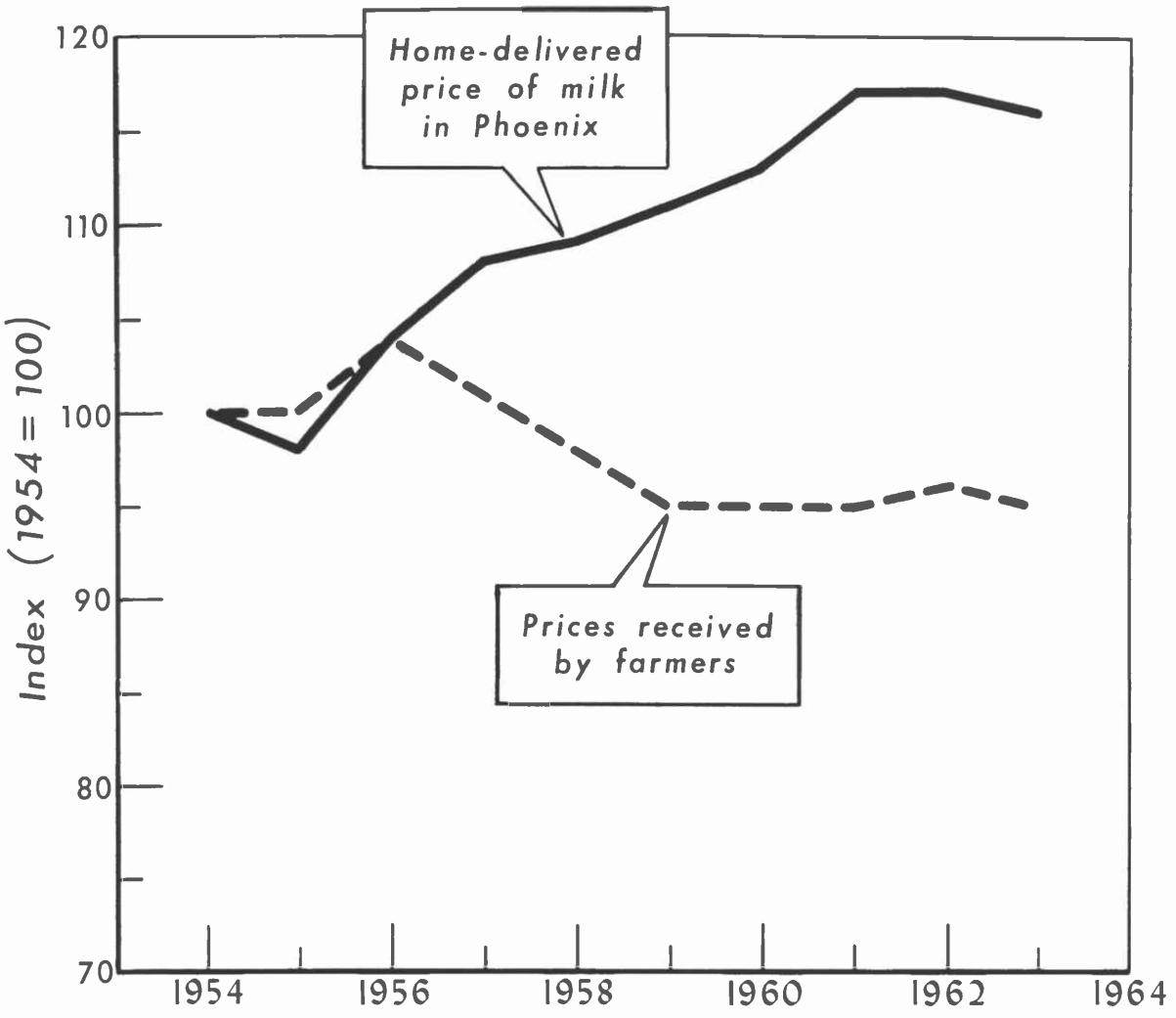

CHART 2 — Index numbers of retail milk prices in Phoenix and prices received by farmers.

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continue to provide future increases of dairy efficiency. The rate of increase, though, is likely to vary. Economic research indicates that dairies in the size range of 150 to 350 cows are most efficient size units. Most of the economies of scale are achieved at the 150 cow level. At present, the average size herd on DHIA test has reached 155 cows.

There still are smaller herds, and average costs for the industry will likely decrease as these expand. In general, though, the opportunity for cost reductions through increased herd size appears to be more limited than previously.

Opportunities for increased efficiency through higher output per cow still appear favorable. Herds in the DHIA testing program averaged 12,560 pounds of milk per cow in 1963. The average production of all cows in the state was 9,800. The difference — 2,760 pounds — probably is sufficient to enable a cost reduction of about 40 cents per hundred pounds of milk.

With such opportunities, and with the aid of an excellent DHIA program, it appears likely that dairy farmers will continue to strive for and achieve higher outputs per cow.

The Perilous Problems of World Agriculture

By George Campbell and John Burnham

The most important fact about world agriculture today is that total output is increasing — but not as rapidly as is population. Per capita production was less in 1964 than it was in 1958.

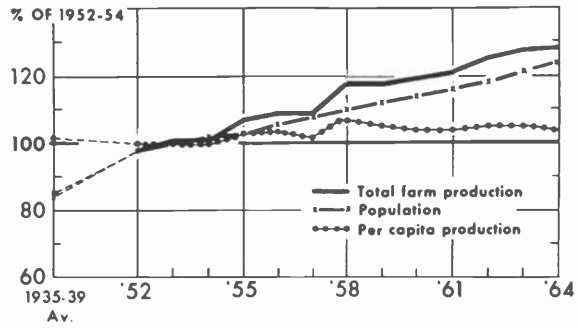
The next most important fact is that agricultural production is unevenly distributed among countries, and in relation to population.

One sixth of the world's population lives in countries having more than half of the agricultural lands. These countries include the United States of America, Soviet Russia, South Africa and the countries in Oceania and the River Plate subregions of South America, (Argentina and Uruguay).

At the other extreme, more than half of the world's population today lives in Asiatic countries which have less than one-sixth of the world's agricultural lands.

Two-thirds of this world's population lives in countries whose people do not have enough food, or the right kind of food, to give them an adequate diet. These diet-deficit areas include all of Asia except Japan and Israel, all of Africa except South Africa, the northern part of South America and almost all of Central America and the Caribbean.

World: Total Farm Output Again High; Per Capita Output Down Slightly



These people live in the "twilight belt" of hunger. There is never enough to eat — and any decrease in production pushes someone into the dark of starvation. Almost 90 percent of the diet-deficit people are in Communist China (62.4%), East Asia, excluding Japan (12%) and India (13.2%).

A geographer with the U. S. Department of Agriculture, Nelson P. Guidry, points out that "Adding to the imbalance between population and farm output are such factors as variations in climate, soils, patterns of agricultural production, and the level of agricultural technology."

It is true that progress in applying modern farming techniques has, to great extent, been most rapid in the highly developed countries which have skilled manpower and which also can more easily afford the needed large capital investment than can the poorer, undeveloped regions.

These are reasons why farm output per capita has been kept at high levels in temperate North America and

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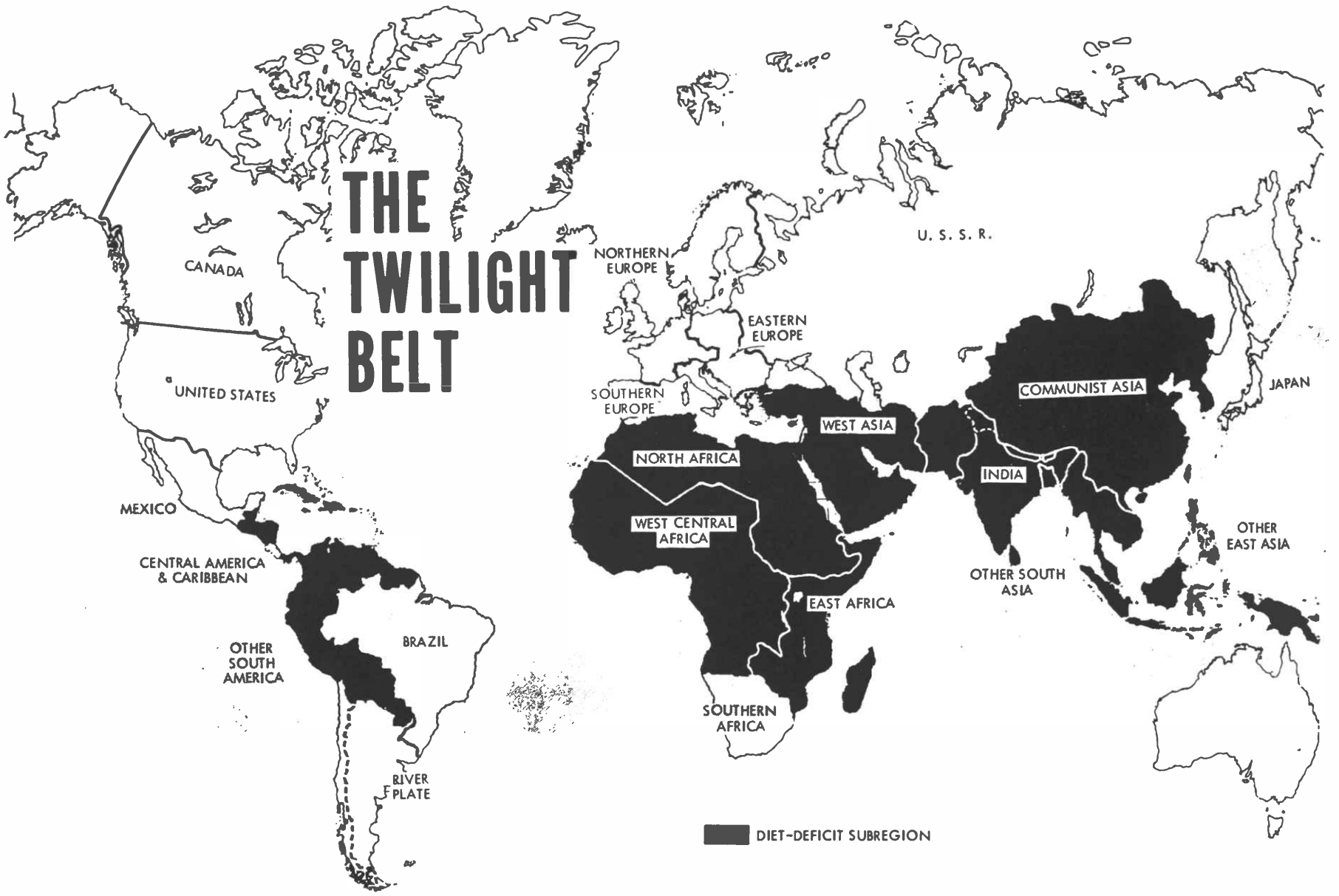
The authors are extension economist and experiment station editor, respectively. This is first half of a two-part article.



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Oceania, and above the world average in densely populated Western Europe. Likewise, the high quality of the human diet in these areas is a reflection of high per capita consumption as well as production. In fact, the United States, Canada, Australia and New Zealand produce more food products than they consume. Densely populated Western Europe, however, is a net importer of farm products. By far the largest outlet for exportable surpluses from other parts of the world, this highly industrialized region of Western Europe relies chiefly on its manufactured goods to pay for imports of food and raw materials.

"In contrast, the densely populated Far East, including South and East Asia, does not produce enough food and things which can be traded for food to provide its inhabitants with more than a meager diet," Dr. Guidry points out. With more than half the world's population, this region has less than a third of the value of the world farm output, and its net imports of agricultural products are small because it has scant buying power.

The value of consumption per capita is also low in many countries of West Asia, Africa and Latin America, where population pressure on the land is not nearly as heavy as in the Far East, and where exports of agricultural products exceed imports by a large margin.

Interestingly, in all of these underdeveloped regions, agriculture is the major economic activity and the major earner of foreign exchange. In none of them, however, does the value of gross agricultural trade reach as high a level as in the industrialized regions of Western Europe or temperate North America. These two, together, accounted for 43 percent of world agricultural exports and 67 percent of world agricultural imports in 1961.

The world today, through its agricultural scientists, views five means through which the quantity of food per person can be increased:

1. Increase agricultural production faster than population is increasing. (The U. S. is already doing this).
2. Decrease the rate of population increase to the level required to give more of the available food to each person. (Japan so far is the only nation to do this).
3. Increase production of goods which can be sold or exchanged for agricultural products. (Western Europe and Great Britain have done this).
4. Receive gifts of food from countries which have food surpluses. (India and Egypt are among countries receiving such gifts).
5. Some combination of the above factors.

In a rather gloomy prognosis, the U. S. Department of Agriculture indicates there is little hope for major improvement in diets of the people in the world's "Twilight Zone" before 1970, at the earliest.

The simple facts of life point back at No. 2, above, for the population growth is a major factor affecting the pressure upon food supplies. A given amount of food will feed a given number of people, and when the population grows without commensurate growth in food available, or the means to buy food and ship it in, someone goes hungry — in many countries many people starve.

This growth in population is, naturally, the total number of births less the total number of deaths — the net gain. Over most of the long scope of history, the number of births hasn't significantly exceeded the number of births in any one period, but

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TEST DEMONSTRATION on interplanted beans and cotton. Dr. Lindbergue, soils professor, ← stands in fertilized plot in foreground, as Dr. Mardonio stands in unfertilized plot in background.

FERTILIZER TESTS BEGUN IN BRAZIL

By Howard E. Ray

Nearly 100 fertilizer test demonstrations were conducted in 37 Ceará municipios (counties) in 1965. In only a few cases did crops fail to respond to the applied fertilizer. It would appear that farmers in this northeast Brazilian state should be fertilizing their crops regularly. However, the situation is not quite that simple.

Little Fertilizer Used Now

Little or no commercial fertilizer is used in Ceará at present. Why? Because there is no supply available for sale. Because there are no adequate credit facilities available to farmers for financing fertilizer purchases. And, because the benefits from fertilizer usage are not clearly established or accepted.

In spite of the results quoted above, it is obvious that much must be done before the use of chemical fertilizers will become an accepted practice here. For example, the need for fertilization must be clearly established before supplies and credit facilities can be developed. The work has started, and *how* it has started is the subject of this story.

August, 1964 marked the beginning of the first organized attempt to determine fertility needs of Ceará soils. Although a few scattered tests and demonstrations had been conducted earlier by various groups, there was almost no information available on returns which could be expected from use of fertilizers.

Agree on 3-Year Tests

Following a series of preliminary conferences, state and federal agencies agreed to cooperate in a three-year fertilizer test demonstration program having the following objectives:

1. To promote interest in the value and use of chemical fertilizers for increasing production of corn, beans, rice, mandioca, and forage grass.

2. To determine the fertility status of representative Ceara soils and identify specific nutrient needs.

3. To develop a program of soil and plant analysis for estimating fertilizer needs based on correlation of laboratory results with responses in the field.

Necessary fertilizer for the program was furnished by SUDENE, a developmental agency for northeast Brazil,

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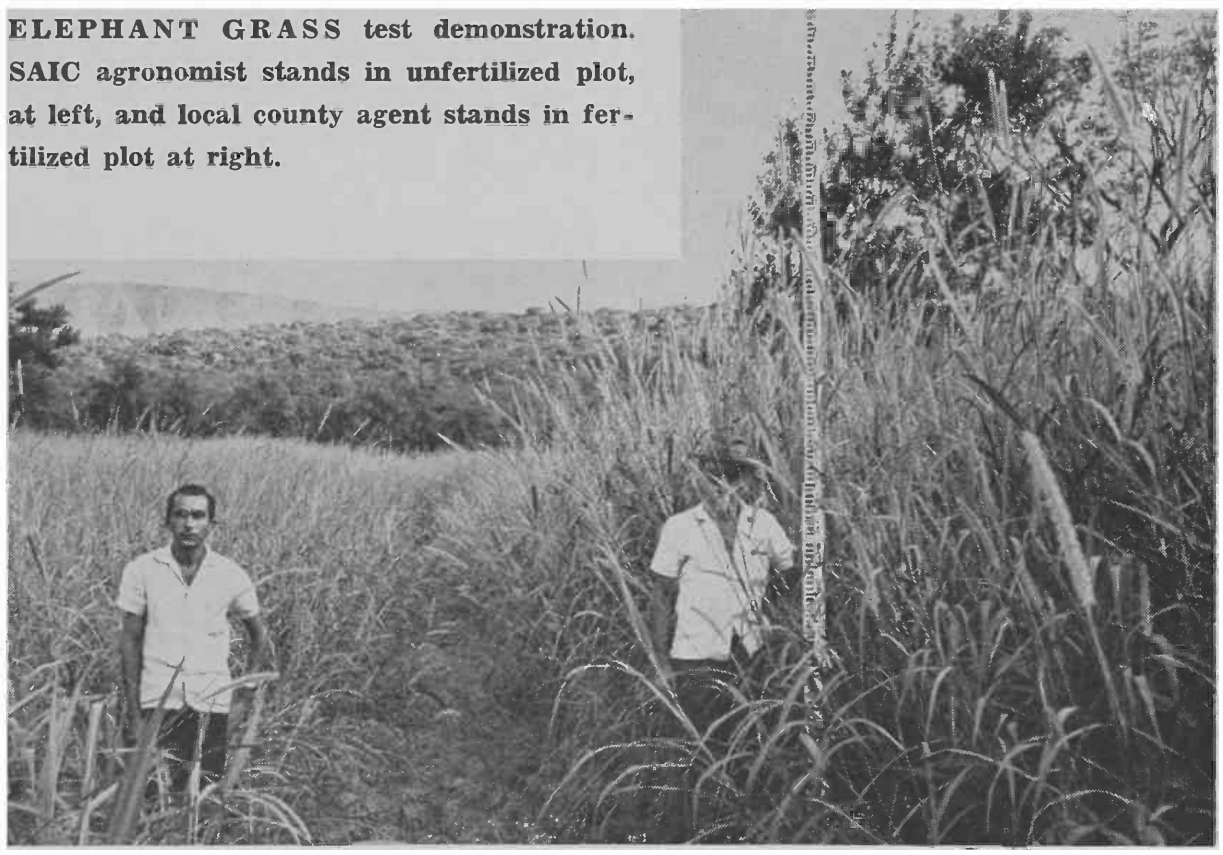

ELEPHANT GRASS test demonstration. SAIC agronomist stands in unfertilized plot, at left, and local county agent stands in fertilized plot at right.

Here we start the second "go-round" of articles by members of The University of Arizona's team of agricultural scientists stationed at the University of Ceará, at Fortaleza, in northeast Brazil. Each member of the team has submitted an article to PROGRESSIVE AGRICULTURE. Now, after several additional months of experience, each will report again. Dr. Ray is the U of A adviser in soils and extension education on the Brazil team.

(Continued from Previous Page)

in the last few decades this historical balance has been drastically upset by man himself.

Thus, while the 1959-61 world population slightly exceeded three billion people, the current annual increase of 1.8 percent, compounded, will populate the world with 3.6 billion by 1970. Ironically, man's humanitarian efforts have contributed largely to this problem, as more knowledgeable nations have sought to bring better sanitation, better medical facilities, knowledge of causes of infant mortality, more clinics, nurses and hospitals, to nations which formerly had high rates of infant mortality and a limited life span of its adults.

(To be concluded in our next issue)

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using fertilizer received from the United States Agency for International Development (USAID).

Many Agencies Cooperated

Fieldwork — including planting, fertilizing, harvesting, etc — was done by the county agents of ANCAR-CEARA (the state agricultural extension service), and agronomists of SAIC (the state secretary of agriculture) and SFPAP (a division of the federal ministry of agriculture).

The Escola de Agronomia and Instituto de Zootecnia of the University of Ceará, in cooperation with The University of Arizona team, agreed to coordinate the entire program, conduct necessary training events for personnel in the field, make necessary laboratory analyses, summarize data and draw conclusions from results obtained.

Dr. Faustino, rural sociology and extension professor, served as the University of Ceará coordinator. Drs. Mardonio and Lindbergue, soils professors, and this writer were primarily responsible for supervision of work in the field, laboratory analyses, and summarization of data. Drs. Clairton (crops professor), Mauro (zootecnia professor), Kokay and Clinton (extension specialists), and Briggs and Humphrey (University of Arizona team) were also actively involved in the program.

First Tests Were Simple

Due to the almost complete lack of background information and the lack of experience of men responsible for work in the field, a very simple test was used. At each location, three plots were established — one fertilized plot with an unfertilized plot on each side. The fertilizer formula varied with the crop to be planted.

At the time of this writing, (late August) harvests of corn, beans, and

STANDING IN unfertilized rice plot, left, is Dr. T. C. "Curt" Tucker of the U of A Ag. Chem. and Soils Department. In fertilized rice plot at right is SFPAP agronomist. Note contrast in growth.

rice are nearing completion, and some forage grass plots have been cut for the first time. Mandioca will not be harvested until next year. The accompanying photos offer visual proof of responses in the field, and a few of the yield results are mentioned at the beginning of this article. Laboratory equipment has been installed, and analytical work will begin as soon as necessary reagents arrive.

Sinaloa Visitors See Sinaloa Bulletins

"Hey, they're from back home" might well be the comment of Ing. José Rochín, who teaches in the Agricultural College of the University of Sinaloa at Culiacán, Mexico.

José, who graduated from The U of A College of Agriculture, in agricultural engineering, recently returned to visit this campus, bringing his pretty young wife, Blanca.

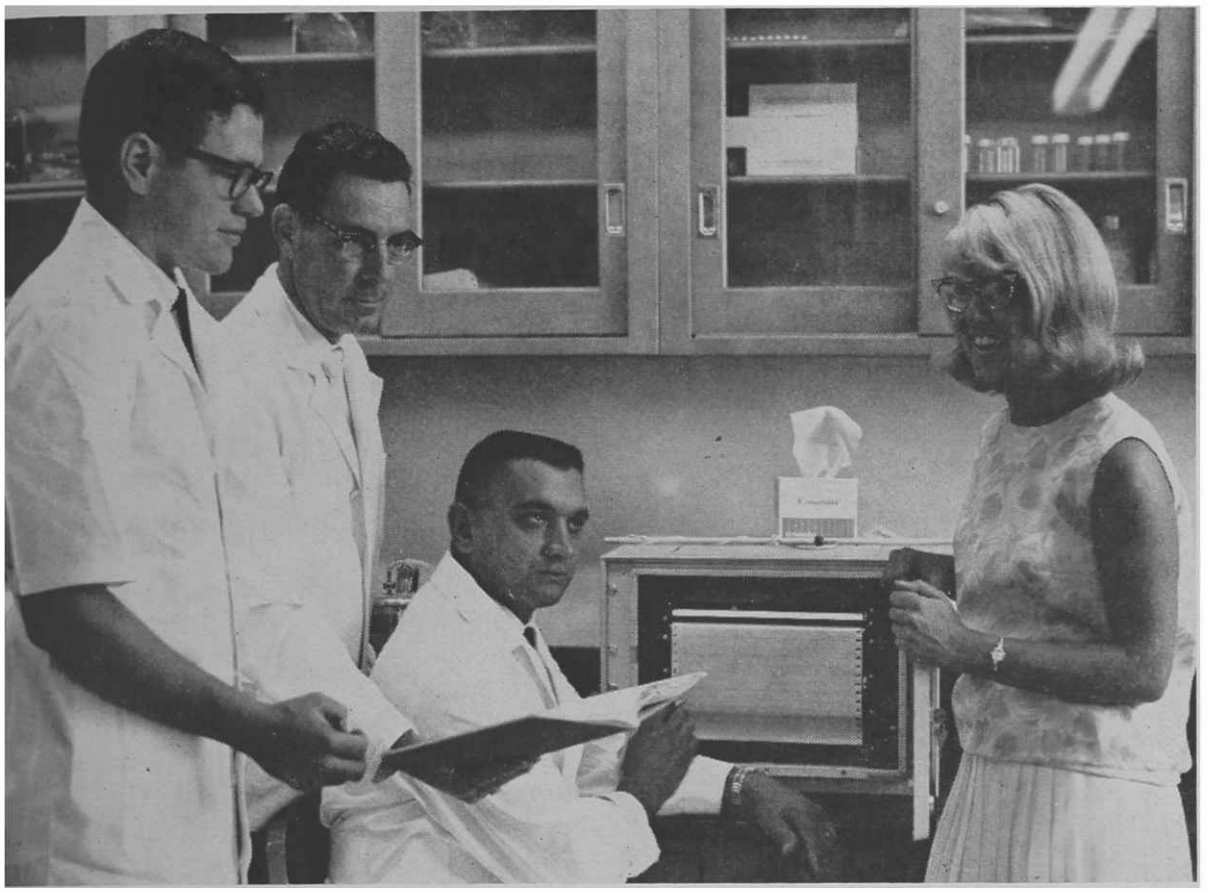
By coincidence, previous visitors here from Sinaloa had just left several agricultural bulletins published in that rich Culiacán valley, and those bulletins had been put up for display on a bulletin board in this college.

The Rochíns found them interesting — and familiar.

This College of Agriculture has many ties with our neighbors to the south, and a constant stream of very welcome visitors from all of Mexico, but especially Sinaloa and Sonora. The rich winter vegetable region of Sinaloa, too, is subject of a current research study by our Department of Agricultural Economics.

Photo below shows José and his attractive Blanca, looking at Culiacán bulletins displayed by the U of A College of Agriculture.

Science Education on Three Levels



The National Science Foundation has received wide attention and acclaim for its support of basic science research.

This activity of itself has pointed to another need, the need for an instructional program to fit students for the research and science teaching ranks.

What is believed to be a unique application of this approach, through NSF aid, has taken place in the laboratories of the Department of Agricultural Chemistry and Soils, explains Dr. W. H. Fuller, head of that department.

In that department students on three different levels of learning have worked side by side in the laboratory, although each on his own research problem. A graduate student soon to be awarded his Ph.D., undergraduate students and even high school students have participated in this NSF program in Dr. Fuller's department.

"We feel that this unified team effort between the NSF and a university is remarkably well demonstrated in our Department of Agricultural Chemistry and Soils," says Dean Harold E. Myers.

Shown in a typical laboratory pose in the photo, left to right, are Russell Krapf, a senior in chemistry at California Western University; next to him the head of the department, Dr. Fuller, and seated, Bernard Knezek, who soon will complete all the requirements for the Ph.D. degree.

The young lady at right is Miss Kathy Storey, a Yuma High school senior, whose research problem has the impressive title, "The absorption and concentrations of contamination from nuclear fission of uranium radiostrontium by desert algae."

Thus, under NSF sponsorship and departmental supervision were grouped, this past summer, a high school student, undergraduate college students and Ph.D. doctoral candidates, working side by side in the same laboratory of the same department — unique in American education.

Goddard, 10 Others Given FFA Honors

Governor Sam Goddard headed a list of 11 persons who received the "Honorary State Farmer Degree" of the Future Farmers of America at the FFA conference in Tucson this past summer.

Receiving the award along with Gov. Goddard were:

Dr. George E. Hull, director, Agricultural Extension Service, U of A; Al Lane, livestock specialist, Agricultural Extension Service, U of A; Page Bakarich, teacher of vocational agriculture, Willcox High School, Willcox;

Carnell Sipes, teacher of vocational agriculture, San Simon High School, San Simon; A. D. Adams, superintendent, Marana High School, Marana; Robert Rives, regional director, Sears Roebuck Foundation, Los Angeles, Calif.; Clay Napier, information specialist, Agricultural Extension Service, U of A;

GOVERNOR SAM GODDARD

Floyd N. Smith, vice president, Salt River Project, Phoenix; Fred W. Mathews, vice president, Eller Outdoor Advertising Company, Phoenix; Robert Rassmussen, professor of animal husbandry, Arizona State University.

Richard Morrison of Gilbert, state FFA president, said the 11 were chosen for the honor because of their contributions to FFA and youth programs in Arizona.

"This is the highest and most coveted recognition which the FFA can bestow on an individual for his outstanding service to vocational agriculture, the FFA and young people with agricultural interests," said Morrison.

IF MODERN-DAY SCIENTISTS HAVE THEIR SAY, cows will be wearing their hides longer next season. A few years or so ago, the researchers came up with a plastic substitute for leather that looked like the real McHereford. Now it's "leather coats" — made of cotton. The coats have the same grainy texture of leather but, like cotton, they can be washed and ironed. Their "leather look" is achieved by applying a silicone resin finish that becomes part of the fabric itself. Result, they won't crack or peel in the coldest temperatures. Moreever, they're permanently water-repellent.

Forage Production With Limited Water

By William R. Kneebone and Rex K. Thompson

Thousands of acres of cleared floodways and abandoned agricultural land presently lie fallow in Arizona because their uncertain or high cost water supply, topography or location makes them inefficient for annual cash crop production. A perennial crop, capable of production when low cost water was available, and survival when it was not, could transform this waste of potential into productive and beneficial use.

The perennial forage grasses and legumes are most promising as means of transformation and provide additional values in terms of soil conservation and erosion control. To evaluate this unexploited agricultural potential, an experiment was initiated at the Mesa Experiment Station in 1957. Eight forage species (Table 1) drill planted at one foot and three foot drill widths were compared over the 6-year period 1958-1963 under three levels of irrigation.

Table 1. Forage Species Investigated

COMMON NAME	*SCIENTIFIC NAME*
Alfalfa (Moapa variety)	*Medicago sativa L.*
Kleingrass	*Panicum coloratum*
Blue panic	*Panicum antidotale*
Boer lovegrass	*Eragrostis chlorameles*
Wilman's lovegrass	*Eragrostis superba*
Pima pappusgrass	*Pappophorum mucronatum*
Sideoats grama	*Bouteloua curtipendula*
Turkestan bluestem	*Andropogan ischaemum*

Table 2. Stand estimates in percentage of ground covered. Mesa, Arizona 1957-1964

Species	*Number of Irrigations Applied 1958-1963*								
	3			2			1		
	1957	1962	1964	1957	1962	1964	1957	1962	1964
Moapa alfalfa	100	95	50	100	78	30	100	38	20
Kleingrass	88	98	100	94	94	80	92	74	40
Blue panic	66	60	60	69	50	10	75	40	20
Boer lovegrass	36	80	70	60	93	50	49	64	60
Wilman's lovegrass	73	91	60	85	95	80	83	68	50
Pima pappusgrass	3	78	80	7	80	60	18	45	50
Sideoats grama	49	89	70	71	89	50	64	58	30
Turkestan bluestem	36	89	70	45	90	50	46	55	30
Average	56	85	70	66	84	51	66	55	38

Five Inches Per Irrigation

The plots were flooded with approximately five inches of water per irrigation in three schedules. One series was irrigated once a year, in April. Another series was irrigated in April and in July. The third series was irrigated three times, in April, July, and October. Production was measured by cutting and weighing the green forage whenever there was a weighable amount for harvest. This procedure was followed in each of the six years 1958-1963. In 1964, the last year of the experiment, all plots were irrigated in April and in July.

Table 3. Average Green Forage Yields at Mesa, Arizona 1958-1963 under Three Irrigation Levels*

Species	*Green Weights in Tons per Acre* Number of Irrigations		
	3	2	1
Moapa alfalfa	9.2	4.5	2.8
Kleingrass	4.4	3.6	1.3
Blue panic	3.6	3.7	1.8
Boer lovegrass	3.7	3.0	1.7
Wilman's lovegrass	3.1	3.4	1.4
Pima pappusgrass	3.1	2.8	1.4
Sideoats grama	2.6	2.5	.8
Turkestan bluestem	2.0	1.6	.3

Species

* 3-April-July-October 2-April-July
1-April only

No fertilizer was applied until 1960 when signs of nitrogen deficiency appeared on the early growth of grass plots receiving two and three irrigations. In that year 15 pounds of nitrogen per acre was applied to all plots prior to the July and October irrigations. After 1960, 15 pounds of nitrogen was applied to all plots prior to each irrigation.

Initial stands varied from less than 10 percent for Pima pappusgrass to 100 percent for the Moapa alfalfa (Table 2). By 1962 the thinner stands had increased and stands of all species, with the exception of the blue panic and alfalfa, were at somewhat similar levels within each irrigation treatment.

July Irrigation Important

October irrigations had little effect on stand maintenance over that of the April and July applications. The July irrigation, however, made an appreciable difference in stand survival over the single irrigation in April, and it is probable that without supplemental water most stands would have been lost. Average rainfall at Mesa during the years of this test was seven inches per year. Minimum annual requirements for long term survival of the species tested probably range from 8-15 inches.

Average annual green weight production for six years is shown in Table 3. Drill row spacing made no

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Table 4. Average Dry Forage Yields at Mesa, Arizona 1958-1963 under Three Irrigation Levels

Species	*Estimated Dry Matter in Tons per Acre** Number of Irrigations		
	3	2	1
Moapa alfalfa	3.3	1.6	1.0
Kleingrass	1.7	1.4	.5
Blue panic	1.4	1.5	.7
Boer lovegrass	2.0	1.5	.8
Wilman's lovegrass	1.4	1.6	.7
Pima Pappusgrass	1.5	1.4	.7
Sideoats grama	1.5	1.4	.4
Turkestan bluestem	.9	.7	.1

* Estimates based on average green weight yields 1958-63 average dry matter percentages in 1963 crop.

Table 5. Average Dry Forage Yields at Mesa, Arizona in 1964, with two irrigations (April and July) on all plots

Species	*Estimated Dry Matter In Tons per Acre** Number of Irrigations During Previous Six Years		
	3	2	1
Moapa alfalfa	3.3	1.6	1.9
Kleingrass	3.3	2.6	3.7
Blue panic	1.6	1.8	3.4
Boer lovegrass	2.5	2.1	2.8
Wilman's lovegrass	2.1	2.2	2.7
Pima pappusgrass	2.3	2.4	3.5
Sideoats grama	1.9	2.0	1.9
Turkestan bluestem	1.7	2.3	2.2

* Estimates based on 1964 green weights and average dry matter percentages in 1963 crop.

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difference in yield per acre. All yields given are averages of both spacings. Moapa alfalfa gave the highest production (in part because of its deep-rooted habit and deep sub-irrigation from nearby irrigated plots). Kleingrass, blue panic, Boer lovegrass and Wilman's lovegrass fell into the next group. Pima pappusgrass and sideoats grama gave equivalent production on a somewhat lower level and Turkestan bluestem was least productive.

Average dry matter production over the six years of the experiment is shown in Table 4. On a dry weight basis, alfalfa yield was no better under the two irrigation regime than that of the top producers among the grasses. The extra irrigation in October favored the alfalfa and the Boer lovegrass, both capable of growth later in the season than the other species.

Show Excellent Recovery

In 1964 all plots were irrigated in April and July to measure possible stand and yield recovery. Dry matter production figures are shown in Table 5. All yields were higher than the longtime averages, with least change on the plots irrigated three times per year. Excellent yields were obtained on the plots previously receiving only one irrigation per year, eloquent testimony to the survival and recovery potential of the species tested.

Data from this study suggest that many areas now fallow which might not have sufficient water available for cash cropping, yet could receive one or two irrigations per year, could produce usable forage with those irrigations and maintain a soil conserving stand of grass.

Some estimates of costs for forage harvested as hay following two irrigations per year are given in Table 6. Forage produced with limited water might be more valuable and could be more economically handled as pasture in many farming operations. In addition, the expected life of the stand is somewhat more than the seven years of this experiment, further reducing annual establishment charges.

Ton and Half of Hay

The average production under two irrigations of 1.5 tons dry matter would be equivalent to 1.7 tons of hay at 10 percent moisture. This amount of hay valued at $20 per ton should cover the normal direct additional costs incurred and provide a small margin toward fixed expenses which ownership of the land imposes, whether productive or not.

Putting perennial forage in place of tumbleweeds should receive serious consideration from owners of land no longer capable of sustained crop production because of water difficulties, but still having some water available.

Further studies with additional species and additional systems of management will continue. They should clarify further the possibilities for more efficient use of lands marginal because of water limitations.

The authors are professor of Agronomy and research associate in Agronomy, respectively. This project was planned and established by D. D. Rubis and was headed, 1960-63, by A. A. Baltensperger.

Table 6. Estimated Annual Costs Per Acre to Produce Forage With Two Irrigations Per Year

Establishment Expense	
Disc	2.00
Float	2.00
Drill	2.00
Seed	2.50
1½ acre feet water @ 12.00	18.00
	26.50
1 year interest @ 6%	1.59
Total Establishment Expense	28.09
Annual cost per acre amortized over 7 years	4.01
Annual Production Expense	
Water 10 inches @ 12.00 acre foot	10.00
Nitrogen 30 lbs. @ .12 lb.	3.60
2 Applications of Nitrogen @ 1.25	2.50
Mowing, raking, 3 cuttings @ 2.00	6.00
Baling 1.7 tons 10% DM hay @ 4.00	6.68
	28.78
Establishment charge	4.01
Total Annual Production Expense	32.79

FARMERS THANK A BUG

A memorial to an insect has been unveiled in the town of Dalby in Australia. The insect is the cactoblastis moth which was responsible for ridding 65 million acres of Australian land from prickly pear.

Prickly pear cactus was introduced into Australia by the first European settlers in 1788. By 1925 it covered 65 million acres, mostly in Queensland.

The infestation was particularly heavy on the Darling Downs, one of the richest areas in Queensland. Control of the pest seemed economically impossible. A Prickly Pear Board hit on the idea of experimenting with cactoblastis cactorum, a cactus-eating moth from South America.

The first cactoblastis eggs were released in Queensland in 1926. In seven years the caterpillars had wiped out the main primary growth of prickly pear. By 1940 Australia was virtually free of prickly pear.

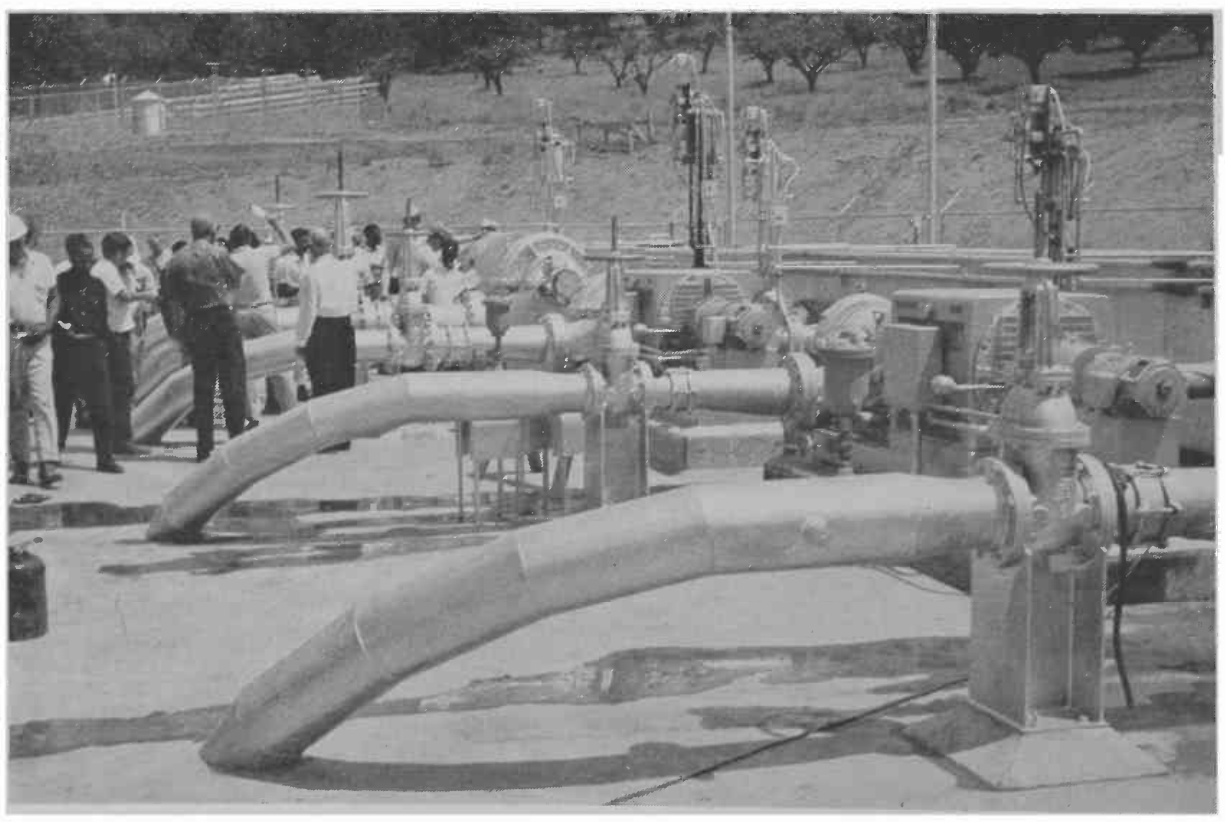
This victory of the moth over the pear has been described as the most outstanding example ever recorded of the control of pests by biological means.

Busload of Agriculturists Enjoy

CLASSROOM ON WHEELS

By M. R. Selke and LeMoyne Hogan

COMMERCIAL STRAWBERRY field in California. The group takes notes as Dr. Hogan explains.



MORE NOTE-TAKING at The Dalles, Oregon, where a huge pumping station furnishes Columbia River water for irrigating orchards and fields.

AT THE FEDERAL animal disease laboratory at Ames, Iowa, the Arizonans had to don white coats and rubber boots before entering the laboratories.

The College of Agriculture completed a successful 30 day Agricultural Travel-Study Course this past summer. Twenty-six students took the six unit course which was offered for the first time. Two instructors, the co-authors of this report, accompanied the students.

Purpose of the travel course was to study experimental and applied food production and processing methods in various major livestock and crop regions of the United States. Dr. D. S. Metcalfe, Director of Resident Instruction for The University of Arizona College of Agriculture, stressed that the tour was designed "to provide an opportunity to observe first hand the influence and interdependence of markets, economics, agro-chemical industry, food processing, manufacturing, waste disposal, urban development, and scientific research on agricultural production."

They Worked, Too

Students enrolled in the course were required to take detailed notes and photographs, make scientific observations and make a thorough written report of what they learned on the trip. They also collected numerous hand outs and brochures which described many of the operations visited.

The students left Tucson June 1 aboard a chartered bus and spent the night in Yuma after having visited the Bruce Church Ranch. Most of the second day was spent in the Imperial Valley of California, where they toured several beef cattle feedlots and saw sugar beets being processed at the Holly Sugar Corporation plant lo-

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CREAMY WHITE Charolais cattle in pasture gazed at the visitors from the cactus country. This photo was taken at the Litton Charolais Ranch at Chillicothe, Mo.

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cated there. Another of the very interesting stops in California was at Monrovia Nursery Company at Azusa, one of the world's largest producers of container grown plants.

As the tour worked its way up the west coast, it went through some of the major fruit producing areas in the United States. Among the orchards visited were those growing peaches, pears, plums and cherries. The group also saw dates, rice, potatoes, mint, hops and grass seed being grown.

From Lumber to Fish

The class also toured the Weyerhauser Lumber Company's mill in Springfield, Oregon, before reaching Portland, most northwestern point of the trip. The Dalles Dam and adjacent irrigation project along the Columbia River also provided one of the most spectacular sights of the trip. Moving on through Oregon and into Idaho, Wyoming and South Dakota, stops included the Pendleton Woolen Mills, a co-operative dairy, several ranches and a fish hatchery. Through this area, vast differences in rainfall, soil types and topography were observed.

Not all of the time on the trip was spent working because some time was taken to do some sightseeing in a few of the most scenic spots in the United States. The group spent one Sunday afternoon in Yellowstone National Park, in spite of a snowstorm, and also went through the Black Hills and Badlands of South Dakota.

In Minnesota several swine, poultry and dairy farms were visited. Among the stops in the Midwest which the students thought most worthwhile were those at the Minneapolis Grain Exchange and the National Animal Disease Laboratory at Ames, Iowa. They also visited the American Hereford Association offices, the stockyards and the Wilson and Company meat packing plant in Kansas City.

Many Breeds of Cattle

Among the ranches which created much interest among the students were those of some of the lesser known breeds of beef cattle. These included Beckton Stock Farm's Red Angus at Sheridan, Wyoming; the Litton Charolais Ranch at Chillicothe, Missouri, and the Lasater Ranch's Beefmasters at Matheson, Colorado.

As the trip progressed, the group visited the campuses of six agricultural colleges along the route. This gave the students an excellent opportunity to see the facilities and research at these schools.

On June 30 the group arrived back in Tucson after covering 6600 miles and having been in 14 states.

The hosts at all of the stops were extremely willing to take time from their busy schedules to explain their work and to answer questions, which were generally numerous. The gracious reception which the group received wherever they went will certainly have a lasting effect on them for many years.

Dr. Hogan is a member of the Horticulture Department, Dr. Selke a member of the Animal Science Department. As co-chaperons on this trip, both men believe that similar trips in future summers would be worthwhile. Photos in this article were taken by a farm-loving professional photographer, Roy L. Caples.

Agric. Journalism Article Reprinted For Use in India

An article "Agricultural Journalism Offers Opportunities," by John Burnham, editor of PROGRESSIVE AGRICULTURE, was published last February in THE QUILL, the monthly magazine published by Sigma Delta Chi, national professional society of journalists.

In July we received a letter from R. Lyle Webster, for many years head of the U.S. Department of Agriculture's office of information in Washington, and now the Ford Foundation's consultant on communications and agricultural information at New Delhi, India. Dr. Webster has replicated the agricultural journalism article in THE QUILL, making it available to "all persons in India interested in agricultural journalism."

A month later comes a letter from T. F. Buehrer, long a staff member in the College of Agriculture, University of Arizona, and now chief of party of the University of Tennessee's AID program. Writing from Bangalore, India, he refers to the reprint which has come to him from the Ford Foundation at New Delhi, thus giving him happy opportunity to report to old friends here in Tucson.

He writes: "My own activities here in India prove more challenging every day. It is truly a thrill to have a part in the development of a brand new agricultural university patterned after the land-grant institutions of the United States.

"At the present stage, the vice chancellor (or the president in our American institutions) is engaged in securing the appointment of his key officials — the deans, directors, comptroller, registrar, administrative officer, etc. It is rather interesting that nearly all of those who have thus far been appointed have received their advanced degrees . . . from American land-grant institutions."

Bangalore, he writes, has an elevation and climate delightfully comparable to Tucson. A frustrated author, Dr. Buehrer now writes frequent articles for agricultural and educational publications in India.

$182,337 In Grants Aid Agric. Research

Industry and governmental agencies recently awarded $182,337 in supporting funds earmarked for agricultural research projects at The University of Arizona.

Dr. Harold E. Myers, Dean, U of A. College of Agriculture expressed appreciation for the awards, which, he said, "Help the College of Agriculture in its search for new knowledge and service to the people of Arizona."

Among the awards are four grants from the U.S. Public Health Service. Of these, $42,720 supports the second year of continuing research by the Dairy Science Department and Entomology Department on environmental sources of pesticide entry into milk. Dr. J. Warren Stull, U of A professor of dairy science, is the leader of this project, and Dr. W. H. Brown is co-leader.

A $17,232 award aids continuation of genetic study of heat tolerance by Dr. Carl B. Roubicek, professor of animal science.

Other Public Health Service grants include continuation for research in metabolism of cyclopropene compounds by Dr. Archie J. Deutschman, Jr., and $18,907 for continuing work on metabolism of cyclopropenoid fatty acids in animals by Dr. M. G. Vavich, both of the Department of Agricultural Biochemistry.

A $10,000 grant continuation agreement from the City of Tucson supports research relative to water supply investigations and survey of the Tucson area. Dr. Kenneth K. Barnes, head of the Department of Agricultural Engineering, conducts this project.

Martin M. Fogel, acting head of the U of A Institute of Water Utilization, conducts work under a $3,695 agreement from the Proctor and Gamble Co. aiding research entitled "Water Conservation Through Evaporation and Seepage Control from Small Reservoirs in Arid Regions."

Awards from the U. S. Department of Agriculture include a $7,000 cooperative agreement for research to develop new types of safflower with greater potential for producing oil and protein. This work is directed by Dr. D. F. McAlister, head of the Department of Agronomy.

Another USDA cooperative agreement provides $50,000 for research on insects affecting forage, cotton, and bee culture, conducted by Dr. L. A. Carruth, head of the Department of Entomology.

Another USDA-U of A cooperative agreement provides $15,800 for support of beef cattle research, directed by Dr. Bruce R. Taylor, head of the Department of Animal Science.

Agricultural Group Named by Yuma C of C

The Yuma Chamber of Commerce is fully aware of the importance of agriculture in that thriving, productive and growing community. Impressive is the membership of the Yuma Chamber's Agricultural Committee.

Jack Consaul of the L. A. Consaul Company is chairman, and Chuck Hanson of Imperial Date Gardens is vice chairman, with Sid Woods, Chamber president, liason officer.

Other members of the committee include Al Face of Bruce Church, Inc.; Bob Grounds from the County Extension staff; Don McCain from Arizona Agrichemical; Jim Willis from First National Bank of Arizona; R. D. "Dutch" Woodman of Curtis, Woodman and Roach;

Robert C. Burr; Bill Griffith, from Krop Care of Arizona; Cushing Lord; Larry Warren, from Producers Cotton Oil Co.; E. E. "Jack" Winebarger, president of the county's Farm Bureau; Thad Baker, lawyer kept handy to advise the group; Sam Dick, of Yuma Water Users Assn.; Ernest Johannsen, of Farmers Marketing Corp.; C. L. Rennells, from Growers Service & Equipment; C. C. Tabor, of Wellton-Mohawk Irrigation & Drainage, and Clark Yarwood, member of the Yuma County Board of Supervisors.

Bob Grounds has compiled some exciting figures crediting Yuma County with an agricultural income of more than $90,000,000.00 in 1964. He breaks down this total as follows:

Horticultural Crops	**$46,949,790.00**
Field Crops	**11,694,015.00**
Cotton & Oilseed Crops	**17,613,015.00**
Livestock (estimate)	**14,000,000.00**
TOTAL	**$90,256,820.00**

Sort of gives you to understand that that committee is concerned with a big operation!