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David H. Teem, Acting Director

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A WORD WITH THE EDITOR

IF A PICTURE is worth a thousand words, a look at the actual object or event should be even more educational. That is certainly true in explaining research findings. A chance to view the actual research—walk through the crop or forest plots, inspect food animals on test, or see machinery in action—gives added meaning to the facts and figures reported. Many illustrations come to mind in this regard, but weed control studies provide an excellent example. Reading that a herbicide treatment provided 80% weed control may present a mental picture that differs greatly from the idea received when an actual 80% control plot is examined.

The value of first-hand observation explains why the Alabama Agricultural Experiment Station holds field days every year at substations and other research units across the State. Although reports of findings presented by researchers are important program components, a major part of each field day is a tour through research areas. Those attending can see differences that result from the use of experimental production practices and visit with researchers to find out details about the tests.

R.E. STEVENSON

One important result of research field days is early adoption of new technology. Many progressive individuals choose to try new practices on their farms before a research project can be completed and dependable conclusions drawn by project leaders. Not all of these new practices will make the grade, of course, but early on-the-farm use helps assure acceptance of technology that proves valuable in long-term research.

Success of research field days emphasizes the value of the Experiment Station System that includes substations, experiment fields, and other research units that blanket the State. Farmers viewing research at these outlying units see results on soil types like those on their own farms, making results readily adaptable. The leaders who began the outlying unit system more than 50 years ago recognized the need for research on the major soil types and in major farming regions of the State. This system truly blankets Alabama with agricultural research.

The field day schedule for 1986 lists a total of 12 meetings, covering research on most major commodities produced on Alabama farms. Mark your calendar for the appropriate field days in the following list:

March 25—Dairy Field Day, Black Belt Substation, Marion Junction.

April 17—Beef Field Day, Lower Coastal Plain Substation, Camden.

June 17—Horticulture Field Day, Chilton Area Horticulture Substation, Clanton.

June 17—Weed Control Field Day, Wiregrass Substation, Headland.

July 8—Agronomy Field Day, Black Belt Substation, Marion Junction.

July 10—Horticulture Field Day, North Alabama Horticulture Substation, Cullman.

July 15—Conservation Tillage Field Day, Wiregrass Substation, Headland.

July 24—Melon Field Day, E. V. Smith Research Center, Shorter.

July 31—All Commodity Field Day, Tennessee Valley Substation, Belle Mina.

August 5—All Commodity Field Day, Sand Mountain Substation, Crossville.

August 26—Field Crops Field Day, Wiregrass Substation, Headland.

October—Ornamental Horticulture Field Day, Ornamental Horticulture Substation, Mobile (date to be announced).

may we introduce

Dr. Joseph J. Giambrone, Associate Professor of Poultry Science. A native of Norristown, Pennsylvania, Giambrone joined the Auburn faculty in 1977, after completing his Ph.D. in microbiology at the University of Georgia. He also holds B.S. and M.S. degrees in animal science from the University of Delaware. In 1980 he was appointed Adjunct Assistant Professor of Microbiology in the College of Veterinary Medicine and in 1983 was promoted to Associate Professor.

Giambrone is currently a member of the University Senate and was the 1984 recipient of the Director's Research Award for assistant and associate level scientists in the Alabama Agricultural Experiment Station. Since coming to Auburn, he has gained international recognition for his work on immunology and control of poultry diseases. Though he has worked extensively with coccidiosis, newcastle disease, malabsorption syndrome, and fowl cholera, Giambrone is recognized as the foremost expert in the world on Gumboro, or infectious bursal disease.

In the article on page 3 of this issue of Highlights, Giambrone and associates describe research on the effects of aflatoxin-contaminated feed on young chickens and turkeys.

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DAVID H. TEEM ..... *Acting Director*
R.E. STEVENSON ..... *Editor*
ROY ROBERSON ..... *Associate Editor*
TERESA RODRIGUEZ ..... *Art Designer*

Low Levels of Aflatoxin Safe for Young Turkeys and Chickens

J.J. GIAMBRONE, U.L. DIENER, N. DAVIS, V.S. PANANGALA, and F.J. HOERR

AFLATOXINS IN FEED can cause a variety of ill effects in poultry. Among these are liver damage, retarded growth rate, impaired feed conversion, and depression of birds' natural immunity against disease. Since aflatoxin contamination of feed grain is a prevalent problem, this continues to be an important topic for research.

Much of the research previously reported about aflatoxin and poultry has been with grains artificially contaminated with types of aflatoxin not produced under natural contamination. In addition, contamination levels were usually higher than those normally found in commercial market grain. Therefore, research was begun at the Alabama Agricultural Experiment Station to determine effects of aflatoxin produced in natural outbreaks.

Corn containing aflatoxin produced by a natural outbreak of *Aspergillus flavus*, the most commonly occurring mycotoxin on corn, was used to measure the effect on growth and health of turkeys and chickens (broilers). Levels of contamination tested were 0, 100, 200, 400, and 800 p.p.b. Most U.S. corn samples tested in a year have less than 400 p.p.b., so data from the Auburn tests reflect commercial conditions.

Turkeys and chickens were used in the Auburn test. Five 40-bird groups each of 14-day-old turkeys and broiler-type chicks were fed rations containing the five levels of aflatoxin. Male and female birds were fed separately during the 35-day feeding period.

Results showed that aflatoxin levels of 400 p.p.b. or greater were highly toxic to turkeys. These levels produced clinical signs and lesions of aflatoxin poisoning, along with the decrease in weight gain and poorer feed conversion shown in the table for the 5 weeks. Microscopic lesions, indicative of aflatoxin poisoning, were evident with aflatoxin contamination as low as 100 p.p.b.

Mortalities of 40% and 100% were evident in turkeys in the 400 and 800 p.p.b. groups, respectively. Post-mortem examination showed that all dead turkeys had severe gross lesions indicative of aflatoxin poisoning.

Other results indicated that chickens were less susceptible to aflatoxin than turkeys. Neither morbidity nor mortality occurred in broilers in any of the aflatoxin feeding groups. Gross lesions consistent with aflatoxin toxicity were evident in chickens given 800 p.p.b., and microscopic lesions were observed in birds on feed containing lower levels of aflatoxin. Feed conversion was significantly poorer for broilers in the 800 p.p.b. feeding group.

In the Auburn tests, feeding a ration containing corn naturally contaminated with aflatoxin was highly toxic to 2-week-old turkeys and mildly toxic to 2-week-old broiler chickens when fed for 5 weeks at the 400 and 800 p.p.b. levels. Feeding diets containing 200 p.p.b. or less of aflatoxin had no adverse effect on growth and feed conversion, an important finding in light of the recent decision by the U.S. Food and Drug Administration to raise the legal concentration of aflatoxin-contaminated corn to 100 p.p.b. for interstate shipment.

Corn naturally contaminated with no more than 100 p.p.b. of aflatoxin will be eventually diluted by one-third in a standard corn-soybean poultry ration, thus yielding about 66 p.p.b. aflatoxin in the ration. This level should cause no adverse effect on production when fed to well managed and properly fed young poultry.

AVERAGE WEIGHT CHANGE, FEED CONVERSION, AND PATHOLOGIC CHANGES IN TURKEYS AND BROILERS FED DIFFERENT LEVELS OF AFLATOXIN FOR FIVE WEEKS

Aflatoxin, p.p.b.	Turkeys					Broilers				
	Weight gain	Feed conv.	Micro. lesions	Gross lesions	Mortality	Weight gain	Feed conv.	Micro. lesions	Gross lesions	Mortality
	Pct.				*Pct.*	*Pct.*				*Pct.*
0	48.2	1.81	—	—	0	50.8	2.02	—	—	0
100	48.3	1.81	mild	—	0	48.1	1.95	mild	—	0
200	46.1	1.80	moderate	—	0	50.4	2.03	mild	—	0
400	33.2	1.89	severe	mild	40	49.6	1.99	moderate	—	0
800[1]	19.7	2.28	severe	mild	100	46.9	2.11	severe	mild	0

[1]Data for fourth week, because all birds died between fourth and fifth weeks.

Giambrone is Associate Professor of Poultry Science, Diener and Davis are Professors of Botany, Plant Pathology, and Microbiology, Panangala is Assistant Professor of Animal Health Research, and Hoerr is Adjunct Assistant Professor of Pathology and Parasitology.

Effect of soil amendments on blueberry production

W.A. DOZIER, M.H. HOLLINGSWORTH, and J.W. KNOWLES

IN RECENT YEARS considerable interest has developed in establishing commercial plantings of rabbiteye type blueberries in Alabama. The survival and growth of blueberries are greater when the soil is amended with peat moss prior to planting. The general recommendation is to amend the soil in a planting hole with 1/8 to 1/2 bu. of peat moss. Due to the cost of peat moss, many growers have not used an amendment or would like to use a less expensive one.

An Alabama Agricultural Experiment Station study was conducted to evaluate three soil amendment materials and mulching on the establishment and growth of rabbiteye type blueberries. The treatments consisted of: (1) peat moss, (2) fine ground pine bark, (3) aged sawdust, and (4) no soil amendment. One-half bushel of the appropriate soil amendment was incorporated into each planting hole, which was 24 in. in diameter and 12 in. deep.

The planting was established in the spring of 1984 at the North Alabama Horticulture Substation in Cullman on a sandy loam soil with a pH of 4.9. Plots were divided so that half were mulched with 6 in. of pine straw and half were not mulched. Drip irrigation was applied to all plants in the study. An emitter which will deliver 1 gal. of water per hour was placed 6 in. from each plant. Pan evaporation readings were used to determine amount of moisture lost and the amount of water needed to replace it. Irrigation was applied based on these readings. Tifblue and Climax varieties were evaluated in this study.

The treatments were evaluated for effects on plant survival, vigor, height, width, and shoot growth. The vigor of the plants was subjectively rated with a rating of 10 being the most vigorous plants and a rating of 1 being the least vigorous plants.

There were no treatment effects on plant survival; few plants were lost in this study. The soil amendment treatments resulted in greater plant vigor, new shoot growth, and plant height than the non-soil amendment treatments, table 1. The values recorded for the peat-amended treatment were greater than for the pine bark or aged sawdust amended treatments.

Mulching had no effect on the growth and vigor of the Tifblue variety, table 2. However, the mulched Climax plants had a higher vigor rating and a wider plant width than the non-mulched plants. The new shoot length was greater on the non-mulched Climax plants than on the mulched plants.

In summary, growth and vigor were greater with peat moss as the soil amendment than with pine bark or aged sawdust. The differences, however, were not great and may not justify the additional cost. All three soil amendment treatments resulted in a greater plant response than no soil amendment. The lack of response to mulching probably was due to the maintenance of adequate soil moisture by use of drip irrigation.

TABLE 1. THE EFFECT OF SOIL AMENDMENTS ON BLUEBERRY PLANT VIGOR AND GROWTH

Soil amendments	Plant height		Plant width		Shoot length		Plant vigor rating	
	Climax	Tifblue	Climax	Tifblue	Climax	Tifblue	Climax	Tifblue
	In.	*In.*	*In.*	*In.*	*In.*	*In.*		
No amendment	27.6	29.7	27.1	28.1	10.4	12.0	4.4	4.7
Peat moss	35.0	36.8	33.7	34.3	17.3	15.5	6.7	6.6
Pine bark.....	29.9	33.4	30.0	32.0	15.7	13.6	5.5	5.4
Aged sawdust ...	30.5	32.0	30.8	32.1	14.9	12.7	6.1	5.5

TABLE 2. THE EFFECT OF MULCH ON BLUEBERRY PLANT VIGOR AND GROWTH

Mulch treatment	Plant height		Plant width		Shoot length		Plant vigor rating	
	Climax	Tifblue	Climax	Tifblue	Climax	Tifblue	Climax	Tifblue
	In.	*In.*	*In.*	*In.*	*In.*	*In.*		
Mulch	30.3	31.7	33.3	31.2	14.0	13.6	6.2	5.5
Non-mulch	31.2	34.4	27.5	32.0	15.2	13.3	5.1	5.6

Dozier is Professor of Horticulture; Hollingsworth is Superintendent of the North Alabama Horticulture Substation; and Knowles is a Research Associate of Horticulture.

Narrow rows and early planting produce top grain sorghum yields

H.H. BRYANT, J.T. TOUCHTON, and D.P. MOORE

DROUGHT TOLERANCE, wide range of potential planting dates, and adaptability to multiple cropping systems are advantages claimed for grain sorghum. Nevertheless, yields are frequently disappointing in Alabama, especially in central and southern regions.

Inadequate yields are commonly attributed to late planting dates (June and July), wide row widths (30 to 36 in.), and high plant populations (greater than 100,000 plants per acre). To determine if these production practices affect sorghum yield, a 1985 study was carried out at the Alabama Agricultural Experiment Station's Prattville Experiment Field. Late planting and wide rows appeared to reduce yields, but the effect of high plant populations was not clearcut.

Row widths tested were 18, 24, 30, and 36 in.; seeding rates were 60,000, 100,000, 140,000, and 180,000 seed per acre; and planting dates were March 19, April 19, May 20, and June 21. The variety planted was a full season hybrid, Northrup King Savanna 5. The soil was a Lucedale sandy loam, one of the more productive Coastal Plains soils. Lime, P, and K applications were based on soil test recommendations. Nitrogen rate was 120 lb. per acre, 40 lb. applied at planting and 80 lb. applied 4 weeks later.

The number of harvested heads and per acre grain yields were dependent on planting dates, seeding rates, and row widths. As expected, the number of grain heads harvested increased with seeding rate. However, plants in low populations were able to compensate by tillering (sprouting of extra stalk from base of plants), and many plants in high populations were not competitive enough to reach maturity. Thus, differences in number of harvested heads did not differ greatly between low and high seeding rates.

Emergence is highly dependent on soil conditions such as temperature and moisture at planting. Unfavorable soil conditions result in weak seedlings which are more susceptible to insect and disease damages. It is generally assumed that 60 to 75% of the sorghum seed planted will survive and produce mature plants. The March planting date resulted in a poor harvest population (38 to 58% of the seeding rate), most likely the result of cold wet soils at planting. The April planting resulted in excellent populations (above 86% of the seeding rate). The relatively poor harvest population with the May planting (46 to 70%) was due to severe chinch bug damage to some plots. For the June 21 planting, harvest population ranged from 56% with the highest seeding rate to 79% for the lowest rate.

Table 1. Grain Sorghum Yield as Affected by Seeding Rate, Planting Date, and Plant Populations at Maturity

Seeding rate/acre	Yield and harvest populations/acre, by planting date							
	March 19		April 19		May 20		June 21	
	Pop.	Yield	Pop.	Yield	Pop.	Yield	Pop.	Yield
	No.	*Bu.*	*No.*	*Bu.*	*No.*	*Bu.*	*No.*	*Bu.*
60,000	35,000	65	66,000	82	42,000	47	47,000	39
100,000	45,000	67	94,000	85	59,000	67	69,000	45
140,000	58,000	68	128,000	90	68,000	69	84,000	46
180,000	69,000	71	155,000	91	82,000	75	102,000	45

Grain yields increased as row widths decreased and seeding rates increased, tables 1 and 2. An increase in grain yields as row widths decreased from 36 to 18 in. was expected, but yield increases as seeding rates increased were not expected, especially when seeding rates exceeded 140,000 per acre. Increased grain yields with high seeding rates were most likely due to lower-than-expected germination, emergence, and/or seedling survival.

With the April planting date, final populations of 128,000 plants per acre and higher were required for top yields. Within each planting date, the higher seeding rates did not result in yield reductions, but low seeding rates always resulted in yield reductions. Unfortunately, the high seeding rates, especially with the wider row widths, caused some problems with lodging (plants breaking over).

Climatic conditions in 1985 were most favorable for the April planting date, and that planting date resulted in the highest plant populations. Lower yields with the March than April plantings were most likely a result of low plant populations. Reasonable yields were obtained with the May planting if row widths were narrow (18 to 24 in.) and harvest populations exceeded 80,000 plants per acre. The June planting date resulted in drastic yield reductions regardless of row width or seeding rate.

The data from the first year of this study support previous observations: sorghum yield potentials will probably not be fully expressed with row widths as wide as 30 to 36 in. or with late planting dates; and plant populations exceeding 100,000 per acre may not result in yield reductions, especially with early planting dates and narrow row widths. An unexpected response was that the detrimental effect of wide row widths on grain yields was as great with early as with late planting dates. Since climatic conditions vary widely from year to year, firm conclusions should not be drawn from 1 year of data.

Table 2. Grain Sorghum Yield as Affected by Row Width and Planting Date

Row width	Yield per acre by planting date[1]			
	Mar. 19	Apr. 19	May 20	June 21
	Bu.	*Bu.*	*Bu.*	*Bu.*
18 in.	75 (53)	93 (100)	71 (62)	48 (69)
24 in.	68 (45)	91 (107)	68 (58)	41 (67)
30 in.	63 (43)	87 (81)	64 (54)	45 (66)
36 in.	65 (42)	78 (93)	53 (49)	42 (63)

[1]Numbers in parenthesis represent percentage of seed planted that formed seed heads.

Bryant is Graduate Assistant in Agronomy and Soils, Touchton is Associate Professor of Agronomy and Soils, and Moore is Superintendent of the Prattville Experiment Field.

NEW TECHNOLOGY

For converting swine waste to methane gas

J.P. BOLTE and D.T. HILL

ANAEROBIC fermentation is the process of converting organic wastes, such as livestock manure, into methane gas, a valuable energy resource. Since the oil crisis of the early 1970's, this process has received considerable attention as a means of providing both a stable, on-site energy source and an effective waste treatment alternative for livestock producers. Conventional anaerobic fermenters consist of an airtight vessel, generally containing a mechanism for mixing the reactor contents (i.e. motor-driven paddles or recirculation pumps) and provisions for adding influent feed material and removing treated reactor effluent.

The conversion of organic feed material to methane is accomplished by a diverse microbial culture termed anaerobic bacteria. These bacteria have relatively low growth rates and are sensitive to temperature, pH, and toxic materials. These characteristics have made conventional anaerobic fermenters susceptible to failure due to overloading of feed material, washout of bacteria at a rate faster than they can reproduce, or rapid fluctuations in reactor operating conditions. Additionally, influent solids concentrations of 5-15% are generally required for efficient conversion of organic wastes in these reactors. Unfortunately, many of the waste streams encountered in agricultural production systems are of a dilute nature (0.5-3%), and as such are not readily amenable to fermentation in conventional anaerobic reactors. Examples include animal manures collected with flushing techniques where considerable amounts of water are added to facilitate waste transport, the liquid portion of separated manures where solids are utilized for refeeding, and food processing plant wastes. This is a particular problem in swine production facilities in the Southeast, since approximately 70% of these facilities employ flushing systems for waste collection.

To overcome the problems associated with conventional anaerobic fermentation, research on a new reactor technology is being conducted at the Alabama Agricultural Experiment Station in Auburn. These "Suspended-Particle-Attached Growth" reactors employ reticulated open-cell foam or needle-punched nylon particles contained within the reactor vessel to provide support surfaces for anaerobic bacteria to attach to and colonize. As the bacteria grow, they secrete a gelatinous polysaccharide material which forms a "biofilm," a thick slime layer of concentrated active bacterial mass. By trapping these bacteria in the biofilms contained within the open foam-type support material, high bacterial concentrations can be retained inside the fermentation vessel. The result is faster conversion rates of organic matter to methane, enhanced capabilities for effectively utilizing dilute wastes, and generally more stable reactor operation.

Since bacteria are fixed inside the reactor vessel, washout problems are minimized. This allows reduced hydraulic retention times (HRT's, the average amount of time feed material stays inside the reactor) and reduced reactor volumes, important economic considerations since initial reactor vessel cost constitutes a major portion of the investment required to set up and operate a fermentation system. Thus, because of their capabilities for effective conversion of dilute wastes at short HRT's, these reactors appear to be well suited to treatment of flushed livestock wastes and integration into refeeding/energy production systems.

To evaluate the performance of these reactors using flushed swine waste, four 1.3-gal. suspended particle-attached growth anaerobic reactors were set up and operated for a period of approximately 4 months. The reactor volumes were filled with reticulated open-cell polyurethane foam blocks (1/2 x 1 1/2 x 2 in.) and needle-punched nylon pads (3/8 x 1 1/2 x 2 in.) in equal portions to provide support surfaces for biofilm formation. These support particles were retained inside the fermenters using screens placed over the inlets and outlet ports of the reactor vessel. Two of the fermenters were operated at 130°F and two were operated at 95°F. To simulate conditions encountered in a refeeding/energy production swine waste management system, flushed swine waste was screened to remove large particulate solids using an 18-mesh vibrating screen separator. This allowed the solid portion of the waste to be used for refeeding, with the liquid portion available for anaerobic fermentation.

Previous research at the Alabama Agricultural Experiment Station has shown that approximately 50% of the potential methane present in the flushed waste remains in the liquid portion after screening. In this study, the screened swine waste liquids contained approximately 1.2% total solids, of which approximately 80% was organic material available for conversion to methane. The remaining 20% of the solid material consisted of inert ash. This flushed waste material was considerably more dilute than the 5% solids level generally considered a minimum for conventional anaerobic fermentation.

The fermenters used in this study were operated over a 4-month period at a variety of loading rates. The thermophilic (130°F) fermenters were started at a 5-day retention time (HRT) and reduced progressively to 3, 2, and 1 day HRT's. HRT's for the 95°F reactors ranged from 10 to 2 days. These values can be compared to values of 5 to 20 days for conventional anaerobic fermenters. Data were taken at each HRT for gas production, gas quality (percent methane), and influent and effluent chemical parameters. The fermenters performed well at all the HRT's examined, although effluent quality began deteriorating at the shortest HRT's (highest solids loading rate).

The data collected indicated that successful attachment and colonization of the support media by methane-producing bacteria occurred, and that these bacteria could be retained inside the fermenter vessel at concentrations substantially greater than in conventional anaerobic fermenters. Additionally, these reactors displayed remarkable stability, rapid response to changing loading rates, and extreme tolerance to operational upsets. Several times during the study, the entire fermenter contents were accidentally drained from the reactor vessel; however, upon recharging the fermenter with fresh waste, both 130° and 95° fermenters showed essentially no adverse effects and completely recovered within 12 to 36 hours.

The results of this preliminary study indicate the suspended particle-attached growth fermenter is ideally suited for conversion of dilute animal wastes to methane gas. These fermenters were successfully operated at hydraulic retention times approximately five times shorter than those considered minimum for conventional anaerobic fermentation, which translates into smaller fermentation vessels and lower initial costs for fermentation systems. The fermenters used in this study showed a rapid start-up time and displayed extreme tolerance to operational upsets and rapid response to changing operating conditions. These characteristics indicate that suspended particle-attached growth fermenters can be successfully integrated into flushed waste and refeeding/energy production systems, providing smaller reactor vessels, enhanced stability, and adaptability to fluctuating feed scheduling and waste variability.

Bolte is a Research Associate and Hill is Alumni Associate Professor of Agricultural Engineering.

EFFECTIVE ESTATE PLANNING PROVIDES ECONOMIC BENEFITS

W.J. HARDY, JR., and S.C. BELL

TAX LIABILITY, family strife, uncertainty about distribution and future use of property, and excessive probate and administrative costs are common problems associated with estate transfer. Many of these problems can be avoided, however, if farmers develop estate plans that take advantage of existing laws.

Advantages of effective estate planning showed up in a recent Alabama Agricultural Experiment Station study of farm estate transfers. A detailed examination was made on the transfer of 10 actual estates over the period 1968-82. The study identified estate planning tools currently available for transferring a farm estate, and compared results with estate planning results during the early part of the study period.

Findings of the study are illustrated by one of the estate transfers, which took place during 1977-81 under regulations of the Tax Reform Act of 1976. The example farm was a cattle and row crop operation with 2,235 acres of land.

Three major objectives were addressed in the estate transfer plan cited as an example:

1. Provide for wife until her death—accomplished by leaving spouse half ownership in the land (fee simple) and a life estate in the other half.

2. Provide an inheritance for children that would be equitable and escape taxation at death of the surviving spouse—accomplished by naming children as equal remaindermen to the spouse's life estate.

3. Save taxes—accomplished by using the marital deduction, employing current-use valuation for the real property, and taking advantage of any unified credit that might be available for the estate.

Provisions for "current-use valuation" of farmland allow valuing land at its value for agricultural use rather than "highest or best use" value. Use of this provision in the example estate transfer resulted in considerably lower value of the real estate portion of the estate. The result was large tax savings, table 1. The major requirement for the current-use provision is for the farm to be operated by a qualified heir.

The marital deduction was another valuable tool used. This is basically a credit against the taxable estate for property which passes to a surviving spouse. Its use is spelled out in the will, with the amount of deduction determined from the amount of property passing to the spouse, in complete ownership, under the will. At the time of this farm transfer, the marital deduction was limited to $250,000, or one-half of adjusted gross estate value, whichever was larger.

Another major tool utilized was the unified credit provision. At the time of transfer, this amounted to $47,000 which could be used as a direct credit against the amount of tax due for the estate.

TABLE 1. ESTATE TRANSFER UNDER TAX REFORM ACT OF 1976

Item	Results under different provisions	
	Current-use	Fair-market
	Dol.	*Dol.*
Real estate (2,235 acres)	710,810	1,310,810
Personal non-farm property	250,262	250,262
Personal farm property	251,000	251,000
Total gross estate	1,212,072	1,812,072
Debts, mortgages, liens	(-) 400,933	(-) 400,933
Administration costs	(-) 32,153	(-) 32,153
Adjusted gross estate	778,986	1,378,986
Estate marital deduction	(-) 389,493	(-) 689,493
Taxable estate	389,493	689,493
Tentative gross estate tax	118,228	225,912
Available unified credit	(-) 47,000	(-) 47,000
Credit for Alabama death tax	(-) 6,464	(-) 17,580
Federal estate tax due	64,764	161,332
Total estate tax due	71,228	178,912

TABLE 2. ESTATE TRANSFER UNDER ECONOMIC TAX RECOVERY ACT OF 1981

Item	Results with and without estate plan	
	With estate plan	Intestate (no plan)
	Dol.	*Dol.*
Real estate (2,235 acres)	572,160	1,200,195
Personal non-farm property	250,262	250,262
Personal farm property	251,000	251,000
Total gross estate	1,073,422	1,701.457
Debts, mortgages, liens	(-) 400,933	(-) 400,933
Administration costs	(-) 32,153	(-) 32,153
Adjusted gross estate	640,336	1,268,371
Estate marital deduction	(-) 791,822	(-) 659,186
Taxable estate	-0-	609,185
Tentative gross estate tax	-0-	196,198
Available unified credit	(-) 96,300	(-) 96,300
Credit for Alabama death tax	-0-	(-) 14,367
Federal estate tax due	-0-	85,531
Total estate tax due	-0-	99,898

The Economic Recovery Tax Act of 1981 offers even greater opportunities for savings in estate transfer, table 2. Savings resulted from lower land value under current conditions and larger allowable marital deductions.

Under the latest law, the full value of all property transferred to the spouse will qualify for the marital deduction (an "unlimited" provision). This provision can be used to eliminate all taxes at the death of the first spouse; however, care needs to be exercised to ensure that the surviving spouse's estate does not become excessively large.

The limit on "unified credit" also was raised by the latest law, making $155,800 the total available for 1986. This will exclude an estate of up to $500,000 from federal estate tax liability.

As indicated by data in table 1, the farmer was generally successful in accomplishing his objectives for estate planning. The newer laws would allow even greater success, as indicated by data in table 2.

Hardy is former Graduate Research Assistant and Bell is Professor of Agricultural Economics and Rural Sociology.

J.D. HARPER, G.R. STROTHER, M.E. MARVEL, and J.T. EASON

SWEET CORN must be near blemish-free to be acceptable in commercial markets. Therefore, essentially no damage by insects can be tolerated when producing this crop. This calls for timely use of an effective insecticide, applied with a sprayer that provides good plant coverage.

Air-blast sprayers appear suited for ground application of insecticides to sweet corn. A machine of this type was effective in Alabama Agricultural Experiment Station research last year at the Sand Mountain Substation, Crossville. The model tested was an Ag-Tech Model 3004, a three-point hitch sprayer that is power-take-off driven. This tractor-mounted unit is considered to be well suited for vegetable production because of its small size, flexibility, and low cost. It seems especially suited for use in irregularly shaped fields like those found in the Sand Mountain area.

Field plots were established to determine (1) the number of rows of corn the air-blast sprayer can penetrate and provide acceptable insect control, (2) the level of control compared to a conventional high clearance sprayer, and (3) any differences between activity of two different insecticide mixes when applied with the Model 3004 sprayer. Test plots were 50 ft. long, with either 8, 16, 24, 32, or 40 rows (36-in. rows). Penetrability of the air blast was determined by spraying into each plot from both sides. A second test used 8-row plots to compare a Super Blue Boy 6000 high-clearance sprayer with the air-blast sprayer.

A final test compared air-blast applications of Lannate® (0.45 lb. active ingredient per acre) with a combination of Pydrin® + Lorsban® (0.1 + 0.5 lb. active) on 24-row-wide plots. The air-blast sprayer delivered 10 gal. per acre while the high clearance sprayer delivered 20 gal. per acre.

The spray schedule used for all treatments was: one application when first tassel shoots appeared, a spray 3 days later, and five consecutive daily sprays beginning at early silking followed by sprays on alternate days until harvest. Using this schedule, a total of 16 applications was made beginning June 17 and ending July 17. Plots were harvested on July 18. Ten ears were picked from alternate rows in each plot to estimate the level of control across the entire width of each plot. Each ear was shucked and examined for insect damage, and ears were rated as either perfectly clean or insect damaged. Damage included presence of insects or signs of any visible insect feeding.

The degree of spray penetration by the air-blast sprayer was determined by statistically comparing the damage from the outer 4 rows of all plots, then the outer 8, 12, 16, and 20 rows. In this way it was possible to determine (1) damage at various distances into each plot, (2) the point at which protection dropped, and (3) the importance of overlap of sprays directed into each side of the plots.

Comparison of the two application methods in the table shows that the air-blast sprayer protected corn in plots that were 8, 16, or 24 rows wide as well as the high clearance sprayer protected 8-row-wide plots. Furthermore, the 24-row plots treated with the combination of Pydrin and Lorsban were as well protected as the 24-row plots treated with Lannate. The outer eight rows were well protected in all plots, all showing 95% or greater clean ears. Rows 9-12 were similarly protected in the 24-row plots, but in the 32- or 40-row plots, protection dropped below 90% clean ears. This demonstrates that rows 9-12 in the 24-row plots were in the zone of overlap of spray penetration from each side. Thus, 24 rows was the maximum plot size which could be treated using the air-blast sprayer under the conditions of this test. Rows 9 to the center of the 32- and 40-row plots were not adequately protected.

PERCENT DAMAGED EARS IN SWEET CORN PLOTS RECEIVING VARIOUS TREATMENTS FOR INSECT CONTROL

Treatment—plot width	Percent clean ears
Untreated-4 rows	58
High clearance sprayer	
Lannate-8 rows	96
Air-blast sprayer	
Lannate-8 rows	95
Lannate-16 rows	97
Lannate-24 rows	95
Pydrin + Lannate-24 rows	94
Lannate-32 rows	84
Lannate-40 rows	78

In this test, the best treatments resulted in approximately 95% insect control. This level of damage may not be acceptable for U.S. Fancy corn. To achieve higher levels of control, it could be necessary to make more than the 16 applications used in this test. Grading in the test may have been more rigorous than that required by the U.S. Government, which could mean that the damage ratings could be reduced by several percent in most treatments.

Within the limitations of this test, the air-blast sprayer was an effective method for ground treatment of sweet corn.

Harper is Professor of Zoology-Entomology, Strother is Extension Entomologist, Marvel is Extension Horticulturist, and Eason is Superintendent of the Sand Mountain Substation.

Market potential for fresh vegetables shows promise

M.E. ZWINGLI and J.L. ADRIAN

AS FARMERS EVALUATE alternative enterprises, many are attracted to the high per acre net returns that are possible with fresh vegetable crops. However, this profit potential has associated with it a high degree of price and yield variability and related income risks.

Many Alabama vegetable producers have traditionally used some type of direct marketing strategy to sell produce, but increasingly producers are turning to national wholesale markets as a primary outlet. To provide farmers with realistic information concerning the market potential of fresh vegetables grown in the area, an analysis of 15 spring-summer and 10 fall crops was undertaken by the Alabama Agricultural Experiment Station in conjunction with the Tennessee Valley Authority.

The Tennessee Valley production region was used as the basis for the study. Weekly price data at six national vegetable wholesale markets (Atlanta, Baltimore, Chicago, Cincinnati, New Orleans, and St. Louis) were analyzed for the 1979-83 period. Selected crops were evaluated on the basis of price versus cost of production and price variability.

The price-cost of production, or "market window," analysis involves determination of the percentage of weekly price quotations at a given market and for a given crop which are above the producer's "at market cost." The producer's "at market cost" is the sum of all production, transportation, and marketing costs and represents the break-even price. The "at market cost" varies among markets by differentials in transportation costs. Market potential was measured at a yield considered to be average for a good producer (used as 100% in this study) and at 70% of this average yield level. Details for each of the crops are given in the table and represent the percentage of weekly price quotations during the harvest season which are at or above the break-even prices at both the 100% and 70% production levels. The calculated percentages represent an average at the primary markets (Atlanta, Cincinnati, and St. Louis).

Of the late spring crops, both broccoli and turnip greens showed good potential at both yield levels. Cabbage showed good potential at the 100% yield level, but had much lower potential at the 70% level. These data show that cabbage producers can expect to receive favorable prices 3 of 5 years on average.

Price levels for collard greens at the Atlanta market were favorable, but they were low at Cincinnati and St. Louis markets. This difference in price levels points up the regional nature of the demand for collards.

Of the late spring-summer crops, snap beans, zucchini squash, yellow squash, and cucumbers demonstrated favorable price-cost of production relationships at the 100% yield level. All but cucumbers showed good potential at the 70% yield level.

Favorable price-cost of production relationships existed for watermelons at the 100% yield level, but declined significantly with a yield reduction. The data indicated higher than average prices through the July 4th market with prices declining throughout the summer.

Both bell peppers and tomatoes showed good market potential at 100% yield level, but much less potential at the 70% yield level. This indicates a need to maintain high production levels and reflects the high production costs for these items.

Irish and sweet potatoes had lower than average market potential at the 100% and 70% yield levels which was due, in part, to the high cost of production. Analyses indicated that producers could expect to receive favorable prices 3 to 4 years out of 5.

Sweet corn showed the lowest market potential of all crops examined. Potential was greatly reduced with decreasing yield levels, pointing out the absolute necessity for high production levels. As seen with watermelons, the highest degree of market potential existed in pre-July 4th markets.

Of the fall crops, broccoli, snap beans, turnip greens, yellow squash, and zucchini squash showed the greatest market potential at both break-even price levels.

Tomatoes and cucumbers demonstrated moderate potential at the 100% yield level, but showed much less potential at the 70% yield level. This has important implications as producers risk reductions in yield levels in order to capture the higher late fall prices.

Collards, cabbage, and watermelons had poor price-cost of production relationships at break-even price for both yield levels. Watermelons had some potential at the Chicago and New Orleans markets when packed in cartons rather than sold bulk.

Analyses such as these provide insight into the relative market opportunities for fresh vegetables capable of being produced in the area. While this study analyzed the potential for producers in the Tennessee Valley region, the results are applicable for much of Alabama. Vegetable crop production does hold opportunities for farmers in Alabama who can grow a high quality product and operate efficiently, keeping yields up and costs down. However, losses can be expected during some years.

Overall, producers in Alabama are in a position to capture the higher prices seen in the late fall markets. Midwestern markets, such as Cincinnati and St. Louis, seem to offer good potential for Alabama-grown produce.

Zwingli is Graduate Research Assistant and Adrian is Professor of Agricultural Economics and Rural Sociology.

PERCENTAGE OF WEEKLY PRICE QUOTATIONS ABOVE BREAK-EVEN LEVELS AT TWO LEVELS OF PRODUCTION, AVERAGE OF THREE MARKETS, 1979-83

Crop	Pct. of time price quotes above break-even level	
	100% prod. level	70% prod. level
	Pct.	*Pct.*
Spring crops		
Snap beans	100	98
Broccoli	100	100
Cabbage	96	78
Sweet corn	65	37
Cucumbers	95	69
Collard greens	72	52
Turnip greens	98	97
Okra	94	90
Bell peppers	90	67
Irish potatoes	78	56
Yellow squash	93	75
Zucchini squash	96	94
Sweet potatoes	74	59
Tomatoes	90	61
Watermelons	90	73
Fall crops		
Snap beans	100	95
Broccoli	100	100
Cabbage	66	42
Cucumbers	84	60
Collard greens	73	42
Turnip greens	99	88
Yellow squash	95	92
Zucchini squash	98	94
Tomatoes	85	45
Watermelons	52	36

Comparison of nutritional quality in new and old tomato varieties

K.S. RYMAL, J.L. TURNER, G.C. BARTLEY, D.A. SMITH, E. CARDEN, and R. McDANIEL

MANY new tomato varieties are released each year and growers and gardeners are faced with a confusing array of literature proclaiming each new variety as superior to all others. In truth, tomatoes that are perfect for all climates and for all uses have not been developed.

For this Alabama Agricultural Experiment Station study, 11 promising new varieties, which were released in the last 2-3 years, were compared with 7 varieties that have been popular for at least 10 years. The test was planted at the Gulf Coast Substation in Fairhope on April 5, 1985. Representative samples from each plot were picked at the firm-red-ripe stage and held in cool storage for 2-3 days, then analyzed.

Average results of the tests by which the varieties were compared are reported in the table. Rankings for each evaluation category are given in parenthesis, with 1 being the most desirable in each case.

The first column, soluble solids, indicates the sugar content of the fruit; usually the higher the sugar content, the better the flavor, although the final flavor is determined by the sugar/acid ratio which takes into account total acidity and pH. Tropic and Better Boy ranked the highest of the older varieties and were tied for first place by the new variety Pole Boy 83. Five percent soluble solids is considered good for tomatoes.

The second column, labeled Instron, indicates the firmness of the tomato. The rank of 1 was given to the firmest tomato since firmness is desirable if tomatoes are to be shipped to distant markets. However, firmness may not be most desirable in tomatoes for the home garden.

The third column indicates color, based on instrumental readings, with the highest values indicating the deepest red color of the tomato surface. Results indicate that all samples were uniformly ripe and of acceptable color.

As shown in column four, ascorbic acid or vitamin C values were also close together, indicating that all the varieties were good food sources of vitamin C.

Conversely, total acidity values in column five varied considerably, ranging from a low of 0.435% for Horizon to 0.608% for Bonnie Nematode Resistant. This variety with the highest acidity and one of the lowest pH's had a slightly below average sugar content, which results in a tart flavor. Mountain Pride, on the other hand, with one of the lowest acidity and highest pH and a slightly above average sugar content should be a sweet tasting tomato.

The values in the column labeled pH relate to safety for canning, with the lowest values indicating the greatest availability of hydrogen ions (acidity) to combat the growth of spoilage organisms in a canned product. Generally, pH 4.2 is considered a good average for a canning tomato, while tomatoes with pH 4.4 or higher should not be canned unless some food acid such as lemon juice or citric acid is added.

In addition to quality factors, a desirable characteristic of tomato plants is the so-called jointless character (J2). Five of the newer varieties and one of the older favorites, Flora-Dade, have this characteristic. This characteristic of the plant allows the fruit to separate easily from the vine without leaving a short stem attached to the fruit.

The yields (pounds per plant) reported are for these varieties grown with ideal cultural practices which include: use of soil testing recommendations for liming and fertilization, a good spray program of fungicides and insecticides, and irrigation as needed.

In some aspects the older varieties outperformed the newer ones. Better Boy, Bonnie Nematode Resistant, and Monte Carlo had the highest index rating (lowest total score) and ranked 1, 2, and 3 on yield per plant. The newer varieties Liberty Hybrid, Suncoast, and Castlehy 1035 also had excellent scores. Overall the newer varieties compared favorably to the older ones, especially considering the additional insect and disease resistance from the newer ones.

Rymal is Professor, Turner is Research Associate, Bartley is Senior Lab Technician, and Smith is Associate Professor of Horticulture, Carden is Superintendent and McDaniel is Associate Superintendent of the Gulf Coast Substation.

TOMATO VARIETY TRIAL, FAIRHOPE, ALABAMA 1985[1]

Variety	Soluble solids	Instron, kg/cm²	Hunter (a)	Ascorbic acid	Total acidity	pH	Disease[4] and insect resistance	Yield/ plant	Index rating[5]
	Pct.			*Pct.*	*Pct.*			*Lb.*	
Better Boy	5.75(1)	19.3(6)	24.2(3)	27.5(3)	0.525(3)	4.26(5)	VFN	11.73(2)	3.2
Bonnie Nematode Resistant	4.98(5)	26.1(3)	24.4(3)	25.5(5)	.608(1)	4.19(2)	VFN	9.55(3)	3.1
*Castlehy 105[2]	4.98(5)	22.0(4)	23.2(3)	24.5(5)	.488(4)	4.21(4)	VF_2 Tmv	NA	NA
*Castlehy 1035 (j_2)[3]	4.83(7)	22.6(4)	24.3(3)	26.5(4)	.555(3)	4.14(1)	VF_2	10.14(3)	3.4
*Castlehy 1065 (j_2)	4.58(8)	20.6(4)	23.4(3)	27.0(4)	.455(4)	4.23(5)	VF_2	10.34(3)	4.3
*Celebrity	5.10(4)	24.3(4)	21.8(4)	25.7(5)	.555(3)	4.21(4)	VF_2 N	10.82(3)	3.6
Flora-Dade (J_2)	4.53(8)	20.4(5)	21.7(4)	25.0(5)	.565(3)	4.12(1)	VF_2	10.45(3)	4.1
Four Way Hybrid	4.85(7)	20.9(4)	21.4(4)	27.0(4)	.450(5)	4.34(7)	VF	11.38(2)	4.0
*Hayslip (j_2)	4.95(6)	22.1(4)	26.4(1)	26.0(5)	.445(5)	4.31(6)	VF_2	9.05(4)	4.3
*Horizon (j_2)	4.48(9)	20.7(4)	25.5(2)	30.5(1)	.435(6)	4.25(5)	VF_2	9.39(4)	4.3
*Liberty Hybrid (J_2)	5.25(4)	27.9(2)	21.0(5)	26.8(4)	.590(2)	4.20(3)	VF_2	9.36(4)	3.3
Monte Carlo	5.45(3)	24.4(4)	22.9(3)	26.5(4)	.550(3)	4.22(4)	VFN	12.50(1)	3.1
*Mountain Pride	5.05(4)	17.5(8)	23.2(3)	24.8(5)	.443(5)	4.36(8)	VF_2	9.89(3)	5.0
*Pole Boy 83	5.78(1)	17.3(8)	20.9(5)	24.0(5)	.505(3)	4.21(4)	VF_2	9.74(3)	4.1
*Suncoast	5.10(4)	28.7(1)	26.8(1)	24.0(5)	.470(4)	4.21(4)	VF_2	7.76(5)	3.3
*Sunny	4.50(8)	21.4(4)	23.0(3)	28.3(2)	.480(4)	4.26(5)	VF_2	10.95(2)	4.0
Tropic	5.90(1)	19.8(6)	21.6(4)	25.8(5)	.460(4)	4.33(6)	VFTmv	8.73(4)	4.2
Walter Villemaire	5.15(4)	17.1(8)	24.7(3)	25.3(5)	.523(3)	4.23(5)	VF_2	8.77(4)	4.4

[1]Varieties are arranged in alphabetical order.

[2]* = newer variety.

[3]J_2 = jointless characteristic.

[4]Disease and insect resistance as reported by seed producers: V = verticillium wilt, F = Fusarium wilt race 1, F_2 = Fusarium wilt race 1 and race 2, N = rootknot nematode, Tmv = tobacco mosaic virus.

[5]Index of ranking, lowest scorer equal top performance.

Alfalfa and AU-Lotan sericea produce good summer pastures

S.P. SCHMIDT, C.S. HOVELAND, E.D. DONNELLY, and R.A. MOORE

GOOD SUMMER GAINS by grazing beef cattle may be a reality. Steers grazing alfalfa and AU-Lotan sericea lespedeza, a 1980 variety release by the Alabama Agricultural Experiment Station, made excellent summer gains in a 3-year grazing test.

Comparisons of AU-Lotan with Auburn's older Serala variety confirmed the new variety's advantages. Although both varieties are fine stemmed, AU-Lotan contains only about half as much tannin as Serala. Thus, AU-Lotan is higher in digestible dry matter and 7% higher in crude protein content at the hay stage, however it produces only about 85% as much hay as Serala.

The test was established at the Upper Coastal Plain Substation, Winfield, in spring 1980, with three paddocks of Serala and six paddocks of AU-Lotan planted. That fall, three paddocks of Cimarron alfalfa were planted. Paddocks were 3 acres each. In addition, 5-acre pastures of alfalfa and Serala sericea were planted to hold extra steers needed to adjust stocking rates to keep stubble height at 4-8 in.

Three AU-Lotan paddocks were grazed continuously throughout the growing season. All other paddocks were subdivided into 1-acre subpaddocks for rotational grazing. A drought in 1980 delayed the grazing test until 1982.

The paddocks were stocked with 500-lb. Angus x Hereford steers. The grazing season over the 3-year period averaged from March 30 to September 8 (163 days) on alfalfa and April 22 to September 8 (139 days) on the two sericeas. Salt, shade, and water were available in all paddocks and, in addition, steers grazing the alfalfa were provided poloxalene blocks for bloat control.

Stands were generally good except in one rotationally grazed AU-Lotan paddock that had inadequate reseeding. Weeds were not a problem except during late summer in alfalfa. Sericea stands remained good throughout the test, even under continuous grazing of AU-Lotan, table 1. Shoot numbers of sericea declined under severe drought conditions in 1983 but generally recovered by the end of the third grazing season. The good stand persistence of sericea under grazing is probably the result of keeping stubble height at 4-8 in. Alfalfa shoot counts declined each season.

TABLE 1. SHOOT NUMBERS OF ALFALFA AND SERICEA LESPEDEZA AS AFFECTED BY GRAZING

Legume species and grazing system	Shoots per sq. ft.			
	May 6, 1982	May 25, 1983	June 8, 1984	Sept. 6, 1984
	No.	*No.*	*No.*	*No.*
Rotational grazing				
Cimarron alfalfa	46	44	36	27
Serala sericea	61	64	39	52
AU-Lotan sericea	52	48	38	46
Continuous grazing				
AU-Lotan sericea	50	52	37	40

This crop needs a 3- to 4-week rest between grazing periods, rather than the 2 weeks used here, to maintain stands.

Digestibility of alfalfa averaged 69% over the 3 years, consistently higher than AU-Lotan sericea (44%) and Serala sericea (36%).

Carrying capacity of the forages was about the same for the four treatments, table 2. The drought of 1983 affected carrying capacity of alfalfa more adversely than either sericea.

The daily gains of steers grazing alfalfa averaged 2.17 lb., table 2, about double that typically obtained on Coastal bermudagrass. Although daily gains of steers grazing AU-Lotan sericea were less than on alfalfa, they were greater than on Serala sericea and similar to those obtained on small grains and fungus-free tall fescue.

Beef gain per acre was highest on alfalfa, with AU-Lotan next in performance, table 2. Rotational grazing gave no advantage over continuous grazing.

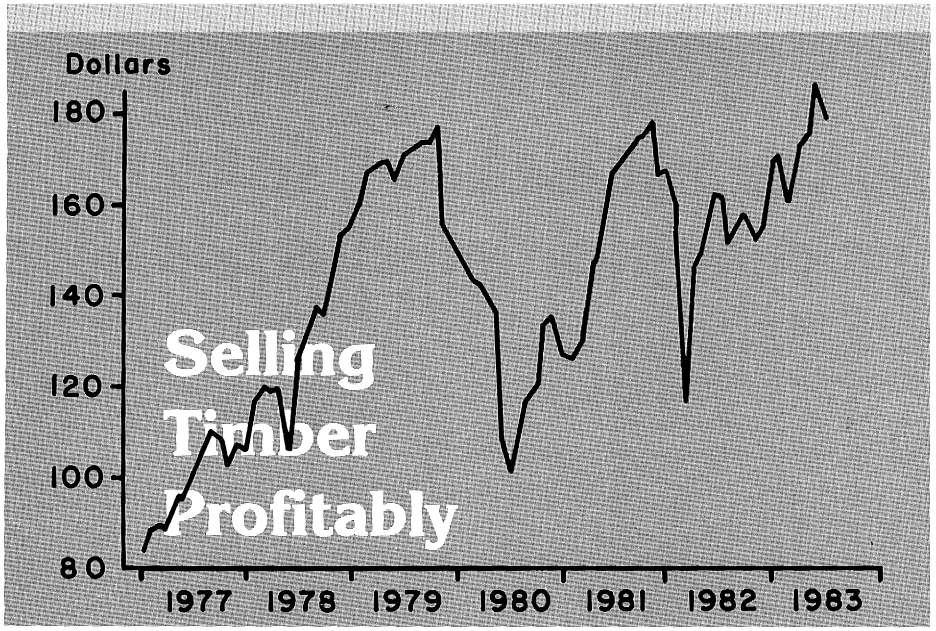
Although gain per acre was lower on AU-Lotan sericea than on alfalfa, sericea has certain advantages. It has the capacity to grow on acid, high-aluminum soils where alfalfa will not grow unless heavily limed. The potential for low-tannin sericea in furnishing low-cost grazing for steers makes it attractive in many situations.

The excellent gains obtained with alfalfa and AU-Lotan sericea indicate the potential of these perennial legumes for production of stocker steers during the warm season in Alabama and other Southeastern States. Since no nitrogen fertilizer is needed for these pastures, there is the potential for lower cost of gain than on warm season grasses. Using these summer legumes offers the opportunity to extend the grazing season over that of cool season pasture, thus furnishing feeder cattle to feedlots over a longer period of the year.

Schmidt is Associate Professor of Animal and Dairy Sciences, Hoveland is Professor of Agronomy at the University of Georgia, Donnelly is Professor Emeritus of Agronomy and Soils, and Moore is Superintendent of the Upper Coastal Plain Substation.

TABLE 2. PERFORMANCE OF STEERS GRAZING ALFALFA AND SERICEA PASTURES, 3-YEAR AVERAGE

Legume species and grazing system	Carrying capacity, steers/acre	Animal days/acre	Average daily gain	Beef gain per acre
	No.	*No.*	*Lb.*	*Lb.*
Rotational grazing				
Cimarron alfalfa	1.32	216	2.17	475
Serala sericea	1.27	174	1.39	248
AU-Lotan sericea	1.20	165	1.65	276
Continuous grazing				
AU-Lotan sericea	1.17	163	1.87	306



Pine sawtimber prices per thousand board feet in Alabama.

Selling Timber Profitably

W.A. FLICK

THE KEY to successful investing is to "buy low and sell high," and that is as true with timber as with anything else. It can be a mistake, then, to concentrate too much on growing timber and not enough on selling it. When it comes time to convert a timber crop into cash, two selling considerations are paramount: selling when prices are high and qualifying for long-term capital gains treatment of the income.

A good way to measure the importance of such advice is to see what difference timber marketing decisions might have on standard measures of investment value—present net worth (PNW) and internal rate of return (IRR). A PNW is a forecast of the immediate value of a prospective investment, stated in number of dollars. It is the sum of all discounted revenues less the sum of discounted costs, hence it is dependent on the interest rate used in discounting. It is a favorite measure of investment value among economists because it neatly accounts for the important financial attributes of an investment. An IRR, instead of giving a dollar value of the investment's immediate worth, denotes an average percentage rate of growth on all of the unrecovered costs. A bank account in which a $100 deposit today grows to $108 in 1 year has an IRR of 8%.

What difference does it make to sell timber at the top versus the bottom of the market? The answer depends on how wide the price gap is between the top and bottom of the timber markets. If timber prices were nearly constant through time, any differences in investment values would be small. As illustrated by the graph, however, timber prices can fluctuate wildly. Since 1976, the absolute range of variation in Alabama sawtimber prices has been $113, from a low of about $84 per thousand board feet (mbf) to a high of $197 per mbf. And some of the peaks and valleys are only four or so months apart. The prices shown are statewide averages—actual prices may vary even more in particular counties depending on local economic characteristics. Prices of pulpwood and intermediate grades also vary, but not as much.

Timberland owners must keep in mind that another, more serious variation lurks behind the scenes in timber markets. When markets are booming and the industry wants wood, buyers lower their specifications for veneer logs and sawlogs, accepting wood at sawtimber prices which they would never take when markets are slow and buyers are more selective. An average quality 12-in. log might be worth $160 per mbf as sawtimber in a good market and only $16 per cord, or $48 per mbf, as pulpwood in a depressed market. Landowners who sell timber only occasionally may not be aware of these market changes, but they nevertheless can be devastating to someone selling 25- to 35-year-old timber in a poor market.

Finally, timberland owners must know the legal qualifications for capital gains treatment of timber income. If timber is sold properly, that is, in accord with the laws determining capital gains, only 40% of the net capital gain is added to an individual taxpayer's income. Corporate taxpayers benefit too in that they pay tax at a lower rate on capital gains.

The effects on a timber investment of changing prices, changing specifications, and capital gains taxation are shown in the table. Those results are derived from an Alabama Agricultural Experiment Station study of a loblolly pine plantation in which pine growth, forest management costs, and timber prices were all predicted and combined to create an imaginary pine forest, one which is managed on paper or in a computer, and the results of which are available almost immediately rather than in 30 years. Tree growth was predicted for three sites: poor (site 50), average (site 60), and high (site 70). Land costs were included, and a 30% marginal, federal tax rate was used. All of the financial data were computed on an "after tax" basis, that is, net of federal income taxes. The data are "real" values, meaning they are not inflated by changing prices.

On site 70 timberland, if prices are near their high values over the last several years, the IRR of a successful pine plantation is 7.5%. While that might seem low compared to certificates of deposit, mutual funds, and other financial instruments, investors must keep in mind that the 7.5% is a real rate of return, net of inflation and net of federal income taxes. If capital gains treatment is denied because the timber was sold "improperly," the rate of return drops to 6.7%, and if capital gains is denied and timber is sold at the bottom of the market instead of the top, the rate drops further to 4.6%. Similar results can be seen for site 50 and 60 plantations.

The research model clearly indicates selling timber carefully and properly is crucial. It demonstrates the importance of consulting a good forester if unsure about the timing of a sale, conditions of local markets, or qualifications for capital gains. The potential of turning financial loss to profit by doing it all correctly is significant.

Flick is Associate Professor of Forestry.

AFTER TAX PRESENT NET WORTHS AND INTERNAL RATES OF RETURN FOR LOBLOLLY PINE PLANTATIONS WITH AND WITHOUT CAPITAL GAINS TREATMENT, AND WITH THE COMBINED EFFECTS OF LOW PRICES, PRODUCT DEGRADATION, AND NO CAPITAL GAINS TREATMENT

Discount rate, pct.	Poor—site 50			Average—site 60			High—site 70		
	With[1] cap. gain	No cap. gain	Combined[2] lows	With cap. gain	No cap. gain	Combined lows	With cap. gain	No cap. gain	Combined lows
	Dol.	*Dol.*	*Dol.*	*Dol.*	*Dol.*	*Dol.*	*Dol.*	*Dol.*	*Dol.*
2	239	140	-7	789	578	194	1,311	993	406
4	-32	-89	-173	283	162	-55	588	404	72
6	-183	-216	-264	0	-70	-194	182	75	-116
8	-268	-287	-315	-159	-201	-273	-48	-112	-224
IRR	3.7%	3.1%	1.9%	6.0%	5.3%	3.5%	7.5%	6.7%	4.6%

[1]Capital gains and no capital gains present net worths are computed with high prices of $18 per cord and $180 per mbf.

[2]Denotes dollar value if all things, such as no capital gains and selling in a poor market, go against the landowner.

Dual feeding system for broiler breeders

G.R. McDANIEL

FIG. 1 (above left). Male feeder. FIG 2 (top). Female feeder. FIG. 3 (above right). Broiler breeder house with segregated male and female feeders.

IN ORDER TO maintain high fertility in a broiler breeder flock it is essential to control body weight in both males and females. Present day feeding systems and feed formulations are designed to meet the needs of the female breeder. Therefore, the amount of feed fed each day is determined by the average body weight and egg production of the females. The male, being the more aggressive, often over-consumes feed and becomes overweight, especially during the latter half of the life of the flock. Excess weight is the primary cause of foot and leg problems and declining reproductive performance of males as they become older.

In recent studies at the Alabama Agricultural Experiment Station, it was found that males require a low protein ration to maintain optimum semen production (*Highlights* Vol. 30, No. 4). To take advantage of these findings, a separate feeding system was designed by Auburn researchers and is being tested in commercial operations.

The dual feeding system allows feeding different type rations in specific amounts to males each day. A workable dual feeding system requires that the female feeder be designed to prevent the male from eating from it and, likewise, the male feeder be designed to prevent females access to it. To accomplish this in existing facilities, the present feeder was modified and used as the female feeder. A 1-in. PVC pipe was placed in the grill to reduce head room and prevent males access to the feeder, figure 1. A separate feeder for the males was added, figure 2. The male pan-type feeders were placed between the waterers either on slats or on the floor. While size of the grill opening can vary as long as males have easy access to the feed, the height of the feeder from the floor is critical. The bottom grill opening was positioned approximately 17 in. above the floor, preventing the females from having easy access. Feeders were spaced so that all males could eat at one time. Feeders were designed to ensure the same amount of feed was delivered to all the pans simultaneously. Uniform feed distribution prevented migration from one part of the house to the other and gave the less aggressive males an equal chance at the feed, resulting in more uniform birds.

In using a dual feeding system, research indicates it is important that the amount of feed fed females be adjusted to compensate for the amount normally allowed for males. The reduction in total feed to the females, when males were fed separately, was approximately 10-12%. However, this is just a general rule and the best guide to follow is to continue feeding females based on body weight and egg production.

The male ration in a dual feeding system should be 11-12% protein with 0.8-1% calcium, providing a peak amount of feed for the males of approximately 27 lb. per 100 birds per day. Recommended body weight for the breed should be maintained and activity and body weight should serve as a guide to the amount of feed given. As production declines with age, the female daily feed intake is reduced. However, similar feed reductions in mature males affect semen production, so they should not be taken from an overfeed situation and underfed to reach an average level.

Results obtained to date with the separate feeding systems look extremely promising, see table. The mechanism of the system works as well or better than expected. At feeding time, males and females segregate to their respective feeders with little attempt on the male's part to eat from female feeders or vice versa, figure 3. In addition, performance data are encouraging for separate feeding systems versus conventional feeding systems, see table. These data are being collected from commercial flocks with 6,000 breeders per house using the same type housing and birds. Data from the first hatch from the two flocks show both fertility and hatchability to be higher for the separate feeding system. Body weight of the males has also been controlled better where separate feeders are used.

EFFECT OF DUAL FEEDING SYSTEM ON FERTILITY (FERT.) AND HATCHABILITY (HATCH.)

Age, weeks	Dual feeding		Convent. feeding	
	Fert.	Hatch.	Fert.	Hatch.
	Pct.	*Pct.*	*Pct.*	*Pct.*
30....	93.8	84.2	94.0	83.1
31....	—	86.1	—	83.9
32....	97.8	87.8	95.2	86.5
33....	—	90.2	—	85.2
34....	—	—	—	—

McDaniel is Professor of Poultry Science.

No cholesterol problem with lean beef and pork

D.R. STRENGTH
and D.L. HUFFMAN

BEEF AND PORK are hard to beat. Not only do they appeal to the taste, these red meats are highly nutritious. They provide nutritionally complete proteins that contain the 10 essential amino acids, plus several vitamins and minerals. And, despite claims by critics, neither beef nor pork has excess fat or cholesterol in the lean portions that are traditionally consumed.

Proof of the relatively low fat content of lean red meat was established in Alabama Agricultural Experiment Station research. Assorted cuts of beef and pork from Choice carcasses were compared with chicken and fish to determine relative composition of protein, water, fat, minerals, and cholesterol. The meats were closely trimmed of excess fat to produce a high quality, saleable product. "Regular" cuts were representative of the whole, well-trimmed cut, which included small portions of fatty and connective tissue. "Lean" samples were derived only from the lean portions of the same well-trimmed cuts of meat.

Similarities in composition of pork, beef, chicken, and catfish are illustrated by data in the table. The differences between regular and lean cuts make it clear that much of the fat and cholesterol are concentrated in the fatty portion of beef and pork. Since this is normally trimmed at the meat market or by individuals when eating, the fat and cholesterol contents pose no health problem.

Representative steak cuts were remarkably similar, as shown by the graph. There were only minor differences in the protein, total fat, mineral, and water compositions of lean portions of T-bone, rib, and bottom round cuts. The extra lean ground beef was prepared by separating and grinding of the lean portion from several muscle tissues. This preparation was similar in composition to the other lean cuts. The regular ground beef was prepared in the manner of regular commercial ground beef.

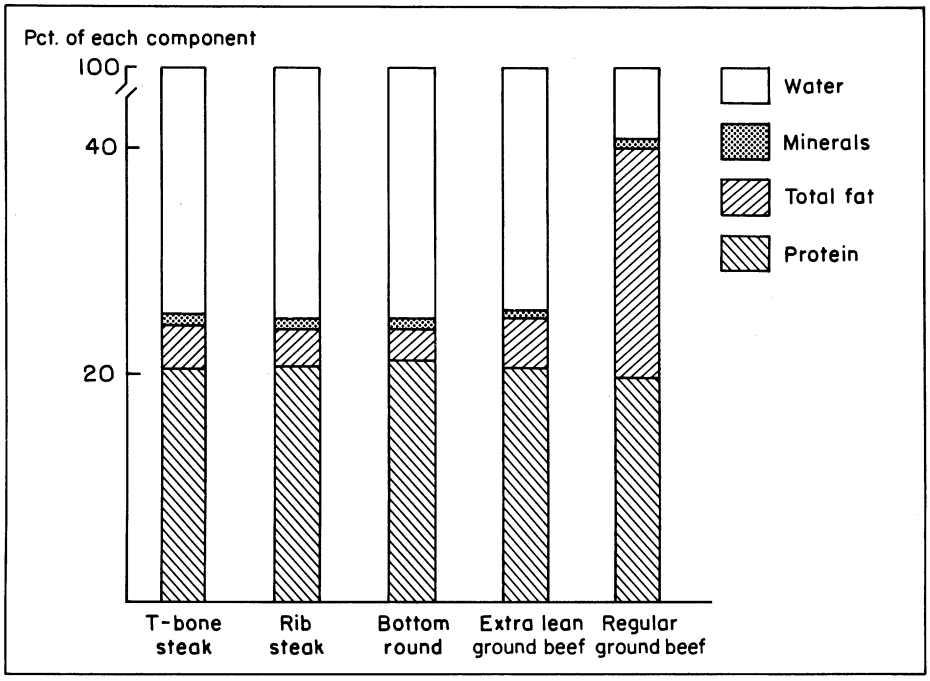
The protein contents of all the samples are remarkably similar for the five preparations in the graph, as well as for five additional common beef cuts analyzed. Lean and regular preparations were analyzed from the 10 cuts, making a total of 20 beef samples analyzed. The protein contents of the 20 samples ranged between 19.2 and 22.7%. Seven major market cuts of the pork carcass were analyzed as lean and regular cuts and the results of the analyses were quite similar to those for beef. The lean cuts of beef and pork contained approximately the same amounts of protein, fat, minerals, and cholesterol.

One serving of broiled meat is about 3 oz. (cooked weight). In several trials, lean red meat (upon broiling to medium done) lost about 30% of its weight; thus, 3 oz. is equal to about 4.3 oz. of fresh uncooked meat. The information in the table presents the percentage of total weight made up by each component. The losses during cooking lean meat are due mostly to loss of water; however, cuts containing appreciable amounts of fat lose fat as well as water.

One 3-oz. serving of broiled lean beef provides the following percentages of adult man's requirements of essential nutrients: protein, 43; vitamin B12, 75; niacin, 18; thiamin, 24; riboflavin, 15; iron, 14; zinc, 36. In addition, meat is a major source of choline, and lean meat contains the essential polyunsaturated fatty acids. One serving of lean red meat would contain only about 150 calories (5-6% of daily requirement) and 75 to 80 mg of cholesterol (only 25% of the daily cholesterol level recommended by the American Heart Association in a prudent diet).

Based on the Auburn findings reported, nutritious red meat can be enjoyed without fear of problems from fat and cholesterol.

Strength and Huffman are Professors of Animal and Dairy Sciences.



Lean portions of Choice T-bone, rib, and bottom round beef cuts had about equal amounts of protein, minerals, total fat, and water.

COMPARATIVE COMPOSITION OF SELECTED FRESH MEAT CUTS

Meat cut	Percentage of total weight of serving				
	Protein	Water	Fat	Minerals	Cholesterol
	Pct.	*Pct.*	*Pct.*	*Pct.*	*mg/100 g*
Pork loin chop, lean	20.2	75.1	3.0	1.1	73
Pork loin chop, regular	19.9	72.8	5.2	1.1	88
Pork leg, center cut, lean	20.6	75.1	2.3	1.1	70
Pork leg, center cut, regular	20.5	73.8	3.1	1.1	78
Beef, bottom round, lean	21.2	74.8	2.8	1.2	62
Beef, bottom round, regular	19.7	72.4	6.4	1.1	90
Beef, sirloin, lean	20.1	73.2	4.3	1.2	78
Beef, sirloin, regular	19.3	71.0	8.4	1.1	92
Chicken, dark meat	20.7	73.2	4.4	1.3	65
Chicken, light meat	23.2	73.6	1.9	1.2	60
Channel catfish, fillet	17.6	78.0	3.1	1.2	68

Evaluation of herbicides for watermelon weed control

J.D. NORTON, D.M. COSPER,
J.E. BROWN, and M.H. HOLLINGSWORTH

ALABAMA'S 1985 watermelon crop was valued at $6-7 million, despite a drop in acreage from previous years. Weeds pose a serious threat to this increased productivity, because they slow early growth of the watermelons and wrap around vines later, making cultivation difficult. Most of the herbicides currently labeled for use on watermelons have provided erratic control and/or have caused damage to the crop. Tests by Auburn researchers indicate recently labeled Sonolan® and other non-labeled herbicide combinations may provide better control in the future.

Of the herbicides currently labeled for use on watermelons, both Alanap® and Prefar® have shown excellent crop tolerance in field tests, but erratic weed control from the former and weed tolerance of the latter limit their effectiveness. Planavin® and Dacthal® have not provided satisfactory control at labeled rates and have shown some phytoxicity to the plants. Treflan® and Prowl® have not shown adequate crop tolerance on sandy soils. The problem is getting progressively worse as growers run out of weed and grass-free virgin land on which to produce watermelons.

Tests at the Alabama Agricultural Experiment Station's North Alabama Horticulture Substation in Cullman from 1979 to 1985 screened unlabeled herbicides for effectiveness and crop tolerance on watermelons. Jubilee seed were planted on a Hartselle fine sandy loam soil. Ten herbicide treatments, a hand weeded check, and an unweeded check were evaluated. The plots were 30 X 7.3 ft., with two plants per hill spaced 6 ft. in the row.

Herbicides were applied pre-plant incorporated, preemergence immediately after planting, followed by a light 15-minute sprinkler irrigation, and postemergence over the top 20 days after planting. Due to crop damage from pre-plant incorporated applications, this method was dropped for the 1984 and 1985 tests. Herbicide treatments and results are shown in tables 1 and 2.

Weed and grass control was evaluated 40 and 70 days after seeding, table 1. First harvest was 85 days after seeding and second harvest 7 days later. Soluble solids content of two fruit from each of four replications was determined at harvest.

Predominant weed species in the unweeded check plots were pigweed and crabgrass with lower populations of purslane, morningglory, fall panicum, goosegrass, and carpetgrass. Populations of grass and broadleaf weeds were heavy.

Of the materials tested, control of all weeds (broadleaf and grasses) at 40 days was best with Amiben® at 2 lb. per acre or a combination of 1 lb. Sonolan® and 2 lb. Amiben; Sonolan at 1.5 lb. per acre was almost as good. Each of these treatments gave better control of grasses and weeds at 70 days than post applied treatments of Poast and Fusilade, table 1.

Best weed control did not always result in top yield. Yields were highest for plots treated with Amiben at 2 lb. per acre, Sonolan at 1.5 lb. per acre plus Amiben at 2 lb. per acre, Prefar at 4 lb. per acre plus Alanap at 2 lb. per acre, Sonolan at 1.5 lb. per acre, and the hand weeded check plot. These results indicate the importance of controlling both broadleaf weeds and grasses, table 2.

The highest yielding herbicide treatments also produced fruit with the highest percent total soluble solids, table 2. Results from similar tests on cantaloupes gave similar results on weed control, yield, fruit size, and total soluble solids.

Data from the test were instrumental in Sonolan gaining clearance for use on watermelons in Alabama. However, registration for use of the product on cucurbits has been withdrawn by the manufacturer.

TABLE 1. WEED CONTROL AT 40 AND 70 DAYS AFTER TREATMENT, WATERMELON HERBICIDE TRIAL, CULLMAN, ALABAMA, 1984 AND 1985

Treatment[1]	Grass control 40 days[2]	Grass and broadleaf weed control	
		40 days	70 days
	Pct.	*Pct.*	*Pct.*
Preemergence			
Sonolan[3] 1 lb./acre + Amiben 2 lb./acre	100	95	90
Prefar 4 lb./acre + Alanap 2 lb./acre	97	92	87
Amiben 2 lb./acre	100	96	92
Sonolan 1.5 lb./acre	98	93	88
Devrinol 2 lb./acre	94	87	81
Postemergence			
Fusilade 0.25 lb./acre	88	69	53
Poast 0.5 lb./acre	87	67	51

[1]Amiben, Devrinol, Fusilade, and Poast are not labeled for use on watermelons.
[2]Hand weeded plots had 100% control of weeds and grasses and unweeded plots had no control.
[3]Registration for use on cucurbits has been withdrawn.

TABLE 2. YIELD, FRUIT SIZE, AND TOTAL SOLUBLE SOLIDS CONTENTS OF WATERMELONS IN HERBICIDE TRIAL, CULLMAN, ALABAMA, 1984 AND 1985

Treatment	Yield/acre	Fruit size	Total soluble solids
	Lb.	*Lb.*	*Pct.*
Preemergence			
Sonolan 1 lb./acre + Amiben 2 lb./acre	33,000	23.4	10.1
Sonolan 1.5 lb./acre	30,000	21.9	10.2
Prefar 4 lb./acre + Alanap 2 lb./acre	30,000	20.3	10.1
Amiben 2 lb./acre	26,000	24.0	10.0
Devrinol 2 lb./acre	20,000	26.6	10.0
Postemergence			
Fusilade 0.25 lb./acre	12,000	16.1	9.6
Poast 0.5 lb./acre	12,000	17.0	9.6
Checks			
Hand weeded	19,000	21.9	9.7
Unweeded	0	0	0

Norton is Professor of Horticulture; Cosper is former Research Associate of Horticulture; Brown is Assistant Professor of Horticulture; and Hollingsworth is Superintendent of the North Alabama Horticulture Substation.

Bluetongue serotype 2 virus poses concern for Alabama cattlemen

G.R. MULLEN and L.H. LAUERMAN

DURING the past year BTV serotype 2, an exotic form of bluetongue virus (BTV), was found in Alabama cattle. This virus, suspected of being introduced from the Caribbean, was confirmed at two locations in the State, marking the first time BTV-2 has been detected in the United States outside of Florida. It represents the first clinical cases associated with BTV serotype 2 in North America.

In August 1984, eight suspected cases of BTV occurred in a herd in west-central Alabama where infected animals exhibited sores and erosion of muzzle tissue and mucosa of the mouth, figure 1. Lameness was evident due to inflammation of the coronary bands of the hooves, figure 2. BTV-2 was later isolated from the blood of these animals. Serum samples, which indicate only BT virus, not which serotype, from 220 cattle in the area revealed that 38% were seropositive for BTV, indicating their previous exposure to the virus. In March 1985, a bull from this site was admitted to the Large Animal Clinic at the Auburn University College of Veterinary Medicine, where BTV-2 was isolated from his blood.

In January 1985 a high incidence of aborted fetuses and dead newborn calves occurred in a herd in the southeastern part of the State. The calves were abnormally small (20 to 40 lb.) even though they were dropped near term. BTV-2 was subsequently isolated from the tissues of one of the aborted fetuses.

Transmission of the virus occurs primarily by the bite of tiny flies in the genus *Culicoides*, commonly referred to as biting midges, punkies, or no-see-ums. The principal known vector species of bluetongue virus in the United States is *C. variipennis*. In Florida, however, the cases of BTV-2 in cattle have occurred in areas where this species is relatively uncommon or absent, strongly indicating that one or more other species may be responsible for transmission of BTV-2. *Culicoides insignis* has been implicated as the probable vector in Florida based primarily on the high incidence of this species in association with cattle and the isolation of BTV-2 from field-collected adult flies.

To determine which *Culicoides* spp. are involved in transmission of BTV in Alabama, extensive light-trap collections of these insects have been made in Alabama Agricultural Experiment Station research at various outbreak sites in the State during the past 2 years in an effort to recover the virus from field-collected flies. More than 5,000 *Culicoides* specimens collected at the time at the 1984 site are still being assayed for possible virus infections. The major species attacking cattle at each site have been *C. variipennis*, *C. stellifer*, *C. venustus*, and *C. debilipalpis*. In the meantime, Auburn research, in conjunction with personnel at the USDA Arthropod-borne Animal Diseases Research Laboratory in Denver, has demonstrated that both *C. stellifer* and *C. debilipalpis* can support the development of BTV in laboratory infection studies. One or both species may thus play a supplemental role in transmission of BTV by *C. variipennis*. *Culicoides insignis* has been found only in the extreme southern part of Alabama along the Florida border. No specimens of *C. insignis* have yet been found at any of the outbreak sites, suggesting that, unlike the situation in Florida, this species cannot account for the occurrence and spread of BTV-2 in Alabama.

Currently little is known about the distribution of BTV-2 in Alabama and other parts of the Southeast. There is reason to suspect, however, that it had already spread throughout much of the southern half of the State at least as early as the summer of 1984.

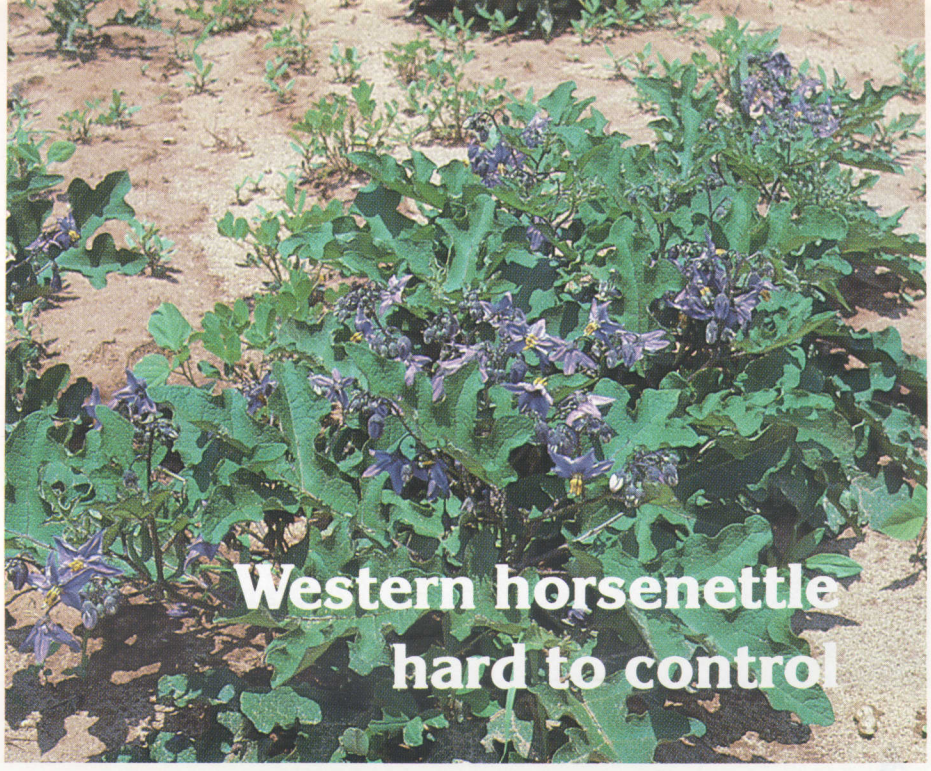
The association of BTV serotype 2 with severe clinical cases of bluetongue disease in Alabama cattle is of particular concern. The incidence of bluetongue activity in Alabama involving other serotypes of the virus has been documented. Previous statewide surveys have revealed BTV activity in 48 of Alabama's 67 counties, with up to 81% of the herds in some parts of the State demonstrating antibody to BTV. However, most infected animals exhibit little or no overt signs and thus go unrecognized. It is only in acute cases and obvious reproductive disorders, such as aborted or deformed calves, that infected animals are usually detected.

Cattlemen should be alert to possible outbreaks of this disease in their own herds. If suspected cases occur, they should promptly contact their local veterinarian to obtain appropriate samples for diagnostic purposes. This can help Auburn researchers significantly in their continuing efforts to monitor the distribution of the virus and to determine the species of insect vectors involved in transmission. Such information is important to the ultimate goal of developing a control program for this significant livestock disease.

Mullen is Associate Professor of Zoology-Entomology; Lauerman is Head of the Microbiology Section, Charles S. Roberts Veterinary Diagnostic Laboratory, Alabama Department of Agriculture and Industries.

FIG. 1 (below). Sores and erosion of muzzle tissue are samples of BTV symptoms in young cattle.

FIG. 2 (right). Lameness caused by hoof inflammation is another symptom of BTV.



Western horsenettle hard to control

G.R. WEHTJE and D.L. COLVIN

WESTERN HORSENETTLE is not as prevalent as many weeds in the peanut growing region, but it is present on enough Alabama farms to create concern. Therefore, a study was begun at the Alabama Agricultural Experiment Station to learn about this tough weed.

Although related to the more common Carolina horsenettle, western horsenettle is larger and more robust. It grows up to 3 ft. tall and produces fruit nearly as large as cherry tomatoes. Its large purple flowers contrast with the white flowers of Carolina horsenettle, which produces fruit usually smaller than ½ in. in diameter.

Western horsenettle produces an extensive network of roots which run parallel to the soil surface, and the roots apparently are the primary means of spread. Since spread of the weed is mostly by roots, the project investigated the size of root fragment necessary for regeneration and how natural drying of roots would affect their ability to regenerate.

To determine effect of root fragment size on spread of western horsenettle, roots that had been unearthed during spring tillage were cut into sections of 3.2, 2.4, 1.6, 0.8, 0.4, and 0.2 in. long. These sections were planted near the surface of moist potting soil and kept in a greenhouse. Sections 2.4 in. long or longer had a 99% regeneration rate, as compared with 76, 50, 10, and 0%, respectively, for segments 1.6, 0.8, 0.4, and 0.2 in. long.

Effect of root drying was determined by exposing 3.5-in. root fragments for 0, 2, 6, and 12 hours and 1, 2, and 3 days during May 1983. This was done to simulate the effects of root fragments being brought to the soil surface by tillage and then being allowed to dry. After 3 days, viability was reducted to 55% relative to roots that were not allowed to dry.

In a second trial conducted in August when the temperature was higher and the humidity lower, roots were killed after 3 days of drying. These results emphasize the value of tillage to break up and bring roots to the surface as a means of control.

Western horsenettle produces seed, but those from mature fruits had only a 33% germination rate. None of the standard germination enhancing treatments, such as scarification or leaching with water, improved germination. Even though some of the seed are viable, plants that originate from seed are seldom apparent in the field. Young plants are invariably connected by lateral roots to neighboring plants.

Seed germination is slow. Under ideal conditions, seeds do not germinate until the third week after planting, and seedlings develop slowly. A 3-month-old seedling is typically less than 12 in. in height. Seedling survivial is probably a fairly rare event in the field, and this probably limits the spread of this species.

Greenhouse and field studies with herbicides indicated that only herbicides that have a hormone-disrupting type of activity (like 2,4-D) have any worthwhile activity against western horsenettle. And none of those provided satisfactory control with a single application.

A study on set-aside land evaluated control of western horsenettle with Roundup® and Banvel D®. Both herbicides were applied at 1 and 2 qt. per acre at three stages of the weed: (1) early to full bloom, i.e. July, (2) early fruit development, i.e. August, and (3) mature fruit, i.e. September. Each treatment was applied broadcast to the same plots in both 1983 and 1984. Control shown in the table was evaluated at the close of each season (November).

Results indicate that Banvel D was superior to Roundup, and the greatest control was achieved when herbicides were applied in July when plants were blooming. Banvel D applied at 1 qt. per acre at this time provided 96% control the first year and 100% after the second year. Roundup applied in the same manner provided comparable final control, but first-year control was poorer. These treatments are exorbitantly expensive if applied on a broadcast basis; however, in most cases spot treatment is all that is necessary.

These findings emphasize that there is no quick and easy method by which western horsenettle can be controlled. Summer tillage that allowed root fragments to dry was obviously beneficial, and herbicides applied in mid-summer proved helpful.

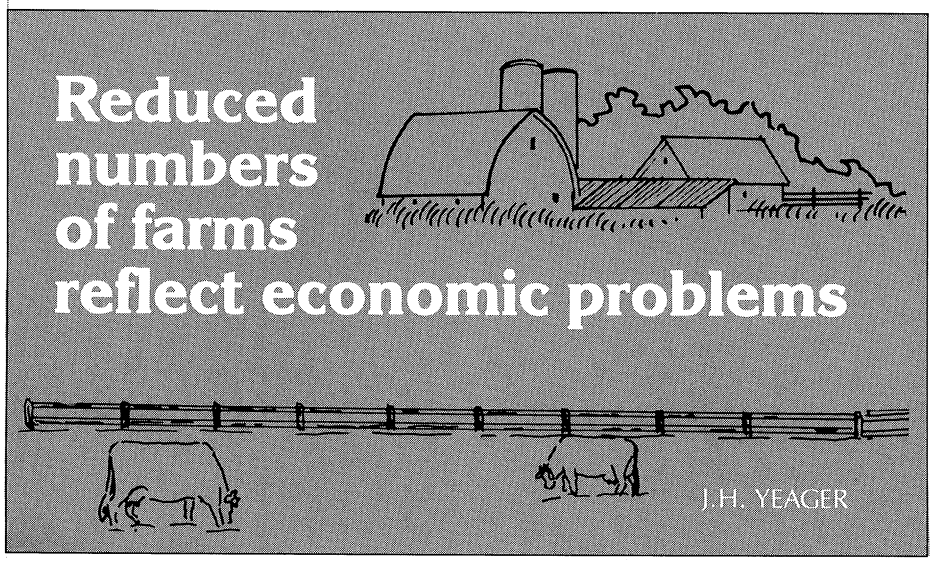
Fruit produced by western horsenettle are nearly as large as cherry tomatoes.

CONTROL OF WESTERN HORSENETTLE WITH BANVEL D AND ROUNDUP

Herbicide/acre and time of application	Percent control[1]	
	First year	Second year
July		
Banvel D, 1 qt.	96	100
Banvel D, 2 qt.	95	100
Roundup, 1 qt.	71	100
Roundup, 2 qt.	93	100
August		
Banvel D, 1 qt.	92	90
Banvel D, 2 qt.	100	96
Roundup, 1 qt.	53	81
Roundup, 2 qt.	78	84
September		
Banvel D, 1 qt.	62	70
Banvel D, 2 qt.	90	86
Roundup, 1 qt.	70	69
Roundup, 2 qt.	80	73

[1]Rated in November of each year, with numbers of weeds compared to those in untreated plots.

Wehtje is Assistant Professor and Colvin is Graduate Assistant of Agronomy and Soils.



ALL IS NOT WELL with agriculture. Farms are being sold because of credit and financial problems. Newspapers report almost daily about the farm situation and bank failures in major agricultural areas. Movies such as "Country" and "Places in the Heart" depict the plight and demise of farms.

What is responsible for the situation? Exports of farm products peaked in 1981, declined 15% in 1982, increased some in 1983, and have declined since then. From 1950 to 1981, farm real estate values increased each year with few exceptions. Demand for farm land was strong by farmers to expand their operations and by non-farmers for investment, speculative, or tax purposes. Since 1981, U.S. farm real estate values have declined, 50% or more in some areas.

The decade of the 1970's included several years of substantial inflation in the economy. Real interest rates (nominal rate minus inflation), which averaged 1% to 2% in the 1970's, abruptly rose to relatively high levels when inflation subsided in the early 1980's. Inflation was slowed by stringent control of monetary growth and a worldwide recession that weakened international markets. Interest rates were deregulated and allowed to seek market clearing levels.

With high interest rates, foreign capital was attracted to the United States. This resulted in a strong dollar relative to foreign currencies, which led to reduced exports.

Farm production costs increased in the 1970's, and high real interest rates in the early 1980's compounded the adverse financial effects. Interest costs became a major expense item with high levels of farm capitalization and operating expenses. Thus, with a decline in exports and increased costs of production, net farm income was squeezed. Farmers faced problems in obtaining credit to finance their operations. Declining real estate values reduced the farmer's equity base and caused lenders to be more cautious in their lending practices.

An Alabama Agricultural Experiment Station study completed in early 1985 provided information about the financial situation of Alabama farmers. Sixteen percent reported being delinquent in principal or interest payments on real estate loans, 17% on equipment or livestock loans, and 18% on operating loans. The average debt-to-asset ratio reported was 28%, with farmers in the Black Belt Area showing the highest average, 40%. The highest average ratios of debt-to-net income were for farmers in the Gulf Coast and Black Belt. There was some evidence that farms with higher gross sales had somewhat higher delinquency rates. Also, debt-to-asset ratios declined somewhat as age of the farmers increased.

When the farmers surveyed were asked if they expected to be farming in the next 5 years, 38% (almost two out of every five) replied "no." The proportion indicating they would not be farming in 5 years was fairly well distributed by farming regions of the State and levels of gross sales. However, 52% of the farmers 60 years old and over indicated they would not be farming in 5 years. Major reasons given for leaving farming were retirement, financial problems, health, and others.

If the estimated demise of farms occurs, this could mean that Alabama will have only 35,000 farms by 1990, down from the peak 273,000 in 1935. In 1984, Alabama had 54,000, approximately the same as the number given in the table for 1860.

In general, the number of farms in Alabama and the United States has declined since the 1930's. This decline accelerated after World War II as capital in the form of machinery and equipment, fertilizer, chemicals, and other inputs increasingly was substituted for labor. Total capital investments in farms and annual operating expense requirements increased substantially as farms became larger and more capital intensive. Many people left the farm to find employment in nonfarm industries and firms.

CHANGE IN FARM NUMBERS, 1860-1984

Year	Alabama		United States	
	No. of farms	Change	No. of farms	Change
	Thous.	*Pct.*	*Thous.*	*Pct.*
1860	55	—	2,044	—
1870	67	22	2,640	29
1880	136	103	4,009	52
1890	158	16	4,565	14
1900	223	41	5,737	26
1910	263	18	6,429	12
1920	256	-3	6,500	1
1925	238	-7	6,475	0
1930	257	8	6,672	3
1935	273	6	6,611	-1
1940	232	-15	6,350	-4
1945	223	-4	5,967	-6
1950	212	-5	5,648	-5
1955	177	-17	4,654	-18
1960	111	-37	3,963	-15
1965	93	-16	3,356	-15
1970	82	-12	2,949	-12
1975	63	-23	2,521	-15
1980	59	-6	2,428	-3
1984	54	-8	2,333	-3

Source: Various Censuses of Agriculture.

The decline in number of farms was also associated with increases in size. From 1950 to 1985, the average size of Alabama farms doubled while the number of farms and farmers declined from 200,000 to 54,000. The release of people from agriculture, in a large measure, made possible the growth of manufacturing, trade, and service components of our economy.

The decline in farm and farmer numbers that started about 50 years ago apparently is being accelerated by the financial situation today. Will farmers become an endangered species?

Implications derived from research are that middle size farms may be the ones that will decline most. Generally, larger farms are somewhat more efficient and are able to take advantage of economies of scale in their operations. At the other extreme are small farmers who depend on off-farm work for most of their income, and this allows them to continue farming even under unfavorable economic conditions.

Agribusiness firms face substantial adjustments in their operations, product sales, and services in order to survive. The concept of the farm as strictly a family enterprise is increasingly outdated. Modern farmers are marketers and financial managers who are breaking old ties with local firms. As a result, an increased number of small towns will likely wither away. Thus, the decline in farm and farmer numbers will have far-reaching effects.

Yeager is Professor of Agricultural Economics and Rural Sociology.

IMPROVING GRASS CONTROL IN GRAIN SORGHUM

B.E. NORRIS and R.H. WALKER

CONTINUOUS use of atrazine and 2,4-D for selective removal of broadleaf weeds has resulted in a proliferation of some grass species, especially in minimum-tillage systems. Despite this, research by the Alabama Agricultural Experiment Station indicates Texas panicum and large crabgrass can be controlled in grain sorghum planted in either conventional or minimum-tillage systems.

The development of herbicide protectants or safeners to prevent excessive sorghum injury from the acetanilide herbicides has given farmers added flexibility in their weed control programs. This allows for preplant incorporated or preemergence application of Lasso® or Dual® for control of many annual grasses. However, difficult to control grasses, such as Texas panicum (generally tolerant of Lasso and Dual), or excessively heavy infestations of grasses still pose problems. Consequently, supplemental postemergence-applied herbicide applications are needed to eliminate escape grasses. Therefore, research was initiated to determine the effectiveness of several herbicide systems, including postemergence over-the-top and postemergence-directed applications, for annual grass control in grain sorghum.

Tests were established at the Wiregrass Substation, Headland, in areas infested exclusively by large crabgrass or Texas panicum. Plots were four rows wide and 23 ft. long. Conventional-tillage plots were prepared for planting by one chiseling, two diskings, and a single smoothing operation. A Brown-Harden Ro-Till® was used to prepare the minimum-tillage plots in wheat stubble desiccated with Paraquat® (1½ pt. per acre). Grain sorghum seeds treated with Screen® (antidote for Lasso) were planted in 30-in. rows in late April each year. A 20-20-0 starter fertilizer was used at planting and an additional 80 lb. of N per acre was applied 3 to 4 weeks later.

Herbicides utilized in the tests included: Lasso (2½ qt. per acre) preplant incorporated, AAtrex® (1½ qt. per acre) plus Tandem® (1 pt. per acre) postemergence over the top, and Paraquat® (1 pt. per acre) postemergence directed. All herbicides were applied broadcast except when Lasso was applied to the minimum-tillage plots. In this case, Lasso was delivered in a 15-in. band and incorporated by the barrel-shaped crumblers which are a component of the Ro-Till. AAtrex plus Tandem was applied postemergence over the top to annual grasses when they reached the one- to three-leaf stage. Paraquat was directed towards the base of 12- to 15-in.-tall sorghum. In addition to the herbicide systems, weedy and hoed checks were included in each test.

Tandem is a new herbicide, manufactured by Dow Chemical Co., which enhances the efficacy of AAtrex on annual grasses. It is expected to be marketed nationwide in 1986 for postemergence over-the-top control of annual grasses in corn.

Large crabgrass and Texas panicum control was evaluated for each herbicide system 48 days after planting (DAP). The two center grain sorghum rows of each plot were combine harvested and yields were recorded at 12.0% moisture.

With conventional tillage, the herbicide system consisting of Lasso, AAtrex, and Paraquat provided excellent large crabgrass and Texas panicum control, table 1. With minimum tillage, two systems which included Paraquat as a postemergence-directed spray also gave excellent annual grass control. Unacceptable large crabgrass and Texas panicum control was observed after the application of Tandem plus AAtrex without a supplemental treatment of Paraquat. Without Paraquat, tests indicate two applications would be necessary for adequate control of these grasses.

All herbicide systems provided acceptable grain sorghum yields relative to the weedy check. Minimum-tillage sorghum treated with a directed spray of Paraquat produced yields comparable to, if not better than, the hoed check. Poor large crabgrass and Texas panicum control displayed by the herbicide system composed of Lasso and Tandem plus AAtrex resulted in the lowest sorghum yields.

These herbicide systems appear to be feasible for the control of Texas panicum and large crabgrass in conventional or minimum-tillage grain sorghum. However, generally better results have been attained in conventional culture due primarily to the additive effects of tillage. Despite the tillage method used to plant grain sorghum, good large crabgrass and Texas panicum control and grain sorghum yields can be achieved with several herbicide systems.

Norris is Graduate Research Assistant and Walker is Associate Professor of Agronomy and Soils.

LARGE CRABGRASS AND TEXAS PANICUM CONTROL AND GRAIN SORGHUM YIELD AS INFLUENCED BY HERBICIDE SYSTEMS AND TILLAGE[1]

Herbicide system[2] and tillage	Large crabgrass control 48 DAP[3]	Sorghum yield/ acre	Texas panicum control 48 DAP[3]	Sorghum yield/ acre
	Pct.	*Bu.*	*Pct.*	*Bu.*
Conventional tillage				
Lasso, (PPI-bc); AAtrex (POT); Paraquat (PDS)	94	77	97	82
Minimum tillage				
Lasso, (PPI-bd); AAtrex (POT); Paraquat (PDS)	89	85	89	75
Lasso, (PPI-bd); Tandem + AAtrex (POT)	68	72	58	62
Tandem + AAtrex (POT); Paraquat (PDS)	94	87	92	79
Weed check	0	46	0	47
Hoed check	99	99	99	71

[1]Average of 1984 and 1985 data.
[2]Abbreviations for herbicide application are: PPI-bc = broadcast and soil incorporated; PPI-bd = banded and soil incorporated; POT = postemergence over the top; PDS = postemergence directed.
[3]DAP = days after planting.

OBJECTIVE ANALYSIS OF FISH FOR OFF-FLAVOR

R.T. LOVELL and I. LELANA

DURING July-September in both 1983 and 1984, over 50% of catfish ponds evaluated in a study area of western Alabama were unharvestable because of off-flavor in the fish. Catfish absorb flavor compounds, produced by pond organisms, which render the fish unmarketable. Hopefully, a practical and consistent pond control for off-flavor will be found. Meanwhile, industry and research need objective methods to replace the presently used taste test for evaluating fish for off-flavor.

Development of a satisfactory objective test for off-flavor in fish requires the following: (1) identification of the compound(s) causing most of the off-flavor; (2) sensory threshold of the compound (the concentration in the fish that is necessary for a perceptible flavor); and (3) an instrumental method to reliably measure the off-flavor compound(s) at sensory threshold levels.

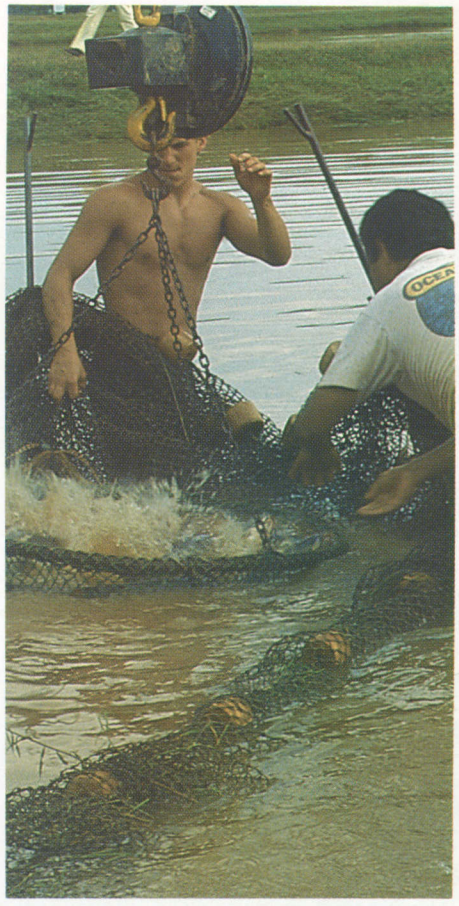
To identify the predominant types of pond-related off-flavor in intensively fed fish ponds, 77 catfish ponds in western Alabama were sampled monthly, April through October, and evaluated sensorily for type and intensity of off-flavor. "Earthy-musty" and "muddy" were the flavors found in 79% of the off-flavor fish. Fifteen of the musty or muddy flavored fish were chemically analyzed and all but one contained the compound geosmin.

A sensory threshold in catfish flesh was established by spiking control fish (no detectable geosmin) with graded levels of the compound and determining the concentration at which taste testers could identify it in the fish 75% of the time. Taste threshold for geosmin in catfish is as low as 8.4 parts per billion (p.p.b.).

A procedure was developed for geosmin analysis of fish flesh which consisted of vacuum distillation to extract the compound with subsequent injection of the extract into a gas chromatograph for determination of geosmin content. The procedure is reliable down to around 1 p.p.b. of geosmin.

Agreement between objective and subjective analysis for determining intensity of off-flavor was measured by evaluating fish with graded levels of geosmin by instrument and taste test. Fish with intense musty off-flavor were transferred from ponds to clean water and held for various periods to remove off-flavor. At 0, 1, 3, 6, 9, and 10 days, samples of fish were removed and evaluated by taste test and by instrument for geosmin. As shown in the table, results of the evaluation showed a close relationship between sensory score and concentration of geosmin in the fish flesh. By the sensory scoring system used, where 9-10 = no off-flavor and 1-2 = extreme off-flavor, a score of 8 would be minimum for a marketable fish. This represents slight off-flavor and would not likely be objectionable to an untrained person. Associating the instrumental with the taste test analysis indicates that a concentration of 6 p.p.b. of geosmin would equal a sensory score of 8.

Results of this Alabama Agricultural Experiment Station study indicate that geosmin is the cause of most off-flavor in catfish ponds during the summer growing season and the insrumental test will accurately measure it below the taste threshold level. Although instrumental evaluation for off-flavor appears feasible, it should not completely replace sensory evaluation because unidentified compounds other than geosmin can also cause off-flavor in fish. However, it can supplement subjective testing. For example, if the instrumental test shows a geosmin concentration of 6 or above, sensory evaluation of the fish is unnecessary.



Lovell is Professor and Lelana is a Doctoral Graduate Assistant of Fisheries and Allied Aquacultures.

GEOSMIN CONCENTRATIONS AND SENSORY SCORES FOR OFF-FLAVOR CATFISH HELD IN CLEAN WATER TO REMOVE OFF-FLAVOR

Days in clean water	Geosmin concentration	Sensory score[1]
	p.p.b.	
0	90	5.2
1	40	7.0
3	30	7.7
6	5	8.3
9	non-detectable	9.1

[1]No off-flavor = 9-10, slight off-flavor = 7-8, distinct off-flavor = 5-6, intense off-flavor = 3-4; and extreme off-flavor = 1-2.

ALABAMA AGRICULTURAL EXPERIMENT STATION, AUBURN UNIVERSITY
AUBURN UNIVERSITY, ALABAMA 36849

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