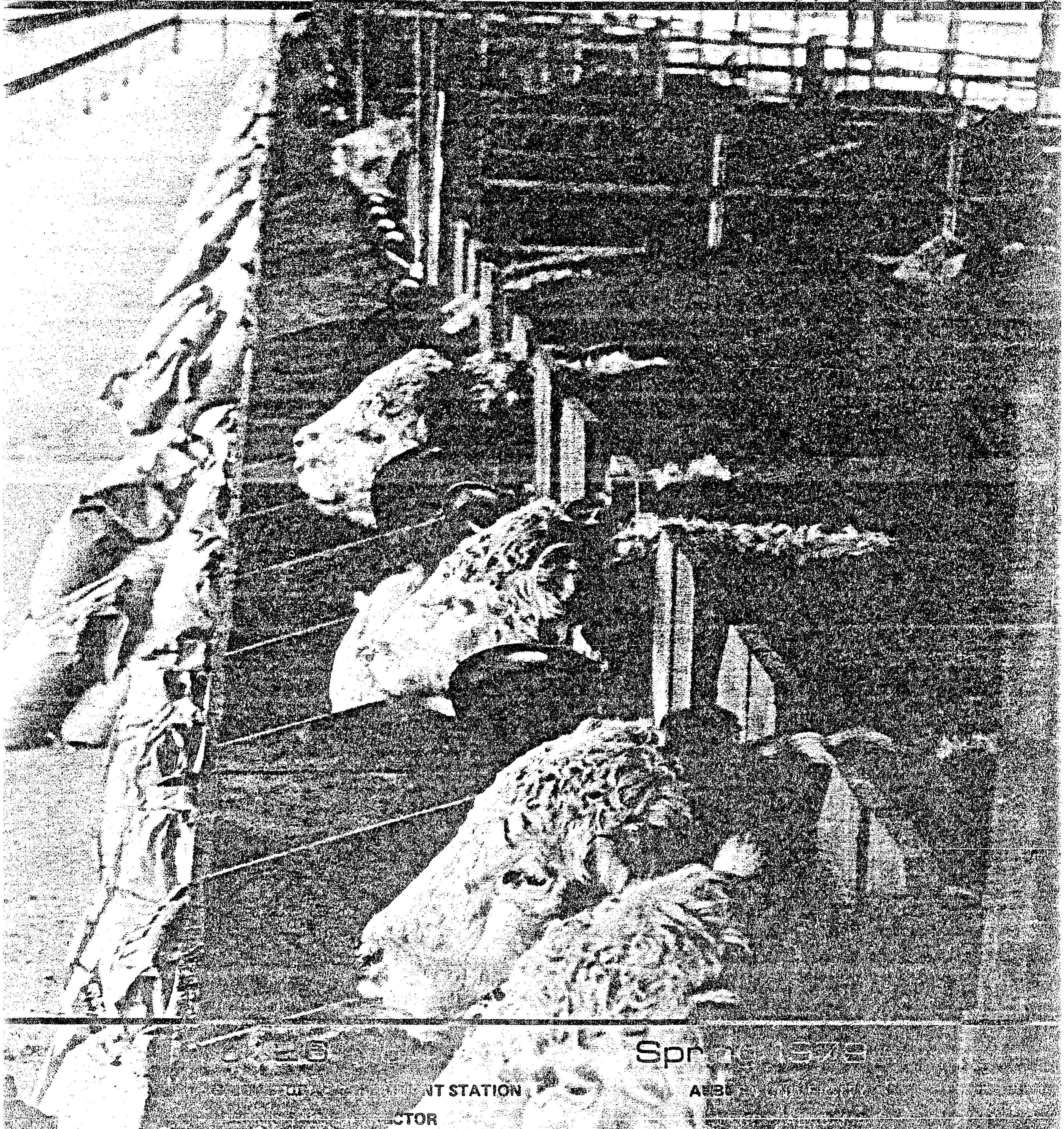
highlights

of agricultural research



Vol. 26 — Spring 1979

AGRICULTURAL EXPERIMENT STATION — AUBURN UNIVERSITY

DIRECTOR

DIRECTOR'S COMMENTS

THE YEAR 1979 marks 50 years of agricultural research on outlying units of the Agricultural Experiment Station. An Act of the Legislature of 1927 authorized the establishment and maintenance of "sub agricultural experiment stations, one upon each of the five main large soil types of the State as represented in the Tennessee Valley, the Sand Mountain Section, the Black Belt, the Wiregrass, and the Gulf Coast Area – and to provide for the carrying on of research work on experimental fields in different parts of the State." During 1927-28-29, land was obtained and facilities constructed for the Tennessee Valley, Sand Mountain, Black Belt, Wiregrass, and Gulf Coast substations, all of which are still in operation, and 7 experiment fields, including the Brewton, Monroeville, and Prattville fields which are still active today. The first experiments were conducted in 1929 and the data from these experiments are in the record books of this office. Fifty years ago, 36 different varieties of cotton were tested at the Tennessee Valley Substation and the average yield was 503 lb. of seed cotton per acre. For this same station, a contract is on file which shows that the total contract price in 1928 for the construction of a superintendent's residence, 5 labor houses, a mule barn, machine shed, office building, double garage, and a chicken house was only $17,873. Eight of these 11 buildings are still in service today.

R. DENNIS ROUSE

The remainder of the present-day substations were established after authorization by the Legislature as follows: Upper Coastal Plain – 1944, Piedmont – 1945, Chilton Area Horticulture – 1948, North Alabama Horticulture – 1948, Lower Coastal Plain – 1949, and the Ornamental Horticulture Field Station in 1952.

Research on the outlying units has played an important role in the research program of the Agricultural Experiment Station and has made major contributions to agriculture and forestry of Alabama. In addition to affording the obvious advantages of attacking and solving problems in the particular soil type and climatic environment of the area in which a unit is located, outlying units serve an important function of providing a link between the Agricultural Experiment Station and the people of the State. Producers can observe experiments on such things as varieties, pest control, crop rotations, cultural practices, and livestock under similar conditions existing on their farms. As an example, during 1978, a total of 2,300 people attended 35 station-conducted meetings and tours held at outlying units in cooperation with the Cooperative Extension Service staff and other agricultural leaders. Another 4,300 attended 65 meetings of farm-related organizations and school class tours. Also, numerous unscheduled visits were made.

The research at the outlying units is planned cooperatively by department heads and project leaders at Auburn and superintendents and assistant superintendents of the outlying units, with overall direction from the Director's office. Each experiment is planned to fit into our total program of research. In 1978, over 500 experiments were conducted on the outlying units – each in cooperation with one or more project leaders from Auburn.

Changing priorities in agricultural research require adjustments in the research program of the outlying units. Thus, there has been a continuous evolution in research and we can be assured there will be further changes in the future. Continued emphasis will be on applied research dealing with studies of varieties, fertilization, pests, cultural practices, and livestock production.

may we introduce . . .

Dr. Coleman Y. Ward, the new head of the Department of Agronomy and Soils for the School of Agriculture and Agricultural Experiment Station. He fills the position left vacant by the retirement of Dr. L. E. Ensminger.

A native of Millican, Texas, Ward came to Auburn from the University of Florida where he was chairman of the Department of Agronomy, a position with responsibility for teaching, research, and extension activities. At Auburn he will direct teaching and research in agronomy and soils.

Before joining the Florida faculty in 1974, Ward had been professor of agronomy at Mississippi State University for 13 years. His work there involved research on forage and pasture crops and turfgrass management. His earlier experience, in Florida, Texas, and New Mexico, involved various areas of crops and soils.

Ward received B.S. and M.S. degrees from Texas Tech University, and holds the doctorate from Virginia Polytechnic Institute and State University. His principal fields of specialization include soils, forage crops and turfgrasses, and biochemistry-plant physiology.

HIGHLIGHTS of Agricultural Research

SPRING 1979 VOL. 26, NO. 1

A quarterly report of research published by the Agricultural Experiment Station of Auburn University, Auburn, Alabama.

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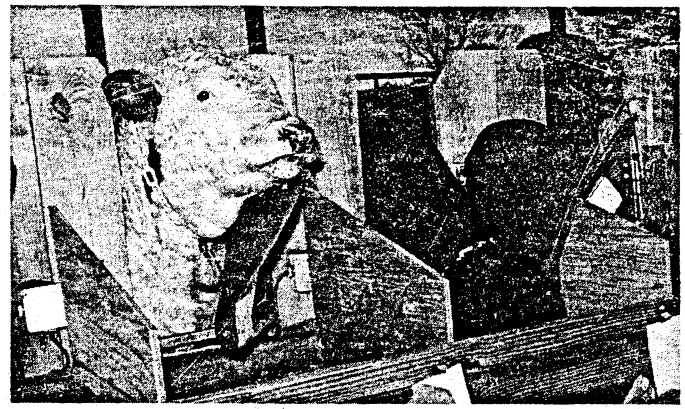
Information contained herein is available to all without regard to race, color, or national origin.

ON THE COVER. New bull test station gives added dimension to performance testing program.



Electronic key on neck chain allows bull to feed in assigned bunk only. Thus, individual feed consumption can be measured.

STEADY PROGRESS IN PERFORMANCE TESTING

T. B. PATTERSON, Dept. of Animal and Dairy Sciences

PERFORMANCE TESTING started at Auburn University in 1951. That first test had 19 bulls – 13 consigned by Alabama breeders and 6 from the Agricultural Experiment Station herd. Average daily gain (ADG) was 1.94 lb. and weight per day of age (WDA) averaged 1.93 lb., table 1. The highest performance, ADG of 2.50 lb. and WDA of 2.40 lb., was made by a Hereford bull consigned by C. W. Gantt, of Titus. Performance at this level in today's test would be below average for both traits.

Since that modest beginning, 2,491 bulls have been tested, and 1,684 have qualified for sale. In addition, several high performing bulls have been retained by their owners for breeding purposes.

Requirements for bulls to enter the test have been increased periodically in an effort to reduce compensatory gain and to improve test reliability. Compensatory gain makes individuals appear to perform at unrealistically high levels. Requirements were increased as follows: WDA was increased to 2.00 lb. in 1960, to 2.10 lb. in 1966, to 2.20 lb. in 1970, and to 2.30 and 2.50 lb., respectively, for British and large breeds in 1973. Weaning weight records were required in 1961, and membership in Alabama Beef Cattle Improvement Association became mandatory in 1964. These requirements are still in effect.

Success of the program is evidenced by the steady increase in participation and improvement in overall performance of test bulls. For example, ADG went from an average of 2.24 lb. during 1952-59 to 2.74 lb. average for 1970-76, table 1. Increases for WDA, conformation score, and selling price for the same periods were 2.04 to 2.59 lb., 11.9 to 13.3, and $407 to $874, respectively.

It appeared that performance had reached a plateau by the mid-1970's and that continued progress would be hard to achieve as long as bulls were tested under existing environmental conditions. A new bull test center designed to overcome environmental limitations was built in 1977. This new facility has the unique capability of not only testing bulls for their ability to gain weight, but also to measure individual feed consumption. This measurement is accomplished without confining bulls in separate pens. Each feed bunk has an electronic panel contained in an especially designed door that allows access to the feed. Each bull has an electronic key on a plastic chain around his neck that will open the door to his assigned feed bunk only. Thus, individual feed consumption can be recorded for determining feed efficiency (FE). Bulls learn to open their assigned door in a 7- to 10-day training period before the test begins.

The 96-capacity barn is divided into eight pens with 12 feeding bunks each. Each pen is connected to a dirt loafing lot. Electronic scales in the adjoining working pens are used for periodic weighing of the bulls during the test. These scales are self balancing and show animal weights on a display panel.

TABLE 1. SUMMARY OF AUBURN UNIVERSITY PERFORMANCE TESTING, 1951-76[1]

Test years	Bulls on test	Bulls sold	ADG	WDA	Conf. score[2]	Price
	No.	*No.*	*Lb.*	*Lb.*		*$*
1951	19	0	1.94	1.93	10.2	......
1952-59	448	344	2.24	2.05	11.9	407
1960-69	954	733	2.46	2.30	12.7	595
1970-76	986	547	2.74	2.59	13.3	874

[1] Performance data are for sale bulls only.
[2] 10 = average Good, 11 = high Good, 12 = low Choice, 13 = average Choice, and 14 = high Choice.

TABLE 2. COMPARATIVE PERFORMANCE FOR LAST TWO TESTS[1]

Test years	Bulls on test	Bulls sold	ADG	WDA	Feed eff.	Final wt.	Conf. score	Price
	No.	*No.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*		*$*
1976-77	119	58	2.51	2.53	....	1,065	14.0	736
1977-78	84	60	3.12	2.78	7.3	1,170	13.4	1,021
Junior	26	23	3.14	2.85	6.7	1,092	13.4	
Senior	58	37	3.11	2.75	7.5	1,205	13.4	

[1] Data are for the last year at North Auburn Beef Unit (1976-77) and first year at the new test unit (1977-78).

Comparative results of the first year in the new facility and the last year at the old site are given in table 2. A total of 84 bulls finished the 1977-78 test, of which 60 were sold. The ADG and WDA, respectively, were 3.12 and 2.78 lb. in the new facility, a substantial improvement over the 1976-77 values of 2.51 and 2.53 lb.

Average FE, which is calculated as pounds of feed required to produce a pound of gain, averaged 7.3 lb. for the 84 bulls. The range was from 5.6 lb. for a junior Charolais that had ADG of 3.19 lb. to 11.6 lb. for a senior Angus that gained only 1.86 lb. per day. These data indicate a correlation between ADG and FE.

Because of lower maintenance requirements, younger, smaller bulls will require less feed per unit of gain than will older, heavier bulls, table 2. Even though there was no difference in ADG (3.11 vs. 3.14 lb.) between senior and junior bulls, the junior bulls that averaged 1,092 lb. required 0.8 lb. less feed per pound of gain than the senior bulls that averaged 1,205 lb. at the end of the test.

Since feed accounts for the majority of the expense involved in beef production, it is extremely important that feed efficiency, as well as rate of gain, be considered in selecting bulls for commercial beef herds. Both of these traits are highly heritable and therefore subject to improvement through selection.

Farm Real Estate Market Developments and Implications

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

IT TAKES a lot of money to get set up in farming. The major reason is increasing farm real estate values. There are significant implications of higher farm real estate values to those who wish to start farming, those presently owning and operating farms, and to those contemplating the sale or transfer of a farm.

One has to go back to 1954 to find the last year that the average value of farm real estate per acre declined in the United States, see chart. Economic data available to the Agricultural Experiment Station show that for Alabama it was also 1954. However, the 1950's were generally a period of increasing farm real estate values. The last time of declining values for a period of years was in the 1930's.

But the period of most rapid increases, based on the record of farm real estate values, was the 1970's. Average annual percentage increases were in the teens with the highest of 23% for the United States registered in 1974. In Alabama, farm real estate values increased an average of 24% in 1974.

Since farm real estate is a major part of the capital investment in a farm, total capital investment has increased drastically in the past few years. USDA reported the average total investment in production assets per farm in 1978 as $219,625, or $142,622 per farm worker. This investment has more than doubled since 1972. A major part of the increase resulted from higher farm real estate values.

For the farmer who is attempting to get set up in farming, these higher values have major implications. Unless the person already owns farm real estate and has some equity accumulated, it is most difficult to obtain financing. One of the reasons is that farm earnings have not increased in proportion to real estate values.

Consider this example. Suppose that 6 years ago a young farmer could have bought a 400-acre farm for $300 per acre or a total of $120,000. Assume that net earnings from the farm would equal about $20,000. In 1978, based on the average increase in Alabama farm real estate since 1972, this 400-acre farm would have a price tag of about $573 per acre or a total of $229,200. Although net farm income has fluctuated considerably from year to year, as an average there has not been a great change since 1972. Thus, if only farm income is considered in financing the farm and the farmer bought the farm in 1978 rather than 1972, the ratio of capital investment required relative to income generated almost doubled. As a result of this situation there has been increased demand for income from nonfarm sources to help in the financing of farms. Many farmers and members of their families have obtained full or part-time jobs off the farm.

In some cases the increased farm real estate values have gone beyond the ability of the productivity of the land to support the high level values at present farm product prices. This is most pronounced in areas where non-farm factors such as urbanization are influencing values.

Farmers are not normally in the business of buying and selling farm real estate. Their objective is to generate net income from use of the land resource in farming. However, one way to capitalize on the increasing farm land value is to sell. The substantial increases in farm real estate values in recent years have invited non-farmers to invest in farm land and to take advantage of the rising market. There are tax advantages that may accrue, in particular from capital gains treatment of profits from the sale of farm real estate.

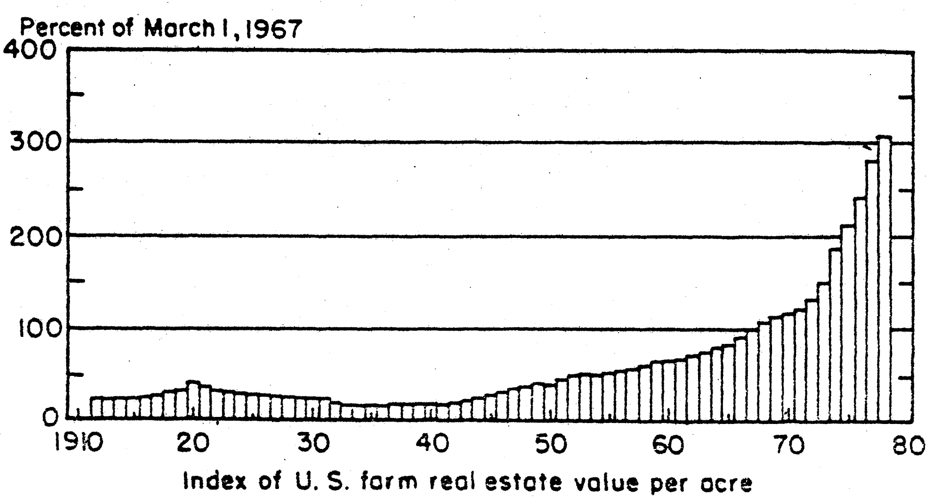
The investment by foreign groups and individuals in U.S. farmland has received attention in recent weeks and months. No doubt one of the reasons for such investments is to hedge against further inflation. Also, possible incentives may exist for foreign investors.[1]

To the farmer who invested in a farm several years ago, the increasing annual farm real estate values have meant the building of equity or an estate. Of course many farmers have used this increasing equity to buy additional land or expand operations. Records indicate that more than 50% of the purchases of farm real estate in recent years have been for enlargement purposes. This in itself has been a factor in increasing values because of the dollar amount a farmer is willing to pay for small tracts conveniently located to his existing farm. The increased price paid may be justified based on gains in efficiency of operation from increasing farm size.

A farmer who has built an estate of considerable value through increased real estate values or otherwise needs to make wise decisions in utilization of this estate for retirement purposes and inter-generation transfers.

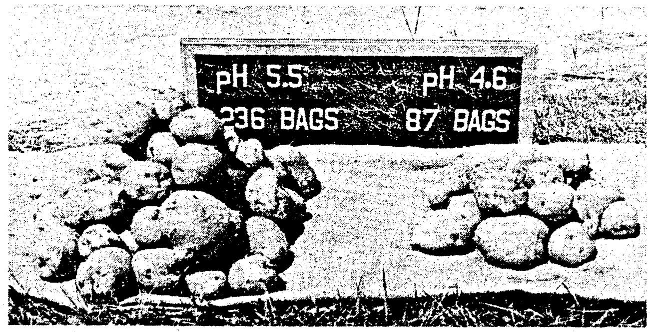
Thus the implications of farm real estate market developments depend on the situation in which the farmer finds himself and his opportunities to take advantage of the situation through wise management decisions.

[1] Donald Abramson, Karl Gertel, and James Lewis, "Federal Taxation of and Incentives for Foreign Investment in U.S. Real Estate," Proceedings of the Seminar on Federal Taxation and Land Use, Lincoln Institute of Land Policy, Cambridge, Massachusetts, April 9-11, 1978.



Index of U. S. farm real estate value per acre

Liming Potato Soils Can be a Good Practice



CLYDE E. EVANS, Department of Agronomy and Soils
J. L. TURNER, Department of Horticulture

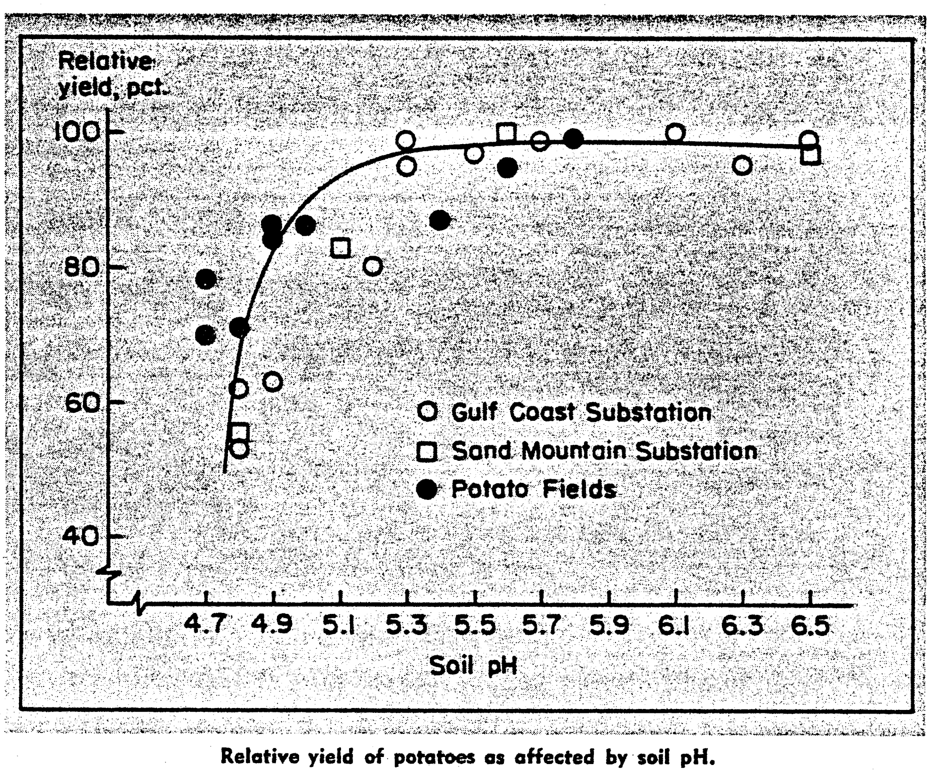
IT IS THE GENERAL practice in Alabama to grow potatoes in slightly acid soils, because of the danger of potato scab when soil pH value is above about 5.7. Because of a fear of overliming, commercial potato growers have a tendency to underlime their soils. With the widespread use of acid-forming nitrogen fertilizer, soil acidity progressively increases with fertilizer use. This acidity effect can readily be overcome by an adequate liming program. Without corrective liming, soil acidity will develop to the point that potato yields will be severely reduced.

During recent years, several liming experiments by the Auburn University Agricultural Experiment Station have verified a need for liming highly acid potato soils for commercial production. One of the most important findings is that maximum yields are realized in the soil pH range in which scab **does not** usually occur.

At the Gulf Coast Substation, in Baldwin County, an experiment was conducted on a Malbis fine sandy loam soil that had a soil pH range of 4.8 to 7.0. The soil pH values in the graph are for samples taken in winter prior to planting potatoes. Open circles on the graph represent potato yields as affected by soil pH at that location.

Maximum yield was realized at a soil pH of 5.3. At higher pH values, yields were about the same. No scab was observed at the higher pH values. However, potatoes had not been grown on this particular field before, and certified seed were used.

Another experiment was established in 1975, this one on a Hartsells fine sandy loam at the Sand Mountain Substation in DeKalb County. This location also included a range in soil pH values. Yields at this location are represented by the square points on the graph. Maximum yield was realized at pH 5.6. Yield was 83% of the maximum at pH 5.1 and only 55% of the maximum at pH 4.8. Raising the pH to 6.5 at this location did not increase yields over that at pH 5.6.



Relative yield of potatoes as affected by soil pH.

In 1974, lime experiments were begun on growers' potato fields in the Sand Mountain commercial potato producing area of northeastern Alabama to better define the soil pH requirements for potatoes. Placing such tests on farmers' fields, in addition to those on units of the Experiment Station, provides results under a variety of management practices on different soil types. These experiments cover a period of 5 years and are represented by the solid circles on the graph. Results show that a soil pH of about 5.3 is the point of maximum yield and that more acid soils sharply decrease yields. Liming some of these fields to pH 5.7 or higher resulted in potato scab disease.

The effect of acid soils on potato yields is deceptive, because plant symptoms may not be obvious. For example, plants growing side by side on a highly acid plot and on a limed plot may look the same in top growth. At harvest time, however, tuber yields will be less on the low-pH plots. Root observations at the Sand Mountain Substation about 6 weeks after planting indicated major differences in root growth as a result of soil pH differences. At pH 5.6, there was an extensive, well branched, healthy-looking, fibrous root system. At pH 4.8, there were only a few thickened, poorly branched roots. Even though plant tops grew about the same during the season, the effect of poor root growth was highly evident in tuber yields at harvest time.

All these tests show the same results: Maximum production can be realized within the soil pH range of 5.2-5.7, a pH range where scab does not occur. The results showed definite benefits of liming to correct high soil acidity caused by continuous use of fertilizers. However, there was no additional benefit from liming to pH values higher than 5.6, which would bring soils into the danger zone for potato scab.

LANDLORD-TENANT RELATIONSHIPS

SIDNEY C. BELL and BRUCE CANOLES
Department of Agricultural Economics and Rural Sociology

THE LAW defines a tenant as anyone who uses the land of another and pays rent either in cash, crops, or livestock. The tenant with a written, long-term lease is in an advantageous legal and economic position. However, many tenants continue to occupy land on a short-term agreement basis. Economic data available in the Agricultural Experiment Station show that in Alabama a short-term tenant is involved in one of three types of tenancy. In each type the landlord, as well as the tenant, is in different legal positions with varying legal rights and responsibilities in regard to continuation of the lease arrangement.

Tenancy from Year to Year

The first type of tenancy is "tenancy from year to year." Alabama law provides for the termination of lease agreements on an annual basis (December 1 unless otherwise specified), if the lease is an oral agreement or if rent is collected annually or unless a longer lease period is explicit and in writing. Therefore, any tenant who does not have a long-term written lease with a multi-year rental payment agreement has a "tenancy from year to year" leasing arrangement. The "tenancy from year to year" was created when the tenant made his oral agreement with the landlord to rent the property for the current year.

In the case of a "tenancy from year to year," the landlord has the right to reclaim his property when the lease term expires. However, the tenant is entitled to some considerations, and when and how the landlord repossesses his land are restricted by law. The "tenant from year to year" maintains all the possessory rights to the property granted him in the annual rental agreement for the full duration of his lease term. Nonetheless, the law clearly specifies that annual leases do not automatically carry over to the next year in the absence of a notice to terminate. Therefore, since the landowner is not obligated by law to give notice of his intent not to renew the oral lease, it is the responsibilitv of the renter to vacate the premises of the landlord when his current lease term expires. If the tenant does not vacate the premises on his own, the landlord may evict him. The landlord, however, must give the tenant proper notice of his intentions and the eviction notice may not be delivered until after the tenant's annual lease term has ended. After the lease has expired, the landlord has two legal-eviction remedies (unlawful detainer proceedings or ejectment) at his disposal to regain control of his property from a "tenant from year to year" who refuses to relinquish possession.

In a "tenancy from year to year" arrangement, the landlord's legal right to terminate the contract at the end of the current lease term is all but undisputable. Nevertheless, the tenant is protected by statutes and court decisions from errors by the landlord in interpreting the oral contract and from any unreasonable or unequitable demands of the landowner.

The second type of tenancy is a "tenancy at will." A "tenancy at will" is similar to "tenancy from year to year" in that no fixed term is specified. Under a "tenancy at will," however, a landlord or tenant may terminate the lease by giving the other party 10 days' written notice of intent to vacate the premises.

Tenancy at Will

A "tenancy at will" may be created implicitly if the tenant remains on the lands of the landlord after the term of a previous agreement has ended, and if the landlord does not voice objection to the arrangement. Under these conditions, the tenancy may be allowed to continue for an indefinite period, and often a "reasonable notice" is required rather than the customary 10 days' notice. Depending on circumstances the reasonable notice period may extend to 30 days, particularly if extension of the agreement was continued more or less on a monthly basis and a period in excess of 10 days is necessary for the tenant to vacate the premises. Although there is no security for either party in a "tenancy at will," both the landlord and the tenant have an equal legal right to terminate the agreement. However, in the event the landlord elects to end the lease, and if after proper notice the tenant refuses to leave the property, then the landlord has available the legal remedies of unlawful detainer and ejectment.

Tenancy at Sufferance

The third type of tenancy is a "tenancy at sufferance." Persons who acquire possession of land or other real property by some lawful means, such as an annual lease, but who fail to leave the premises after the term has expired and notice given, create a "tenancy at sufferance." There is a distinction between failure to vacate the lands creating a "tenancy at will" and one at sufferance. The "tenancy at will" was created implicitly with the approval of the landowner. A "tenancy at sufferance" is automatic when a tenant remains in control of the lands without the landowner's consent. Therefore a "tenant from year to year" upon expiration of his lease term becomes either a "tenant at will" or a "tenant at sufferance," depending on the acquiescence of the landlord. A "tenant at sufferance" is legally entitled to very few considerations by the landlord. About the only right the landowner must allow the "tenant at sufferance" is sufficient time to complete the job of moving.

None of the three types of short-term tenancy offer the renter or the landowner any certainty about the future of the landlord-tenant relationship. One year is not sufficient time to initiate farm improvement practices or justify acquisition of expensive machinery. The uncertainty of annual agreements reduces the incentive of both parties for making fixed investments that may not be recovered for several years, such as soil liming, building fences and other needed improvement, or various conservation practices.

Written Agreement Preferred

Another weakness of many Alabama landlord-tenant agreements is that it is an oral agreement. Oral leases for 1 year or less are legal and binding, but the written agreement is much preferred. The act of condensing an oral agreement to writing forces both landlords and tenants to think-out more of the detail of their agreement and reduces the possibility of a misunderstanding later about what the agreed terms were.

If the farm lease is chosen as a means to farming or farm operation enlargement it is definitely advantageous to have a written long-term lease agreement. This will provide better understanding between landlord and tenant and will contribute to the longevity of successful farm operations.

SOME FACTORS INFLUENCING PECAN SCAB DEVELOPMENT

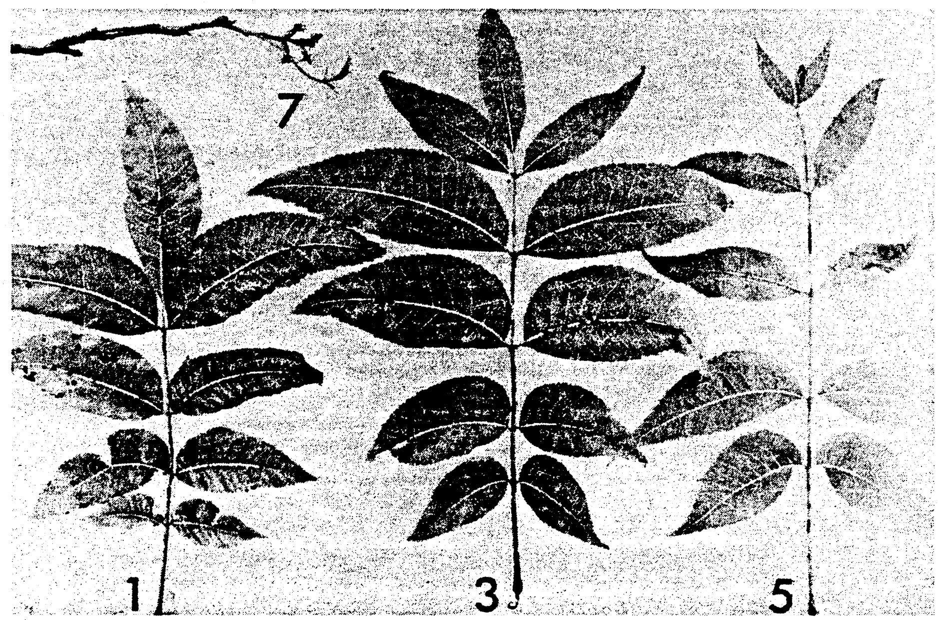
A. J. LATHAM, Department of Botany and Microbiology.

THE EXTENDED TIME interval when pecan trees produce new leaves provides a long susceptibility period for infection and conidial development by *Fusicladium effusum*, the causal fungus of pecan scab.

Pecan leaves are susceptible to scab when they are immature and yellow-green and become less susceptible as they mature and turn dark green. During this period, new scab lesions or leaf spots develop when environmental conditions are favorable. Leaf emergence along the growing shoot and maturity of leaflets along the leaf rachis prolongs the time and amount of susceptible pecan leaves available for scab development. An increasing number of lesions develop on each succession of leaflets during rainy or highly humid weather.

Development of scab lesions on pecan leaves was followed from April to the first part of June at the Bedingfield pecan orchard approximately 5 miles west of Auburn. Twenty compound leaves were collected by scientists of the Agricultural Experiment Station at weekly intervals per tree from four sectors around 12 randomly-selected mature Schley trees. If sufficiently mature, the second compound leaf was collected 7 days after the first leaf with similar procedures used for the third and successive compound leaves throughout the foliation period. Leaf buds opened about March 20 on Schley pecan with scab infection developing sufficiently for lesion counts to be made by mid-April. Lesion counts for each compound leaflet pair were recorded for each collection period.

The two-phase growth pattern of pecan foliage or the succession in leaf emergence and development that prolongs the susceptibility periods for *F. effusum* infection is illustrated in the photograph. A series of leaves from one representative pecan shoot were photographed during the first week of May.



Compound pecan leaves from the same shoot showing scab lesions (black spots) on matured and maturing leaflets. Only the alternately formed 1, 3, 5, and 7 compound leaves are illustrated.

Compound leaf 1 was mature, while the three terminal leaflets of compound leaf 3 and 5 were immature. The leaflets of compound leaf 7 were just beginning to unfold. Some lesions were just visible on maturing terminal leaflets of compound leaves 3 and 5. Extensive leafspot symptoms were evident on terminal leaflets late in May and June, table 1.

The data indicated that new compound leaves kept emerging along the elongating shoot to provide a continuous succession of susceptible leaf tissue. After the second week of May, lesion numbers increased very rapidly and, consequently, inoculum (spore populations) was intensified. These high-spore populations, accompanied by wet weather and an abundance of susceptible leaf tissue, resulted in such high lesion numbers that counting became difficult by June, table 2. Scab was so severe during 1975 that defoliation occurred in July and new leaves appeared in August. No nuts were set in this orchard during 1976. This tends to confirm reports by other researchers that pecan trees must retain their leaves well into the fall to obtain a nut set the following year.

The susceptibility period of pecan foliage may extend for 90 or more days during leaf development. During this time, protective fungicide applications made at regular intervals are essential to (1) control inoculum buildup and (2) prevent infection of the tender young pecan nutshucks.

TABLE 1. NUMBER OF SCAB LESIONS ACCORDING TO SAMPLING DATE, LEAFLET PAIR, OR TERMINAL LEAF DURING 1976

Date	Compound leaf	Maturity of terminal leaflets[1]	Leaflet pairs and average number of lesions						Terminal leaflet lesions	Total lesions
			1	2	3	4	5	6		
	No.	*Pct.*								
April 16	1	—	—	—	—	—	—	—	—	1.4
April 23	1	55	—	—	—	—	—	—	—	7.3
April 30	2	73	—	—	—	—	—	—	—	7.7
May 7	3	84	2.0	2.2	2.3	1.7	2.1	0	1.2	11.5
May 14	4	89	1.4	1.4	1.4	1.5	3.9	1.0	2.7	12.5
May 21	5	90	0.6	0.8	2.5	9.2	11.3	2.3	8.1	34.8
May 28	6	90	0.5	2.0	9.9	22.4	33.9	14.7	19.3	102.7
June 4[2]	7	91	3.4	15.8	45.7	76.7	94.2	56.3	55.7	347.8

[1] Based on development of 3 terminal leaflets.
[2] Trees were fully leafed-out, a few new leaves emerged on terminal shoots throughout the summer.

TABLE 2. AVERAGE NUMBER OF SCAB LESIONS PER COMPOUND LEAF ON SCHLEY PECAN ACCORDING TO WEEK AND YEAR

Month and week		1975	1976
April	2	----	1.4
April	3	----	7.3
April	4	36.2	7.7
May	1	69.3	11.5
May	2	40.5	12.5
May	3	285.8	34.8
May	4	238.0	102.7
June	1	300.0	347.8

Pond Water Movement Can Improve Natural Aeration

C. D. BUSCH and C. A. FLOOD, JR., Dept. of Agricultural Engineering

ON A SUNNY DAY the plant life in a catfish pond manufactures oxygen rapidly enough to boost the pond water oxygen concentration up to supersaturated levels. It's not uncommon to measure 10-14 parts per million (p.p.m.) of oxygen even though the saturation level is only 7 or 8 p.p.m. At least this is true in the top few feet of pond water penetrated by sunlight. Beneath the level of light penetration, if there's no top to bottom water movement, the oxygen concentration may be near zero p.p.m. Catfish cannot survive in water in which oxygen concentration has dropped below about 1.0 p.p.m.

Since oxygen depletion is the most common cause of massive fish kills, it is beneficial to maintain adequate levels of dissolved oxygen in the deeper locations of the pond. This allows for a more continuous oxidation of waste products and increases the total reserve of oxygen available in the pond.

Experiments at Auburn University's Agricultural Experiment Station with multiple paddlewheels, like those shown in figure 1, have demonstrated their value in mixing oxygen rich and oxygen poor water. Six paddlewheels, powered by ¼ hp. electric motors, were positioned to provide circular water movement in a 1.4 acre pond as shown in figure 2. The paddlewheels were controlled by time clocks and set to run continuously for 5 hours. Dissolved oxygen measurements were made periodically to note any changes of concentration.

The results for one set of measurements are shown in the accompanying table. An hour before the paddlewheels were started, a definite decrease in oxygen level was evident for measurements made in the deeper locations. After 2 hours of operation (3:00 a.m.) some improvement in oxygen level near the pond bottom could be seen. After 5 hours of stirring, the water had achieved a uniform oxygen content. This was true for both the deepest location within the main paddlewheel current, and the northwest corner which was a good distance outside the flow circle. Decrease in oxygen levels at the surface is due to mixing, oxygen use by fish waste and plants in the pond, and the mechanical aerator's removing oxygen from the water when it is supersaturated. (In this case about 7.3 p.p.m.).

DISSOLVED OXYGEN LEVELS AS INFLUENCED BY WATER MOVEMENT (PARTS PER MILLION)

Time	Deepest pond location			Northwest corner		
	Depths					
	1'	5'	10'	1'	4'	8'
Midnight	8.5	8.3	2.7	8.5	8.2	3.8
	Paddlewheels on 1:00-6:00 a.m.					
3:00 a.m.	7.2	6.6	3.9	7.4	7.4	6.0
6:00 a.m.	6.6	6.7	6.6	6.7	6.7	6.5

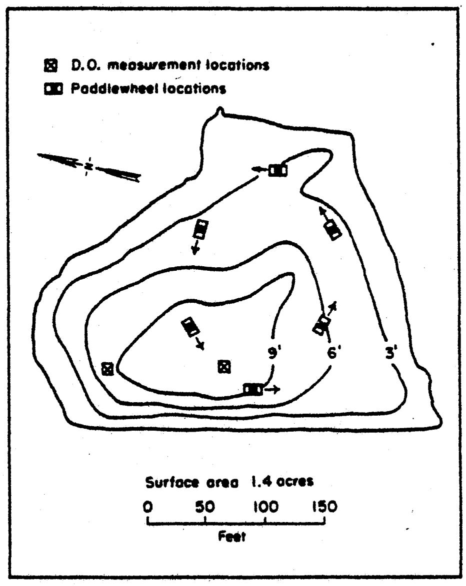


FIG. 2. Catfish pond with paddlewheel and measurement location

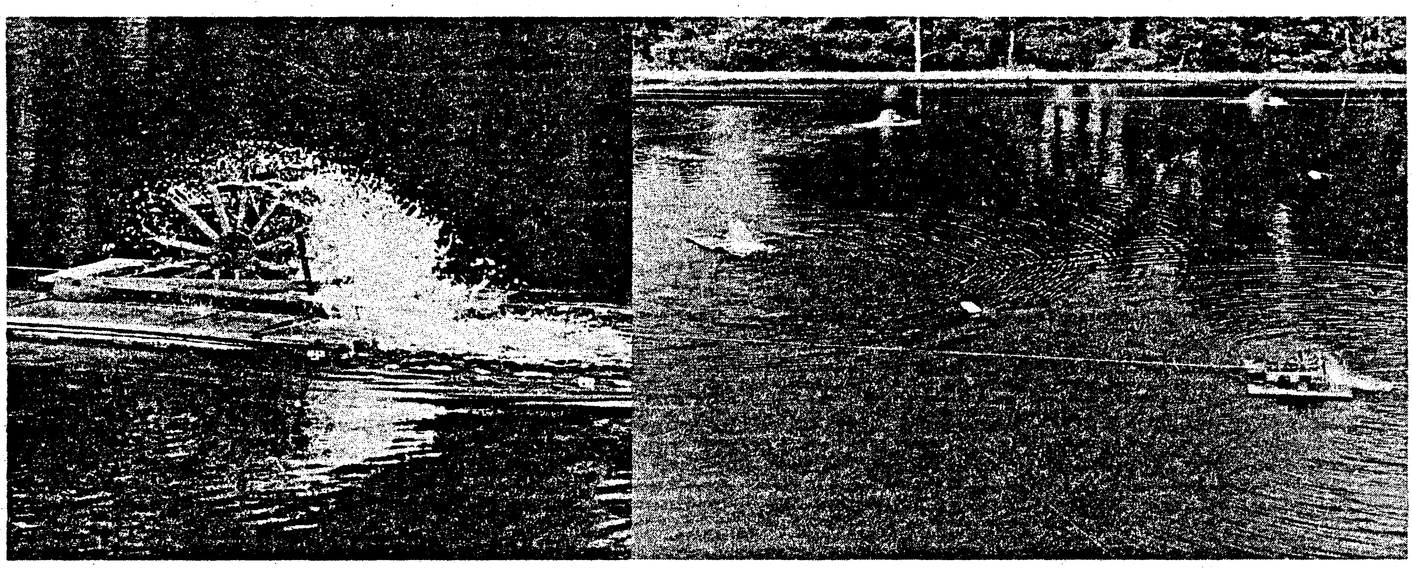


FIG. 1. Paddlewheels in action.

Tomatoes were grown with and without irrigation (left) and with three nitrogen rates (right).

GOOD FALL TOMATOES WITH TRICKLE IRRIGATION

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FALL-GROWN TOMATOES are not generally thought to be a good crop in Alabama because of drought, high temperatures, and disease and insect problems. However, Alabama's late frost date allows sufficient time for a fall crop if these adverse conditions can be overcome.

Nothing can be done about heat, of course, but irrigation can solve the drought problem. Trickle irrigation resulted in good production in 1978 research by the Auburn University Agricultural Experiment Station. Despite severe drought, both yield and quality were high when irrigation was combined with strict disease and insect control measures.

Different nitrogen rates, number of applications, and methods of application also were studied in the irrigation project with Tropic variety of tomato. Nitrogen rates compared were 40, 80, and 120 lb. per acre – applied either dry or in the irrigation water. The dry N material was ammonium nitrate. That put out in irrigation water was a commercial solution of equal amounts of urea and ammonium nitrate containing 30% N.

For treatments getting two N applications, one-third was applied at planting and the remainder when fruits on the first hand were approximately 1 in. in diameter. Plots getting eight N applications received N at weekly intervals beginning at planting.

Test plots were rototilled and chiseled beneath the row to a depth of 12-15 in. immediately before plants were set July 6. The P and K fertilization was based on soil test. Weekly spraying with insecticide and fungicide provided effective pest control.

Water for the trickle irrigation system was applied through a single line of twin-wall plastic tubing placed on the soil surface next to the plants. Liquid nitrogen solutions were loaded into cylinders and injected by compressed air into the irrigation lines through plastic quick-couplers. Amounts were controlled according to the individual row treatment.

Rainfall was unusually low during the latter part of the 1978 fall crop period. Total rainfall from planting to last harvest was 10.8 in. However, only 1.6 in. of this fell during the 71-day period preceding last harvest.

Plants were irrigated approximately 5 to 6 days after rain and every 2 days thereafter. About 1/4 in. of water was applied at each irrigation. Number of irrigations totaled 36 for the season, with 8.6 in. of water applied.

Early plant growth and plant height at first harvest showed little difference among treatments. Average final plant heights ranged from 47 to 54 in. for the different treatments shown in the table. But there were tremendous differences in yield among treatments, especially between irrigation and no irrigation, as shown by data in the table.

Irrigation increased marketable yield an average of 20,000 lb. per acre, nearly double the production without irrigation. At the 120-lb. N rate, marketable yields ranged from 20,460 lb. per acre with soil applied ammonium nitrate and no irrigation to 50,490 lb. with trickle irrigation and weekly applications of liquid N.

Increasing N from 40 to 80 lb. per acre boosted marketable tomato yield an average of 7,100 lb. A further N increase, to 120 lb., increased production another 1,060 lb. per acre.

Method of applying N also had an effect on production, as shown by results with 120 lb. of N in two applications. Applying it in irrigation water increased yields by about 8,400 lb. per acre over the same amount to the soil. Dividing the N into 8 weekly applications increased yields an average of 2,850 lb. per acre over that for the two N applications (average of all rates).

Yields reported were obtained in harvests over a 4-week period, with the last harvest on October 24. All marketable size tomatoes were harvested October 24 in anticipation of a freeze. Neither a freeze nor killing frost occurred as anticipated, however, and tomatoes continued to produce and were harvested until December 5. Marketable yields would have been considerably higher if harvesting for yield records had been extended to December 5 in the normal manner.

In addition to boosting yield, irrigation also increased the percentage of large size fruit. An average of 71% of fruit on irrigated plots was rated large, as compared with 45% on nonirrigated plots. There also were fewer cull tomatoes on irrigated plots – 15% as compared with 34% with no irrigation.

These results indicate that high yields of high quality tomatoes can be produced in the fall by use of trickle irrigation and adequate nitrogen.

MARKETABLE TOMATO YIELDS AS AFFECTED BY IRRIGATION, NITROGEN RATE, NUMBER OF N APPLICATIONS, AND N APPLICATION METHOD

Irrigation and nitrogen treatment	Marketable yield/acre, by N rate/acre		
	40 lb.	80 lb.	120 lb.
	Lb.	*Lb.*	*Lb.*
No irrigation			
Dry mix ammonium nitrate, 2 applications	—	—	20,460
Trickle irrigation			
Dry mix ammonium nitrate, 2 applications	—	—	40,550
Liquid N in irrigation, 2 applications	39,060	47,630	48,950
Liquid N in irrigation, 8 applications	44,020	49,690	50,490

Cattle Egret Damage To Pine Plantations

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SINCE THE EARLY 1960's cattle egrets, large white birds seen feeding in pastures with cattle, have come into Alabama and become our most common wading bird. Their habit of feeding on pasture insects, or following mechanized equipment and feeding on soil insects and small animal life, have all been quite beneficial; and cattle egrets are welcome in most agricultural situations. However, when allowed to nest in large numbers in pine plantations, they do damage trees.

An excellent example of this damage is in a pine plantation adjacent to the Holiday Inn in Tuskegee in Macon County. Egrets have nested there since 1970, but only since 1973, when the nesting colony increased in size to about 12,000 birds, has the damage been so evident.

The birds have concentrated in an area about one-half acre in size, shifting to different areas in the plantation after the trees die. The figure (left) shows the destruction in the center of the plantation; the trees already down and replaced by undergrowth. The figure (right) shows the appearance of the area, while the tree stubs were still standing. This is almost a complete loss as a pine plantation.

Though fecal droppings of the birds landing on leaves defoliate trees quickly, it is changes in the soil that are the most significant.

Soil samples were taken in the colony area for several years and control samples taken at the edge of the area, away from the nesting birds and their droppings. The table shows the soil sample data for 3 years. The samples vary but the overall general tendency is the increase in pH and usually greater increase in all of the nutrients. The pine trees were growing well on the control soils, but then phosphorus was increased 13 to 104 times, potassium increased four to 19 times, magnesium two to 12 times and calcium one and a half to eight times. This was more than the pine trees could tolerate and they quickly died.

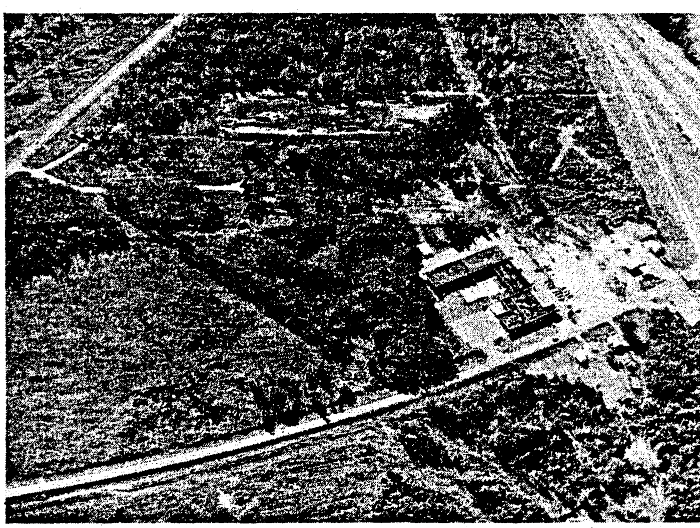
Cattle egret colonies must be kept in areas where they are compatible with man's activities. When they nest in pine plantations, they should be immediately induced to move before they can cause damage. This doesn't mean for landowners to kill the birds, because cattle egrets, like most other birds, are carefully protected by State and Federal laws. Instead, contact a Fish and Wildlife Service agent. In Alabama, contact Keith McCartney, whose office is in Room 727, of the Federal Building at 474 South Court Street, Montgomery 36104. His phone number is 823-7228. Fish and Wildlife agents can determine the legal and proper way of solving cattle egret problems and help landowners to solve them.

In this way the cattle egrets can be carefully caused to move from a place, where they will cause damage, to another site nearby, where the benefits can be enjoyed.

SOIL DATA FROM THE TUSKEGEE HERON COLONY SITE

Date	Sample	pH	Phosphorus[1]	Potassium	Magnesium	Calcium
9-16-76	1	6.3	1,505	1,082	468	3,058
	2	6.1	1,555	1,500	521	1,966
	3	5.2	690	772	115	650
	Av.	5.9	1,250	1,118	368	1,891
	Control	4.6	15	77	42	363
7-14-77	1	7.0	905	999	324	1,994
	2	6.4	140	450	125	918
	3	7.0	615	999	244	1,233
	Av.	6.8	553	816	231	1,382
	Control	6.4	28	113	60	529
8-28-78	1	6.3	440	427	144	810
	2	6.0	256	359	64	250
	Av.	6.15	348	393	104	530
	Control	5.8	20	40	19	160

[1] All nutrients expressed as pounds per acre.



Aerial view of Tuskegee Holiday Inn, the pine plantation remains to the left and the center of the pine plantation, devoid of trees. Ground view of the center of the pine plantation, showing the dead trees.

Screening Corn For Aflatoxin: A New Approach

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AFLATOXIN B_1 IS A potent carcinogenic mycotoxin produced by the mold *Aspergillus flavus* on corn in the field and in storage. In recent years, feed and livestock producers in the southeastern United States have suffered from problems caused by aflatoxin in corn. In 1977, 60% or more of the corn grown in the South contained at least 20 ppb ($\mu g/kg$) aflatoxin – the legal maximum level permitted by the Food and Drug Administration for corn in interstate commerce.

Most methods for detection and analysis of aflatoxin in corn are time consuming and expensive. The bright greenish-yellow fluorescence (BGYF) test has been used extensively for rapid screening. Unfortunately, this test is highly controversial and generally less reliable than most circumstances demand. Minicolumn procedures are reliable but are also expensive and time consuming. Minicolumn methods require 10-15 minutes and cost approximately $1.00 per sample (supplies only). Commercial laboratories charge $15.00 or more per sample for aflatoxin analysis by minicolumn methods.

A new approach for detection and analysis of aflatoxin in corn has recently been developed in the mycotoxin laboratory at Auburn University Agricultural Experiment Station. It is called the Fluorometric Iodine Rapid Screening (FL-IRS) method. The FL-IRS method requires about 7-8 minutes and costs about five cents per sample (supplies only). Samples are designated aflatoxin positive or aflatoxin negative by this test. Aflatoxin positive samples may be further analyzed by one of the standard methods. No further analysis is required for aflatoxin negative samples.

For analysis, corn samples are finely ground and 10 grams of each sample of corn are stirred for 2 minutes with 25 ml of extraction solvent (80% methyl alcohol-20% water). Fifty ml of zinc acetate-salt solution is stirred into the mixture and the sample is filtered under vacuum. The clear filtrate is diluted with water to 100 ml. A check (control) is similarly prepared using corn which is known to be free of aflatoxin.

One ml of a saturated aqueous solution of iodine is added to a 20-ml aliquot of each clarified sample extract. A Coleman Model 12-C Electronic Photofluorometer, equipped with special filters, is used for estimating the fluorescence of the sample extracts containing aflatoxin. The instrument meter is adjusted to zero using a water blank and to 50 using the clear extract of the check (aflatoxin-free corn). Fluorescence of samples is then determined by reading the meter of the instrument. Samples with meter readings of 54 to 100 are labeled aflatoxin positive and samples with meter readings of 0 to 53 are labeled aflatoxin negative.

TABLE 1. SCREENING OF 170 CORN SAMPLES FOR AFLATOXIN BY FL-IRS METHOD[1]

Group	No. of samples	FL-IRS screen neg./pos.	Aflatoxin[2] ppb	Comment
I	119	negative	0	correctly labeled
II	32	positive	6-650	correctly labeled
III	14	positive	0	false positives
IV	5	negative	5,5,8,9,106	false negatives

[1] Fluorometric iodine rapid screening procedure.
[2] Determined separately by quantitative analysis by FL-I method.

TABLE 2. SCREENING OF 170 CORN SAMPLES FOR BGY FLUORESCENCE[1]

Group	No. of samples	BGYF neg./pos.	Aflatoxin[2] ppb	Comment
I	86	negative	0	correctly labeled
II	28	positive	8-560	correctly labeled
III	47	positive	0	false positives
IV	9	negative	5,6,9,10,10 47,52,228,300	false negatives

[1] Also known as the black light test.
[2] Determined separately by quantitative analysis by FL-I method.

Table 1 lists the results of screening 170 randomly selected samples of corn by the FL-IRS method. Actual aflatoxin content as determined separately for each sample by quantitative analysis is also listed in table 1. Table 2 presents results of the BGYF test on the same group of 170 samples (50 corn varieties grown in 1978 at five widely scattered locations in Alabama).

Results (table 1) show that only one sample containing more than 20 ppb aflatoxin passed through the FL-IRS screen compared with four (table 2) that passed through the BGYF screen. Moreover, the BGYF screen falsely labeled 47 samples as contaminated compared with only 14 false positives via the FL-IRS screen. The false positives do not represent a health hazard, since they do not actually contain aflatoxin and in any event would not be consumed without further analysis. However, they are of importance since the follow-up quantitative analysis is both time consuming and expensive. Results also show that the FL-IRS test incorrectly labeled five samples as false negatives. However, only one of the false negatives contained more than 20 ppb of aflatoxin. False negative samples are important since they contain aflatoxin but are labeled aflatoxin negative. By comparison, the BGYF test incorrectly labeled nine samples as false negatives, of which four contained more than 20 ppb aflatoxin.

These results show that the new FL-IRS screening method for aflatoxin in corn is more accurate than the BGYF test. Other than capital outlay, the two screening methods would require about the same time and expense for sample analysis. Overhead and labor would be similar for both methods. Since the BGYF test is controversial, the FL-IRS method appears to be a valuable new screening method for aflatoxin in corn.

Toughness of southernpea pods was measured by specialized laboratory machine (left), which measured force necessary to penetrate the pod with a stainless steel probe (right).

Southernpea Pod Toughness Appears Related to Resistance to Curculio

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SOME SOUTHERNPEA VARIETIES consistently sustain less damage from the cowpea curculio than others growing next to them in the same field. Such variety resistance to the crop's major insect enemy could be valuable to growers.

Incorporating resistance into varieties has been difficult because of the lack of understanding of the mechanism of resistance. Two Auburn University Agricultural Experiment Station projects shed some light on the question. Both were reported in *Highlights*.

The first[1] indicated that resistance to curculio attack was due in part to the lack of a feeding stimulant in the pods which made them less attractive to the insects. In the second project[2], microscopic examination of pod cell structure showed basic differences between resistant and susceptible cultivars in the cell walls of the fiber layer of pods. This observation led to the conclusion that these differences might contribute to differences in pod strength or toughness. Pod toughness that discourages penetration of the pod by insects might therefore be a factor in plant resistance, along with the chemical factor.

The latest Auburn study dealing with the question measured differences in pod toughness. A specialized laboratory machine (Instron Model 1122 Food Testing System fitted with a small stainless steel probe 1 mm in diameter) was used for testing the pods.

After seeds were removed, the fresh pods were stretched over a polyurethane block and hand held while the probe penetrated the pods at the points which had covered the center of each seed. Pods were selected from two curculio resistant breeding lines (Ala 963.8 and CR 22-2-21) and one curculio susceptible variety (California Blackeye). Pods representing seven stages of maturity were tested.

In the three immature stages there was no obvious correlation of curculio resistance with pod strength, as shown by data in the table. In fact, at the immature stage, pods of the susceptible California Blackeye were at least as resistant to pod puncture as pods of the resistant lines. As the pods matured, however, the force necessary to puncture the resistant pods became significantly higher than in the susceptible cultivar. This is important since curculio feeding is much more active on the mature pods, especially on those in mature I and II stages.

Though all the pods were ranked subjectively by size, seed maturity, and color into seven maturity groups, there were essentially only two maturity stages on the basis of pod strength. Analysis of data for all lines and varieties tested showed no differences among the three early stages or the four later stages.

Analysis of data from all stages showed (1) there were no significant differences in force values between the two lines, and (2) the two resistant lines required significantly more force to penetrate the pods than was true for the susceptible variety.

Obviously, mature pods of curculio resistant southernpeas are harder and more difficult to penetrate than those of varieties that are susceptible to curculio attack.

FORCE REQUIRED TO PUNCTURE PODS OF THREE SOUTHERNPEA CULTIVARS AT THREE MATURITY STAGES

Maturity stage	Grams of force to puncture pods[1]		
	California Blackeye	CR 22-2-21	Ala 963.8
Immature I	65a	50b	58ab
Immature II	61ab	54a	66b
Snap	64a	72b	60a
Mature I	52a	138b	104c
Mature II	96a	136b	126b
Color	109a	126b	143c
Dry	76a	125b	176c

[1] Means followed by the same letter are not significantly different at the 5% level, within maturity groups.

[1] RYMAL, K. S. AND O. L. CHAMBLISS. 1975. Insect Resistant Southernpeas May Lack Chemical Attractants. *Highlights*, Vol. 22, No. 1.

[2] ENNIS, T. H. AND O. L. CHAMBLISS. 1976. Pods Resist Insect Penetration in Curculio Resistant Southernpeas. *Highlights*, Vol. 23, No. 1.

Creep Fed Calves Heavier at Weaning

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THERE'S NO QUESTION that creep feeding boosts weaning weight of beef calves. But that does not necessarily mean that nursing calves should get creep feed. Such factors as quantity, quality, and distribution of forage, milking ability of cows, calving season, and price of feed in relation to anticipated calf prices are points that must be considered.

Several creep feeding experiments have been conducted at the Black Belt Substation in earlier years using Hereford and crossbred cattle. In a newer 5-year experiment by the Auburn University Agricultural Experiment Station at the same location, creep feeding was evaluated with calves from Hereford cows sired by Hereford, Charolais, and Simmental bulls.

The test cattle were on dallisgrass-white clover pasture, 1½ acres per cow-calf unit. Grass hay and supplement were fed to cows in winter. Calves were born from November to mid-January and weaned August to October. All weaning weights were converted to 270-day figures.

Cows and nursing calves were equally divided into three groups, based on breed of calf. A control group (group 1) received no creep feed. The other two groups were creep fed: group 2 received a high protein (19%), low energy feed; and group 3 was fed whole shelled corn, a low protein, high energy feed.

Consumption of creep feed averaged 671 lb. per calf per year for the high protein group and 716 lb. for those fed low protein feed. It required 9.68 lb. of high protein and 10.71 lb. of low protein creep feed to put on an extra pound of gain over the control. During the 112-day winter period when calves were small, 5.59 lb. of high protein and 5.31 lb. of low protein creep feed were required for an extra pound of gain.

Weaning weights of all breeds were heavier in groups 2 and 3 than in group 1, table 1. There was no significant difference between the two rations (groups 2 and 3) in weaning weights. Steers and heifers showed the same type response to creep feeding.

Steers and heifers getting creep feed also weaned with higher live slaughter grades, table 1. Group 3 steers graded slightly higher than group 2 steers, and group 3 heifers had higher grades than those in group 2. However, these differences were too small to draw any definite conclusions.

With both creep treatments, Charolais and Simmental sired steer and heifer calves were significantly heavier at weaning than Hereford sired calves, table 2. There were no significant differences between Charolais and Simmental calves. Even though there were only minor differences in live slaughter grades, Hereford calves had more backfat than other breeds when measured by sonoray. Calves of all breeds in the high and low protein groups had more back fat than controls.

Results of the recent creep feeding study show that calves getting either high or low protein creep feed wean heavier than non-creeped calves. Differences in the rations did not affect weaning weight. All Hereford calves in both creep groups averaged 63 lb. heavier than non-creeped calves of the same breed. With Charolais and Simmental crosses, the difference was 64 lb. per calf in favor of creep feeding.

Although all breeds responded about the same to creep feeding, between-breed differences were noted. Charolais and Simmental sired calves averaged 55 lb. heavier than Hereford sired calves under each feeding treatment.

TABLE 1. PERFORMANCE OF CALVES IN CREEP FEEDING TEST, AVERAGE OF ALL BREEDS

Feeding treatment	Weaning weight		Live grade[1]	
	Heifers	Steers	Heifers	Steers
	Lb.	*Lb.*		
Control (group 1)	498	542	9.7	9.6
High protein creep (group 2)	568	612	10.8	10.3
Low protein creep (group 3)	567	604	11.0	10.7

[1] 9 = low Good, 10 = middle Good, 11 = high Good.

TABLE 2. PERFORMANCE OF DIFFERENT BREED CALVES IN CREEP FEEDING TEST, AVERAGE OF CREEP TREATMENTS

Breed of calf	Weaning weight		Live grade[1]	
	Heifers	Steers	Heifers	Steers
	Lb.	*Lb.*		
Hereford	515	554	10.6	10.2
Charolais x Hereford	574	612	10.6	10.3
Simmental x Hereford	555	617	10.2	10.2

[1] 10 = middle Good, 11 = high Good.

IS CULTIVATION NECESSARY for COTTON?

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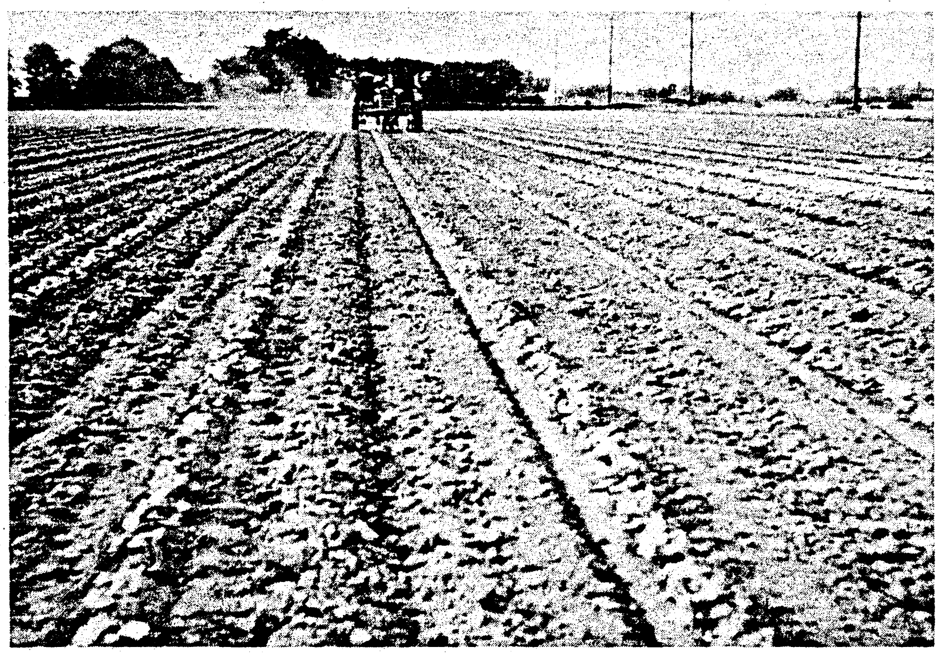
FROM THE BEGINNING of row crop agriculture, farmers have pulled weeds by hand, hoed them out of the soil, uprooted and buried them with cultivators drawn by animals and later by tractors, and most recently killed them with herbicides. Some chemical weed control practices are so effective that little if any cultivation is needed for weed control in crops such as cotton. If weeds are not a competitive factor for cotton growth, can cultivation be eliminated without losing yield? Research shows that it can.

Effects of shallow cultivation, deep cultivation, removal of weeds without stirring the soil, and allowing weeds to compete with cotton were determined in experiments at the Tennessee Valley and Sand Mountain substations of the Agricultural Experiment Station on Decatur silty clay loam and Hartsells fine sandy loam soils, respectively. Experimental areas were essentially level and were plowed to about 9 in. depth with a moldboard plow in late winter each year. One and sometimes two diskings were made during seedbed preparation. Stoneville 213 cotton was planted with conventional 4-row planters in 42-in. rows each year on the same plots. Fertilization, disease, and insect control practices were applied as necessary to remove these factors as yield limitations. Cultivation treatments began early in the season and consisted of (a) flatweeding or cutting weeds at the soil surface with a sharp hoe without stirring the soil, (b) three shallow cultivations, (c) three deep cultivations, and (d) no weed control. Shallow cultivations were made with tractor-mounted sweeps set flat to run 2 to 3 in. below the soil surface, while deep cultivations were made with the same equipment set to run 4 to 6 in. deep. Weeds in the row not removed by cultivation were hoed as necessary to prevent competition. Herbicides were not used in any of these treatments. The flatweeding treatment simulated a herbicide effect without tillage.

In each of 5 years at Tennessee Valley, good yields of cotton were obtained where weeds were removed, but essentially no yield obtained where weeds were uncontrolled, see table. The equal results of shallow and deep cultivation and weed removal without stirring show no beneficial effects of cultivation beyond weed control. Similar results were obtained in 2 of 3 years at Sand Mountain.

Elimination of weed competition was the critical factor for high yielding cotton; except for 1969, no advantage was gained with cultivation. In this year, cotton yield was increased by deep cultivation as compared with flatweeding. A similar trend occurred in 1970, but variability indicated that the cultivation effect was probably not significant in 1970. Other tillage experiments on this soil show cultivation increases rainfall infiltration and improves corn yield. With cotton, however, this apparently is not a major factor. Differences in the nature of the root systems of cotton and corn, as well as differences in water requirements, may account for their relative responses to cultivation. While cultivation was generally no advantage to cotton, neither was it detrimental. Root pruning by deep or late cultivation has been implicated in injury of corn and soybeans. For cotton, the primary requirement is weed control with effective and economical use of herbicides, cultivation, or combination of both.



YIELD OF SEED COTTON AS INFLUENCED BY CULTIVATION

Treatment	Seed cotton yield per acre				
	1969	1970	1971	1972	1973
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Tennessee Valley Substation, Decatur sicl.					
Flatweed	2,174	2,724	4,454	3,259	2,677
Cultivate shallow (3 times)	2,097	2,647	4,183	3,360	2,895
Cultivate deep (3 times)	2,265	2,685	4,397	3,127	2,740
No weed control	220	40	20	0	864
Sand Mountain Substation, Hartsells fsl.					
Flatweed	3,053	2,950	3,419	-------	-------
Cultivate shallow (3 times)	3,272	2,984	3,128	-------	-------
Cultivate deep (3 times)	3,395	3,347	2,989	-------	-------
No weed control	153	278	5	-------	-------

REDUCING PRICE RISKS FOR PRODUCERS OF AGRICULTURAL CROPS

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FARMERS ARE CONFRONTED with many problems when trying to market products effectively. Price uncertainty is a major risk that has traditionally plagued farmers.

Historically, the farmer's price was assured only after transferring ownership in the marketplace. Unstable and volatile input and farm commodity prices, inflation, international developments, technical advances, various government farm policies, and seasonal weather conditions are some of the factors which have added to uncertainty in farm production and marketing. In addition to this uncertain environment is the fact that a majority of the markets utilized by farmers have market power concentrated on the side opposite them.

Farmers are still basically "price takers." However, shifts in institutional arrangements in markets in recent decades have provided them more alternatives. Thus, some flexibility as to marketing and pricing strategies employed by farmers does exist, enabling them to better their economic position through effective marketing planning.

Agriculture has experienced a large increase in the number and types of coordinated activities, ranging from complete vertical integration to various forms of contractual relationships. Through research conducted at Auburn University's Agricultural Experiment Station, attempts are being made to identify the nature and structure of farm-level markets for major agricultural crops in the State, and also to determine the extent to which farmers are utilizing alternative marketing and pricing strategies to improve their economic position and reduce price risks.

Information obtained revealed that alternative marketing opportunities were available for soybean, cotton, peanut, and corn producers. For various reasons, however, individual producers restricted the number of alternatives used. Peanut producers had the most options with an average of almost three potential buyers available, see table. Cotton farmers had the fewest selling alternatives. Twenty-nine percent of the cotton producers knew of only one market outlet, and 92% sold to only one buyer. Other commodity producers seemed to be fairly loyal to one marketing firm in that 60% or more of the producers sold to one outlet. Prices, convenience, and tradition were reasons most commonly offered to explain this relationship.

Cooperative organizations were found to be important in marketing soybeans, peanuts, and corn. One-half of the soybeans and about one-third of the peanuts and corn were sold through these outlets. Cooperatives act to gain market power for their members; that is, they attempt to increase competition in the market and thus increase economic benefits to members through higher prices and income. Higher than average prices received at cooperative outlets indicated that they were achieving their goals and were viable alternatives. In fact, the differences in prices could result in substantially higher incomes for producers marketing large volumes through these outlets.

Alternative marketing and pricing strategies for soybean, cotton, and corn producers were not used extensively to cope with risks. Over one-third of the soybean and cotton producers and almost three-fourths of the corn producers sold their output at harvest. Another 29% of the soybean producers, 38% of the cotton producers, and 20% of the corn producers sold part of their output at harvest and stored the remainder hoping for higher prices. The government loan program was utilized by 6% of the cotton producers. Marketing peanuts differed from marketing of other commodities in that government policy influenced pricing and marketing in a way that resulted in less need for farmers to utilize alternatives.

One-third of the soybean producers and 13% of the cotton producers used contracts in which price and other marketing terms were stipulated. These varied from forward contracting arrangements, which were most prevalent, to deferred pricing arrangements. Hedging in the futures market was not a common practice among Alabama farmers.

In summary, Alabama farmers have alternatives available in marketing and pricing products. Basically, they continue to sell products at harvest, but storage, contracting, and hedging are being used to prevent drastically low prices at harvest and to reduce extreme price variability. Several reasons for the lack of more extensive use of alternative practices were reported. First, farmers lacked the necessary information to initiate these actions. Second, bad experiences may have been detrimental to continued use of the alternatives. Use of practices that reduced losses resulting from price declines also limited potential gains in the case of price increases. Some farmers prefer to assume risks and accept gains and/or losses that result. Farm commodity prices are moving on an upward trend. At higher levels of prices, opportunities for wide price fluctuations are greater and use of practical pricing alternatives will grow in importance to farmers.

MARKETING PRACTICES AND STRATEGIES OF CROP PRODUCERS, BY MAJOR CROPS, ALABAMA, 1977 CROP YEAR

Item	Unit	Major crops			
		Soybeans	Cotton	Peanuts	Corn*
Marketing practices:					
Potential buyers identified by seller	no.	2.5	1.7	2.7	2.3
Sellers knew of only one buyer	pct.	13	29	6	17
Buyers utilized	no.	1.5	1.1	1.5	1.4
Sold to only one buyer	pct.	62	92	80	65
Used cooperative outlet	pct.	60	6	34	33
Price received—all	dol.	6.26	.50	402	2.20
Price received—cooperatives	dol.	6.33	**	407	2.38
Marketing strategies:					
Harvest and sell	pct.	37	39	96	71
Sell part at harvest and store rest	pct.	29	38	—	20
Contract agreement	pct.	33	13	—	5
Use of govt. loan program	pct.	—	6	—	—
Other	pct.	1	4	4	4
Hedged	pct.	1	4	0	0

* The 1977 corn crop year was abnormal in that weather and aflatoxin influenced production and marketing.
** Too few observations were available to make comparisons.

FIG. 1. Eastern tent caterpillar in cherry.

THE EASTERN TENT CATERPILLAR

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DURING MARCH and April in Alabama, large white silken webs are often evident on trees scattered throughout the countryside, figure 1. A closer look will usually reveal that the webs are primarily on wild cherry.

These webs, or tents, are made by larvae of the eastern tent caterpillar, *Malacosoma americanum*. In most years natural regulating factors keep populations relatively low – a single web occurring on an occasional tree – and presence of the caterpillar attracts little attention. Periodically, however, populations may increase so that: multiple webbing may occur on most cherry trees; trees may be completely defoliated; plants other than wild cherry may be fed upon; and migrating caterpillars become very noticeable. Such a population increase occurred in Alabama in 1977 and 1978 causing considerable concern and prompting numerous inquiries as to the identity, life cycle, and destructiveness of the insect.

Life Cycle

The tent caterpillar spends the winter in the egg stage. Eggs occur in masses in the form of bands encircling twigs of host trees, figure 2. Hatch occurs in spring about the time that leaf buds of host trees begin to unfold. In the Auburn area, hatch began about March 1 in 1977 and on March 13 in 1978. Time of hatch may be 10 days to 2 weeks earlier in southern Alabama and delayed by this time period in northern Alabama.

Eastern tent caterpillar larvae are gregarious. Newly hatched caterpillars feed briefly on the egg mass covering, figure 3, and begin construction of the web in a limb crotch or crotch of trunk and limb and enlarge it as they grow. Caterpillars migrate from the web to feed and return to the web where they remain between feeding periods. Duration of the larval developmental period is 5 to 6 weeks.

The fully grown caterpillar, figure 4, is about 2 in. long. The body is dark, sparsely clothed with fine, light-brown hairs, and has a conspicuous light stripe along the mid-line of the back. At this stage of development, larvae abandon their gregarious habit, leave the web, and begin migrating in search of pupation sites. It is during this period that caterpillars are often observed on non-host plants.

Pupation occurs in white, silken cocoons, figure 5, on the bark of trees, on weeds and brush, under logs, leaves, or other debris, on fences, and even on sides of buildings. After about 3 weeks, moths, figure 6, emerge and begin laying eggs in masses around twigs. In the Auburn area, egg laying began on May 5 in 1977 and May 16 in 1978 and extended over a period of 2-3 weeks. The number of eggs per mass ranged from 212 to 424, with an average of 287. Eggs remain on the twigs through summer, fall, and winter and hatch the following spring; thus, there is only one eastern tent caterpillar generation per year.

Egg production in 1978 was high. Overwintering masses are currently abundant on cherry trees, indicating the possibility of a high caterpillar population again in 1979 unless natural control agents, such as parasites and predators, bring about a reduction.

Hosts and Damage

The favored host of eastern tent caterpillar in Alabama is the common wild black cherry. When populations are at a low level, oviposition and infestations are confined primarily to this species, but may also occur on apple. As populations increase other plants of the Rose family, including peach, pear, and plum, serve as hosts for the caterpillar.

The eastern tent caterpillar, even in periods of high population, is largely a nuisance pest. Complete defoliation of wild cherry trees may occur, but these trees generally refoliate and little or no economic injury results. However, defoliation of ornamental or fruit-producing trees may cause sufficient damage to warrant application of measures for caterpillar control.

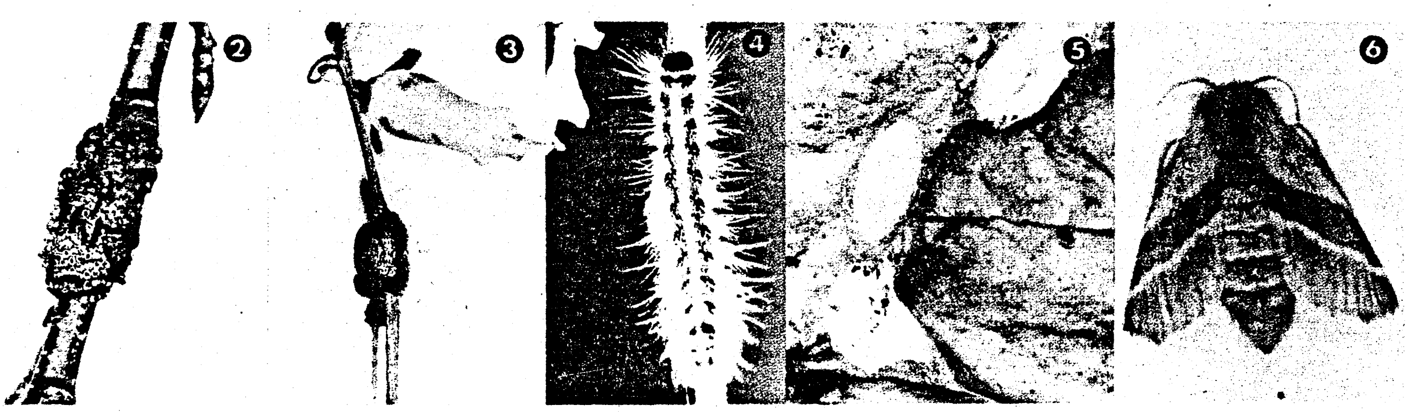

FIG. 2-6. Development stages of the tent caterpillar: (2) egg mass; (3) newly hatched caterpillars; (4) fully grown caterpillar; (5) silken pupal cocoon; and (6) moth adult. Photos by J. V. Edelson.

THE SOYBEAN CYST NEMATODE: A New Threat to Alabama Soybeans

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THE SOYBEAN cyst nematode, *Heterodera glycines*, causes a destructive disease in soybean referred to as "Yellow Dwarf." This disease was first reported in 1915 in Japan. Other foreign countries where the cyst nematode is known to occur include Korea, China, Egypt, Poland, and Taiwan. The first report of the soybean cyst nematode in the United States was in North Carolina in 1955. Since first reported, this dreaded pest has spread rapidly throughout the eastern United States.

The cyst nematode was first detected in Alabama in the summer of 1973. Shortly thereafter, a quarantine was placed on portions of Conecuh, Escambia, and Monroe counties in South-Central Alabama. This action, taken by the State Department of Agriculture, was implemented in hopes of preventing the spread of cyst nematodes to other soybean growing areas of the State.

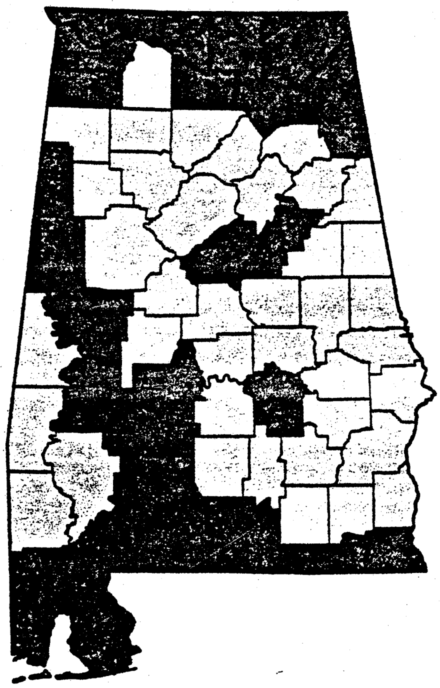

FIG. 1. Distribution of the cyst nematode in Alabama. Black areas indicate counties where one or more fields were found to be infested with cyst nematode. Blue counties may have the soybean cyst nematode, but it has not yet been detected.

FIG. 2. Partial stand loss caused by the cyst nematode to soybeans in Jackson County.

In July 1977, several soybean fields in Northern Alabama, quite removed from the area under quarantine, were found to be severely damaged by the cyst nematode.

Cyst Survey

To determine the extent of spread of this pest within the soybean growing areas of the State, a survey was conducted beginning August, 1977 and ending August, 1978. The survey was jointly conducted by the Alabama Cooperative Extension Service and the Alabama Department of Agriculture. Soil samples were collected from soybean fields with a history of poor growth and from fields that had a soybean cyst problem. Samples were tested in the Alabama Cooperative Extension Service's Plant Diagnostic Lab.

Of 335 soybean fields surveyed during the one year period, 75 (representing 24 of the 67 counties) were found to be infested with the cyst nematode, figure 1. These 24 counties encompass over 65% of the State's total soybean acreage. Soil populations of the cyst nematode in some samples exceeded 9,000 larvae per pint of soil.

When laboratory records were checked for 1975 through 1977, the number of samples having cyst nematodes increased from 2.1% in 1975, to 6.5% in 1976, to 22.4% in 1977, indicating a drastic increase in occurrence of this pest within the State.

Cyst Nematode Symptoms

Plant symptoms directly attributable to the cyst nematode were first noticed in early June and persisted until harvest. Overall symptoms of infested soybean fields usually consisted of stunted, chlorotic, and dying plants occurring in somewhat circular areas from a few feet to several hundred feet in diameter, figure 2. In addition, the incidence of several fungal diseases including Southern Blight, Pod and Stem Blight, and Brown Spot appeared to be much higher on plants having cyst nematode infections.

Crop losses were more severe in fields where soybeans were continuously cropped for several years. Yield losses in individual fields were as high as 75%.

New Cyst Race

To complicate matters, four pathogenic races of the soybean cyst nematode have been described from the U.S. Races are identified by their ability to reproduce on certain soybean varieties and/or breeding lines. Since observations within the State indicated that race 3 resistant varieties were performing well, it was assumed that race 3 was the dominant population of cyst nematodes occurring in Alabama. However, with the adjoining states of Tennessee and Mississippi reporting the existence of the newly formed race 4, the possibility of its development in Alabama seemed likely. This would be of particular interest since soybean varieties having resistance to race 4 are not yet available.

To date, greenhouse tests conducted by the Agricultural Experiment Station at Auburn indicate race 3 to be the dominant race in Alabama. Should race 4 develop, however, growers would be forced to rotate out of soybeans for two or more years or resort to chemical control, which is relatively expensive.

Use of Planting Time Application of Ethylene Dibromide For Control of Plant Parasitic Nematodes on Soybeans: New Uses For an Old Fumigant

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RECENT ACTIONS by the Environmental Protection Agency (EPA) have restricted use of DBCP (Fumazone, Nemagon) on soybeans to a degree that it can no longer be considered for practical use on the crop. In the past DBCP provided an inexpensive (6-8 dollars per acre) means of controlling nematodes parasitic of soybeans. While other nematicides can be used for this purpose, they are either not cleared for commercial use, or they are too expensive because of the amounts or equipment required to attain effective control.

Ethylene dibromide (EDB) is one of the oldest nematicides available for commercial use. In the past its use on soybeans was not explored, probably because of the general availability of DBCP and early reports on other crops that the latter nematicide was two to three times more effective than EDB. Since EDB is produced at comparable costs to DBCP, it was thought that EDB could be an adequate economical substitute for DBCP for farmers to use on soybeans. This article presents results of experiments conducted by Auburn University Agricultural Experiment Station scientists during the 1978 season to determine the feasibility of using a formulation of EDB (Soilbrom® 90 EC) and a mixture of EDB with 27% (w/w) chloropicrin (Terr-O-Cide® 72-27) at planting time for control of nematodes parasitic of soybeans.

Tests were conducted at three locations in the State: (1) The Gulf Coast Substation in Fairhope on a field heavily infested with the root knot nematode *Meloidogyne arenaria;* (2) in a field heavily infested with race 3 of the soybean cyst nematode (*Heterodera glycines*), located on the Engel Farm in the vicinity of Summerdale also in Baldwin County; (3) in a field on the Wiregrass Substation in Headland in Henry County which was moderately infested with the northern root-knot nematode (*M. hapla*). The fumigants were applied at rates of 1.0, 1.5, 2.0, 2.5, 3.0, and 4.0 gal./acre using two chisels per row separated 10 inches apart. A treatment of 1 gal./acre of DBCP 86 EC (Fumazone 86 EC) and no treatment control were also included for comparative purposes. In every test each treatment was represented by eight replications arranged in a randomized complete block design. Each replication was a single plot, two rows (36" or 38") wide and 20 ft. long. The test at Fairhope did not include any Terr-O-Cide 72-27 treatments.

Yield increases in the test at the Gulf Coast Substation (table 1) in response to applications of Soilbrom 90 EC were sharpest in the range of 1.0 to 2.0 gal./acre. Small but significant yield gains over those obtained with the 2.0 gal./acre treatment were evidenced with the use of either 3.0 or 4.0 gal./acre of the fumigant. Yield differences between the 1 gal. rate of Soilbrom 90 EC and the DBCP 86 EC treatment were not significant. The use of Bragg soybeans, a variety with some degree of tolerance to root-knot nematodes should have resulted in higher yields for the control. However, previous work has shown that tolerance as measured by yield response is limited and that significant yield increases can be obtained by the use of nematicide treatments in heavily infested fields such as at the Gulf Coast Substation, even when

TABLE 1. EFFECT OF ETHYLENE DIBROMIDE (SOILBROM 90 EC) AND A MIXTURE OF ETHYLENE DIBROMIDE CONTAINING 27% CHLOROPICRIN (TERR-O-CIDE 72-27) ON YIELD OF BRAGG (GULF COAST) AND RANSOM (SUMMERDALE AND WIREGRASS) SOYBEANS IN FIELDS INFESTED WITH THREE DIFFERENT SPECIES OF PLANT PARASITIC NEMATODES

Treatment	Gallons per acre	Location					
		Gulf Coast		Summerdale		Wiregrass	
		Bu./acre	Return ($)	Bu./acre	Return ($)	Bu./acre	Return ($)
Control		12.3		3.4		27.8	
Soilbrom 90 EC	1.0	20.1	27.0	7.3	7.5	42.1	59.5
Soilbrom 90 EC	1.5	26.2	51.5	9.9	14.5	47.9	82.5
Soilbrom 90 EC	2.0	36.3	96.0	12.1	19.5	44.1	57.5
Soilbrom 90 EC	2.5	37.9	98.0	14.6	26.0	44.9	55.5
Soilbrom 90 EC	3.0	40.0	102.5	15.2	23.0	44.8	49.0
Soilbrom 90 EC	4.0	43.2	106.5	19.3	31.5	46.7	46.5
Terr-O-Cide 72-27	1.0	—	—	6.9	3.5	32.8	11.0
Terr-O-Cide 72-27	1.5	—	—	6.6	−5.0	48.9	84.5
Terr-O-Cide 72-27	2.0	—	—	8.6	−2.0	49.2	79.0
Terr-O-Cide 72-27	2.5	—	—	13.6	16.0	50.6	79.0
Terr-O-Cide 72-27	3.0	—	—	12.4	3.0	49.7	67.5
Terr-O-Cide 72-27	4.0	—	—	20.4	29.0	47.6	43.0
DBCP 86 EC (Fumazone, Nemagon)	1.0	19.4	26.5	6.2	7.0	33.2	20.0

* Figures for yields are averages of eight replications.

** Gulf Coast and Wiregrass fields were infested with the root-knot nematodes, *Meloidogyne arenaria* and *M. hapla*, respectively; the Summerdale field was infested with race 3 of the soybean cyst nematode (*Heterodera glycines*).

*** Net return per acre over control calculated on the basis of $5.00/bushel of soybeans, and cost of Soilbrom 90 EC, Terr-O-Cide 72-27, and DBCP set at 12, 14, and 7 dollars/gallon respectively.

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resistant varieties are planted. Results also suggest that in heavily infested fields, levels of Soilbrom 90 EC of 2.0 to 2.5 gal./acre are necessary to maintain smaller larval populations of *M. arenaria* than those in the control and that this practice results in profitable yield increases.

In the Wiregrass tests, with the exception of one treatment (Terr-O-Cide 72-27 at 1.0 gal./acre) all applications of the fumigants containing EDB increased yields significantly above the control, but no pattern of response to amount of fumigant applied was evidenced. One gal./acre of Soilbrom 90 EC or 1.5 gal./acre of Terr-O-Cide 72-27 was sufficient to attain significant maximal yield response. Yield response obtained in this experiment to treatment for control of this low level of infestation reflects the lack of nematode resistance in Ransom soybeans. Very likely if a more tolerant variety, such as Bragg, had been used yield responses would not have been as great.

Results from the Summerdale test indicated that yields increased somewhat proportionally to the amount of either Soilbrom 90 EC or Ter-O-Cide 72-27 applied. Results also confirmed that these two fumigants were as effective as DBCP in improving yields. The test at Summerdale represents a situation where the level of infestation was such that a rotation with corn would be recommended; however, this level of infestation provided an excellent means of discriminating between nematicides to quickly determine the relative efficacy of these materials.

Data from the three experiments show conclusively that either Soilbrom 90 EC or Terr-O-Cide 72-27 are good substitutes for DBCP for control of plant parasitic nematodes on soybeans. While rates of 1 gal./acre of the two EDB formulations may be sufficient for treatment of fields with low to moderate levels of infestation with root-knot nematodes, fields with very severe infestations of either root knot or the soybean cyst nematode may require applications of 2 gal./acre or higher of the fumigants to attain maximal yield response.

Planting Time and Postemergence Use of Ethylene Dibromide-Chloropicrin Mixtures for Control of Root-Knot Nematodes On Florunner Peanuts

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THE PEANUT PLANT is subject to attack by a variety of nematode species which cause significant yield losses. In Alabama, the most important parasitic species are the southern peanut root-knot nematode (*Meloidogyne arenaria*), and to a lesser extent the northern root-knot nematode (*M. hapla*), also species of *Pratylenchus*. Control of these parasites in seriously infested fields has been primarily effected through the use of DBCP (Nemagon, Fumazone) at planting time. Use of this fumigant resulted in consistently good control of the parasites for a reasonable investment ($7-10/acre).

Recent actions by the Environmental Protection Agency (EPA) have eliminated the use of DBCP on peanuts. Although other contact and systemic nematicides can be used for control of nematodes parasitic of peanuts, these materials are generally either not as effective, or are more expensive, and their correct use on peanuts is still under study.

Although the fumigant ethylene dibromide (EDB) is one of the oldest nematicides, its use on peanuts has been restricted because of the general availability of DBCP, which was considered to be three to five times more effective in preliminary trials with other crops. Planting time applications of EDB, and especially of EDB-chloropicrin mixtures, have been thought to be phytotoxic to peanuts, hence recommendations for use were only for preplant application. Because EDB and EDB-chloropicrin mixtures could provide acceptable economical planting time treatments for nematode control on peanuts, scientists in Auburn University's Agricultural Experiment Station decided to explore the possibility of their use.

Tests were conducted near Headland, Ala. on the Marshall Brothers Farm in a field which was heavily infested with the southern peanut root-knot nematode (*M. arenaria*). In every test each treatment was represented by eight plot replications arranged into randomized complete block designs. All tests were conducted following recommended cultural practices for the area.

Planting time applications of the fumigants were effected using a gravity flow apparatus. The materials were injected into the soil to a depth of 8 in. using two chisels per row separated 8 in. apart; postemergence applications were performed similarly in the first week of July at midbloom but with the chisels separated 10 in. apart. Experiments were conducted in 1977 and 1978 using the Soilbrom 90® EC formulation for EDB and Terr-O-Cide® 72-27 (72% EDB and 27% chloropicrin).

Soilbrom 90 EC or Terr-O-Cide 72-27 applied at planting during the 1977 season resulted in yield responses that were inversely related to nematode numbers. After a sharp rise in response to the 0.5 and 1.0 gal./acre treatments (table 1), maximal yields were obtained with rates of 2.0 gal. or higher; yield differences between treatments with 2.0 gal./acre or higher were not significant. The performance of Soilbrom 90 EC (1 gal./

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TABLE 1. RELATIVE EFFICACY OF PLANTING TIME APPLICATIONS OF ETHYLENE DIBROMIDE (SOILBROM 90 EC) AND A MIXTURE OF ETHYLENE DIBROMIDE CONTAINING 27% (W/W) CHLOROPICRIN (TERR-O-CIDE 72-27) AGAINST *M. arenaria* IN FIELD EXPERIMENTS WITH FLORUNNER PEANUTS DURING THE 1977 AND 1978 SEASONS

Treatments	Gal./acre	Yields and returns per acre			
		1977		1978	
		Pounds	Dollars**	Pounds	Dollars**
Control		1724		2024	
Soilbrom 90 EC	0.5	3463	359.19	------	------
Soilbrom 90 EC	1.0	3901	445.17	2630	115.26
Soilbrom 90 EC	1.5	------	------	2785	141.81
Soilbrom 90 EC	2.0	4355	528.09	3110	204.06
Soilbrom 90 EC	3.0	4225	489.21	2705	107.01
Soilbrom 90 EC	4.0	4029	436.05	3027	162.63
Terr-O-Cide 72-27	0.5	2701	198.17	------	------
Terr-O-Cide 72-27	1.0	3400	337.96	2267	87.03
Terr-O-Cide 72-27	1.5	------	------	3054	195.30
Terr-O-Cide 72-27	2.0	4162	483.98	2764	127.40
Terr-O-Cide 72-27	3.0	4274	493.50	3197	204.63
Terr-O-Cide 72-27	4.0	4114	445.90	2940	156.36
DBCP (Nemagon, Fumazone)	1.0	3330	330.26	2826	161.[illegible]

* Figures for variables are averages of eight plot replications.
** Returns over the control based on $0.21 per pound of peanuts and Soilbrom 90 EC, Terr-O-Cide 72-27, and DBCP at 12, 14, and 7 dollars per gallon, respectively.

acre) compared with DBCP was superior with respect to yield response but was similar for degree of nematode control. Results also indicated that Terr-O-Cide 72-27 (1 gal./acre) was inferior to DBCP for yield response and degree of nematode control.

Data from the 1978 test indicated that planting time applications of Soilbrom 90 EC or Terr-O-Cide 72-27 at rates of 1.5 gal./acre or higher resulted in maximal yield increments (table 1). Differences in yield response between these rates were not significant. Soilbrom 90 EC at the 1 gal. rate significantly increased yield but Terr-O-Cide 72-27 did not increase yields above the control.

Results from these experiments suggest the superiority of EDB over EDB-chloropicrin mixtures for control of *M. arenaria*. Chloropicrin is mixed with EDB to provide fungicidal activity to the formulation, since EDB is strictly a nematicidal fumigant. Consequently, the use of the more expensive ($12-14/gallon) Terr-O-Cide 72-27 should be restricted to fields with nematode-fungal complexes. Some difficulty was experienced in the application of Terr-O-Cide 72-27, particularly in the transfer of material prior to delivery in the field. This was due to the lachrymatory properties of chloropicrin (tear gas). Our results indicate that in fields with only nematode problems Soilbrom 90 EC should be given preference. Soilbrom 90 EC proved to be a good substitute for DBCP; the equipment needed for its application is the same as that for DBCP and its price is within an acceptable range ($10-12/gallon).

Midbloom applications of Soilbrom 90 EC during the 1977 season did not result in the degree of control obtained with planting time applications of this fumigant. Yields from Soilbrom-treated plots, although higher than that for the control, were not significant. None of the postemergence treatments equaled the degree of control or the yield increments obtained with the planting time treatment of DBCP at 1 gal./acre.

Results indicate that either EDB (Soilbrom 90 EC) or EDB-chloropicrin (Terr-O-Cide 72-27) can be effectively used at planting time for control of root-knot nematodes in peanuts without danger to the crop. Maximal yield responses can be expected with rates in the range of 1.5-2 gal./acre. Soilbrom 90 EC is as effective as DBCP for control of root-knot nematodes in peanuts and more effective than Terr-O-Cide 72-27. Florunner peanuts can tolerate up to 4 gal./acre of Soilbrom 90 EC applied at midbloom using two chisels/row separated 10 in. apart. However, the value of such postemergence applications is questionable since they did not result in as adequate a degree of control or yield response as a planting time application of the fumigant at 2 gal./acre.

TABLE 2. EFFECT OF POSTEMERGENCE APPLICATIONS OF ETHYLENE DIBROMIDE (SOILBROM 90 EC) ON YIELD OF FLORUNNER PEANUTS IN A FIELD HEAVILY INFESTED WITH THE SOUTHERN ROOT-KNOT NEMATODE (*M. arenaria*)

Treatment	Gal./acre	Yields and returns per acre	
		Pounds	Dollars**
Coltrol		2993*	------
Soilbrom 90 EC	1.0	3284	49.11*
Soilbrom 90 EC	2.0	3160	11.07
Soilbrom 90 EC	3.0	3623	96.30
Soilbrom 90 EC	4.0	3134	−18.39
DBCP (at planting) Nemagon, Fumazone	1.0	4160	238.07

* Figures for variables are the averages of eight replications.
** Returns over the control based on $0.21 per pound of peanuts and Soilbrom 90 EC, Terr-O-Cide 72-27, and DBCP at 12, 14, and 7 dollars per gallon, respectively.

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