SUMMER 1961

Vol. XIII No. 2

Progressive AGRICULTURE IN ARIZONA

ASPHALT STRIP AIDS GROWTH

See Page 4

Consumer is the Winner, Says Freeman

Frequently we have stated our belief that the true beneficiary of agricultural research is not the farmer but the consumer, who gets more and better food for a smaller portion of his pay check than is true in any other country, or ever in the past in this country.

We note that the new Secretary of Agriculture, Orville Freeman, said pretty much the same thing recently in a talk before the National Press Club. We quote from that speech:

"Our farmers are the world's most efficient agricultural producers, and their products are the basic essentials of human life. For this efficient production of essential needs they must have an average capital investment, exclusive of the farm home, of $36,000. Yet they receive for their labor an average of about 81 cents an hour.

"In achieving its prime purpose of production, American agriculture in this generation has reached a pinnacle of success. It has tripled its output per hour of labor in the past two decades, while industry's output has only doubled. Twenty years ago one farmer produced enough for 11 people; he now produces enough for 25.

"Under our system of enterprise and initiative we expect that success will bring an appropriate reward. And this phenomenal success in agriculture has brought its reward. But the reward is to the American consumer, and not to the American farmer. The consumer in America works fewer hours to feed himself and his family than in any other country. He is able to buy a balanced and varied diet for approximately one fifth of his take home pay.

"Contrast this with the consumer in other nations. A meal of beef, potatoes, cabbage, bread, butter, milk and fruit for four people can be bought by the average industrial worker in the United States for one hour's wages. In Germany and England that meal would take over two hours' work; in Austria, four hours; in France, four and one-half hours; in Italy, over five hours.

"These are facts the American public should acclaim, and for which they should pay tribute to the American farmer for his contribution to our standard of living," said Secretary Freeman.

Harold E. Myers

Dean
College of Agriculture and
School of Home Economics

In This Issue

Progressive **A***griculture* **IN ARIZONA**

Vol. XIII No. 2

July, August, September, 1961

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

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

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

Editor: John Burnham.

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

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.

Coming Events

JULY

14-15—Regional 4-H Leaders' Conference—Holbrook (Navajo and Apache counties)

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

AUGUST

1-4—State 4-H Roundup—U of A Campus, Tucson

10—Field Crops Field Day—Yuma Experiment Station

16-18—FFA Leadership Conference, U of A Campus

17-19—Regional 4-H Leaders' Conference—Payson area (Mohave, Maricopa, Yuma, and Yavapai counties)

SEPTEMBER

29-30—Regional 4-H Leaders' Conference—Tucson (Pima, Pinal, and Santa Cruz counties)

29-30—Cochise County Fair—Douglas

OCTOBER

1—Cochise County Fair—Douglas

1—Regional 4-H Leaders' Conference—Tucson (Pima, Pinal, and Santa Cruz counties)

6-8—Graham County Fair—Safford

12-13—Plant Virus Disease School—U of A Campus

18—Cotton Field Day, Cotton Research Center, Tempe

27—Fall Field Day—Mesa Experiment Station

LITTLE QUEEN, chosen at the UA student livestock show in May, is 4-year-old Christine Briggs, whose daddy is a member of the Agronomy Department.

Root Development Of Blue Panicgrass

Neal Wright

The root systems of perennial grasses have received less attention than the aboveground parts, for obvious reasons. Tops are exposed and form an easily available source of material for study.

The aim of the grass breeder is to develop varieties capable of sustained yields. To help achieve this, good management practices are of primary importance in evaluating the yield potential of genotypes. Therefore, information on root distribution and the effects of cultural practices on root responses are important in the interpretation of management data.

Roots Have Many Jobs

In general, the root system of blue panicgrass performs the functions of absorption, conduction, anchorage and storage and serves as asexual reproductive structures. Perhaps the most important function of roots is absorption of water and nutrients. Once these plant foods are absorbed from the soil, the root conducts the materials to the stem. Thus water and nutrients can be distributed throughout the plant.

Anchorage is a mechanical function of roots, which support the stem by anchoring it to the soil. Roots and rhizomes accumulate food reserves manufactured in the aboveground parts of the plant, which are carried to the roots and stored for future use. In addition blue panicgrass rhizomes are capable of developing adventitious buds, which give rise to leafy shoots. Rhizomes provide a means of propagation, which is a decided asset to the grass breeder because it permits vegetative increase of selected plants.

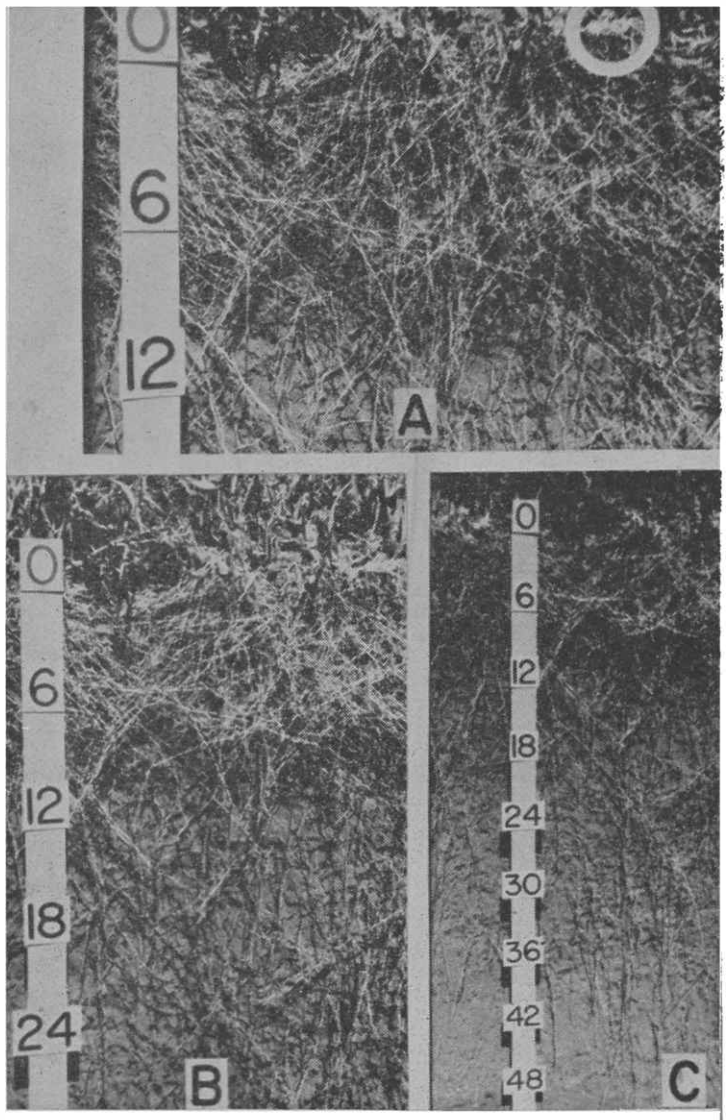
This is a contribution from the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture and the Department of Agronomy, University of Arizona. Dr. Wright is a Research Agronomist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Tucson, Arizona.

Since the growth of a plant depends so much on its root system, a look into the rooting habits of a crop plant may help to determine management practices for sustained forage yields. For example, a knowledge of the depth of rooting and quantity of roots at various depths is important in determining irrigation schedules. When the effective rooting depth is known, the amount of water potentially available to growing plants can be more than an estimate. Also, the amount of irrigation water needed to recharge the soil can be predicted.

An Underground Profile

Root distribution of blue panicgrass under irrigated conditions has been studied to a depth of 12 feet. The pictures on this page show a profile of blue panicgrass roots and rhizomes to a depth of 48 inches. All the rhizomes of this grass are located near the surface, in the upper 6 inches, (A). The study showed approximately 70 percent of the roots in the top two feet, (B). The amount of roots between two and 12 feet decreased progressiveiy and represented approximately 30 percent of the total. Under irrigation, where soil moisture is replaced as it is used, roots in the 0-to 2-foot zone, making up to 70 percent of the total, are of major importance to growth. Also, the depth of root penetration serves an important function when soil moisture is limited.

Blue panicgrass does not exhibit visible stress until the soil moisture in the upper two-foot root zone has been depleted to the wilting point. Then the 30 percent of roots in the lower depths provide moisture when the available moisture is reduced in the upper two feet, which demonstrates the capabilities of this grass when moisture stress cannot be avoided. However, for maximum forage production, sufficient available moisture must be maintained in the upper two-foot root zone.



ROOT DISTRIBUTION of a blue panicgrass profile; A—0 to 12 inches, in rhizomes shown in circle; B—0 to 24 inches, and C—0 to 48 inches.

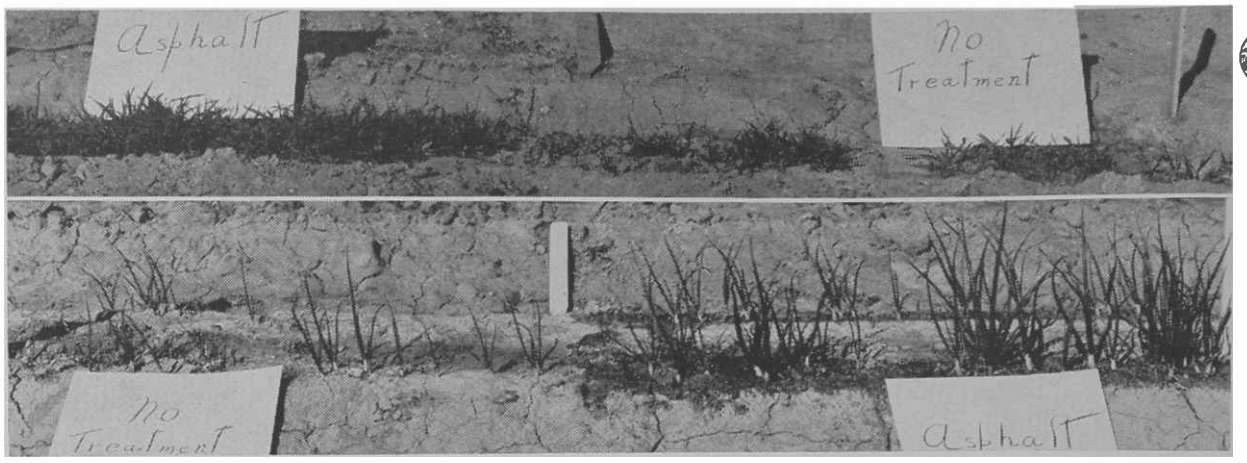
Nitrogen Helped

The effects of fertilization, cutting height, and soil-moisture stress on blue panicgrass root weights in the upper two-foot zone have been investigated. The quantity of roots was increased by nitrogen fertilizer, while phosphorus and potash did not increase root weight. Root weights increased as cutting height was increased from 3 to 12 inches. Root weights decreased as soil moisture was reduced to the wilting point at depths of 6, 12, 18, and 24 inches.

These studies indicate that management practices do affect development of blue panicgrass roots. Application of nitrogen fertilizer, harvesting forage to leave 9 to 12 inches of stubble, and providing available moisture in the upper two-foot root zone will result in the best root development under irrigation.

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

Asphalt Improves Germination, Growth Of Crops in Winter



ABOVE, winter grasses at Tucson, winter of 1960-61; below, winter onions at Tucson station.

W. I. Thomas

"Jim, when you start planting cotton today be sure to paint the rows black. And when you plant the late potatoes be sure to paint the rows white."

That conversation, in slightly varied form, might be heard five years from now. And it wouldn't be out of place in this fast-changing world of agriculture, which has seen more change in the past 50 years than in the previous 5,000.

Painting the planting surface black, thus keeping soil warm for cold season planting, looks promising at University of Arizona farms in Tucson and Mesa. The Esso Research and Engineering Company (an affiliate of Humble) is underwriting these Arizona tests. The "paint" is an asphaltic material, a petroleum product seeking new uses.

A spray attachment at the rear of the row planter applies this thin black covering of asphalt on the planted row. Already it has been shown that crops planted in cool weather will germinate sooner, have better stands and grow faster where such a strip is applied.

LATTICING of broadcast small grain plots is reflected in early growth stage. Heavier growth is where asphalt coated the seed bed.

Works With Many Crops

The results have been consistent with a variety of crops, including small grains, sugar beets, corn, cotton and more than a dozen commercial vegetable crops. In all cases, when weather during and after planting time was cool or cold, response has been favorable. Under warm conditions, such as midsummer plantings of corn and sorghum, the black asphalted strips have a killing effect as a result of too much heat. Under the latter conditions the soil temperatures can be reduced below their normal soil temperature by the use of hydrated lime.

The main principles of the asphalt strip are that black color absorbs heat and the film conserves moisture in the seedbed. This heat penetrates the soil to a depth of several inches and some of the heat will be retained in the seed zone until the early morning hours, usually the coldest part of the day. Amount of warmth varies with soil type, but a 10 degree increase at a two-inch depth over untreated soil is typical during the afternoon hours.

Desirable aspects of the black strip are many and varied. It can lengthen the growing season. It can give a better stand, more rapid early growth and increased yields. It holds moisture in the top soil.

Much To Learn

Costs of the treatment are not yet available, but already it seems that benefits will pay those costs, which should be only a few dollars per acre. Nor is it known how wide a band to use, although tests of 3 to 8 inch widths have been tried in the Arizona tests. The six-inch strip may become standard, or it may be found best to vary the width according to the crop seeded. There is much yet to learn.

Mr. Thomas is an Associate Agronomist in the Department of Agronomy.

The material used is a special asphalt formulation called EAP 2000 by Esso. The formulation can be handled at the usual air temperatures and dries quickly when applied to the seedbed, leaving a thin black film which holds moisture and absorbs solar heat. Conventional spray equipment is used to apply EAP 2000.

To do a satisfactory "paint" job with minimum use of material, the soil ahead of the spray must be as smooth as possible. Clods make for difficulty of application, and in the Arizona tests a number of implements, including clod breakers and small trowels followed by a rubber-tired packer wheel, have been tried with varying degrees of success.

The Paint Fades Away

In both cases, with asphalt and lime, no attempt has been made to remove the coating. Gradually the black (or white) strip is disturbed and obliterated. No indication of residual harm to the soil has been found.

Because cotton is Arizona's chief row crop, and cold soil during planting season early in April has been a hazard, this crop offers a real application of the asphalt stripping. There may also be possibilities for such crops as melons and lettuce, where earliness in growth of a crop may mean a premium market.

Meanwhile, trials are continuing, for there are scores of variables, of "how's" and "why's" to learn about. The smoothing of the soil without undue compaction by the packer wheel is a real problem in heavy soils. The economics of asphalt application has to be studied. Meanwhile, the heavy stands and vigorous growth of crops in the "painted" rows, compared to sparse, slow growing stands in check rows, give the UA research workers confidence that they are working on a program which may result in major benefits to agriculture.

TIMING

Is the Key to Johnsongrass

CONTROL

K. C. Hamilton

Johnsongrass is the most serious perennial weed in Arizona's irrigated crops.

Proper use of the herbicide 2,2-dichloropropionic acid (dalapon) is our most effective and economical control for light infestations of this weed in cotton. Dalapon is applied as a spray to Johnsongrass foliage; it is translocated within the plant to the underground stems or rhizomes. Applications of dalapon usually destroy the topgrowth and most of the rhizomes of Johnsongrass.

The drawing at the *left* shows a Johnsongrass plant six to 10 inches high, the proper stage for treatment. After treatment the topgrowth is affected at a rate dependent upon the temperature. Most of the rhizomes attached to the topgrowth die; some become dormant. Rhizomes about to emerge a few inches from the main crown continue normal or near-normal growth. This portion of rhizome is physically attached to the main system but appears to grow almost independently.

Time To Kill Survivors

The drawing at the *right* is the same plant two to three weeks after the first treatment. The treated foliage is dead as is much of the rhizome system. It is now time to treat the aerial stems from the surviving rhizomes.

Most established Johnsongrass plants in cotton fields emerge early in the season. They are largely destroyed by two spot treatments with dalapon. However, a few plants will not emerge until after the second spot application of dalapon. Some of the treated plants resprout later in the season. A third treatment can be timed to destroy many of these plants.

Widespread acceptance of dalapon for controlling Johnsongrass has been slowed by erratic results some growers obtained using this herbicide. During the past two years tests have been conducted on the Arizona Agricultural Experiment Station

Farm at Marana to determine some of the factors influencing applications of dalapon in cotton fields.

Study Individual Plants

In these tests the reactions of individual plants rather than groups of plants were studied. After cotton planting, individual Johnsongrass plants were located and marked with stakes soon after they emerged. To minimize the effects of cultivation, only Johnsongrass plants in the drill row were selected. Normal cotton growing practices were maintained on the study area except that Johnsongrass plants were not disturbed during hoeing. Applications of dalapon were made in May when the first spot treatments are made in cotton fields.

Thirty to 40 plants selected at random were subjected to a given treatment. All plants treated were thoroughly wet with a spray solution containing the recommended rate of dalapon. Within two days the topgrowth was clipped at the ground level. At two and three weeks after clipping the number of surviving plants, the length of the longest stem, and the number of stems per plant were determined.

In these tests the importance of timing of dalapon applications was evident. Properly-timed applications always affected the growth of Johnsongrass. In various tests single applications destroyed 30 to 90 percent of the treated plants. Two applications destroyed more than 95 percent of the treated plants.

Height Is Important

One aspect of timing is the height of Johnsongrass plants when treated. It is recommended that Johnsongrass be treated when six to 10 inches high. In one test the top growth of Johnsongrass was removed at three to four-day intervals to produce plants of different heights. The plants were then sprayed and after two days the topgrowth was removed.

Three weeks after treatment, 60 percent of the plants sprayed when three inches high were growing. Only 10 percent of the plants sprayed when six to 10 inches high were growing. Plants sprayed when three inches high had two and one-half times as many stems on their regrowth as plants sprayed when six to 10 inches high. The regrowth was also shorter on the plants treated when six to 10 inches high .

Control of Johnsongrass taller than 10 inches with spot applications of dalapon may be possible but is not recommended. More spray is required to wet the grass and more crop plants are injured. Very poor Johnsongrass control results from treating after the flag leaf (first leaf below the flowers) is visible.

In other tests, spot applications of dalapon have been made at various times of the day with different temperatures, relative humidities, and light intensities. The time at which the application was made affected the rate at which foliage symptoms appeared, but did not affect the survival or amount of regrowth on treated plants.

For Spot Application Only

It is possible to control spot infestations of established Johnsongrass in cotton with applications of dalapon. For this method to be successful it is necessary to understand the importance of timing and to develop a control program for each field. Only fields with spot infestations should be selected for treatment. The spraying must be timed in relation to the growth of the Johnsongrass and cultural operations such as cultivation, fertilization, and irrigation. A control program should continue for several years, integrating dalapon spot treatments with cultural operations which will maintain Johnsongrass control.

Dr. Hamilton is an Associate Agronomist in charge of weed control studies.

Effects of Feeding High Levels Of Vitamin A to Beef Cattle

W. H. Hale, F. E. Hubbert, Jr. and B. R. Taylor

The need of vitamin A for beef cattle has long been recognized. However, only recently has the general supplementation of feedlot cattle with this vitamin come into practice. The reason for the widespread use of vitamin A is due to the apparent poor utilization, under certain conditions, of the pro-vitamin A (carotene) of plant material.

Frequently, cattle coming from drought areas are fed or intrarumenly injected with doses of up to one million I. U. of vitamin A at the time they are placed in the feed lot and with good results. The usual recommended feeding levels are from 10,000-20,000 I. U. of vitamin A daily throughout the feeding period. The question is asked as to the effect of high levels of vitamin A intake in cattle.

In recent experimental work at the Arizona Experiment Station, fattening steers were fed from 0 to 2.5 million units of vitamin A per steer daily. The high level is approximately 250 times the daily minimum requirement. Twelve steers weighing 731 lbs. initially, were individually full-fed a 65% milo, 35% cottonseed hull mixture plus two pounds of a cottonseed meal supplement daily. The vitamin A was added to the cottonseed meal supplement. Block salt was available free-choice.

No Detrimental Effects Noted

Throughout the course of the experiment, six liver biopsies and 14 blood samples were taken from each steer. In all probability, the frequent handling of the steers reduced performance. Table 1 indicates that the high intake of vitamin A in treatments five and six did not have a detrimental effect on gains and feed efficiency.

The small number of animals per treatment does not permit definite conclusions as to their effect on weight gains. In the case of the animals receiving no vitamin A, one lost weight and the other gained only a few pounds during the last 28 days, indicating that the vitamin A was becoming critical even though the liver still contained a fair level of vitamin A. It is interesting to note that salt consumption was highest in the lots receiving the highest vitamin A levels. The two steers receiving no vitamin A consumed little or no salt.

At the time of slaughter, various tissues were collected to determine what effect feeding the various levels of vitamin A had upon tissue deposition. This information is presented in Table 2. The liver values are proportional to the level of vitamin A fed. Under conditions of this study, the 40,000 I. U. level maintained initial liver values, whereas the 10,000 I. U. level did not maintain the initial values. This trial indicates that the livers of steers have the ability to store extremely high levels of vitamin A when the intake of preformed vitamin A is abundant.

Some Stored In Fat

Of the other tissues studied, only fat appeared to show increased vitamin A levels due to feeding of vitamin A. Considerably increased vitamin A storage in fat occurred at the 2.5 million I. U. level but little, if any, increase occurred in fat at lower levels of feeding.

At no time throughout the 168-day trial was there any indication that even the highest level of vitamin A feeding was toxic.

Several observations may be drawn from the above trial:

(1) Vitamin A toxicity with fattening beef cattle is of no practical consideration within the usual feeding levels of this vitamin.

(2) It appears that a 10,000 I. U. feeding level will not maintain liver stores and that in feeding practice a daily feeding level of 40,000 I. U. per day may be necessary to maintain initial stores.

(3) The liver of beef cattle has a remarkable ability to store enormous levels of vitamin A.

(4) Other tissues in the body have little ability to store vitamin A except possibly fat, and then only when the level of vitamin A being fed is extremely high.

TABLE 1. Average Daily Gain, Feed Efficiency and Salt Intake of Steers Fed Various Levels of Vitamin A

(Two steers per treatment)
(Sept. 20, 1960—Mar. 7, 1961—168 days)

I. U. vit. A Per Steer Daily	Av. Daily Gain, lbs.	Feed per lb. Gain, lbs.	Salt Intake Per Steer 168 days, lbs.
Control (no vit. A)	2.20	13.5	0.25
10,000	1.72	15.5	3.25
40,000	2.15	13.7	1.62
160,000	1.96	14.2	11.75
640,000	2.13	13.4	11.12
2,560,000	2.23	12.4	6.25

TABLE 2. Vitamin A Content of Tissues from Steers Fed Various Levels of Vitamin A

Micrograms per gm. of Wet Tissue

I. U. vit. A per steer daily	Initial Liver Value	Final Liver Value	Kidney	External Fat	Kidney Fat	Lean	Tongue	Heart	Lung
Control (no vit. A)	105.4	9.4	2.0	4.5	6.2	2.1	1.6	2.2	1.4
10,000	117.0	59.5	2.1	3.1	4.2	.9	1.4	0.8	1.8
40,000	98.2	101.2	1.9	3.2	4.3	1.4	1.1	1.0	0.8
160,000	129.5	367.8	2.2	3.7	6.8	1.4	1.2	0.8	1.5
640,000	120.4	1357.3	2.3	7.8	8.2	1.2	1.5	1.1	1.7
2,560,000	104.1	5074.0	4.2	21.8	18.1	4.3	5.0	1.4	2.4

The authors are members of the Department of Animal Science.

Home Economics Is Vital To Family Life

Margaret V. Barkley

For the nation as a whole in 1958, one-fourth of the girls of 18, one-sixth of those 17, and one-sixteenth of those 16 were married. This fact alone points out the need for home economics in the high school curriculum of today.

Some people believe that homemaking skills can be learned at home but few busy mothers, especially those gainfully employed, have the time to instruct their daughters and sons in the knowledge required to manage a home. The White House conference proceedings makes quite clear the need for education for marriage outside the home when it states,

". . . That it be recognized that in our complex society no family can be entirely responsible for its own destiny, and that marriage is a joint career requiring preparation to achieve success.

". . . That family life courses, including preparation for marriage and parenthood, be instituted as an integral and major part of public education from elementary school through high school, and that this formal education emphasize the primary importance of family life and particularly the child rearing role of the mother."

Families of today cannot be expected to keep up-to-date with all technological and social changes affecting the family. Changes in the textile field alone make it difficult for the specialist to keep informed, so the homemaker with more limited resources available must depend upon home economics at all levels to help the family of today.

What Is Home Economics?

Instruction in home economics is the application of knowledge based on scientific principles learned through research. At the beginning levels of home economics the basic principles and applications learned are quite simple, but the complexity of the subject increases until many of the subjects offered in college home economics become quite specialized in subject matter.

Most high schools in Arizona offer three years of home economics and include the areas of child guidance, clothing selection and construction, housing and home furnishings, nutrition, food selection and preparation, management, related arts, personal and family relationships.

Students may take all three years of home economics, or they may take a year or two as an elective course. In some schools a course has been especially designed for juniors and seniors who have not previously had home economics. This course centers around personal and family relationships, establishing a home, and the child development area.

Many teachers have found it desirable to bring small children into the home economics department for a play group so that students have actual experience with children. Equipment, housing, and house furnishings are studied in this course through the use of field trips, films, and working with actual equipment and furnishings.

Boys, as well as girls, find this course especially useful. Most high school students are able to fit into their program this concentrated course in home economics, even though they are taking a college preparatory or business course or some other major, and it carries college credit the same as their other courses.

Tied To Other Learning

In all high school home economics work an effort is made to integrate the work with the other departments of the school. Nutrition facts and principles may be learned in biology classes, but these principles are applied in menu planning and food preparation in home economics. The principles of basic chemistry are applied to both the textiles and food areas. Even the social issues of today learned in social science classes are applied to the family situation in home economics classes.

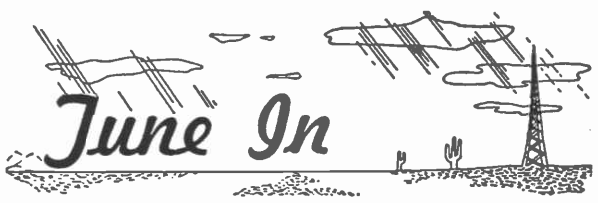
Home Economics at the high school level, unlike college home economics, is not expected to prepare boys and girls for any vocation except homemaking. However, principles of sanitation, management, nutrition, and food preparation learned in high school home economics can be used to good advantage in food service work. Girls and boys are more likely to be competent baby-sitters if they have studied the developmental patterns and behavior of children. Safety rules, art principles, good grooming practices and consumer education principles stressed in home economics can be applied in many vocations.

In College Its Professional

Professional education is one of the chief objectives of home economics at the college level, although education for homemaking is possible to obtain in college. Careers in hospital dietetics, community nutrition, junior and senior high school home economics teaching, utility home service work, and extension service positions require college home economics as part of their professional preparation.

Nursery school teachers, social welfare workers, institutional management personnel, women journalists, store buyers, and interior decorators find home economics useful in their professional education.

Home economics has a contribution to make to American families and home economists are trying to meet this challenge with improved offerings in the field.



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.
KGLS, 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., 5:35 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. Barkley is a professor of Home Economics.

Agriculture in the Future

R. E. Seltzer

This is a portion of an address made by Raymond E. Seltzer, retiring head of the Department of Agricultural Economics, University of Arizona, before the Agricultural College Men's Club on May 9, 1961. At this final meeting of the school year the club was host to graduate students of the College of Agriculture, students and staff comprising an audience of 215 luncheon guests. Dr. Seltzer has joined the staff of an independent research organization.

The greatest immediate problem of American agriculture is its tremendous productivity—productivity in excess of total domestic demand and in excess of export demand at prices in line with our costs of production. Contrast this with Soviet agriculture which is even now undergoing another purge to attempt to discover the causes, and to institute remedies, for their chronic scarcity of agricultural production.

The United States produces an embarrassing surplus with less than 10 per cent of our population employed on farms; the USSR is faced with an embarrassing scarcity with over 40 per cent of its population employed in agriculture. I leave it to you, which problem would you choose?

Why does this difference occur? I believe that two major factors are responsible: (1) the research, teaching, and extension activities of the Land Grant Colleges of Agriculture, and (2) the motivating force of profit in the conduct of American business. Some people seem to feel that "profit" is a sort of nasty word, that it has a connotation of greed, but I feel that most Americans work for God, for country, and for profit, and many might even question the order in which I have ranked these goals.

Profit is the catalyst of progress. The hope of profitable application stimulates research and the adoption of research findings. Profitable research is often the prerequisite to further research in any field or science.

All Research Ultimately Valuable

Much research may have no immediate practical application, and we often use as an identifying characteristic the term "basic" research. But even basic research draws support from the idea that some day, somehow, somewhere the findings of such research may have tremendous practical value in some application or another. Thus, these two major goals, profit and research, are seen to be complementary in their effects.

What are the major observable trends which will influence the organization, technology, and scale of agricultural production in the next few years? First is the clearly demonstrated trend toward bigness in agriculture and in agriculturally-related industries. Nowhere is this trend more readily apparent than in Arizona. Substantial economies of scale are apparent in many agricultural enterprises and, although less apparent, are nevertheless just as real as many others.

Not only are producing units becoming larger in terms of acreage, number, etc., but they are also increasing in scale through intensification. We have fewer farms, larger farms, and farms producing a greater yield per acre and per man. Since the end of World War II, output per man hour has increased more rapidly in agriculture than in any other industry.

Some examples may serve to point up this tendency toward bigness. In Arizona the gross value of sales from typical farms runs in the neighborhood of $40,000 to $50,000 per year and net returns per farm average between $10,000 and $15,000. This is nearly twice as great as the income per farm produced in any other state and about five times the national average. Our irrigated farms will average about 320 acres (half a section) in size and our cattle ranches will average 50 to 60 sections in size and will run an average of about 400 cow units.

1,000 Cow Dairies Now

Our dairies are twice as large as they were 10 years ago and now average about 130 cows, with several near or even over the 1,000-cow size. Poultry, too, is experiencing a trend toward bigness. The backyard and farm flocks of yesterday are nearly a thing of the past, and our eggs and broilers are now produced in large commercial operations of 5, 10, 50, and up to 100 thousand chickens. Our vegetable industry has for years been dominated by large grower-packer-shipper units, where diversification product-wise and area-wise, and substantial capital and credit of such large firms enable them to survive the risks inherent in this speculative industry.

Cattle-feeding provides another good example of the growth so characteristic of our agriculture. Over half our cattle in Arizona are fed out in feedlots of 10,000 head capacity or greater, and our feedlots operate close to capacity every month of the year.

Some people see the increasing size of agricultural enterprises as a threat to the existence of the so-called "family farm." I do not agree. These people are not well informed. We are not trending away from the family farm, we are trending toward it. The family farm must grow toward an economic-sized unit if it is to survive in the light of the changing technology of agricultural production.

We may well ask, what will limit the growth potential of our agricultural firms? To me, two factors would seem to be of paramount importance—management and capital. Of these two, management may be the real barrier to growth. Management capable of operating large agricultural units is probably the one scarce resource. Given proven, capable management, capital will cease to be a limitation as successful corporate farming units may tap investment markets through the sale of stock. The failures and the successes of large farming units here in Arizona are a reflection of the adequacy of their management more than any other factor.

Trends in Service, Marketing

As we turn from the farm itself, we see similar evidences of increasing scale in our farm supply, farm service and marketing firms. The economies and efficiencies associated with large size are recognized in these agriculturally-related industries just as they are on farms and ranches themselves. The farmer deals with and through large businesses—in agricultural chemicals, farm machinery, feeds and feedstuffs, water, power and many other purchased inputs. He markets to and through large middlemen or cooperatives, or deals directly with processors themselves. The final stage of the marketing process, retailing, provides the most striking evidence of growth. The overriding goal of the modern supermarket is volume. Both chain stores and independents operate in a fiercely competitive market which keeps margins of profit low, but which emphasizes the importance of volume as the key to success.

The second major trend which we all see taking place is the increasing mechanization of agricultural production, processing, and marketing. Much of the gain in the productivity of labor in American agriculture has been the result of the combination of men and machines in agricultural production. There are strong incentives toward mechanization. Mechanization may often reduce costs through increasing efficiency. However, we also realize that some jobs and some farms may be over-equipped, and that the marginal rates of substitution of machinery for labor define the critical limits beyond which further equipment adds to costs of production per unit of output.

Mechanization may be carried beyond this point of diminishing economic returns for reasons other than cost. It may make a hard or a distasteful job easier or more pleasant, and if a producer can afford this aspect of mechanization, additional equipment may be justified in his particular set of values. Mechanization makes the producer more independent. If he has adequate equipment he can perform various operations at the time and in a manner which he considers most desirable. He is not dependent on schedules of custom operators, nor is he dependent on an often unpredictable and sometimes unsatisfactory source of farm labor.

Farm Labor Unions

The difficulties of finding adequate supplies of labor constitute a real inducement toward mechanization. There is increasing activity in attempts by labor unions to organize farm labor. Numerous strikes in California last year presented serious difficulties in the harvest of certain perishable crops. Similar forces are at work in an attempt to increase the coverage of our minimum wage laws and to raise the legal minimum wage. Agriculture in Arizona employs two general types of labor—the skilled, dependable year-round farm workers and large amounts of unskilled, migrant, seasonal labor.

It is with this last type of labor that most of the difficulties occasioned by unionization and minimum wage legislation would be felt. Much of this labor, although not all, is of a residual character—a sort of scraping the bottom of the barrel. Many of these people lack the skills, the ambition, and the reliability necessary to hold steady jobs. They do not identify themselves with any one employer, and they exhibit little interest in a level of performance beyond the minimum necessary to hold intermittant jobs. Unionization and minimum-wage legislation, applied to such labor will provide the spur for rapid advances in mechanization of agricultural production and harvesting operations.

A third direction of agricultural progress is toward the increasing application of scientific technology in our production, processing, and marketing of farm and ranch products. Fertilizers, insecticides, feed additives, antibiotics, growth regulators, new varieties, disease control, nutrition, conservation, mechanization, accounting, systems analysis, quality control, tax planning, finance and many other highly technical subjects are of ever-increasing concern to the modern farmer. Obviously, all of these technical fields provide a wealth of opportunities for research, education, and extension. Equally evident is the fact that no farmer or rancher can qualify as an expert in all these areas.

The Consultant-Salesman

This has resulted in the addition of a new layer of personnel to our agriculture —the technical salesman or consultant. In many cases the typical farmer will get the greatest part of his technical advice from the salesman, the field representative, the accountant, or the lawyer. These men sell products, services and themselves. In many cases there is little real difference among the products of the various companies available to any farmer. The soundness of the salesman's advice, his knowledge of his product, and his personality and salesmanship will often be the deciding factors in the farmer's choice of the product he purchases.

Farmers and their organizations are also making greater use of technical consultants in all fields for testing services, advice, and consultation with respect to their technical problems of production and marketing. Agriculturally-related industries devote increasing attention to research into all aspects of their business in order to maintain their competitive position.

Integration, forwards and backwards, horizontally and vertically, is receiving increasing attention. Vertical integration represents a combination of ownership or control of successive stages in the production, processing, and marketing process. Horizontal integration represents replication of similar units, usually in a geographic sense. Vertical integration represents integration in depth, horizontal represents integration in breadth. Forward integration represents a consolidation of control of operations from the point of production forward toward the retailer. Backward integration represents consolidation by the retailer, wholesaler, processor, or farm supply dealer backward toward the farm.

Actually, integration is the reflection of advantages which appear to the integrator who may be a farmer, feed dealer, processor, wholesaler, or a retail food chain. The farmer sees integration as a way of expanding his capital base through cost and profit-sharing contracts with suppliers or processors. Thus, he may be able to expand without resorting to borrowing. He may also see integration as a means of reducing risk and adding technical assistance. In return for these advantages, he necessarily relinquishes a part of his managerial freedom.

The farm supplier, for example the feed dealer, sees integration as a means of establishing "captive" markets, of reducing sales expense and, at times, as a means of building and participating in a profitable farming operation. The processor, wholesaler, and retailer all have two major concerns for which integration seems to offer a partial answer. These concerns are quality and regularity of supply. Modern mass merchandising demands a constant flow of a uniform product tailored to the demands and preferences of the consumer. Integrated grower-processor contracts and processor-wholesaler or processor-retailer contracts provide the processor, wholesaler, and retailer with a measure of control over the variety, class, type, and quality of commodities produced, also control over the terms, timing, and sometimes price at delivery.

A Continuing Trend

Specification buying will grow as retail food chains continue their growth. Contract farming will grow in some industries (for example, over 90 per cent of the commercial broilers produced are grown under contract), but will not dominate agriculture as some people fear. However, specification buying will become an increasingly important factor in directing the type and timing of agricultural production as producers, processors and market agencies find it necessary to orient their operations to the demands of the retailer.

Another well-defined trend, if I may be permitted to coin a word, is the "businessization" of agriculture. We speak of mechanization, specialization, capitalization, etc. so why not businessization. The term as I am using it here, is intended to refer to the application of the principles of sound business management in the

(Continued on next page)

Sound Diet Is Best Medicine

Catherine M. Adams

The best medicine, if you aren't sick, is no medicine at all. And unless there is a real or suspected dietary deficiency, there is no reason in the world to fill the human system with pills, potions, vitamin capsules, blood purifiers and bone builders.

Actually, the American people spend many millions of dollars a year on these concoctions for which there is no physical need. Likewise, medical science suspects that abnormal dosage of some of the vitamins may actually be harmful.

We All Eat Well

The American food supply is unsurpassed in volume, variety and quality. Never before in the history of the world, and nowhere else in the world, has a population had as ready access to such an excellent food supply so reasonably priced. Fruits, fresh vegetables, eggs, meat, dairy products, poultry, fish, cereal foods—all are available in abundance, at moderate cost.

Yet, because of the high profit margin in the pills and potions designed "to correct dietary deficiencies," Americans living on the world's best diet are still spending millions of dollars that there is no need to spend.

Miss Adams is a staff member of the School of Home Economics.

GOOD FOOD, at left on white background, if eaten in balanced proportion, eliminates need for pills and potions shown on dark background, right.

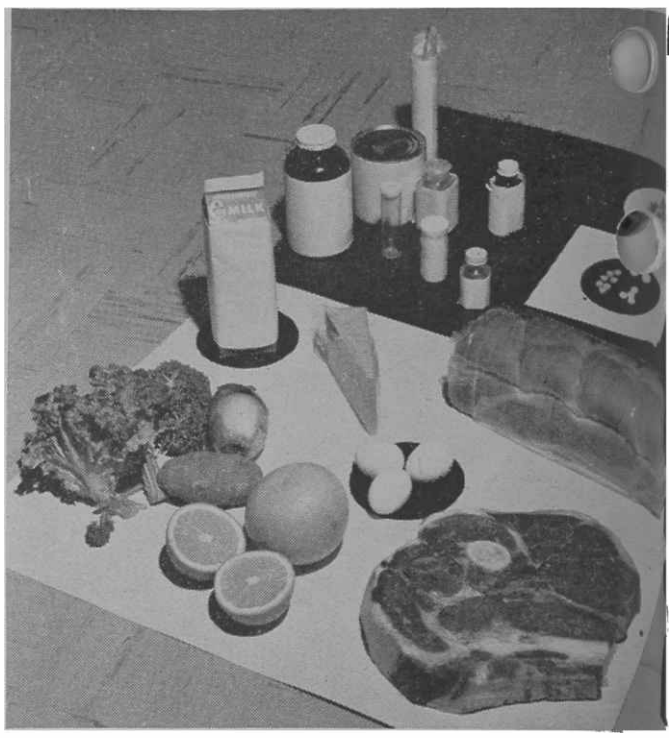
Distortion of facts about food and nutrition is big business—profitable big business—today. Science and superstition, woven into carefully worded advertising, paint a picture of imaginary nutritional deficiency, a word picture designed to appeal to the emotions of those who see and hear the advertising message.

"Food From Tired Soil"

The claims that are made are fantastic. One pitch is that all diseases are directly due to a faulty diet. Another is that foods are grown on worn out, depleted soil, which is the cause of many malnourished people in America. The fact is that the quality of the soil is related to the quantity of any food produced on it, but has very little effect on the quality of the food.

Then there is the convincing argument of the constant danger of "subclinical deficiencies." This is a high-sounding technical term and apparently very effective in its use. It merely means a deficiency for which there are no observable symptoms. Almost any ailment from that "tired feeling" to an ingrown toenail may be projected by these so-called "health experts" as a subclinical deficiency and blamed on a shortage of essential nutrients.

Nutritive losses in the processing and cooking of foods, the harmfulness of certain types of cooking utensils, recommending of so-called miracle foods(yogurt, strap molasses, honey and vinegar, etc.) are among other claims currently



used by these hoaxers. The use of a smattering of scientific knowledge in the promotion of their wares gives these self-styled authorities an air of plausibility.

Balanced Diet Answers Needs

Actually, bona-fide nutrition authorities agree that needed nutrients can best be obtained from vegetables, fruits, milk, eggs, meat and whole grain or enriched bread and cereals. These foods are readily available and they provide all the vitamins, minerals, proteins and other nutrients that a normal healthy individual requires in his diet. Too many people are currently throwing away hard-earned money on useless products and senseless literature instead of buying wholesome nutritious food.

The best defense against nutrition hokum is knowledge of what constitutes good nutrition, an intelligent skepticism about extravagant and mysterious claims related to nutrition, and information from reliable sources.

(Continued from Previous Page)

conduct of agricultural operations. Farming operations in Arizona and throughout the nation represent substantial businesses which benefit from sound managerial planning and the employment of professional business services.

It used to be that a farmer could about tell how he was getting along by going out and looking at his crops or his livestock. Now he has to go inside and look at his books. Records are of vital importance and accountants, bookkeepers, and tax consultants have become necessary adjuncts to successful farming operations.

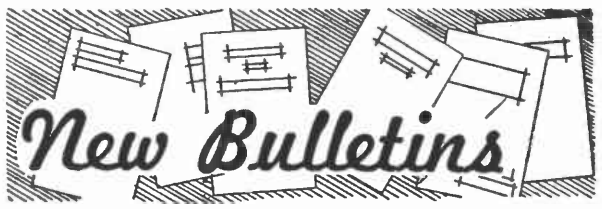
Competing For Resources

A final trend which should be noted is the increasing competition for the resources now employed in agriculture. Our current surplus problem would seem to indicate the desirability of diverting resources from agricultural production, and many of our farm programs do have this as an objective. On the other hand, we are faced with a rapidly increasing population—now 180 million, 230 million by 1975, and from 600 to 900 million expected by 2060. We must use care in reducing our agricultural resource base to insure that the process can be reversed when the need arises.

In the area of resource competition, we in Arizona are most acutely aware of the competition for water—for domestic, industrial, and agricultural use. Agriculture is the residual user of water, domestic and industrial uses being able to pay much more for water than is possible in its use for irrigation. We also see increasing competition for land—for residential, industrial, and recreational uses. For example, about 90,000 acres of fertile Salt River Valley land has been diverted from agriculture to small plots of weedy bermuda and colored gravel—home sites. Half of Tovrea's feedlot—one of the world's largest—has been torn down for sale as industrial sites.

These, then, are some of the major trends which will shape the future of American agriculture. The Land Grant College of Agriculture has had an important role in bringing agriculture to its present productive state, and can do so in the future providing it recognizes the changing complexion of the industry with which it works and adjusts its program to this change.

INTERESTING LEARNING and interesting trips are earned by College of Agriculture students whose abilities place them on a judging team. Here is the Range Management judging team, from the Department of Watershed Management. The boys who competed with students from other Land Grant colleges in identification of range plants, entered an intercollegiate contest at Salt Lake City, held in conjunction with the annual meetings of the American Society of Range Management. Shown above, left to right, are Jeff Holdren, Coral Gables, Fla.; Christopher Williams, Tucson; Dr. David G. Wilson, the team coach; Larry Knapman and David McGowan, both of Tucson.



These new U of A publications are available at your county agent's office. Phone or write your agent for a copy.

Circulars

281—Freezing Meats, Poultry, Fish, & Game
282—Home Citrus for Central Arizona
283—Freezing Cooked Foods

Bulletins

A-11, Soil Management
A-12, Cattle Ailments & Diseases
A-13, Kill Livestock Pests
A-14, Insect Control Recommendations

Special Reports

No. 7, Commercial Citrus Production in Arizona
No. 9, New Developments in Forest Fire Control Applicable to Grass and Brush Fires

Folders

68—List of Available Publications (revised)
87—Citrus Blossoms, Bees and Insecticides
88—Control Field Bindweed
89—Rural Traffic Tips
90—Melon Pollination, Bees, and Insecticides
91—Bees and Insecticides in Alfalfa Seed Production

Male-Sterile Cotton Found

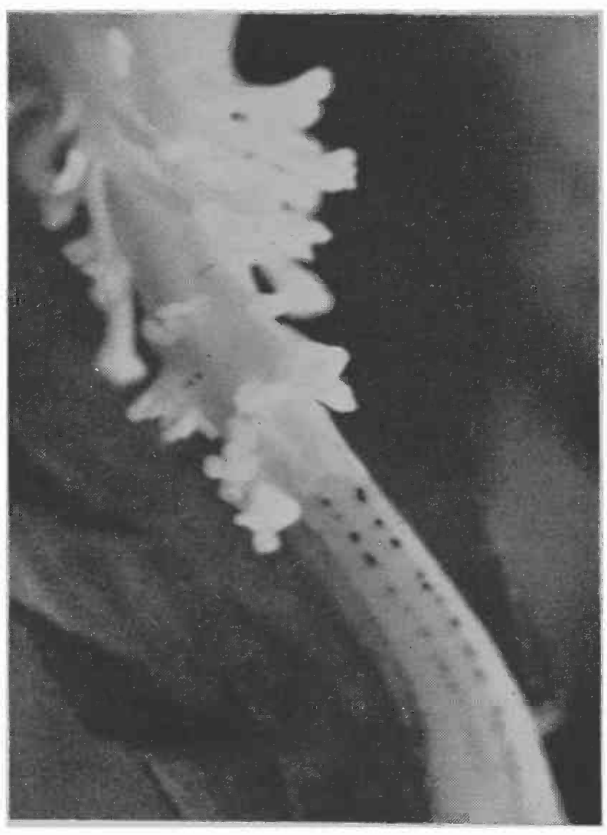
Warner D. Fisher

A practical means of utilizing heterosis or hybrid vigor has been the aim of plant breeders working with many different crops for many years. The use of male-sterility in such crops as grain sorghum and corn has been a very successful method of utilizing hybrid vigor in these crops. Cotton breeders have also sought some means of utilizing hybrid vigor, and an intensive search for male-sterile plants has been under way for the past few years. Some male-sterile lines or partially male-sterile lines have been reported recently. These lines are characterized in general by the failure of the anthers to shed pollen.

In September 1960 a male-sterile plant of an apparently different type was found by the author. This plant was found in a pure seed increase field of A44 cotton grown by the Cooper brothers in the Magma area. The flowers are characterized by their failure to produce anthers, although the female portion of the flower is apparently normal. This plant was moved into the greenhouse where it grew and set normal bolls when pollen was supplied from a normal plant.

The seed thus produced has been planted in the field at the Cotton Research Center to initiate studies of the inheritance of this male-sterile character. Three F^1 plants were started earlier in the greenhouse, and these are all fertile and apparently entirely normal.

It should be emphasized that studies of this plant are just beginning and that nothing is yet known concerning the potential value of the male-sterile character herein reported.



ENLARGEMENT OF photo of male sterile cotton flower. Note rudimentary anthers, although female portion of flower is normal.

Dr. Fisher is Plant Breeder at the Cotton Research Center.

POULTRY INDUSTRY MUST LOOK AHEAD

A. A. Kurnick

The poultry industry of Arizona has witnessed notable progress in recent years in both production and in the several phases of allied industry.

Looking ahead, we can anticipate that the next few years will be a period where details and balancing will receive greatest emphasis. The era where progress was realized in large increments has ended. During that time we tended to overlook many details, so that the next few years will see a refining of those big strides and attention to details that were masked by the great leaps of the past.

Here are some of the areas which represent our greatest concern in the immediate future: First of all we must learn to avoid head-on collisions with industry pressures. The poultry industry in Arizona has witnessed rapid progress as a result of pressures brought to bear very suddenly. These pressures hastened change and progress, often at a speed and time we could least afford. Now, like other industries, we must learn to foretell our needs and bring changes at our own beckoning and at a time and under conditions of our choosing. We must become the masters of our industry's future.

This planning must be based upon enlarged production units, larger both in size and in scope of operation. We must realize we are in the manufacturing business, under constant pressure of cost accounting and efficiency the same as other businesses.

Need Accurate Record System

This in turn means that a sound record keeping system will become indispensable. We have all known the importance of this, but it is those who have already made use of this practice who will be a step ahead of the others. We will also consider more refined and involved record systems than those which served in the past. We now speak in terms of records that will analyze the operation in every phase of its activity. We will have to learn cost accounting as it applies to all facets of the poultry industry.

We will find ourselves more and more involved in management than just performing the actual tasks of poultry production. The planning of the physical layout, the mechanics of daily operation, feeding, egg handling, etc., must be arranged for easy and rapid supervision. The job analysis of individual tasks, again based on cost accounting figures, could very well be the determining factor between profit and loss. It won't be enough to save on one phase of the operation if we are bogged down on two or three other phases which cancel the initial saving. Supervision and cost accounting must cover every detail and result in a balanced, efficient operation.

One large aspect of our operation where savings may be possible is in personnel. Traditionally this has been one of the most neglected phases of the poultry industry. In the future we will seek to mechanize tasks which require non-technical and non-qualified individuals. Where thinking and planning are not required in any phase of the operation, that part must be subjected to mechanization.

Labor Must Merit Its Wage

The other side of the coin is utilization of trained personnel in those parts of the operation where training, skill and thinking are required. The individual who cannot be placed in a position where his interest, ingenuity, training and effort bring a return well above his salary must be replaced either by the machine or a more skilled human being. We must show an interest in the education and training of the skilled personnel which the poultry industry of the future will require.

This article is a summary of an address by Dr. Kurnick, head of the Department of Poultry Science, at the fifth annual Poultry Industry day, May 5, 1961, at the University of Arizona's Poultry Research Center in Tucson.

While we are training others, we must sharpen our own wits and abilities. No longer can we afford to remain in one place and wait for information on new products and developments to reach our desks. In the future we will have to go beyond the confines of our own establishments and seek out new developments important to our operation. We must read trade journals, attend industry meetings, learn about the businesses allied to the poultry industry so that we can continuously harvest ideas from those not directly participating in our enterprises but who have information helpful to us.

In the next few years management will have to do better and will have to be less reliant on the elixirs which come from the drug and supply houses and from the feed manufacturers. Food and Drug Administration legislation will become more cumbersome. Products will appear on the market much more slowly but they will be better tested. Disease problems, in the future, must be met on a preventive basis rather than on a curative one.

Need Cohesive Industry

The last two phases of change will be public relations and integration Through public relations an organized poultry industry must create a favorable image in the minds of the community, the customer and the general public. The industry must be organized to defend, promote or change and improve industry practices. Integration will involve the producer in the areas of packaging and marketing. The industry must act as a unit in responding to consumer demands. Substandard production by one individual can be a deterrent to the entire industry, so we must police our own standards.

The poultry industry of the future, to be successful, must be manned by able, alert individuals who will, however, act with cohesive force through industry organization.