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NOVEMBER
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Number 6

A Kindly Scientist With a Passion for Plants

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IN THIS ISSUE

PROGRESSIVE AGRICULTURE IN ARIZONA

NOVEMBER-DECEMBER
Vol. XVIII No. 6

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The complex world of today has developed to the point where men may improve their society only with the capacity given them by educated people. Higher education faces a situation in which it is being asked to supply the competence to unravel and answer every major unsolved social problem, as well as continuing its traditional role of providing technological skills. From training for civil defense through raising the educational level to obliterate the causes of poverty and urban ills, the rising pressures of a changing age are flowing over the door step of the university.

James W. Sherburne, Vice Chancellor
Division of Continuing Education
Oregon State System of Higher Education

NOVEMBER

4 - 13—Arizona State Fair, Phoenix, Arizona
10—Thurber Hereford Ranch Sale, Sonoita, Arizona
11—Rod Graves Hereford Sale, Williams, Arizona
15—Long Meadow Ranch Hereford Sale, Prescott, Arizona
19—Hereford 4-H Family Field Day, Campbell Ave. Farm, Tucson, Arizona

DECEMBER

17—Elgin Hereford Sale, Elgin, Arizona

1967

JANUARY

13 - 21—National Western Stock Show, Denver, Colorado
31—Tenth Annual U of A Agric. Chemicals Conference, Math-Physics Bldg., Auditorium — U of A Campus

FEBRUARY

1—Tenth Annual U of A Agric. Chemicals Conference, Math-Physics-Meterology Bldg. — U of A Campus

MARCH

18—FFA Field Day — U of A Campus

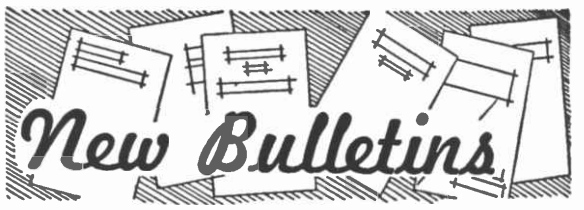
UN SERIO PROBLEMA que existe en la gran mayoría de las fincas ganaderas es la mala utilización de las plantas forrajeras. En general su aprovechamiento es inadecuado, por lo cual es frecuente ver terrenos sobrepastoreados, crosionados que muchas veces quedan totalmente inútiles para la explotación ganadera.

Hillman In Washington As Food-Fiber Director

Dr. Jimmye S. Hillman, head of the Department of Agricultural Economics, is spending a year in Washington, D.C., as executive director of President Johnson's National Advisory Commission on Food and Fiber. Hillman will return next summer.

Dr. Hillman says the assignment of the commission "involves an intensive study of food and fiber policies in the light of our domestic needs and foreign commitments."

Dr. Thomas Stubblefield, shifted last spring from the Department of Agricultural Economics to position of assistant experiment station director, supervising branch experiment stations, has been named acting head of Agricultural Economics, assuming a dual responsibility.



A-49 Establishment and Management of Irrigated Pastures in Arizona
C-266 Nutritious Holiday Meals
C-216 (revised) Pressing Fabrics and Garments
C-292 Helping Children Develop Responsibility
C-293 Inexpensive Play Ideas for Children
C-294 A Guide for Family Day-Care Mothers

A MESSAGE TO NEW STUDENTS

EDITOR'S NOTE: Each fall the students in this College of Agriculture issue a handbook for incoming freshmen. An important item in the handbook is the message from Dean Myers. Because we feel it is worth reiterating — and also to be read by a much larger audience, including parents, upper classmen and faculty members — we are reprinting Dean Myers' message here.

As a freshman enterng this College of Agriculture, you take your first step into a scientific community. In this college your teachers are research scientists — better teachers for you because of their active research programs.

You will find much of your curriculum will not be from textbooks hoary with age, but often from materials not yet published, from laboratory exercises, from field trips and farm activities. Even the texts you do use often will be new editions, republished frequently because the knowledge you seek is new and growing. It is an exciting world, this world of science.

The first thing a freshman must learn is the habit of study, concentration, regular uninterrupted study hours. The pace is faster here than the one you learned in high school, and regular concentrated study is necessary. After all, you and your parents, the state of Arizona and this University, all are contributing heavily in money and time and facilities to change you from a high school senior into a university-trained man or woman. You have an obligation to all of these participants, an obligation to fulfill their hopes and measure up to your abilities.

We would urge, at the start, that you limit outside activities, participation in social activities, until you first master this habit of study, and until your early grades prove your ability to do college work.

After that you will have plenty of time to discover the rich world of a university campus — the cultural programs which can fill your evenings with music, drama, forensics. You should very early discover the vast storehouse of learning which is called a library, and you should train yourself to use it, as an adjunct to your classwork and also as a map leading you into a thousand pathways of interesting knowledge.

Your classmates here are not just from your neighborhood, but from the entire world. In time you will widen your viewpoint through friendships with students from many different countries. You and they will benefit equally as you each learn about the customs and conditions of different lands. Conversation, properly controlled, can be a key to learning, too.

As you advance in your college work, you will discover that *how* you learn is even more important than *what* you learn. Many of the processes of agriculture, science and industry will be different after you graduate than today, as you enter college as a freshman. Many of the steps in preparation of soil, use of water, planting and managing a crop, likewise the handling of livestock and the processing and marketing of agricultural products, will be improved, changed, speeded up, refined in the years just ahead.

Thus many of the methods used today will be discarded. But the techniques employed in learning, the trained ability to proceed in research activity, the ability to train a mind to meet new problems and new conditions — those tools you will shape in college now can be equally useful in meeting new conditions as well as the old.

Lastly, plan your curriculum to include not only the "useful" courses within your field of interest, but also the cultural courses, the fields of literature, government, language, the arts.

Our job — with your help and your youthful enthusiasm — is to shape you so that you will be able not only to earn a living, but also to live a life, a life rich in usefulness to yourself, your community and this nation.

Harold E. Myers

Dean
College of Agriculture
and
School of Home Economics

"Hybrid Vigor" Gain Accurately Measured

Many commercial cattlemen have observed that crossbreeding can increase the number of calves that reach weaning weight. But, a University of California animal geneticist reports that this hybrid vigor has now been accurately measured in controlled studies.

Wade C. Rollins, animal geneticist at the university, reports that studies at his university, as well as in Nebraska, Virginia and Saskatchewan, Can., show a 9.3% advantage in crosses from Hereford bulls on Angus cows and Angus bulls on Hereford cows.

This advantage, known as hybrid vigor, was in weaning weight and number of calves reaching weaning weight. But there was little difference between straightbreds and crossbreds on the basis of weaning grades.

"A good measure of success for a cow-calf operation is pounds of beef weaned per cow each year," Rollins says. "Taking our hybrid vigor estimates for weaning weight and for percentage of calf crop weaned, it would seem that for every 100 lb. of calf weaned per cow in straight breeding, there would be 113.6 lb. weaned in a reciprocal crossbreeding setup."

Rollins warns, however, that reported data are not extensive enough to show a cattleman whether he would do better using Angus cows and Hereford bulls, or vice versa.

THE DOCTOR STUDIES a typical patient, a bit of sick citrus. ←

Doctor for Sick Plants

R. B. Streets Serves College, Community For Over 40 Years

The great value of decades of research and experience find their flowering this fall as Dr. Rubert B. Streets turns over to The University of Arizona Press the manuscript of "Plant Diseases of the Southwest." It is a book greatly needed by scientists and students, and it is written by an authority.

Rubert Burley Streets was born at Helena, Montana, May 22, 1895. His bachelor of science degree from Montana State College carried majors in botany and bacteriology. His master's degree from the University of Wisconsin had plant pathology as a major and botany as a minor, while the Ph.D. degree from Wisconsin (1924) likewise had plant pathology as a major but entomology as a minor.

Came Here in 1924

Dr. Streets was an agent for the U. S. Department of Agriculture office of Cereal Investigations from 1918 through 1920, directing crews which were eradicating the barberry bush, alternate host of wheat rust, and therefore a hazard to the wheat crop of the Northern Plains. He was an instructor in Plant Pathology at the University of Wisconsin 1922-24, and in 1924 he came to The University of Arizona as assistant professor of Plant Pathology.

He rapidly advanced to associate professor and professor and Experiment Station Plant Pathologist, and headed the department from 1952 to 1960, when he willingly retired from administrative chores. If anything, that gave impetus to his research work and writing.

The Root Rot Battle

Dr. Streets' research has been in many areas of his field. He is best known for control of Texas root rot in field crops, tree crops and ornamentals; wide studies in diseases of dates and citrus; studies in diseases of guar; his selection of flax resistant to fusarium wilt; studies of brown rot in stone fruits; work in diseases of roses; development and recommendations for use of antibiotics for control of fire blight in ornamentals, apple and pear trees and other useful trees, and his studies in serology of citrus viruses.

As a capable, understandable and well-liked classroom teacher, Dr. Streets in his 43 years here has taught all plant pathology courses from bachelor of science to doctorate level. In his courses, Dr. Streets strives to have his students evaluate a plant disease situation and recommend practical and effective control measures.

As a parent he directed two boys toward Boy Scout work, and himself participated so energetically and ably that he was recipient (1948) of the Silver Beaver award, highest Scouter award to an adult. He has taken his professional skill to scout activities, being named a counselor on Nature Studies and Conservation for the Boy Scouts of America. Locally, Dr. Streets has been a member of the Catalina Council of Scouts.

Authority on Roses

Nationally known and esteemed as a rose judge, Dr. Streets has been Consulting Rosarian for the Southwest District, American Rose Society, for more than 15 years, and has judged

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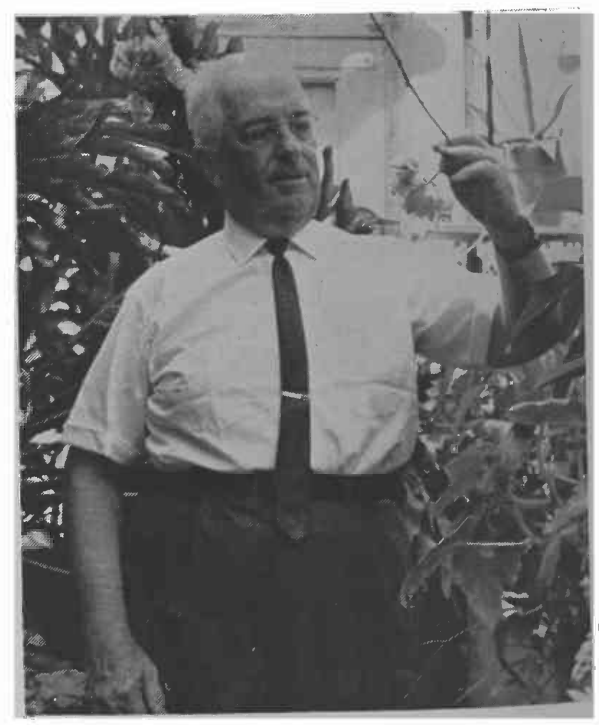
BELOW, IN HIS GARDEN. The consuming interest in plants and their behavior does not end at 5 p.m. Dr. Streets has a greenhouse and a variety of ornamental plantings at his home.



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at flower shows and rose shows, and for horticulture divisions of state and county fairs for 35 years.

Quoted by garden writers and nurserymen as a reliable, informed source, Dr. Streets has been the recognized local authority on which the entire community has leaned for advice and counsel, regarding plant health.

Will that advertised new rose in the catalog do well in Arizona? How do I get rid of root rot in my hedge? What shall I do with an ailing ornamental tree? When should I plant, root, transplant, fertilize, prune? On television, on radio, at farmers' meetings, before garden clubs, in newspaper columns and articles, Dr. Streets has spread his wisdom and counsel widely through the area he has served.

His Talents Recognized

Recognition has come from many sources. The Arizona State Council of Garden Clubs in 1962 gave him a special award for his judging at shows, and for his helpful talks. The University of Arizona recognized his worth with an Award of Merit in 1960. The national convention of the American Horticultural Society gave him a citation for outstanding service in 1965. The National Council of Women's Garden Clubs has named him an accredited national instructor in Horticulture, training those who judge their shows.

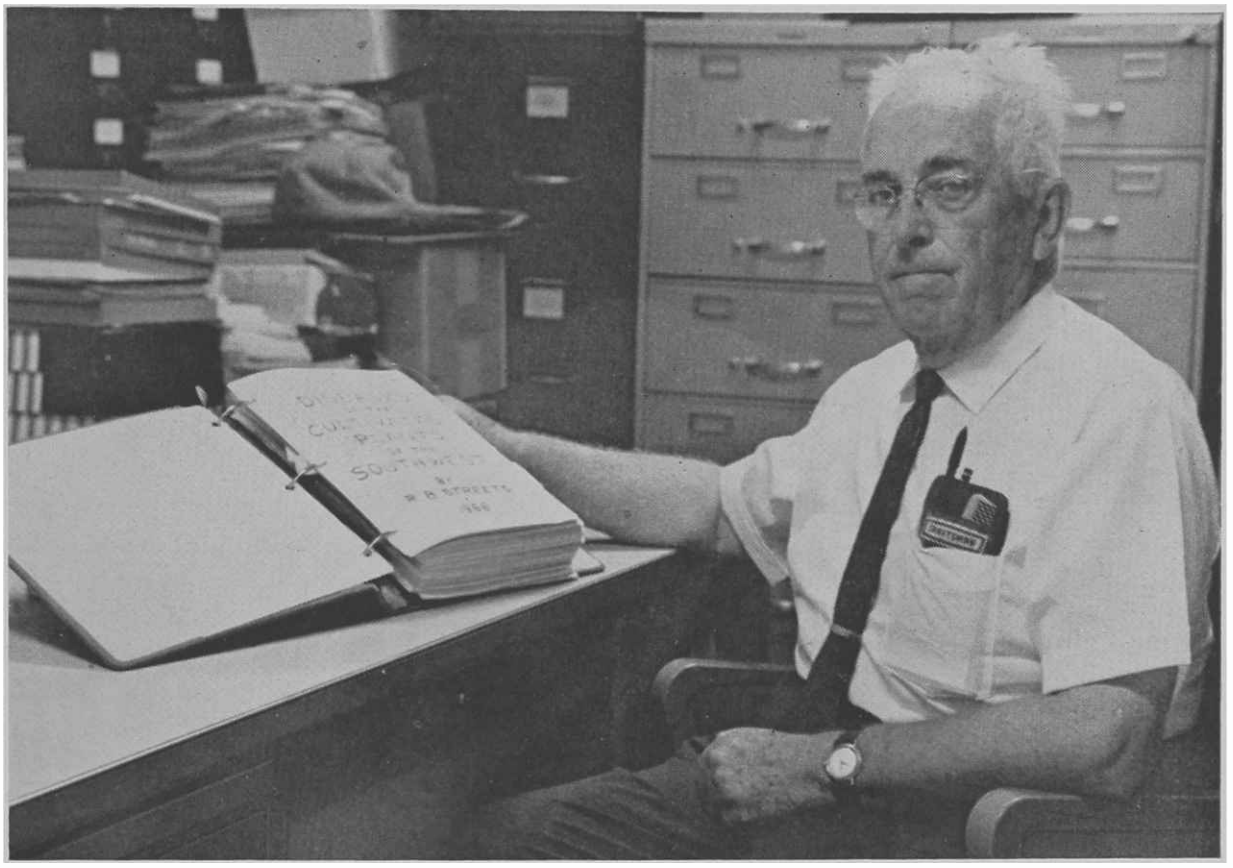
Member of several professional societies, Dr. Streets lists the American Assn. for the Advancement of Science, American Phytopathology Society, Sigma Xi, Phi Kappa Phi, and Gamma Sigma Delta.

Dr. Streets is emotionally wrapped up in two things — the plants with which he works and the three fine children whom he has raised, to great extent, because of the mother's illness.

Paul Douglas Streets, who received his bachelor's degree at The University of Arizona last spring in Watershed Management, is continuing with graduate work here. His twin, Catherine, is married to Thomas E. Delfs, a UA graduate in public administration. They live on the West Coast, where Mrs. Delfs indulges her hobbies of water color painting and gardening.

In the Space Age

The eldest son, Dr. Rubert B. Streets, Jr., is in highly sensitive employment as an electronics engineer in the Space Division of Boeing Aircraft Corp. at Seattle. Married, he has three degrees from The University of Arizona as well as one from Massachusetts Institute of Technology.



FINISHED AT LAST! A needed and valuable contribution to agricultural and horticultural science is Dr. Streets' book on "Plant Diseases of the Southwest." Here the author looks at his first draft of the volume which summarizes 43 years of field experience.

Dr. Streets, Sr. completing the manuscript of "Plant Diseases of the Southwest," has no intention of soon stopping his professional activity which began nearly half a century ago in Montana barberry patches. "Soon," he says, "I'll start work on my next book."

> *"While I have done a lot of public service work, because I enjoyed it and it needed to be done, my principal accomplishments have been in control of Texas Root Rot, formerly our major plant disease (and a long and bitter battle it was!), and 'the book,' which attempts to preserve in usable form the facts of life about all the diseases of Southwestern plants encountered in 43 years of field experience."*
>
> **—Dr. R. B. Streets**

To the layman, Dr. Streets — in spite of all his prodigious record of research, teaching and publication — is a comfortable, gracious, always kindly and thoughtful gentleman who never is too busy to arrange a bouquet of flowers on a secretary's desk, to answer a telephone inquiry from a harried gardener, or give a helping hand to an eager or baffled student.

Honors Program Head, Dr. A. H. Beattie, Dies

Those who heard, or later read, Dr. Arthur H. Beattie's address to Gamma Sigma Delta a year ago, entitled "Cultivating Our Garden," join his family and friends in a deep sense of personal loss in his death last August. The talk was published serially in this magazine.

Dr. Beattie had a philosophy of life which was sheer beauty, a vivid and incandescent personality which shone its light upon the students who had the great fortune to know him.

He made the French language come alive in the classroom, the Honors Program a definition of stature and achievement. He was, as President Harvill said so well, "an ideal teacher and faculty member."

Arthur Beattie had a gift with words and phrases. Every memo from his pen was a gem, a breath of poetry.

Each of us who had the bright experience of knowing him is poorer, our lives more drab, because of his passing.

After 18 Months of Study, Food Commission Brings In Controversial Report

By Roger W. Fox

This summer the National Commission on Food Marketing submitted its final report to the president and Congress.

The commission's report reflects 18 months of intensive investigation into nearly all phases of food marketing in the United States, including such subjects as efficiency and market power, regulatory activities of government agencies, measures to benefit consumers and producers, and farm-retail price spreads.

Critical on some points, complimentary on others, the commission concluded that the huge food industry is generally "efficient and progressive."

Producer-Consumer Spread

The commission, consisting of five members of the Senate, five members of the House, and five public members appointed by President Johnson, was created at a time of depressed farm product prices and constant or rising retail food prices. An example of this concern was the low level of livestock prices during 1964.

During the commission's investigation, economic conditions changed rapidly, so that today attention is focused on increasing food prices both at the farm and the retail level. This concern is illustrated by the 10 percent increase in the Index of Prices Received for all farm products between August 1964 and August 1966, and the six percent increase in the level of the Consumer Price Index for all food during the same period. Nevertheless, many of the commission's findings are relevant to the current situation, particularly those relating to increasing retail prices for food.

Groceries Plus Service

The commission report points out that in spite of rising food prices, the share of the consumers' after-tax income being spent for food has declined from 22.2 percent in 1950 to 18.2 percent in 1965. At the same time the consumer is demanding and receiving an increasing quantity of services with each dollar expended on food. This observation is supported by the fact that the farm-retail price spread for a fixed "market basket" of food increased by 37 percent between 1950 and 1965. It is a recognized fact that consumers are purchasing more "built-in maid services" in the form of prepared and semi-prepared foods.

In addition, changes in the farm-retail price spread reflect rising processing and distribution costs throughout the marketing channel. For example, labor costs per unit of food manufactured by the food industry advanced 22 percent during the 15-year period, 1950-1964.

Huge Merchandising Costs

Furthermore, increased advertising expenditures added to the costs of marketing food. The commission indicated that "the costliest item in retailers' sales promotion is trading stamps." Stamps were little used by food retailers in 1950 but cost them about $680 million out of an estimated $2.1 billion promotion effort in 1964. The commission concluded that the added cost of trading stamps is generally passed on to the consumer in the form of higher food prices.

Finally, retailers' costs have increased because of such services and amenities as parking lots, air conditioning, roomier stores, and greater variety.

Collectively, the above facts provide considerable insight into the reasons for rising retail food prices. However, the report provides little in the way of explanation for the depressed farm level prices during the late fifties and early sixties or for the recent increases in farm product prices.

Industry Concentrated

The commission points with some alarm at the tendency of the food industry to become highly concentrated in the hands of a few large firms. Asserting that food marketing firms tend to grow much larger than necessary to be fully efficient, the commission urges positive action by regulatory agencies to prevent "horizontal mergers and acquisitions by the largest firms in each concentrated branch of the food industry."

Although the report emphasizes that the consumer is well-served by the food industry, it maintains that current practices fall short of giving consumers information needed for skillful buying. Proposals to help the consumer get the most for her money include consumer grading for "all foods for which such grades are feasible"; establishment of standards of identity "for all foods recognized . . . as belonging to a definite product category and for which standards are practicable"; elimination of deceptive packaging and labeling; and a "centralized consumer agency . . . established in the executive branch of the government."

On the producer side of the market, the commission concluded that farmers have been significantly affected by fundamental changes in the food industry, such as specification buying, vertical integration and rising price spreads. The commission contends that these developments "Pose more clearly than ever before the question on how farmers can obtain sufficient bargaining strength to defend their prices and other terms of sale."

Stronger Producer Groups

To strengthen the farmers' bargaining position, the commission recommends increased use of producer cooperatives and federal marketing orders and agreements. Furthermore, the commission proposed a new device known as the "Agricultural Marketing Board." Essentially an extension of the Marketing Order Program, Marketing Boards could be voted into effect by the producers with the primary purpose of performing "group marketing activities in the farm sale of a particular commodity."

Other conclusions reached by the commission relate to regulation of competition in the marketing of perishable farm foods, the need for more complete and accurate market information, desirability of greater uniformity among state regulations affecting the food industry, licensing of local livestock markets, use of the U. S. Public Health Code for milk inspection, a study of advertising rates, improvement of price data compiled by the Bureau of Labor Statistics and the U. S. Department of Agriculture, and supervision of fu-

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

TO OUR READERS

The Postoffice Department orders that after Jan. 1, 1967, all periodicals must be addressed, bagged and mailed according to Zip Code Number.

In preparation, we inserted a little green return postal card in the last three issues of PROGRESSIVE AGRICULTURE IN ARIZONA – in our May-June, July-August and September-October issues.

Thousands of readers have returned those little cards, correctly filled out, including the Zip Code Number. Other thousands have failed to do so. If you are one of those who has sent in the card, we thank you very much – and you will continue to receive this magazine.

If you have not sent in the card, tear one out of a previous issue and mail it to us immediately, correctly filled out, including Zip Code Number. If you don't have one of the green cards, just send us a plain postal card, giving your name and address – including Zip Code Number.

The Cut-Off Date Is November 15, 1966.

At that time we will remove from our mailing list the names of ALL ADDRESSEES FOR WHOM WE DO NOT HAVE A ZIP CODE ADDRESS. Then the January 1967 issue, and all subsequent issues, will go only to Zip Coded addressees, in accordance with the Postoffice ruling.

If you are complying now, and do not have the addressed green card, mail your postal card or letter to:

Experiment Station Editor
College of Agriculture
The University of Arizona
Tucson, Arizona 85721

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tures trading in livestock, meat, coffee, and sugar under the Commodity Exchange Authority.

The final report was not unanimously accepted by the commission members. In fact, six of the 15 members dissented and submitted minority statements. The fact that members of the commission, after examining the same material, reached such diverse conclusions would indicate a difference in the philosophy and background with which they approached the study. Those members who signed the majority report are Fred J. Marshall, Minnesota Farmer; Elmer R. Kiehl, Dean, College of Agriculture, University of Missouri; Senator Warren G. Magnuson, Washington; Senator Gale W. McGee, Wyoming; Senator Philip A. Hart, Michigan; Representative Leonor K. Sullivan, Missouri; Representative Glenn C. Cunningham, Nebraska; Representative Benjamin S. Rosenthal, New York; and Phil S. Gibson, Retired Chief Justice, Supreme Court of California. Those who entered minority reports, disagreeing with the majority in many essential points, are William M. Batten, J. C. Penney Co.; Albert K. Mitchell, New Mexico Rancher; Senator Thruston B. Morton, Kentucky; Senator Roman L. Hruska, Nebraska; Representative Graham Purcell, Texas; and Representative Catherine May, Washington.

Minority Dissented

Objections by the minority are concerned primarily with the manner in which parts of the study were conducted, and the nature of conclusions reached by the commission. The dissenters felt that the commission exceeded its charge in making recommendations for specific legislative and administrative changes that would affect the food industry. In addition, the minority refuted evidence indicating that the food industry is characterized by high and growing concentration of ownership and power.

Thus, after a year and a half of intensive study costing about $2 million, substantial disagreement remained with respect to certain facts about the food industry as well as what should be done to improve its performance.

You Can Weigh a Range Cow Before She Knows It!

By S. Clark Martin, Kenneth K. Barnes,
and Leonard L. Bashford

Range cattle, like pudgy people, don't like to be weighed. Even reasonably gentle cattle can be so disturbed by gathering, sorting and weighing that they lose several pounds. So, if you weigh wild cattle often enough, they'll lose weight even on good feed. But, if you can tell when and how fast cattle are gaining or losing, and relate changes in weight to changes in the weather, the vegetation, and the market, you'll be in a better position to decide whether to sell now or later.

With some of these things in mind, the authors got together to see if the problem could be solved. After some reading and exploration, we decided to try an electrical method using strain-gage transducers and a strip-chart recorder. Strain-gage transducers have been installed on trucks to weigh loads of feed without having to drive to a scale. It seemed reasonable that range cattle could be weighed without disturbance with similar equipment.

The general scheme was that inexpensive platforms could be built at locations where cattle would have to cross them to get to water. Weighing could begin as soon as the cattle became accustomed to the platforms and would cross them at a normal walk.

A platform would be prepared for weighing by attaching the transducers and connecting them to the recorder. The transducers would not change the appearance or feel of the platform, and the platform would not move as the animal crossed it, but the animal's weight would change the resistance of the transducers.

Recorder At Slight Distance

By using a long lead, the recorder could be placed far enough from the scale to avoid disturbing the animals. We obtained satisfactory records when the recorder was operated from the cab of a pickup truck parked 50 feet from the scale.

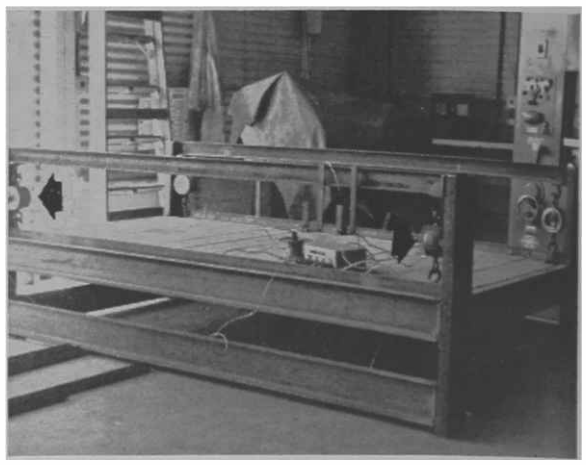

FIGURE 1 — Assembled scale with strain-gage transducers supporting the weighing platform at the corners. (U.S. Forest Service Photo).

Four strain-gage transducers were made and attached to the four corners of an experimental model of the scale in The University of Arizona shop (Fig. 1). The scale was calibrated by loading it with sandbags of known weight, then leading gentle University of Arizona cows across it.

The calibrated unit was installed at the Santa Rita Experimental Range, so that cattle had to cross it to get to water (Fig. 2) Interpretable charts were obtained as cattle crossed the scale at a normal walk (Fig. 3).

Improved Model Started

The scale pictured on these pages is our first attempt. The Rocky Mountain Forest and Range Experiment Station is building another unit with a simpler platform and commercial load cells. Additional components are being assembled and tested. These include switches and timers to start and stop the recorder, and a camera to photograph the animal being weighed. If all innovations perform as planned, the scale will be automatic. The present model requires an operator.

The scale will have many uses for research in range management and range animal husbandry. It will be possible to associate weight gains with changes in weather or vegetation. The researcher or the rancher will be able to tell when calves stop gaining in the fall. With such a scale the rancher can know what his calves

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FIGURE 2 — "When I'm thirsty and going for a drink, I really don't mind too much crossing this thing." (U. S. Forest Service Photo).

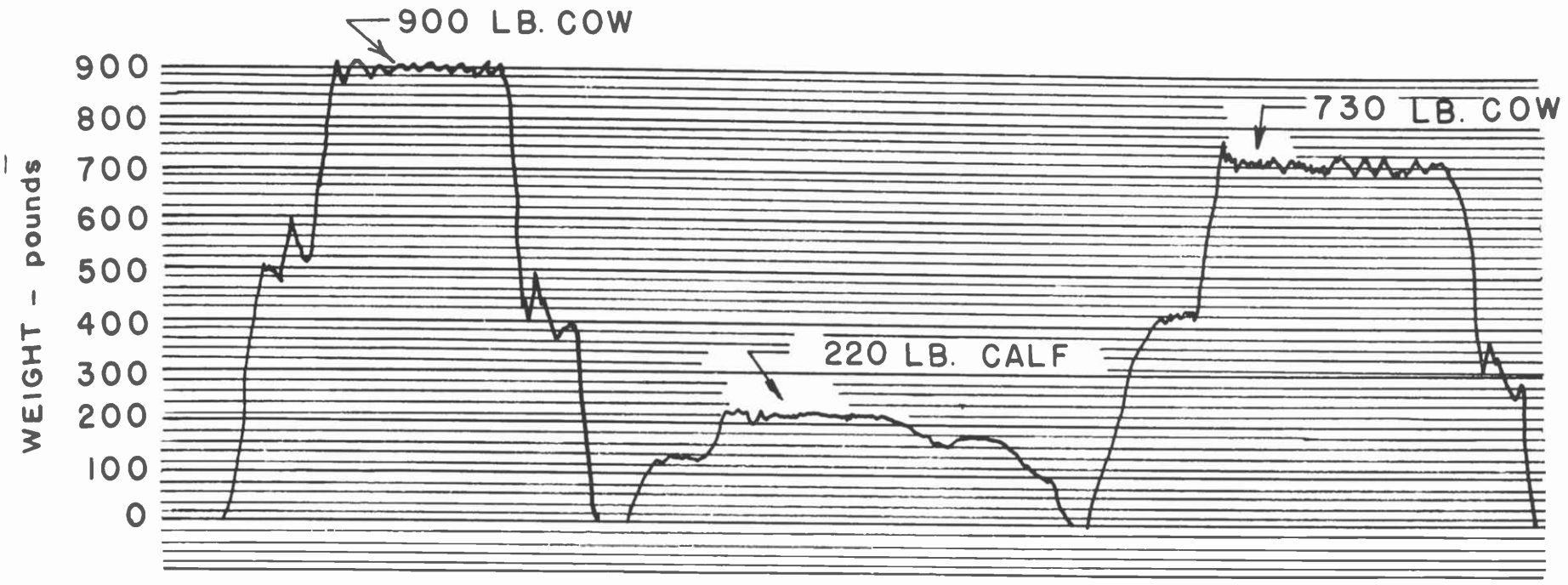

FIGURE 3 — As animals walk across the platform, the recorder writes interpretable lines on a chart. These traces were obtained as two cows and a calf each crossed the scale.

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weigh before he shows them to a buyer.

It Isn't Cheap!

The scale is expensive. Commercial components for the experimental model now being assembled will cost $3,000 to $4,000. However, one set of electrical components can be moved about to serve several platforms in different locations. There is a possibility, too, that the cost can be reduced by using less expensive components than those now being tested.

Mr. Martin is principal range scientist at the Rocky Mountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture, at Tucson; Dr. Barnes is head of the Department of Agricultural Engineering at The University of Arizona, and Mr. Bashford formerly was a graduate research assistant in the same department. The Rocky Mountain Station has a project location in cooperation with The University of Arizona; its central headquarters is located at Fort Collins, Colorado, in cooperation with Colorado State University. Readers who desire more detailed discussion of this project should read the report which will appear in an upcoming issue of the JOURNAL OF RANGE MANAGEMENT, submitted as Arizona Agricultural Experiment Station Journal Paper No. 1130.

HAY QUE CONTAR con un nidal por cada cinco ponedoras, y deben acondicionarse con cama suficiente, manteniéndola siempre limpia y seca. Se situarán repartidos por todo el gallinero, eligiendo al ser posible las posiciones que ofrezcan mayor penumbra. Vigilar, sobre todo en las iniciaciones de postura de las tandas, la puesta en el suelo, recogiendo aquellas aves que se observe lo hacen y trasladándolas inmediatamente a uno de los nidales libres.

Dr. Cline, Ag. Education Head, Dies Suddenly

Dr. Russell Walter Cline, head of the Department of Agricultural Education at The University of Arizona for 29 years, died last July.

A native of North Carolina, he earned his B.S. degree from North Carolina State College in 1924, M.S. from Virginia Polytechnic Institute in 1927, and Ph.D. from Ohio State University in 1937, the year he joined U of A faculty.

Besides a devotion to students in agriculture, he had a strong fondness for the Future Farmers of America program in Arizona, devoting much time to support and promote the program. Future Farmers of America is a part of the high school vocational agriculture program.

Dr. Cline authored one book and co-authored eleven others devoted to teaching and course designs for Vocational Agriculture.

He was a member of American Vocational Association, vice-president of the Association of Teacher Educators in Agriculture, American Association of University Professors, Arizona Vocational Association, Arizona College Association, Alpha Tau Alpha, Gamma Sigma Delta, Phi Delta Kappa, and Phi Kappa Phi.

Dr. Cline is listed in Who's Who in America and Who's Who in American Education.

He is survived by a brother, Carl H. Cline of Hickory, North Carolina.

Can Calf's Sex Be Predetermined?

If there's any way to tell the sex of a calf before it's born, animal researchers might come up with the answer some day. Dr. Robert Loy, animal scientist, University of California, Davis, says that male and female-producing sperm have been successfully separated and the sex predetermined in this way . . . but no researcher has been able to repeat his success, thus far.

Dr. Loy says it is possible to transplant the embryo from an outstanding cow to a less desirable one and let the second cow carry the embryo through delivery. "Many fertilized ova could conceivably be transferred from an outstanding cow to other cows, but the transplantation techniques are apt to become commonplace before we reach a decision as to what the characteristics of an outstanding cow are," Loy remarks.

The animal scientist says that control of ova production has not been too promising, but there is a possibility of controlling reproductive processes to the extent that calving of twins would be a certainty.

Synchronization of heat periods in cows needs more development and refinement, according to Loy, who mentions that this is a management practice that could improve reproductive efficiency.

Lots of Hot Dogs

Enough hot dogs to stretch from New York City to Los Angeles more than ten times will be eaten during the 1966-67 school year by public school youngsters participating in the school lunch program. An estimated 18 million pupils will put away approximately 38,050,000 pounds or 30,026 miles worth of franks.

4-H FACES ERA OF CHANGE AND GROWTH

"We want blue ribbon boys and girls as well as blue ribbon projects"

Arizona 4-H is in a state of transition.

It is progressing to meet the needs of boys and girls in a changing society. And, where earlier emphasis in 4-H has been teaching "how" to produce, the new program gradually being developed will place greater stress on the "why."

This program conversion, points out Graham P. Wright, State Leader of 4-H Club Work, will accent individual development rather than a project oriented program.

"In other words we want Blue ribbon boys and girls as well as Blue ribbon projects."

Changes in Last 50 Years

"It helps us to understand how valuable is 4-H flexibility when we view the changes that have taken place over the past 50 years," Mr. Wright recounts. The 4-H program started as an educational movement with a dual purpose of teaching rural boys and girls, and indirectly, their parents in the techniques of improved methods of farming and homemaking.

Records are not exactly clear but boys and girls first became involved in the educational movement, Mr. Wright says, when they accompanied their parents to Farm and Home Institutes. The institutes were conducted by the Agricultural Experiment Station of The University of Arizona College of Agriculture.

As early as 1907 boys and girls were invited to the university for these institutes, which had program features planned for their interests.

Six years later, in 1913, the first 4-H Club was formed as a cotton club in Chandler by the first volunteer 4-H leader, Charles Peabody. Two years later Arizona 4-H had its first national winner when Floyd W. Medlock, presently of Phoenix, turned in cotton production records which were the best in the nation.

In 1914 the Smith-Lever Act, creating the Cooperative Extension Service, incorporated in its program boys and girls club work. This is one of Extension's historically important features, later to be copied with certain variations by more than 90 nations.

A Vast New Program

It didn't take long for those working on the Extension 4-H programs to recognize they had an important youth development program — a human program — instead of just a cropping or production program.

These early-day 4-H workers came from the farm in most states. Also, the 4-H Clubs were generally closely tied to the local rural schools. About 90 percent of the early 4-H members were rural.

Even though the early Arizona 4-H workers were guiding boys and girls in project activity oriented toward production, they felt a need to help broaden 4-H'ers with other experiences.

The production emphasis, according to Mr. Wright, was usually centered around the boys learning to grow cotton, or tomatoes, or poultry and livestock. The girls, on the other hand, were trained in techniques of food preservation, such as canning. They learned to can the tomatoes grown by their brothers, or can the poultry and other foods which were the fruits of their brother's project in one or more production areas.

Learning Rubbed Off On Parents

Canning or preserving foods, in those days, was a particularly important experience because proper food preservation for rural families was very important during the period when food poisoning and spoilage was quite common. And, through the successes and failures of boys and girls in their projects, much of their learning rubbed off on their parents.

In recognition of their successful efforts, the boys and girls competed for local, state and national awards.

The national awards program was well established by 1924. It was also about this time when the 4-H Clover was adopted as the symbol for 4-H Clubs. On this clover are the four H's which emphasize the training of head, heart, hands and health for better living.

The Flannegan-Bankhead Act in 1945 provided additional funds to promote 4-H Clubs in the United States. This act and its resultant promotion program brought about changes which 4-H professional workers felt had been needed for many years. The new emphasis was to make 4-H Clubs more of a youth development program. It still utilized its project activities, but began to use agricultural and home economics projects as an education method. This change focused the direction of teaching towards the world famous motto — Learn By Doing.

One of the best ways for a boy to learn animal nutrition, or management is by combining his reading and instruction with the practice of feeding and raising an animal. And when 4-H boys and girls complete a successful year they participate in fairs and demonstrations in order to let others see how well they have performed.

Another value of these events is that young people are given an opportunity to extend and broaden their knowledge and experiences through idea exchange with other successful boys and girls.

America Growing More Urban

Characteristically through the years 4-H was deep rooted in the rural way of living. It has not had the same rate of mobility as the rest of the population in its move from rural to urban.

Mr. Wright points out that 60 percent of the 4-H enrollment in Arizona is still rural. There never has been a great campaign to enlist members from urban areas. "But, urban 4-H Clubs do exist," he says.

They exist primarily because rural parents who move to urban areas want their children and their friends' children to be able to enjoy and gain from 4-H experiences as the parents once did.

With these changes slowly evolving, our projects are still oriented towards agricultural, home economics and related interests. And 4-H has also become incorporated with many other activities which reach boys and girls through Extension. Examples are the International Farm Youth Exchange, 4-H citizenship, 4-H recreation and safety, Civil Defense, conservation, management, nutrition and leadership development.

Learning by doing in real life experiences is the main theme for development of other youth organizations

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Border Bug Battle

Few Land-Grant colleges of agriculture are as near the border of a foreign country as is this college, at The University of Arizona. Likewise, probably all readers of PROGRESSIVE AGRICULTURE IN ARIZONA have been stopped at the Nogales border and asked "Bringing any fruits or vegetables?"

But of the thousands who are stopped daily, few realize the importance of that question, or the hazard to our agriculture, our livelihood and food supply, in the possible invasion of insects and diseases from which our crops, trees, soil, and ornamental plants and flowers are now protected. The USDA Plant Quarantine inspectors are doing an important job and deserve the good will and support of all of us.

The side door camper had come all the way up from Panama and, said the U. S. Department of Agriculture plant quarantine inspector at San Ysidro, Calif., "I spent 20 minutes playing hide and seek in drawers, closets, etc. Every drawer, in its remote corner, yielded at least one plant or fruit wrapped in used clothing.

"The wife of the driver insisted 'This is the very first time we ever did anything like this; we didn't know it was wrong.' "

But then, under a mattress in the sleeping portion of the camper, the inspector found a cactus plant 2½ feet tall, with balled roots 8 inches in diameter and a foot deep.

The glib wife explained: "Oh, we took some clothing to the poor people down south, and they probably slipped that cactus in there, as a secret gift for us to discover when we got home again." The inspector mentally questioned the ability of anyone's sleeping on top of a 2½ foot cactus with a bigger-than-football ball of earth at its base, but all he said was that such smuggling of forbidden plants would bring a $5 fine.

Carelessly, the woman reported sharply: "But it only cost us a dollar!" As the search of the camper continued, it netted a total of 48 plants — citrus, orchids, cactuses, 13 sugar cane nodes, nearly half a pound of cotton seed, nuts, etc.

The inspector computed, assessed a total fine of $27, sharply asking if there might possibly be anything else, anything he had overlooked.

"No," the lady replied. "Absolutely not," as she reached in her purse to produce the $27 — and out rolled three more oranges!

Congressional Record Reprints Editorial

The editorial by Dean Myers in the September-October issue of PROGRESSIVE AGRICULTURE IN ARIZONA entitled "Aid is Two Way Street," was reprinted in *The Congressional Record* at the request of Rep. Morris K. Udall of this district. The editorial, pointing out that plant searches by U. S. botanists throughout the world bring many valuable plants from other countries to the U.S., including pharmaceuticals with great promise, was reprinted with a preface by Cong. Udall, in which he warmly endorsed the sentiments expressed.

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with career exploration programs. 4-H has become the largest out of school co-educational youth program in the world.

"We're proud that 4-H provides such wonderful opportunities for citizenship and leadership development," says Wright. As an example he cites the 4-H camping activities. This is one of the ways 4-H youth live together in an informal environment to learn, practice and broaden their citizenship and leadership acumen. They learn to live close to nature, with each other, see the values of conservation practices, and the needs for proper utilization of our natural resources.

The 4-H of Today

"Today, 4-H is in transition," says Wright. "The reason for this is that there is a need to up-date experiences to fit living in a changing society in which there are changes in technology, education, the struggle for socio-economic equality and a movement towards better international understanding.

"In the future, 4-H will become more individual, more people-centered," he said. "Being people-centered rather than project-centered will provide opportunities for boys and girls to find, in the program development, factors to help them reach their potential in decision making and career exploration.

"The emphasis will swing away from only 'how' to 'why' in project effort. The 'why' we need cotton production is becoming as important as 'how' to produce it. We need to teach 'why' a commodity is needed, 'why' is it utilized and in what ways, 'why' consumer education is important, and 'why' economics plays such a vital role in the overall production scheme," says Wright.

Although membership in 4-H clubs has never been restricted to anyone who wanted to belong, Arizona 4-H leadership will continue in efforts to reach more boys and girls from disadvantaged rural, as well as urban, areas. Projected growth will require more adults in leadership roles.

Volunteer leaders work with boys and girls in the age bracket of from 9 to 19. Currently these volunteer leaders, more than 1,300 of them in Arizona, are working with more than 8,000 4-H boys and girls. There are 4-H clubs in each of Arizona's 14 counties. And, every county has an opportunity to expand 4-H opportunities and experiences to more youth.

GROUP OF HEIFERS in accelerated group. Weights and age represented from left to right: 200 pounds at 3 months; 400 ← pounds at 6 months; 700 pounds at 9 months; 950 pounds at 14 months; 1200 pounds at 16 months. Attention is directed to the size and lack of patchy fat on these animals.

Rapid Growth and Early Breeding of Dairy Heifers

By R. W. Gardner and L. V. Garcia

A series of nine month periods were significant in the history of a special group of 24 Holstein heifers. In a time lapse of nine months they developed from microscopic sized eggs to 95 pound calves. Nine months later they were sexually mature and large enough to breed.

Given another nine months they had calved and were starting to pay for their keep. This type of intensified agricultural production is showing some merits we may have overlooked in our heifer feeding and breeding programs in the past.

These 24 heifers are being compared to 24 other Holstein heifers fed to grow at rates commonly observed in the field. Measures of comparisons of the two groups have included rate of gain, skeletal development, age and size at puberty, feed consumption, efficiency of feed utilization, and feed costs. Other comparisons, which are incomplete at this time, relate to breeding efficiency, calving problems, milk production and lifetime performance.

The 48 heifers were fed one of three calf starters and hay, free choice, from birth to 200 pounds. The 24 rapidly grown heifers continued on a self-feeding grain and hay program until verification of pregnancy 60 days post-breeding. The grain ration appears as a footnote to Table 2.

Dr. Gardner is a member of the Dairy Science Department staff, Mr. Garcia a graduate student in that department.

From verification of pregnancy to calving, grain was restricted to four pounds per day and alfalfa hay was always accessibe. The 24 normally fed (control) heifers were limited to four pounds of grain daily and excellent alfalfa hay, fed at levels to allow weight gains according to a current standard (U.S.D.A. Tech. Bull. 1099). Anticipated calving weights of heifers in both groups is 1200 pounds.

First breeding of heifers fed to grow rapidly was at the time of second estrus (heat), if their weight exceed 670 pounds. Breeding age of the control heifers was set at 15 to 16 months (800-840 pounds.) Breeding was by artificial insemination.

Grew in Every Way

Of particular significance in this study was the observation that growth in body dimensions paralleled weight gains (Table 1, and photo at the top of this page). The heifers allowed unlimited access to grain gained 40 percent faster, measured 40 percent taller and 40 percent longer in the time required to gain 600 pounds (200-800 pounds) vs. their mates fed normal rations. Equated to equal weights, the average body measurements of the two groups were

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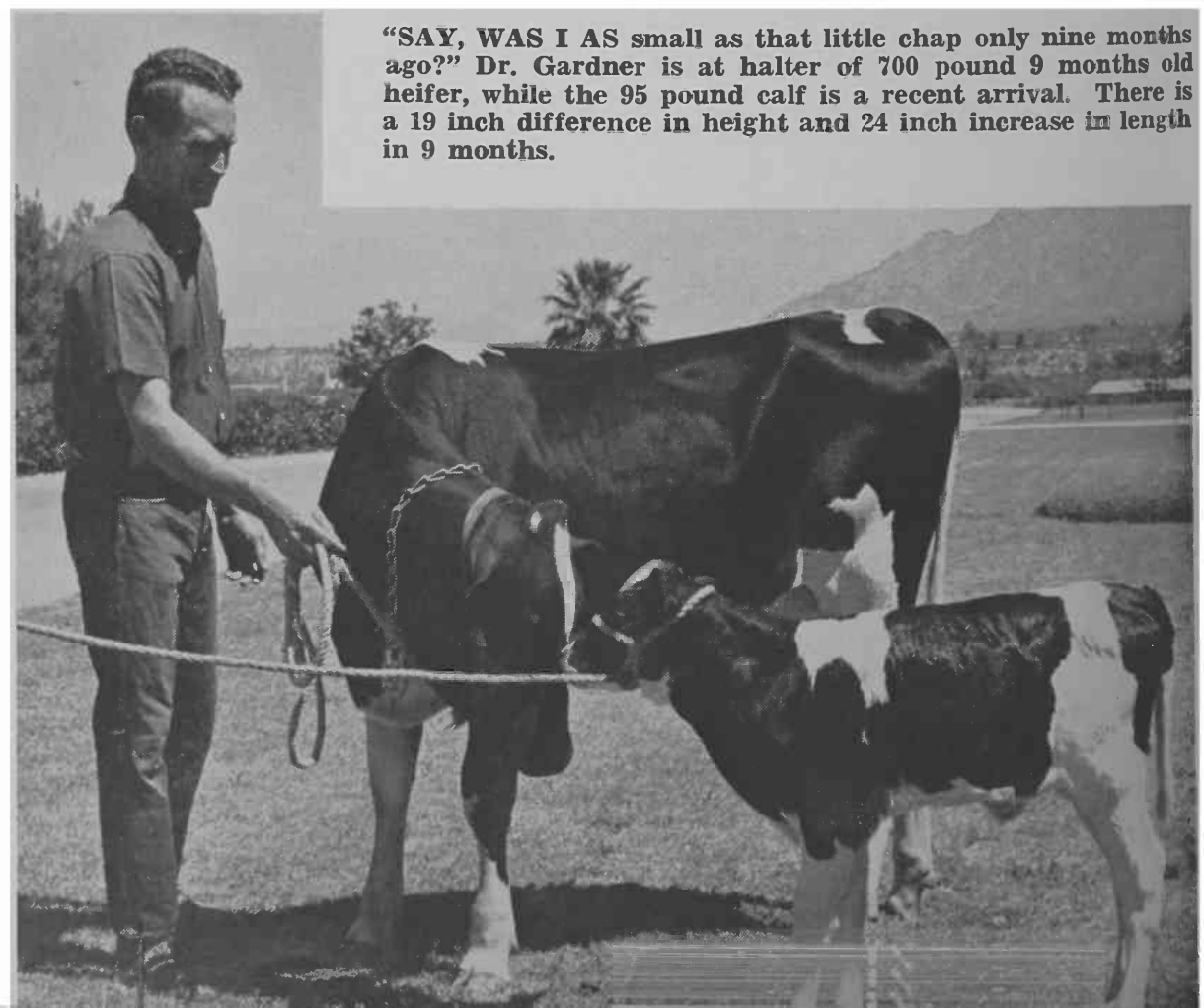

"SAY, WAS I AS small as that little chap only nine months ago?" Dr. Gardner is at halter of 700 pound 9 months old heifer, while the 95 pound calf is a recent arrival. There is a 19 inch difference in height and 24 inch increase in length in 9 months.

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approximately equal. This is shown graphically in graph at right. Individual points on the graph demonstrate that genetic factors affected height at equal weights more than the nutritional treatments imposed.

Many have assumed that feeding large amounts of grain fattened heifers without eliciting more rapid skeletal development, and accordingly high roughage rations have been called "growing" rations. Results of this study indicate that this assumption is fallacious. Obviously the growth potential of dairy heifers is not normally observed due to a deficiency of one item in the daily ration — *calories.* These heifers exhibited slick and glossy hair coats but did not become excessively fat nor patchy around the tailhead (see photo, opposite page).

Age at first estrus was reduced by two months due to feeding grain free-choice (Table 3). You will note in Table 1 that body weight, not age, is the chief determinant of sexual maturity. In accelerating the growth of heifers by grain feeding, a breeding program based on weight rather than age should complement the feeding program or any advantage is forfeited.

Feed Consumption & Utilization

Total pounds of daily feed intake were surprisingly similar between groups, differences in gain being attributable to differences in energy concentration in the grain (Table 1).

The heifers accelerated in growth required only 80 percent as many digestible calories as the control heifers over equal weight gains (200-800 pound). An "overhead" of calories required to maintain the body functions of the slower growing animals over a longer period reduced the productive utilization of feed calories (Table 2).

Cost Comparisons

Pricing grain and hay is arbitrary because of differences in pricing at different locations and times of year. Assuming that excellent quality alfalfa hay is purchased at $32 per ton and grain at $60 per ton the feed costs for the two groups of heifers from 200 pounds to conception would approximate values given in Table 2. Examination of preliminary results indicate that feed costs to calving will continue to be slightly less for the animals accelerated in growth and bred early.

Other cost and return factors, including labor, interest on investment, six month earlier production, etc., have not been considered but would

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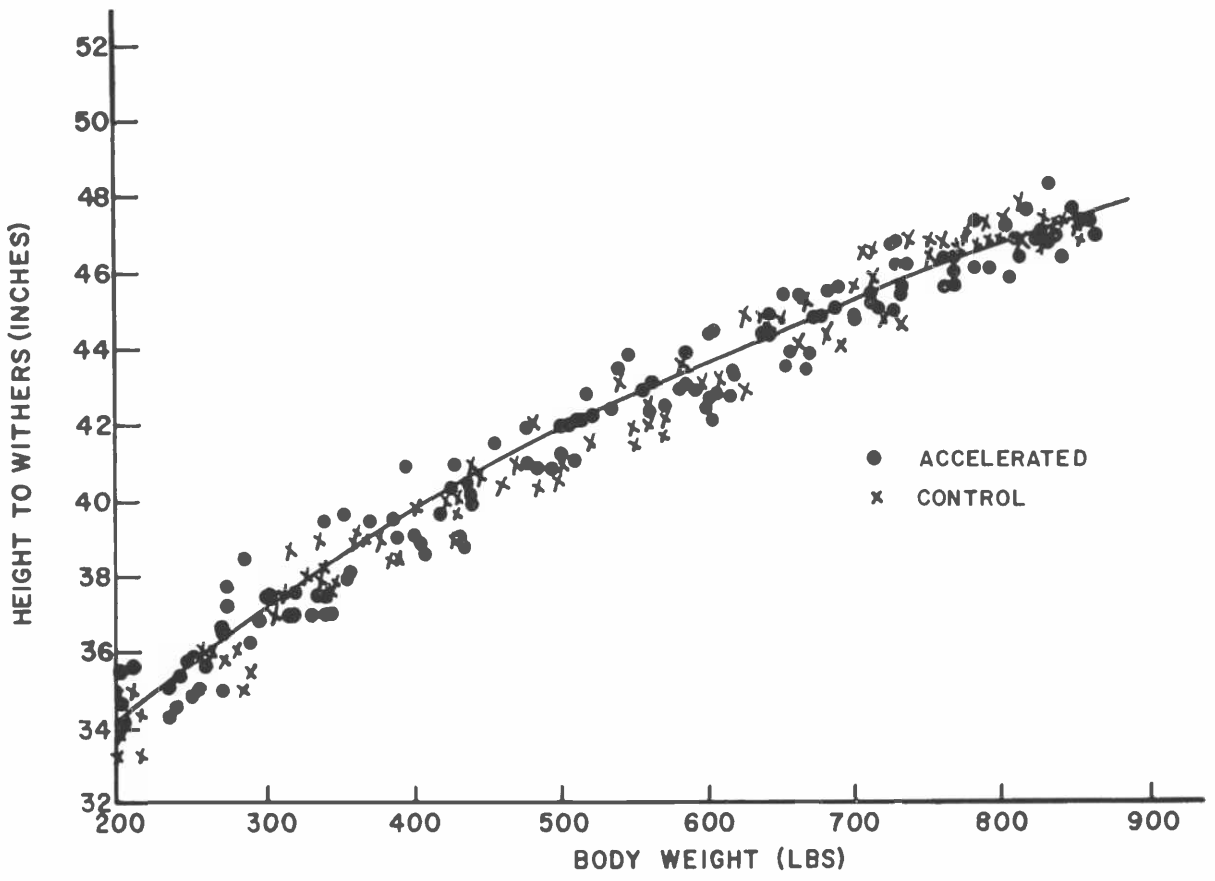

RELATIONSHIP BETWEEN BODY WEIGHT AND HEIGHT AT WITHERS OF HEIFERS GROWING AT DIFFERENT RATES

Table 1. Average Daily Gains and Feed Consumption of Heifers During Each 100 Pound Weight Gain.

Treatment	*Body Weight Gains (lb.)* 200-300	300-400	400-500	500-600	600-700	700-800
Rapid growth						
Daily gain, lb.	2.3	2.7	2.6	2.6	2.1	2.3
Daily feed consumption						
Grain, lb.	7.6	11.0	12.8	13.3	12.6	13.1
Hay, lb.	1.9	1.5	2.4	3.3	4.4	6.3
Normal growth						
Daily gain, lb.	1.6	1.9	2.0	2.1	1.5	1.1
Daily feed consumption						
Grain, lb.	4.0	4.0	4.0	4.0	3.4	0.0
Hay, lb.	4.3	7.9	10.1	12.5	14.6	17.4

Table 2. Feed Consumption and Feed Costs of Heifers Fed Different Levels of Energy From 200 Pounds to Conception.

	Treatment Groups	
	Rapid Growth	*Normal Growth*
Feed consumption		
Grain[1], lb.	2625	927
Hay, lb.	515	5178
Total, lb	3140	6105
Feed cost		
Grain[2]	$ 78.75	$ 27.81
Hay[2]	8.24	82.85
Total	$ 86.99	$110.66

[1] Grain mixture for accelerated heifers: rolled barley, 74.3%; molasses dried beet pulp, 10%; cottonseed meal (pellets) 10%; molasses, 5%; calcium carbonate, 0.7% and vitamin A, 202,000 I U/cwt. The grain mixture for the normally fed heifers and accelerated heifers restricted in grain intake was a conventional dairy ration.

[2] Feed costs were calculated on basis of alfalfa hay at $32.00/ton and grain at $60.00/ton.

A few years ago the possibility of a vegetable greenhouse industry in southern Arizona – where the sun spends the winter – would not have been given serious thought. Now, with the advent of plastics for greenhouse coverings, increased interest in growing high quality crops, and development of new information on growing vegetables under controlled conditions, greenhouse production is a reality and offers potentials for making profits in Arizona. About 10 greenhouses covering about four acres of vegetables now are in production.

Thinking of Greenhouse Production?

By Norman F. Oebker and Boyce R. Foerman

Why use a greenhouse for growing vegetables in this climate? Although we do have desirable growing conditions part of the year and can grow some crops most of the year, the extremes in temperature at other times cause poor growth and quality and even death of certain plants. A warm season vegetable, such as the tomato, cannot tolerate the cool weather and infrequent freezes of our winters, or set fruit during the heat of our summers.

By providing the proper environments by means of greenhouses, high quality vegetable crops can be produced year around. Not all crops can be grown profitably under this arrangement. The tomato is the best possibility.

Although the potential is good, just having a greenhouse does not guarantee success. Nor is greenhouse vegetable production all a bed of roses. There are many pitfalls in the path to profits. Many factors first need to be considered in building a greenhouse and in managing a crop.

The greenhouse should be on a well drained, sandy loam to silt loam soil, with good quality of water available. Areas with salt problems should be avoided.

It is important in the design and construction to know the requirements of the crop and the situation. Expert help is needed to plan the structure and facilities for heating, cooling, ventilating and watering. In southern Arizona both heating and cooling are necessary.

Temperature control is so important that it is being re-emphasized here. The temperature ranges maintained during the day and night will determine to a great extent the yield and quality of the crop. For the tomato, a night temperature of 58° to 65° F. and day temperature of 65° to 80° is desirable. The lower temperatures are used during cloudy weather, or under poor light conditions.

Diseases can become a real problem. Precautions should be taken to prevent their development. Soil fumigation, growing of resistant varieties, and a sanitation program should be adopted. Botrytis, leaf mold and viruses have caused serious problems in some Arizona greenhouses.

Greenhouse plants need specialized care. With the tomato, the following cultural practices are necessary: transplanting, periodic fertilizing, training and pruning, mulching, watering and pollinating.

The marketing outlet is often the last factor to be considered but actually it is the most important. Sales opportunities should be surveyed early in the game. Without sales, no reward can be reaped. Local stores are interested in high quality vegetables. Growers marketing together may sell their products more efficiently.

Much can be learned from the experiences of others. Our table lists the costs and returns of a tomato greenhouse in the Phoenix area. Depending on efficiency of operation and price received, about 70 to 75 tons per acre yield of salable product is needed to break even. Since these figures will vary with each situation, this table should be used only as an indication of what to expect.

Greenhouse production is intensified and high investment agriculture. Before going into the business, one

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favor rapid growth and early breeding.

Since more dairy heifers are being fed in dry lot and good pasture land is becoming more expensive and less available, accelerated growth and early breeding is becoming increasingly more attractive and may some day supplant the traditional system of raising heifers.

Data is continuing to be accumulated and will be published as it becomes available.

Table 3. Reproductive Performance.

Observation	*Treatment Group*	
	Rapid Growth	*Normal Growth*
Av. weight at first estrus, lb.	603	630
Av. age at first estrus, mo.	7.7	9.7
Av. weight at first breeding, lb.	700	820
Av. age at first breeding	9.4	15.5

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should investigate all phases of construction, growing and marketing. The University of Arizona is developing background information on these subjects. Consult the U of A County Agricultural Agent in your community for the latest.

The authors are Extension Horticulturist and Maricopa County Extension Agent, respectively.

Estimated Costs and Returns for Plastic Greenhouse Tomato Growing in Phoenix Area

CONSTRUCTING AND EQUIPPING COSTS for recognized economic unit 75 x 200 ft. covering 15,000 sq. ft. (approx. ⅓ acre)		
Minimum—80¢ per sq. ft., all plastic, some used material		$12,000
Typical—$1.00 per sq. ft., fiberglass roof, plastic walls, mostly new materials		$15,000
Seasonal Culture		
Fertilizer (20 tons manure @ $4.00)	$ 80.00	
chemical fertilizer	20.00	
Fumigation (300 Methyl Bromide @ 85¢ per Application)	300.00	
Plants (3,000 @ 5¢)	150.00	
Water	25.00	
Special Tillage	25.00	
Misc. Material (Insect and Disease control, etc.)	50.00	
		$ 650
Labor & Management (10 mo. @ $500.00)		$ 5,000
Fixed Costs		
Maintenance		350
Utilities (Approx. 10 mo. @ $150.00)		1,500
Depreciation (Annual, 10 yr. period)		1,500
Insurance, Taxes & Interest		1,500
SEASONAL PRODUCTION COSTS		$10,500
Marketing Costs (Extra Labor, cartons, hauling, etc.)		2,000
TOTAL SEASONAL COSTS		$12,500
SEASONAL GROSS INCOME POTENTIAL		
75 Tons/Acre 50,000# yield/unit @ 25¢		$12,500
50,000# yield/unit @ 30¢		$15,000
90 Tons/Acre 60,000# yield/unit @ 25¢		$15,000
60,000# yield/unit @ 30¢		$18,000
120 Tons/Acre 80,000# yield/unit @ 25¢		$20,000
80,000# yield/unit @ 30¢		$24,000

Dr. Paul Keener, Expert On Forest Fungi, Dies

Dr. Paul D. Keener, a member of The University of Arizona College of Agriculture faculty for 21 years, died suddenly last August of a heart attack. He was 57.

Funeral services were held at Lawrenceville, New Jersey, where Dr. Keener was born.

During the course of his career, Dr. Keener wrote more than 50 scientific papers. He was a specialist in the study of fungi and a forest pathologist in the Department of Plant Pathology.

He came to the UA in 1945 after receiving his Ph.D. from the University of Pennsylvania. He received bachelor and master's degrees at Pennsylvania State University.

Dr. Keener belonged to 12 professional organizations including the American Phytopathological Society and the Botannical Society of America. He was the first president of The University of Arizona chapter of Gamma Sigma Delta, a national agricultural honorary society.

In addition to his wife, Elizabeth, Dr. Keener is survived by two sisters, Miss Jane D. Keener of Washington Grove, Md., and Miss Ruth D. Keener of New York.

Cochise County
- KAWT, Douglas — 6:15 a.m. Mon. through Fri.
- 12:20 p.m. Monday through Friday
- KHIL, Willcox — Mon. thru Fri., 6:05 a.m.

Coconino County
- KCLS, Flagstaff — Tues. and Thurs., 8:45 a.m.
- KCLS, Flagstaff (Home Agent) — Wed., 10:15 a.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., 9:06 a.m. (Extension Home Economist)

Navajo County
- KDJI, Holbrook — Tues., 1:00 p.m.-1:15 p.m.
- KINO. Winslow — Sat., 12:15-12:30 p.m.

Pinal County
- KPIN, Case Grande—Mon. thru Sat., 6:55 a.m.; Mon and Fri., 9:30 a.m.; Tues., Thurs. 11:30 a.m. on Monday and Wednesday and Sat., 12:20 p.m.

Yavapai County
- KYCA, Prescott — Mon., Wed., Thurs. and Fri., 3:45 p.m.
- KNOT, Prescott — Mon., Wed. and Fri., 6:25 a.m.
- KVIO, Cottonwood—Mon. and Fri., 8:15 a.m.

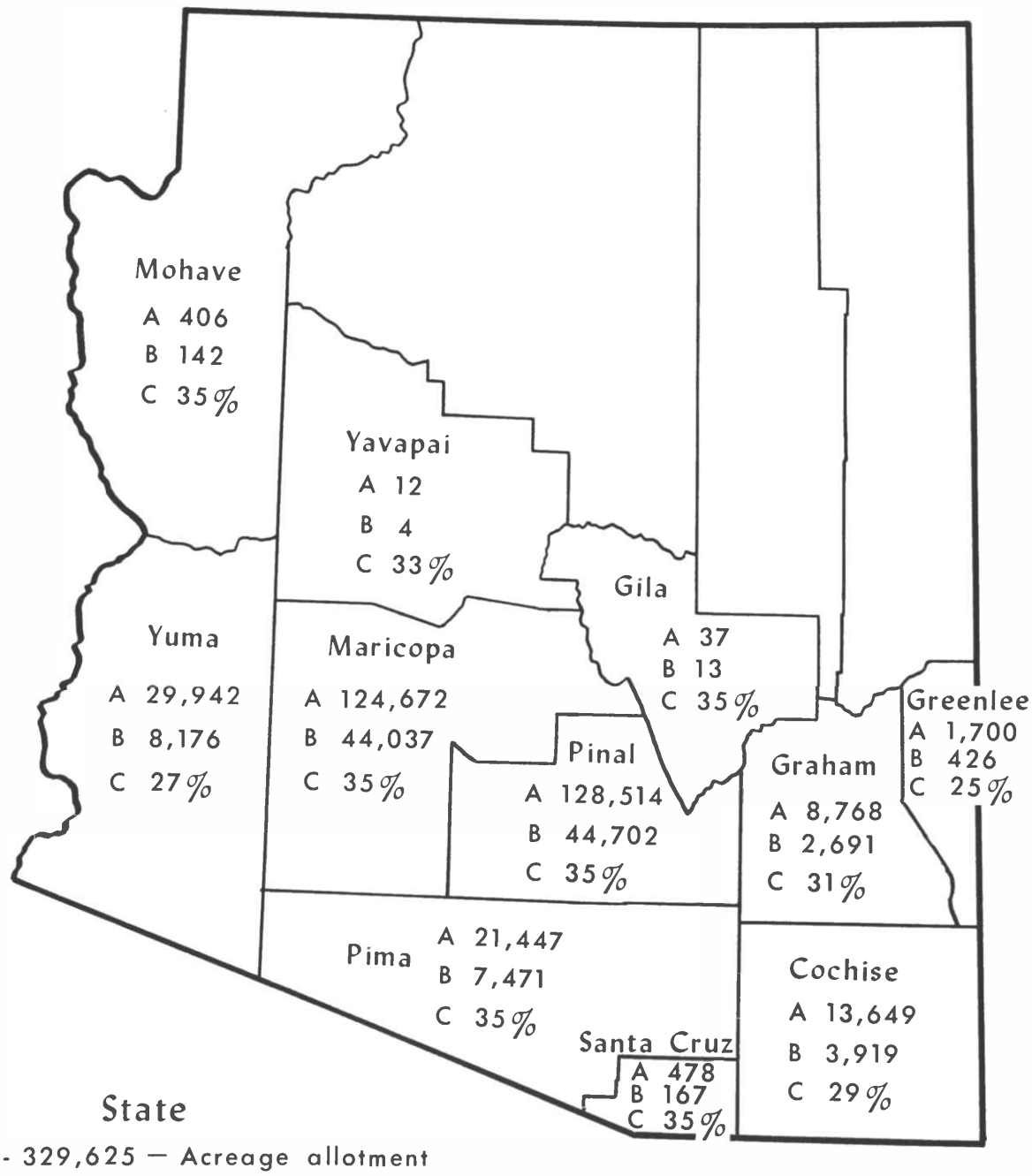
Yuma County
- KVOY, Yuma — Mon. thru Fri., 5:45 a.m.
- KYUM, Yuma — Tues., Thurs. and Sat., 6:25 a.m.
- KYUM, Yuma — Saturday, 4-H Program, 10:05 a.m.

Growers Will Face Changes, Including High Marketing Cost

By C. Curtis Cable, Jr. and Robert S. Firch

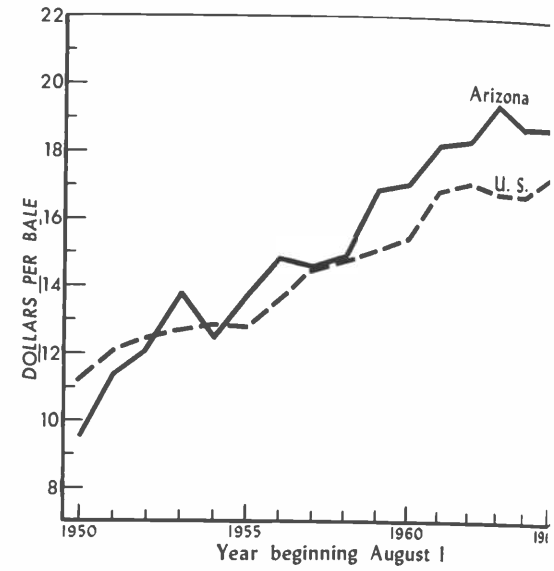
Under the present cotton program, Arizona cotton producers have diverted about 112,000 acres or about 34 percent of the 1966 state allotment of 329,625 acres (See Map). By counties, diverted acreage ranges from a low of 25 percent in Greenlee County to a high of 35 percent in six counties. Assuming a per acre yield of 1,200 pounds, which is slightly higher than for any previous crop year, approximately 218,000 acres planted in 1966 will produce 523,200 bales. This will be the smallest crop since 1950, and will be less than the 1964 and 196 crops by about 220,000 bales.

The authors are marketing specialist, Agricultural Extension Service, and associate professor, Department of Agricultural Economics, respectively.



COTTON ACREAGE allotment, diverted acreage and proportion of allotment diverted, by counties, Arizona, 1966-67 crop.

Cotton



CHARGES FOR GINNING upland cotto Arizona and U.S. — 1950-65.

A reduction in production of th magnitude will necessitate some m jor changes in the operations of firm providing ginning, warehousing other marketing services to Arizon cotton producers. The quantity these services needed will be redu in about the same proportion as t reduction in cotton production. Thu much of the existing gin capacit warehouse receiving space, and oth cotton marketing facilities in the sta will not be as fully utilized as the have in the past few seasons.

This will tend to increase the co per bale for the volume actually ha dled, and in turn tend to reduce t profit of marketing firms or exert upward pressure on charges to pr ducers for marketing services. The marketing firms, as well as produce are vitally interested in possible mea for counteracting these development

Volume handled and efficiency operation are two key componen affecting the total per bale cost marketing firms. Efficiency of oper tion affects the total cost of labo power, and other variable cost ite Since these inputs are usually e ployed and purchased as needed, th costs per bale are not appreciably a fected by volume. For example, if firm closes down a particular gin pla for a season, there are no expenditur for plant labor, power, and similar o erating inputs.

Volume Affects Costs

Volume, however, is a major d terminant of the costs per bale for d preciation, taxes, insurance, and oth

utback

xed costs associated with invest-ents in gins and other marketing fa-lities. Unlike total variable cost, tal fixed cost remains unchanged nce it is established for the season, ven if the facility is not used. Thus, ne greater the volume processed or andled, the lower the fixed cost per ale. Conversely, as the volume han-led declines, fixed cost per bale in-reases because there are fewer bales absorb the total fixed cost.

Although all business firms should ntinually strive for greater effi-ency, the problem of maintaining olume is currently more critical than perating efficiency for firms provid-g cotton marketing services in Ari-na. With prospects of an annual olume down 40 percent from the cent peak production in 1962, al-rnatives confronting these firms are) accept sharply lower profit mar-ns, (2) substantially increase their arges to producers, (3) temporarily se down, or dispose of some of eir facilities and thereby reduce the ntity of services provided, (4) ne combination of any or all of the st three choices, and (5) go out of siness. None of these alternatives e mutually attractive to producers, nners, warehousemen, and other in-vidual segments of the cotton trade. us, the final choice for individual ms will be difficult.

Forced to Face Problem

During the past decade many firms ve already faced up to these oices, because of increases in in-stments in gins and other facilities, d almost continuous increases in it costs of variable inputs for op-ating them. In many cases, these ms partially counteracted rising in-stment and input costs by improv-; their operating efficiency, and/or reasing their charges to producers. For example average charges for ning Arizona upland cotton in-ased fairly steadily from about 50 per bale in 1950 to $18.79 in 65 (See Graph). This increase in arges is equivalent to a reduction almost 2 cents per pound in the ce producers receive for cotton.

Charges for warehousing services, ept for receiving, also went up dur-this 16-year period. The charges bale for compression in Arizona nt up from $1.40 to $1.76 for stand-density, and from $1.50 to $1.96 for high density. Monthly charges per bale for insured storage increased from 30 cents in 1950 to 51 cents in 1965. Receiving charges, which averaged $1 per bale from 1952 to 1961, were 52 cents per bale in 1965.

Drastic Cut in Volume

Production of cotton in Arizona exceeded 700,000 bales annually during this period of rising charges to growers. With production in 1966 expected to drop to the lowest level since 1950, the problem of reversing or at least checking the upward trend in marketing costs and charges becomes increasingly difficult.

For the past seven ginning seasons, for example, there were approximately 135 to 140 gins in Arizona. Their average annual volume ranged from a low of about 5,250 bales in 1959, to a high of about 6,700 bales in 1962. To even maintain the 1959 average, less than 100 gins would be required to handle the estimated production of 523,000 bales in 1966. And, apparently, average volumes as great as 6,000-7,000 bales are insufficient to appreciably offset rising costs and to reverse the upward trend in ginning charges.

The problems resulting from the reduction in volume as summarized here not only deserve the attention of the immediate firms involved, but are equally important to all other sectors of Arizona's cotton economy.

Multiplier Effect Of Decreased Acreage On Arizona Economy

By William E. Martin and Leonard Bower

The 1966 upland cotton crop is being grown according to a new set of government regulations intended to reduce acreage and production of this surplus crop. To receive price supports for the cotton grown, producers were required to reduce plantings at least 12.5 percent from the maximum set by their allotment (small farms were excluded).

In addition, growers were encouraged to divert another 22.5 percent of their effective allotment, for which they would receive government payments. Thus, cotton producers were able to divert up to a total of 35 percent of their effective allotment in 1966 and receive payments for doing so.

Arizona upland cotton farmers have diverted acreage at close to the 35 percent maximum for which government payments will be made. Table 1 shows the breakdown by county of acreage planted and diverted out of the current allotments. Of Arizona's 2,749 cotton farms, 2,610 have signed up for participation in the 1966-67 program. Our purpose is to assess the impact on the entire Arizona economy resulting from the large decrease in cotton production which is taking place between 1965 and 1966. Effects on income and labor and water use will all be considered.

Dr. Martin and Mr. Bower are associate professor and research assistant, respectively, in the Department of Agricultural Economics.

Input-Output Analysis

The method of analysis is input-output, already quite familiar to economists and rapidly finding wider usage outside of strictly academic problems. Input-output analysis is an analytical tool blending together theoretical, mathematical, and statistical aspects of the field of economics. Essentially, it is a method of output accounting which takes advantage of the relatively stable pattern of the flow of goods and services among the sectors of our economy.

We have constructed a 25-sector input-output model for Arizona which relates each of Arizona's producing sectors to every other producing sector in the state. This model enables us to assess the impact of a change in any one sector on all other sectors. In this particular case, cotton is un-

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dergoing a substantial decrease in production. Using our model, the total impact on the other 24 sectors of the Arizona economy can be assessed along with the effects on the cotton industry itself.

In column one of Table 2 are the estimated decreases in production for each of the 25 interdependent Arizona sectors as a result of the decrease in cotton production from 1965 to 1966. The figures are dollar values of output expressed in terms of 1965 prices. The $35 million figure for the cotton sector is not hard to understand. With the decrease of about 34 percent in acres planted, the expected result is a substantial decrease in value of production. The other entries in column one are direct *and indirect* results of the decreased need for productive inputs in the cotton sector.

Many Are Affected

Cotton farmers buy part of their fertilizer, machinery, services, and other supplies from Arizona industry. When cotton acreage is cut back, the amount of inputs required from these other Arizona producing sectors is also reduced. A study of cotton production reveals that this sector makes direct purchases from only 10 of the 24 other sectors listed. However, when indirect effects are taken into account, a decrease in cotton production has an effect on 22 of the other Arizona sectors.

Chemicals and fertilizers (sector 16) is an example of a sector from which cotton directly purchases inputs for its own production. Cotton does not make any direct purchases from the mining sector but still affects mining. Part of the explanation is that cotton buys inputs from fabricated metals and machinery (sector 18) which in turn buys some inputs from mining. Another example is meat animals and products (sector 1) from which cotton makes no direct purchases of inputs. However, chemicals and fertilizers (sector 16) purchases inputs from meat and poultry processing (sector 12) which in turn purchases inputs from the meat animals and products sector.

A complete evaluation of the economic effects of the decrease in cotton production must take into account all of these circular indirect effects as well as the direct effects. One of the advantages of input-output analysis is that it makes possible this complete analysis. The most affected of the other agricultural sectors is miscellaneous agriculture (sector 10), which is composed in part of cotton ginning, a service that will be needed much less in 1966.

Table 1. Arizona Participation in the 1966-67 Upland Cotton Program.

County	*Acres Allotted*	*Acres Planted*	*Acres Diverted*	*Percent of Acres Diverted*
Cochise	13,649	9,730	3,919	28.7
Gila	37	24	13	35.1
Graham	8,768	6,077	2,691	30.7
Greenlee	1,700	1,274	426	25.0
Maricopa	124,672	80,635	44,037	35.3
Mohave	406	264	142	35.0
Pima	21,447	13,976	7,471	34.8
Pinal	128,514	83,812	44,702	34.8
Santa Cruz	478	311	167	34.9
Yavapai	12	8	4	33.3
Yuma	29,942	21,766	8,176	27.3
All Arizona	329,625	217,877	111,748	33.9

Source: United States Department of Agriculture, Agricultural Stabilization and Conservation Service, Arizona State Office, Phoenix, Arizona, June 1966.

Table 2. Decreases in Gross Output, Employment, and Water Intake Anticipated in Arizona Economic Sectors as a Result of the Increased Cotton Acreage Diverted from 1965 to 1966.[a]

	Sector	*Decrease In*		
		Value of Gross Output	*Labor Requirements*	*Water Intake Required*
		Dollar	Man-Hours	Acre-Feet
1	Meat Animals & Products	5,260	385	2.06
2	Poultry & Eggs[b]			
3	Farm Dairy Products	3,557	764	.90
4	Food & Feed Grains	36,962	10,069	2,841.63
5	Cotton	35,264,839	2,846,014	470,857.90
6	Vegetables[b]			
7	Fruit & Tree Nuts	42	10	.37
8	Citrus	42	10	.41
9	Forage	274,166	38,431	11,806.16
10	Miscellaneous Agriculture	3,750,300	631,891	23,334.03
11	Grain Mill Products	12,171	544	.22
12	Meat & Poultry Processing	9,007	314	.11
13	Dairy Products	8,256	511	.07
14	Canning, Preserving & Freezing	803	100	.04
15	Miscellaneous Agric. Processing	21,082	2,311	.41
16	Chemicals & Fertilizers	716,534	44,842	20.42
17	Petroleum	24,532	1,012	.52
18	Fabricated Metals	139,309	21,541	.41
19	Aircraft & Parts	21,646	4,508	.07
20	Primary Metals	32,791	1,716	5.32
21	Other Manufacturing	135,924	17,797	1.16
22	Mining	12,498	1,031	1.50
23	Utilities	566,165	82,028	112.18
24	Services	3,136,309	327,942	27.84
25	Trade & Transportation	292,921	82,655	2.66
	Total All Arizona	44,465,116	4,116,426	509,016.40

[a] All decreases are from the 1965 levels in the 25 Arizona sectors.
[b] The blank entries indicate that cotton is not related, either directly or indirectly, for inputs to this sector.

Among the nonagricultural sectors,

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chemicals and fertilizers, utilities, and services experience the greatest adverse effects from the decreased level of cotton production. The total effect on gross domestic products in Arizona for 1966 is estimated by the model to be nearly $44.5 million.

By comparing the total effects on the Arizona economy with the direct effect on cotton, we derive an income multiplier for the cotton sector. The value of this multiplier is 1.26. This means that for every dollar decrease in production in the cotton sector the total decrease in the entire Arizona economy will be $1.26. This value is somewhat smaller than the majority of the multipliers in the Arizona economy; 18 of the 25 sectors have larger multipliers.

Cotton occupies a rather unique place in the economic structure of Arizona. All of the cotton output is sold to places outside of Arizona and is, in the context of the input-output model, produced for final demand. Cotton does not serve as an input for any other Arizona producing sector but affects, directly or indirectly, nearly every other sector by its own input purchases.

How About Other Crops

The decreases in production in the Arizona sectors could be offset if some other crop (or crops) were being grown on the acres diverted from cotton. However, the government program was designed to reduce surpluses and, therefore, prohibits farmers from taking their land out of cotton, for which they receive government payment, and planting some other surplus crop. There are a few minor crops which could be planted on the diverted acreage, but these do not appear to have any significance.

In the long run, over the next one to five years, it is possible that cotton growers will release part of their allotments and shift some of their acres into alternative crops. This is not taking place in the current year, thus there is little offset to the decreased cotton acreage planted.

Although cotton production is expected to decrease in value by more than $35 million, cotton farmers will not fare as badly as may appear at first glance. Arizona cotton farmers are receiving payments for taking acres out of production in 1966. These payments are based on the expected production which would have occurred had the land actually been planted. On this basis, Arizona cotton farmers should receive about $12.7 million in direct government payments for taking their land out of production.

The question of the welfare of the cotton farmer depends on what happens to his net income per acre on the diverted acres in 1966 as compared with what might have occurred had he not diverted. Arizona cotton budgets show a top return per bale of $64.62 before fixed costs and a low return of $46.22 per bale before fixed costs. (Fixed costs are those costs which occur whether or not a crop is grown, for example taxes.) The difference in the return per bale depends largely on the cost of water needed for irrigation. The scale of government payments on diverted acres will yield a net return of about $52.50 per bale before fixed costs. Thus, even though the value of cotton production will be greatly reduced in 1966, and in turn the level of economic activity in the entire state will be affected, the net income of cotton farmers will not be altered much.

Seriously Affects Labor

Another way to measure the impact of the 1966 decrease in cotton production is to look at its effect on labor in the state economy. In order to produce cotton, labor is required as one of the productive factors. To supply the other material inputs which cotton buys from other Arizona sectors, labor is also required. Thus, the initial decrease in cotton production will decrease its own demand for labor but will also cause decreased labor demands in all other Arizona sectors which directly or indirectly supply inputs for cotton production. These effects are shown in column two of Table 2. The values in column two depend on the labor intensity of the various sectors and also the extent to which they provide inputs for the cotton sector. Miscellaneous agriculture, utilities, trade and transportation, and services, along with cotton, have the largest decrease in man-hour labor requirements. In the entire State economy, the estimated reduction in labor demand is about 4.1 million man-hours.

The 1966 decrease in cotton production will also affect Arizona's scarce primary resource, water. Each producing sector has some requirements for water as an input. The size of this requirement varies greatly between the 25 Arizona sectors. Column three of Table 2 gives the decrease in water requirements for each sector as a result of the decrease in cotton production. Diverting acreage from cotton production saves nearly 471,000 acre-feet of water in that sector alone; another 38,000 acre-feet is saved in the other sectors because of the reduced levels of output required.

Nearly all of the decreases in water requirements occur in the agricultural sectors (1 through 10) because of their large water intake per dollar of output. The manufacturing, trade and service industries use relatively small amounts of water per dollar of production. The 509,000 acre-foot decrease in water requirements represents roughly seven percent of Arizona's annual water usage.

Conclusions which emerge from this input-output study of the 1966 decrease in cotton production are:

1. **There will be large decreases in gross output and labor requirements in the cotton sector and those other producing sectors which, directly or indirectly, provide inputs to cotton growers.**
2. **The net income position of cotton growers should not be greatly affected by the 1966 program because of the payments received for diverting acres.**
3. **Water requirements in the Arizona economy, particularly in agriculture, will show a substantial decrease.**

Barley Cross Is Released as Breeding Stock

The Agricultural Experiment Stations of The University of Arizona and Cornell University, and the Crops Research Division, ARS, U.S. Department of Agriculture, announce release as a breeding stock of the Composite Cross XXVII of world winter barleys.

This cross is the result of cooperative efforts of members of the Agronomy Department, University of Arizona; the Department of Plant Breeding, Cornell University; and the Crops Research Division, ARS, U.S. Department of Agriculture. Work here was done by Dr. R. T. Ramage, ARS and UA barley geneticist, and R. K. Thompson, research associate in agronomy.

Composite Cross XXVII is the result of harvesting naturally pollinated male sterile segregates in a bulk planting of the F_2 generation of the original composite cross of world winter barleys, which was released to plant breeders in 1964. Seed from

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A Dairyman's Trek to Europe

By F. E. Nelson

The 17th International Dairy Congress was held last summer in Munich, Germany. I attended as a member of the United States delegation.

More than 2,500 men engaged in dairy research, production, processing and marketing in all parts of the world attended. While numerous papers on current research are submitted and printed in the proceedings of the Congress, individual papers are not read; rather, several people summarize important points of the papers, emphasis being on the present state of knowledge in that specific area.

While this arrangement does save time, one does not have the advantage of the specific viewpoints of the individual authors, and discussion frequently is minimized. Control of microbial contamination and prevention of chemical deterioration, particularly of fats, received considerable attention.

New Machinery Shown

An international dairy machinery exhibition and a book exhibition were held simultaneously with the congress. Each was the largest of its type held in the world. The machinery exhibit was particularly impressive, occupying several large exhibition halls. Particularly impressive were several systems for mechanized cheese making, a number of types of equipment for aseptic packaging of continuously sterilized fluid milk products, and a wide variety of new packages for milk and milk products.

Whereas much of the developmental emphasis in the United States is on plastic bottles, the Europeans are beginning to use flexible plastic bags ("pillow packs") or are forming containers from rolls of properly treated paper immediately before the filling operation. While European equipment for pasteurizing and handling milk and milk products usually is beautifully made and has the reputation of functioning well, American exhibitors reported that they sold much equipment, often because they could produce and deliver more rapidly than could most of the Europeans.

Following the congress, I had the privilege of observing some aspects of the food industries in Switzerland, Austria, The Netherlands, Denmark, Sweden and Norway. All of these countries import considerable amounts of concentrates for animal feeding, because both of climate and local demands for human needs limit the local supplies. Interesting was the extensive industrial support provided for the various laboratories that do research and development work, even though the laboratories are also supported to some degree by various governmental agencies. This situation has resulted in many of these laboratories being unusually well staffed and equipped.

Fewer "Convenience Foods"

Use of partially or completely processed convenience foods is much less common in Europe than in the United States, but is increasing rapidly. Ice cream is becoming much more popular and more available than it has been. However, general use of frozen foods must be preceded by more general availability of home freezers for holding these products prior to use. Home gardens still are very popular, and fresh vegetables are found in great quantity and variety in the various markets. The great variety and general high quality of European bakery products made it very difficult to pass by these shops. However, a good steak or a good beef roast as we know it is extremely hard to find, as they have no beef production of consequence, other than the slaughter of cows no longer useful for dairy production.

Much of Europe, and particularly the Scandinavian area, appears to be suffering from inflation and high taxation. Sales taxes are as high as 12 percent and special taxes may more than double the costs of such things as automobiles, coffee, cigarettes and beer in some areas.

"Bargains" for the American traveller are increasingly difficult to find, particularly in the urban centers frequented by tourists. Where prices remain low, a government subsidy, such as that for buses and trains, frequently is involved. One hears considerable comment about the high costs, but the people still support the governments that are taxing them to support the socialistic programs.

The author is a professor in the Department of Dairy Science.

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F_1 plants of the original cross (now named Composite Cross XXVI) has been distributed to over 50 barley breeders in the United States and abroad.

A portion of this F_1 seed was planted at Mesa, Ariz., in the fall of 1964. The resulting F_2 crop segregated for male sterility and fertility. About 8,000 male sterile plants were tagged at flowering time and seed from them was bulked at harvest. About 65 pounds of hybrid seed from natural pollination was produced on these plants, a portion of which was planted at Mesa in 1965-66. The increase is now available for distribution to barley breeders.

Previous studies with composite crosses indicate that the extremely large number of new combinations in World Composite Cross XXVII may hold valuable potential for any winter barley growing area of the world, due to its wide germ plasm base. It can be grown at a given location in bulk from successive crops with relatively little time and expense. Natural selection for a period of generations will tend to favor types that are adapted at that location. Certain characters will be eliminated more rapidly at some locations than at others.

Composite Cross XXVII should contain a large number of recombinations not present in CC XXVI. No more cycles of crossing are planned of this material for distribution purposes, but reserve hybrid seed will be increased in subsequent years as needed. It is expected that the CC XXVII will not be used directly for commercial production, but as a source from which plant breeders may select superior strains.

Un contenido de 3.50 a 3.75% de calcio en la ración de las aves es suficiente para que pongan huevos con cáscara de buena calidad. Además, la eficiencia del alimento (kilos de alimento necesarios para producir una docena de huevos) es algo mejor con este sistema de alimentación (calcio incluido en la harina) en comparación con el antiguo sistema de suministrar 2.25% de calcio en la harina más harina de conchas de ostión para consumo a voluntad.

DOS TIPOS DE HORMONAS, el estrogénico que producen los ovarios y el gonadatrópico que se compone de extractos de la pituitaria y otros que actúan sobre los ovarios se han empleado para tratar la esterilidad de la vaca. Por los resultados obtenidos, se estima que quedaron cargadas un 60% de las vacas tratadas.

FIGURE 1 — Petroleum coke solid fuel grove heaters packed two 2-pound bricks to a polyethylene-wrapped package.

Solid Fuel Heaters For Citrus Groves

By Kenneth K. Barnes and Kenneth R. Frost

A number of oil companies are developing solid fuel orchard heaters. Performance evaluations of this type of heater were conducted at The University of Arizona's Yuma Mesa Citrus Station during the winters of 1964-65 and 1965-66.

During 1964-65 wax candles were tested. The wax candles burned for from 12 to 14 hours and if snuffed out after one night's use could be used for protection on a second cold night. The effectiveness of the candles was judged by measurement of air temperature five feet above the ground at the periphery of trees. These air temperatures were compared with corresponding air temperatures in adjacent unheated grove areas to determine the temperature rise attributable to the heat released by the burning fuel. The heated test areas were about 2½ acres in extent. In the 1964-65 tests, trials were conducted with one candle per tree under the trees, two candles per tree under the trees, two candles per tree between trees, and three candles per tree between trees.

Two conclusions were drawn from the tests with wax candles. First, the same temperature difference resulted from under-tree placement and between-tree placement of candles. Second, one candle per tree will give a temperature rise of from 1½ to 2 degrees Fahrenheit, and the temperature rise will be proportional to the number of candles used per tree.

Respectively professor and head, and professor, Agricultural Engineering Department.

Petroleum Coke Tried

A petroleum coke brick grove heater was evaluated in 1965-66. In addition to measurement of its influence on temperature, a number of observations were made regarding labor requirements for distributing and lighting the units. The material was in the form of two-pound bricks packed in pairs in polyethylene bags to form a 4-pound package as shown in Figure 1.

These packages burned for from 4 to 5 hours after lighting. Trials were made of seven different patterns of placement of packages in the grove. The patterns are defined in Figure 2. They include a comparison of under-tree placement (pattern 3A) with between-tree placement (pattern 3B) and a comparison of distributed between-tree placement (pattern 2A) and in-line between-tree placement (pattern 2B). In all there were tests with 1, 2, 3, 4 and 6 packages per tree. Tree spacing in all tests was 22′ x 23.′ Figure 3 is a view between two rows of trees in a grove where solid fuel packages have been placed three per tree as in pattern 3B.

Results of a typical test are shown in Figure 4. The packages were ignited between 12:00 midnight and 1:00 A.M. The temperatures given for each test area and for the check area are the average of thermometer readings at the tree periphery five feet above the ground. Two packages per tree in pattern 2B were not as effective as two per tree in 2A. This is thought to be because of the greater chimney effect in 2B, with rapid rise of heated air above the concentrated heat source of the two packages grouped together.

Placement Important

Figure 5 summarizes the results of all tests. It is noted that at 3 packages per tree there is essentially no temperature rise difference between under-tree placement and distributed between-tree placement. It is thought that if, in the case of pattern 6, the 6 packages per tree had been

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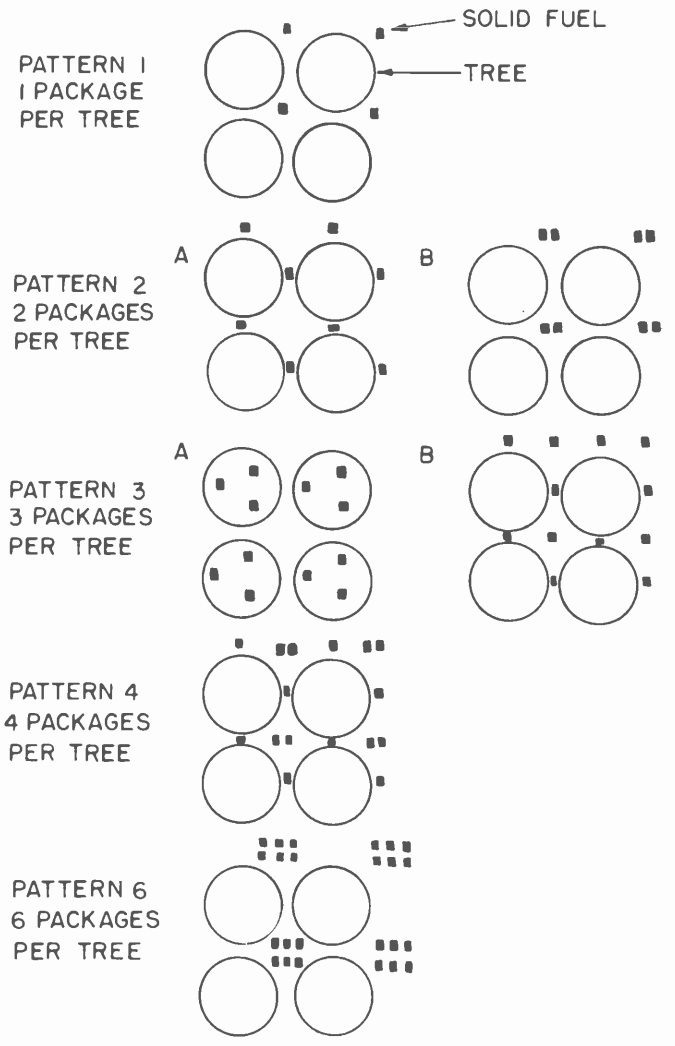

FIGURE 2 — Distribution patterns used in trials of petroleum coke, solid fuel grove heaters during 1965-66.

FIGURE 3 — Petroleum coke grove heating packages distributed three per tree as in pattern 3B, illustrated in Figure 2.

Labor Requirements for Distributing Petroleum Coke Heating Packages in Groves* Man-hrs./100 Trees

Pattern	*Packages per Tree*					
	1	*2*	*3*	*4*	*5*	*6*
In-Line Patterns	0.5	0.7	0.8	1.0	1.1	1.2
Distributed Patterns	0.5	0.8	1.2	1.6	1.8	2.2
Under-Tree Patterns	1.0	1.3	1.8	2.0	2.4	2.7

* Underlined figures are observed data. Other figures are developed from personal judgment.

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distributed about the tree more uniformly, an additional 2 degrees of temperature rise would have been achieved.

All tests were run at air temperatures above 30° F. to insure that the operation of wind machines in adjacent grove areas would not interfere with results. It is assumed that the temperature increases obtained from solid fuel in the 30 to 40 degree air temperatures could also have been obtained in 20 to 30 degree air temperatures.

Labor studies of operations with the petroleum coke packages covered a range of systems of handling and distributing the product in the grove and of lighting of the fuel.

For Labor Efficiency

Table 1 gives expected labor requirements as drawn from results of the field studies. In-line patterns such as 1, 2B and 6 which allow straight-line movement through the grove result in minimum labor ranging from 0.5 man-hours per 100 trees for one package per tree to 1.2 man-hours per 100 trees for six packages per tree. Distributed patterns such as 2A, 3B or 4 which require movement in and out of the rows require additional labor.

In some cases it may be possible to minimize this by tossing the packages into the in-row position. Under-tree placement requires greatly increased labor when the tree canopy comes to the ground all around, as was the case in the grove treated in these tests. All experience reported here used a three-man crew in which one man drove a tractor pulling a trailer load of fuel and two men distributed the packages.

In addition to the distribution labor presented in our table, labor was required for loading packages onto the trailer. Solid fuel packages used in these tests were delivered packed 12 to a fiberboard carton. Time studies showed that opening cartons and dumping heating packages onto a flatbed trailer required 0.8 man-hours per 100 cartons. Additional labor time must be allowed for carton disposal and for travel to and from grove areas.

In summary, the total time for loading and distributing 3 packages per tree in a uniform pattern such as 3B may be expected to be 1.5 man-hours per 100 trees, allowing for some travel time.

Time to Ignite

Labor is also required for ignition of the solid fuel. Liquid fuel torches which burn a combination of gasoline

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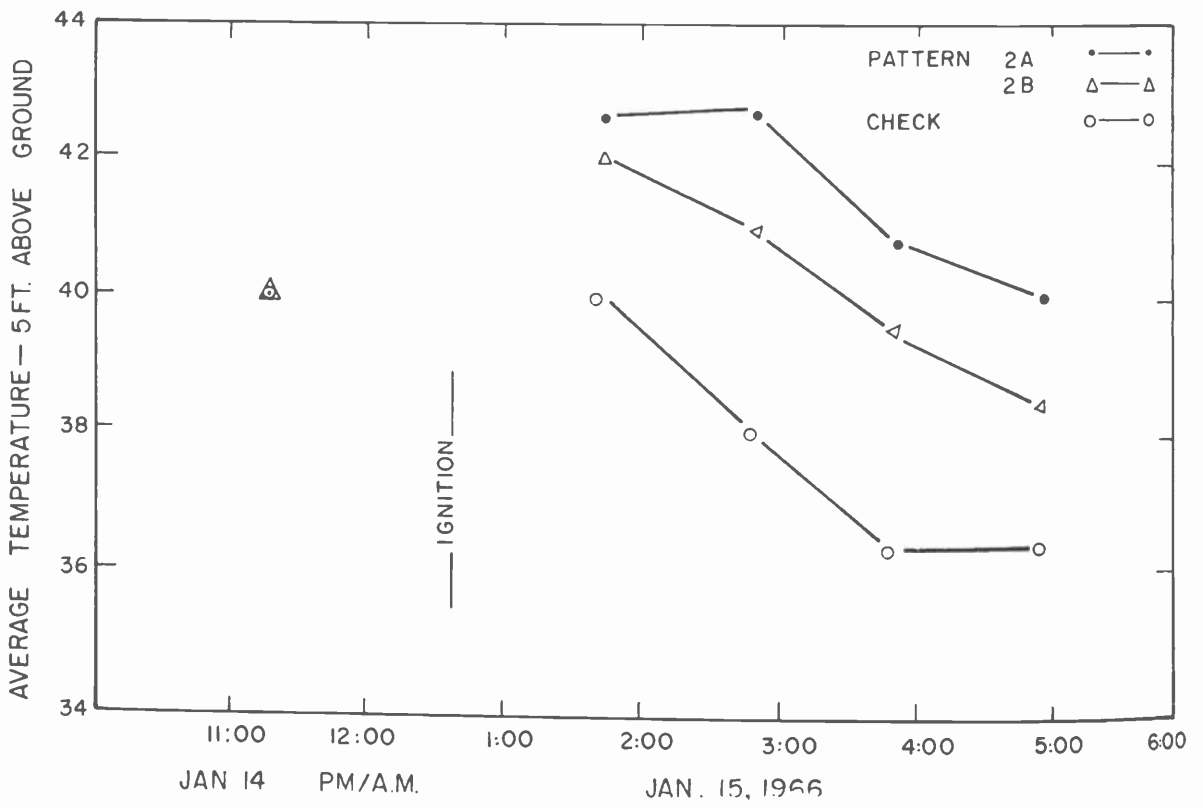

FIGURE 4 — Typical air temperature differences resulting from release of heat from petroleum coke grove heaters during 1965-66 tests.

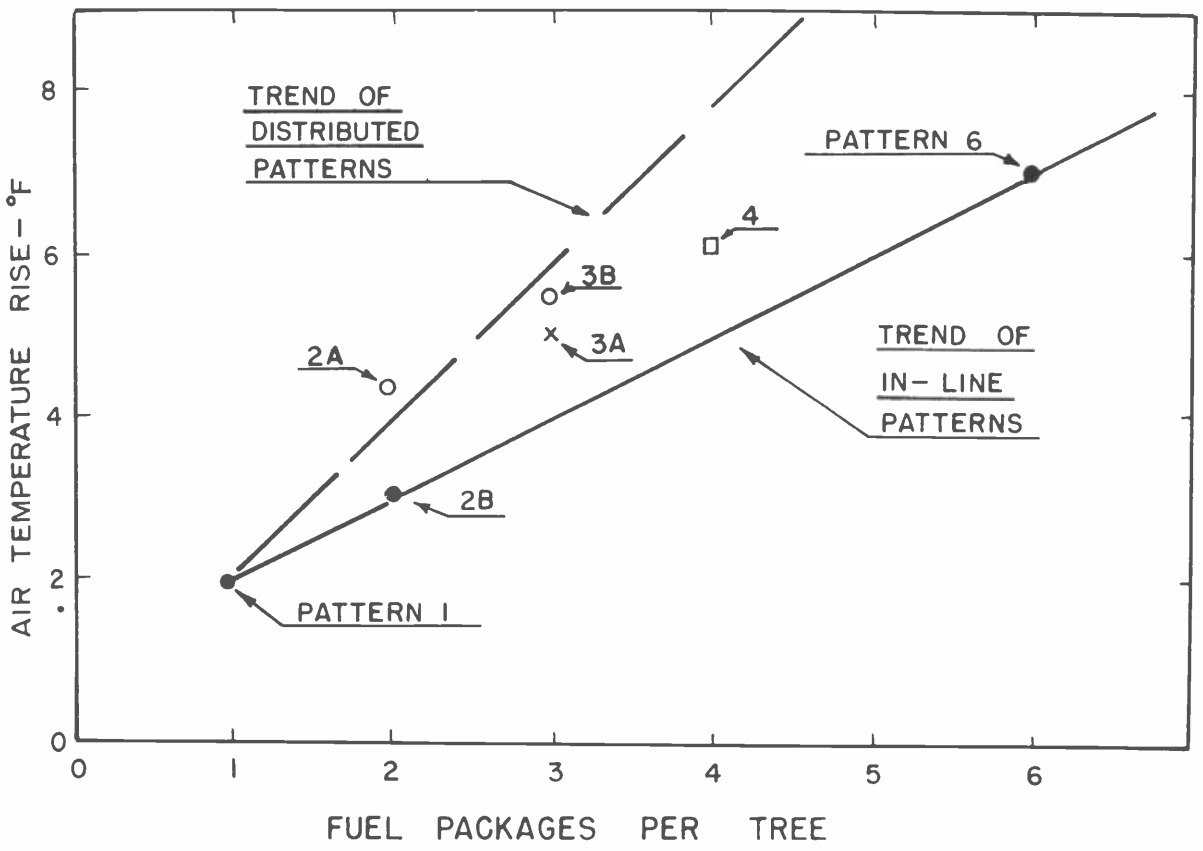

FIGURE 5 — Temperature rise above unheated areas achieved by various amounts and placements of petroluem coke grove heaters during 1965-66 tests.

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and diesel fuel are very effective. The upper surface of the solid fuel package can be quickly covered with the burning liquid fuel to achieve good ignition. Igniting the solid-fuel packages required 0.2 to 0.5 man-hour per 100 trees. The lower figure is for one package per tree, and the labor is increased for distributed patterns compared to in-line patterns. The 0.5 man-hour per 100 trees applies to six packages per tree in a distributed pattern. Placement under trees having low canopies required two to three times the lighting labor of between-tree patterns.

Typically one might achieve a six degree temperature rise for four hours using three 4-pound packages of petroleum coke fuel per tree, uniformly distributed in the grove, with a total expenditure of labor for handling and lighting the fuel of 1.9 man hours per 100 trees.

Conclusions:

Solid fuel petroleum coke grove heating products in 4-pound packages may be effectively used in grove heating with expectation of the following inputs of labor and heating results.

1. **Labor for loading and placing in grove in practical patterns will range from 0.6 man-hour per 100 trees for one package per tree to 1.7 man-hours per 100 trees for six packages per tree. Labor for opening and disposing of cartons will be an additional 0.8 man-hour per 100 cartons.**
2. **Lighting will require 15 minutes per 100 trees for one package per tree to 30 minutes per 100 trees for six packages per tree placed in groups of two around the trees.**
3. **Average air temperature rise at the 5-foot level in groves may be expected to be 1½ to 2° F. per package per tree with the high figure applying to the lower numbers of packages per tree and the most uniform distribution patterns. Two degrees per tree may be expected at one package per tree. Nine degrees per tree may be expected if six packages per tree are distributed about trees in groups of two.**

TURKEY

For Thanksgiving and Christmas

By C. D. Busch

(A staff member reports on his travels from last Nov. 15 through Jan. 15, which were devoted to evaluating a Turkish irrigation project.)

The Turks tell many stories relating the outlook of a village teacher known for centuries as the "Hodja." One such story concerns a gathering where the people were discussing the merits of youth and old age. They all agreed that a man's strength decreases as the years go by.

The Hodja dissented: "I don't agree with you gentlemen," he said. "In my old age I have the same strength as I had in the prime of my youth."

"How do you mean, Hodja, sir?" asked somebody. "Explain yourself."

"In my courtyard," explained the Hodja, "There is a massive stone. In my youth I used to try to move it. I never succeeded. Neither can I move it now."

In a somewhat similar spirit we eight irrigation development evaluators (four Israelis and four Americans) were asked to suggest ways of moving the large obstacles to completion of the farm irrigation development for 130,000 acres. Youth was exemplified in the five year construction period; age, in the practices born of centuries of non-mechanized experience and tradition.

Plenty of Water

The Seyhan Irrigation Project, fed by the Seyhan River water, is designed to irrigate an area of 425,000 acres in the Adana Plain (see accompanying map). The river, with much of its watershed high in the Taurus Mountains, has ample water for irrigating the entire area. Winter rainfall, averaging about 30 inches, has provided enough moisture for winter grains, for dryland cotton, and for a considerable drainage problem. However, the long, hot, dry summers make irrigation necessary to permit citrus, double cropping, and increased yields from winter crops.

Water for irrigation is available from the district's main canals. To enable utilization of the water on the farmer's land, irrigation ditches, land leveling, and tile drainage are needed. This, of course, necessitates financing, with credit from the Agricultural Bank, an institution that proved to be notoriously wrapped in red tape, and tied to severe collateral requirements.

Slow and Difficult

Over the past two years, only 21 farmers had been approved for credit. The average time to arrange an improvement loan had been seven months. A man's credit approval for land levelling might be near completion, when his need to borrow for seed or fertilizer would ruin his credit rating — and thereby scuttle his plans for land improvement.

Operation of the irrigation system's

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main canals has done little to encourage the local farmer to plan better farm water management. The system, in fact, was turned on in the spring and turned off sometime before harvest. The ditchriders, responsible for approximately 20,000 acres per man, lacked any sort of four wheeled transportation.

In addition, the system is totally without provision for measuring water at the farm turnouts. Additional evidence of operational problems came from the office collecting water dues. The previous year's record showed an equivalent of $320,000 owed to the district by all farmers. However, only $120,000 had been collected. For the same year, operation costs totalled $180,000.

No Proper Provisions

In planning for the land leveling and farm ditch construction, an order for close to a million and a half dollars worth of machinery was placed. Presumably, operations would start during the following spring, about four months away. However, not a single spare part had been ordered, nor were any known to be available in the country. Neither were the projected mobile repair shops expected to be available at the start of the land leveling operations. Finally, there was no training program to provide the people needed to operate the new equipment, or to man the repair shops.

After we had gained some understanding of the problems of finance, equipment and operations, the problems of field size and farm fragmentation still remained. The average field size was 6½ acres. A farmer's two or three fields were most often separated, and irregular in shape. Even if the farmer and the bank were in favor of land leveling, and the equipment and operator were available, it would have been impossible to do an efficient job on the small, scattered fields.

Suggestions for Improvement

On the four problems cited, and on a number of other issues, the evaluation team wrote suggestions in a report totalling 140 pages. In financing we proposed that the government bear the cost of land leveling. For operation of the system, we proposed formation of an entirely new organization, complete with an advisory team to help it get started. The same was suggested for the operation and maintenance of land leveling machinery.

Finally, the problem of small field size was sidestepped by a proposal to level the area in blocks of fields, the smallest being 60 acres.

These specific proposals were supplemented by further proposals for expanded agricultural extension to help the program along, and for working committees to facilitate cooperation between the farmers and the government.

Hope For the Future

The number and severity of the problems besetting the development of the Seyhan Project might lead the reader to despair of progress in Turkey. It is not true, of course, that the evaluation team discovered these problems, while the Turks had been blindly muddling along unaware of their existence.

The problems, and most of the solutions, were worked out through intensive cooperation with Turkish authorities. The advantage which rested with our team was that of a non-partisan approach to local agency rivalries, and authority to look at the whole scene. This led to acceptance and adoption of some of the team's suggestions before the report was formally published.

We left Turkey with great hopes that the youthful development project would indeed have the strength not found in the older practices, strength to move the obstacles blocking better utilization of the fertile Seyhan region.

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

QUINIENTOS POLLOS requieren aproximadamente, 250 kg. de alimento durante las primeras diez semanas de vida. Para las diez semanas siguientes los pollos consumirán unos 1,450 kg. Esto indica que se necesita de once a trece kilos de alimento para criar una polla hasta su madurez.

Arizona has 4½ to 5 million acres of chaparral, brushland fit only for grazing range cattle.

What is it worth? What species of shrub and grass does this vast area provide? Which grasses or shrubs are most palatable and nutritious for the range animal? Would this area be more productive if the native chaparral were replaced by introduced grasses? Can this be done? How?

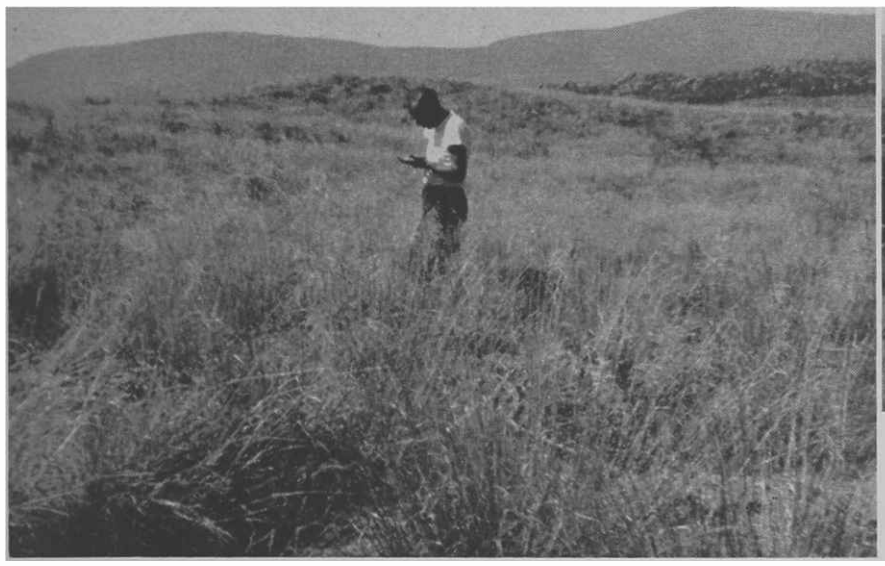

PHOTO ABOVE SHOWS general view of part of the Tonto Springs study area. Light areas are the Weeping Lovegrass on the root-plowed pastures, while dark areas are oak chaparral. Photo at left shows a root-plowed pasture. Floyd Pond is thigh deep in the Lovegrass.

Should Chaparral Be Replaced by Grass?

The Forest Service, branch of the U.S. Department of Agriculture, is seeking some of these answers. The Rocky Mountain Forest & Range Experiment Station (which also operates the Santa Rita Range Station just south of Tucson) is using an area in the Prescott National Forest, in Yavapai County, as a laboratory.

This 1200-acre outdoor "laboratory" on the Contreras Allotment, some 20 miles west of Prescott, was established in 1961. Some of the sub-totals of research effort are interesting, but final answers aren't expected until after 1970. Probably the study will continue for a few years after that.

Much Can't Be Plowed

First of all, of course, of some 5,000,000 acres of chaparral in Arizona, only about five percent of it can be changed by plowing or other surface manipulation. The other 95 percent is too rocky, too steep or too remote. That 95 percent can be manipulated, if deemed desirable, by burning to remove the brush, by aerial spraying to do the same thing, and by aerial grass seeding to replace the brush.

The 1200-acre "laboratory" at Tonto Springs, this area 20 miles west of Prescott, is made up largely of valley floors and moderate slopes, fairly free of rocks. It is good soil, as mountain soils go, fairly deep gravelly loam with a clay subsoil. Precipitation, rain and snow, give it an average of 15 to 18 inches of precipitation, divided about equally between summer and winter. It is typical of the 600,000 acres of chaparral range in Yavapai County, of which perhaps 100,000 acres is suitable for such ground manipulation.

The Tonto Springs project was started in 1961, the 1200 acres divided into 12 fenced pastures, with three blocks of four pastures each. Each pasture was set up to carry three adult animals.

The four pastures in each block included: 1) A 200-acre unit of native chaparral pasture, pastured year-around; 2) A 40-acre pasture, root-plowed in the summer of 1961 to remove the chaparral and seeded with grass at time of plowing, just before summer rains were expected. This pasture was grazed from May through November; 3) A native chaparral pasture of 100 acres, grazed from November to May; 4) An 80-acre pasture which was root-plowed in 1961 and grazed year long. It also was seeded at time of plowing.

Seeded When Plowed

The root plow was a 10-foot blade which undercut the chaparral, the blade travelling 6 to 18 inches beneath the surface. The blower-seeder behind the plow seeded ¾ pound of Lehman Lovegrass seed and a like amount of Weeping Lovegrass seed per acre. The pastures were not grazed until 1964, in November, giving the seeded areas plenty of time for grass to be well established.

About the first thing learned was that these high country ranges may be too cold for Lehman Lovegrass. About 10 times as much feed is furnished by the Weeping as by the Lehman, the latter showing up only on the warm south slopes. In fact, Floyd Pond, range scientist with the sponsoring agency, suspects that the Lehman winterkills and re-establishes itself from seed each year as an annual.

The seeded pastures furnish so much feed, almost all Weeping Lovegrass, that the animal units have been steadily increased. Now, with 10 head per pasture, they show no overgrazing. The seeded pastures provide from 600 to 1,000 pounds of forage (oven-dried) per

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ZONE TILLAGE SAVES ON TIME AND ENERGY

By W. A. LePori and H. N. Stapleton

Cotton producers must lower production costs to remain competitive with producers of other fiber products. Energy and time inputs for machine operations are important in determining production costs.

Electrical energy is purchased in kilowatt-hours, which are recorded by meters, but energy required for field operations are not so easily determined. Horsepower-hours per acre is a term used to describe energy used in farming operations. It denotes the amount of work expended per acre by a machine doing a specific function.

Power is the time rate at which work is done and is often confused with energy. Energy can be considered independent of operating speed, but power varies with speed. For example, if an operation requires 50 tractor horsepower-hours per acre, theoretically a 50 horsepower tractor could complete an acre in one hour while a 25 horsepower tractor would take 2 hours per acre to do the same operation.

Fuel Index to Energy

Fuel is the source of energy for tractor operations. Because of energy losses, much more fuel energy is consumed by the tractor than is used by implements. Energy is lost through exhausts, transmissions, slip, and rolling resistance. The ratio of implement drawbar energy to fuel input

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acre, compared to some 150 pounds on the native chaparral range.

Predominant species of chaparral is Scrub Liveoak, but also there is Mountain Mahogany, Desert Ceanothus and Skunkbush. Earliest native grasses in the spring are Squirreltail and Long-tongue Muttongrass. Later in the summer come the gramas — sideoats, black, blue and hairy — and three-awn.

The cattle used as the "consumer panel" for this research are weighed monthly. Results from one year of trials (May 1965 to May 1966) show cattle on grass gained .91 of a pound a day, those on native brushland .83, and those grazed half a year on the root-plowed and seeded pasture, May to November, and then the other half of the year on native pasture, November to May, gained the least, at an average of .70 of a pound per day.

No Recommendations Yet

"It is too early, with just one year's results, for any final conclusions," Pond says firmly. "Certainly, we wouldn't want anyone to adapt any new practices on the basis of our brief experience.

"We are learning all the time, we are checking all the variables so our answers will be valid. But on the basis of rainfall alone, one year is very apt not to be typical of a long time average. That is why you will be getting only progress reports from us for the next few years — not any firm recommendations."

One of those progress reports was given at a field day in August, timed at the end of the month so the grass would be lush and the country green. With characteristic stubbornness, the weatherman didn't cooperate, and the field day came before the rains did. Barry Freeman, University of Arizona Extension Range Specialist, was master of ceremonies. An audience of less than 100 was highly receptive, but the sponsors of the field day were disappointed because the crowd was so small.

A few interesting findings:

1. Animals on the root-plowed pastures consumed 8 to 11 pounds of forage (oven-dry basis) per day, principally the Weeping Lovegrass, while animals on chaparral ate 4 to 6 pounds (oven-dry) per day, indicating that the rest of their diet was made up of browse from the chaparral.

2. On root-plowed pastures with introduced grasses the animals gain weight for eight months of the year, from May through late November or December, while animals on chaparral gain weight for nine months, getting a month more of "gaining weather" in December or January, depending on the year.

3. The root plow kills about 75 percent of the oak chaparral. In one pasture the kill was made complete by using fenuron, a soil sterilant. In the other root-plowed pasture a very noticeable 25 percent of the shrub oak has reestablished itself.

4. While Lehman Lovegrass may be the introduced answer to southern Arizona ranges, it isn't cold-tolerant enough for the mile-high Yavapai County ranges.

5. Where degree of slope is equal, the root-plowed pastures absorb more runoff from rains. Apparently the disturbed soil, with depressions and uneven surface where the shrubs have been dislodged, allows water to stop and penetrate into the soil. As a contrast, in the native chaparral pastures, ground between shrubs is smooth and hard-surfaced, permitting runoff of surface water and poor penetration.

6. While root plowing, chaining, bulldozing, aerial spraying, burning and reseeding are all tools which man can — and does — use in trying to make native ranges more productive of nutritious forage, research is too sparse, terrain and other conditions too variable, for anyone today to come up with any quick and easy answer applicable generally.

The Forest Service people, at Tonto Springs and in all their work, have an earnest humility which invites cooperation from other federal and state agencies, with several represented at the field day in August. While the grazing animals used in this project are privately owned cattle, property of Lee Iles, permittee on the Contreras Allotment, the "laboratory" does include two fistulated steers provided by The University of Arizona and fistulated by its Animal Science Department, for rumen studies.

"We're learning," says Floyd Pond. "We hope in a few years to have information of considerable value to Arizona ranchers, answers which they can translate into dollars in their own ranching operations.

"Meanwhile we are doing this work carefully, keeping accurate records, making close observations of the animals and the forage they graze. And we are utilizing, too, the counsel and help which others contribute so graciously."

Total Energy Inputs in Horsepower — Hours Per Acre

Machine System	*Operations*	*Energy in HP-HR/Acre* Imple-ment	Fuel Input	*Over-all Effi-ciency %*	*Energy Input as % of Con. Sys.* Imple-ment	Fuel Input
BROADCAST TILLAGE SYSTEM						
Conventional	Disk	3.12	18.26	17.1		
	Plow	25.05	140.52	17.8		
	Disk	3.19	30.57	10.4		
	Float	6.39	44.74	14.3		
	List	6.78	51.37	13.2		
	Five Operations	44.53	285.46		100	100
ZONE TILLAGE SYSTEMS						
List only	One Operation	11.16	66.65	16.7	25	23
Shallow Chisel-List	One Operation	11.45	62.67	18.3	26	22
Medium Chisel-List	One Operation	13.27	82.41	16.1	30	29
Deep Chisel-List	Chisel	16.81	98.86	17.0		
	Chisel-List	15.28	102.52	14.9		
	Two Operations	32.09	201.38		72	71

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energy provides an overall efficiency rating of the operation.

Present pre-plant tillage systems have been described as "broadcast" tillage systems. Entire fields of soil are worked to plowing depth and subsequently reworked in preparation for planting. "Zone" tillage is a new method of working soil zones in relation to the needs of the plant root system. Cotton plants have long tap roots. This suggests that the soil zone beneath the row requires more preparation than zones between the rows.

Zone tillage would be expected to require less energy and time than broadcast tillage because the soil is worked less with fewer operations. If land preparation costs can be cut without reducing yield, the result will be increased profit. An experiment has been initiated to compare several tillage machine systems and the effect of these systems on yield.

Zone Tillage Study

Fuel input energy, implement drawbar energy, and theoretical capacity were measured in a study of five tillage machine systems on The U of A Marana Experiment Farm while preparing land for the 1966 cotton crop. The five tillage machine systems were:

Broadcast Tillage System

Conventional — shred stalks, disk, plow, disk, float, list.

Zone Tillage Systems

List only — shred stalks, list.

Shallow chisel-list — shred stalks, chisel-list, (chisels run in old furrows 10-12 inches deep; new rows formed over chisel slots).

Medium chisel-list — shred stalks, chisel- list, (chisels run in old furrows 14-18 inches deep; new rows formed over chisel slots).

Deep chisel-list — shred stalks, pre-chisel 24 inches deep, chisel-list, (chisels run in old furrows, 18-20 inches deep; new rows formed over chisel slots).

Energy Is Reduced

Fuel input energy, implement drawbar energy, and overall efficiencies of the different operations and systems are shown in our table. Plowing required more energy than any other single operation, and the conventional system required more energy than the other systems. Shallow chisel-list required only 22 percent of the fuel input energy required by the conventional system.

Overall efficiencies are also shown in the table. The overall efficiencies for disking, floating, and listing after plowing are lower than the efficiencies of other operations because the plowed soil increased rolling resistance and slip for these operations. The same was true for chisel-listing after pre-chiseling in the deep chisel-list system.

Time Also Reduced

Capacity of a machine is the time rate at which a machine performs its function. Machine capacities are important because of labor costs and allowable time intervals for different operations. Time inputs per acre were computed from theoretical capacity measurements and included only time when the machine was operating in the row.

If lost time is assumed to be equal for all systems, time requirements can be compared. Plowing required more time than any other single operation, and the conventional system required more time than other systems. The time input in minutes per acre for the systems were: Conventional, 84; List only, 18; Shallow chisel-list, 17; Medium chisel-list, 22; and Deep chisel-list, 51. Shallow chisel-list required only 20 percent of the time required for the conventional system.

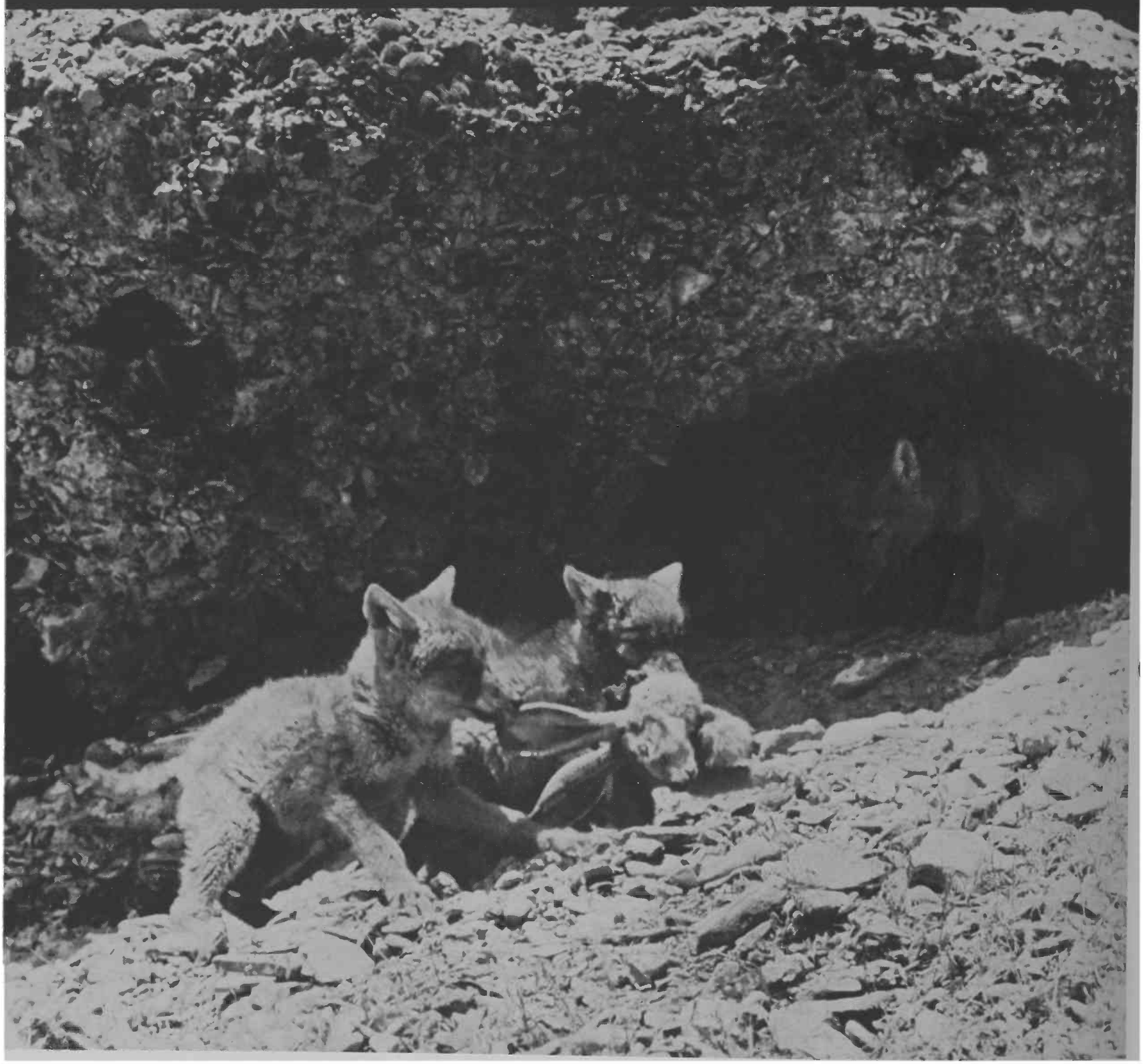
Yields About the Same

Net profit is the final criteria for judging machine systems, and yield is important in determining net profit. To benefit financially from time and energy savings, yield level must be maintained. No significant differences in yield due to the tillage machine system have been found. Since the same yield level has been maintained, Zone Tillage provides a means of reducing land preparation costs, thereby increasing net profit.

Abstracted from Arizona Agricultural Experiment Station Technical paper No. 1113.

Wayne LePori and H. N. Stapleton are, respectively, research associate and professor in the Department of Agricultural Engineering.

Coyotes, Cantaloups and Cows



This coyote den, hidden under an outcropping of conglomerate and warmed by the sun's rays, offers sanctuary for the young coyotes who live there. Spring pups are satisfying their insatiable appetite with a freshly killed jackrabbit, brought to them by one of their parents. Photo, by Kay Boulter, is furnished through courtesy of Utah Fish and Game Magazine.

The coyote has always made himself at home in Arizona. He was here before farming and ranching and he is still here today, displaying an amazing ability to survive in spite of efforts to discourage him. Coyotes have spread from the western plains and deserts to much of North America. They have developed heavy fur coats and taken up residence in Alaska, and shown up also in such unlikely places as Maine and Florida.

By C. R. Hungerford

The coyote has been and perhaps always will be looked at in a different light by different people, wherever he occurs. Few other wild animals are as smart, as adaptable, and as capable of living and reproducing in spite of man's best control measures.

Both Liked and Disliked

Because of this he is both admired and despised. His vocal efforts at dawn or sunset seem to many to be the very symbol of the west. Many Indian tribal customs still frown on killing coyotes because "he is a brother." Perhaps the reason so many other Americans are against control of coyotes is a similar feeling of sympathy for this under dog, and an admiration for his wit and nerve.

On the other hand, the farmer near Salome who had 1,000 Crenshaw melons eaten or damaged by coyotes last summer cannot be expected to lightly dismiss this as coyote playfulness. In the market these melons brought seventy-five cents to a dollar apiece. Coyotes damaged cantaloup and other melons in several other Arizona localities last year.

Arizona's Navajo feel a respect for the coyote, but since sheep and goats constitute their major livestock industry, they have had to use more and more control of coyotes in recent years including den hunting (killing the pups in the den) to protect their livestock. When the Arizona Game and Fish department replanted antelope in the Arizona strip country or planted white-winged pheasant near Buckeye, it was sound game management to reduce the coyotes and other predators until the new birds or animals were familiar with their habitat.

Control Is Necessary

Because of their adaptability, fecundity and skill at avoiding man, the coyote must be controlled where his activity conflicts with man's. There is no balance of nature in a melon patch, and today's purebred livestock and irrigated crops represent big investments. The question, then, is how to control and how much to control the coyote in Arizona.

One group of sportsmen feel the best way to handle coyote problems is to hunt them. This new sport, for that is what it amounts to, is called varmint calling, and quite a few people have tried it. No one knows for sure how many coyotes the organized and individual callers take each year in the state, or the effect on our coyote populations. Other control will still be needed and requested, but a considerable number of coyotes are taken by callers.

For example, Jerry Day, a Game Department research biologist, asked Tucson and Phoenix varmint callers to save coyote stomachs for him to examine. Day was interested in finding out if coyotes were killing many javelina. In only four months they saved 142 coyote and 21 bobcat stomach samples for him.

Varmint callers enjoy this year-round hunting, and some teams of two callers are getting 10 or more coyotes per month. These coyotes had been eating mostly rodents and rabbits, and the only javelina, other game or livestock found was carrion. They also had eaten a variety of other items, from grapes to cattle droppings.

Calls Are Effective

The coyote call is effective enough so that the professional mammal control agents of Interior's Bureau of Sport Fish and Wildlife often use them. These men also employ den hunting, steel traps, and they have briefly tried scouting for dens from airplanes (but not shooting from planes, as that is against Arizona Law). Perhaps their most effective tools are cyanide guns, strychnine drop baits and "1080" poison stations. The major control of coyotes in Arizona is done by these federal mammal control agents employed by the Department of the Interior but in cooperation with, and partly financed by, other federal and Arizona agencies.

Their cooperators last year included the Gila River Indian Community, White Mountain Apache tribe, Navajo Tribal Council, Army Electronic Proving Ground, Bureau of Land Management District 1, and the Rocky Mountain Forest and Range Experiment Station. The parent federal agency, the Apache and Navajo tribes listed, and two other state cooperators (the State Game and Fish Department and the Livestock Sanitary Board) provide the major financial support.

Control is done only on request and under prior written agreements. They control jackrabbits, rodents, occasionally cougar and bear, and they answer a variety of complaints ranging from a raccoon in a patio in Tucson to a coyote killing sheep near Monument Valley. Control requests for coyote outnumber those of all other predators.

Perhaps because they do more control of the controversial coyote than anyone else, these mammal control agents have also become involved in controversy themselves. One result of their controversial position was a change in the title of their federal division from the Branch of Predator and Rodent Control to the Division of Extension Services.

Opposition to 1080

Much of the controversy stems from their use of the poisonous compound "1080" in coyote control. The division argues that this is one of the most effective weapons ever found for coyote control, it is one of the least expensive to apply to large areas, and it is quite selective for coyotes with a minimum of danger to humans and livestock.

Opponents of "1080" argue that it is too effective, and accuse it of causing secondary poisoning of desired wildlife. In this age of overkill they have a fear of this predacide much as they fear some insecticides and fallout. At any rate, its use in Arizona has decreased in recent years,

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Dr. Hungerford is an associate professor of Wildlife Management, and a recognized authority in his field.

Recreation

By David A. King

Anyone who has gone fishing, camping, or picnicking recently is well aware of the recreation boom on our wildlands. (By wildland we mean noncultivated forest and range land.) The boom is reflected also in recreation use statistics.

In Arizona, the number of visits to recreation areas under the administration of the Park Service and Forest Service increased 42 and 54 percent, respectively, between 1960 and 1964.

In 1964, Arizona's National Forests ranked between 3rd and 5th among

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perhaps in response to protests.

Recently the National Wool Growers Association asked a U.S. Senate subcommittee to appropriate more funds for the control of predators in the west but apparently most cattle ranchers are not pushing for additional federal control. Coyotes infrequently injure heifers or kill calves, but losses are minor compared with lamb and sheep losses to coyotes. Some cattle ranchers like to see some coyotes around to keep down the rodents and rabbits. Mr. Clump, a rancher near Dos Cabezas, feels a coyote on his range all year saves enough forage to feed one cow. If the coyote takes only one jackrabbit a week, the total of 52 jackrabbits would eat more of his range forage than one cow.

Don't Kill All Rabbits

On the other hand, coyotes are quite mobile, feed on what is most available to them, and they cannot be depended upon to control effectively all rabbits and rodents. Very little control of coyotes is practiced on the Papago Indian Reservation. Jackrabbits and rodents still thrive there, and their numbers vary from year to year with rainfall, local predator numbers and many other factors, just as they do throughout the state. Bill Carty has worked on the reservation for nine years and he knows of no kills of cattle or calves by coyotes, in spite of the lack of control there.

Modern range livestock management in Arizona requires good wildlife management as well as good range management. Coyote management should not be merely coyote control, although control other than by sport hunting will still be needed. Research offers new methods of coyote population management, especially needed in urban areas where traps, cyanide guns and poisons are not desirable.

Now They Have "The Pill"

Don Balser of the Fish and Wildlife Service Denver Research Center is experimenting with a steroid for population control of coyote. He uses a drop bait without poison, but containing alpha stilbesterol to interrupt or to prevent pregnancy of female coyotes. Other research is needed to assess the ecological interrelationships of coyote, jackrabbits and rodents.

Facts and the right tools should help us find the right niche for the coyote in Arizona, and allow us to use more of him than his howl. Economic loss on farms and ranches cannot be tolerated. We must find proper management methods because apparently the coyote is here in Arizona to stay.

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all National Forests in number of visits to the following site categories: all developed sites, campground, picnic sites, organization camps, and hotels and resorts on National Forest lands. This is especially interesting when it is noted that Arizona's National Forests ranked 10th in the total number of developed sites.

Despite these impressive statistics, it is safe to say that Arizona's recreation resource potential has not been reached. If it is to be reached efficiently and without lowering the quality of recreation experiences, research is needed to provide information to guide planning and management.

Some Recreation Problems

The problems for which solutions or information are needed are many and varied, requiring different kinds of research expertise and subject matter knowledge. A brief summary of some of the problems will illustrate this.

A basic problem in recreation, comparable to one in range management, is the determination of "carrying-capacity" for different sites under different kinds and rates of recreational use. In other words, how much use can an area receive before undue physical deterioration of the plant and soil complex takes place, and before recreation visitors impinge on one another to the extent that the quality of the experience is lowered beyond some minimum. Here we see that what may appear to be mainly a biological problem will also involve some sociological and psychological aspects.

Another problem involves the layout or design of recreation areas. What sizes of campgrounds are desirable? How many of each size? Where should they be located? How far apart should the individual campsites be? What species of shrubs and trees are best suited for use as screens and barriers?

Answers to these questions require knowledge of the plant and soil complexes best adapted to recreational development, the preferences of campers for areas of differing vegetative and topographic characteristics, and the potential demand for campgrounds of different types. These questions are biological and sociological.

How Entertain Them

Educational programs at recreational areas raise questions for which we need more information. What type of audience do we have? What methods of presentation best accomplish program goals? Can people be educated to appreciate nature? What should be the content of these programs? These kinds of questions involve biology, sociology, education and political science.

Several federal agencies are encouraging private recreational development, and these private developers need planning guides to ensure successful ventures. County and local governments need information on zoning and land use development, in order to prevent the kind of disorderly development that can kill the very basis for the attractiveness of an area. These problems involve economics, political science and aesthetics.

Although we know that "not every aspect pleases," we don't really know what "aspects" do please. To what extent does the average person recognize difference in vegetative cover? What are the preferences, if any, for different vegetative covers? What silvicultural practices can be encouraged to produce aesthetically pleasing landscapes? Is different treatment of forested roadside strips really necessary? These problems involve ecology, silviculture, aesthetics, and psychology.

Know Ecology First

While the problems of wildland recreation management and planning involve several fields of knowledge, a basic understanding of forests and ranges is necessary. This understanding is required by the importance of the basic wildland resource in efficiently satisfying the recreation wants of our growing population. A lack of recognition of this could result in development that would destroy the very thing people are looking for when they go into these areas for recreation.

The brief summary above shows the multitude of problems that could be studied in a total recreation research program. However, in initiating a new program it is necessary to narrow the scope. This is what has been done in the new recreation research project in the Department of Watershed Management. The project will be limited to investigating problems related to the demand for and economic value of wildland recreation.

The objective of the demand studies is development of improved ways of forecasting how many people will want and be able to use recreational facilities in the future. In order to attain this objective, studies will be made to find out why people participate in recreational activities, and how these reasons are related to the kinds of areas they use and to their social and economic characteristics. A byproduct of such studies will be descriptive information about recreation visitors that will be useful to recreation managers in planning site layouts and visitor information services.

What Is Dollar Value?

The economic valuation of recreation sites is useful in helping to make land use decisions. These decisions involve both questions of recreation versus other land uses, e.g., for timber or forage production, and of one kind of recreation development versus another kind. Economic valuation is difficult because public recreation has been traditionally provided free of charge.

Even though daily and seasonal charge are now made on federal areas, the same fee is charged for all areas and the fees have been set administratively. Because of this, there have been several different valuation methods proposed. The basic differences between them are really based on differences in opinion among economists. Thus, empirical research can't be used to pick the best one. But research can attempt to test the assumptions underlying them and help to improve their application; leaving the choice of method up to the judgment of the evaluator.

Just a Beginning

Future studies under the project will be broader, covering more kinds of recreation and broader areas. The total program may also expand to include other problems of importance to Arizona and the nation in general. This project is just a start at attacking a small portion of the problems in wildland recreation management.

Dr. King is an associate professor in the Department of Watershed Management.

Existe la posibilidad de que la clase de alimento que el ave ingiere pudiera influir en la postura de huevos con manchas de sangre. En unas investigaciones, la incidencia de las manchas de sangre alcanzó los niveles más altos en los huevos producidos por gallinas que recibieron alfalfa deshidratada.

Tops at Papago Range School

When the annual All-Reservation Cattle and Range Management School ended July 1, these three Papago youths won top awards. Left to right, Nicholas Ramon, special award for camp cookery; Herman Ramon, first conservation award, and Edward Pablo, second conservation award.

The school is held each June at the Santa Rosa Ranch School, on the Papago Reservation west of Tucson, under the able leadership of Phil Premy.

Directing instruction is Charles Whitfield, BIA Range Conservationist on the Papago Reservation, who boasts that "I give these lads the same kind of work I had in Range Management and Animal Science at The University of Arizona."

Twenty boys this year completed the course, which is concerned with a study of beneficial and harmful range plants, water and soil conservation, cattle distribution, charco construction, livestock judging, fencing, and cattle selection and management.

PROGRESSIVE AGRICULTURE IN ARIZONA

Official Publication of the College of Agriculture and School of Home Economics The University of Arizona

Harold E. Myers Dean

to: Abbie