highlights
of agricultural research

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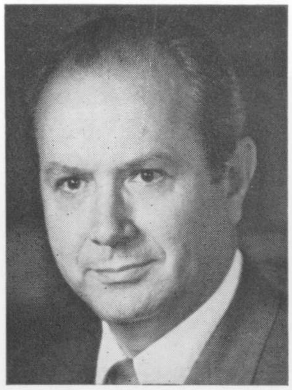
Agricultural Experiment Station
R. Dennis Rouse, Director

Auburn University
Auburn, Alabama

DIRECTOR'S COMMENTS

ONCE AGAIN, the Legislature and the people of Alabama, through elected officials and individually in voting booths, have demonstrated support of agriculture by passing overwhelmingly on January 13, 1976, Amendment No. 1. This amendment, which along with funds for mental health and prison facilities, provides $2 million to construct a vitally needed seed technology center and foundation seed facilities making possible improvements in planting seed, including processing of high quality foundation seed. This will ensure Alabama seed producers seed of high viability and vigor and of proven genetic purity that may be used to produce better certified seed for general use. The achievement of this funding required the untiring efforts of many individuals and organizations. For this, let me say thank you on behalf of Alabama agriculture and all citizens of Alabama.



R. DENNIS ROUSE

As a progress report on our new facilities, let me report that:

On January 8, construction began on the new Forest Products Laboratory. This $500,000 facility will greatly improve the capability of the Agricultural Experiment Station to serve forest landowners and the forest industry of Alabama.

On January 20, C. C. Harris, Chairman of the Alabama Pork Producers Division, and J. D. Hays, President of the Alabama Farm Bureau Federation, Inc., presented a key to symbolize the presentation of an $80,000 swine production research facility to this Station, and I was able to announce that this had been matched by $120,000 from Station funds for the completion of this unit. I also announced that plans are being developed for one additional unit to this facility. This addition will make it an outstanding swine production research facility. This will mean much to the pork producers and consumers of this State.

In accepting this facility, I stated that there are three major factors required for successful research: (1) adequate facilities, (2) well-trained scientists, and (3) users of information working in partnership with the scientists. We must continue our efforts to ensure that all three are at a level needed to move Alabama agriculture forward.

We now have the estimated farm sales for 1975. The figures show once again the great uncertainties in farming. The gross returns from some commodities increased, others did not; unit price for some increased, others did not; and acreage and yield per acre also showed wide variations. It is obvious that cost of production and problems of marketing varied widely. This variability is a characteristic of agriculture which non-agriculturists can't conceive. We in agriculture accept it as a fact of life, but also as one of the greatest challenges of farmers and scientists. For a biological process that requires such investment of time, capital, training, and commitment, we must ever strive to reduce the uncertainties of production and thus the economics of production. This is a major mission of the Agricultural Experiment Station – to carry on a program of research for the improvement of human conditions, for the reduction of uncertainties, and for a better life. Our record for the past 100 years has much for us to be thankful for, but it leaves much to be desired. Much of the land in Alabama is producing far less than currently known potentials. The overriding reason is that uncertainties are still so great. Therefore, the mission of the Agricultural Experiment Station is far from being accomplished. We can succeed if we continue striving with all our abilities and resources to further our understanding of nature.

may we introduce . . .

Dr. Charles D. Busch, associate professor in the Department of Agricultural Engineering, reports on one phase of his Auburn research in the article on page 3. A member of the research and teaching staff, Dr. Busch is participating in research studies for irrigation scheduling, drip irrigation, terracing, and aeration of catfish ponds.

A native of New York City, Dr. Busch came to the Auburn faculty in 1969, from Adana, Turkey, where he was project manager for a major irrigation development. He also has worked as an associate professor of agricultural engineering at the University of Arizona and for the Agency for International Development. While at Arizona, Dr. Busch formed a group of consulting engineers to provide assistance to the farmers of Sonora, Mexico.

Busch earned a bachelors degree from Cornell University and a masters degree in agricultural engineering from Utah State University. He then returned to Cornell to earn a Ph.D.

The author of several research and demonstration publications on water systems and irrigation, Busch is also a member of numerous professional societies.

HIGHLIGHTS of Agricultural Research

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ON THE COVER. Dr. Charles Busch is shown checking the drip rate and moisture content of the soil on a drip irrigation system used in pecan research plots at the Gulf Coast Substation in Fairhope.

WATERING A DROP AT A TIME: DRIP IRRIGATION FOR ORCHARDS

CHARLES D. BUSCH, *Department of Agricultural Engineering*
HARRY J. AMLING and KAREN A. MARCUS,
Department of Horticulture

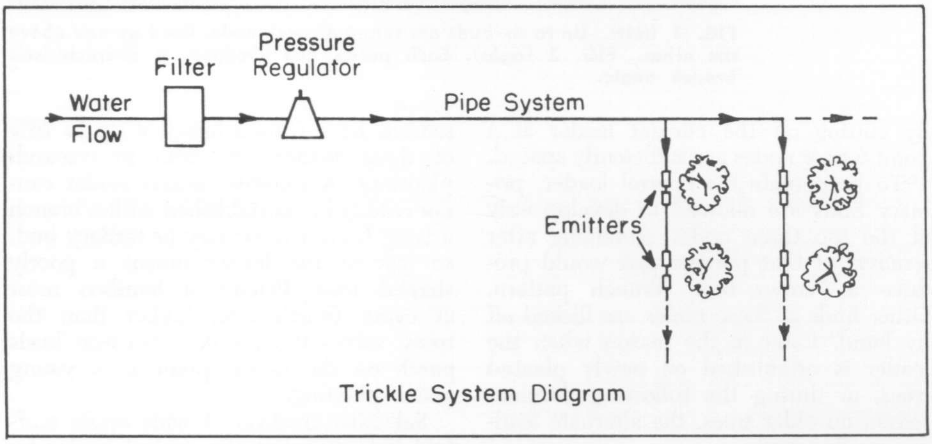


FIG. 1. Diagram of a drip-irrigation system.

THE DRIP irrigation system offers a new way to apply water to orchard crops. The system's slow and steady flow rate creates a pocket of moisture within the tree's root zone. The moisture is sufficient even through dry periods in the growing season.

The Drip System

Most drip systems consist of a filter, pressure regulator, plastic pipe distribution system, and drippers or emitters that discharge water near the tree.

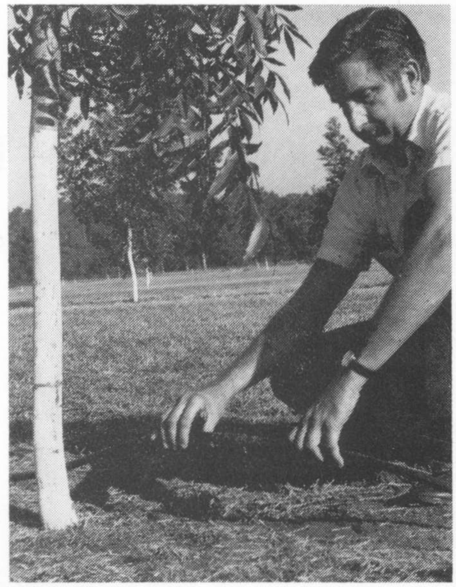
When water enters a drip irrigation system it must be filtered. The tiny outlet passages of the emitter can be plugged or partially stopped by several soil particles or a flake of rust. The outlet passages must be small to cut flow rates down to about 1 gal. per hour, about a drop at a time. Filters can be replaceable cartridges as used in automobiles, or a series of screens, or a sand-filled tank through which the water flows.

The operating pressure of most drip systems is about 15 p.s.i. This allows the use of lower pressure and less costly plastic pipe. However, to keep the supply pressure from varying, a pressure regulator usually follows the filter in the water supply line.

Lateral pipes, carrying the water along the tree row, are seldom more than ½ in. in diameter. This is an adequate diameter for laterals up to 800 ft. long where there is little or no change in elevation and trees are spaced 30 to 40 ft. apart. Main pipelines are usually 2 in. in diameter or less. Their specific size is determined by the engineering design.

The emitters, or drippers, are the key elements in the orchard irrigation system. Each emitter provides a slow, accurate flow needed to maintain a pocket of moisture for the tree's root zone. Often two or three emitters are used for each tree.

FIG. 2. Tree spacings and drip line in pecan research plot at Gulf Coast Substation.



Water Supply Contrast

A comparison of sprinkler and drip irrigation shows the contrasts in these water application ideas. A sprinkler system applies water uniformly over the entire orchard area while the drip system emitters keep only small areas watered. The areas are usually 3-4 ft. in diameter for medium textured soil. Therefore, with a 35-ft. × 30-ft. tree spacing, an application of 1 in. of water by a sprinkler system would require about 650 gal. per tree while two emitters per tree would together discharge 16 gal. to supply an inch of water to the two pockets of moisture. Since a small portion of the tree's root system is able to provide moisture for all parts of the tree, the pockets of moisture assure an improved water supply for the tree during a dry period.

Drip Irrigation for Pecans

Research is underway at the Gulf Coast Substation to evaluate a drip system on a new pecan planting and to compare drip and sprinkler irrigation needs. To date there have been no noticeable differences due to the type of irrigation. Both systems are providing ample water. However, there are substantial differences in the amounts of water applied. The sprinkler system, set to provide 0.9 in. per week requires 580 gal. of water per tree; the drip system set to drip 8 hr. per day uses only 60 gal. per tree each week.

Applying water a drop at a time near the base of a tree provides needed moisture without watering an entire orchard area. This can mean a lower cost system because pipes and pumps can be smaller. It also means that a lower discharge well can provide the amount of water required.

Training YOUNG PECAN TREES

HARRY J. AMLING, *Dept. of Horticulture*

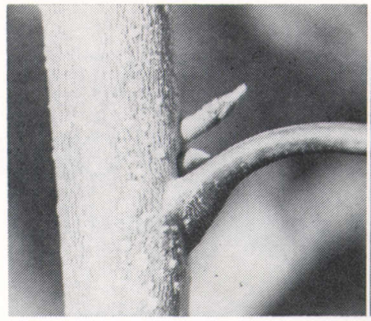


FIG. 1 (left). Up to six buds are found at each node, lined up one above the other. FIG. 2 (right). Each pecan bud produces a characteristic branch angle.

ALL NEWLY ESTABLISHED pecan trees require training during early growth years. Without proper shaping, the trees develop narrow crotch angle scaffold limbs that split off when subjected to wind and crop load. The worst condition is when dominant lower scaffolds are poorly trained because splitting of these has the effect of cutting the tree in half. Often this occurs when trees reach 14-20 years of age.

Techniques for training pecan trees were developed as part of a long-range research program on cultural techniques for high density plantings by Auburn University Agricultural Experiment Station.

It was observed that the branch angle is directly related to the position of the bud originating the branch. At each node, pecans may have up to six buds lined up one above the other, Figure 1. A characteristic branch angle arises from each bud, Figure 2. The primary bud (uppermost one) generally produces the most vigorous branch when all buds at a node are allowed to develop.

The primary bud often is subtended by a short stem, ranging from 1 to 300 mm in length. The term "neck bud" has been coined to describe this. The longest buds are often found in axils of leaves of fast growing nursery trees. Most lateral branches on nursery trees arise from primary buds. Primary buds may have necks, but none have been observed on secondary or lower order buds.

In the Auburn system of training, illustrated in Figure 3, primary buds are used solely to perpetuate a central leader. If allowed to develop into branches, these primary buds always produce the narrow crotch angles which, in later years, lead to limb splitting.

As growth of the central leader slows late in the growing season, distances between nodes decrease sharply. If this section of the central leader is allowed to remain on the young tree, a profusion of branches arise in close proximity the following year. This phenomenon, referred to as "crows foot," is eliminated by cutting off the current leader at a point where nodes are sufficiently spaced.

To perpetuate the central leader, primary buds are allowed to develop only at the top three nodes remaining after removal of that portion that would produce a "crows foot" branch pattern. Other buds at these nodes are flicked off by hand. Later in the season when the leader is established on newly planted trees, or during the following dormant season on older trees, the alternate leaders are removed.

Birds perching on growing central leaders during first and second growing seasons have caused losses of up to 16% of these leaders on trees in research plantings. A suitable central leader cannot readily be reestablished with a branch arising from a secondary or tertiary bud, so loss of the leader means a poorly shaped tree. Placing a bamboo roost at every fourth tree, higher than the trees, solves the problem because birds perch on the tallest point in a young pecan planting.

Selective creation of wide angle scaffold branches and the central leader by bud selection is continued into the fourth and fifth years after planting.

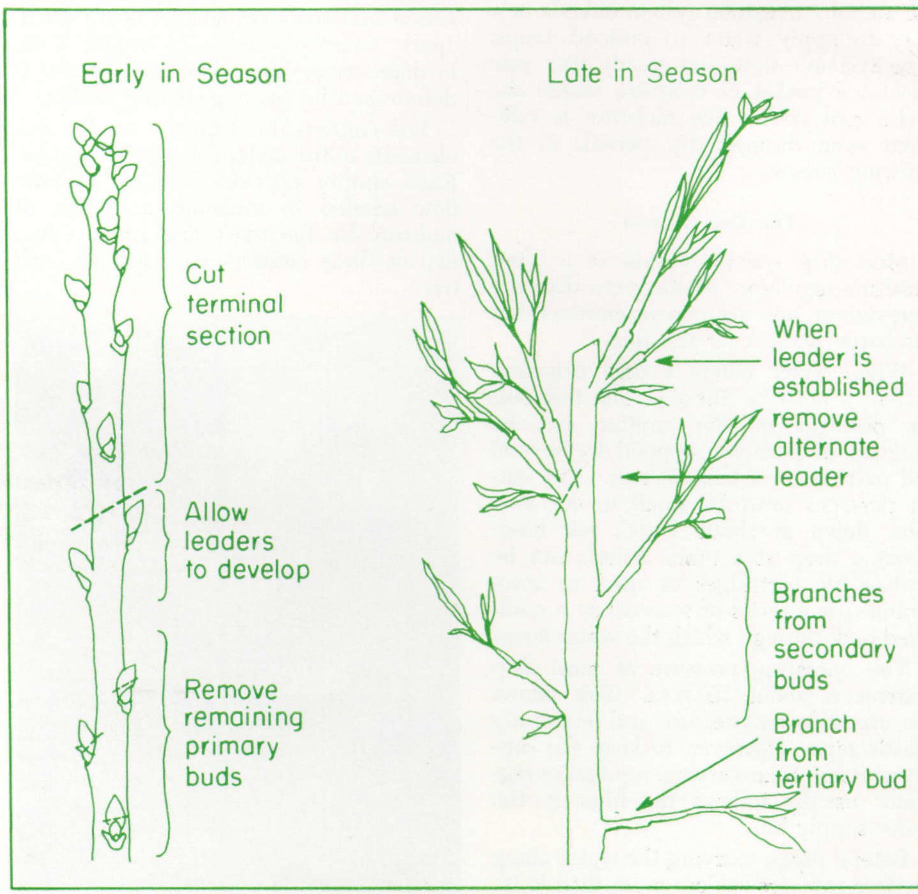


FIG. 3. In training young pecan trees, primary buds are used solely to perpetuate the tree's central leader. Secondary buds produce branches.

MEASURING FARM INCOME

J. H. YEAGER, Department of Agricultural Economics and Rural Sociology

FARM INCOME is generally accepted as an indicator of success in farming for a given period of time. It may be calculated for a farm, a group of farms, or for all farms in a state or the nation. It is important to know the components of farm income and how they are measured since they provide a better understanding of farm income and changes that occur.

Realized Gross Income

Cash receipts from farm marketings normally account for the major part of realized gross farm income. Cash receipts are derived from marketings of crops, livestock, and livestock products. Value of these marketings is influenced by quantity marketed and price received per unit. Production of a commodity may decline from one year to the next, yet cash receipts may increase because of a higher price received per unit sold.

As a long-time trend, cash receipts from farm marketings have increased in Alabama. In 1973 and 1974, Alabama's cash farm receipts were about twice the amount of the mid 1960's. However, cash receipts by Alabama farmers were more than $100 million less in 1974 than in 1973, see table. This resulted primarily from lower prices received for farm products in 1974 than in 1973.

REALIZED GROSS AND NET FARM INCOME, ALABAMA

Item	1973	1974
	Mil. Dol.	*Mil. Dol.*
Cash receipts from farm marketings	1,302.0	1,190.3
Government payments	51.5	9.2
Non-money income	110.3	141.0
Other farm income	11.0	12.0
Realized gross farm income	1,474.9	1,352.5
Farm production expenses	994.6	1,165.7
Realized net farm income	480.3	186.8
Net change in farm inventories	44.0	77.5
Total net farm income	524.3	264.4

Source: State Farm Income Statistics, ERS, USDA, 1975.

The second component of realized gross farm income is government payments. Except for one year, government payments to Alabama farmers have declined since 1967. The decline from 1973 to 1974 was more than $42 million.

In 1973, a major part of government payments to Alabama farmers was associated with cotton. However, in 1974 payments in connection with conservation rather than cotton or feed grains accounted for the biggest part.

A third item in realized gross farm income is non-money income. Value of family-used products produced on the farm, such as vegetables, fruits, milk, eggs, and meats were at one time more important than today. In addition, a reasonable rental value for farm dwellings is included in non-money income.

From the early 1950's into the 1960's, non-money income of Alabama farmers declined. Each year since 1970, however, non-money income has increased. The 1974 figure of $141 million in non-money income was approximately equal to that of 1952. There is increased interest in food production on the part of farm, as well as non-farm, people. As a result of including non-money income in calculating realized gross farm income, greater comparability among farms is obtained. Also, a part of production expenses may be used in producing the non-money income. Thus it is logical to include non-money income in the gross figure. Other farm income includes such things as income from custom work and sales of miscellaneous items.

The sum of the above-mentioned four items gives realized gross farm income – an overall measure of income without any consideration to expenses or inventory changes.

Net Farm Income

Net farm income is classified as realized net and total net farm income. Realized net farm income results from subtracting farm production expenses from realized gross farm income.

Farm production expenses include many items such as feed, livestock, seed, fertilizer, supplies, repairs, hired labor, depreciation, taxes on farm property, interest, and net rent to non-farm landlords.

Increased concern exists about the growing costs of farm production. In 1974, total farm production expenses by Alabama farmers were approximately twice what they were in the late 1960's.

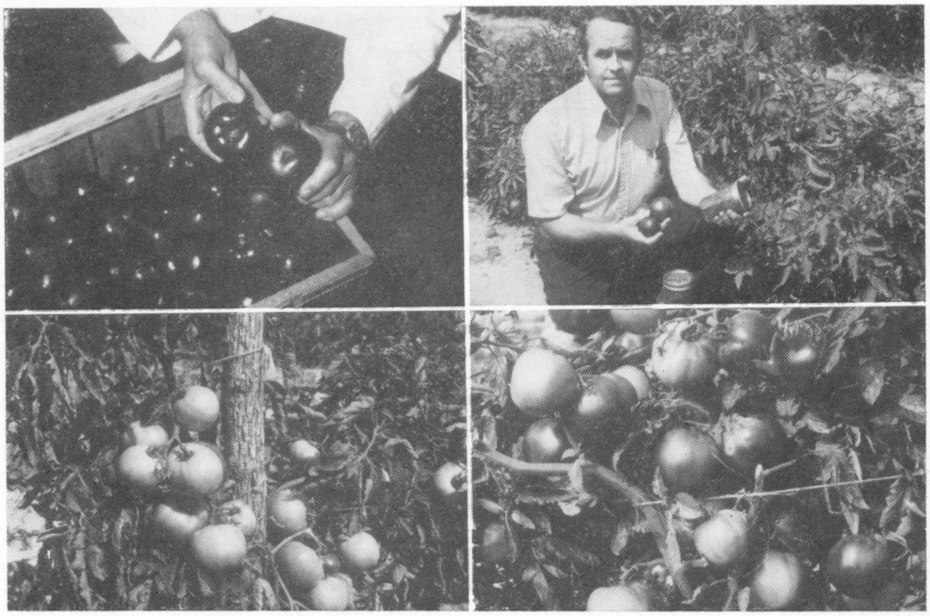
Certain farm production expenses increased dramatically from 1973 to 1974. For example, total amount spent on fertilizer and lime increased almost 75%, seed 23%, repairs 27%, depreciation 21%, and interest on the farm mortgage debt 20%.

Generally, farm production expenses as a percentage of realized gross farm income have increased since 1950. At that date expenses by Alabama farmers were 48% of realized gross farm income. In 1974, they were 86% of realized gross farm income. Expenses relative to income varied from 64 to 79% of realized gross farm income in the 1960's. In 1973, expenses relative to gross income were 67%. This lower ratio resulted in a large measure from the increase in prices received by farmers in 1973. The long-time outlook is for expenses to continue to take a major part of the value of farm products produced. Such squeezes on income will call for the best in farm organization, planning, and management in the years ahead.

Total Net Farm Income

Still another measure of income is total net farm income which considers inventory changes. Since many farmers do not sell everything produced during the year, and since assets of various kinds are used in production and may vary from beginning to end of the year, net inventory change should be considered in accurately reflecting net income. Net income would be understated if expenses to produce cattle were included but the value of cattle on hand at the end of the year compared to the beginning of the year were not included. Therefore, total net farm income is the most comprehensive measure of farm income.

The next time you hear, read, or quote a farm income figure, give some thought as to what is included.



Top left shows selection of only top quality fruit (sound fruit) for canning; top right preserving fresh vine ripe fruit with good flavor; bottom left shows Homestead 61 variety grown by two-leader system; and bottom right is the Floradel variety grown by trellis binder-twine method.

ARE the TOMATOES from your GARDEN SAFE for CANNING?

K. S. RYMAL and J. L. TURNER
Department of Horticulture

SOME TOMATO VARIETIES grown in Alabama may not be suitable for canning. Two cases of deadly botulism from eating home-canned tomatoes were reported in 1974.[1]

It is not known exactly how these cases occurred, since tomatoes normally have enough acid (below pH 4.5) to prevent germination of the spores of the botulism producing bacteria. However, it was obvious from the case histories that the proper recommended procedures for canning were not followed and it is assumed that the tomatoes used were probably abnormally low in total acid and high in pH as well.

Some tomatoes sampled in the laboratory at Auburn University Agricultural Experiment Station have had pH values of 4.7 to 4.9, which is well above the safe limit (pH 4.4) for canning. The total acidity is important also, since it represents the ability of the fruit to withstand changes in pH and is involved in flavor (sugar to acid ratio). In June and July, 18 of the popular varieties for home gardening were grown at two locations in Alabama and harvested at a firm, red-ripe stage of maturity. These varieties were evaluated for their adaptability and potential for commercial and home garden production. Recommended fertilizer rates, insect and disease controls, and irrigations were followed. Varieties were grown on stakes and pruned to a two leader system at Fairhope and the binder twine trellis method at Cullman. Seventeen harvests were made at Fairhope and 18 at Cullman.

All the Homestead selections performed well at both locations and were consistently low in pH and high in total acidity, see table. All varieties tested were acceptable in regard to pH, as were all the breeding lines except AU-75-12 (F8) which was borderline at Cullman (pH 4.37) and high enough at Fairhope (pH 4.46) to be rejected on the basis of pH.

Some tips for the home gardener-canner are:

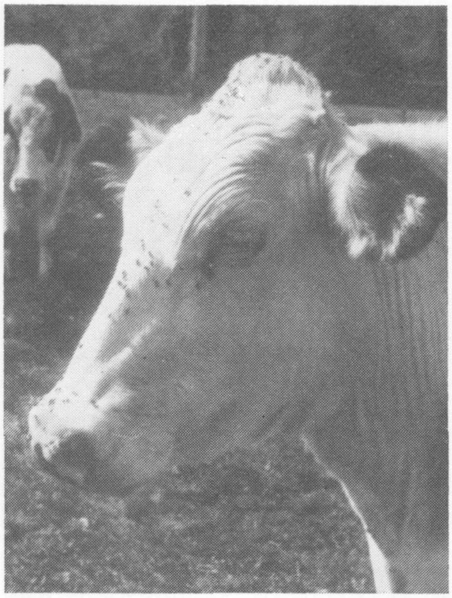
1. Choose a variety that has performed well in your area.
2. Recommended insect and disease control practices should be carefully followed to produce sound, high-quality tomatoes for canning.
3. Fruit should be harvested at the firm, red-ripe stage. Overripe or diseased fruit may be low in acids and high in pH.
4. Although tomatoes can be adequately processed without adding citric acid or lemon juice, the addition of food acids provides an extra margin of safety in home-canning operations.

CHARACTERISTICS OF FRESH MARKET TOMATOES GROWN IN CULLMAN AND FAIRHOPE, ALABAMA, 1975[1]

Variety	Mean pH		Total acid.[2]		Av. fruit size		Fruit plant	
	Cull.	Fair.	Cull.	Fair.	Cull.	Fair.	Cull.	Fair.
	pH	*pH*	*Pct.*	*Pct.*	*Lb.*	*Lb.*	*No.*	*No.*
AU-75-12(F8)	4.37	4.46	26	29	41	37	24	13
Better Boy VFN	4.18	4.18	36	41	45	46	19	12
Bonnie Nematode Resistant	4.15	4.18	47	29	39	35	18	15
Floradel PS	4.08	4.22	40	30	40	40	21	16
Homestead Elite	4.17	4.21	44	36	39	36	21	11
Homestead 24	4.20	4.25	39	39	36	32	21	10
Homestead 61	4.13	4.21	39	33	36	33	20	10
Homestead 500	4.15	4.24	37	32	36	28	22	11
Monte Carlo VFN	4.19	4.27	38	30	39	42	20	16
Terrific VFN	4.31	4.25	35	32	43	39	21	15
Traveler	4.18	4.31	37	29	34	31	21	11
Tropic	4.15	4.31	35	28	45	44	18	13
Walter Early Strain	4.25	4.27	34	29	37	34	13	12
AU-75-8(F5)	4.25	4.25	32	30	33	33	22	19
AU-75-84(F_1 BC_2)	4.33	4.31	30	27	38	38	24	15
Florida MH 1	4.19	4.28	31	29	33	35	17	11

[1] At each location values are means of 4 replications.
[2] Expressed as percent citric acid.

[1] The Center for Disease Control, U.S. Department of Health Education and Welfare, Atlanta, Georgia, published two reports of botulism from tomato products. Morbidity and Mortality—Vol. 23:10, Vol. 23:27. One occurred in Courtland, Alabama, in March and the other in Pocatello, Idaho, in July.



THE FACE FLY in ALABAMA

KIRBY HAYS, *Department of Zoology-Entomology*
J. K. BOSECK, *Tennessee Valley Substation*

THE FACE FLY, *Musca autumnalis* DeGeer, first appeared in Nova Scotia in 1952, and by 1955, it had spread to Tennessee and Georgia. In all probability, it spread into the northeastern corner of Alabama by 1960, but it did not appear in large populations until 1972 in the Tennessee Valley. It is now known to be as far south as Lee County in Alabama. In Mississippi it has been reported as far west as Oxford, and as far south as Louisville. It appears that this pest will continue to move south and west.

The adult fly looks very much like a housefly, and like a housefly, its mouthparts are for sucking but cannot pierce the skin and suck blood. Thus, the adults congregate on the faces of farm animals, principally cattle, horses, and mules, where they feed on mucoid substances around the eyes, nose, and mouth. Freshly born baby calves attract thousands of flies which feed on the fluids associated with birth.

This species may be confused with the horn fly, housefly, and stable fly that also are found on animals. The horn fly and stable fly may easily be separated because their mouthparts protrude in front of the head like a bayonet from a rifle. Houseflies may only be separated with the aid of a microscope.

At night or when animals enter buildings, these flies leave the animals and rest on vegetation, posts, buildings, fences, or other objects nearby. The eggs are laid on fresh cow manure and the larvae feed within this substance. Mature larvae move into the soil and pupate. A complete life cycle requires about 2 weeks in summer. The adult fly enters buildings or other places to spend the winter, but it moves outdoors as soon as the weather warms up in the spring. Studies in New York state show that this insect will fly as much as 7 miles in 5 days, and that many flies will disperse 1 mile from their place of birth in 2 days.

In the Tennessee Valley of Alabama, as many as 100 flies may be seen on the face of a single animal in late spring and summer. In mid-August, the populations of this fly had diminished to almost nothing in both 1974 and 1975. Perhaps this phenomenon is due to hot weather killing the larvae in the feces.

Even though the fly does not suck blood, it is a serious economic pest as a nuisance to cattle. Eye abnormalities and diseases are more common in herds of cattle infested by face flies. And the frequency of spraying necessary to control the fly results in a considerable cash outlay for labor and insecticides above that normally necessary to control the horn fly.

Face flies are very difficult to control for several reasons. One is that they are constantly moving from one animal to another. A second reason is that the tears produced by the eyes as a reaction to the feeding of the flies washes away any insecticides put on the animals. A third reason is that insecticides are brushed off the animals by grass and weeds as they feed. Lastly is the difficulty experienced in getting an animal to hold its head still while the insecticide is applied.

Research at the Tennessee Valley Substation has provided some insight to the control of these flies. The only effective insecticides were those with a quick knock down. Sprays containing Dichlorvos (Vapon®) were the most effective. The addition of ciodrin or Gardona (Rabon®) added some residual effectiveness to sprays. Other materials such as Trichlorfon gave a good initial kill. However, migrations by flies were such that animals were rapidly reinfested, and treatments had to be repeated at intervals of 5 to 7 days.

Smears of petroleum jelly containing an insecticide were placed on the midline of the face and in that position were relatively ineffective, but when placed under the eyes and around the mouth, they reduced the fly population somewhat but were not real effective.

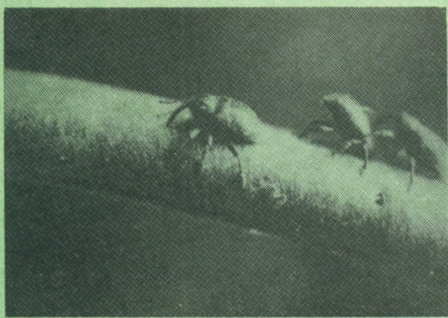
Dust bags containing 3% ciodrin were relatively effective in limiting the size of the face fly population on one herd of cattle when compared to an untreated herd, but the levels of flies remaining were too high to consider this method of application to be a form of control when used alone.

Baits containing sugar and/or blood serum attracted many houseflies and a few face flies, but they did not kill enough face flies to be of any value in a control program.

Natural parasites, predators, and diseases of the face fly are unknown in Alabama. The high populations observed indicate that if such enemies are present, they are not exercising enough pressure to control populations of this pest.

The sudden decrease in numbers of the face fly in mid-August indicate that the larvae or eggs of this species may be affected by the high temperatures and dry conditions which are caused by the sun shining on feces piles in the dryer parts of the summer. We already know that these temperatures adversely affect the immature stages of the horn fly while it is in cattle feces.

It appears that this insect will continue its spread south and west through Alabama. As it expands its range, research will be continued on its biology and control. As newer controls are discovered, they will be made public.



Pods Resist Insect Penetration in Curculio Resistant Southern Peas

THOMAS H. ENNIS and OYETTE L. CHAMBLISS, *Department of Horticulture*

PEAS THAT resist damage by the cowpea curculio may someday be available for Southern gardeners. Certain breeding lines of southern peas are known to be resistant to this insect that is a serious pest in Alabama. Breeding efforts are aimed at incorporating this resistance into varieties with other desirable characteristics.

Recent investigations have shown that overall resistance is composed of three separate and independent mechanisms: (1) a nonpreference factor, (2) an antibiotic factor, and (3) a pod factor that prevents the adult insect from penetrating the pod wall and piercing the seed.

The pod factor mechanism of resistance was investigated at Auburn University Agricultural Experiment Station. Microscopic histological examination was made of pods from eight varieties and breeding lines, both susceptible and resistant types. This was done at four stages of development. Five layers of tissue make up the pod wall, and the thickness of each and total wall thickness were measured at each growth stage.

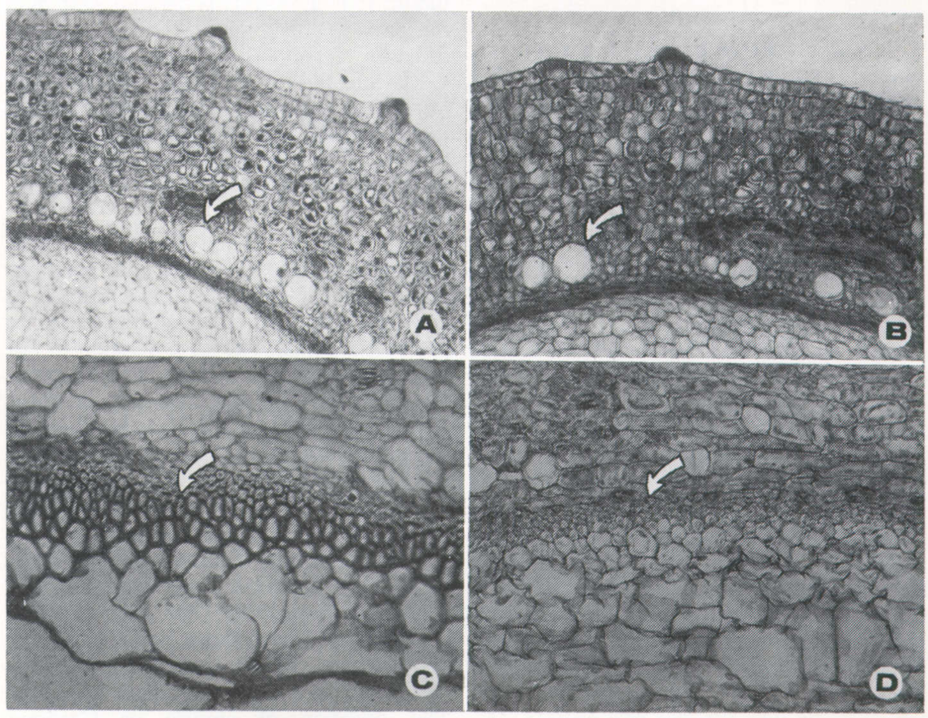
No correlation was found between resistance and thickness of the pod wall or thickness of any individual tissue layer. Several differences were observed between the resistant and susceptible lines, however, which may be involved in the pod factor resistance mechanism.

Amounts of tannin contained in sacs close to the fiber layer of the pod wall showed differences between resistant and susceptible varieties in early stages of pod development. The more resistant lines had more tannin sacs, with intermediate and least resistant lines containing progressively fewer. This suggests that the tannin sacs may act as a chemical barrier or feeding deterrent that discourages the adult insect from completely puncturing the pod wall.

Another difference noticed in later stages of pod development was a distinct variation in thickening of the secondary cell walls of the fiber layer. Varieties with the greatest degree of secondary cell wall formation were the most resistant. Little or no secondary cell wall development of fibers was found in the more susceptible ones.

Numerous punctures by the adult curculio on resistant lines in late stages failed to completely penetrate the pod wall. Microscopic examination revealed that many of the punctures went only as deep as the fiber layer, but not through it. The fiber layer, containing cells with well developed secondary walls, may function as a physical barrier preventing the insect from penetrating the pod wall.

Further investigation is needed to confirm preliminary findings about the pod factor resistance mechanism, and to positively correlate the tannins and thick walled fiber cells with resistance. Better understanding of the nature of resistance will aid breeding efforts to combine all three resistance factors into southern pea varieties with a high degree of resistance to curculio.



Microscopic cross sections of young pods of southern peas reveal that pod walls of the curculio resistant line, Ala. 963.8 (A), have more tannin sacs (arrows) than California Blackeye (B). Ala. 963.8 also has thickened fiber cell walls (C), whereas those of susceptible California Blackyeye (D) are not thickened.

Maintaining Fescue Stands in Bahia-Fescue Mixtures

C. S. HOVELAND and R. F. McCORMICK, JR., *Department of Agronomy and Soils*
E. L. CARDEN, *Brewton Experiment Field*

TALL FESCUE PASTURES in central and southern Alabama are almost certain to be invaded by Pensacola bahiagrass. But management that combines heavy nitrogen applications in winter with high stubble maintenance in summer helps maintain productive stands of fescue.

Winter application of 200 lb. N per acre resulted in best fescue stand maintenance in the Auburn University Agricultural Experiment Station tests. Total forage production by the fescue-bahia mixture was greater when an additional 200 lb. N was applied in summer, but bahia accounted for a big percentage of the total.

Maintaining stubble height at 4 in. resulted in best stands. Close grazing or cutting in summer was shown to reduce tall fescue growth and allow bahiagrass to dominate.

Area of the State affected results. Stands lasted longer at the Plant Breeding Unit, Tallassee, than further south at the Brewton Experiment Field.

Management Practices Compared

Kentucky 31 tall fescue was established in October 1971 on sandy loam soils at both test locations. Pensacola bahiagrass seed were broadcast on the fescue sod in March of the following year. Combinations of two summer (May-September) stubble heights and N rates were evaluated over the next 3 years. Forage was harvested from October to May at a stubble height of 1½ in.

Total forage yields were highest when bahia dominated the fescue-bahia sward, Table 1. Highest average yield for the 3 years, 6½ tons per acre, was at Brewton with summer stubble height of 1½ in. and 400 lb. N. Under this management at both locations, fescue was virtually eliminated by the second year, leaving nearly a solid stand of bahia.

Location Differences Found

Tall fescue stands in April of the third year indicate that persistence was better at Tallassee than at Brewton, Table 1. The longer warm season at Brewton favors bahiagrass. At Brewton, fescue persisted best when fertilized in winter with 200 lb. per acre N and not cut from May through September. Tall fescue on sandy soil at Brewton apparently will be eventually dominated by bahia, regardless of management. Nematode populations can build to high levels in this soil and seriously damage fescue, while bahiagrass is relatively tolerant.

Further north at Tallassee, fescue persisted well with bahia when cut during summer at a stubble height of 4 in. and fertilized with 200 lb. per acre N or more annually. At lower N rates, bahiagrass encroached on the fescue regardless of summer stubble height.

Seasonal productivity during the third season with a tall fescue-bahia mixture was best with winter N rate of 200 lb. and summer stubble height of 4 in., Table 2. Close clipping in summer sharply reduced stands and winter production of tall fescue. Applying nitrogen in summer accelerated the shift from tall fescue to bahia.

Difficult to Maintain Stands

Results of the experiment reported emphasize the difficulty of maintaining tall fescue stands in association with bahiagrass on sandy loam soils of central Alabama. Only under high rates of winter nitrogen fertilization and a high summer stubble height is it possible to maintain tall fescue in this mixture. Close clipping or grazing in summer, together with low nitrogen fertilization rates, leads to a complete bahiagrass sward. In south Alabama on sandy soils, bahiagrass can be expected to dominate the sward in a few years regardless of management.

TABLE 1. EFFECT OF NITROGEN RATES AND SUMMER CUTTING ON FORAGE YIELDS OF TALL FESCUE OVERSEEDED WITH BAHIAGRASS, 1972-75 AV.

Nitrate, lb./acre		Forage yield/acre		Fescue ground cover, April 1975 (3rd year)	
Winter	Summer	Brewton	Tallassee	Brewton	Tallassee
		Lb.	*Lb.*	*Pct.*	*Pct.*
4-in. stubble height					
200	200	11,240	7,360	19	89
200	100	9,690	7,190	38	90
200	0	6,000	6,080	40	89
100	100	7,800	5,450	20	76
100	0	3,840	4,280	35	35
1½-in. stubble height					
200	200	13,110	11,420	0	23
200	100	10,580	9,770	4	46
200	0	6,870	7,290	14	39
100	100	8,930	8,080	5	11
100	0	4,450	5,270	6	6
Not cut in summer					
200	0	4,170	4,030	62	100
100	0	2,270	2,840	45	58

TABLE 2. EFFECT OF WINTER NITROGEN RATES AND SUMMER CUTTING ON SEASONAL FORAGE DISTRIBUTION OF TALL FESCUE OVERSEEDED WITH BAHIAGRASS, THIRD SEASON (1974-75), PLANT BREEDING UNIT

Summer stubble ht.	Forage yield/acre						
	12/18	3/26	4/24	6/13	7/15	8/12	9/30
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
200 lb. N in winter							
4 in.	700	1,320	2,170	1,220	300	520	1,510
1½ in.	140	440	2,100	3,200	960	1,320	750
100 lb. N in winter							
4 in.	420	270	1,760	910	370	380	1,100
1½ in.	80	120	790	2,140	850	850	500
100 lb. N winter, 100 lb. summer							
4 in.	450	410	1,500	910	250	460	2,040
1½ in.	150	160	980	2,760	880	1,180	1,450

A NEW METHOD OF IDENTIFYING PHOTOSYNTHESIS INHIBITING HERBICIDES

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Most persons involved in agriculture would insist that the continued use of pesticides is essential if an ever increasing world population is to be fed and clothed. There is a great deal of public concern, however, regarding the possible damaging effects of pesticides on man and other nontarget components of the environment.

Until recently, the public was concerned mostly with what it considered the indiscriminate use of insecticides; but as the recent 2,4,5-T controversy has shown, certain very valuable herbicides are now coming under scrutiny also, and this trend is likely to continue.

We are thus faced with the paradoxical situation of the farmer needing pesticides to fulfill his obligation of increasing crop yields in order to meet public demand, and a section of that same public attempting to take away from him the very tools he needs to accomplish this. It is undeniably true that certain pesticides are toxic to man and wildlife and it is likely that a compromise will eventually be reached that will limit the farmer's pesticide armory to only the safest of the suitable compounds available.

In a previous article (Highlights of Agricultural Research, Vol. 18, No. 4, 1971) it was described how certain herbicides, such as S-triazines, kill plants by blocking photosynthesis. In the process of photosynthesis a green plant in the light manufactures energy-rich carbohydrates and oxygen from carbon dioxide (a low energy gas) and water. Because photosynthesis is unique to green plants, a chemical which affected only that process would not be injurious to animals. For that reason, photosynthesis-inhibiting herbicides, when used with discretion, are generally considered safe.

Each year the manufacturers of agricultural chemicals screen many hundreds of compounds in their search for new herbicides. The techniques conventionally used for determining whether or not a compound inhibits photosynthesis require expensive equipment, highly skilled personnel, and a great deal of time. Consequently, such determinations are not routinely made at an early stage in the screening process and generally are considered only at a later stage in the development of a herbicide when its mechanism of action is being determined. The availability of a rapid method, which required no specialized apparatus and which could be carried out by relatively unskilled labor, for recognizing photosynthesis-inhibiting chemicals would be a valuable technique in the search for safe new herbicides.

We recently developed such a technique from a chance observation that we made while conducting some quite unrelated experiments. We were studying the effects of one of the S-triazines, prometryne, on cucumber tissue. We wished to treat cucumber tissue with either a phosphate solution alone or a phosphate solution containing prometryne. To do this we punched small discs of tissue out of the first leaves (cotyledons) of cucumber seedlings and added them to the phosphate and phosphate plus prometryne solutions in beakers placed under a bright light. To our surprise, we found that in those beakers which contained prometryne the discs sank to the bottom of the solution after a few hours. In the beakers that contained only phosphate solutions the discs continued to float. Since the best documented effect of prometryne is the inhibition of photosynthesis, it was postulated that the discs lost their buoyancy and sank when sufficient time had elapsed for the prometryne to penetrate the discs and inhibit their photosynthesis.

The observation was investigated further using discs punched from cotyledons of pumpkin and various other tissues. It was discovered that sinking did not occur in all leaf tissues. It was further observed that with pumpkin cotyledon tissues sinking occurs more rapidly if semi-circular half-discs are used rather than complete discs, and the rate of sinking is increased by agitating the beakers and by including a trace amount of a surface active agent in the phosphate medium.

Table 1 shows the rate of sinking of half-discs floated on a phosphate medium with or without prometryne in the light or dark. In the light there was no sinking of discs in an 8-hour experimental period in the absence of prometryne, but sinking was rapid in the presence of prometryne. In the dark photosynthesis is not possible, and sinking was rapid in both the presence and absence of the herbicide.

Table 1. Effect of Prometryne and Darkness on the Rate of Sinking of Pumpkin Cotyledon Half-Discs

Treatment	Discs sunk at various times (hours) after treatment				
	0	2	4	6	8
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Light, no prometryne	0	0	0	0	0
Light, prometryne	0	0	71	89	93
Dark, no prometryne	0	0	17	55	79
Dark, prometryne	0	0	47	79	88

Table 2. Effect of Eight Herbicides on the Rate of Sinking of Pumpkin Cotyledon Half-Discs in the Light

Chemical treatment	Discs sunk at various times (hours) after treatment				
	0	2	4	6	8
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
None	0	0	0	0	0
Photosynthesis inhibitors					
Atrazine	0	0	15	57	95
Prometryne	0	0	29	79	96
Bromacil	0	0	25	79	96
Fluometuron	0	0	7	53	91
Diuron	0	0	34	82	95
Not photosynthesis inhibitors					
DSMA	0	0	1	1	3
Potassium azide	0	0	0	1	7
2,4-D	0	0	0	0	3

Table 2 shows that the method is specific for those herbicides that inhibit photosynthesis. Again, there was no sinking in the absence of herbicide, but in the presence of the five herbicides known to inhibit photosynthesis sinking was rapid. Discs continued to float on the three solutions containing herbicides that kill plants through effects on other, nonphotosynthetic, processes.

The method can also be used to measure exceedingly low concentrations of such herbicides in solution because the rate at which the discs sink is directly proportional to herbicide concentration. Using the technique we have been able to detect prometryne in solution at concentrations as low as 0.02 p.p.m.

Buoyancy of the discs is due to gases present in the small spaces between the cells of the tissue. When photosynthesis ceases the composition of this gas mixture will change; carbon dioxide concentration will increase to a high level and oxygen content will be reduced to a low level. Carbon dioxide is relatively soluble and it is believed that sinking probably results from the external liquid gradually infiltrating the tissue and replacing the gas that gave the leaf buoyancy.

Because this method is so simple to carry out it is receiving attention in a number of research and industrial laboratories both in the United States and abroad. Hopefully, it will serve as an additional valuable tool in the search for better and safer agricultural chemicals.

FARM ESTATE PLANNING in ALABAMA

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ESTATE PLANNING is the continuous process of organizing the affairs of the estate owner to fulfill his objectives for his property at death.

Inadequate estate planning can result in excessive estate taxes, uncertainty pertaining to future owner-operatorship of the farm business, unnecessary administrative and transfer costs, and liquidation losses.

The estate plan should provide for the family's future needs and preserve a maximum amount of property for their welfare. To see how well this is being done by Alabama farmers, 10 actual cases were studied.[1] One example, Case A, is presented.

Case A

Mr. A owned 515 acres of land at his death. His main enterprises were beef cattle and cotton. Mr. A died between the age of 65 and 70 and his wife was in the same age range. He had only one son who was between 45 and 50 years old. In this case the grandchildren were also designated as heirs to the estate in a will.

Mr. A started distributing his estate by gifts in 1950, and had reduced his taxable estate by $47,000 at the time of his death. Mr. A used lifetime gifts to transfer part of the farm business to his son. The first gift was 230 acres of land, which was valued at $23,000 at that time. This gift was divided into $6,000 as an annual gift, and $17,000 as a "lifetime specific gift tax exemption." Again in 1966 Mr. and Mrs. A gave a split gift of the cotton gin to the son. This gift was valued at $13,000. That same year they gave their granddaughter a house and 5 acres of land which were valued at $11,000. These gifts totaled $24,000 for that year. Since the annual exclusion can be deducted for each person, $12,000 was deducted on this basis. The other $12,000 was transferred under the remaining lifetime exemption.

Mr. A established a trust for his grandson in 1966. Included in this trust was land referred to as "The Old Homestead." This was 160 acres of land including the house in which Mr. and Mrs. A lived. Mr. A's son was appointed trustee. This trust as drawn, however, was revocable; Mr. A still retained some control, so that this property was included in Mr. A's estate.

As mentioned above, Mr. A also drew up a will to complete his estate plan. Mr. A's objectives in his will were to:

1. Provide security for his wife during her lifetime.
2. Transfer the estate in a way that would reduce problems to the family and limit the estate taxes.
3. Retain the farm land within the family.

By using a will Mr. A gave one-third of his estate to his wife, and one-third to each of two grandchildren. This was bypassing the middle generation, by request of Mr. A's son. Through this method the estate is taxed only once between the three generations, whereas, in most cases it would be taxed twice – at present and again at the son's death.

The liquid assets or cash available for taxes, debts, and transfer cost amounted to $7,000 in the checking account, $12,200 in other bank deposits, and $5,000 in insurance at the time of Mr. A's death. This gave the executor excellent liquidity to handle financial matters.

Mr. A had the following assets included in his estate:

	Gross estate	*Probate estate*
Real estate (including home)	$ 96,500	$ 96,500
Real estate (in trusts)	32,000	------
Mortgages, notes and cash	200	------
Insurance on the decedent's life	5,000	------
Jointly owned property	40,000	------
Other personal property	13,700	13,700
Total	$187,400	$129,200

Most of Mr. A's real estate was owned in sole ownership. Included in the jointly owned property were one small tract of land, livestock, machinery, and savings deposits. Mr. A did not have any debts other than the current bills for utilities and small debts, which amounted to $100. Mr. A's estate settlement is presented below:

Case A Estate Settlement

Gross estate		$187,400
Less: Indebtedness	$ 100	
Administrative cost	3,500	3,600
Adjusted gross estate		$183,800
Less: Marital deduction	$61,266	
Specific exemption	60,000	$121,266
Taxable estate		62,534
Gross estate tax		$ 10,210

Mr. A's estate plan lacked uniformity or any specific outline. The gifts were given at irregular times in irregular amounts. If the gifts had been spread over a number of years to take full advantage of the annual exclusion, then more of the estate could have been transferred in this manner, tax free. However, Mr. A's sole objective was not to minimize taxes, but to transfer his property for his son's use, which he did, and still saved over $8,000 in taxes to his estate.

Tax summary

	Taxes paid
Mr. A's estate plan (without gifts)	$18,892
Mr. A's estate plan (with gifts)	10,210
Added cost of gifts	0
Net savings	$ 8,772

Most Alabama farmers inherited or bought their farms many years ago, and some of them are not aware of how much their farms have increased in value. Therefore, many Alabama farm estates are going to be taxed quite heavily unless there has been adequate estate planning prior to the death of the farmer.

Case A farm estate has been re-valued based on current prices of land to indicate the effect of estate planning.

Case Estate A at Present Values

	Mr. A's estate plan		*No estate planning*	
Gross estate		$238,657		$379,057
Less: Indebtedness	$ 100		$ 100	
Administration cost	3,500	3,600	3,600	3,600
Adjusted gross estate		$235,057		$375,457
Less: Marital deduction	$ 77,685		$ 35,503	
Specific exemption	60,000	137,685	60,000	95,503
Taxable estate	$ 57,529	100,372	$279,954	
Gross estate tax paid in 1970	$ 10,210			
Gross estate tax at present values	$ 19,404			
Gross estate tax with no estate planning	$ 75,285			
Net savings from estate planning	$ 75,285			

[1] Farm Estate Planning in Alabama, Problems, Tools, and Case Studies, Agricultural Experiment Station Bulletin 466, is available upon request.

COTTON WILT-DISEASE FUNGUS AFFECTED BY HERBICIDE-ROOT INTERACTIONS

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ENTIRE REGIONAL projects are now devoted to investigations of rhizosphere ecology and its relation to the overall health and vigor of plants. The rhizosphere is that area of soil immediately adjacent to roots and influenced by substances exuded or leaked from roots. Microbiologically, this unique zone is "where the action is."

Any stress upon plant growth, whether brought on by climatic agents, pesticidal injury, or other factors, may alter the quantity and chemical nature of root exudation. Since exuded substances are principally sugars and amino acids they affect the growth and behavior of pathogenic fungi in the rhizosphere. Herbicides, though formulated to kill weeds, will also affect "nonsusceptible" crop plants to some degree. "Non-target" soil microorganisms also must be affected, either by direct contact with the herbicide or indirectly in response to root environmental changes; it is essential to know whether such effects are beneficial or pose potential hazards to crop plants.

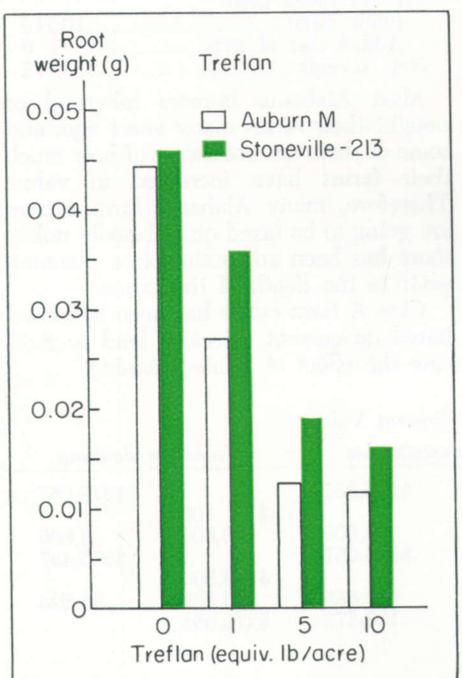

FIG. 1. Effects of Treflan on seedling root weights of two cotton varieties.

Fusarium oxysporum f. sp. *vasinfectum* is the pathogenic agent causing wilt of cotton in Alabama and other cotton-growing states. It survives in soil by resistant structures called chlamydospores, which also serve as the primary source of infection. These spores lie dormant until a suitable stimulus, such as root exudates, induces their germination.

Basic experiments in the Department of Botany and Microbiology were conducted to test the influence of two cotton herbicides on root exudates and the germination of *Fusarium* chlamydospores. Fertile, nonsterilized sandy loam in small containers was treated with rates of fluometuron (Cotoran) or trifluralin (Treflan) equivalent to 0, 1, 5, and 10 lb. per acre. Cotton seedlings of Auburn M (*Fusarium* resistant) and Stoneville 231 (*Fusarium susceptible*) were established in both treated and untreated soil. A suspension of chlamydospores of cotton-wilt *Fusarium* was injected into the rhizosphere zone. After 12 hr., spores were recovered by special techniques and stained, and the percentage germination of spores was calculated. Other factors measured were root weights, amounts of sugars and amino acids exuded into the rhizosphere soil, and extent of germ tube lysis (usually microbial destruction) following spore germination.

Root development of both cotton varieties was severely inhibited by Treflan (Figure 1), whereas Cotoran apparently enhanced growth slightly. In contrast to root weights, the percentage spore germination in the rhizosphere increased sharply in presence of Treflan (Figure 2) used at rates equivalent to 5-10 lb. per acre, but Cotoran had little effect.

Increased spore germination around roots in Treflan-treated soil is believed to be related to a critical change in carbon/nitrogen availability created by root exudation of sugars and amino acids in the rhizosphere.

Cotoran had one significant effect on *Fusarium;* following spore germination in the rhizosphere, lysis or disintegration of spore germ tubes increased with increasing levels of Cotoran in the soil (Figure 3). Treflan did not promote this effect.

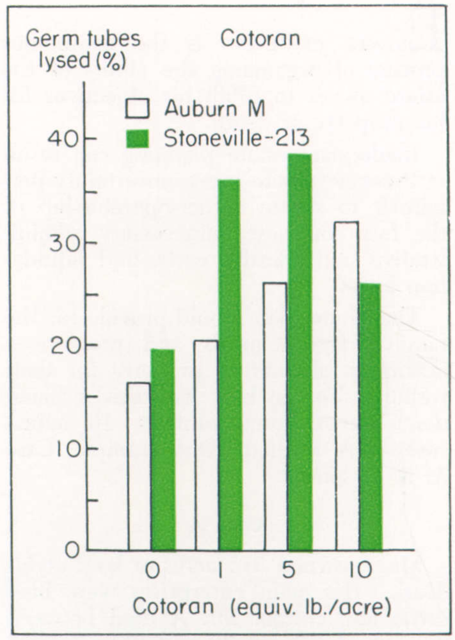

FIG. 2. Effect of Treflan on spore germination of cotton-wilt Fusarium in the root zone.

Results of these tests suggest contrasting effects of the two herbicides. While Treflan suppressed root development and created a rhizosphere environment favorable to spore germination of *Fusarium,* Cotoran slightly enhanced root development and created conditions for increased lysis or destruction of germinated spores. There appeared to be no great qualitative differences between rhizospheres of the two cotton varieties.

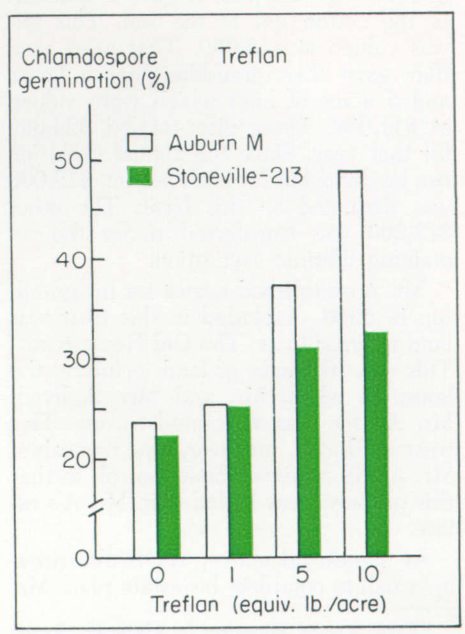

FIG. 3. Effect of Cotoran on destruction of germinated Fusarium spores in the root zone of two cotton varieties.

Micronutrients for Crops in Alabama

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FERTILIZER ELEMENTS required by plants in small amounts are called micronutrients. These elements include boron, zinc, copper, manganese, iron, and molybdenum. In most cases, Alabama soils furnish the required amounts of these elements for high yields and good quality of crops. There are exceptions, however, for some crops.

Plants differ in their capacity to obtain micronutrients from the soil. Cotton may starve for boron on a soil that provides enough to produce a 100-bu. corn crop. Conversely, corn may be deficient in zinc on a soil that is capable of producing 2 bales of cotton with no zinc added.

Deficiencies Identified

Research by Auburn University Agricultural Experiment Station has established the need for certain micronutrients by specified crops. Boron was found to be deficient for several crops grown on sandy soils in Alabama. Additions of this element are needed for cotton, peanuts, white and crimson clover, and many vegetables.

During 3 years of testing at the Sand Mountain Substation, Crossville, yields of seed cotton were increased about 150 lb. per acre by adding boron. These tests were on both acid and limed soils. Other trials at 21 Alabama locations showed an average increase of about 50 lb. of seed cotton per acre. Some of these tests were on farmers' fields and others on units of the Agricultural Experiment Station System.

Boron Needs

Boron for cotton can be applied in fertilizer or preemerge herbicide solution, or it can be sprayed on the plant foliage. Since only small amounts of boron are needed, application rates must be carefully controlled. Specific boron needs determined in long-term Auburn research are given below for different application methods.

Fertilizer application: 0.3 to 0.5 lb. of elemental boron per acre from fertilizer borate, FB-46 (14.3% B) or FB-65 (20.2% B), are used, either of which can be included in the fertilizer.

Preemerge application: Boron can be mixed with herbicide and applied with preemerge herbicide at planting. The same amount of boron as in fertilizer application is supplied with Solubor (20.5% B).

Foliar application: A highly water soluble material, such as Solubor, is included with insecticide spray application at the rate of 0.1 lb. boron per acre for each of 3 to 5 applications.

For peanuts, 0.5 lb. per acre of boron is used to prevent "hollow-heart," an internal defect of peanuts that causes a hollow darkening on the inside of the seed halves. Since 1% or more hollow-heart causes a market price penalty to peanut growers, using the small amount of boron is good insurance.

Considerable research in Alabama established that boron will increase seed yields of crimson and white clovers. Vegetables such as turnips, cabbage, beets, and cauliflower required 1 lb. per acre of boron for best production.

Need for Zinc

Zinc deficiency of corn appears as white to yellow streaks in the leaves and white to yellow buds when plants are 6 to 12 in. high. Research results show consistent yield increases of 5 to 10 bu. per acre from application of 3 lb. per acre of zinc in the starter fertilizer.

Zinc deficiency of pecans appears as a rosette and dieback of shoots in the top of the tree. This is prevented by applications of 1 lb. of zinc per tree per year. The condition can be corrected by an application of 0.1 to 0.3 lb. of zinc per tree for each year of the tree's age, up to 2 to 3 lb. per tree.

Other Micronutrients

For soybeans, it is important to grow the crop with a soil pH of 5.6 or higher. Where the soil is more acid, a small amount of molybdenum added to the seed will prevent a molybdenum deficiency. Three-tenths of an ounce of molybdenum will treat a bushel of seed (1 oz. of sodium molybdate in ½ pt. of water).

Present Experiment Station research indicates that Alabama soils usually supply enough copper and manganese for crops. Iron deficiency is present on some ornamental plants, such as shrubs and lawn grasses, where pH or phosphorus, or both, is very high. An iron spray usually corrects these deficiencies.

The micronutrient problem is more than just whether the element is present in adequate amounts in the soil. Many factors affect the availability to plants. For example, boron deficiency is more prevalent in dry soils than in moist soils. Very high phosphorus slows zinc uptake in plants. An excess of one micronutrient in the soil may reduce uptake of another, such as excess zinc reducing iron uptake.

WHAT DO ALABAMA CONSUMERS KNOW ABOUT FLAME RETARDANT SLEEPWEAR?

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THE ISSUANCE of federal flammability standards covering children's sleepwear in sizes 0-14 has caused a drastic change in the fabrics used in these garments, and in those fabrics available for home sewing.

Whereas, previously most of this sleepwear was cotton, now that fiber represents only about 10-15% of the market. Fibers such as polyester, nylon, acetate, modacrylic, and matrix predominate, while cotton, in order to be used at all, must have a durable flame retardant (FR) finish. Almost all fibers, but especially cotton, require special care to ensure maintenance of their flame retardant properties.

A group of Alabama consumers was surveyed to determine their knowledge and interest in flame retardant sleepwear; their reactions to new products on the market and their practices in caring for these products; their main source of information about flame retardant fabrics; and their opinions on the need to expand flammability standards into other areas. The sample was composed of mothers of children in nursery and elementary school.

The survey was done in an urban area of the State. A total of 119 mothers was interviewed after an initial screening to assure a middle class background for the participants. The level of education of participants was relatively high, with 95% having completed high school and 46% having attended college for some length of time.

The consumers were questioned about their awareness of federal rules on the flammability of childrens' sleepwear, carpets and rugs, mattresses, and mattress pads. Seventy-five, 25, and 21% of the consumers, respectively, indicated they were aware of these standards. The much lower awareness of the regulations concerning carpets and mattresses is not surprising in light of the low turnover rate of such items in a home. Many of those questioned may not have purchased one or both of these items since the federal regulations went into effect.

The introduction of flame retardant sleepwear has caused a rise in prices of children's sleepwear. This has occurred because of higher costs of some of the new fibers and because of costs of applying flame-retardant finishes. When consumers were asked about price changes in sleepwear, most of them (55%) believed that there had been a change in the price of children's sleepwear, and the change was a rise in price. Interestingly, however, only one-third of the respondents believed that flame-retardancy was the cause of the price rise. Most answers gave inflation as the cause.

When asked whether they would be willing to pay $1.00-$2.00 more for children's sleepwear that resists burning, 88% of the mothers answered yes, thus indicating strong support for the concept of flame-retardant sleepwear.

Of the 119 consumers surveyed, 73 indicated that they had purchased or been given FR sleepwear. Of these, 68 were satisfied with the garments. The few complaints about the garments included comments that the garments wore out too soon, that they looked old and dirty, and that the material felt rough to the skin. The garments that consumers were dissatisfied with were made of polyester or modacrylic fiber.

The sources of information about FR children's sleepwear available to consumers were of considerable interest. Those respondents who had indicated awareness of FR sleepwear were asked to indicate their sources of information about garments. The table shows responses given. The percentages are greater than 100% because often more than one source was cited. Other sources that were added by the respondents were labels and hang tags on garments, catalogs, and fabric shops. Less than one-third of those subjects who had knowledge of FR garments had received any information about them from salespeople, perhaps the very people who should be the most informative.

The questionnaires for the survey were administered in two ways: one in which the form was filled out and mailed back, and the other in which a personal interview took place. The method of administration had an effect on the answers to some questions, in particular the question "have you heard about sleepwear made to resist burning?" and the question about willingness to pay extra for FR sleepwear. In both cases, more of those consumers that were interviewed answered yes than those who filled out the questionnaire in private. Evidently the presence of the interviewer had an effect on the answer given, with a positive answer perceived to be "correct."

The consumers in the survey were asked about the need for expanding flammability standards into other areas. The responses varied from a high of 84.5% of the subjects choosing "all should be made to resist burning" for 0-6X children's sleepwear to a low of 44.8% choosing that response for girl's dresses. For both girl's dresses, and for boys' slacks and shirts, opinion was divided between mandatory FR garments and a choice for the consumer. The third response, "none should be made to resist burning," was chosen rarely, probably because such a response was considered to imply that the respondent doesn't care about people who get burned. Sleepwear for the elderly, an area where problems are known to exist, was the area of greatest concern, other than children's sleepwear. Unfortunately, it is an area in which specific solutions for the elderly are unlikely to come forth.

There was substantially less support for mandatory standards on girls' dresses and boys' slacks and shirts. This comparative lack of support is presumably indicative of an intuitive feeling that such garments represent less inherent risk than sleepwear. It seems clear that more opinions from average consumers concerning the type of standards and choices desired in the area of textile flammability are needed to help the Consumer Product Safety Commission make decisions in keeping with the wishes of its constituency.

SOURCES OF INFORMATION ABOUT FLAME RETARDANT SLEEPWEAR

	Pct.
Friends of family	36.7
Salespeople	29.7
Newspapers or magazines	72.3
Bulletins or leaflets	11.1
Meetings or classes	4.4
Radio	15.2
Television	71.4

The Family Vegetable Garden — An Enjoyable Way to Save

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A FAMILY VEGETABLE garden is not a new idea. To the contrary, supermarket purchase of fresh, frozen, and canned vegetables is a relatively recent phenomenon that accompanied urbanization. Most city dwellers opted for lawns and shrubbery over vegetable gardens and other leisure-time activities instead of gardening. In recent years, however, vegetable gardening has gained in popularity. In 1975, for example, an estimated 50% of U.S. families had vegetable gardens.

Many factors led to the upsurge of interest in home food production. Among these were inflationary pressures on food prices, increased fuel costs that decreased participation in activities away from home, and heightened interest in the environment and nature.

Although the rising price of food probably has been a prime reason for many people taking up gardening, vegetable growing can hardly be justified strictly on an economic basis. The clearest indication of this fact is that most people do not continue gardening unless they gain pleasure from the activity.

A city family that raises a garden to cut food costs must consider expenses of such things as land preparation, fertilizer, other chemicals, seed, and plants. Labor is a major input into a garden, but it is usually not included with expenses as in most economic considerations.

As an example of costs involved, consider inputs into a 20- × 25-ft. garden plot. Land preparation, soil testing, liming, and fertilizing – getting ready for planting – will cost about $12 for the plot. Labor will vary in the 2- to 20-hour range, depending on whether a power tiller is rented for breaking the ground. Seed and plant costs would amount to about $13, bringing total cost to about $25 for the 20- × 25-ft. garden area, as shown in the table.

Estimated production and value of products from the garden are given in the table. Prices are based on those that might normally be expected during the garden season. Vegetables in the home garden usually mature at the same time as commercial crops, the season when supermarket prices are lowest.

Cost and yield data in the table are based on spring, summer, and fall crops. In the case of single plantings, yields of radishes, lettuce, carrots, cabbage, turnips, and snap beans would be about halved, and total value would be reduced accordingly. Use of irrigation would increase yields, costs, and labor requirements.

Additional costs for other factors will be necessary. In the South, yields will not approach the levels in the table without weed and insect control. Weed control can be done entirely by hand labor, or labor saving practices can be used. Mulching, for example, retards weed development and conserves moisture, but may lead to increased damage from slugs. Insects and plant diseases can be controlled by various techniques, depending on the problem, but usually require a small sprayer or duster.

The combination of preparing land, fertilizing, planting, weeding, controlling diseases and insects, harvesting, disposing of crop residue, and setting up and removing crop supports can require as little as 50 hours of labor during a 250-day growing period. This brings total seasonal labor to about 70 hours for a small garden.

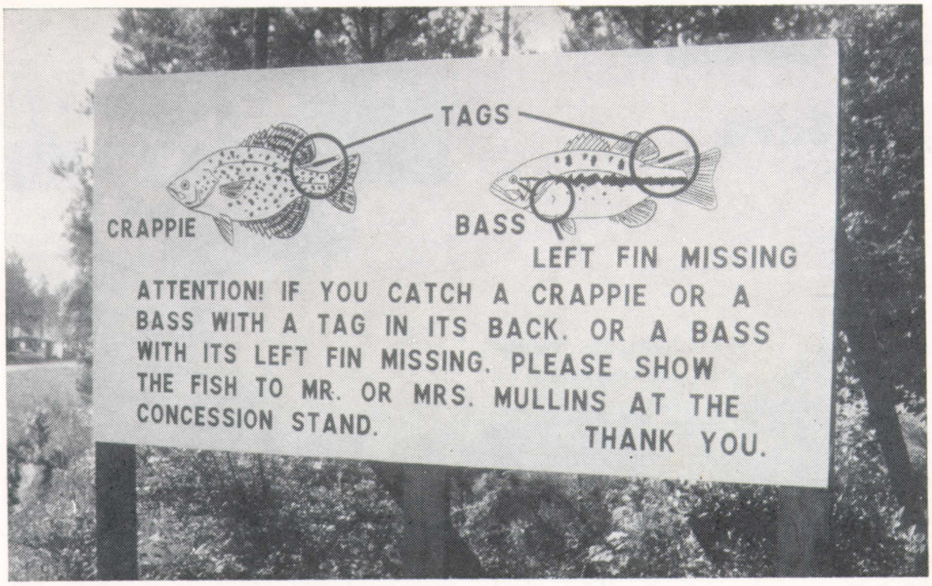
Variable costs would amount to $25 for fertilizer, seed, and soil test. Capital investment could be figured at about $30 – for a shovel, hoe, sprayer, and lime.

As shown by production data in the table, vegetables with retail value of more than $125 can be grown with the costs and investments described. Net return over variable costs would be about $100, or $1.40 per hour for the labor involved in gardening.

From a strictly monetary standpoint, the gardener would be better off with a part-time job. However, there are numerous intangible gains to the home gardener that do not show up in economic analyses. Vegetables such as sweet corn simply cannot be purchased fresh in a store, so it is misleading to price such products at retail store value. And a surplus of vegetables need not go entirely to waste. Friends and relatives generally receive them with appreciation. Moreover, the decision is usually not between gardening and part-time work, but between gardening and boating or watching television. Many new gardeners have discovered that caring for plants is a worthy substitute for leisure activities they once preferred.

INPUTS AND OUTPUTS OF SMALL HOME GARDEN

Vegetable	Inputs		Outputs		
	Quantity	Cost	Quantity harvested	Retail value per unit	Total value
Peas—early	1 packet	$1.00	16 lb.	$0.35	$5.60
Green onions	120 sets	.50	100 onions	.03	3.00
Radish	2 packets	1.00	24 bunches	.25	6.00
Lettuce	2 packets	1.00	48 heads	.45	21.60
Carrots	2 packets	1.00	36 lb.	.25	9.00
Cabbage	30 plants	1.50	25 heads	.35	8.75
Turnips for greens	2 packets	1.00	14 lb.	.30	4.20
Cucumbers (trellis)	1 packet	.50	60	.25	15.00
Tomatoes (staked)	10 plants	1.50	115 lb.	.20	25.00
Peppers	10 plants	1.50	40 lb.	.30	12.00
Summer squash	1 packet	.50	40 lb.	.15	6.00
Snap beans	2 packets	2.00	30 lb.	.30	9.00
Total seed and plant costs		$13.00			
Soil test, fertilizer, and chemicals		12.00			
TOTAL		$25.00			$125.15



Fishermen are encouraged to return marked or tagged fish: The rate that tagged fish are recaptured is a measure of the effect of fishing on a fish population.

MANAGEMENT PROBLEMS WITH CRAPPIE IN FARM PONDS AND SMALL IMPOUNDMENTS

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CRAPPIE are not usually recommended for stocking in farm ponds or small impoundments because they tend to become overcrowded or stunted which results in poor fishing. Crappie also compete with other species which can result in slow growth and small average size of other important sport fish.

Well meaning fishermen often stock crappie on their own. Usually only a few adults are added. However, these few individuals are capable of producing a tremendous number of young. When this happens, the dense population suppresses its own reproduction for several years until natural mortality and fishing reduce their numbers to a level where another large number of young are produced. The net result is a cyclic pattern in the quality of fishing. In the Southeast this appears to be a 5-year cycle resulting in only 1 to 2 years of good fishing.

In Lee County public fishing lake, black crappie were introduced sometime in 1968. These fish spawned heavily in 1969; individuals of the 1969 "year-class" finally reached a harvestable size in 1973. During 1973 and 1974 members of this "year-class" still were present in large enough numbers to suppress their own reproduction. The annual rate of mortality for the 1969 "year-class" is estimated to be 65%. This means that only 35% of the fish present at the start of the year will be present 12 months later. The portion of this mortality caused by fishing is being determined from the number of tagged fish being caught. During 1974, approximately 10% of the 335 tagged fish were recovered. When these data were adjusted for tagging mortality and tag loss, deaths due to fishing accounted for 15% of the total mortality. Natural mortality is obviously a significant cause of deaths. The reduction in numbers of crappie has allowed the remaining fish to grow rapidly. A relatively large "year-class" was again produced in the spring of 1975.

What might be done to regulate the population to lessen the chance of an extremely large "year-class" being produced? Where deaths due to fishing represent a significant cause of mortality then regulating the number of crappie caught by fishermen would help regulate numbers of crappie remaining in the population, thus modifying the rate of reproduction. Also, stocking large numbers of fingerling bass just before a large "year-class" of crappie is expected would help reduce fry to a level where there is sufficient food to allow the remaining crappie to reach a harvestable size.

In farm ponds where crappie have become a problem, the best procedure found to restore good fishing is to either poison with rotenone or drain the pond and start again. In draining a pond, all fish should be removed and all pot holes and standing water should be treated with cube powder or a liquid formulation that contains 5% rotenone. If the entire pond is to be poisoned, best results have been attained by using 10 lb. of cube powder or 10 pt. of liquid rotenone per acre ft. of water. Tests have shown that this work should be done in October or later in the fall so that there will be no reproduction if wild fish should get into the pond. The pond can then be re-stocked with bass, bluegill, and/or catfish at the recommended rates. An application for fish may be obtained from the Alabama Department of Conservation and Natural Resources in Montgomery.

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