HIGHLIGHTS

of agricultural research

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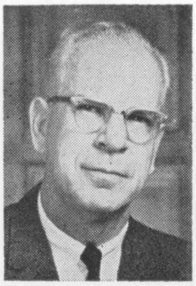
DIRECTOR'S COMMENTS



E. V. Smith

FARM-CITY WEEK was observed in thousands of communities across America during the week that included Thanksgiving. Many farm and commodity organizations and civic clubs symbolically celebrated the occasion by sponsoring luncheons that seated city dwellers and farmers in the ratio of 48 to 1. The symbolism was simply that one American farmer now produces enough food for 48 people besides himself.

Thus, Farm-City Week recognizes and pays tribute to the remarkable increase in the efficiency of American agriculture. In a very real sense, the individual farmer today is more important to the national economy and to the general public than any farmer who ever lived before him. In this context, the brightest spot in the rather dismal balance of payments picture is the income derived from the cash export of farm products such as soybeans and cotton.

It is a sad commentary, however, to recognize the importance of the farmer to our national well-being and have, at the same time, to acknowledge that the farmer does not benefit from the abundance that he has created to the same extent as other segments of society. While the prices that farmers receive have in general represented a declining relation to parity, the prices of production supplies have continued to increase.

There is a fallacy in assigning full credit to the farmer for feeding 48 other people. Actually, the farmer might be considered to be in partnership with a broad array of non-farmers in the business of producing food and fiber. The latter includes those who manufacture or sell production supplies such as fertilizers and farm machinery and those who handle, process, and market farm products. Thus, in a numbers-conscious nation, it is important to stress the fact that modern agriculture provides jobs for about 30% of the country's work force and not merely the 5% who actually farm. When viewed in this real context, agriculture represents one of the nation's largest businesses.

Those of us who have a vested interest in the welfare of American agriculture applaud Kiwanis International for originating the idea for Farm-City Week. We appreciate the publicity given to activities in connection with it by the press, radio, and television. We must remember, however, that public relations is not a "one-shot" affair. Agriculture has a good story to tell. Let's tell it at every opportunity throughout the year and not just during special occasions such as Farm-City Week.

may we introduce . . .

Elmo S. Renoll, author of the article on page 3, is an associate professor in the Department of Agricultural Engineering. He does both teaching and research. He has authored several Station publications and both technical and popular articles on time studies in efficient use of farm machinery.

Elmo is a native of Glen Rock, Pennsylvania, received his B.S. from Auburn University and M.S. from Iowa State College. He has been a member of the Auburn University faculty since 1949. He is a member of Alpha Zeta, Gamma Sigma Delta, American Society of Agricultural Engineers, American Association for the Advancement of Science, and American Society of Engineering Education.

He has been on two national standing committees in ASAE and has served two years as chairman of the Southeast Region student paper awards committee of ASAE.

look for these articles

HIGHLIGHTS of Agricultural Research

WINTER 1971 VOL. 18, NO. 4

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ON THE COVER. The size and type of stacks made by machine and fed to cattle at the Black Belt Substation are illustrated.

STACKED vs. BALED SYSTEMS of HANDLING and FEEDING HAY

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A RECENT DEVELOPMENT in hay machinery is a large wagon-type vehicle called a Hesston Stackhand. This machine is of interest to hay producers and livestock farmers because of possible labor saving in hay harvesting and feeding.

A comparison of this stack system with a conventional bale system using johnsongrass hay was made during the summer of 1970 and winter of 1971 at the Black Belt Substation. Grass for both systems was cut with a self-propelled hay conditioner and left in the swath until partially dry and then windrowed.

Baled hay was produced using a New Holland 277 baler. The baled hay was loaded, transported, and unloaded with a self-propelled New Holland 1047 Stackcruiser operated by one man.

Stacked hay was handled from the windrow to storage stack with one machine, the Hesston Stackhand 30. This machine is pulled by a tractor and powered from the P.T.O. Hay from the windrow is picked up by the machine and discharged into the top of the unit. The top is movable and serves as a hay compressor for the entire hay load. The compressed stack of hay was unloaded at the site where it was fed. Each stack was approximately 8 ft. wide, 14 ft. long, 9 ft. high, slightly rounded on the top to shed water, and weighed about 3 tons. Stacks were not covered.

The bale system had a capacity of 2.95 tons per man-hour and the stack system 3.47. This includes windrow to storage plus a hauling distance of 1 mile.

The stacks harvested by the Hesston Stackhand were stored in a fescue field. All stacks were fenced so animals could eat only one stack at a time. The field (14.5 acres) was fenced into two equal areas. A group of 52 Angus and Angus-Hereford steers averaging 476 lb. was divided into 2 groups of 26 animals each. One group was fed the hay stacks and the other group baled hay. In addition to hay, each group received per head daily 2 lb. ground shelled corn and 1½ lb. of 41% cottonseed meal. The feeding period was November 10, 1970, through March 2, 1971. Baled hay was fed free choice daily in hay racks. Steers fed stacked hay had access to a stack 24 hours a day. When a stack was consumed, the two groups of steers were rotated on the fescue pasture and a new stack of hay was opened.

TABLE 1. BALED VS. STACKED JOHNSON GRASS HAY FOR YEARLING CATTLE, BLACK BELT SUBSTATION

Item	Baled hay	Stacked hay
Animals, no.	26	26
Average days on test, no.	113	113
Average final live weight, lb.	636	612
Average initial live weight, lb.	476	477
Average gain, lb.	160	135
Average daily gain, lb.	1.42	1.19
Feed required per cwt. gain:[1]		
Hay, lb.	963 (754)	1,547 (1,178)
Corn, lb.	141	167
CSM, lb.	106	126
Estimated total feed cost per cwt. gain[2], dol.	20.53	26.01

[1] Values in ( ) are hay expressed as dry matter.
[2] Feed ingredient prices were: Corn, $3.30/cwt.; CSM, $4.20/cwt. Hay costs per ton were: production $8.53, baling $15.21, and stacking $11.13, assuming 500 ton production and feeding per year.

Weather damage to hay in stacks did not appear to be excessive. No measurements of this damage were made, but it is estimated to be less than 5%. Considerable loss did occur while animals were eating the stacks. Some hay was pulled to the ground, trampled in mud, and contaminated by animals. This loss averaged 41%.

Although baled hay was fed in racks, there was some wasted and refused hay. The loss was 6%. In addition there was an estimated 4% rotten hay on the bottom of the pile where bales were in contact with the ground, making a total loss of 10%.

Data in Tables 1 and 2 indicate that feed efficiency and average daily gain favored the baled hay. However, there was some savings in labor with the stack method (3.47 tons/man-hour vs. 2.95 tons/man-hour) during harvesting and storing. Some labor also was required in feeding the baled hay but none was used for the self-fed stacked hay. There was a cost of fencing the individual stacks and for a tarpaulin to cover the stored bales of hay. All of these costs are included in Table 2.

Costs per ton harvested were lower for the stack system than for the bale system for any volume of production, Table 2. This was mainly because of higher fixed cost per ton resulting from the higher investment required for the bale system. Excluding tractors, the estimated new equipment cost for the bale system would be $21,547 compared with $13,639 for the stack system. This estimate includes the windrower, rake, baler, and Stackcruiser for the bale system and the windrower, rake, and Stackhand for the stack system.

The costs per ton actually utilized, however, were lower for the baled hay system because of a high loss of hay by trampling for the stack system. Costs per cwt. gain were lower for the bale system for the same reason. Because of a high loss encountered with the stack system, this experiment will be continued to examine this problem in more detail.

TABLE 2. ESTIMATED HARVESTING COSTS PER TON BY AMOUNTS HARVESTED AND FED PER YEAR FOR TWO SYSTEMS OF HAY HARVESTING, BLACK BELT SUBSTATION

Machine or item of cost	Costs per ton, when average tons harvested per year are:				
	250	500	1,000	2,000	3,000
Baled hay					
Total cost/ton harvested	$21.44	$15.21	$12.09	$10.54	$10.02
Ownership (fixed) costs	12.46	6.23	3.11	1.56	1.04
Operating (variable) costs	8.98	8.98	8.98	8.98	8.98
Total cost/ton actually utilized	23.70	16.81	13.36	11.65	11.08
Total cost/cwt. gain	10.32	7.32	5.82	5.08	4.82
Stacked hay					
Total cost/ton harvested	$16.05	$11.13	$ 8.68	$ 7.45	$ 7.04
Ownership (fixed) costs	9.83	4.91	2.46	1.23	.82
Operating (variable) costs	6.22	6.22	6.22	6.22	6.22
Total cost/ton actually utilized	27.54	19.10	14.90	12.79	12.08
Total cost/cwt. gain	12.41	8.61	6.71	5.76	5.45

Computerized Rations for Fattening Beef Steers

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B. R. MILLER[1], *Dept. Agricultural Economics and Rural Sociology*

COMPUTERS are attracting considerable interest as a means of formulating beef cattle fattening rations. The composition of such mixtures is easily adjusted as ingredient prices change; however, the resultant mixtures must be consistent with good nutrition and must not be changed so drastically that cattle will go "off feed."

Two feedlot studies of computerized rations were conducted at Auburn University's Lower Coastal Plain Substation at Camden. Yearling beef steers weighing 725-750 lb. initially were used as test animals. The first study was conducted in April-June 1966, and a second, more complete trial was conducted from September 1966 to March 1967. Both compared the performance of steers fed computerized rations with that of steers fed more conventional high-roughage blended fattening mixtures.

Certain restrictions were imposed in an attempt to ensure mixtures that would support satisfactory animal performance. The minimum crude protein content was 10.5% and the total digestible nutrient (TDN) content was controlled at 65% or 75%. Calcium, phosphorous, and magnesium contents of the mixtures were allowed to vary over acceptable ranges. Also, maximum quantities of certain ingredients, principally roughages, either singly or in combination were specified.

Nutrient composition and current cost data of available feedstuffs were programmed into the computer and two fattening mixtures were formulated for the first trial. These mixtures by design did not contain silage. One mixture was 65% TDN and the other 75% TDN. A 64% TDN control mixture contained ear corn, cottonseed meal, cane molasses, and grass hay. These 3 mixtures were fed to yearling beef steers during a 71-day finishing trial. Rate of gain and feed conversion on the computerized rations were similar to those on the control during this first study.

The same general procedure was followed for the second, more detailed, trial except that corn silage was included among the available ingredients. Four mixtures were calculated by the computer: 65% and 75% TDN, each with and without silage. These mixtures were similar to those fed during the first trial except that hominy feed replaced citrus pulp, urea was increased from about 1% to 1.5% of the mixture, and stabilized animal fat was added up to a maximum of 5%. The control ration was very similar to the one used in the first trial and was one that had been used successfully for several years. The corn silage was produced under extreme drouth conditions and was low in grain content (17.6% on dry matter basis).

As shown in the table, steers on the control ration gained well. Those fed the silage-containing computerized mixtures gained very poorly. The cattle fed the 75% TDN mixture containing silage gained an average of 1.0 lb. daily during the first 77 days of the study. Since this rate of gain was not satisfactory, they were changed to the control ration and gained 2.7 lb. daily for the subsequent 57-day period. Those cattle that were fed the 65% TDN mixture containing silage were also changed. Their comparable daily gains were 1.1 and 2.6 lb. for the 77- and 71-day periods, respectively.

Steers fed the 65% TDN mixture without silage gained slower than companion cattle fed the 75% TDN ration; however, neither group gained at a satisfactory rate for feedlot cattle under these conditions. Consumption of the computerized mixtures was only 73% of that on the control ration (19.0 vs. 25.9 lb. daily). Decreased feed intake was a factor contributing to mediocre performance.

A much shorter feeding period and lower feed cost per cwt. of gain was observed for cattle on the control ration compared with those on computerized rations.

Carcasses graded Good or Choice with only minor differences in marbling, yield grade, dressing per cent, fat thickness, ribeye area, and kidney fat.

A conventional digestion trial was conducted at Auburn in an effort to explain the poor performance of the feedlot cattle located on the Substation. The 5 rations were prepared at the Substation and transported to Auburn for the metabolism study. Data on digestible dry matter (DDM) content of the mixtures are included in the table. DDM is essentially equivalent to TDN. All of the rations were below estimated values of DDM and thus cattle would not perform as well as expected. No answer was obtained as to why nutritive values were overestimated. Chemical compositions of the mixtures were within expected ranges. The differences in feed intake observed in the feedlot were also noted in the metabolism trial. It is possible that the combination of inedible fat and urea was responsible for lack of palatability.

Care must be exercised in computer programmed formulation of fattening mixtures for beef cattle. Feed consumption and animal gain are not readily predictable for some combinations of ration ingredients.

ANIMAL RESPONSE TO COMPUTERIZED RATIONS, CAMDEN, ALABAMA, SEPTEMBER 1966-MARCH 1967

Item	75% TDN		65% TDN		65% TDN
	No silage	With silage	No silage	With silage	Control
Days in feedlot	134	134	168	148	99
Initial wt., lb.	747	746	745	746	744
Final wt., lb.	979	976	1,013	1,015	1,014
Gain, lb.	232	230	268	269	270
ADG, lb.	1.7	1.7	1.6	1.8	2.7
Ration cost, dol./cwt.	2.56	2.46	2.01	1.88	2.04
Feed cost/cwt. gain, dol.	29.35	28.30	23.01	22.68	19.39
Dry matter digestibility, %	71.39	67.28	56.21	59.11	62.33
USDA carcass grade[1]	10	11	11	10	11

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

[1] Now at University of Georgia, Athens.

YIELD LOSS CERTAIN WHEN SICKLEPOD INVADES SOYBEANS

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Department of Agronomy and Soils

Sicklepod is more competitive between soybean rows than in the drill.

ONE OF THE MOST widespread weeds plaguing Alabama farmers goes by at least two names in the State. Its correct name is sicklepod (*Cassia obtusifolia* L.), but it is also commonly referred to as coffeeweed.

Present in practically all areas of Alabama, sicklepod is one of the most difficult weeds to control. It is particularly troublesome in soybeans, as noted in past *Highlights* stories reporting weed research by Auburn University Agricultural Experiment Station. Because it is present in so many soybean fields, research was begun in 1968 to determine the extent of yield losses caused by varying sicklepod densities.

Bragg soybeans were planted with a conventional cornbean planter on two areas heavily infested with sicklepod. In some experiments, additional seed of sicklepod were planted in the row with seed of soybeans. Tests were on Chesterfield sandy loam soil (Agronomy Farm at Auburn) and Malbis sandy loam (Gulf Coast Substation at Fairhope). Soybeans were planted in 42-in. rows at Auburn and 40-in. rows at Fairhope. Trifluralin (Treflan) was applied preplant at each location to control annual grass weeds.

Densities of sicklepod ranging from 1 weed per 3 ft. of row to 4 per ft. of row were established by thinning when weeds were 3 to 6 in. high. At harvest, number of sicklepod plants per foot of row and weight of beans and weeds were determined.

Soybean yield decreased steadily as density of sicklepod increased. Without weeds, yields exceeded 33 bu. per acre at Auburn and 37 bu. at Fairhope, Table 1. One weed per foot of row cut soybean yield about 14% at Auburn and 8 to 14% at Fairhope. Yield loss for both locations averaged 13%, or 4.8 bu. per acre, at this density. With 4 sicklepod plants per foot of row, soybean yield losses ranged from 35 to 59% and averaged 50% (19 bu. per acre).

TABLE 1. YIELD LOSS BY SOYBEANS AS AFFECTED BY DIFFERENT DENSITIES OF SICKLEPOD

Location and year	Av./acre yield, no weeds	Yield loss, by weed density 1/ft. of row	2/ft. of row	3/ft. of row	Rainfall May 1 to Oct. 1
	Bu.	*Pct.*	*Pct.*	*Pct.*	*In.*
Agronomy Farm					
1968	36.5	15	29	59	19.3
1969	33.0	14	28	56	26.7
Gulf Coast Sub.					
1968	37.5	14	29	58	21.2
1969	37.7	9	17	35	42.5
1970	44.9	11	23	45	32.2
AVERAGE	37.7	13	25	50	

TABLE 2. YIELD LOSS OF SOYBEANS AS AFFECTED BY DRY WEIGHT OF SICKLEPOD AT HARVEST

Location and year	Yield loss, by weed weight/acre ½ ton	1 ton	1½ tons
	Pct.	*Pct.*	*Pct.*
Agronomy Farm, 1969	13	23	34
Gulf Coast Sub., 1969	11	22	33
Gulf Coast Sub., 1970	12	23	35
AVERAGE	12	23	35

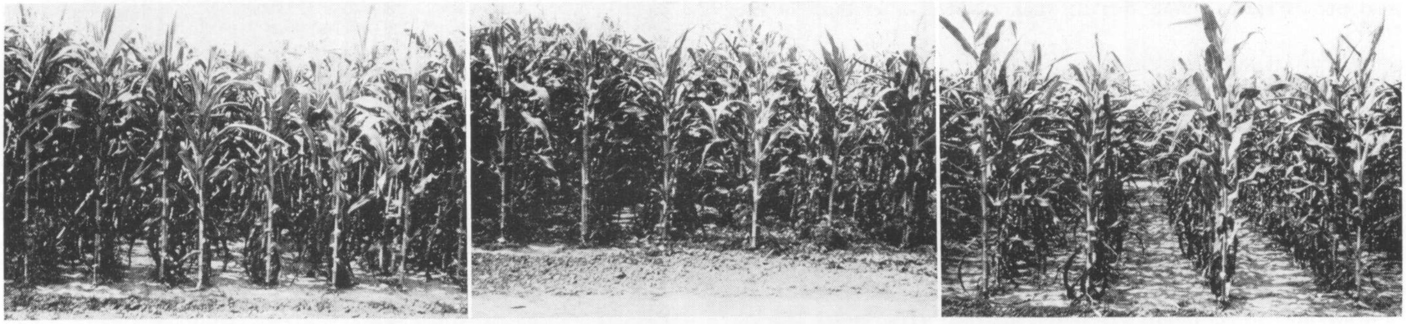
These experiments were conducted under a wide range in rainfall – both amount and distribution – during the 3 years. There was less soybean yield reduction at each location when moisture was plentiful, Table 1. Because of sicklepod's growth habit, shading is probably not as important a factor in yield reduction as moisture stress.

These results show that sicklepod can be highly competitive with soybeans, even at low densities. Yield reduction in this crop, however, is not as severe as in cotton and peanuts.

Soybean yields were also compared with dry weight of sicklepod plants at harvest. Yields were reduced 12, 23, and 35%, respectively, at ½, 1, and 1½ tons per acre of dry weeds, Table 2.

Also studied were competitive effects of a constant density of sicklepod when weeds were planted in the drill and 6, 12, and 18 in. from the row. Weeds in the drill were not as damaging to yields as those 6 or 12 in. away. Stands of sicklepod were actually reduced when planted in the drill with soybeans.

All yields in this study were by hand harvest. If soybeans had been combined, reductions from weeds undoubtedly would have been greater. Also, losses to the grower would be further aggravated by weeds in harvested soybeans, resulting in greater cleaning cost and higher moisture content of beans.



Corn shown here is planted 20-inch rows, left, 30-inch, center, and 40-inch, right.

NARROW ROWS for CORN in ALABAMA— PROFITABLE or UNPROFITABLE?

C. E. SCARSBROOK, *Department of Agronomy and Soils*

SHOULD CORN be planted in 30-in. or 20-in. rows in Alabama? The conventional 36- to 42-in. row widths were well adapted to cultivation with mule power. With development of weed control chemicals and modern equipment for planting, cultivating, and harvesting, the grower can handle a wide range of row widths. However, even with the best equipment, narrow rows are more difficult to cultivate and harvest than conventional width rows. Accordingly, the narrow rows must offer greater yields or other advantages if the practice is to be profitable.

Results of experiments from the Corn Belt of the Midwest have shown that with constant plant population there is about a 10% grain yield increase from 20-in. over 40-in. row widths when yields are in excess of about 125 bu. per acre. At lower yield levels there is no increase from narrow rows.

Experiments on corn row widths were begun in 1967 on the Tennessee Valley, Upper Coastal Plain, and Lower Coastal Plain substations at Belle Mina, Winfield, and Camden, respectively. A well adapted hybrid was used at each location. Comparisons were made on row spacings of 20, 30, and 40 in. with per acre plant populations of 13,100, 17,400, and 26,100. Results of these experiments show no yield advantage to 20- or 30-in. rows as compared with 40-in. row widths, see table. Average yields were relatively low as a result of inadequate rainfall. Even in the best years, when yields averaged near 100 bu. per acre, there was no effect of narrow rows on grain yield. In the best years the higher the plant population the larger the yield.

Average yields were increased from 39 bu. per acre to 60 bu. per acre by the application of 100 lb. of N. Additional N did not result in appreciable increases in average yields at any location.

Plants grow taller and have smaller stalk diameter in high than in low populations. Thus, thick planting increases the susceptibility to lodging. Increases in the rate of N and in the plant population resulted in more lodging. For example, at Camden the highest average lodging was 28% where 200 lb. of N was applied and the plant population was 26,100. With lower plant populations the lodging ranged between 10 and 20%.

The more plants per acre the fewer multi-eared plants and the more barren stalks. However, modern corn hybrids produce few barren stalks with plant populations used in these experiments. So long as a plant produces at least one ear the number of ears is not an important factor in yield. And as population increases, the ear size may be sharply decreased. Ear size was an important factor when corn was harvested and shelled by hand, however, ear size is of little importance where modern corn harvesters are used.

Since few growers in Alabama now produce average yields in excess of 125 bu. per acre, the use of narrow rows does not appear profitable.

These experiments show that narrow rows did not result in increased yields in the average or in the better years. Accordingly, a drill row spacing of 8-9 in. (about 17,000 plants per acre) in 36- to 42-in. width rows is recommended (see Auburn University Agricultural Experiment Station Circular 152, Spacing and Rates of Nitrogen for Corn, March 1966).

ROW WIDTH, PLANT POPULATION AND RATE OF NITROGEN EXPERIMENTS ON CORN, 1967-70

Row width	Spacing in drill	Population, plants/acre	N rate	Yield/acre, best year at all locations	Average grain yields, per acre: Lower Coastal Plain Substation 3-year	Upper Coastal Plain Substation 3-year	Tennessee Valley Substation 4-year	Weighted average all locations
In.	*In.*	*No.*	*Lb./A.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*
40	12	13,100	0	62	15	57	43	39
40	12	13,100	100	89	58	73	52	60
40	12	13,100		85	58	63	46	55
40	9	17,400	100	95	55	82	55	63
40	9	17,400	200	94	58	73	51	60
30	12	17,400	100	93	57	76	54	62
30	12	17,400	200	96	61	75	52	62
20	18	17,400	100	94	56	75	55	61
20	18	17,400	200	97	62	66	57	61
20	12	26,100	100	96	57	86	54	65
20	12	26,100	200	101	61	87	54	66

What Next for Farm Real Estate Values?

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

WHAT GOES UP MUST come down, so the old adage says. Farm real estate values have defied this for a long time, but a reversal may be coming.

It has been 18 years since Alabama had a year of declining farm real estate values, according to USDA figures. Since 1954 there has been a continuous increase. The decline from 1953 to 1954 was slight, as was the 1949 to 1950 drop. For the depression-ridden 1930's, however, "plunge" is a more apt description of how values changed.

Value of Alabama farm real estate in March 1971 averaged $212 per acre. This is exactly double the $106 average in 1963, just 8 years earlier. Previous to this it took 12 years – 1951-63 – for average price to double. Thus, increases in Alabama farm real estate values have been rather substantial in recent years. In some states and areas, however, there is current evidence that the upward pressure on values is off. In a few cases prices have declined.

From 1965 to 1970, Alabama farm real estate values increased 46%, as compared with 32% for 48 states. Although several states had increases of 50% or more, Georgia led all with a 73% rise in the 5 years. As a group, the Delta States of Mississippi, Arkansas, and Louisiana registered the greatest percentage increase. Certain states in the Northeast, such as Vermont, New Jersey, Pennsylvania, and Maryland, had an increase of 50% or slightly more.

Mountain and Pacific states had the smallest increases. The four states with less than a 20% increase were Arizona, Nevada, Utah, and California.

The state with the highest average farm real estate value per acre in March 1971 was New Jersey, with $1,094. In contrast, the lowest was $38 per acre for Wyoming, followed by New Mexico with $44 and Nevada with $46.

There was considerable variation in values among and within regions. Generally, Corn Belt averages were in the $400 to $500 range. In the Mountain Region, with the exception of Idaho, all average values were less than $90 per acre. Florida had the highest average of the four states in the Southeast, and California was highest of three Pacific states.

From March 1970 to March 1971, USDA reports slight decreases in average farm real estate values for Kansas, Illinois, Arizona, and California. As further shown on the map, Alabama and Delaware were top states in percentage increases, each with 12%. States other than in the Northeast, Appalachia, and Southeast generally had small value increases from 1970 to 1971. The average increase for 48 states amounted to only 3%.

Per acre value of irrigated orchards and groves in California declined from $2,730 to $2,495[1]. Declines were also reported in value of irrigated land used for intensive and extensive field crops and for nonirrigated cropland in that state.

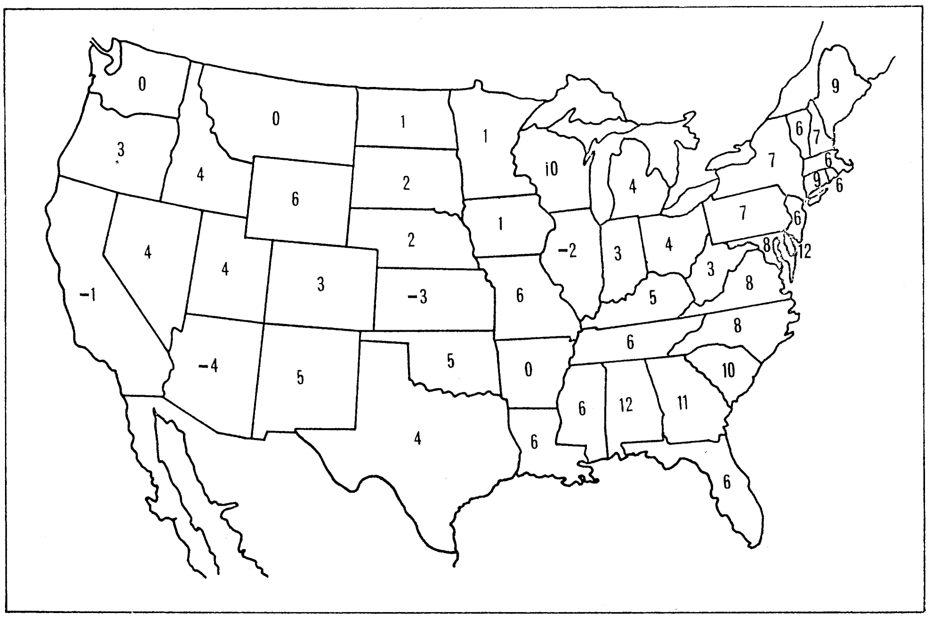
Is the pressure off for spiraling farm real estate values? Evidence indicates prices have leveled off, or actually declined in some areas. In part this resulted from tight monetary restraints. From 1970 to 1971 the geographical areas having smallest increases in farmland values were generally regions of largest size farms. It apparently has become more difficult to finance large units. In addition, there is some evidence of decline in the trend toward adding acreage to existing farm units. This for several years was a factor that gave strength to the farm real estate market. There has also been a decline in seller financing of farms since 1969.

No one knows for sure what will happen to farm real estate values in the future. Although the adage of "what goes up must come down" may not hold true, farmland values in some areas last year did some "drifting in the wind."

FARM REAL ESTATE VALUE PER ACRE AND CHANGE, 1965 TO 1970

State and region	Average value per acre		Change
	1965	1970	
	Dol.	*Dol.*	*Pct.*
South Carolina	177	251	42
Georgia	142	246	73
Florida	290	351	21
Alabama	130	190	46
Southeast	185	262	42
Northeast	242	356	47
Lake States	178	247	39
Corn Belt	277	380	37
Northern Plains	92	120	30
Appalachian	194	259	34
Delta States	184	285	55
Southern Plains	116	152	31
Mountain	51	62	22
Pacific	295	353	20
48 states	146	193	32

[1] ERS, USDA, Farm Real Estate Market Development, CD-76, August 1971.



Percentage change in average farm real estate values per acre are shown for each state for the period March 1, 1970, to March 1, 1971. Calculated from data in "Farm Real Estate Market Developments," ERS-USDA, CD-76, August 1971.

[1] ERS, USDA, Farm Real Estate Development, CD76, August 1971, page 31.

Managing Arrowleaf Clover for Grazing and Hay

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YUCHI ARROWLEAF CLOVER production in spring can be high or low. It all depends on how you manage it.

You get highest production from this winter annual by regular harvesting (grazing or cutting) until early April, followed by a hay cutting later. And forage quality was good under this management system in Auburn research.

Effect of various cutting treatments on clover regrowth and forage quality was the subject of 3 years of field testing at the Plant Breeding Unit, Tallassee, and 2 years at Prattville Experiment Field. Yuchi arrowleaf was planted on prepared land in late September, with harvesting begun in January or February when forage became sufficient. Cutting treatments tried are shown in Figure 1. Total production was measured by making the last cutting in late May.

Dry matter digestibility was used as a measure of forage quality. It was determined by placing nylon bags containing forage samples in the rumen of steers fitted with fistulas (capped openings into the rumen). The bags were removed after 24 hours and digestibility calculated on the basis of undigested matter remaining.

Forage yield was highest (about 3½ tons per acre) when Yuchi was cut biweekly until April and harvested for hay in late May, Figure 1. Cutting biweekly until April 15 sharply decreased the aftermath cutting in May, giving total yield of only 2 tons. Total production was reduced even further by cutting biweekly to May 1. Cutting only once on April 15 yielded about 2 tons of hay per acre, similar to cutting April 1 and May 1. With the two-cut system (April 1 and May 1), about two-thirds of the total was harvested April 1.

Lack of regrowth on tall clover cut in late April and May is easily explained by the lack of buds in the lower 6 in. of stems, Figure 2. Plants cut biweekly maintained a high number of buds on the bottom 6 in., whereas uncut plants had no buds within 6 in. of the ground by May 1.

The small regrowth on clover cut biweekly to April 15 or May 1 is difficult to explain, Figure 2. Grazed Yuchi may remain leafy, green, and palatable until June or July.

Forage quality of Yuchi was high, Figure 3. Digestible dry matter (DDM) averaged 80% from March to early April, declining to 72% in early May and 69% in late May. Frequency of cutting had no effect on DDM at a particular date.

Tannin content of Yuchi arrowleaf leaves is relatively high, averaging 5%. This chemical – generally considered a limiting factor in forage utilization – may be responsible for the low incidence of bloat in cattle grazing this clover. New Zealand researchers found that tannin reduced rumen foam production. Excellent animal gains on Yuchi pasture suggest that tannin does not adversely affect animal performance. Either the tannin levels are not high enough or it is of a type that does not reduce digestibility or intake.

Other forage quality components are of interest. Crude protein of Yuchi hay cut in mid-April was 23%, dropping to 13% in late May. Level of the essential amino acid lysine was high, 7 to 9% of total protein.

Yuchi arrowleaf forage had high quality both under frequent cutting (simulated grazing) or as hay. Since regrowth was poor when the clover was cut at hay stage in mid-April or later, grazing until early April followed by a hay cutting in late May should give highest total production.

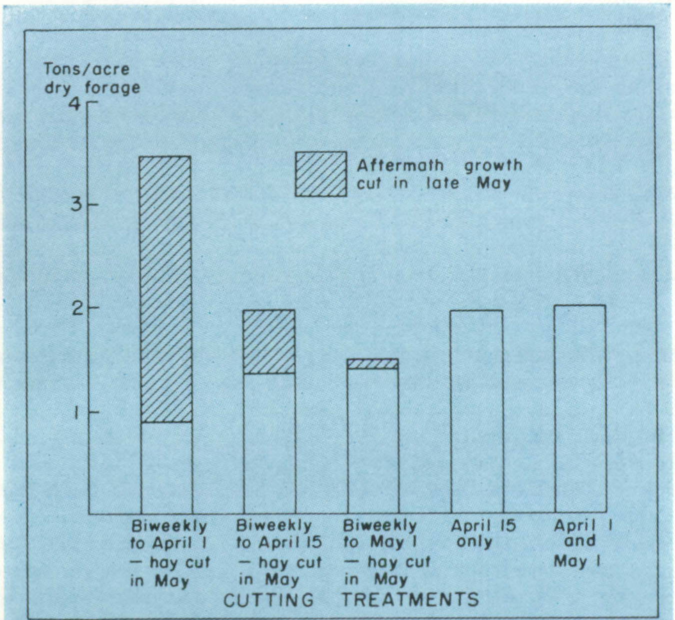

FIG. 1. Forage yield of Yuchi arrowleaf clover as affected by cutting treatment, average of 5 location years.

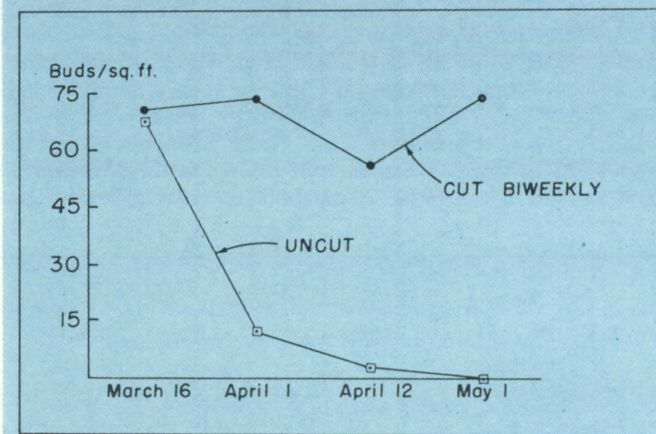

FIG. 2. Stem buds per sq. ft. on lower 6 in. of plant.

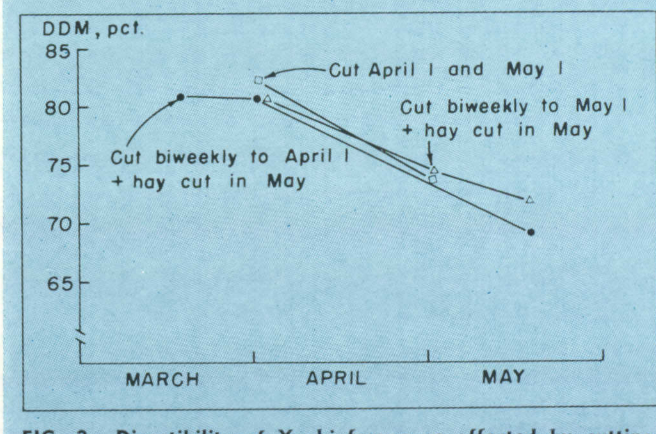

FIG. 3. Digestibility of Yuchi forage as affected by cutting.

Selective Cutting and Use of Silvicides on Mixed Forest Stands

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MANY FOREST STANDS in the Piedmont Province of Alabama are of a mixed type. A mixture of loblolly, shortleaf, and some longleaf pines with many species of hardwoods is typical on sloping ground. Pine stands predominate on dry ridge tops and hardwood stands along the stream bottoms. There is a strong demand for pine trees for pulpwood and larger trees for sawlogs. The demand for hardwood is limited to the best quality trees.

An experimental forest area in Coosa County was used to test the effectiveness of cutting and cultural practices in modifying composition of a second-growth mixed forest stand present on sloping ground. The area was divided into ½-acre plots. On some plots all merchantable hardwoods were cut but selected merchantable pines over 10 in. in diameter were left for future growth. On other plots some selected merchantable hardwoods in addition to pines were left. Immediately following the logging operation cull trees on half of the plots were killed with silvicides. The objectives were to improve stand composition by deadening tree species of very low or no merchantable value and to compare the effects on future stands on paired plots where cull trees were left.

After 10 years a complete inventory of all trees was made. They were recorded by species and diameter sizes. From this record, trees were grouped into two diameter classes and five species groups as shown in the table. Pines, the most desirable species from the standpoint of their merchantability, are shown in one group. Yellow-poplar and sweetgum are hardwoods that have good market potential. White and red oaks have a fair market potential. Hickory and many other hardwoods usually have little or no value.

The criteria used in selecting trees to be cut did not have an effect on the pine component on the plots supporting a mixed stand. Pines were the dominant component of the original stand and leaving some good hardwoods mixed with pines had little effect on the relative predominance of pines 10 years after treatment. On all plots, regardless of treatment, smaller pines were either reduced in volume or did not show an increase, apparently because of the residual stand of larger trees offering increasing competition. This result is to be expected. There was a considerable increase in volume in the larger pines. This increase in volume took place largely on trees over 10 in. in diameter purposely left for future growth.

Because of the lack of good hardwoods it was not possible to leave a number sufficient to support a mixed stand dominated by hardwoods. The hardwoods were high-graded in the years before the woodlot was subjected to selective cutting. This is apparent from the fact that on those plots where silvicides were used only yellow-poplar and gums were left in a volume comparable to that on other plots. Other species of hardwoods were largely culls or trees of poor potential value and were killed.

It can be concluded that in pine-dominated mixed stands with a limited availability of good quality hardwoods, an effort to apply marking criteria to maintain a hardwood component would not be successful. Pine volume can be increased rapidly by leaving vigorous pines which are 10 in. and larger. Such trees are ordinarily cut for sawlogs. Application of silvicides to kill the culls and low value trees further enhances the dominance of pines at the expense of a hardwood component.

EFFECTS OF SELECTIVE CUTTING AND CULL TREE CONTROL IN A PIEDMONT PINE-HARDWOOD STAND 10 YEARS AFTER TREATMENT

Time of inventory	Tree sizes D.B.H.	Pines	Yellow-poplar	Gums	Oaks	Other hard-woods
	In.	*Cu.ft.*	*Cu.ft.*	*Cu.ft.*	*Cu.ft.*	*Cu.ft.*
After	5-10	685	35	130	40	125
cutting[1]	11+	280	35	115	145	20
10 years	5-10	575	20	140	115	115
later[1]	11+	610	70	180	150	10
After	5-10	600	45	115	35	170
cutting[2]	11+	430	95	100	60	110
10 years	5-10	355	25	130	80	190
later[2]	11+	855	165	170	100	135
After cutting and	5-10	465	40	100	5	25
cull tree control[1]	11+	115	100	85	15	......
10 years	5-10	500	40	120	90	35
later[1]	11+	580	135	120	30	......
After cutting and	5-10	500	15	125	35	50
cull tree control[2]	11+	230	30	85	30	......
10 years	5-10	550	40	130	85	40
later[2]	11+	500	40	140	50	20

[1] Selected to leave good merchantable pines but no hardwoods.
[2] Selectively leaving all good trees.

ALABAMA'S FEED GRAIN SOURCES[1]

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WHILE ALABAMA'S feed grain consuming livestock numbers have increased year after year, home production of feed grains has gradually decreased. This has left a deficit which must be filled from out-of-state. A bumper corn crop in 1971 somewhat reduced the need for imported grain, but the deficit continues.

Research at Auburn University is concerned with this and other aspects of the feed grain problem in Alabama. Some of the research areas include the nature and capability of as well as the need for grain marketing firms and facilities; the market channels through which Alabama gets its feed grains; the modes of transporting feed grain to Alabama, including a study of least cost methods; the pattern of prices for feed grains; and the impact of present and possible Government programs and technology on feed grain marketing. This article is concerned with the market channels for feed grains.

Corn Imports

Out of more than 83 million bu. of corn imported in 1970, nearly 80% was received from Illinois and Indiana. This was mainly because of favorable rail and barge rates between these States and Alabama. As shown in the table, more than half came from Illinois.

Water transportation was the most important method of bringing corn into Alabama in 1970. Barged corn was received primarily at Tennessee River points, mainly from Illinois points on the Mississippi and Illinois rivers. Rail corn was shipped into Alabama almost entirely from points in the southern part of Indiana and Illinois because of the favorable rail rate structure. Important barge origin points in Illinois include East St. Louis, Pekin, and Cairo. Another important barge origin is Minneapolis, Minn. Major rail origin points in Indiana include Evansville, Princeton, and Mt. Vernon. Major rail origin points in Illinois include East St. Louis, Belleville, Cairo, and Wayne City. Another important rail origin is Henderson, Ky.

Most of the corn transported by truck into Alabama is from "backhaul" operations. This involves taking goods from the South to points such as Chicago and bringing back a load of corn to help meet expenses and to make extra profit.

Soybeans

The soybean picture in Alabama is completely different from that of corn. Alabama is a surplus producer of soybeans. A large portion of the soybeans produced in the State is exported from the Port of Mobile, while the remainder is crushed by processors in Alabama and Georgia. Soybeans received from out-of-state in 1970 came mainly from Illinois to Mobile for export and to northern Alabama for processing. Most of these were received by water.

Other Grains

Most of the oats received into Alabama in 1970 were for feed manufacturing. They came mainly from Minnesota and Memphis, Tenn. Soft wheat imports represented only 1.8 million bu. and were mainly for export through the Port of Mobile. The same is true of the 5.4 million bu. of hard wheat. Most soft wheat came from Illinois and Indiana, with scattered amounts from other areas. Hard wheat came from Minnesota and Missouri. That from Missouri probably came from the Great Plains wheat producing areas nearest to the Missouri shipping point. Grain sorghum was imported into Alabama for feed, with Kansas accounting for 1,167,000 bu. (52.5%). Another 556,000 bu. (25.0%) from Missouri probably also came mostly from Kansas. Another 335,000 bu. (15.1%) was from Indiana.

All of these data point out the vulnerability of Alabama's agriculture to such things as freight rate changes, transportation technology changes, rail and dock strikes, and other factors which might disrupt the flow of feed grains into Alabama and the export of certain grains out of Alabama. In recent months, rail strikes have caused great concern among poultry farmers. Storage and drying facilities in Alabama are short, relative to the Corn Belt and some other areas of the country, and feed grain handling and processing firms are not usually able to keep many days' supply on hand. Also, as this article goes to press, spokesmen for Alabama soybean farmers are pressing the Secretary of Agriculture for relief from losses due to the Mobile dock strike. A large per cent of Alabama's soybeans are exported, and storage and drying facilities on farms are short, causing a bottleneck at harvest time and severe economic losses.

The Future

Feed grain deficits in Alabama are expected to continue in the forseeable future as grain-consuming livestock numbers continue to increase with no immediate upward trend in local grain production. Also, Alabama farmers will continue to rely on the foreign export market for marketing a large percentage of their soybeans and lesser amounts of some other grains. There will, therefore, be a continuing need to study and make recommendations on all factors affecting the orderly flow of imported feed grains into Alabama and the export of soybeans and other grains.

GRAIN RECEIPTS, BY GRAIN HANDLING AND USING FIRMS, FROM OUT-OF-STATE SOURCES, BY AREA OF ORIGIN, ALABAMA, 1970[1]

Area of origin	Corn	Soybeans	Oats	Soft wheat	Hard wheat	Grain sorghum	Total
	1,000 bu.	*1,000 bu.*	*1,000 bu.*	*1,000 bu.*	*1,000 bu.*	*1,000 bu.*	*1,000 bu.*
Ill.	49,410	6,177	393	908	0	83	56,971
Ind.	17,441	300	141	152	0	335	18,369
Minn.	6,446	0	2,833	0	961	0	10,240
Mo.	1,354	299	207	0	4,401	556	6,817
Iowa	4,556	0	0	0	0	0	4,556
Miss. (n.) and Tenn. (w.)	150	471	1,485	393	0	83	2,582
Ky.	2,158	0	0	151	0	0	2,309
Kans.	0	0	0	90	0	1,167	1,257
Ohio	1,045	0	0	0	0	0	1,045
Tenn. (cent.)	263	157	0	0	14	0	434
Ga. (s.)	256	0	0	100	0	0	356
Miss. (s.)	29	290	0	0	0	0	319
Ga. (n.)	0	0	0	4	0	0	4
Total	83,108	7,694	5,059	1,798	2,224	2,224	105,259

[1] For fiscal year 1970—July 1, 1969-June 30, 1970.

[1] Soybeans and wheat, referred to as feed grains here, are traditionally oil crops and food grains.

SOIL ORGANIC MATTER—Is It Needed In This Age Of CHEMICAL FARMING?

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Department of Agronomy and Soils

THE RESIDUAL effects of turning under a 10-year-old reed canarygrass sod on yields of corn, cotton, and soybeans were compared with continuous row cropping on two river terrace soils at the Auburn University Agricultural Experiment Station's Plant Breeding Unit near Tallassee, Alabama. The soils were fertilized and limed as recommended by soil tests to maintain adequate fertility levels.

Striking increases in crop yields for incorporating the grass sod were noted the first year and residual effects have persisted for 5 years, Table 1. Increases in corn, cotton, and soybean yields from turning under grass sod as compared with continuous row-cropping on Cahaba loamy fine sand ranged from 32 to 150% over the 5-year period.

On the finer textured Wickham fine sandy loam, corn yields were 130% higher on the previously sodded areas 4 years after its incorporation, with an average increase over no grass sod of 60%. Rainfall during the critical period for the crop was important in determining the residual effects of previous cropping on yields. Soybean yields, for example, were increased 40% in 1968, 3 years after incorporating the sod, when only 2.3 in. of rainfall occurred from August 15 to September 20. This is the critical period for this crop to receive water in central Alabama (Highlights of Agricultural Research, Vol. 17, No. 2, 1970). In 1967 and 1969, high rainfall years, lodging of soybeans on the previously sodded plots reduced the beneficial effect of the sod. Responses of cotton to the grass residue were more erratic on this soil which was caused by excessive vegetative growth some years, delayed maturity and accompanying boll rot. Boll rot probably could have been reduced or avoided by the use of less nitrogen than the 90 lb. per acre applied.

Soil Effects

Several properties of the Wickham soil were studied to explain the long-term residual effects of turning under grass sod, Table 2. Four years after incorporating the sod, soil organic matter in the surface 8 in. was more than double that in the adjacent soil with a long history of row-cropping, 1.80 and 0.85%, respectively. Bulk density of the subsoil, a measure of soil compaction, was not affected by previous treatment. Chemical soil test data in 1969 showed similar levels of phosphorus, potassium, and magnesium and a favorable pH on both treatments. Since adequate amounts of nitrogen were added annually for corn and cotton, beneficial effect of the sod is not attributed to this element. **Nematode numbers were not high enough to be an important factor in yields** based on counts of 7 different species. See Table 2 for count data on those species of significance on these crops.

Moisture stress as indicated by wilting of plants was noted at various times over the 5-year period to be more severe on the low organic matter soil. This was especially noticeable on corn in mid-June of 1969, 4 years after turning under the sod. The increase for sod that year was 45 bu. The role of organic matter varies with different soils but its major beneficial effect in this case is attributed to improved soil-plant moisture relations.

TABLE 1. RESIDUAL EFFECTS OF GRASS SOD COMPARED WITH ROW CROPPING ON YIELDS OF CORN, COTTON AND SOYBEANS

Crop	Years after sod or row-cropping	Yields per acre following: Grass sod	Yields per acre following: Row crops	Increase for sod over row-cropping
Cahaba loamy fine sand[1]				
				Pct.
Soybeans	1st	39 bu.	23 bu.	70
Cotton (lint)	2nd	1,007 lb.	764 lb.	32
Corn	3rd	85 bu.	34 bu.	150
Soybeans	4th	42 bu.	29 bu.	45
Corn	5th	91 bu.	61 bu.	49
Wickham very fine sandy loam[2]				
		Bu.	*Bu.*	
Corn	1st	77	46	67
	2nd	101	83	22
	3rd	100	82	22
	4th	85	37	130
		Lb.	*Lb.*	
Cotton (lint)	1st	1,058[3]	878	21
	2nd	925	991	−7[3]
	3rd	1,199	1,062	13
	4th	642[3]	986	−35[3]
	5th	1,089	998	9
		Bu.	*Bu.*	
Soybeans	1st	58	50	16
	2nd	51	46	11
	3rd	53[4]	38	40
	4th	34	34	0[4]
	5th	38	33	15

[1] Crops planted in succession shown in column 1.
[2] Rotation of corn, cotton, and soybeans. Corn yields are not reported for 5th year of residual study, 1970, because of severe blight damage.
[3] Excessive vegetative growth with delayed maturity and boll rot reduced lint yields on previously sodded plots.
[4] Excessive July and August rainfall. Beans lodged severely on sodded plots.

TABLE 2. EFFECTS OF TEN YEARS OF GRASS SOD COMPARED WITH ROW CROPPING ON SELECTED PROPERTIES OF A RIVER TERRACE SOIL[1]

Soil property[2]	Previous cropping: Grass sod	Previous cropping: Row cropped
Organic matter in surface 9 in., pct.	1.80	0.85
Bulk density of subsoil (10-12 in.), g/cc	1.63	1.67
Soil test data:[3]		
pH	6.0	6.1
Phosphorus	High	High
Potassium	Medium	Medium
Magnesium	High	High
Nematodes, no. per pt. of soil:		
Rootknot (cotton)	628	4
Rootknot, meadow, stubby, stunt (av. under corn)	44	155

[1] Wickham very fine sandy loam.
[2] As measured 4 years after turning under sod. Acknowledgment gladly given to A. E. Hiltbold and B. F. Hajek, Agronomy and Soils Department, for organic carbon and bulk density determinations, respectively, and to R. Rodriguez-Kabana, Botany and Microbiology Department, for nematode counts.
[3] Limed and fertilized as per soil test recommendations.

Some Herbicides Kill by Interfering with Energy Flow

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A UNIQUE CHARACTERISTIC of living things is that they consist of complex organic chemicals organized, interrelated, and functioning as a unit. The maintenance of this organization depends on a constant supply of chemical energy.

By far the most important chemical energy source in cells of both animals and plants is a compound called adenosine triphosphate (ATP). The energy-rich ATP molecule functions somewhat like a battery. It is charged by some of the reactions going on within the cell and, in its charged state, is able to perform work; when its energy has been used up, the energy-drained molecule is then recharged to repeat the cycle.

The living world is entirely dependent on its environment for raw materials. It is in the primary incorporation of these raw materials that green plants fill a fundamental role in the cycle of life. During photosynthesis, the green pigment chlorophyll absorbs light and uses some of the light energy to charge ATP molecules. This ATP is then used to combine carbon dioxide from the air with hydrogen, obtained from water, to produce sugars. It is from these sugars that all of the other complex chemical constituents of plants and animals are derived.

Photosynthesis is the only natural reaction that is of any quantitative importance in extracting energy from the environment; thus, it is fundamental in sustaining life. Animals and the non-green parts of plants do not photosynthesize and must rely on the green parts of plants to supply the food they need to produce energy for their own existence. This means, of course, that the amount of food produced by green plants is greater than the amount consumed by all other forms of life. If all green plants were suddenly to disappear, life as we know it would quickly cease.

The compounds produced by photosynthesis can serve as foods because, during their manufacture, the energy from ATP is built into their chemical structure. When these foods are eaten by an animal they are broken down within its cells to give back carbon dioxide and water, and energy is released. Some of this energy is used by the animal cell to charge its own ATP molecules. The process has been likened to the operation of an internal combustion engine. Fuel is fed into the engine where it is combusted to produce carbon dioxide and water and the energy released is used to drive the pistons. A similar situation exists in the cell, except that energy from the fuel, instead of being used directly, is built into molecules of ATP. These can then be used to drive the cell's energy requiring processes. The relationship between food production and consumption is illustrated in the drawing.

HERBICIDES KNOWN TO INTERFERE WITH THE ENERGY ECONOMY OF LIVING CELLS

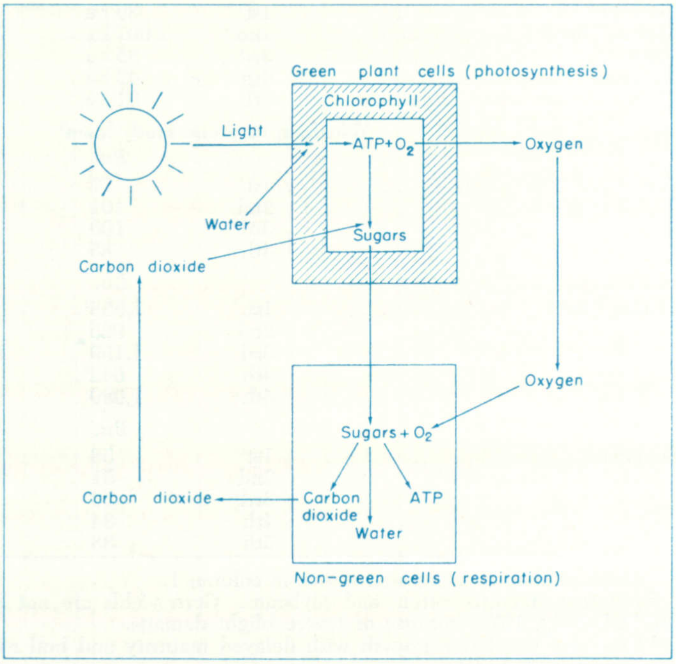
Herbicide, family and example[1]	Energy yielding process affected: Photosynthesis	Energy yielding process affected: Respiration
S-Triazine (atrazine)	X	
Urea (diuron)	X	
Substituted phenol (dinoseb)		X
Pyrimidine (bromacil)	X	
Substituted benzoic acid (ioxynil)	X	X

[1] Name in parenthesis is an example of a specific herbicide of the family.

Certain families of herbicides are effective against weeds because they interfere with the ATP production associated with either photosynthesis or the subsequent breakdown of the synthesized sugars (respiration). Herbicides that only affect photosynthesis are relatively non-toxic to man and other non-green organisms. Since all cells of both plants and animals break down sugars, however, herbicides that interfere with respiratory energy production (like dinoseb) are potentially poisonous to man and animals. Listed in the table are some herbicides that interfere with energy production.

For many herbicides the mechanism of action is not fully known. Some of these, such as the arsenicals, might be phytotoxic because they interfere with some aspect of energy production.

There is still a great deal to learn about the mechanisms involved in production of ATP by cells. Work underway at the Auburn University Agricultural Experiment Station is concerned with the study of these energy conserving processes. Herbicides are being used in these investigations because, being inhibitors of the process, they are valuable tools in studying details of the energy trapping systems involved. Understanding exactly how a herbicide interferes with energy production may make it possible to synthesize new and better herbicides that will perform their task more effectively and yet be less injurious to man and the environment.



The energetics of green and non-green cells.

FAT IN HOG FEED—

improves feed efficiency, raises cost of ration

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MANY NEW FEEDING IDEAS are being tried to keep pace with modern swine production. Continual reevaluation has been needed to improve gain, reduce feed cost, and retain carcass quality of modern swine that are leaner and more muscular than those produced a few years ago.

There has been a lot of attention to protein levels for most efficient production. However, more care should be given to levels and sources of energy since these feeds account for the largest percentage of total ration cost. Yet growers often fail to consider any source other than corn, since it is usually the cheapest. Only when price fluctuations justify a change or some other source becomes available is there any concern with alternate energy ingredients.

Using fats and oils as ingredients in feed has been suggested because such addition greatly increases energy value per pound of feed. (Fat supplies 2¼ times as much energy as carbohydrates.) Adding fats and oils to rations has been demonstrated to be beneficial with certain species of animals.

More thought and study are being given to the protein-energy ratio for swine rations, since pigs reduce their feed intake on high energy rations. Auburn University Agricultural Experiment Station research has shown that adding fat did not significantly affect growth rate or carcass leanness, but it did improve feed efficiency.

The study at the Sand Mountain Substation, Crossville, was designed to learn how level of supplemental fat and percentage crude protein affected rate and efficiency of gain and carcass quality. A total of 354 weanling pigs were used in four trials during December 1969 to May 1971. Experimental groups, equal at beginning on basis of weight, age, sex, litter, and breed, were as follows:

Group 1 (control) – conventional 14% protein corn-soybean meal ration.

Group 2 – 14% corn-soybean meal rations plus 10% added animal fat.

Group 3 – 16.7% protein corn-soybean meal ration with ratio of calories to special nutrients the same as in the control ration.

All pigs averaged 56 lb. initially and were self-fed in concrete-floored pens to about 215 lb. Live backfat thickness was determined by conventional probe.

Performance of the test pigs was satisfactory, Table 2. There was no significant difference in rate of gain from additional fat in either Group 2 or Group 3. Only a slight (not statistically significant) increase in average backfat as a result of fat in the ration showed up in groups 2 and 3.

Adding fat reduced daily feed intake of pigs by 18% in Group 2 and 20% in Group 3. There was also a corresponding reduction in feed required per pound of gain. However, there was practically no difference in feed cost per pound of gain among the three ration groups.

Rations containing fat (groups 2 and 3) were more expensive per pound because of the added cost of fat and additional protein. This about balanced out the reduced feed requirements, resulting in approximately the same feed cost per pound of gain in all three ration groups.

In addition to reducing feed required per unit of gain, the high energy content of the rations resulting from fat additions also reduced metabolizable energy intake. This amounted to 2.7% reduction in Group 2 and 6.5% in Group 3.

Daily protein intake of Group 2 was approximately 18% lower than in the other groups, a result of the relationship between feed consumption and energy content.

As shown by the experimental results, rate of gain and backfat thickness were not affected by ration fed. Feed consumption was determined primarily by energy level of the ration. Adding fat to the ration reduced feed per unit of gain, but the feed cost per pound of gain was virtually the same in all treatment groups.

TABLE 1. COMPOSITION OF TEST RATIONS

Ingredient	Content		
	Group 1	Group 2	Group 3
	Pct.	*Pct.*	*Pct.*
Ground yellow corn	78.3	67.0	58.3
Soybean meal (44%)	16.0	17.3	25.0
Alfalfa meal (17%)	2.5	2.5	3.0
Fat (animal)	....	10.0	10.0
Ground limestone	1.0	1.0	1.2
Dicalcium phosphate	1.5	1.5	1.7
Trace-mineralized salt[1]	.5	.5	.6
Vitamin premix[2]	.1	.1	.12
Antibiotics[3]	.1	.1	.12

[1] Contents: 1.0% manganese, 0.8% zinc, 0.8% iron, 0.01% cobalt, and 97.4% salt.
[2] Each pound supplies the following: vitamin A and D_2, 1,000,000 and 600,000 USP units, respectively; riboflavin, 2,000 mg.; niacin, 9,000 mg.; D-pantothenic acid, 4,000 mg.; choline chloride, 12,000 mg.; vitamin B_{12}, 5 mg.; and folic acid, 60 mg.
[3] Aureomycin-10.

TABLE 2. EFFECT ON PIG PERFORMANCE OF ADDED FAT IN GROWING-FINISHING RATION

Item	Resultant		
	Group 1	Group 2	Group 3
Number of pigs	113	112	114
Initial weight, lb.	56	56	56
Final weight, lb.	212	214	213
Days on feed	104	104	105
Average daily gain, lb.	1.50	1.53	1.50
Backfat, in.	1.21	1.26	1.25
Daily feed consumption, lb.	5.79	4.74	4.65
Feed/cwt. gain, lb.	386	314	313
Feed cost/cwt. gain, dollars[1]	11.62	11.24	11.74
Average daily consumption of metabolizable energy[2], kcal.	8,268	8,048	7,728
Metabolizable energy/lb. gain, kcal.	5,512	5,260	5,152
Average daily intake of crude protein, lb.	.82	.67	.78
Crude protein/lb. gain, lb.	.55	.44	.52

[1] Feed costs per cwt. include $2.60 for corn, $4.60 for 44% soybean meal, $3.00 for 17% alfalfa meal, $8.00 for fat, $2.00 for ground limestone, $4.50 for dicalcium phosphate, $2.50 for trace-mineralized salt, $29.00 for vitamin premix, and $40.00 for Aureomycin-10.
[2] Calculated from National Research Council Publication 1232.

What Now For PEANUT SEED PROTECTANTS?

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A SEARCH for better and safer fungicidal seed protectants for peanuts is underway, now that organic mercurials are no longer recommended.

Damaged seed are highly susceptible to attack by soil-borne fungi. Often, mechanical shellers damage a portion of the seed. When seed are passed over shaking screens, most of the split seed and undersized seed are removed. The remaining seed pass along a moving belt where the visibly damaged seed are removed. However, many seed with broken seedcoats, small chipped spots, and minute cracks go undetected. Sound and undamaged seed may not be invaded by fungi; however, they do carry organisms which later attack the developing seedling.

Invasion of seed by fungi can be retarded by using fungicidal seed treatments. This practice increases stands through prevention of seed rot. There is no evidence that properly applied seed treatments interfere with nodule development.

Research conducted by Auburn University Agricultural Experiment Station over the past 18 years has documented the value of seed treatment and identified many effective seed treatment materials for peanuts. The recent curtailment of organic mercurials for use as seed protectants has emphasized the importance of continued research for suitable seed treatment fungicides. During the past 3 years more than 30 non-mercurial seed protectants have been evaluated as individual treatments and in treatment combinations. Included among them have been experimental compounds and those commercially available. Several of these materials have proven very effective in controlling fungi, Table 1, and increasing stands, Table 2, of Florunner peanuts.

TABLE 2. EFFECT OF CHEMICAL SEED PROTECTANTS ON EMERGENCE OF FLORUNNER PEANUTS AT THE WIREGRASS SUBSTATION, HEADLAND, ALABAMA, 1969-71

Seed protectant	Rate per 100 lb. shelled seed	Increase in emergence 1969	1970	1971
	Oz.	*Pct.*	*Pct.*	*Pct.*
Benlate T	4	----	17	17
Benlate T	5	----	2	17
Botran-Captan (30-30)	4	----	0	15
Botran-Captan (30-30)	5	----	26	20
Botran-Captan (35-30)	6	----	4	16
Botran-Captan (35-35)	5	----	9	20
Botran-Difolatan (35-35)	5	89	0	12
Bravo D	2	----	----	14
Bravo D	3	----	----	9
Bravo D + Terrazole	2	----	----	10
Bravo D + Terrazole	3	----	----	11
Difolatan 65 SP	5	75	0	18
Granox P.F. (Maneb-Captan, 30-30)	5	----	----	18
Granox P.F. (Maneb-Captan, 30-30)	7	----	----	18
Orthocide 75	4	63	9	16
TCMTB, 8%	6	----	8	12
Vitavax	3	----	13	17
Vitavax	4	----	7	19
Vitavax-Captan (37.5-37.5)	3	----	14	10
Vitavax-Captan (37.5-37.5)	4	----	7	10
Vitavax-Thiram (37.5-37.5)	3	----	15	18
Vitavax-Thiram (37.5-37.5)	4	----	28	19

TABLE 1. FUNGI ISOLATED FROM FLORUNNER PEANUT SEED TREATED WITH VARIOUS FUNGICIDAL PROTECTANTS, 1970-71

Seed protectant	Rate per 100 lb. shelled seed	Total fungi isolated '70-'71		Individual fungi obtained[1], 1970 and 1971: Asp. flav.		Asp. niger		Asp. spp.		Bot. thes.		Fus. spp.		Glio. spp.		Pen. spp.		Rhiz. spp.		Tric. vir.	
	Oz.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Benlate T	4	8	0															8			
Benlate T	5	40	0															40			
Botran-Captan (30-30)	4	12	0															12			
Botran-Captan (30-30)	5	20	0			4						4						12			
Botran-Captan (30-30)	6	24	0	6				6				4						8			
Botran-Captan (35-35)	5	8	--	2		4		2													
Botran-Difolatan (35-35)	5	12	4									8		4			4				
Bravo D	2	----	16		16																
Bravo D	3	----	12		4		2										6				
Bravo D + Terrazole	2	----	20		8		12														
Bravo D + Terrazole	3	----	4																4		
Difolatan 65 SP	5	24	0	2		4		2				4		4				8			
Granox P.F. (Maneb-Captan, 30-30)	5	----	0																		
Granox P.F. (Maneb-Captan, 30-30)	7	----	0																		
Orthocide 75	4	8	4		2		2							4				4			4
TCMTB, 8%	6	44	40	3		14	4	3						8			32	16			
Vitavax	3	80	88		4	20	16					4					68	56			
Vitavax	4	92	100	5		38		5								8	100	36			
Vitavax-Captan (37.5-37.5)	3	16	4			4										4		12			
Vitavax-Captan (37.5-37.5)	4	32	0	1		14		1										16			
Vitavax-Thiram (37.5-37.5)	3	40	32		16	32					12						4	8			
Vitavax-Thiram (37.5-37.5)	4	28	16	1		26	8	1									8				

[1] *Aspergillus flavus, Aspergillus niger, Aspergillus spp., Botrydiplodia theobromae, Fusarium spp., Gliocladium spp., Penicillium spp., Rhizopus spp., Trichoderma viride.*

Improving Farm Woodlots

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FARM WOODLOTS are capable of producing steady incomes for their owners while gradually improving the value of growing trees. Value is improved by increasing the proportion of desirable trees and by increasing the total stocking of the stand. However, some cultural work is necessary to initiate these desirable changes.

A 237-acre tract of timber on the Fayette Experiment Forest was selected to be managed as a farm woodland. The first inventory, made in 1951, indicated that this forest unit had a very low stocking with a large percentage of low quality trees and undesirable species. Prevailing soil quality indicated that this woodlot could support pine but not good hardwoods. A management plan, which provided for adjustments every 5 years, was initiated to improve forest conditions. After each 5 years a new inventory was made and the management plan was revised to fit changing stand conditions.

The original objectives were to determine the effects of good forest practices on forest stands and to evaluate cost and return factors. These objectives were accomplished by selling as much of the low grade hardwoods as possible and selectively cutting poor risk pines – trees that were diseased, poorly formed, overcrowded, or otherwise undesirable. Improvement operations included eradicating unsalable hardwoods and planting or seeding of pine trees. The intensity and cost of the improvement operations were limited to approximately 25 per cent of the returns from the sale of timber.

Early weed tree control was done by girdling and some frilling and poisoning of cull trees larger than 4 in. d.b.h. Results of this type of work were unsatisfactory as many of the treated hardwoods did not die and many of the untreated smaller hardwoods kept the understory pine from developing. Later treatments included injecting herbicides into trees as small as 1 in. d.b.h., some mistblowing, and some site preparation by burning, bulldozing, or disking. This work did not produce completely satisfactory results but it did aid in producing more acres with desirable pine stocking, Table 1.

Basal area[1] in square feet per acre increased steadily except between 1966 and 1971. During this period a heavy cut was made to salvage little leaf infected shortleaf pine trees and to remove poorly stocked mature trees to develop favorable conditions for growing well stocked stands of young pine. This trend is also shown in the pulpwood and sawtimber volumes per acre. Present stocking of merchantable timber is below the acceptable level of 60 sq. ft. per acre, but pine regeneration is generally satisfactory. Included is one stand of 60 acres that had no merchantable timber but was planted or seeded to loblolly pine in 1963 and is presently developing a good pine stand.

Hardwood control programs from 1951 through 1966 cost a total of $1,774, or $7.48 per acre, Table 2. These treatments have improved the overall value of the unit. However, present volumes would have been greater had these operations been more intensive at the beginning of the management program. The planting program should also have been completed earlier in the plan.

Returns of $7,654, Table 2, from the sale of forest products have been quite satisfactory. Comparing original with present values of standing timber plus returns from timber sales and the increase in quantity and quality of desirable trees, this forest is producing a satisfactory annual increment in value.

TABLE 2. CULTURAL WORK—COST, RETURNS, AND VOLUMES CUT, FAYETTE, ALABAMA

Date	Improvement		Cutting			
	Hdwd. control	Seeding-planting	Pulp	Sawtimber	Other[1]	Returns
	Dol.	*Dol.*	*Cu. ft.*	*Cu. ft.*	*Cu. ft.*	*Cu. ft.*
1951	275	58	823	11,096	383	669
1956	512	25	3,754	12,185	868	1,687
1961	646	205	6,522	1,121	------	763
1966	341	----	30,590	14,411	4,412	4,220
1971	----	----	4,500	------	------	315
Total	1,774	288	46,189	38,813	5,663	7,654

[1] Includes pine fence posts and poles.

TABLE 1. CHANGES IN FOREST CONDITIONS THROUGH 20 YEARS OF MANAGEMENT, FAYETTE, ALABAMA

Date	Acreages by type			Open	Per acre basal area		Volume per acre			
							Pulp[1]		Sawtimber[2]	
	Pine	P-H	Hdwd.		Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.
	A.	*A.*	*A.*	*A.*	*Sq.ft.*	*Sq.ft.*	*Cu.ft.*	*Cu.ft.*	*Bd.ft.*	*Bd.ft.*
1951	104	80	51	2	11.3	5.3	----[3]	----[3]	558	364
1956	128	78	31	--	26.3	5.7	125	--[3]	1,473	90
1961	167	37	33	--	31.2	11.0	211	100	1,076	188
1966	102	111	24	--	44.3	11.9	362	60	1,772	248
1971	141	81	15	--	31.5	15.3	229	84	1,701	228

[1] Trees 3.6 in. to 9.0 in.
[2] Trees 9.1 in. and larger using International 1/4 rule.
[3] Pulpwood trees not tallied.

[1] Basal area is the summary of square feet in the cross sections at breast height of all trees in the stand.

Late Winter Temperature Affects Cottontail Breeding

EDWARD P. HILL, III, *Alabama Cooperative Wildlife Research Unit*

ALTHOUGH SEVERAL AUTHORS have indicated that there are one or more environmental factors that determine the breeding season in rabbits, there is a generally accepted hypothesis that lengthening photoperiod is responsible for governing the onset of breeding in most mammals. The purpose of this study was to investigate the possible effects late winter temperatures may have on the commencement and synchronization of cottontail (*Sylvilagus floridanus*) breeding in Alabama.

During annual rabbit hunts held on Wheeler National Wildlife Refuge from 1963 through 1967, two checking stations were operated at locations convenient to hunters. Each rabbit brought to the checking station was weighed and had a single eye removed for ageing purposes. Female reproductive tracts were removed and ovaries were sectioned to determine ovulation and implantation rates and the approximate date of conception in pregnant females. Average daily temperatures during February were computed from weather summaries recorded at Decatur, Alabama. Temperature departures from the long-time means were then computed. Conceptions were compared with average daily temperatures and long-time means of January and February to detect any possible influence of temperature on the onset of breeding.

In the cottontail populations from Wheeler Refuge, differences in the effect of temperature on the start of breeding were demonstrated among the years of collection. Cooler than normal temperatures in 1963 and 1964 were accompanied by fewer conceptions, while in 1965, 1966, and 1967 periods of mild temperature were accompanied by mass conceptions. Only 9 conceptions in a sample of 64 females and 4 conceptions in a sample of 73 females were found in 1963 and 1964, respectively. During years when waves of mild temperature occurred, 34 of 51, 21 of 54, and 49 of 68 female cottontails had conceived in 1965, 1966, and 1967, respectively. This influence of temperature on the breeding activity produced a synchronized onset of breeding over 200 miles of latitude. During years with warm temperature waves, conception dates of cottontails from southern Alabama populations were in many cases the same as those for populations from the Tennessee Valley in northern Alabama.

During the only year with cooler than average temperatures and for which comparable data were available from southern Alabama, there was a gradual onset of breeding rather than the synchronized effect when mass breeding occurred. Additionally, there was a gradient delay in breeding with an increase in latitude. In samples of females collected from the two regions before February 15, 1964, 49.1% of 55 females from southern Alabama were pregnant, whereas only 6.8% of 73 females from northern Alabama were pregnant.

In view of the varying pregnancy rates found among years and between locations in the same year, it can be said that the time of the first few conceptions and the general onset of the cottontail breeding season in Alabama may vary from year to year and within populations during the same year. It appears that frequency and extent of late winter periods of warm and cold temperatures determine this variation. Colder than normal temperatures such as occurred in northern Alabama in 1963 and 1964 seemed to delay the general onset of breeding, while warmer than normal temperatures such as occurred for short periods in 1965, 1966, and 1967 were associated with an earlier general commencement of breeding.

Since the male appears to be in breeding condition earlier than the female, one might conclude that late winter temperatures may control the onset of breeding indirectly by influencing the receptiveness of the female.

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