Progressive

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Vol. XII No. 4

AGRICULTURE IN ARIZONA

UA Faculty 60 Years Ago

Our Cover Picture

University Faculty at Turn of the Century

This being an anniversary year, we selected for our cover picture a historic picture of the University of Arizona faculty of 1900-1901. You agriculturalists should recognize at least two of those pictured.

In the group, left to right, standing: W. W. Skinner, chemist in the Agricultural Experiment Station; F. Yale Adams, professor of history, commandant of cadets and in 1901 named university president; Louise H. Foucar, who taught botany, mathematics, ancient and modern languages from 1899 until 1902, when she married Thomas K. Marshall and moved to a home adjoining the campus.

Next is S. M. Woodward, professor of mathematics and mechanics, 1896-1904, when he went to Iowa State College and attained national prominence with studies of hydraulics and flood control; Mrs. M. Guild, instructor in subcollegiate subjects at this time when some four-fifths of the students were of subcollegiate rank. (Phoenix was the only Arizona town with an established high school in 1900, said The Wildcat when it published this same picture in 1928); F. N. Guild, who came to the university in 1897 and became head of the Department of Geology and Mineralogy;

Howard O. Hall, professor of English and librarian from the opening of the institution in 1891 until 1904, when he went to Stanford as professor of English; Robert H. Forbes, chemist for the Experiment Station, 1894-1911, director, 1899-1918, dean of the College of Agriculture, 1915-18; Nora Towner, no professional identification given;

Seated, left to right, Mary E. Plympton, preceptress, dean of women and instructor in English and French; G. E. P. Smith, who came to this university in 1900 and served as irrigation expert, agricultural engineer, Colorado River water expert, member emeritus of the University of Arizona staff until this past year; University Pres. M. M. Parker; D. H. Holmes, instructor in shop work, drawing and architecture; and Mrs. Mary B. Aguirre, widow of a wealthy freighter who was killed in a raid by Indians. She was an instructor in Spanish.

Not shown in the picture, but also members of the 18-person University of Arizona faculty at that time, were Prof. W. P. Blake, director of the School of Mines; Opal McGaughey, later Mrs. W. V. Whitmore, instructor in physical education and English; David Griffiths, professor of botany, and Mabel G. Hoover, instructor in domestic science, which now has evolved into home economics.

Silver Dollars — Not Ivory Towers

A publication from South Dakota State College says something applicable to all Land Grant Colleges, such as the College of Agriculture of the University of Arizona. We quote:

"There's no "ivory tower" at South Dakota State College.

"Actually, the heralded tower has long since come to earth in our colleges and universities. People have become aware that today's advances are based upon yesterday's research and that tomorrow's improvements are being discovered in the laboratory right now.

"There was once a fable that professors and researchers lived completely apart from the practical world. This disappeared in the mushroom cloud of the atomic bomb which owes its existence to Einstein's classic 'E=mc²' formula.

"Research conducted in colleges and universities is as practical as next week's pay check or next year's income. This connection is not at all remote, as research results have a marked effect on our pocketbooks."

Applying that last statement to the Arizona scene, we note that in the 30 year period of 1926-56 the *average* per acre yield of upland cotton in Arizona has risen from 364 pounds to 1130, of American-Egyptian cotton from 275 pounds to 699 pounds, of barley from 1300 pounds to nearly 2900 and sorghum grain from 1200 pounds to 2800. That's a 200 per cent increase in cotton yields and more than 100 per cent increase in barley and sorghum. The same general trend applies to Arizona's important commercial vegetable crops.

But let's just take that 766 extra pounds of upland cotton and the cottonseed that goes with it. That's an increased per-acre return of over $300 based on 1957 prices. Multiply that by 350,000 acres, somewhat below the average acreage in Arizona in recent years, and you get *105 million extra dollars from just one crop in just one year!*

That one year increase in the value of just one crop would, of itself, be nearly 60 times the total of federal and state appropriations to your state Experiment Station for next year's operation. Multiply again by the comparable figures for grains, vegetables, citrus and livestock products and you will agree that agricultural research is not a cost, but the most profitable type of self-liquidating investment.

Harold E. Myers

Dean
College of Agriculture and
School of Home Economics

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A*griculture*
IN ARIZONA

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Arizona farmers, ranchmen and homemakers may have their names placed on the mailing list to receive **Progressive Agriculture** at no cost by sending a request to the College of Agriculture, University of Arizona, Tucson, Arizona.

Handicapped Women Adjust To Home Tasks

Victor A. Christopherson

"More than 10,000,000 handicapped homemakers in America," is the estimate of Dr. Howard Rusk of New York University-Bellevue Medical Center. There are estimated to be more than 30,000 arthritics in the Tucson metropolitan area alone.

A disabled mother frequently means that the wage earner must spend less time on the job and more time at home. The mother's work does not stop when she becomes disabled — children have to be bathed, fed, cared for; ironing, cooking, shopping and other household chores need daily attention. How does she and the other family members manage? Some of the recent research carried out by the Division of Child Development and Family Relations, School of Home Economics, has attempted to find answers to this question and to increase our general knowledge of the physically disabled mother.

Interviews With 84

Eighty-four physically handicapped mothers who had children under 12 years of age were interviewed. These women were classified according to the nature of the disability, and the body parts or extremities in which the disability occurred. It was then possible to compare the subjects' degree of limitation in upper and lower extremities with their general competency as well as their problems with regard to homemaking tasks.

Were the most seriously handicapped mothers the poorest homemakers?

No. One of the unexpected findings was that some of the mothers most severely disabled with polio, for example, were among the most effective homemakers. The way the individual viewed herself and her relationships with others, seemed more significant. A promising approach to rehabilitation seemed to be in helping the disabled woman to see herself and her situation in new ways.

They Still Carried On

Do seriously handicapped women need to leave child care to others?

No. Even though transporting a child is one of the most awesome challenges facing the partially paralyzed or physically sub-normal mother, there are ways to get small children from one place to another. One mother carried the baby in her blouse; another placed the child on a blanket and carried the blanket in her teeth; others eased the children onto carts and pushed them while sitting in wheel chairs.

What seems to be the most difficult problems in child care for the disabled mother? Discipline and outdoor supervision were mentioned more than any other areas of child care as posing difficult problems. Since the mother cannot catch the child until he's ready to be caught, she must accomplish, by and large, with words and understanding what the normal mother accomplishes with strength, speed, and energy.

Keep Youngsters Near at Hand

The more successful ways of controlling children out of doors, were by encouraging the children to return periodically "to check on mother"; by making their own play areas sufficiently attractive that other children came there to play, and having neighbors phone reports on the child's whereabouts. There are no foolproof formulae, however, for insuring the child's safety and well-being once out of eyesight. One mother reported sitting helplessly in a wheel chair watching her toddler sink almost out of sight in some deep mud before he was rescued by a chance passer-by.

Do children of handicapped mothers "grow up" more quickly than other children? Quite possibly. Greater percentages of children, three years of age or younger, of disabled mothers than of physically normal mothers washed themselves, bathed themselves, straightened their own rooms, and entertained themselves.

Does a physical disability seriously modify the homemaking role?

Yes. Ninety-three per cent of the subjects were forced to discontinue a substantial portion of their homemaking activities. However, after the onset of the handicap, 30 per cent of the mothers performed services for their families that were not performed before. For example, mothers read to their children, played with them, told stories, and talked and *listened* to them in a way not characteristic prior to the handicap.

Family Closer Together

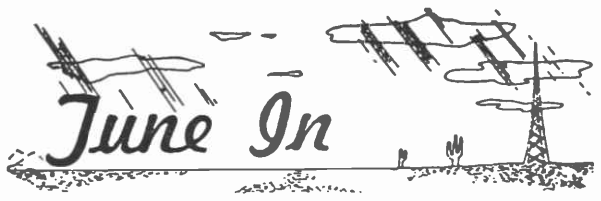
While not typical, a rather dramatic occurrence was that seven subjects indicated that their families had been more closely knit and happier since the disability. Several indicated they would not change to the pre-handicap days even were such a thing possible.

One of the most significant and successful roles assumed by the severely disabled mother was the "enabling" role. She made the most of her potential as a "setter of mood," and fully exploited the emotional reciprocity in her relations with other members of the family.

Community activities were found to constitute an important source of rehabilitation for the disabled woman, and many participated after the handicap that had not done so before.

New Federal Aid Proposed

The some 10 million disabled homemakers in America today can look forward to rehabilitation training never before obtainable. It is expected that the Independent Living Rehabilitation Bill, also known as the Rehabilitation Act of 1959, S.772, will pass both houses of Congress this year and be enacted into law. Tacitly, at least, the occupational significance of the disabled homemaker is being acknowledged as well as her right to aid.



Cochise County

KAWT, Douglas—Mon. and Wed., 6:55 a.m.
KAPR, Douglas—Sat., 12:15 p. m.

Coconino County

KCLS, Flagstaff—Tues. and Thurs., 8:20 a.m.
KCLS, Flagstaff (Home Agent)—Thurs., 9:45 a.m.
KVNA, Flagstaff—Mon. thru Friday, 12:15 p.m.

Yavapai County

KYCA, Prescott—Mon., Wed., and Fri., 5:55 p.m.
KNOT, Prescott—Mon., Wed., and Fri., 6:35 a.m.

Yuma County

KYUM, Yuma—Mon. thru Fri., 6:35 a.m.
KVOY, Yuma—Mon. thru Fri., 12:35 p.m.

Maricopa County

KRUX, Phoenix — Mon. thru Sat., 5:55 a.m.
KTAR, Phoenix—Thurs., 12:45 p.m.
KOY, Phoenix—Sun., 8:45 a.m.

Pinal County

KPIN, Casa Grande—Daily except Thurs., 6:40 a.m., Mon. and Fri. 9:35 a.m.

Dr. Christopherson is Professor of Family Relationships in the School of Home Economics.

Marketing Mexican Cattle In The United States

R. E. Seltzer and T. M. Stubblefield

Historically, the United States has been the market for cattle produced in the northern tier of Mexican states. The exportation of such cattle has made a major contribution to the economy of northern Mexico, and the importation of these cattle is important to the cattle feeding industry in the Southwest. In 1959 some 488,000 head were imported to the U.S. from Mexico.

To an increasing extent both Arizona and California are being forced to reach further and further into the South and the Midwest to secure the number of feeder cattle necessary to supply their rapidly expanding cattle feeding industry.

Is Logical Source

Geographically, northern Mexico is the logical area to which to look for increased supplies of feeder cattle. It lies immediately to the south of the major cattle feeding areas in both Arizona and California, and with the ever increasing cost of transportation the locational advantage of northern Mexico cannot be ignored.

The primary area in Mexico from which cattle move to the United States includes the states of Sonora, Chihuahua, Coahuila, Durango, Nueva Leon, and Tamaulipas. Three factors serve primarily to make the United States the principal market for cattle from these states. These are: (1) proximity to the United States, (2) their position above the tick line, and (3) the lack of an adequate transportation system for the movement of cattle to the south.

Cattle imported from Mexico vary greatly as to type, age, breed, and weight. However, they are predominately yearling steers of Hereford or mixed Hereford breeding, and most of them weigh between 350 and 500 pounds. About two-thirds of the cattle imported go directly into feedlots and the rest go back on ranges in the southwestern United States.

El Paso Main Route

Approximately 40 per cent of the total cattle imported from Mexico are brought in through the port of El Paso; Nogales, Ariz., the second in importance, accounting for about 14 per cent. Calexico, Calif. accounts for about 13 per cent of the total; Eagle Pass, Texas, 8 per cent; Douglas, Ariz., 7 per cent; Presidio, Texas, 3 per cent, and the remaining 15 per cent comes in through other ports along the border. The greatest change in the importance of any particular port-of-entry has taken place at Calexico. Prior to the closing of the border in 1946, this port was of minor significance in the importation of these cattle. Since 1955, volume at Calexico has increased rapidly to the point where this port now ranks third.

Shipments of Mexican cattle to the United States originate from a relatively small number of origins in Mexico. Although many of the cattle shipped come from large ranches, and each shipment represents a single ownership, it also appears that these major shipping points act as concentration centers where multiple-owner loads are assembled.

Most Stay in Southwest

While it is difficult to determine the ultimate destination of Mexican cattle imported into the United States, it is apparent that most of these cattle remain in the Southwest. Of the total imported, 85 per cent were indicated as going to destinations in the Southwest. Many of these cattle undoubtedly moved on to grazing and feeding in other states, but the bulk of them probably remained in the area where imported.

The importation of Mexican cattle is of concern to the range cattle industry in the Southwest in that these importations compete with locally produced feeder cattle in the market in this area. Although the number of Mexican cattle imported is relatively small compared to the number of feeder cattle produced in the United States, locally the trade assumes a greater degree of importance since most of the cattle imported remain in the Southwest for grazing or feeding. These cattle undoubtedly do have some depressing effect on the price of local feeder cattle.

However, the effect of the importation of Mexican cattle on local feeder prices would be no different than the effect of importation of cattle from Texas or any other state. Since Arizona does not produce enough feeder cattle to supply the demand of our own feedlots and of feedlots in southern California, it is necessary that we import cattle from other parts of the United States or from northern Mexico.

Dr. Seltzer is head of the Agricultural Economics Department and Dr. Stubblefield is an Associate Agricultural Economist.

JANUARY

1- 7—Arizona National Livestock Show. Phoenix

11-12—10th Annual Dairy Industry Conference. Tucson

16-20—Annual Extension Service Conference. U of A Campus, Tucson

25—Annual Meeting of Arizona Poultry Federation. Arizona State University. Tempe

FEBRUARY

8- 9—4th Annual Arizona Fertilizer Conference. U of A Campus, Tucson

11—Annual Meeting of Arizona Cattle Feeders Assoc. Phoenix

27-28—Arizona Egg Quality School. Phoenix

MARCH

1—Arizona Egg Quality School. Phoenix

5-12—National 4-H Club Week

8-12—Southern Arizona International Livestock Show. Tucson

18—FFA Field Day. U of A Campus, Tucson

Virus Indexing For 'Clean' Citrus Bud Source Trees

Ross M. Allen

Much too frequently cries are heard from owners of older citrus groves, "What is happening to my trees? They refuse to grow or produce fruit no matter what I do."

Unfortunately, and again too frequently, a simple examination of the roots, trunks, and bud-unions of declining trees shows tell-tale symptoms of virus infection. And worst of all is the fact that there are no lasting, effective cures for the several virus-caused diseases of citrus. All that remains to the luckless grower is to remove the affected trees as soon as they become non-productive.

Budwood Source is Important

All of the virus diseases of citrus may be transmitted in the budding procedure. With only one exception, bud transmission is the usual method of spread for these diseases. Tristeza or "Quick Decline" may be spread also by aphids but luckily, tristeza is not found in commercial groves in Arizona.

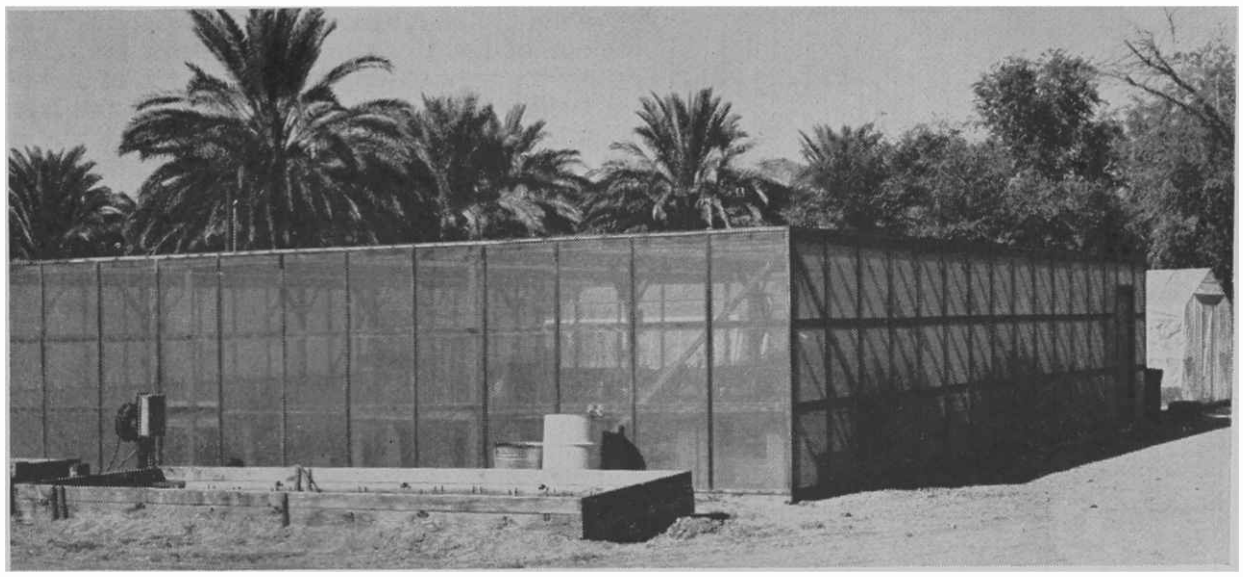
For years it has been standard practice for citrus nurserymen and growers to select their "better" trees as budwood sources. Too often this custom is a serious entrapment and results in major losses in the groves.

Virus diseases of citrus must be identified by the symptoms they cause. Some of the viruses may be present in apparently healthy trees for 15 or 20 years before the trees show symptoms and begin to decline. For this reason the virus diseases have been unknowingly transferred in buds to young nursery stock. Eventually, these diseased trees decline uncontrollably after they have been planted in groves.

Help is in Sight

A citrus virus indexing program for obtaining virus-free varieties has been started at the Yuma Mesa Citrus Experiment Station.

By budding very susceptible indicator citrus seedlings it is possible to determine accurately whether a specific bud-source tree is healthy or diseased. The time required for the process ranges from a minimum of three months for psorosis and tristeza to three or four years for such diseases as cachexia, xyloporosis, exocortis, and Rangpur Lime disease. An even longer period may be needed for determination of Stubborn Disease which probably is caused by a virus also.



THIS GREENHOUSE at the UA Yuma Mesa Branch Experiment Station, is the battleground where citrus viruses are being attacked. Susceptible indicator seedlings are grown in the hot-bed. After transferring seedlings to individual cans they are budded with candidate buds and kept in the screenhouse and greenhouse until virus disease is proved present or absent. (Photo by Lewis Robison, Yuma County Farmer)

The short term tests are being made in an insect-proof screenhouse or in a plastic-covered greenhouse. This prevents all possible introduction of tristeza by aphids. Long term tests are made in a field index nursery nearly two acres large. A complete test series for a single candidate budwood-source tree requires the budding of at least three seedling trees of each of eight or nine different species of indicators.

Fifty-nine entries are now being indexed in this program. This figure includes 27 varieties of citrus imported into the state within the past five years. Also included in the program are 32 local entries. Some of this group are presently popular bud-source trees or are those that have served in this capacity in past years during the expansion of the citrus industry in Arizona.

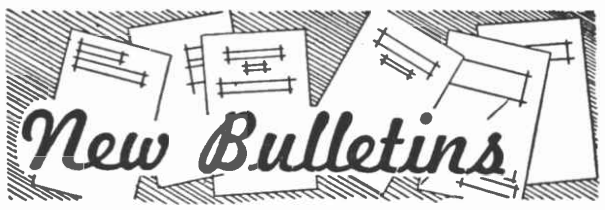
Goal is "Clean" Bud Source

Undoubtedly, some of the present entries in the indexing program will prove to be free of most, if not all, of the known citrus viruses. The goal of the program is the establishment of bud-source trees which are known to be absolutely free of bud-transmitted diseases.

Arizona citrus growers and the general public will reap benefits from the indexing program. The nurserymen and growers can be assured that the buds they use for propagation of new trees will be free of virus diseases. Clean trees will have a longer, more productive field life. Also, a wider choice of rootstocks can be made. Certain of the viruses have prevented the use of desirable rootstocks which are especially susceptible to these viruses.

More scion varieties and strains within these varieties will be available, thus allowing for even more rapid expansion of the industry in the state. Better crop production can be expected at no increase in standard production costs. And perhaps best of all, the growers and consumers will profit from better quality fruit produced in an increased number of types and varieties.

Dr. Allen is an Associate Plant Pathologist stationed at the Yuma Branch Station.



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CIRCULARS

216—Pressing Fabrics and Garments

BULLETINS

A-1—Chemical Weed Control Recommendations for Irrigated Areas of Arizona 1961

A-4—Field Crop Varieties for Arizona 1961

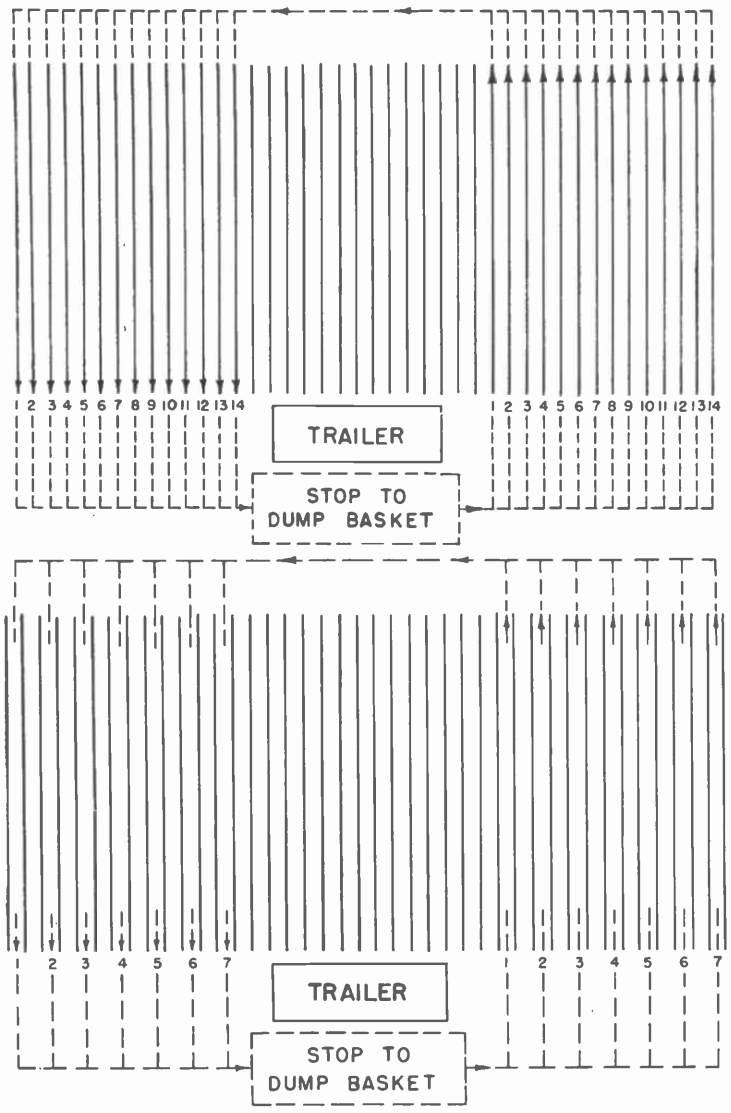
A-6—Lawns for Arizona

A-7—Indoor Gardening

A-8—Pruning Hedges, Shrubs and Trees

A-9—1961 Fertilizer Recommendations for Arizona

302—Forage Production on Arizona Ranges V. Pima, Pinal & Santa Cruz Counties



FIELD TRAVEL patterns for efficient use of time in the field depend on yield, ←——row-lengths and width of headlands. These patterns, shown at the left, will give an efficient use of time under some conditions. At top, pattern for one-row picker; below, pattern for two-row machine.

Capacity of Cotton Picking Machines

K. K. Barnes

Machine picking of cotton utilizes equipment which requires a high level of capital investment. The return on this investment depends on the selection of the proper equipment for the job and the proper management of that equipment on the job.

Should a one-row or a two-row picker be used? Is it profitable to have a man stationed in a cotton trailer to assist in the dumping of baskets into the trailer? What travel patterns in the field give the most effective use of time?

To get information which would help in answering questions like these, a time study of mechanical cotton picking was made during the harvest season of 1959. Operations involving one-and two-row pickers were studied at several locations in Maricopa County.

Involves Many Activities

Machine cotton picking involves a number of separate activities. These are (1) travel down the row picking cotton, (2) turning and traveling across the row ends, (3) traveling to and from cotton trailers, (4) dumping picker baskets into trailers, (5) cleaning out the picker, (6) servicing the picker, and (7) miscellaneous activities such as talking with other workers and counting rows.

Dr. Barnes is head of the Department of Agricultural Engineering.

Our table shows the distribution of time for these activities which may be found in well managed picking operations. The lower part of the table summarizes the capacitive performance of the pickers. Capacitive performance refers to the machine's ability to cover area. It has no reference to the quality of the job that is being done.

One factor in capacitive performance is the theoretical field capacity. The theoretical field capacity is the acres per hour which the machine could cover if it maintained its rated forward speed and actually traveled down the row 100% of the time. Theoretical field capacity is the product of the operating width and the forward speed of the machine. Theoretical field capacity in acres per hour is given by

$$\frac{\text{(speed in m.p.h.) x (width in ft.)}}{8.25}$$

It is obvious that a machine will never achieve its full theoretical capacity. There are many activities other than actually picking cotton which are essential parts of a cotton harvesting operation. Turning at row ends, traveling to trailers, dumping picker baskets into trailers, cleaning and adjusting the machine are all essential parts of the cotton harvest — and they all take time. What really counts is the effective field capacity — the actual area covered per hour over the average of a day's, week's or season's work.

Measuring "Field Efficiency"

Field efficiency is a useful index in judging the capacitive performance of a picker, but its definition must be kept clearly in mind. Field efficiency is the effective capacity as a percentage of the theoretical capacity. A field efficiency of 74% means that the machine is actually picking cotton 74% of the time that it is in the field.

Several important points can be discussed in reference to the table. First of these is the relative capacity of 2-row compared to 1-row pickers. Assuming both sizes of machine run at the same speed it is immediately apparent that the theoretical field capacity of the 2-row machine will be twice that of the 1-row picker. However, many of the activities require as much or more time per acre with the 2-row picker as they do for the 1-row picker. Thus the field efficiency of the 2-row picker is 59% as compared with 74% for the 1-row picker.

The result is that the 2-row picker has an effective field capacity 1.58 times that of the 1-row picker — an important point to remember in deciding which of the two alternative available sizes is best for a specific situation.

More than Just Picking Cotton

Turning, travel and dumping baskets together require 16.5% of the field time for 1-row pickers and 19% of the field time for 2-row pickers. Attention to detail in the management of these activities is a key point in maintaining high effective field capacity.

Laying out lands for picking, that minimize travel across ends while simultaneously providing for convenient and direct travel to and from trailers, will hold down travel and turning time. The actual number of rows in a land can be selected with regard to seed-cotton yield and trailer size to permit minimum moving of trailers from place to place in the field. The travel patterns shown in our graphs will give efficient use of time in nominal ¼ mile rows with a 1.5 bale picking and 4-bale trailers.

Need Man in Trailer

Another point drawn from field time studies is the value of a man in a cotton trailer to assist in dumping baskets. The first one-third of a trailer load of cotton will dump cleanly into the trailer from the picker baskets. The remaining two-thirds of the cotton must be to some extent pulled out of the baskets by hand and spread in the trailer. Either the picker operator must climb into the trailer to do this job or there must be other help available. Our studies indicate that if labor is available at $1 per hour, it can profitably be used as help in dumping baskets into trailers if as many as 4 pickers are dumping into 1 trailer.

The fundamental concepts discussed here in specific relationship to cotton harvesting apply to the operation of all types of field machines. Management of machine operations in the field becomes increasingly important as operations become increasingly highly mechanized to decrease costs.

IDEALIZED PERFORMANCE OF 1-AND 2-ROW COTTON PICKERS ASSUMING A SPEED OF 2.1 MPH, 1240 FOOT ROWS

	Distribution of Time —minutes per acre	
Activity	1-row	2-row
Picking	74.4	37.2
Turning	4.4	2.2
Travel to and from trailer	4.5	2.2
Dumping Basket	7.7	7.8
Cleaning	8.3	12.5
Service and Adjustment*	0.4	0.4
Miscellaneous	1.0	1.0
Total	100.7	63.3

*Does not include daily lubrication and service.

New Technique Improves Cardinal Grape Quality

G. C. Sharples, J. R. Kuykendall,

L. F. True, and H. F. Tate

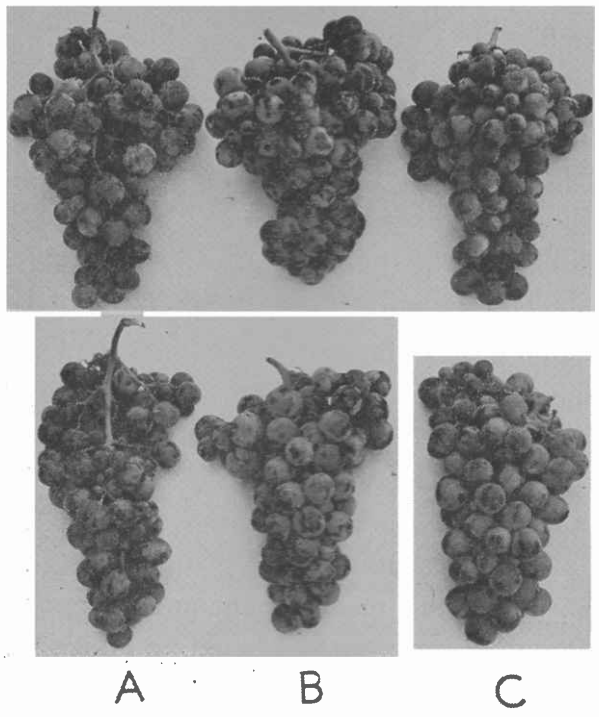
Always conscious of market demands for higher quality, Arizona growers of Cardinal grapes now have available a relatively simple means for increasing production of number one grade fruit. Although the Cardinal is noted for its natural high quality, no one can deny the value of any practice which tends to improve on nature.

Many Cardinal clusters, chiefly those which ripen earliest, are often poorly set with normal seeded berries. Frequently the shoulders of the clusters have the fewest normal berries set, giving them a cylindrical shape rather than the more desirable conical form associated with high quality Cardinal fruit. Some berries which do not set normally fail to drop off, and they remain in the clusters through the ripening period as small, green, seedless shot-berries.

Not Desirable Appearance

Some shot-berries continue to grow slowly and some even acquire color and accumulate sugar. But these characteristics result in mature clusters with a loose, open, straggly appearance, non-uniform color and berry size and therefore, a lower grade. Because of this packers find it necessary to perform expensive hand selection and trimming of clusters to provide the market with fruit of the highest grade.

In simplest terms, the new method for improving fruit quality involves only pinching or clipping off one-fourth to three-eights inch from the tip of each flower cluster before blossoming occurs. Research in progress at the University of Arizona Branch Experiment Station, in Mesa, reveals that this simple method can increase the production of number one grade fruit by as much as 115 per cent. Coincidentally, the yield of number two grade and cull fruit is reduced by nearly one-half, as shown in the graph on this page.

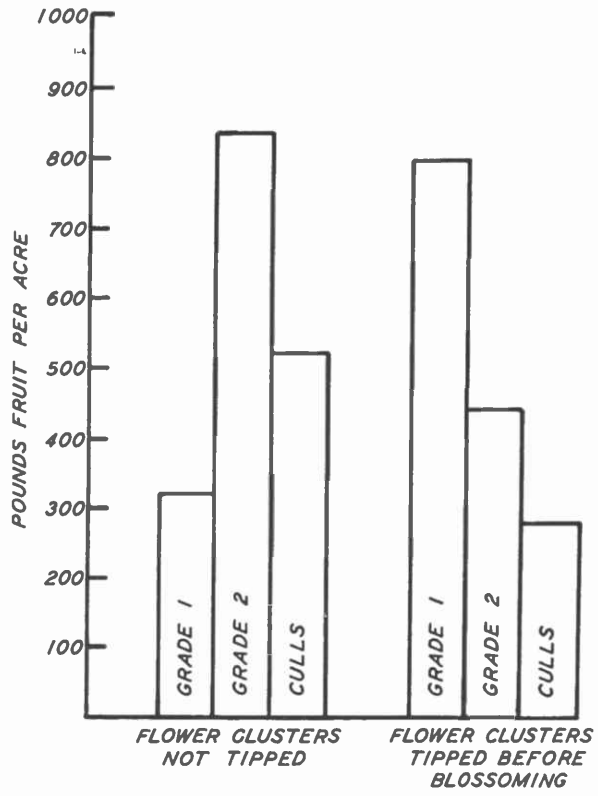


GRAPE CLUSTERS over "A" are normal, while "B" and "C" show the larger, better filled clusters resulting from removal of 3/8 inch at the tip at prebloom flower stage.

Through critical laboratory examinations of harvested fruit, it has been determined that the reasons for this marked grade improvement are (1) more uniform berry size and color, (2) increased set of normal sized seeded berries, which results in more compact, better shaped clusters, and (3) fewer shot-berries, especially in early ripening clusters, as shown in the photos. Of great importance is the fact that total fruit production is not reduced significantly by this practice, a distinct advantage over methods of improving quality which involve severe fruit cluster thinning practices. The sugar content of berries from treated clusters is no different than from untreated clusters.

Also Advanced Ripening

In addition to grade improvement of fruit, the time of ripening was advanced by at least 4 or 5 days by flower cluster tipping. Earliness is an extremely important factor to growers in such a highly competitive market as table grapes. During the course of the 1960 shipping season the overall average market price of Cardinal grapes for one grower decreased by about 9 cents per lug per day.



MORE GRAPES of better quality, as shown by this graph, result from prebloom flower tip removal.

At the beginning of the season price changes were generally much more rapid than late in the season, so that a few days difference in time of ripening could make a great deal of difference in market value of fruit.

Procedure Pays Off

Preliminary calculations based upon the average 1960 market prices of number one and number two grade fruit plus the added effect of five days in advance in maturity indicate flower cluster tipping can increase the value of Cardinal grapes by about $300 per acre. At present we have no information relative to the labor cost involved in performing such an operation, but experienced observers have estimated it at $50 per acre or less.

Mr. Sharples and Dr. Kuykendall are members of the Horticulture Department, Mr. True is a member of the County Extension staff in Maricopa County, and Mr. Tate is Extension Specialist in Horticulture.

Trade names used in this magazine do not endorse products named nor imply criticism of similar ones not mentioned.

Problems of Adjustment In Southwest Agriculture

M. M. Kelso

What are some of the important agricultural adjustment problems that plague the Southwest region? They occur within an environment largely peculiar to the Southwest—aridity, altitudinal extremes, sparse vegetation and sparser population, vast public land holdings, tourists and tourism, young but maturing governments, and explosive population and economic growth.

Nevertheless, some of the agricultural problems of the Southwest are like those of the whole United States. It is well, then, to divide any list of southwestern agricultural adjustment problems into two parts — those relatively peculiar to the southwest and those important but not peculiar to it.

I. Agricultural problems and needed adjustments important to the Southwest region but not peculiar to it

The Southwest region shares these problems with agriculture throughout the United States. They are much discussed and much worked on. Hence, let us only list them here without elaboration.

1. Adjusting commercial agriculture to new economic conditions brought on by changing demands and technologies.
2. Adjusting agricultural production to the changing marketing structures for agricultural products especially related to high value, highly specialized products and to meat animals (mainly beef cattle).
3. The impacts on labor intensive types of Southwest agriculture that result from the changing market structure and price for agricultural labor.
4. Problems associated with the burdens and inequities of the real property tax plague Southwest agriculture as they they do agriculture everywhere.

Problems of Low Income Groups

5. The Southwest has a sizeable problem of low income rural people — its Indian, early Spanish, and others who are on resource units too small for their adequate support.
6. Finally, like the rest of the country, although much "inventory" research has been done, the southwestern region is greatly lacking in adequate inventories of soils, of natural vegetation, of water, of weather, of minerals, etc. Intelligent planning and programming of private management and of public action programs based on expanded use of the resource base are impossible or grossly inadequate when what we have available is unknown or known but dimly.

II. Agricultural adjustment problems relatively peculiar to the Southwest region

Although the adjustment problems listed above are important in the Southwest, those listed below are of peculiar importance because their solution must be found in the Southwest. We will find it difficult to draw on solutions found in other regions. On these, we're "on our own."

1. Huge public investments in the development of basic economic resources within an environment of rapid growth and change.

Water in the region is the principal recipient of this public investment. The investment may be by "engineering" works or by "biological" manipulation or both. The fabulous California Water Project, the Colorado River development program, including the Central Arizona Project, and the trans-mountain diversions in Colorado are examples of development by engineering works. The Arizona Watershed Program is an outstanding example of water development by biological manipulation.

Raised by such programs are troublesome questions about the role of agriculture in the development activity in comparison to industrial, urban, and recreation uses of the expanded water supplies and the power and power revenues usually generated thereby. Throughout the region, the question is—"Is agriculture still the bell wether of water resource development or is it now, simply, a wistful bystander enjoying the crumbs from the developmental feast that fall its way in the course of the activity?" And, what if it is? Is this anything that we should be worried about — or should we be worried about only the development being what is "best" for the region?

Adjustments Must Be Made

2. Approaching adjustments in agriculture made mandatory by (a) water mining, (b) industrialization, and (c) urbanization.

The agricultural adjustments demanded by industrialization and urbanization may be "problems" only from the viewpoint of agricultural sentimentalists. Economically, these adjustments normally will "pay their own way" in that the agriculturalist will not be forced against his economic interest to change or migrate. His interest will be paid for. Agriculture service institutions caught in these situations may not be so lucky — agricultural extension, vocational agriculture, agricultural marketing, processing and supply industries, etc. These activities will find their agricultural base drying up in urbanizing and industrializing areas.

The emerging problem of adjustment to water depletion is quite different. In many areas agriculture has been established on a resouce base that includes a stored ground water supply. In many, maybe in most, of these instances, recharge is vastly slower than withdrawals. The consequence is inevitable. The only questions are when, how, and to what degree must the adjustment occur — and must the adjustment be in the dependent agriculture or in the resource base by substituting "imported" flow resource for the depleted fund resource. In many cases, frantic search will be for the latter but I fear that in most cases the final adjustment will lie in the former.

A Peculiar Situation

Peculiarly, this is the only instance of an agricultural industry based, like the oil, lumbering and mineral industries, on an extractive operation with its inevitable accompaniment of economic and social change and instability. The agricultural industry is ill-equipped through experience to deal with this problem because agriculture has been considered the outstanding example of an immortal industry rooted in a perpetual resource. The institutional equipment of the industry is not adapted to an adjustment problem of this kind.

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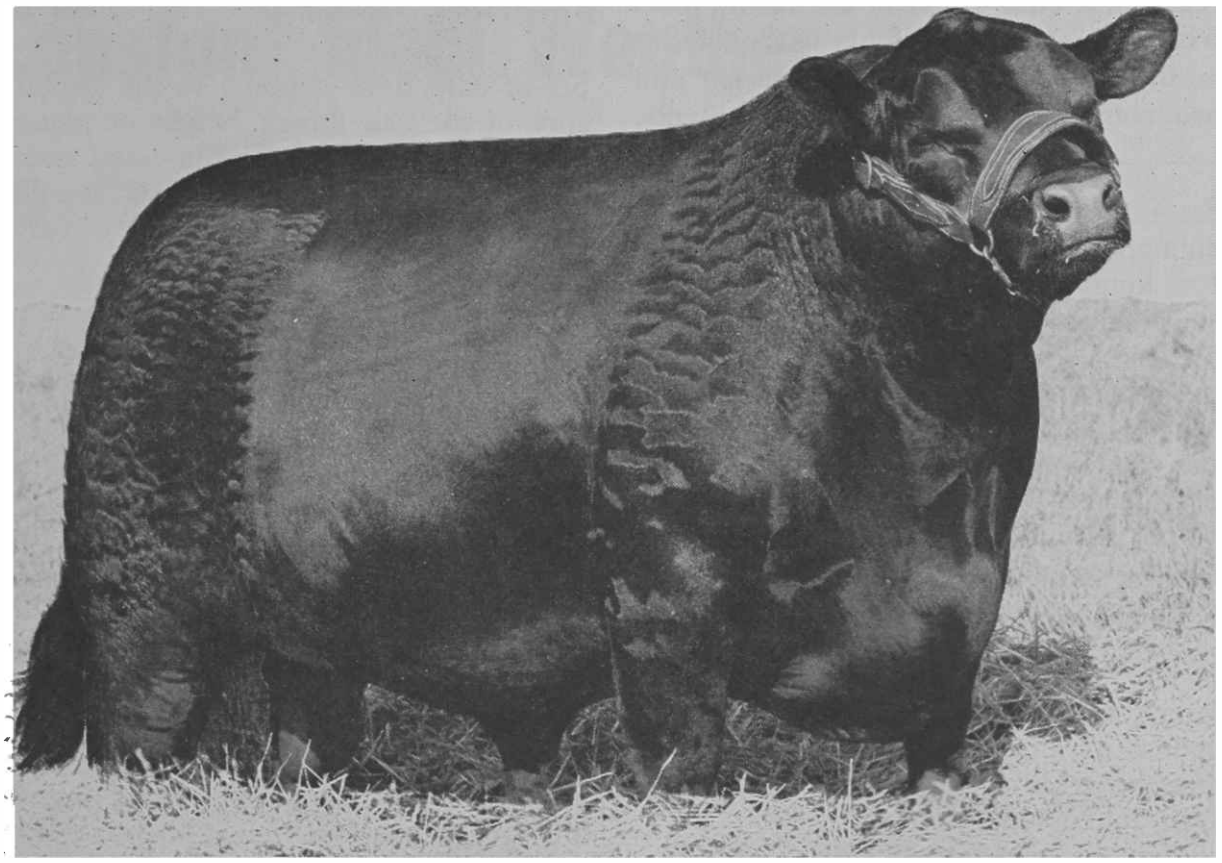
Dr. Kelso is professor of Agricultural Economics.

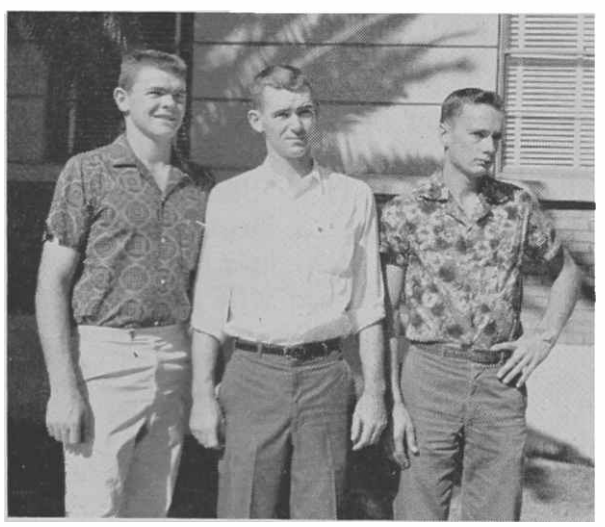


NEW ANGUS herd sire added to the University of Arizona herd is Homeplace Eileenmere 425, bred by Staley Farms, Liberty, Missouri. The new UA acquisition was grand champion Angus bull at the Nebraska State Fair and reserve senior champion at the Texas State Fair.

SIX UNIVERSITY of Arizona students majoring in horticulture have received scholarships of $500 apiece, awarded by the Vegetable Growers Association, Phoenix, through their Memorial Foundation.

Award winners this year, shown above, are (left to right) Frank Hunt, Glendale; Don Smith, Tucson; and Arthur Johnson, Yuma.

Below, same order, Thomas Russell, Tucson; Alfred Johnson, St. David; and Floyd Sharp, Mesa.



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For example, the mineral, oil and lumbering industries are given tax concessions through "depletion allowances" — not agriculture. The agricultural industry in its own "accounting" procedures does not "depreciate" its underlying land values in anticipation of this "depletion cost" as do other industries that exploit fund resources.

3. The approaching necessity for change in our systems and standards of water rationing, both among users and among uses.

Property in water in the region grew first out of placer mining and then out of agricultural requirements. The vastly increasing demands for water today, however, are for industry, urban, and recreation users and uses. In some states the laws of surface water rights are not significant deterrants to the shift of water to non-agricultural uses. In others they are. In all of the region, the problems associated with surface and ground water relationships and the transfer of water among uses and users demands increasing attention.

Role of Federal Lands

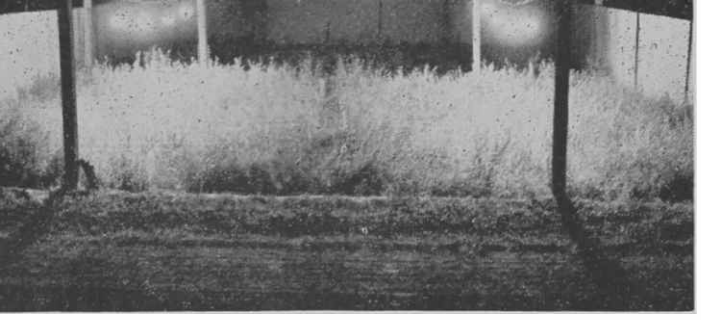
4. The changing role of public, mainly federal, lands as to their management and development, allotment and pricing, retention and disposal.

Public (mainly federal) lands are a dominant feature, at least in area, in all states of the Southwest region. Throughout the region, they have played an important and in many respects dominant role in the range livestock economy. Consequently, what happens to them, particularly what happens to the policies that govern them, has an effect on the livestock economy throughout the region. The growing demand for lumber products, for recreation (in all its forms including wildlife and "solitude"), for minerals, and for water is changing the use priorities on these areas and thus their role in relation to agriculture — especially grazing — in the region.

Priority of Problems

These, then, are the agricultural problems that demand solution in the southwestern region. All of them are serious; all need solution. If I were going to schedule efforts in the region to find solutions in order of their importance and difficulty, I would schedule the following problems for first attention:

1. **The huge public investment program in the development of basic economic resources;**
2. **The approaching adjustments in agriculture made mandatory by water mining, by industrialization, and by urbanization;**
3. **The approaching necessity for change in the systems and standards of water rationing;**
4. **The problems of adjustment of commercial farming to new economic conditions brought on by changing demand and technological conditions; and**
5. **The problems of adjusting to rapidly changing structures and functions in the markets for agricultural products.**



AT LEFT, view of one of the alfalfa plots when the photoflood lights flashed on at midnight, breaking the dark period and producing long-day effects on the plants.

It's Called Photoperiodism

Scientists 'Waking' Plants At Midnight

M. A. Massengale

and D. F. McAlister

While everyone knows that plants must have light to live and grow, it is not such common knowledge that many plants must have a specific number of hours *of light or darkness before they will flower and set seed.*

The response of plants to the duration of the light period required to initiate flower development is called photoperiodism. Plants that flower when days are short are called *"short-day"* plants, those requiring long days are *"long-day"* plants and plants which flower under either long or short days are classified as *"day-neutral"*. Soybeans are typical of short-day plants, sugar beets of long-day plants and most of our short staple cotton varieties are considered to be day-neutral.

Brief Night Lighting Effective

Most of the research on photoperiodism in plants has been conducted under laboratory or greenhouse conditions. The discovery by Dr. H. A. Borthwick and his associates in the U. S. Department ofAgriculture that a light interruption of the dark or night period will produce long-day effects in plants even though they are grown under short days provided a means for conducting length-of-day studies under certain field conditions.

The climate and latitude at Tucson are unique for conducting field experiments on photoperiodism in plants, since this is one of the few locations in the United States where temperatures are high enough for alfalfa to continue to grow for long periods when daylengths are short. Tucson is located at approximately 32½° N. latitude and, except for a short period just before and after the summer solstice, daylengths are short throughout the year. Long-day conditions are provided through the use of photoflood lamps, placed in the field and turned on at midnight each night for 20 minutes, to interrupt the dark period for plants growing under actual field conditions. The picture at left, above, shows the arrangement of lamps and shields used to study the response of alfalfa to long- and short-day treatments at a University of Arizona farm in Tucson.

Study Began 6 Years Ago

Field experiments on the effects of long and short photoperiods on alfalfa have been conducted at the Arizona Agricultural Experiment Station since 1954. At present two studies are in progress. One is designed to investigate the effect of photoperiod on vegetative growth, flowering and seed production of African and Vernal alfalfas. The second experiment deals with the effect of photoperiod on vegetative growth, flowering, crown characteristics, dormancy and forage production of 12 different varieties of alfalfa.

The results from these studies to date have been most interesting. For example, our data show that alfalfa plants are most sensitive to photoperiod during their seedling year. Also, certain varieties are more sensitive than others. Of several characteristics measured — such as number of days from clipping to the appearance of the first flower, height of plants, dry weight and seed weight — the number of days from cutting to flowering proved to be the most responsive to varying the photoperiod.

Plants Flowered Earlier

In the experiment where several different alfalfa varieties are being studied for their reaction to photoperiod, plants of all varieties growing under long days flowered earlier and grew taller during the initial growth after planting than plants growing under short-day conditions.

When a northern species of alfalfa, *Medicago falcata,* was tested, the highest per cent of plants that flowered under natural daylength at any time in the seedling year was 78 per cent. Flowering of this species was much more abundant under the long-day treatment, as shown in the photos below.

After each clipping the winter-hardy varieties flowered earlier throughout the growing season under long days. In some instances during the summer months, when longer natural daylengths and higher temperatures were prevalent, the non-winter hardy varieties flowered earlier under short or natural days.

Each variety under each daylength was harvested when the average number of plants in flower was 90 per cent. Using this index for when to cut, the total number of harvests was more under long days than short days for most varieties. Though the plants grown under long days were cut more times the plants grown under natural, or short days, produced the most hay. Also when diameters of the crowns

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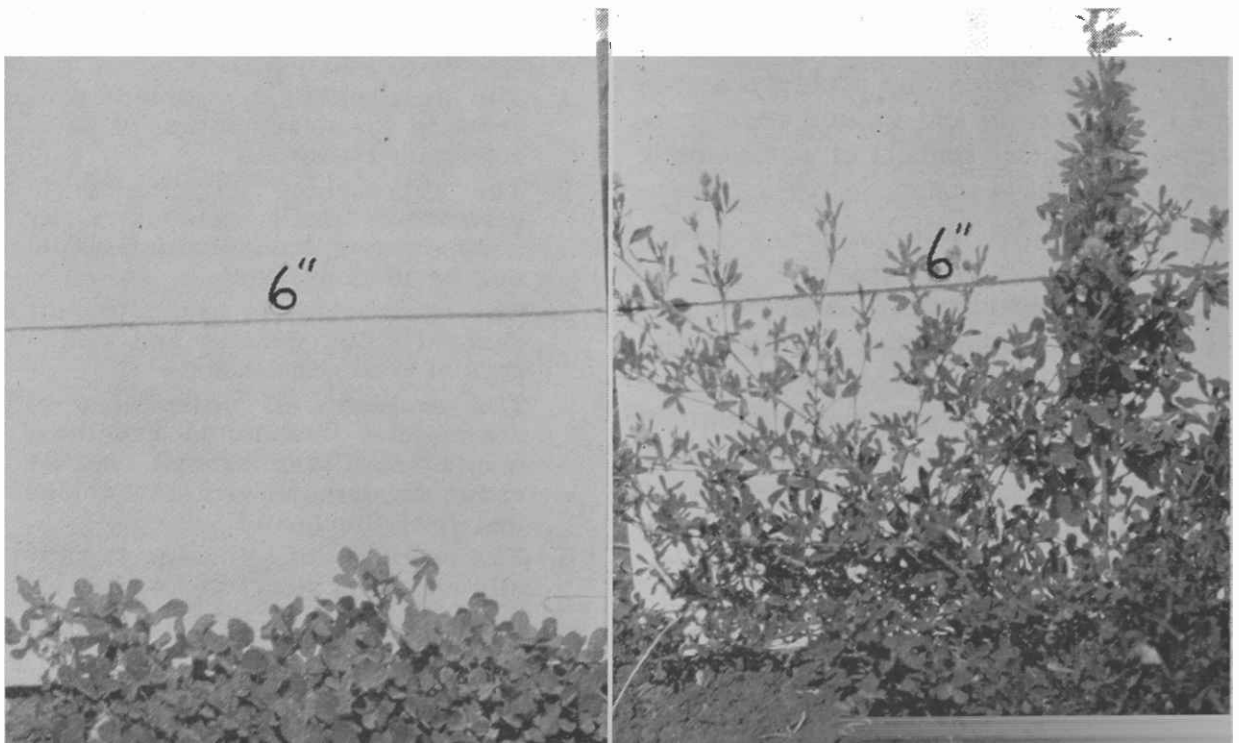
PLANTS of a wild-type alfalfa, *Medicago falcata,* both planted at the same time. Plants at left were grown under natural daylength (short-day photoperiod), while those at right were grown under long-day photoperiod, with light interruption at midnight. Horizontal line represents height of six inches from the ground.



Dr. Massengale is a member, and Dr. McAlister head, of the Department of Agronomy.

Constant Ideal Weather is Aim Of Greenhouse

W. P. Bemis

The purpose of a greenhouse is to create and maintain consistent desirable growing conditions for plants during the changing seasons of the year. Specifically, desirable growing conditions mean that the temperature range should be maintained between 50° and 95° F depending on the type of plants being grown. The relative humidity should be between 50% and 90% depending on the temperature, and the light intensity should remain high.

To create these conditions inside a greenhouse provisions must be made for cooling during the summer days and for heating during the winter nights. To understand better the problems of maintaining a greenhouse with desirable growing conditions let us consider the factors affecting conditions inside a greenhouse on a typical summer day, summer night, winter day and a winter night.

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were measured, all varieties growing under the short, natural daylengths had wider crowns. This would indicate that short days encourage vegetative growth, whereas the long daylength promotes flowering and a reproductive-type growth.

Response of Northern Varieties

During the winter months, when natural daylengths were shortest, the winter hardy varieties grew at a more rapid rate, were taller, and were more upright or erect in growth under long photoperiods. The nonwinter hardy varieties that were adapted to this area were affected very little by length of day.

These experiments will give understanding and fundamental knowledge on the behavior of alfalfa under different lengths of day. Such information can be of value to the farmer interested in growing alfalfa hay, to the seed grower and to the scientist who seeks to improve this important forage crop.

Those Hot Summer Days

During a summer day we can expect outside air temperatures to reach 110° F or higher, with relative humidity below 15% and intense sunlight. A non-shaded and non-ventilated greenhouse under these conditions will easily have inside temperatures greater than 130°F, which would severely injure or kill plants. The reason a greenhouse reaches these temperatures is because the heat from the sun (solar radiation) is trapped inside the greenhouse.

Radiant heat from the sun passes through clear plastic or glass and is absorbed by the floor, benches and plants inside. Most of the radiant heat is then converted and released in a form (convection heat) which will not pass through clear plastic or glass, and thus it becomes trapped inside. Methods of controlling this heat build-up are by shading, ventilating and introducing cool air inside the greenhouse.

Shading reduces the amount of radiant heat passing through the clear plastic or glass, but shading is not desirable for best growth of most plants. Ventilating permits the escape of the trapped heat but cannot reduce the temperature below that of the outside air. The most efficient method is by forcing cool air into the greenhouse by forced ventilation through an evaporative pad system.

Dr. Bemis is horticulturist in the Department of Horticulture.

When the Sun Sets

On a summer night as soon as the sun has set, the source of heat buildup in a greenhouse has been removed. The heat inside a greenhouse will then slowly radiate out through the plastic and temperatures inside the greenhouse will approach those of the surrounding outside air, which usually are within the range for desirable growing conditions.

During a clear winter day a greenhouse will warm up inside much the same as on a summer day, except the amount of heat from the sun is less, and for a shorter period of time. If the temperature inside becomes greater than 90° to 95° F it can be effectively reduced by forced ventilation with the cooler outside air. During overcast winter days the amount of heat from the sun is reduced and artificial heating may become necessary.

Heat Needed on Winter Nights

The winter nights may easily drop to 30° F or lower, and since heat is lost by radiating through the clear plastic or glass, the introduction of artificial heat is necessary to maintain the minimums of 50° to 70° depending upon the type of plants being grown.

Considering the factors affecting greenhouse conditions a plastic greenhouse was designed and constructed which main-

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A TOMATO experiment has complete weather control in the plastic greenhouse.

Tuberculosis In Cattle - 1960

Dr. Raymond Watts

In the days when the Model T Ford had a brass radiator it was found that about 5% of the cattle in the United States had bovine tuberculosis. Nearly 50,000 beef carcasses were condemned annually as unfit for human food.

We all know that the new Ford no longer resembles the old Model T, as it has been greatly improved. However, the tubercle bacillus, the cause of tuberculosis has not changed in all this time. In fact, it has not changed since Biblical times.

Through the cooperation of federal and state authorities, cattlemen and veterinarians, we in the United States declared war against this disease which affected both cattle and man and in a little over 20 years reduced the amount of TB in cattle from 5% to an incidence of less than 0.5% or less than one out of 200, and in some areas less than one out of 1000.

Dr. Watts is an Associate Animal Pathologist.

Tuberculin Skin Test

This big reduction in the number of affected cattle was brought about by the identification of infected cattle thru the injection of a substance called tuberculin between the layers of the skin.

This tuberculin has an interesting history. Back in the latter part of the nineteenth century a German bacteriologist by the name of Robert Koch worked feverishly to produce a vaccine against tuberculosis in man. He figured that if he could grow some of the tubercle bacilli, then kill them, he would be able to inject these killed bacilli into a person and thus produce some immunity against the disease. Unfortunately this did not produce the desired immunity but it was noted that sometimes a swelling would occur at the place of injection.

This was later found to be the result of a sensitivity produced by an infection by the tubercle bacillus sometime before the injection. Since that time we have used the so-called skin test to locate TB infected cattle.

Those of us interested in animal health have not forgotten tuberculosis, but public interest has dropped considerably because the number of infected cattle was reduced so greatly.

TB on Upsurge Again

In recent years the number of reactors to this skin test has again started to climb. In fact, one state reported as high as 2.4% reactors in 10,000 animals tested. Not all the animals slaughtered showed large areas of disease in the tissues, but we must remember that the skin test is a sensitive one and has proven to be quite specific for the TB infection. It is the best tool we have for locating the disease and through its continued use we can eliminate tuberculosis from cattle.

In addition to the periodic area tests we should also check all new additions to a herd before placing them into our herds. It will require the effort of all laboratory workers and field men to accomplish our goal.

In the last 20 years considerable progress has been made in laboratory diagnosis of tuberculosis. Newer and more efficient ways of growing the tubercle bacillus in the laboratory have been developed and these procedures have borne out the usefulness of the tuberculin test in control of TB.

Learning More About It

Also, new means of differentiating bovine, human and avian strains of the tubercule bacillus have been developed and this has led to a better understanding of the infection. Currently considerable research work is being conducted in the physiology or growth characteristics of the tubercle bacillus and this may lead to an enlightened understanding of this complex and troublesome microorganism which has wreaked such havoc upon man and animals.

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tained desirable growing conditions for plants. This particular greenhouse was 41 by 17 feet. The sides were 6′4″ tall with a 9 foot eave. The foundation was 4 x 4 redwood anchored by thirteen 4 x 4 redwood posts buried 2½ feet into the ground. The stud and rafter sections were made of 2 x 4 pine, prefabricated and rigidly held together by nailed and glued plywood gussets. The prefabricated sections were then placed on the foundation at 20½ inch centers. The frame was glazed with a 10 mil clear semi-rigid plastic sheeting.

A 36 inch exhaust fan was located in the center of the south side, and an 18 inch wide evaporative pad system was placed along the center of the entire north side. Plastic covered panels were constructed to fit over the outside of the evaporative pad area for use during the cool season of the year. The cost of this 700 square foot greenhouse, fully equipped, was $1,400.

Fan and Pump Automatic

The exhaust fan and circulating pump for the evaporative pad system are thermostatically controlled. The fan is activated when the inside temperature reaches 92° F, and the pump activated at 95° F. With this type of control system, when the temperature reaches 92° F the exhaust fan is turned on and forces the cooler outside air through the dry evaporative pads into the greenhouse. If the temperature continues to rise, then at 95° F the pump is turned on and the pads become wet, causing the temperature of the entering air to drop as the water is evaporated.

In actual operation during the summer the fan should be activated about 8:30 a.m. and operate periodically until about 10:30 a.m., when the pump would be activated. During the hottest period of the day (11:00 a.m. - 4:00 p.m.) the fan and pump would run continuously. Under these conditions, when outside temperatures reached 110° F, the inside of the greenhouse was kept below 90° F.

Raises Level of Humidity

The evaporative pad system also increased the relative humidity from below 15% outside to around 50% inside and maintained it at this level during the entire day. During the cooler periods of the season when the maximum temperatures remain below 80° F the pump was not activated and the exhaust fan was able to keep inside temperatures below 95° F by forcing the cooler outside air through the greenhouse. If the humidity becomes too low during the day, the pump is activated and the wet pads will correct the low humidity.

As a source of heat, a 40,000 B. T. U. output gas heater was installed. The heater was set to maintain temperatures inside the greenhouse at 65° to 70° F. A circulating fan built into the heater kept the air moving, thereby keeping a uniform temperature distribution within the greenhouse.