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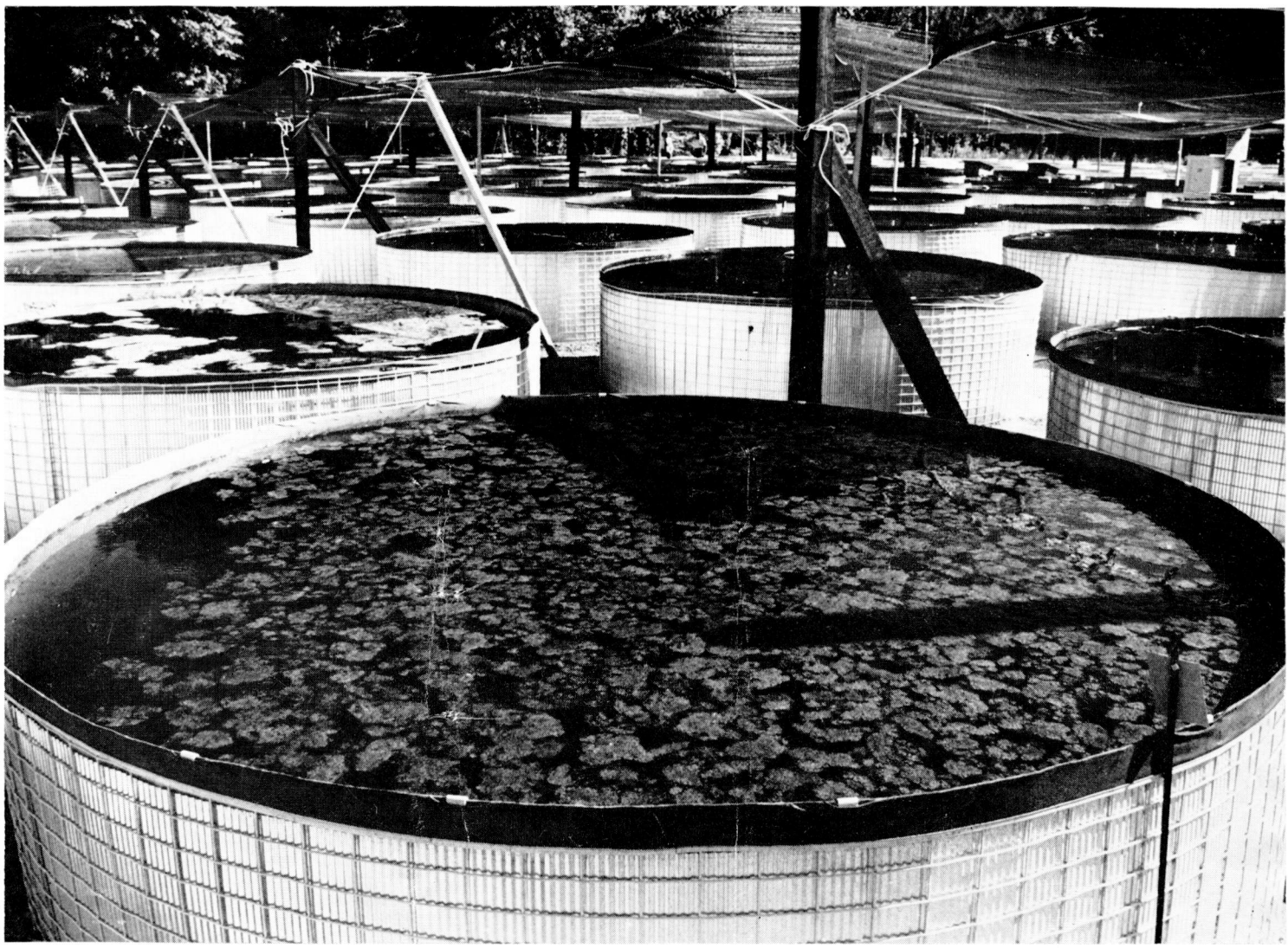

AGRICULTURAL EXPERIMENT STATION, AUBURN UNIVERSITY

HIGHLIGHTS *of* Agricultural Research

A Quarterly Report of Research Serving All of Alabama

VOLUME 11, NO. 3 FALL 1964

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On the cover. Controlling weeds that grow in water is a problem facing many individuals, as well as local, state, and Federal agencies. The problem ranges from that of the small pond owner who is losing fish production because of weed infestation to the governmental agency that must keep down weeds in navigable waterways. Specialized research at Auburn University Agricultural Experiment Station is aimed at providing know-how for effective methods of controlling aquatic weeds, one phase of which is covered in the story on page 3. The cover photo shows part of the large number of plastic pools that are being used in screening tests to evaluate numerous herbicides for their effectiveness against different weeds that grow in water.

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Auburn, Alabama

New and Timely PUBLICATIONS

Listed here are timely and new publications reporting research by the Agricultural Experiment Station.

Bul. 329. Oats for Forage and Grain.

Bul. 335. Crimson Clover in Alabama.

Bul. 352. Alabama Urban Homemakers and Milk Products.

Bul. 353. How Homemakers Select Foods.

Bul. 354. Procurement of Corn in Alabama.

Cir. 145. Christmas Tree Production in Eastern Redcedar and Arizona Cypress Plantations.

Cir. 147. Diseases of Small Grains in Alabama.

Cir. 148. Farm Handling and Marketing of Pecans in Alabama.

Leaf. 66. Forage Production of Winter Annuals Sod-Seeded on Dallisgrass-White Clover.

Leaf. 67. Arrowleaf Clover.

Leaf. 69. Performance of Peach Varieties in Alabama.

Prog. Rept. 84. Rainfall Distribution in Alabama.

Free copies may be obtained from your County Agent or by writing the Auburn University Agricultural Experiment Station, Auburn, Alabama.

In modern civilization, water is playing an ever increasing role.

Conservation of resources is the object of a number of governmental and private agencies. A foremost problem confronting all users of water supplies is the presence of unwanted aquatic plants usually referred to as "water weeds." These weeds range in size from single-cell algae to large, highly differentiated vascular plants.

Alligatorweed

A plant that belongs to the latter category is alligatorweed, (*Alternanthera philoxeroides* (Mart.) Griseb.). It can be classified as a true amphibious plant because it grows in dry soil as well as swampy areas and open water. In water the plants may be anchored by roots to the shore, or in shallow water to the bottom. In deeper water they become detached and form floating mats of considerable size. This weed is primarily a problem in fresh water near the Gulf and Atlantic coasts. Recently it has caused considerable trouble as far inland as Lake Seminole, Figure 1, Lake Eufaula, and in drainage canals at Maxwell Field in Montgomery County.

Control Difficulties

As shown in Figure 2, alligatorweed has opposite leaves and in the axil of each leaf there is a bud that is capable of giving rise to a new plant. Reproduction is usually by vegetative means. The plants set flowers but produce few viable seed. Because of the vegetative reproduction or "dormant" buds, chemical control has been extremely difficult. A number of herbicides show promise in controlling the weed. These herbicides will usually kill most of the leaves and some of the stems but there is always a tremendous regrowth from the buds. Several studies have been initiated at Auburn University Agricultural Experiment Station to find out why the herbicides were not killing the buds and thereby controlling regrowth.

FIG. 1. Alligatorweed has caused problems as far inland as Lake Seminole, Florida.

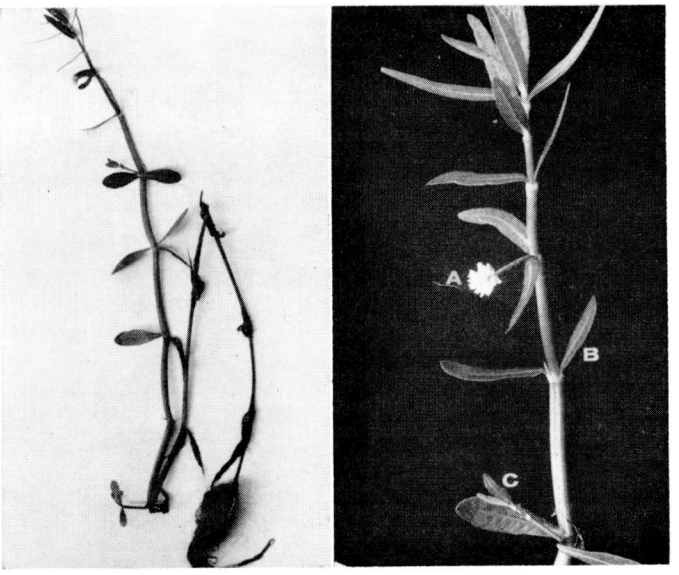


FIG. 2. The entire alligatorweed plant is shown at left and a closeup at right shows a—flower, b—opposite leaves, and c—germinating bud.

CHEMICAL CONTROL of ALLIGATORWEEDS

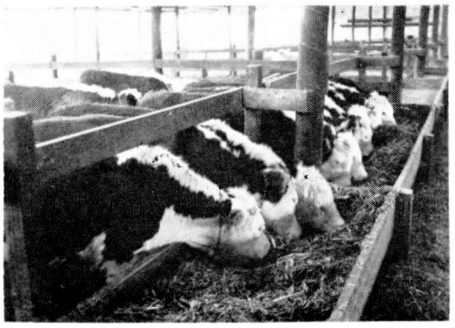
H. H. FUNDERBURK, JR., and D. A. PATE
Dept. of Botany and Plant Pathology
J. M. LAWRENCE, *Dept. of Zoology-Entomology*

Herbicide Effectiveness

For most herbicides to be effective, they must be absorbed by the plant and translocated or moved within the tissues of the plant. In order to study the movement of herbicides in plants and the ultimate effect of these at the cellular level, stems were collected from untreated and treated plants for tissue study. From studies of this type, it was determined that several herbicides caused considerable destruction of tissues within the nodal zone – close to the dormant bud. However, in no case was there any destruction of the tissues that comprise the dormant bud; but, once the bud broke dormancy there was tissue destruction within the bud. This indicates that the tissues between the node and bud were not sufficiently differentiated to translocate or move enough herbicide into the bud to cause its destruction.

Progress Made

In spite of many difficulties that have been encountered, the results of experiments at Auburn and at Lake Seminole indicate that some progress is being made in controlling this weed. Chemicals that are showing promise are various combinations of 2,4-D, diquat, paraquat, silvex, and diglycolic acid.



SILAGES and SUPPLEMENTS for growing beef calves

R. R. HARRIS and W. B. ANTHONY, *Dept. of Animal Science*
J. K. BOSECK, *Tennessee Valley Substation*
V. L. BROWN, *Lower Coastal Plain Substation*
E. L. MAYTON, *Piedmont Substation*

It is possible to reduce feed costs for slaughter beef by feeding corn and sorghum silages.

To realize this reduction, however, maximum use must be made of silages in the growing phase of growing-finishing systems. This means that silage should be the major source of energy in growing rations. Research at the Auburn University Agricultural Experiment Station has shown that corn and sorghum silages do not make adequate complete rations; for this reason, silage rations must be supplemented.

Researchers at Auburn have fed corn and sorghum silages with various supplements to stocker beef calves annually since 1955. These growing rations consist of a standard supplement of 2.0 lb. ground snapped corn and 1.5 lb. 41% CSM. Animal performance data on corn and sorghum silages full-fed with standard supplement are given in Table 1.

In general, gains on corn silage have been good, whereas those on sorghum silage have not been as satisfactory. ADG for cattle fed sorghum silage ranged from 1.02 to 1.52 lb. Comparable data for corn silage were 1.25 to 1.93 lb. The great variability and general low level of performance on sorghum silage prompted testing different supplements.

The first change was made during 1957 when the supplement fed at the Tennessee Valley Substation consisted of 3.5 lb. per head daily of a complete mixture (corn, CSM, alfalfa, urea). This was a relatively high protein supplement formulated to furnish sufficient crude protein to raise total ration protein to 12-13%. This supplement was fed to groups of cattle receiving corn or sorghum silage. Animal performance was lower than the year before when original supplement for silage rations was fed.

Table 1. Animal Performance Data on Silages, Tennessee Valley Substation, Belle Mina, 1955-1963[1]

Ration	Average daily gain	Feed cost per cwt. gain	Daily intake silage
	Lb.	*Dol.*	*Lb.*
Sorghum silage + 2.0 lb. corn + 1.5 lb. CSM	1.32	12.19	25.5
Corn silage + 2.0 lb. corn + 1.5 lb. CSM	1.59	11.56	27.0

[1] Data for sorghum silages are averages of 9 years and that on corn for 8 years.

Chemical composition and digestibility data from tests at the Main Station revealed sorghum silage to be low in available protein. Based on these data, a test was conducted for 2 years at the Piedmont Substation using beef heifers to determine if 3 lb. CSM and 1 lb. corn was a better supplement for sorghum silage than 1 lb. CSM and 3 lb. corn. Results showed the higher protein supplement supported much higher daily gain, 0.4 lb., and reduced the feed cost of gain. The test was repeated with slight change at the Lower Coastal Plain Substation. Steers were used and 3 lb. CSM was compared with 1.5 lb. The higher CSM ration resulted in better animal gain, 0.25 lb., but cost of gain was increased slightly.

In a later trial, pens of steers and heifers were full fed corn silage and a supplement consisting of 2 lb. corn and 1.5 lb. CSM. The heifers gained slightly faster than steers, 0.06 lb., ate slightly more silage daily, 0.5 lb., and had a slightly lower feed cost per cwt. of gain, 52¢.

Dehydrated, pelleted alfalfa is an excellent source of protein as well as certain vitamins, minerals, and so-called "unidentified factors." Therefore, if a nutrient imbalance, or a protein deficiency, or both were present when sorghum silage was fed with the standard supplement, feeding a small amount of alfalfa should correct such conditions. Results of some feeding tests where 2 lb. of dehydrated, pelleted, alfalfa (17%) were fed with sorghum silage and the standard supplement are given in Table 2. In the Lower Coastal Plain trial calves receiving alfalfa gained 0.3 lb. faster than those fed the standard supplement, but the feed cost per cwt. gain was increased by $1.08. In the Tennessee Valley test, the addition of 2 lb. of alfalfa improved rate of gain slightly (0.14 lb. daily), but increased the feed cost per cwt. of gain by $2.33.

Based on these results, feeding CSM or alfalfa pellets in addition to standard supplement with sorghum silage will increase animal gain. However, cost of gain may not be reduced and will depend upon the cost of the extra protein or alfalfa pellets. The standard supplement, consisting of 2 lb. ground snapped corn and 1.5 lb. of CSM (41%) gives excellent performance with corn silage. However, this supplement gives highly variable and somewhat lower performance when fed with sorghum silages.

Table 2. Animal Response to Additional Protein Fed With Sorghum Silage

Performance	Sorghum silage[1] (LCP)	Sorghum silage[1] + 1.5 CSM (LCP)	Sorghum silage[1] + 2 alfalfa (LCP)	Sorghum silage[1] (TV)	Sorghum silage[1] + 2 alfalfa (TV)
ADG, lb.	1.32	1.59	1.62	1.48	1.62
Silage intake, lb./steer daily	36.2	36.7	35.4	26.6	25.6
Feed cost per cwt. gain, dol.	16.44	16.82	17.52	12.63	14.96

[1] All calves received 2.0 lb. of ground snapped corn and 1.5 lb. of 41% CSM daily in addition to the treatments as listed. Data for LCP are for 1962-63, whereas results from TV are averages for 1962-63 and 1963-64.

GUMBORO
Disease in Poultry *

S. A. EDGAR and YUNG CHO
Department of Poultry Science

A VACCINE is now in prospect for control of Gumboro disease (avian nephrosis) in chickens, outbreaks of which have been increasing in the Southeastern States during the last 3 years.

This new development is taking place in the poultry science laboratories of Auburn University Agricultural Experiment Station following extensive studies of how the disease is spread and of possible immunity.

Gumboro disease has been reported in more than 20 large poultry operations in Alabama and Mississippi. The flocks were 1 to 22 weeks old. Not more than 10 to 30% of a flock showed signs of the disease at any one time.

Usually death rate was less than 15%, averaging about 5% in 3- to 5-week-old chickens and less in older ones. The disease lasts about 5-7 days; it may require 2 to 3 weeks to spread in houses divided into several pens.

Symptoms of the disease include: low grade fever (108-110° F.) of short duration, whitish watery diarrhea, loss of appetite, ruffled feathers, trembling, dehydration, and prostration followed by death. Sick birds tend to sit and they move at an unsteady gait.

Find Clue to Spread

Studies begun by Auburn in 1962 confirmed much of the earlier work of other investigators. However, only recently was there a major break-through that provided control measures against spread of the disease from house to house, farm to farm, and area to area. After investigating many possibilities, the writers discovered that the disease was being spread through contaminated, leftover feed removed from feed hoppers and bulk bins on infected farms. This leftover feed was transported to other houses, other farms, or even new areas where the disease had not previously occurred. Birds fed the leftover feed came down with the disease within a few days.

The practice of moving leftover feed had come about largely because of bulk feed, use of at least two feeds (starter and finisher) in growing broilers, and a diminishing profit margin.

Rapid spread of the disease within a large broiler operation between October 1962 and July 1963, and the present containment to certain farms by no longer moving feed are shown in the chart. By the time it was known how the disease spread, 35% of all flocks of this firm was involved. Spread had been stopped during late 1962 and through most of 1963 by cutting off farmers where the disease had occurred. This was discontinued as an unfair practice, and the spread to new farms increased rapidly.

The practice of moving leftover feed has been much more common in broiler than replacement flock operations. This probably accounts for the more rapid spread and greater occurrence of the disease in broilers than in replacement flocks.

Practically all attempts to prevent recurrence on a farm have merely delayed onset of the disease.

Of the many treatments tried, including antibiotics, sulfonamids, extra vitamins, and extra water, only extra water with molasses or sugar lessened mortality and severity of the disease. Sources of chickens, feed, vaccines, service men, trucks, caretakers, varments, or wild birds seem to have had no relation to spread or occurrence of Gumboro.

Immunity is Developed

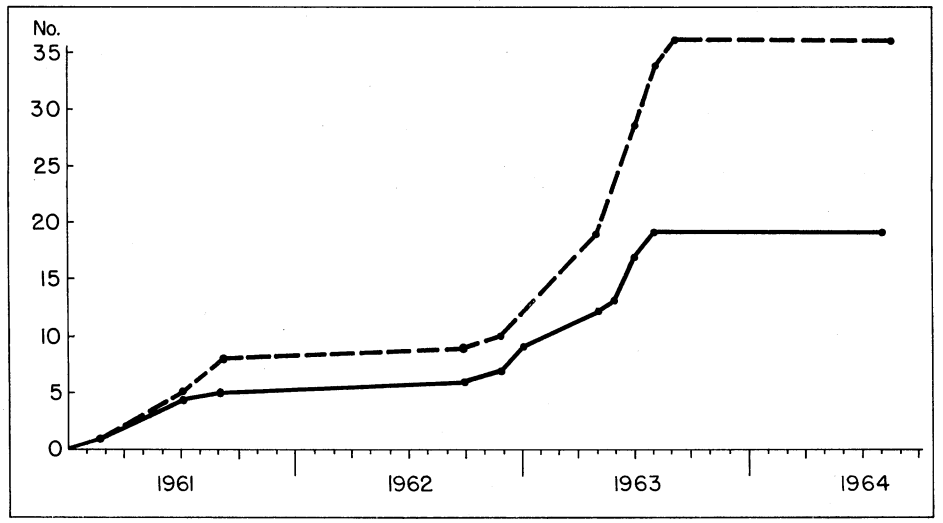
It was discovered that chickens develop immunity to the disease and that losses are less when chicks are exposed at an early age (under 1 week) than later. Some farmers now reduce losses by more than 75% by placing 2 to 4 Gumboro-diseased chicks per brooder along with 4- to 7-day-old placements in houses where the disease has previously occurred. Also, re-use of old litter or transporting of small amounts of contaminated litter to houses of baby chicks resulted in early exposure and reduced losses. However, these latter two practices sometimes increased problems from other diseases.

Gumboro disease has been transmitted to susceptible chickens experimentally by bringing them in contact with infected chickens, feeding them contaminated litter and feces or infected organs, and by being in close proximity to pens of infected birds.

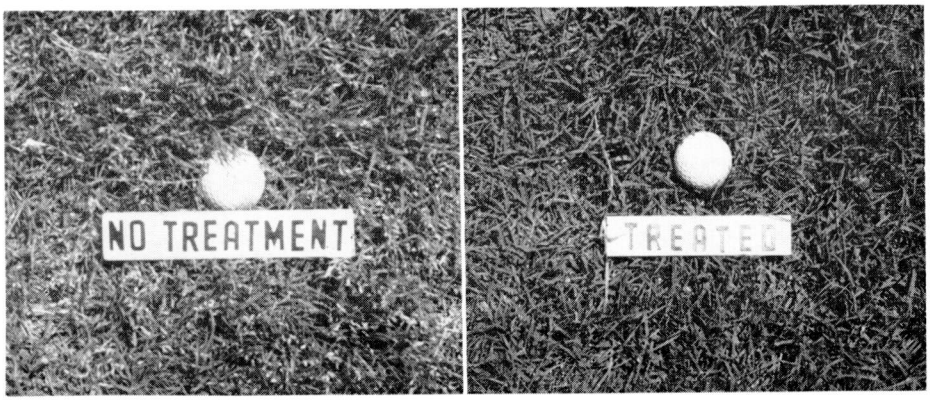
A virus-like agent has been isolated from affected chickens and has been transmitted successfully to susceptible 1- to 6-week-old chicks. As a result chicks have been immunized at an early age without serious loss and are protected against further exposure. Prospects of a vaccine being available soon for commercial use are promising.

Much is yet to be learned as to what is the best way to prevent recurrence of Gumboro disease in chickens.

* This project is financially supported by Southeastern Egg and Poultry Association, and Alabama Flour Mills, Decatur.



Spread of Gumboro disease in a large poultry operation is illustrated by the graph. The solid line represents number of farms, and the broken line is number of flocks.



An area of bermudagrass with a heavy infestation of annual bluegrass (left) is contrasted with a similar area that was treated to control this pest (right).

CONTROLLING annual bluegrass in lawns

D. G. STURKIE
Dept. of Agronomy and Soils

ANNUAL BLUEGRASS (Poe annua) is widely distributed, being present in most areas of Alabama. It is often considered a weed in lawns and golf greens.

The annual plant resembles other bluegrasses, but it is strictly an annual and does not produce creeping underground stems. It is much smaller than Kentucky bluegrass, with short smooth leaves that are distinctly shiny on the underside. The short seed heads are produced profusely and are silvery, giving an infested area a silvery appearance in spring when seed heads are forming.

The seed sprout in fall, early winter, and spring and plants grow during cool weather. It stools prolifically and produces a tuft when plants are single. Often the plants grow so thick that a dense sod is produced, and it is sometimes preferred as a winter lawn grass. This grass has a vivid green color in late winter and early spring. Plants never grow tall, so little or no mowing is needed.

In the vicinity of Auburn annual bluegrass produces seed heads from the middle of April to mid-May. Then it dies rapidly. Usually by June all of the plants are dead and the lawn has a brown, ugly appearance until summer grass spreads over the dead annual. It is impossible to prevent seed formation by mowing – even by cutting as close as ¼ in. Thus, it spreads on lawns or golf greens unless control measures are taken.

Herbicides Provide Control

Pre- and post-emergent chemical control methods have been tested at the Auburn University Agricultural Experiment Station. The pre-emergent is applied before seed germinate (late September or early October) and post-emergent in February after plants are well established.

Pre-emergent herbicides that have been found effective at specified rates of active material per acre are: atrazine, 1.5-3.0 lb.; betasan, 10-20 lb.; dacthal, 10-20 lb.; simazine, 1.5-3.0 lb.; treflan, 6 lb.; and zytron, 20-40 lb.

Atrazine and simazine are sometimes injurious to bermudagrass when used at the highest rates listed. Betasan, dacthal, treflan, and zytron at the listed rates have not caused severe injury on bermuda, zoysia, or centipede.

The pre-emergent herbicides at low rates are effective for a short period. Since annual bluegrass seed continue to germinate until late March, a second application in February might give better control. However, this has not been tested at Auburn. The rates recommended have given control until May when annual bluegrass growth ends.

After annual bluegrass plants are up they can be killed by using post-emergent herbicides. The materials and rates that have proved effective are: atrazine, 1.5 lb.; endothal, 4-6 lb.; paraquat, 1-2 lb.; prometryne, 1.5 lb.; and simazine, 1.5 lb. Phosphone, 5-10 lb., gave good control in 1964, the only year it has been tested. This material is a growth regulator and should not be sprayed on shrubs, trees, and flowers.

These treatments have not been injurious to bermuda, zoysia, or centipede grasses when applied in February when the summer grasses are dormant. Paraquat and endothal produce a temporary injury when applied after the lawn grasses begin growth. This occurs at Auburn frequently by the middle of March.

The herbicides should be mixed with water and applied when the annual bluegrass is dry. A wetting agent (about 1 tablespoon of a good detergent per gallon of water) is necessary to make the herbicide stick to the plants.

Paraquat is quickly active and the grass will be dead in 1 or 2 days. Endothal is slower, requiring about a week to kill the grass. The slow acting atrazine, prometryne, and simazine take several weeks to kill the grass.

Effects on Other Plants

Paraquat and endothal are contact, non-selective herbicides that will kill any green foliage they contact. Care must be taken not to spray them on shrubs, flowers, or other plants that are wanted. Since they are usually not absorbed through the roots, these materials can be used to spray underneath trees or shrubs, provided they are not applied to foliage.

Atrazine, simazine, and prometryne may be absorbed by plant roots, causing damage to trees or shrubs. At recommended rates they are usually not injurious and may be used safely when not sprayed directly underneath the plants. Simazine is less soluble than atrazine or prometryne, hence it is safer.

Betasan, dacthal, treflan, and zytron are usually safe to use around shrubs and trees. Such flowers as iris may be damaged. The safest rule is not to use herbicides around flowers unless the label specifically states that the chemical can be used around those being grown.

Chemical Names of the Herbicides

Atrazine—2-chloro-4-ethylamino-6-isoprophyl-amino-S-triazine
Betasan—N-(Beta-O, O-diisopropyl-dithiophosphoryethyl)-benzine-sulfonamide
Dacthal—dimethyl 2, 3, 5, 6-tetrachloroterephthalate
Endothal—3, 6-dimethyl-4, 4-dipyridylium cation
Phosphone—tributyl-2-4-dichlorobenzyl-phosphonium
Prometryne—2, 4-bis (ethylamino)-6-methyl mercapto-s-triazine
Simazine—2-chloro-4, 6-bis (ethylamino)-S-triazine
Treflan—a, a, a-trifluor-2, 6-dinitro-N, N, dipropyl-p-toluidine
Zytron—dichlorphenyl, methyl-isopropyl phosphoramidothiate

The view at left shows conditions of plants with black plastic mulch in left plot and Nemagon treated in right plot on June 16. Picture at right shows condition of plants in same plots 6 days later.

ROOTKNOT CONTROL PRACTICES in Bush Beans and Mustard

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E. J. CAIRNS, *Dept. of Botany and Plant Pathology*

ROOTKNOT CAN BE a serious problem where vegetable crops are grown intensively.

Tests at the Auburn Agricultural Experiment Station show that growing highly susceptible crops on land 2 years will cause a very high population of rootknot nematode, *Meloidogyne incognita.*

Rootknot Nematode Inoculum

In 1958, before treatments were begun, the rootknot nematode population was increased in all plots with infested tomato plants. Matured plants were turned and a fall crop of squash grown to continue the nematode population increase. The rootknot rating or index on squash in all plots ranged from 98 to 100 where the rating of 10 indicated no visible rootknot and 100 indicated severe rootknot.

Practices Used

Treatments used in this study are listed in the table. All crops grown as a treatment were turned in the soil as green manure. Bush beans were grown as a spring crop and mustard as a fall crop.

All treatments could not be applied at the outset of the experiment because of the sequence for their application. For the first fall crop of mustard, all practices were applied except the growing of marigolds in alternate years. All treatments were in effect by the 1960 season.

Effect of Practices on Rootknot

Treatments were begun in 1959 and continued through 1963. Because of a high population buildup of stunt and stubby root during 1962 and 1963, results are given only for the years when rootknot nematodes were the predominant pest.

The highest degrees of control and increases in yield in both spring and fall crops were from the use of the fumigant in liquid form. The granular form was not as effective. Other practices (see table) with the exception of black plastic and pine straw mulches, gave some control. Very good control resulted from summer fallow and crotalaria treatments. Excellent control and good yields of mustard resulted where marigolds were grown and turned. Marigolds grown in alternate years gave partial control of rootknot and resulted in high yields for both spring and fall crops. When grown in summer and fall, they failed to give control; late planted marigolds usually made poor growth.

With the exception of fumigation treatments, yield results were not always closely related to the level of rootknot nematode population. Yields were usually related to levels of rootknot present when organic material was low and moisture and temperature were at critical levels. Where fumigants were added, marked increases in yields were attributed to pronounced reduction of rootknot nematode and not to addition of residue from crop rotation or conservation of moisture with mulches.

During a long period of time, the nonchemical treatments can reduce rootknot nematode to the level where good crops of beans and mustard can be produced, provided high populations of certain other kinds of parasitic nematodes do not occur. However, such rotation or fallow treatments require time and are not effective against all kinds of nematodes. The fumigant is effective immediately and against all the common nematode pests of Alabama.

INFLUENCE OF DIFFERENT PRACTICES ON THE SEVERITY OF ROOTKNOT AND EFFECT ON YIELD OF SPRING GROWN BUSH BEANS AND FALL GROWN MUSTARD

Treatments	Bush beans			Fall mustard		
	Rootknot index,[1] av. of 1960-61	Av. yields/a 1960-61	Increase in yields	Rootknot index,[1] av. of 1960-61	Av. yields/a 1960-61	Increase in yields
	No.	*Lb.*	*Lb.*	*No.*	*Lb.*	*Lb.*
Check	73	5,048		64	8,931	
Summer and fall fallow	57	4,874	0			
Summer fallow	58	4,534	0	39	9,242	311
Summer fallow plus rye cover	61	6,935	1,887			
Crotalaria plus rye cover	61	6,445	1,397			
Crotalaria cover	55	4,741	0	39	7,437	0
Fumigated-DBCP broadcast[2]	15	7,769	2,721	14	11,693	2,763
Fumigated-DBCP row[2]	18	6,854	1,806	16	11,114	2,183
Fumigated-granular DBCP row[2]	41	6,498	1,450	40	10,090	1,159
Black plastic mulch	83	4,848	0	60	10,266	1,335
Pine straw mulch	75	7,141	2,093	77	6,762	0
Marigold in alternate years	53	7,864	2,816	43	11,152	2,221
Marigold in summer and fall	69	5,058	10			
Marigold in spring and summer				13[3]	18,886	9,955

[1] Rootknot index reading on squash grown in 1958 ranged from 98 to 100 for all plots and 85 for beans grown in untreated plots in 1959. In 1959, the first year of the test, all practices could not be applied because of the planned sequence of application.

[2] DBCP formulation is 1,2-dibromo-3-chloropropane, which is sold under such trade names as Nemagon and Fumazone.

[3] Mustard was not grown in this treatment before 1961.

FRONTIER CRIMSON Furnishes Needed Grazing in Fall and Winter

C. S. HOVELAND, J. M. CREEL, and
H. L. WEBSTER
Dept. of Agronomy and Soils

MORE GRAZING during fall and winter!

That's what can be expected from a new crimson clover variety, named Frontier, that is available for planting this fall.

The new variety is a plant introduction (P. I. 233812) from Italy that was increased and released by the Mississippi Agricultural Experiment Station. Frontier characteristics that distinguish it from other commonly grown crimson clover varieties include the following:

(1) Better seedling vigor, resulting in more rapid fall growth.

(2) Larger seed size. Frontier has approximately 114,000 seed per pound as compared with more than 150,000 for reseeding varieties of crimson.

(3) Leaves are larger and lighter green than other crimsons.

(4) Frontier matures earlier than other varieties.

(5) A nonreseeding type, Frontier has soft seed.

Superior fall and winter forage production of Frontier has been shown in tests at seven units of Auburn University Agricultural Experiment Station. In these trials the clovers were planted on prepared land in September and clipped throughout the season when plants were about 6 in. tall.

Data in the table include production through February. In these tests, fall and winter production of Autauga crimson was only 60% of that made by Frontier. And Autauga is one of the earliest and most productive of the reseeding crimson varieties. Differences in growth during fall months are even more striking, as shown by the photographs.

Although Frontier averaged more early forage than reseeding varieties, it had less total production. However, the lower total yield in some cases was probably the result of close clipping.

Greater seedling vigor of Frontier was noticeable in the tests soon after emergence. Frontier continued to grow more rapidly than Autauga whenever moisture was available.

Frontier suffered somewhat more winter injury than other varieties, but it was not killed by cold weather. The variety has survived temperatures of zero during the last two winters in Alabama.

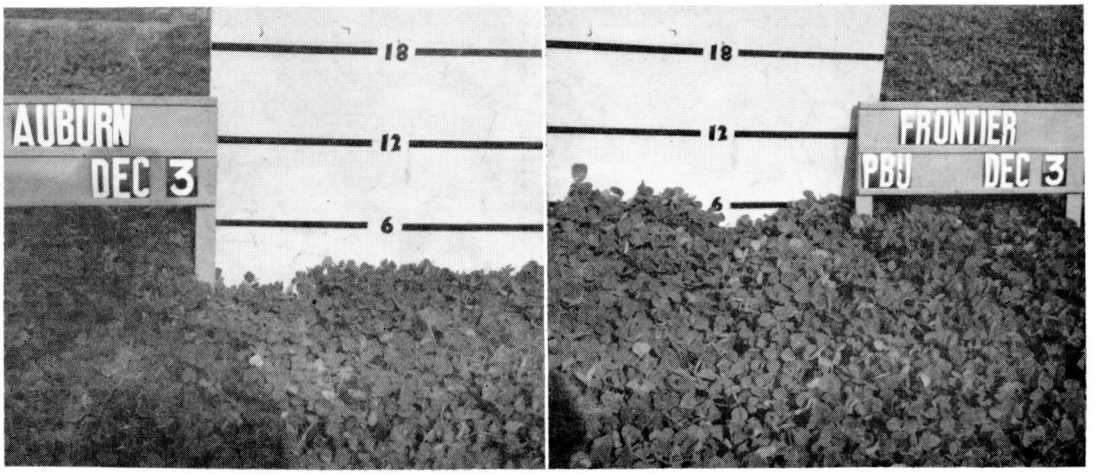
Growers are cautioned that Frontier is not a reseeding variety. Therefore, best use of this variety will be where crimson clover is planted by mid-September each year on prepared seedbed. For this purpose Frontier is ideally suited, since it has the advantage of producing early winter grazing. Late fall seeding of Frontier will not have the advantage of earliness.

A small amount of reseeding may be observed where Frontier has been grown. Seed from these plants should not be saved, since these hard seed are smaller and will not have the superior seedling vigor of Frontier.

Certified seed of Frontier are being produced in Alabama and will be available this fall. Only certified seed should be planted to obtain the early fall and winter yield potential of Frontier.

EARLY AND TOTAL FORAGE PRODUCTION OF FRONTIER AND AUTAUGA CRIMSON CLOVER VARIETIES, SEVEN ALABAMA LOCATIONS

Location	Dry forage yield per acre			
	Frontier		Autauga	
	Fall and winter	Total	Fall and winter	Total
	Lb.	*Lb.*	*Lb.*	*Lb.*
3-year average				
Plant Breeding Unit	*1,353*	3,609	*691*	4,391
Prattville Expt. Field	*856*	2,295	*443*	2,578
2-year average				
Alexandria Expt. Field	*1,834*	2,533	*1,448*	3,392
Gulf Coast Substation	*2,408*	3,876	*1,585*	4,166
1-year average				
Brewton Expt. Field	*1,950*	3,590	*939*	3,357
Monroeville Expt. Field	*1,621*	2,736	*1,021*	2,750
Tuskegee Expt. Field	*1,501*	4,091	*860*	4,243
WEIGHTED AVERAGE	*1,552*	3,150	*945*	3,567



Rapid fall and winter growth of Frontier crimson is illustrated by this comparison photographed at the Plant Breeding Unit, Tallassee. The Auburn reseeding crimson, left, had made little growth by December 3, but the Frontier was already producing enough for good grazing. This early growth ability, which is the result of good seedling vigor, is a major advantage of the Frontier variety over reseeding types.

Variations in Prices for Fluid Milk

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RETAIL MILK PRICES vary widely among markets in the United States. Historically, supplies of milk for a market have been produced and consumed locally. Therefore, milk prices in individual markets have depended largely on local conditions.

Prices received by producers and marketing margins for local areas have been given the most study, although national average prices and marketing margins are computed regularly.

Study Made in 24 Markets

For study of milk price variations, 24 metropolitan areas were selected. Twenty of the metropolitan areas had a population in excess of 1 million people in 1960. The remaining four areas with populations less than 1 million, Birmingham, Jackson, Memphis, and New Orleans, were selected to include more southern cities in the study group (see table). Farmers' share, marketing margin, and retail prices for one-half gallon of milk purchased in stores were determined for each market during May 1964. The half-gallon container was selected because it is usually the most common size purchased. Also, a large percentage of all milk sales is through grocery stores.

Retail prices for milk reported for the 24 markets in May 1964 ranged from 35¢ for one-half gallon in Cleveland to 61¢ in Miami, a difference of 26¢. Prices in seven markets were in excess of 50¢, while prices in six markets were less than 40¢ per one-half gallon. In Birmingham the retail price was 54¢, second highest of the 24-market group and 8.4¢ above the group average. Montgomery and Mobile were excluded from this study since producer and consumer prices in these cities were approximately the same as in Birmingham.

FARMERS' SHARE, GROSS MARGIN, AND RETAIL PRICE FOR STORE PURCHASES OF MILK IN HALF-GALLON CONTAINERS, SELECTED MARKETS, MAY 1964

Market	Retail price	Farmers' share	Gross margin	Farmers' share	Gross margin
	Ct.	*Ct.*	*Ct.*	*Pct.*	*Pct.*
Miami, F	61	29.4	31.6	48	52
Birmingham, S	54	27.6	26.4	51	49
Atlanta, S	53	28.0	25.0	53	47
Jackson, F, S	52	24.5	27.5	47	53
New Orleans, F*	52	27.0	25.0	52	48
Baltimore, F	51	22.5	28.5	44	56
San Francisco, S	50	23.5	26.5	47	53
Philadelphia, F, S	48	21.6	26.4	45	55
Pittsburgh, S	48	24.0	24.0	50	50
Seattle, F	48	21.5	26.5	45	55
Buffalo*	47	26.2	20.8	56	44
Chicago, F	47	20.0	27.0	43	57
Los Angeles, S	47	23.2	23.8	49	51
24 market average	45.6	22.4	23.2	49	51
Dallas, F	45	22.8	22.2	51	49
Cincinnati, F	44	19.9	24.1	45	55
Boston, F	42	23.8	18.2	57	43
New York, F	42	22.5	19.5	54	46
St. Louis, F	41.5	17.5	24.0	42	58
Detroit, F	39	21.4	17.6	55	45
Kansas City, F	39	17.6	21.4	45	55
Milwaukee, F	38.5	18.5	20.0	48	52
Memphis, F	36	21.1	14.9	59	41
Minneapolis, F	35.5	16.4	19.1	46	54
Cleveland, F	35	18.2	16.8	52	48

F = federal order market, S = all prices under state control.
* New Orleans—producer prices under state control; Buffalo—retail prices under state control.
Source: *Fluid Milk and Cream Report.* USDA. May 1964.

Amount received by farmers for one-half gallon of milk (Class I price) ranged from 16.4¢ in Minneapolis to 29.4¢ in Miami, a difference of 13¢. Class I price per cwt. of milk testing 4% butterfat was $6.73 in Miami, in Minneapolis $4.16. Highest producer prices were in the Southern and Northeastern markets, whereas the lowest prices paid producers were in the Midwest. Alabama farmers received $6.56 per cwt. for Class I milk.

In 1961 the USDA made a study in which dealers' buying prices for milk were compared among markets. The study showed that Class I prices were becoming more closely aligned between distant markets as well as major supply areas. Fewer markets had Class I prices less than $4 per cwt. than in two earlier study periods.

Distributors' costs and profits are added to the price paid farmers for producing the milk to make up the total price paid by consumers for a unit of fluid milk. These costs and profits are commonly called the marketing margin or distributors' gross margin. In Miami the marketing margin was 31.6¢, which was more than double the margin in Memphis. Marketing margins in six cities were under 20¢ per one-half gallon. The average marketing margin for the 24 markets was 23.2¢.

Existence of wide ranges in prices and margins has been attributed to differences in institutional organizations and economic factors among market areas. Type of market regulation (federal and state orders), trade practice rules, milk sanitation laws, and transportation regulations have been related to variations in milk prices and margins.

Markets are Regulated

Of the markets studied, 18 are federal order markets and 9 are under state orders. Three are regulated by both federal and state orders. Retail prices in all markets studied under state control were above the 24 market average. However, Miami, the market with the highest prices, is a federal order market. In most state order markets, retail prices are fixed by a state milk control agency. Producer and wholesale prices are fixed in the other state order markets except New Orleans and Buffalo. Federal regulation provides only for classified pricing of producer milk.

Other factors that vary among markets contribute to differences in distribution costs include concentration of consumers and per capita consumption in the market area, street network, and wage rates. Also, monopolistic position of any group in a market may result in high prices, wages, or profits. Such gains will be reflected in consumer prices, but do not represent improvements in economic efficiency.

CREDIT for FARM and HOME

J. H. YEAGER, *Dept. of Agricultural Economics*

FROM $6,300 TO ALMOST $52,000. That is how much the average investment per farm in the U.S. increased since 1940.

Much of this increase came from higher prices. However, commercial farmers today must have more invested in real estate, machinery, and livestock than in the past to earn "going wages."

Credit to finance purchase of additional land, buildings, machinery, and livestock has become a lifeline on which farmers depend. Debt outstanding or borrowed capital used in agricultural production for all farms amounted to $28 billion as of January 1, 1963.

Credit Categories

Two broad categories of credit include loans secured by a farm mortgage and the non-real-estate farm debt. The former was $15 billion and the latter was $13 billion the beginning of 1963. Commodity Credit Corporation loans outstanding of $2 billion are excluded.

The 1963 farm mortgage debt was 2.3 times that of 1940, while the non-real-estate debt was 4.2 times as large. In the past 5 years, the non-real-estate debt has increased by a greater amount each year than in previous years. Total farm debt outstanding January 1, 1963 was about 14% of total assets.

Lenders

The "other" group that includes individuals who lend on farm real estate accounted for the greatest part of the farm mortgage debt. Life insurance companies and the Federal Land Banks, followed by all operating banks, were also important lenders on real estate as shown in table. Banks were the major lenders of operating funds to farmers in the 48 states.

Lender and category	*Outstanding Jan. 1, 1963 (million dollars)*
Farm mortgage debt	
Federal Land Banks	3,023
Farmers Home Administration	709
Life insurance companies	3,397
All operating banks	2,053
Other	6,180
Non-real-estate farm debt	
All operating banks	5,971
Production Credit Associations	1,839
Federal Intermediate Credit Banks	110
Farmers Home Administration	554
Other (loans and book credit)	4,200

Source: ERS, USDA, *The Balance Sheet of Agriculture*, 1963.

Although the need today for credit in agriculture is probably greater than ever before, it is good management for farmers to use credit wisely. Borrowed funds should earn more than their interest cost and other charges. Money borrowed may be used to expand volume of business, to increase efficiency and reduce unit costs, or to take advantage of a price situation.

Alternative sources of credit should be considered. Find out the terms of the loan. Be sure to consider all costs of borrowing; sometimes certain costs are hidden. It is wise to be fair, frank, and businesslike in dealing with a lender.

Once a loan is made, keep up to date on payments. If payment cannot be made as scheduled, arrangements can usually be made with the lender. Timeliness in repayment influences your future ability to borrow.

Consumer Credit

The demand for credit in the home has also increased. Housewives have more appliances and household equipment. These wear out and must be replaced. Also, new items for use in the home appear on the market almost daily.

Consumer credit is not "productive" in the sense that farm credit is used to increase income and efficiency. However, buying now and paying later makes it possible for a family to gain satisfaction from an item prior to the time when the item could be purchased for cash from savings.

Consumer credit may be in the form of a charge account, cash loan, revolving credit, or installment purchase. It is relatively easy to obtain these types of credit in most cases. Thus families sometimes find themselves in financial difficulty.

Just as with farm credit, the cost or true annual interest rate and added charges should be investigated beforehand.

Suppose that a consumer desires to buy a television set that has a price of $200. On an installment basis he must pay $18.50 each month for 12 months. What is the true annual interest rate paid?

The following formula may be used if payments are equal and evenly spaced:

$$\frac{\text{Total finance charge}}{\frac{1}{2}\text{ of original loan}} \times \frac{\text{No. of payments}}{\text{No. of years}} \times \frac{1}{\text{No. of payments} + 1} = \text{true annual interest rate}$$

$$\frac{(12 \times \$18.50) - \$200}{\frac{1}{2}\text{ of }\$200} \times \frac{12}{1} \times \frac{1}{13}$$

$$= \frac{\$22}{100} \times \frac{12}{1} \times \frac{1}{13} = .203 \text{ or } 20.3\%$$

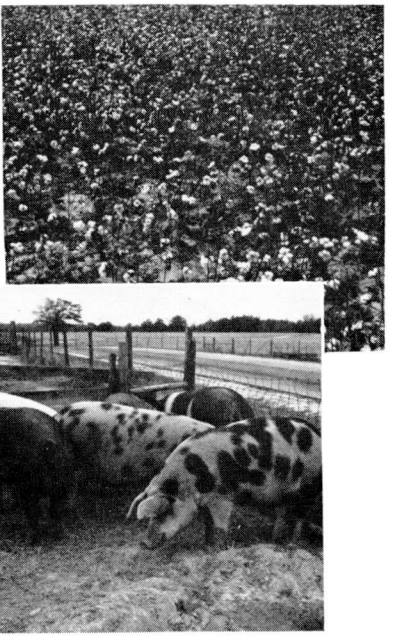
The true annual interest rate is 20.3%. It might be possible for the prospective buyer to obtain a loan at a lower interest rate. Or by "shopping around," he may be able to find more favorable terms.

Credit plays a significant role in operating both the farm and home. Wise use of credit may mean the difference in success or failure.

SMALL FARM, GOOD RETURNS—

that's record made by cotton-hog management units

J. T. COPE, JR., F. E. BERTRAM, and J. W. RICHARDSON
Dept. of Agronomy and Soils



ALABAMA STILL has many small farms that produce little or no return. However, such farms can be profitable, according to records of small management units of Auburn University Agricultural Experiment Station.

Cotton-hog management units were begun on the Monroeville and Prattville Experiment Fields in 1943. The objective was to measure economic returns from small farms using Experiment Station recommendations. Unit size was 37 acres at Monroeville and 28 at Prattville. Data obtained through 1963 have been expanded to 40 acres in each unit for comparison (see table).

Cropping systems were adapted to the land. Each location had about 7 acres of cotton. This was grown on the best land in a 2-year rotation with corn. Vetch, crimson clover, or some other winter legume was planted after cotton and turned as green manure for corn. Corn was grown continuously on other areas that were not well suited to cotton. Some peanuts were grown for hogs during 1943-47.

Land not in cotton or corn was used for pasture, temporary grazing, and erosion control. A mixture of crimson clover, rye, and ryegrass was planted in August or September for winter grazing.

Yields of cotton ranged from an average low of 200 lb. lint in 1946 to a high of 780 lb. in 1958. There was an upward trend in cotton yields through the years. Drought was the major limiting factor in crop yields.

Corn yields varied even more than cotton, averaging 26 bu. in 1952, 71 bu. in 1961, and 30 bu. in 1963. An upward trend in corn yields resulted from higher nitrogen fertilization, closer spacing, and improved varieties. Corn yields at Prattville were lower than at Monroeville because land was less suitable for corn.

Receipts from cotton were fairly constant for the four 5-year periods. Gross returns from cotton exceeded $200 per acre most years. Income from hogs increased because of higher corn yields, more hogs marketed, better prices, and improved management. Gross receipts from cotton and hogs at both locations averaged about $125 per acre annually for the past 10 years.

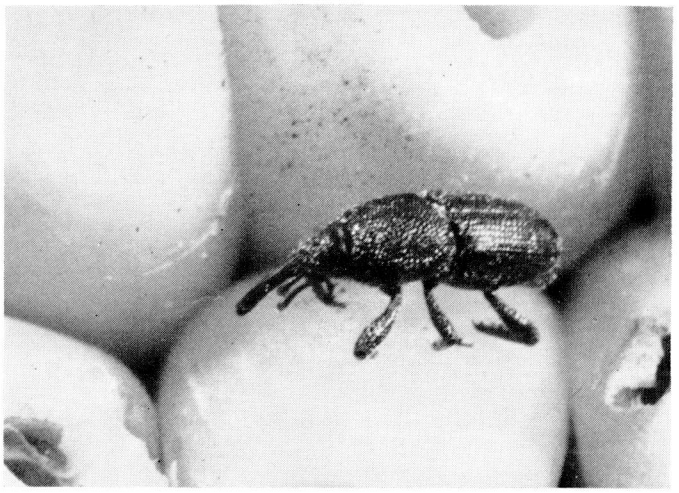
Expenses increased more rapidly than did receipts. Fertilizer costs increased less than did other expenses. Feed costs were primarily for protein supplement and minerals, but corn was bought some years when yields were low.

No charge was made for machinery in the first 10 years because mules were used. Costs for machinery and equipment increased in recent years. No labor records were kept during the first two 5-year periods, but the last two show a charge for cotton picking and chopping. "Other Expenses" in the table include insecticides, herbicides, seed, ginning, yardage, hauling, and miscellaneous expenses.

Net returns have dropped in recent years because of increased costs. For the last 5 years net return to capital, regular labor, and management averaged $55 per acre. If land is valued at $150 per acre and a 6% charge made against the average investment of about $8,000 for the two units, the return to labor and management would have been $43 per acre. Under these circumstances a 100-acre farm with 18 acres of cotton, 66 acres of corn, and 16 acres of forage, plus 15 to 20 sows, would produce an income to labor and management of about $350 per month. Such a farm could be operated by one man with some part-time help.

SUMMARY OF MANAGEMENT UNIT OPERATION, BY FIVE-YEAR PERIODS, 1943-63

	Five-year average							
	Monroeville				Prattville			
	43-48	49-53	54-58	59-63	43-48	49-53	54-58	59-63
Acreage								
Cotton	7.6	7.6	7.6	7.6	7.1	7.1	7.1	7.1
Corn	21.0	23.8	25.0	25.0	21.5	22.0	24.0	27.9
Forage and pasture	11.4	8.6	7.4	7.4	11.4	10.9	8.9	5.0
TOTAL	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Yield								
Cotton, lb. lint	490	520	640	590	360	520	480	560
Corn, bu.	42	51	66	54	30	38	41	46
Receipts								
Cotton	$1,080	$1,630	$1,880	$1,690	$ 890	$1,460	$1,320	$1,440
Hogs	1,970	2,890	3,070	3,610	1,830	2,990	3,640	3,290
TOTAL	$3,050	$4,520	$4,950	$5,300	$2,720	$4,450	$4,960	$4,730
Expenses								
Fertilizer	$ 240	$ 530	$ 550	$ 530	$ 230	$ 270	$ 330	$ 470
Feed	130	190	180	610	110	360	660	460
Machinery			340	420			510	530
Extra labor			320	330			300	390
Other	220	730	590	1,080	180	50	410	810
TOTAL	$ 590	$1,450	$1,980	$2,970	$ 520	$ 680	$2,210	$2,660
Return								
To capital, regular labor, and management	$2,460	$3,070	$2,970	$2,330	$2,200	$3,770	$2,750	$2,070



Insect Resistance Important *in* Corn Breeding Program

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W. G. EDEN, Dept. of Zoology-Entomology

Increased use of combines has emphasized the need for corn hybrids with built-in resistance to insects.

The rice weevil, *Sitophilus oryzae* (L.), is a major pest of corn in Alabama. Some corn hybrids are more resistant to weevil damage than others.

Until recently, research indicated that husk protection of the ear and hardness of grains were major factors contributing to resistance. Specifically, experimental results showed that corn with hard kernels and tight husks extending beyond ear tip either prevented or reduced weevil feeding. As a result, farmers have grown hybrids having these characteristics, and harvested and stored corn in the husk.

There is now quite a definite trend toward use of corn combines that remove the husks and shell the corn in one operation. This method of harvest eliminates the husk as a protection against weevils.

There are effective chemical means of controlling rice weevil in stored corn. However, this adds to corn production cost and is an extra farm operation that can be avoided provided hybrids can be developed having effective resistance.

Hybrid Tests Provide Lead

In routine testing of hybrids by the Auburn University Agricultural Experiment Station, it was noticed that after husk removal some hybrids were more resistant to weevils than others. Among the more resistant hybrids were some that had relatively soft kernels. This indicated that factors other than kernel hardness were involved.

To separate the influences of these various factors contributing to resistance, tests were conducted with a group of selected hybrids. Their husk protection ranged from excellent to poor and kernel hardness from very hard to soft. Given in Table 1 are comparisons of husk cover and kernel hardness with weevil damage. Obviously, husk cover and kernel hardness were positive factors in resistance to weevils. However, analyses of data indicated that factors other than husk cover and hardness were involved in weevil resistance.

Sugar Found Important

Chemical analyses for sugar, starch, fat, and protein content of kernels from each hybrid were made. There was a positive relationship between resistance and both starch and sugar, with sugar being the more important.

In a later experiment, a series of inbred lines of corn was used to study the influence of sugar on resistance to weevil damage. By splitting the kernels, the effects of hardness were lessened. Studies of representative samples indicated a range of resistance in the inbred lines, Table 2. A comparison of data from this study with chemical data revealed no differences in resistance resulting from total sugar content. However, a breakdown into reducing and nonreducing sugars did show some differences. It appeared that the reducing fraction was the more important.

This result is supported by the fact that reducing sugars are probably the most readily available sources of energy for weevils. Inbred lines low in reducing sugars, however, were attacked by weevils if they had no other source of food. Weevils continued to feed on corn after most of the soluble sugar was removed. This indicated that weevils were capable of breaking down the more complicated sources of energy.

Insect resistance has been and continues to be a major consideration in the corn breeding program of the Agricultural Experiment Station.

Table 1. Some Characteristics of 10 Corn Hybrids

Hybrid	Kernels infested, pct.	Husk cover rating*	Grain hardness rating**
Wisconsin 642	19.75	4.88	5
Funk's G-50	14.99	4.33	5
Coker 15	11.31	2.00	3
Pioneer 309A	4.43	2.28	2
Dixie 29	5.02	2.13	4
Dixie 82	2.84	1.70	4
Ala. 5228	0.48	1.70	1
Coker 811	0.98	1.68	1
Dixie 18	0.75	1.20	2
Auburn 602	1.11	1.23	2

* Rating scale: 1 = excellent, 2 = good, 3 = fair, 4 = poor, 5 = very poor husk coverage of ear.

** Rating scale: 1 = very hard, 2 = hard, 3 = average, 4 = soft, 5 = very soft.

Table 2. Rice Weevil Population After Two Months Infestation on Split Kernels of Inbred Lines and Corresponding Sugar Analyses

Inbred	Live weevils	Sugar content		
		Total	Reducing	Non-reducing
	No.	*Pct.*	*Pct.*	*Pct.*
Ab 8	144	1.77	.45	1.32
Ab 30B	176	2.27	.24	2.03
Ab 408	200	1.75	.33	1.42
Ab 204	248	1.63	.38	1.25
Gt 112	261	1.91	.42	1.49
Gt 106	289	2.55	.69	1.86
Ab 18E	430	2.26	.71	1.55
Ab 18	495	2.03	.61	1.47

Search for Better Cotton Insect Control Goes On

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WHY COTTON INSECTS build up resistance to currently used insecticides, and the possible destructive use of inherent characters and egg-destroying parasites are targets of broad-gage research to develop more effective controls.

Undergirding field experiments is laboratory research at Auburn University Agricultural Experiment Station where the latest devised techniques are being used to rear large numbers of the three most destructive pests – boll weevil, cotton bollworm, and tobacco budworm.

The cotton insects are reared in the laboratory on synthetic diets. These diets can be kept in continuous supply, whereas natural host plants are not always available and are costly to provide during off season. Artificial diets result in more uniform groups of insects and require less space and labor than when natural foods are used.

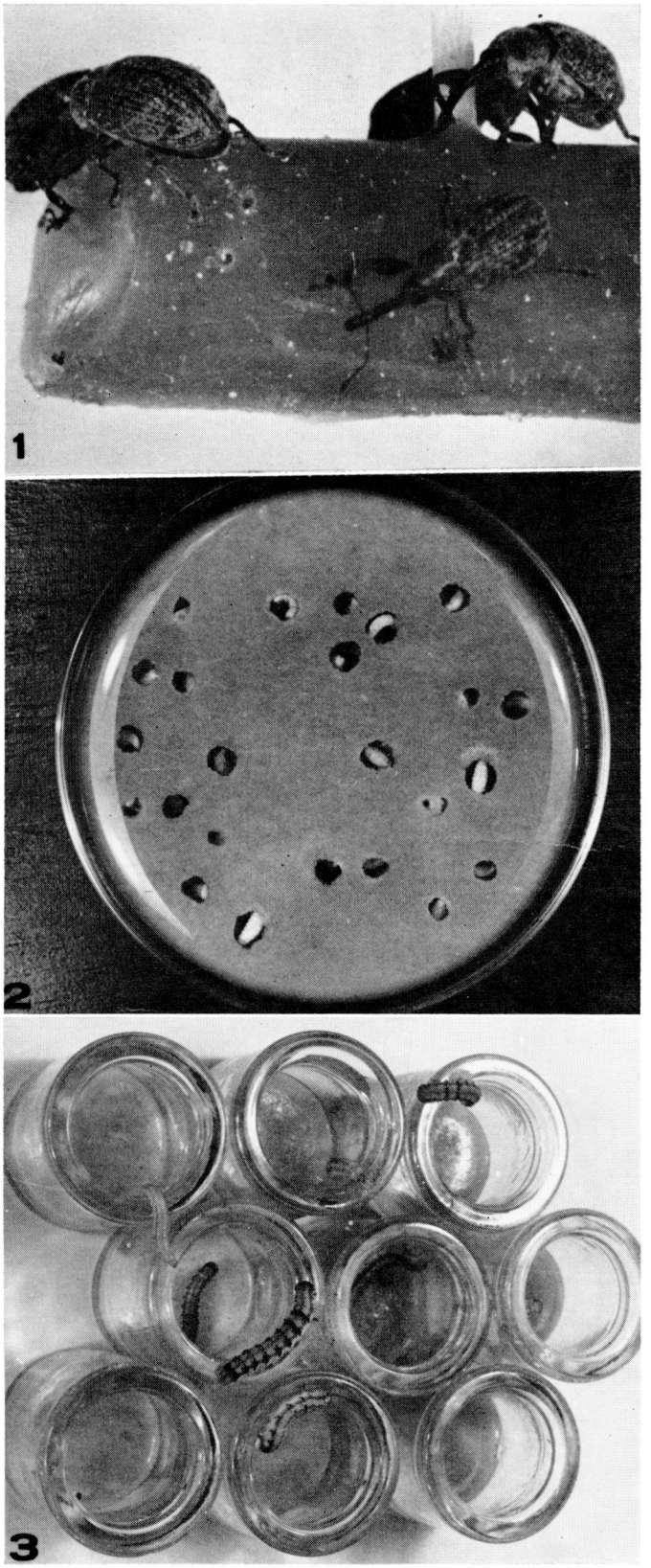
Mass rearing is being done primarily to answer immediate questions concerning control and to explore new approches. The most pressing problem in which laboratory rearing is used pertains to insect resistance to organic insecticides. Field-collected weevils and bollworms are brought to the laboratory from various sections of the State. Their offspring are reared under standardized laboratory conditions. Levels of susceptibility to currently recommended insecticides are determined by applying known amounts to each insect. This helps provide information needed by cotton growers for effective control.

The more basic and more productive aspect of laboratory-reared insects is their use for studies involving new approaches to control. Large numbers of boll weevils are being used at present to study the genetics of resistance to chlorinated hydrocarbon insecticides.

Much emphasis in entomological research is being directed toward utilization of insects for their own destruction, such as sterilization of male Mediterranean fruit flies to eradicate the pest in certain areas. Information gained from the boll weevil genetics study at Auburn may lead to utilizing inherent characters to eradicate this destructive cotton pest.

The bollworm complex (cotton bollworm and tobacco budworm) is now causing much concern throughout the Cotton Belt because of recent development of resistance in some areas to currently recommended insecticides. Research at Auburn is being conducted on a parasite of both bollworm and budworm eggs. Utilization of the laboratory techniques enhance the possibility of successfully mass rearing the parasite for field release. Ideally, by mass-rearing bollworms, a sufficient number of eggs could be produced to rear the parasite in such quantities as to permit its release when needed in any particular area.

A larval parasite of this complex is also found in the field. Under way is investigation of this parasite to determine its possibilities as a control agent.



The newest developed techniques are used to rear large numbers of cotton insects in the laboratory. Mass rearing is done primarily to answer immediate problems and to explore new approaches. (Above) Adult boll weevils feeding and laying eggs on artificial diet. (Center) Boll weevil larvae and pupae shown in a petri dish on synthetic larval diet. (Below) Bollworm larvae raised individually in coffee creamers on artificial diet.

THE CONSUMER:

Final Boss of Food Marketing System

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WITHOUT CONSUMERS there would be no need for modern methods of production and marketing of food. By her purchases, the homemaker casts the deciding vote for the continuing supply of one commodity, the increase in another, or the curtailment of others.

Today's shift of population to urban areas, growth of supermarkets, and specialized production and marketing of food have eliminated the direct contacts by which producers learned what consumers wanted. But the need for this information is greater than ever. The difference is that computers and trained personnel now must determine why consumers buy or don't buy.

Family Characteristics Important

Current research in food-buying decisions of urban homemakers in Alabama reveals that three family characteristics are closely related to the kinds and amounts of food purchased: (1) per capita income, (2) per capita meal cost, and (3) meal equivalent size of household.

To the homemaker, these characteristics take the form of three questions: (1) How much money can I spend for food and still have some for other essential family needs? (2) What are the nutrition requirements and food preferences in my family? (3) How many meals (per person basis) do I have to serve before I go to the market again?

How per capita income, for example, is related to use of milk products is shown by data in the table. In both white and Negro families, as per capita income increased (1) use of sweet milk increased, (2) use of total milk products became greater, and (3) quarts of milk equivalent needed weekly for adequate nutrition decreased, with a resultant increase in percentage used of recommended equivalent. Recommended amounts of milk equivalent per week are 3.5 quarts for adults and 6 or 7 quarts for children.

Data in the table also show that Negro families (1) use about as much manufactured milk products as white families, (2) consume relatively little sweet milk as a beverage, (3) do not use nutritionally adequate amounts of milk equivalent until per capita income reaches $1,200, and (4) those with children usually have per capita incomes under $600. An increase in use of manufactured milk products as a beverage could improve nutrition of children of low income groups, but it would require attitude changes both by the dairy industry and consumers.

Family Size Affects Purchases

Small size families divide income among fewer persons. Smaller families are usually composed of all adults, or adults and one child. Therefore, pressure on available money is less and food preferences become more important than cost. These "unrestricted shoppers" are generally middle aged, and both may be employed. Homemakers usually have at least a high school education, and they are alert to information about food from friends, cookbooks, newspapers, and television.

Other homemakers have worked out a relatively stable list of economically satisfactory foods. These might be called "restricted shoppers." Most of their income goes for food. These families usually have lower per capita incomes, larger size, and many are nonwhite. Often there are several children under 12 years of age. The homemaker usually has a grade school education. There is little contact with printed material or other information sources about food.

Food-Buying Decisions Change

A majority of homemakers have some freedom in food selections. At the various stages of the family life cycle, the homemaker's solution to food buying problems differs. Her selections will respond to the changing composition of her family, which is reflected by variation in per capita income, per capita meal cost, and meal equivalent size of household.

Part of the myth about irresponsible, impulsive food buyers has probably come about because food buying decisions must be made repeatedly under changing conditions. Within the habitual framework, influences having nothing to do with rational approaches to replenishing the food supply sometimes may cause deviations in buying habits. Mood, ill health, getting out of the house, release from tensions, or guest meals may temporarily cause changes in the food purchase patterns.

PER CAPITA USE OF WHOLE MILK EQUIVALENT DURING A 7-DAY PERIOD, BY PER CAPITA INCOME AND BY RACE, URBAN AREAS OF ALABAMA

Milk products used	Whole milk equivalent used, by per capita income							Average use
	Under $300	$300-$599	$600-$899	$900-$1,199	$1,200-$1,799	$1,800-$2,399	$2,400 and over	
	Quarts	*Quarts*	*Quarts*	*Quarts*	*Quarts*	*Quarts*	*Quarts*	*Quarts*
White families								
Sweet milk only	1.4	2.0	2.5	2.8	3.2	3.2	3.7	2.7
Total milk products used	3.2	4.2	4.9	5.2	5.3	5.4	6.3	5.0
Recommended amounts[1]	4.8	4.2	4.7	4.7	4.5	4.2	3.9	4.6
Pct. used of recommended	67	100	104	111	118	129	162	109
Negro families								
Sweet milk only	0.6	1.1	1.2	1.5	2.1	2.6	1.9	1.1
Total milk products used	2.5	3.1	3.6	4.0	5.1	5.5	5.4	3.3
Recommended amounts[1]	5.1	5.1	4.5	4.6	4.1	3.8	3.6	4.8
Pct. used of recommended	49	61	80	87	124	145	150	69

[1] Adjusted to composition of families within each income group.

Channel Catfish Shows Promise As Farm Pond Sport Fish

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THE LOWLY CATFISH is enjoying newfound prestige among fishermen!

For centuries the catfish has had the reputation of being a good food fish, but a poor sport species. Now catfish are getting close scrutiny as a possible sport fish for farm ponds.

Channel catfish came out tops among several species for pond sport fish in Auburn tests. It appears to be the most valuable addition to the list of fish recommended for use in ponds, being adapted for fertilized ponds or for those getting daily supplemental feeding.

Research with catfish as sport fish began only recently. This was made possible when techniques were developed for spawning the species, which made available adequate young channel catfish for experimental use.

Catfish for Fertilized Ponds

Findings at the Auburn Station show that channel catfish can be used successfully in two different species combinations in ponds that receive only fertilization.

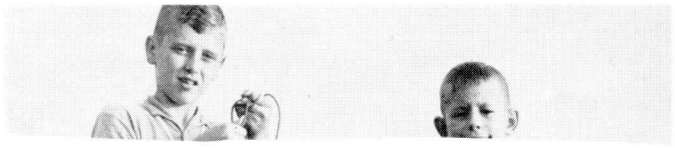
First, they can be added to the standard largemouth bass-bluegill-redear sunfish combination at the rate of 100 fingerlings per acre. This addition does not interfere with growth of the other species and, at the same time, adds materially to the total catch. During the first year of fishing, channel catfish averaged 1.5 lb. each and added an extra 75 lb. to the normal catch of bass, bluegills, and redears.

Although the catfish spawned in this combination of species, few of the young escaped predation by bass. Therefore, their numbers were rapidly reduced and fewer were caught in succeeding years. Restocking with larger fingerlings every year or two will be necessary to maintain good catfish fishing in ponds containing bass and bream.

Ponds initially stocked with 200 channel catfish per acre in combination with bass and bream were considered failures. The catfish competed with the bream for food and drastically reduced growth of bluegills and redears.

The second successful combination for fertilized ponds consists of largemouth bass, fathead minnows, and channel catfish. The recommended rate is 50 bass, 1,000 fatheads, and 500 channel catfish per acre. It is highly important that no bluegills or redears be stocked in this combination since they prevent proper growth of the added catfish.

Catfish stocked as 4-in. fingerlings in February reached an average weight of 0.6 lb. by September at which time the pond was ready for fishing. Light fishing pressure provided an annual catch of 100-140 lb. per acre for 2 to 3 years. The catfish reproduced, but too few escaped predation to maintain good fishing for a longer period. After 2 to 3 years the pond must be drained and restocked. This combination appears desirable for fishermen that prefer channel catfish to bluegills.



Channel catfish like those at left make a welcome addition to a day's catch of bream and bass. This species is growing in popularity among

Feeding for Maximum Catch

Maximum pond catch results from stocking channel catfish and giving daily supplemental feeding. The recommended stocking per acre is 3,000 channel catfish and 1,000 fathead minnows during winter plus 50 to 100 largemouth bass in the spring. It is important that no other kinds of fish be present, since they will reproduce and crowd the pond with thousands of small fish that compete with catfish for food and reduce their growth.

Daily feeding should begin by March 1. This feeding schedule gives good results (amounts are per acre per day):

March—3 lb.	July—16 lb.
April—5 lb.	August—20 lb.
May—10 lb.	September—25 lb.
June—13 lb.	October—30 lb.

Daily feeding rates should not exceed 30 lb. per acre because of danger of fish being killed by low oxygen concentrations. Feeding should be continued during the second year at a rate not exceeding 10 lb. per acre daily and reduced gradually as the catfish are caught.

Channel catfish stocked in February and given daily feeding averaged 0.7 lb. by October when fishing began. In a pond open to unlimited public fishing, the catch during the following 15 months was slightly more than 1,900 lb. per acre – the highest ever reported in fisheries literature. The catfish reproduced, but few of their young escaped predation. Thus, the pond was practically "fished out" during this short period of intensive fishing. A total of 749 persons fished per acre, and they harvested 67% of the catfish stocked. With lighter fishing pressure good fishing could be expected for several years.

The channel catfish is proving to be a popular species among sport fishermen. Results of the Auburn studies show that this fish can be successfully used in several different ways to provide excellent fishing in fertilized ponds or in ponds getting supplemental feeding.

Response of YELLOW-POPLAR to SEEDBED PREPARATION

SHERMAN D. WHIPPLE, *Department of Forestry*

SMALL STREAM BOTTOMS in Alabama are capable of growing larger quantities and better quality forest products.

Yellow-poplar (*Liriodendron tulipifera* L.) is one of Alabama's most desirable hardwoods and has great potential in these areas. Present forest management programs do not assure yellow-poplar regeneration in bottoms.

A study was begun in 1961 at the Fayette Experiment Forest, a unit of the Auburn University Agricultural Experiment Station, to test effects of varied seedbed conditions on germination and survival of naturally disseminated yellow-poplar seed. The study was established on a 4-acre, narrow bottom area of Mantachie soil – a somewhat poorly-drained alluvial soil derived from local materials. Prior to beginning this study, the area contained a mixed stand of red maple, sweetgum, yellow-poplar, and loblolly pine. All merchantable timber was cut in July 1960, except the yellow-poplar, 10 of which were seedbearers.

Three site preparation treatments, replicated 6 times, were applied during August 1961. Treatments were as follows: Bulldozing, with mineral soil exposed; double disking, with mineral soil seedbed prepared with a heavy farm type tractor and gang disk; and check, with all litter and vegetation left undisturbed except for removal of large tops of felled trees.

Annual seed dissemination of yellow-poplar during a 3-year period ranged from 1,000 seeds per acre at a distance of 5 chains to more than 600,000 seeds per acre within 1 chain of a good seed tree. Seed soundness ranged from 7 to 13% and averaged 9%.

The total number of seed germinating was recorded by tallies made 2 weeks apart during the growing season. The first year following treatment an average of 2,187 seed per acre germinated on the bulldozed areas, 2,646 per acre on the disked areas, and only 42 seed per acre on the check areas. New seed germinating on the treatment areas the second year averaged 604, 563, and 125 per acre, respectively, Figure 1.

Invasion by grasses, forbs, and vines was prominent by the end of the first growing season; these were strongly competitive by end of the second growing season on both the bulldozed and double disked plots. Deep litter was present, and hardwood sprouts, vines, and grasses were highly competitive on the check areas from the beginning. Hardwood sprouts were not a problem on either the bulldozed areas or disked areas.

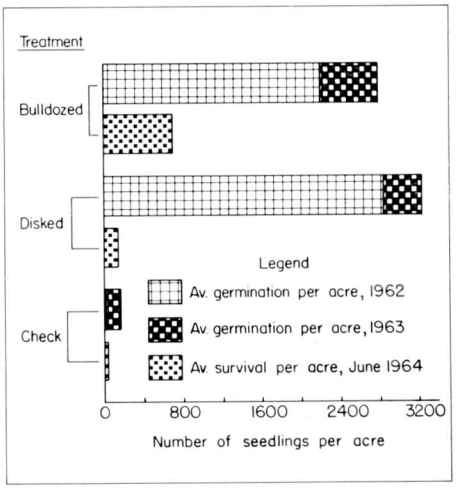


FIG. 1. This chart shows the total number of seed germinating over a 2-year period plus survival after 2 growing seasons.

Established, surviving seedlings as of June 1964 averaged 688 per acre on bulldozed plots, 146 per acre on disked plots, and 42 per acre on the untreated check plots. Corresponding average percentages of survival for the 2 growing seasons were 25%, 5%, and 25% of the total seeds germinated. At the end of the same period, 37.5% of 24 quadrats (13.2 × 6.6 ft.) in the bulldozed plots had at least one seedling, whereas only 16.7% of the quadrats in the disked plots and 8.3% of the quadrats in the check plots had seedlings, Figure 2. Thus both survival and distribution were much better when plots were bulldozed rather than double disked.

The total number of yellow-poplar seeds germinating on both bulldozed and double disked plots was considered satisfactory. Germination on the check plots was considered unsatisfactory.

After 2 growing seasons there were considerably fewer surviving seedlings on disked areas than on bulldozed areas. Treatment by bulldozing resulted in a much more satisfactory stand of established seedlings than either disking or no treatment.

Exposure of the mineral soil by bulldozing appeared to be the best treatment for obtaining natural regeneration of yellow-poplar under conditions of this study.

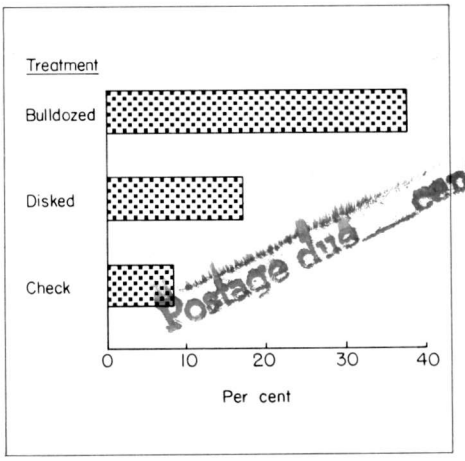


FIG. 2. Shown here are the percentages of plots stocked with established seedlings as of June 1964.