HIGHLIGHTS

of agricultural research

VOL. 16, NO. 2/SUMMER 1969

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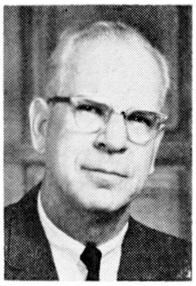
AUBURN UNIVERSITY

DIRECTOR'S COMMENTS



E. V. Smith

EFFICIENT FARMERS have attempted to accommodate their operations to the continuing cost-price squeeze. Nevertheless, farmers are uneasy and have a vague undefined apprehension about the rate and direction of changes affecting agriculture. Dean Kiehl and Professor Rhodes, of the University of Missouri, have discussed the forces underlying these changes and have suggested various pathways that they might take.

As background, they discussed the force of changing technology on the character of the agriculture-food industry, the changing relationships between large-scale retailers and manufacturers, the changes in character of competition among firms involved in production, marketing, and distribution of food and agricultural products as causes of concern among farmers and farm leaders. They pointed to the concern, "Who will control agriculture?" and suggested that farmers and farm groups have not identified fully the nature of their concerns nor the type of action that seems appropriate.

Dr. Rhodes emphasized three important forces which push for further change in the present structural organization of agriculture as follows: 1. The growing technical and economic interdependence of input supplier, producer, and processor; 2. The further intensification of the competitive struggle within and among agribusiness firms for control of their sources of supply as well as control of their product markets; and 3. The growing dissatisfaction of farmers with the result of traditional markets in the present setting.

He suggested four possible future pathways of change and characterized the central features of each as follows:

1. *Family farm-open market agriculture*, modernized version of present agriculture.

2. *Family farm-collective bargaining agriculture*, fewer and larger family farms with effective collective bargaining.

3. *Corporate-integrated agriculture*, extension of type illustrated by present broiler industry.

4. *Corporate-farmhand agriculture*, if extreme were reached, farmer-producer would be a "hired hand" supervised by hired personnel under corporate investment and management.

look for these articles

may we introduce . . .

F. A. Kummer, author of the article on page 11, became head of the Department of Agricultural Engineering in 1948. He has been with the Department since 1936 as an instructor, assistant professor, and associate professor.

Kummer earned his B.S. degree in mechanical engineering from Auburn University in 1935, and his M.S. degree in agricultural engineering in 1938. He initiated present research programs in power and machinery, soil and water, processing, and environmental control. During WW II, he served as consultant to the Army Ordnance Proving Ground, Aberdeen, Md., on problems related to increased mobility of military vehicles on difficult terrain. He received a special citation for this work.

Kummer has done much to improve the professional status of agricultural engineers in Alabama. In 1948, he established the Alabama State Section of American Society of Agricultural Engineers. He initiated ECPD accreditation of the professional curriculum, and he initiated Professional Engineer registration for agricultural engineers in Alabama.

He is a Fellow of the American Society of Agricultural Engineers, and is a member of several honorary and professional societies.

HIGHLIGHTS of Agricultural Research

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COVER PHOTO. Appetite of cattle for this wastelage-containing feed is evident. Use of wastelage is described on page 16.

Agribusiness is Big Business in Alabama

M. J. DANNER, *Dept. of Agricultural Economics and Rural Sociology*

Agribusiness firms, like this potato packing shed in Baldwin County, provide employment for large numbers of Alabama workers. In fact, agribusiness employment was found to account for 15% of all gainfully employed nonfarm workers in the State, excluding workers in government jobs.

REGARDLESS OF HOW it is defined, agribusiness spells big business in Alabama.

Volume of business by State agribusiness firms was estimated at about $2 billion in 1966-67, considering only firms serving the farm segment directly (either as providers of services and supplies to farms or as handlers and processors of products direct from farms). This is how agribusiness was defined in a recent study sponsored by the Alabama Resource Development Committee.[1] Such agribusiness firms account for about one-fifth of total volume of all retail, wholesale, and manufacturing firms in Alabama, as reported in the 1963 Census of Business by U.S. Department of Commerce.

Since agricultural products go through many handling and processing steps before reaching consumers, this concept of agribusiness ties such handling and supply services directly to the farm. And this more correctly outlines the scope of agriculture. Agriculture thus becomes more than simply producing agricultural raw materials.

The leading agribusiness industry group in Alabama was forest products, with 44% of the firms and 26% of the business volume. Food processors accounted for 24% of business volume, followed by field crops handlers and processors with 17% and feed and chemical manufacturers with 11%. The remaining 22% was accounted for by sales and service agencies.

Business volume generated per firm in the various agribusiness industry groups for 1966-67 was as follows:

Industry group	*Volume per firm*
Livestock markets	$1,517,415*
Food processors	1,352,388
Feed and chemical manufacturers	880,861
Field crops handlers and processors	704,458
Machinery sales and manufacturers	424,402
Agricultural supplies retailers	299,281
Forest products firms	296,906
Nursery crops firms	102,412

* Value of livestock sold; business income estimated at 4% of sales would approximate $60,697.

Volume of business per firm averaged $506 million, ranging from $1.4 billion for food processors to $102,000 for nurseries. Generally, larger dollar volume per firm was characteristic of manufacturers and processors, whereas smaller business volume was associated with sales and service organizations.

[1] *Agribusiness in Alabama,* June 1968, Alabama Resource Development Committee, Montgomery.

The average agribusiness volume per county was $26.7 million. There were 45 counties below this average and 22 above. Moreover, the 22 above-average counties accounted for 65% of the State's agribusiness volume. The 10 leading counties in Alabama in agribusiness volume are shown below:

County	*Total volume*
Jefferson	$172.6 million
Mobile	117.9 million
Marshall	89.4 million
Montgomery	78.4 million
Cullman	55.4 million
Morgan	54.5 million
Talladega	53.8 million
Tuscaloosa	51.4 million
Houston	47.6 million
Baldwin	47.0 million

Agribusiness firms in Alabama had about $1.3 billion in capital investment in 1966-67, an average of $19.1 million per county. There were 19 counties with investment above the average. Average investment per firm was $362,000, with variation among industry groups as shown below:

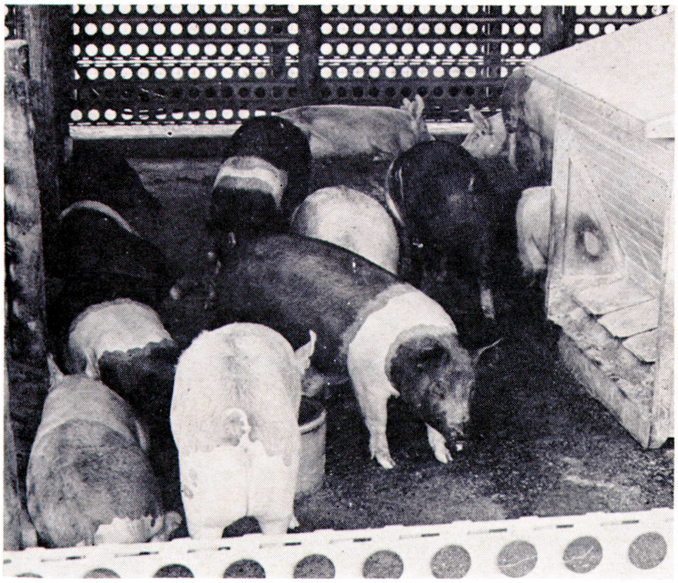
Industry group	*Capital investment per firm*
Field crops handlers and processors	$759,826
Feed and chemical manufacturers	715,125
Food processors	453,624
Forest products firms	347,003
Machinery sales and manufacturers	146,468
Livestock markets	115,775
Agricultural supplies retailers	88,933
Nursery crops firms	61,439
AVERAGE ALL FIRMS	$361,575

Large investments per firm were characteristic of manufacturers of cotton products, feeds, chemicals, certain food items, and forest products. The forest products industry also had large numbers of firms with modest investments, such as pulpwood handlers and dealers.

About 28% of the firms planned to expand production, most within 2 years, and estimated their capital needs at $196 million or approximately 15% of their current capital investment. Those with large capital investments, notably feeds and chemicals, were planning considerable expansion, as were food processors. Capital needs for all firms averaged $55,000 each. Highest needs reported per firm were $87,000 for forest products firms and $73,000 for chemical and feed manufacturers.

Generally, the most important counties in agribusiness volume were also the most important in number of agribusiness employees. Average number of employees per firm for the State was 31, ranging from 7 in agricultural supplies firms to 87 in field crops handling and processing businesses. About 20% planned to expand employment. Firms with higher than average employment expansion plans, which also employed relatively large numbers, were in feed, chemicals, and food manufacturing. Excluding workers in government, agribusiness employment accounted for 15% of all gainfully employed nonfarm workers.

Agribusiness developments are dynamic and can rapidly change an area's economy. For example, almost half of the firms processing food and manufacturing feed and chemicals had significant plans to expand production. Thus, there are many opportunities for work with agribusiness firms for young men and women who do not wish to return to farms or are unable to do so.



PROTEIN LEVEL Affects Growth and Economics of Growing–Finishing Hogs

B. G. RUFFIN and W. M. WARREN, *Dept. of Animal Science*
R. A. MOORE, JR., *Upper Coastal Plain Substation*

MUCH ATTENTION has been focused in recent years on the subject of minimum protein levels needed for optimum swine production. One specific question that has been debated concerns the level of protein – in excess of the minimum – that is required for growing-finishing hogs. Most authorities favor exceeding the minimum.

Important differences in protein quality exist among common ingredients used in swine rations. Since 40 to 60% of total protein in a ration is derived from the low quality protein of corn, it is important to add adequate and good quality protein supplement (one complete in amino acids).

Protein Requirement Measured

In feeding trials used to measure protein requirements, protein is fed at different levels to determine the minimum that will give maximum rate of gain with greatest returns. A series of such tests at the Upper Coastal Plain Substation, Winfield, measured performance of pigs on rations containing different levels of protein supplement.

Trials were conducted from the spring of 1967 to summer 1968, with 279 weanling pigs. Pigs were housed in concrete pens with self-feeders and automatic waterers. Individual pig weights and feed consumed per pen were recorded during the tests. Pigs were marketed on the weekly weigh day that they weighed 215 lb. or more.

Protein levels studied were (1) 16% continuous, (2) 14% continuous, and (3) 14% to 125-lb. size and then 12% to market weight.

Appropriate amounts of 44% crude protein supplement fortified with vitamins and minerals were added to ground yellow corn to formulate the rations. It is noted that this procedure not only altered protein content, but also vitamin and mineral levels.

Faster Gains on High Protein

The 16% protein ration produced the most rapid gain. Pigs fed it gained 4% faster than those on the 14% ration and 9% faster than pigs getting the 12% protein diet, Table 1. Pigs fed the 14% protein ration also outperformed the low level group (12% protein) by 5%. Therefore, there was an increase in daily gain in each treatment as content of protein supplement was raised to 16%.

The increased performance in average daily gain was reflected in a decrease in number of days on feed. Pigs fed 16% protein feeds finished 4 days quicker than those on 14% levels and 11 days faster than those on the 12% protein rations. No difference was found in feed required per cwt. of gain among the test rations.

Feed cost per cwt. gain was less for the intermediate level (14%) of protein. Cost per cwt. gain was 7.6% higher on the 16% than the 14% protein feed, because of the added cost of formulating high protein rations without a reduction in feed required per cwt. gain. There was little difference in cost per cwt. gain between intermediate (14%) and lower (12%) protein rations.

When all factors are considered, crude protein content of growing-finishing rations should not be reduced below a minimum of 14%. The Auburn research also points out that while higher levels of protein (16%) increased cost per cwt. gain, there was a corresponding reduction in time required to get hogs ready for market.

TABLE 1. PERFORMANCE OF PIGS FED DIFFERENT LEVELS OF PROTEIN

Factor measured	Result, by protein level		
	16%	14%	14-12%
Pigs, No.	91	93	93
Initial weight, lb.	43	43	43
Final weight, lb.	217	217	218
Days fed, No.	108	112	119
Average daily gain, lb.	1.60	1.53	1.47
Fed per cwt. gain, lb.	349	344	350

TABLE 2. COSTS AND RETURNS FROM SWINE FED RATIONS WITH DIFFERENT PROTEIN LEVELS

Economic measure	Result, by protein level		
	16%	14%	14-12%
Total value per hog[1]	$43.02	$43.06	$43.35
Feed cost per hog[2]	19.24	17.89	18.19
Vaccination cost per hog	.85	.85	.85
Sales cost per hog[3]	1.56	1.56	1.56
Initial value per hog[4]	14.24	14.24	14.24
Returns for labor, investment, etc.	7.13	8.52	8.51
Feed cost per cwt. gain	11.09	10.30	10.37

[1] A value of $20.28 per cwt. was determined by actual sales from December 1966 to May 1968.
[2] Feed costs include $5.25 per cwt. for 44% protein supplement, $1.40 per bu. of corn, and $1.50 per lb. of SP250.
[3] Sales costs are 3% commission plus 25¢ per head yardage.
[4] Initial value of pigs based on prices for similar weights and quality of pigs at Fayette Feeder Pig Sale.

Effects of Management on Yield and Digestibility of Summer Annual Grasses

C. S. HOVELAND and E. L. CARDEN
Department of Agronomy and Soils
W. B. ANTHONY and J. P. CUNNINGHAM
Department of Animal Science

HIGH QUALITY FORAGE is scarce in mid to late summer when warm season perennial grasses such as bermuda and bahia are productive. Summer annual grasses are often planted to obtain higher quality grazing. In 1968, nearly 200,000 acres of sorghum-sudan hybrids and 50,000 acres of pearlmillet were grown in Alabama.

To determine what effect management has on yield and forage quality of these grasses, several experiments were conducted from 1965 to 1968 at the Agricultural Experiment Station's Plant Breeding Unit, Tallassee. Gahi-1 pearlmillet and Funk's 77F sorghum-sudan hybrid were planted in April and harvested at 2-, 3-, 4-, and 6-week intervals from June to September. A total of 160 lb. N/acre was applied in 4 applications. In another experiment, the grasses were fertilized with 80, 160, or 320 lb. N/acre, and harvested at pre-boot and bloom.

Digestibility of dry matter was determined by placing nylon bags containing forage samples in the rumens of fistulated steers. The bags were removed after 24 hours and digestibility was calculated on the basis of undigested matter remaining in the bag. This is a reliable measure of digestibility and a good indicator of forage quality, especially since reference forages of known digestibility were also carried through the process. Values for the experimental forages were adjusted to standard conditions by relating them to these reference forages.

Forage yield was highest when the grasses were cut every 6 weeks. Pearlmillet was somewhat more productive than the sorghum-sudan under frequent cutting. Yields of pearlmillet per clipping declined sharply in late summer under all clipping intervals. Sorghum-sudan yields declined in late summer when clipped frequently but remained higher than pearlmillet when cut every 6 weeks. More tillers were needed on pearlmillet than sorghum-sudan plants to maintain high yields, Figure 1. Severe stand loss occurred on pearlmillet at all clipping treatments and on sorghum-sudan cut every 2, 3, or 4 weeks. Stand losses at 3- and 4-week cutting intervals were similar to that shown in the graphs for the 2-week interval. In contrast, sorghum-sudan cut every 6 weeks maintained a similar number of live shoots throughout the summer. It appears that frequent cutting is more harmful to the sorghum-sudan than pearlmillet.

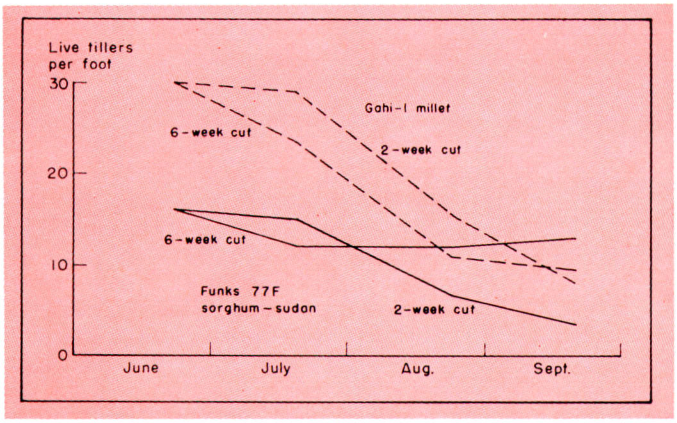


FIG. 1. Tiller numbers as affected by cutting interval.

As shown in the table, digestible dry matter (DDM) of both grasses was high and similar over the growing season. There was a slight decrease in DDM with longer clipping intervals. Coastal bermuda hay used as a reference forage had a DDM range from 36% to 48%.

DDM yield more closely followed total dry matter production than yield of leaves. Therefore, the 6-week cutting interval resulted in the highest production of DDM.

Pearlmillet forage had the highest average leaf percentage, but a short cutting interval increased leaf content for both forages. Leaf yield per acre increased slightly with longer cutting intervals. Per cent DDM was high for both forages and did not change consistently with leaf content of the forage. This suggests that the stem portion of these forages contributes significantly to forage feeding value.

In another experiment, N rates of 80, 120, and 320 lb./acre had no effect on leaf percentage of either grass. Crude protein content of sorghum-sudan was higher than pearlmillet under all rates of N fertilization. Nitrates reached potentially toxic levels only at the 320 lb. rate. This occurred under drought stress in early season on both pearlmillet and the sorghum-sudan cut at pre-boot stage.

In summary, both summer annual grasses were very productive although frequent cutting reduced yields of sorghum-sudan more than pearlmillet. Forage dry matter digestibility was high and followed about the same pattern for both grasses. There was a seasonal decline in DDM but this was reversed in late season. The relatively high digestibility indicates potentially superior feeding value for these grasses. Total yield of DDM per acre was highest when the grasses were cut every 6 weeks. The high DDM suggests that animals should perform well on either of these grasses.

YIELD OF FORAGE, LEAVES, AND DIGESTIBLE DRY MATTER (DDM) AS AFFECTED BY CUTTING INTERVAL, 3-YEAR AVERAGE

Cutting interval	Dry forage	Leaves	Dry leaves	DDM	DDM yield
Wk.	*Lb./A.*	*Pct.*	*Lb./A.*	*Pct.*	*Lb./A.*
Gahi-1 millet					
6	10,750	53	5,710	62	6,640
4	8,220	69	5,650	69	5,700
3	6,570	73	4,800	70	4,600
2	5,460	92	5,050	75	4,120
Funk's 77F sorghum-sudan					
6	10,100	46	4,680	66	6,620
4	6,090	59	3,570	68	4,140
3	5,780	67	3,870	72	4,130
2	5,040	69	3,480	72	3,630

IMPORTANCE of AGRICULTURAL CREDIT To The Beginning FARMER

J. E. EPPERSON and S. C. BELL
Department of Agricultural Economics and Rural Sociology

THE DAY of abundant hand labor has passed leaving behind a rapid acceleration of farm technology.

Along with skyrocketing land prices and greater use of purchased inputs, mechanization has increased greatly the required capital investment for today's farming.

In a recent survey involving 10 Alabama farmers who had been farming for an average of 5 years, financial assistance through borrowed funds was studied. These farmers started with an average net worth of $4,344 and received financial assistance through borrowing in every case, Table 1. The average age of these farmers when they started farming was 24.5 years.

Credit

In the first year of farming, financial assistance through borrowed funds was substantial. Intermediate-term credit was used more than either short- or long-term credit. Short- and long-term credit was used in about equal amounts.

Sources of financial assistance varied considerably the first year. However, three principal sources were FHA, banks, and farm supply dealers.

Total amount of debt incurred in the second year of farming was less than that incurred in the first. Long-term credit was not used the second year; intermediate-term credit decreased, while short-term credit increased about 70%. Sources of financial assistance for the second year continued to be varied, although FHA, banks, and farm supply dealers remained as the principal sources.

In the last complete year (1967) before the survey, average total debt was about 90% greater than average total debt incurred during the second year of farming. Use of short-term credit had increased substantially, while the use of intermediate-term credit had increased by a greater proportion, 136%.

The use of long-term credit did not increase significantly since only 1 of the 10 farmers borrowed on a long-term basis in 1967. The variability of sources used for financial assistance in 1967 increased, and PCA became a principal source of funds.

Assets

The average amount of assets of farm operators at the beginning may be considered too low when considering present farm capital requirements, Table 2. However, two of the farm operators started farming with a partnership with their fathers and six others started as tenants, allowing for less initial capital.

Assets at the end of the second year, with the exception of nonfarm assets, had increased substantially. Land assets increased primarily because of gifts and inheritance, while assets in farm machinery, livestock, and supplies increased because of financial assistance through borrowing.

By the end of 1967, total assets had increased by 114% above the value at the end of the second year of farming. Most of the increase was in farm machinery and livestock as a result of financial assistance through borrowed funds and the use of savings. Land assets increased primarily through appreciation in land values. Nonfarm assets increased but not nearly as much as the increase in farm assets. Net worth was an average of $42,726 at the end of 1967, a significant increase since the operators started farming.

Results

Since assets in farm machinery and livestock were rather low at beginning of the farming operations, financial assistance through borrowed funds on an intermediate- and long-term basis was aimed primarily at increasing assets during the first year. During the second year, attention shifted from building production assets to production and ensuing production expense incurred as short-term debt, while intermediate and long-term debt declined. However, on the average all assets increased.

In 1967, both short- and intermediate-term debt incurred were greater than similar debts incurred during the second year of farming. All assets on the average increased significantly, indicating both an increase in production and assets for production.

Since nonfarm assets failed to increase as significantly as farm assets, income above some minimum level of living expenses apparently was converted into farm assets. Thus, financial assistance through borrowed funds along with the converting of savings into farm assets were primary factors affecting establishment and growth of farming operations involving those who started farming with limited amounts of capital.

TABLE 1. AVERAGE AMOUNTS BORROWED ACCORDING TO YEAR OF FARMING AND TYPE OF DEBT BY 10 ALABAMA FARMERS

Year of farming	Type of debt			
	Short-term	Intermediate-term	Long-term	Total
First	$3,580	$ 5,160	$3,070	$11,810
Second	6,045	4,360	--------	10,405
1967	8,900	10,280	500	19,680

TABLE 2. AVERAGE ASSETS AT SPECIFIED TIME PERIODS FOR 10 ALABAMA FARMERS

Time period	Assets				
	Land	Farm machinery equipment and supplies	Livestock	Nonfarm	Total
At inception	$ 2,305	$ 2,754	$ 1,490	$2,290	$ 8,839
End of second year	15,080	7,235	5,905	2,955	31,175
End of 1967	23,100	22.845	15,432	5,340	66,717

FARM POND RECREATION SAFETY

E. S. RENOLL, *Department of Agricultural Engineering*

IS THERE A FARM POND on your land? Do you have a river or stream flowing through your farm? Are they sources of good fishing and recreation or are they potential death traps? They could very well be both.

This may sound like a strange statement, but let's take a look at the accidental farm death record. Accidental farm deaths have long been associated with farm machinery and tractors, and rightly so. These machines are the single largest cause of accidental deaths on the farm. What about other causes? Table 1 presents some causes of accidental deaths.

The second largest cause of accidental deaths on farms is drowning. Between 350 and 400 persons die this way each year. Drowning accounts for more accidental farm deaths than firearms and falls combined. About 1,000 farm people are killed each year in machinery accidents and about 225 are killed in firearm accidents.

The Victims

Who are these people that drown? The vast majority of the victims are males. Only about 15% are females. Average age distribution of the drowning victims is found in Table 2.

The teenage group accounts for 37% of the total drownings, while the age group under 10 accounts for 31%. Those under 20 years of age make up 68% of all the drowning victims.

A Rescue Station

Every farm pond used for swimming or other recreational purposes should have a rescue or water safety station. It need not be elaborate and it is not expensive. The one shown in the photo will serve very well and is simple to construct.

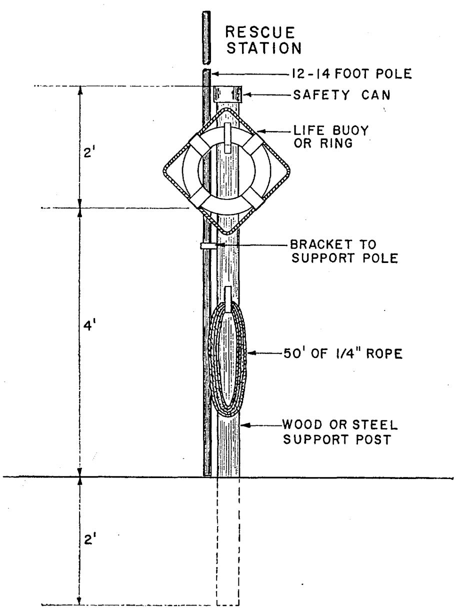


TABLE 1. ACCIDENTAL DEATHS ON FARMS

Cause of death	Per cent of total
Machinery	40
Drowning	16
Firearms	9
Falls	6
Falling objects	6
Fires—burns	5
All others	18

Source—Farm Safety Review

The mounting post should be located near the water's edge and painted yellow or some other highly-visible color. A life or ring buoy should be attached to ¼-in. rope, hung on a bracket, and marked "For Emergency Only." A 12- to 14-ft. white rescue pole should be fastened to the post with a bracket. A "safety can" containing information on rescue techniques, emergency phone numbers, and diagrams on mouth-to-mouth resuscitation should be attached to the top of the post. These safety cans are usually available where marine, boat, or camping supplies are sold.

An inflated innertube also can be used, but isn't as reliable as a buoy. If you use an innertube, check it often and paint the words, "For Emergency Only" on it. A 50-ft. section of ¼-in. rope should be securely attached to the innertube.

A strong bamboo fishing pole or sapling can be substituted for a rescue pole. If the pole has a sharp tip, cover it.

You can make your own "safety can" by cutting off one end of a 46-oz. fruit juice can and nailing the can to the top of the post, so that it can be rotated. Obtain a rescue information sheet, or write out an instruction sheet and attach it to the outside of the can with a coat of spar varnish or shellac. After it is dry, varnish the exposed side to protect it from weather. Your local Red Cross office also can supply plans and suggestions for a water safety station.

TABLE 2. AGE OF DROWNING VICTIMS ON FARMS

Age of victim	Per cent of total
Under 5	16
5 to 9	15
10 to 14	17
15 to 19	20
20 to 24	5
25 to 54	16
55 to 75	11

What Can Be Done?

The following simple precautions will help prevent farm drowning accidents.

1. Caution small children to stay away from ponds and streams unless accompanied by adults.
2. Insist that members of your family, old enough to learn, be taught to swim.
3. Do not operate a boat unless you know the basic fundamentals of boat handling and boat safety.
4. Ride only in boats fitted with correct life preservers and other recommended safety equipment.

Virus Infection of Corn Plants

R. T. GUDAUSKAS and D. W. GATES
Dept. of Botany and Plant Pathology

Healthy corn seedlings were inoculated with MDMV by rubbing the leaves with a pad saturated with sap from an infected plant.

MAIZE DWARF MOSAIC VIRUS (MDMV) is a damaging pest of corn, particularly in the northern half of Alabama. The virus was first discovered in the State in 1965 and is now known to occur in at least 21 counties.

MDMV is spread by aphids. In addition to corn, it infects numerous other grasses including johnsongrass, which serves as an important reservoir of the virus.

Leaves of corn plants infected with MDMV show a mottled or mosaic pattern of normal green-colored tissue alternated with light-colored tissue. In the field, the virus has frequently been isolated from stunted plants having red- to purple-colored leaves. Plants that are artificially infected and kept in the greenhouse develop the mosaic symptom but are rarely stunted and show no discoloration. This suggests that some environmental influence is absent under greenhouse conditions.

These types of symptoms or responses of corn plants to infection by MDMV are easily seen. Recently, efforts have been made to determine what processes might be affected to cause the plant to express such symptoms. Two of the processes studied were photosynthesis and respiration. In addition, the rate at which MDMV builds up in infected tissues was also measured.

Corn plants used in the experiments were grown in a controlled environment chamber. In many cases, 300-400 plants were required for one experiment. When the plants were in the seedling stage they were inoculated by rubbing the leaves with a cheesecloth pad saturated with sap from leaves of a MDMV-infected plant. Virus introduced in this manner increases rapidly and spreads throughout the entire plant. An equal number of seedlings serving as healthy controls were inoculated in an identical manner except with sap from a healthy corn plant. At intervals after inoculation, certain samples of leaves, stems, or roots of both healthy and infected seedlings were removed and the appropriate analysis was performed. Results from diseased tissues were compared with results from healthy tissues to determine any differences.

The rate of photosynthesis was generally decreased in leaves of corn plants infected with MDMV. Reductions as great as 37% were found in some leaves. Figure 1 shows that photosynthesis in the leaf just above the inoculated leaf was reduced by 27% within 3 days after inoculation. Virus content of this leaf is also plotted on the graph. MDMV reached apparently maximum concentration by 3 days after inoculation. This same kind of data was obtained for numerous other leaves as they emerged from the whorl of an infected corn plant and the same general pattern was found. As the virus increased in the leaf, the photosynthesis was reduced. However, greatest reductions in photosynthesis were not always correlated with highest virus concentration, which suggested that some permanent damage to the photosynthesis mechanism had occurred.

An example of the type of data obtained when respiration of MDMV-infected corn tissues was measured is shown in Figure 2. These data came from roots but the same general pattern was also noted in the leaves. Respiration increased during the period the virus was increasing most rapidly. This period of rapid increase was followed by a period of decreased respiration once the virus had apparently reached maximum concentration.

Viruses like MDMV are built at the expense of raw materials and processes in the host cell. Synthesis of MDMV in a corn plant has direct or indirect effects on such vital processes as photosynthesis and respiration. The magnitude of these effects could easily account for some of the symptoms seen in the infected corn plant.

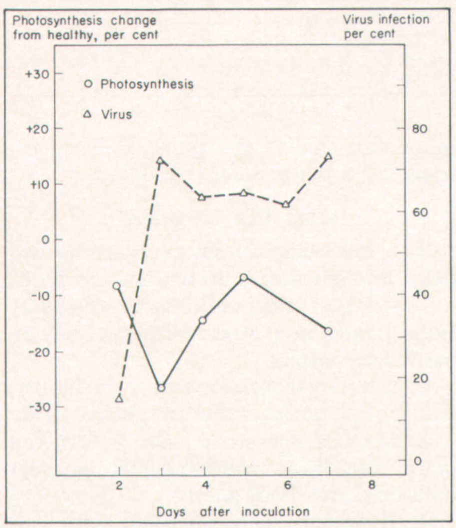


FIG. 1. Photosynthetic activity and virus content of a corn leaf infected with MDMV.

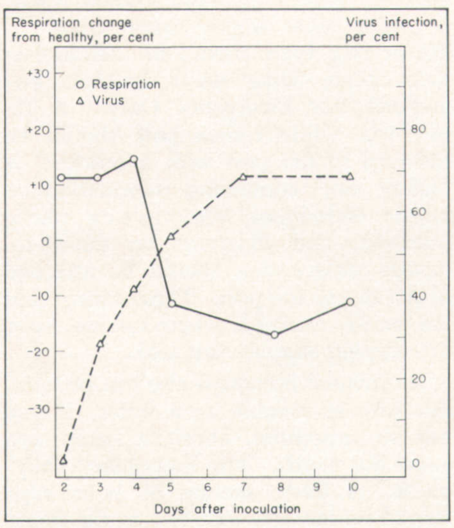


FIG. 2. Respiratory activity and virus content of corn roots infected with MDMV.

Effects of Nematicides on Sweetpotatoes

W. A. JOHNSON, *Department of Horticulture*
M. H. HOLLINGSWORTH, *North Alabama Horticulture Substation*
E. J. CAIRNS, *Department of Botany and Plant Pathology*

Potatoes at left are from check plot, those at right are from plot treated with mocap.

HEAVY DAMAGE from rootknot nematodes causes sweetpotatoes to become worthless for canning.

Therefore, to ensure salable sweetpotatoes they need to be grown on areas free of or with low populations of rootknot nematodes.

A comparative study of different nematicides for control of damage to sweetpotatoes was started in 1966 at the North Alabama Horticulture Substation, Cullman, and in 1967 at the Main Station at Auburn. The Cullman study was conducted on an area that had a high population of rootknot nematode as indicated by a previous crop of squash grown in the fall of 1965. In 1966, before the study was begun at Auburn, the rootknot nematode population was increased in all plots by growing rootknot infested tomato plants to maturity, the land turned and followed by a crop of squash. The rootknot rating index on squash roots in all plots ranged from 77 to 95 where the rating of 10 indicated no visible rootknot and 100 indicated severe rootknot.

Nematicides and rates used are given in the table. All nematicides except the 5-gal. rate of Vorlex were applied broadcast. Each year the same treatments were used on the same plots. Nematicides which acted as fumigants were applied 3 to 4 weeks and the nonfumigants, Furadan, Mocap, and Temik, a few days before sweetpotato plants were set. Soil samples for nema counts were taken 1 ft. apart in the middle row before treatments were applied in the spring at Cullman and at harvest time at both locations. At harvest, samples of sweetpotatoes were obtained from same area soil samples were taken. The sweetpotatoes were steam peeled and nematode infection counts made. Results together with yield data and rootknot larvae counts are given in the table.

Average total yields for the 3 years at Cullman were higher from all nematicide treatments than from the check. At Auburn average yields for the 2 years from nematicides were higher than from the check with the exception of Nellite, Dowfume W-85, and Vorlex. Only 1 year's results were obtained from Dowfume W-85 and Telone. D-D resulted in an increase of 114 bu. at Cullman and 42 at Auburn, Dowfume W-85 increased yield 88 bu. at Cullman and 4 at Auburn. The highest increases at Auburn were from Telone, Furadan, Mocap, Temik, and D-D+SD14647.

The number of rootknot larvae per pint of soil at harvest was reduced 46% for Telone, 48 for Dowfume W-85, 50 for Penphene, 56 for D-D, and 83% for both Nellite and Furadan. The greatest reductions in number of nemas at Auburn were 70 and 84% for Furadan, 83 for Mocap, and 93% for Temik.

The effect on damage was determined by the number of sweetpotatoes infected and the number of infections per potato. The number of infection counts from steam peeled potatoes from Cullman was reduced 57% from use of Telone, 63 from Dowfume W-85, 70 from D-D, 71 from both Penphene and Nellite, and 82% from use of Furadan. At Auburn the per cent reduction for the fumigants ranged from 28 for D-D to 66 for Penphene, whereas, the reduction for D-D+SD14647 was 71%. The per cent reduction for the nonfumigants was 89 and 92 for the two rates of Furadan, and 96 for both Mocap and Temik. The number of potatoes with three or more infections is shown in the table; these results are somewhat similar to the total number of infections per sample.

EFFECT OF DIFFERENT NEMATICIDES ON PRODUCTION OF SWEETPOTATOES AND ON ROOTKNOT LARVAE COUNTS AND THEIR EFFECT ON THE POTATOES

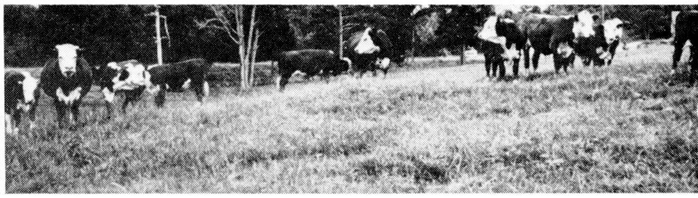
Nematicides (applied broadcast)		Total yield/acre		Rootknot larvae/pt. soil at harvest[1]		Nematode infection counts/sample of			
								No. potatoes with 3 or more infections per sample	
Kind	Rate/a	Cullman 3-yr. av.	Auburn 2-yr. av.	Cullman	Auburn	20 pot. Cullman	15 pot. Auburn[2]	Cullman	Auburn
		Bu.	*Bu.*	*No.*	*No.*	*No.*	*No.*	*No.*	*No.*
Check		253	316	1557	743	84	76	16	7
Dowfume W-85	5 gal.	342	282[4]	806	827[4]	31	90[4]	4	9[4]
D-D	20 gal.	367	358	682	660	25	55	3	6
D-D+SD14647	20 gal.		421		83		22		3
Telone	20 gal.	325	352[4]	839	1052[4]	36	53[4]	4	7[4]
Penphene	2 gal.	287	386	774	460	24	26	3	3
Nellite	3 lb.	326	289	266	630	24	49	3	5
Furadan	10 lb.	278	406	265	120	15	8	2	1
Furadan	6 lb.		402		225		6		1
Mocap	6 lb.		391		123		3		0
Temik	6 lb.		436		50		3		0
Vorlex	10 gal.		344		606		67		5
Vorlex(row)[3]	5 gal.		318		561		52		5

[1] At Cullman the rootknot nematode counts per pint of soil before treatments were applied in 1966 ranged from 339 to 536. At Auburn the rootknot index rating on squash grown in fall of 1966 ranged from 77 to 95.

[2] Some of the counts were from soil insect damage which could not be well distinguished on the peeled potato.

[3] This treatment was applied to row.

[4] Yields for 1968 only; yield for check in 1968 was 278 bu. Rootknot larvae per pt. of soil for 1968; for check it was 1,201. Nematode (rk) infection counts for 1968; for check it was 141 and for No. of potatoes infected was 12 for 3 or more infections per potato.



Differences in cattle and pastures at weaning time is illustrated by these July 23, 1968, photos: left—grass only, no legumes or N; right—grass and legumes plus N.

Legumes vs. Nitrogen for Summer Pastures

J. T. COPE, JR., and C. C. KING, *Dept. of Agronomy and Soils*
TROY B. PATTERSON, *Department of Animal Science*
S. C. BELL, *Dept. of Agricultural Economics and Rural Sociology*

THE OLD QUESTION of legumes vs. commercial nitrogen for summer pastures, never answered completely, is still being studied.

One such project, involving 180 acres of land and 64 brood cows plus their calves and replacement heifers, has been underway for 4 years at the Tuskegee Experiment Field. Objectives were to compare legumes and commercial nitrogen for summer pastures and to evaluate four methods of wintering.

Description of Experiment

Pasture grasses were predominantly Coastal bermuda and bahia, in approximately the same proportions in each treatment. Legumes were crimson and ball clovers on upland sites and white and ball clovers on lowlands. Clovers were allowed to reseed, but were reseeded when seed production was not adequate the preceding spring.

Nitrated pastures received N applications of 50 lb. per acre in March before grasses began growing, and 50 lb. in June or July. Pastures were limed and fertilized by soil test at beginning of the experiment. Thereafter, legume pastures were fertilized each fall with 25 lb. P and 46 lb. K (56 lb. each of P_2O_5 and K_2O), and nonlegume pastures got a similar application every other year.

Each treatment included 16 cows each year, 4 from each of the winter treatments. Stocking rate was varied by using different sized pastures as shown. Excess forage was cut for hay and credited to the system for economic analysis, which will be published when the experiment is terminated in 1969.

Cow Performance (table columns 3-4)

Cows and calves were weighed and put on spring pastures when clover growth was sufficient to carry them to grass grazing. At this time, cows had been on the winter program since about November 1 and weighed an average of 834 lb. The average date when clover was ready was March 28. It varied from March 15 in 1967 to April 8 in 1968. Hay was fed on nonlegume pastures until grass growth was sufficient.

Cows were weighed again in the fall on completion of the summer program. Average date of this weighing was October 16, before the cows began calving. Cows were checked for pregnancy at this time and replaced if open.

Cows on pastures containing legumes or receiving N returned to normal weight of about 1,050 lb. and showed a slight gain from fall to fall. Cows on untreated pastures (without legumes or N) failed to regain their weight in summer and lost an average of 41 lb. each year. Cows were kept on the same treatment year after year as long as they continued to conceive. There were no differences in conception rate between treatments in the 4 years.

Calf Performance (table columns 5-9)

Bulls were placed with the cows February 1 and removed May 31. The calving season started in early November and continued through February, with December 6 being average date of birth. Average birth weight was 63 lb., about the same for all treatments.

Calves averaged 112 days old on March 28 when weighed onto spring pastures. Weight of calves from all treatments, when adjusted for age, were within 10 lb. of the 197-lb. average. At about 250 days of age, the calves were weaned, weighed, and graded. Weaning weights were adjusted to 250 days, for sex and for age of the dam.

Calves on treatment 4 averaged 434 lb. and their slaughter grade 9.5. Those on nitrated pastures weaned 30 lb. heavier and graded slightly higher at 10.4. The heaviest calves were produced on the legume pastures, averaging 30 lb. heavier at weaning. Nitrogen on legume pastures did not increase weaned weight, but resulted in a slight grade increase to 11.2. The average date when calves reached 250 days old was August 13.

Daily summer gain was calculated by subtracting the spring weight from weaning weight and dividing by 138 days. Rate of gain of calves was less on untreated pastures than where legumes or nitrogen were used, as was true for the cows.

Calf gain per acre was calculated by dividing the summer gain by acres per cow. It was only 96 lb. per acre on treatment 4. The addition of 100 lb. N per acre increased per acre yield by 63%, and including legumes in the sward increased per acre yield 50%. Cow gains per acre from the four treatments were in about the same relative proportions as the calf gains.

EFFECTS OF LEGUME AND COMMERCIAL NITROGEN ON COW AND CALF PERFORMANCE, 1965-68 AVERAGE

Treatment	Acres per cow	Cow performance		Calf performance				
		Summer gain	Fall to fall	Spring wt.[1]	Weaned wt.[1]	Grade[2]	Summer daily gain	Gain per acre
	No.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Column No. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
No. 1, legume, 100 lb. N	1.50	235	+ 8	199	494	11.2	2.14	197
No. 2, legume, no N	2.00	212	+12	208	495	10.8	2.08	144
No. 3, 100 lb. N	1.75	228	+10	191	464	10.4	1.98	156
No. 4, no legume, no N	2.50	169	−41	193	434	9.5	1.75	96
AVERAGE	1.94	211	− 3	197	472	10.5	1.99	142

[1] Spring weight adjusted to 112 days, and weaned weight to 250 days.
[2] Grades: 9—low Good, 10—Good, 11—high Good.

A History of Agricultural Engineering at Auburn University

F. A. KUMMER, *Department of Agricultural Engineering*

THE DEPARTMENT OF AGRICULTURAL ENGINEERING had its origin in 1919 when M. L. Nichols came to Auburn at the request of J. F. Duggar, then Director of the Agricultural Experiment Station, Dean of the School of Agriculture, and Head of the Department of Agronomy. The department consisted of Nichols and John W. Randolph, who shared responsibilities for teaching service courses in soil conservation and farm machinery to World War I veterans.

From this modest beginning, service courses for students in other departments developed and other staff members were added. L. C. LeBron, employed as the first Extension Agricultural Engineer, was responsible with Nichols for training county agricultural agents in laying out terraces and holding farm machinery demonstrations.

Nichols learned of Alabama Power Company's interest in rural electrification, and, in 1922, began discussions with the company to initiate a cooperative research and experimental program. E. C. Easter was employed to conduct the program, which included feasibility studies for the construction of rural electric lines and studies of uses of electricity on farms.

At about this same time, A. Carnes was hired to teach farm buildings and farm shop to vocational agriculture students.

The department was first located in the basement of Comer Hall, but was left without quarters when Comer Hall burned. An old airplane hangar that had been used during WW I was obtained and this was home for agricultural engineering until 1939, when the present office and classroom building was constructed.

Also during the early twenties, Dan T. Gray, who succeeded J. F. Duggar as Dean and Director, requested that agricultural engineering assist farmers in Baldwin and Mobile counties obtain better traction for the early steel wheel tractors in sandy soils. This was the beginning of the research in soil dynamics for which the department became internationally known. As this research developed, the need for testing full scale implements and tractors became obvious and the present National Tillage Machinery Laboratory was conceived and finally constructed with PWA funds in 1935.

A national trend that developed during the thirties pointed up the devastating effects of soil erosion on agricultural lands of the Southeast. Nichols and his co-workers developed a channel type terrace that became known as the "Nichols Terrace." Some of the people besides Nichols directly responsible for this development were A. Carnes, L. C. LeBron, J. B. Wilson, E. G. Diseker, and Fletcher Farrington, who was Tallapoosa County agent. As a result of this work, a large technical training center was established in 1932 in Tallapoosa County by the newly created Soil Erosion Service.

Nichols left the department in 1936 to become Assistant Chief of the Soil Conservation Service. R. E. Yoder, a soil physicist on temporary appointment with the Department of Agronomy and Soils, served as acting head until 1939, when J. H. Neal became head.

The first undergraduate curriculum in agricultural engineering was established in 1938, although M.S. degrees had been conferred since 1929.

During WW II, the department's background and facilities in soil dynamics research were the basis for a cooperative research program with the War Department. This program dealt with the mechanical problems involved in the mobility of military vehicles under difficult soil conditions. A. W. Cooper and F. A. Kummer served as consultants to the Army Ordnance Proving Ground, Aberdeen, Maryland. The Agricultural Experiment Station and the National Tillage Machinery Laboratory furnished research facilities to a group of civilian engineers and military personnel here at Auburn.

In 1948, F. A. Kummer succeeded J. H. Neal as head of the department. In 1949, the present teaching laboratory annex was constructed and a 100-acre teaching laboratory facility was established at North Auburn.

During the late 1940's and early 1950's, the rapidly expanding mechanization of row crops caused by the farm labor displacement following WW II required a revision of the department's research program. The department's staff cooperated with the Wiregrass Substation in an accelerated research program of peanut harvesting mechanization. Actively engaged in this program were C. M. Stokes, J. L. Butt, and F. A. Kummer. Within 5 years, this work resulted in the complete mechanization of the peanut harvesting operation which reduced the labor requirement from over 30 to approximately 4 hours per acre.

Renewed emphasis was placed on cotton mechanization research during the early 1950's. T. E. Corley conducted research on this project at the Sand Mountain and Tennessee Valley substations. Evidence of the success of this program is that now almost 100% of commercially grown cotton in Alabama is mechanically harvested.

The department initiated an interdisciplinary doctoral program in 1959. Seven Ph.D. degrees have since been awarded through this program.

In 1961, the State Legislature appropriated funds for a mechanization research farm unit. This unit is located at Marvyn, about 15 miles south of Auburn, and is being operated as a research facility by staff members in cooperation with other departments and agencies.

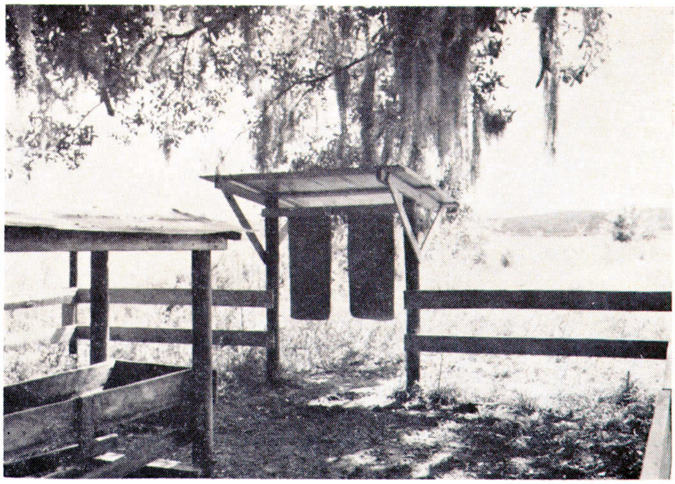
Early in 1966, a grant was received from the National Institutes of Health, PHS, for partial support of construction of a new avian environmental and shelter engineering laboratory. Sixteen individually controlled chambers were assembled and all control equipment was installed using staff labor of the poultry science and agricultural engineering departments under the guidance of W. Grub and C. A. Rollo, who designed the facility. It is now being used as an environmental research facility on cooperative projects between the departments.

Present professional staff of the department consists of 11 persons. Thirteen cooperating personnel, representing three federal agencies, are also stationed at Auburn.

Dusting Stations for Horn Fly Control on Beef Cattle

KIRBY L. HAYS
Department of Zoology-Entomology

V. L. BROWN
Lower Coastal Plain Substation



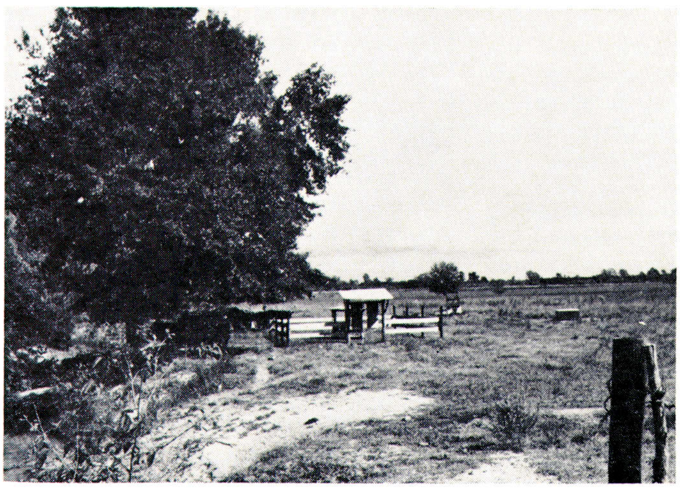
To reach the mineralized salt in the trough, the cattle had to pass under the burlap bags containing the insecticide.

Dusting stations seem to be one of the most economical methods of applying insecticides to cattle and the amount of chemical applied is minimal.

A dusting station must be inexpensive and easily constructed, require little maintenance, and be of such design and construction that cattle will use it regularly. Six such units were constructed on the Lower Coastal Plain Substation, Camden, Alabama, in the spring of 1968. Construction costs, including materials and labor, were about $25 per unit.

The basic pen was 24 ft. square and constructed of rough, untreated, 1 x 8 oak boards nailed inside creosoted posts sunk 2 ft. into the ground. A shelter to protect the insecticide from weathering consisted of a 6-ft.-square sheet metal roof sloping toward the outside of the pen. This metal roof was supported 6 ft. above the ground by 2 creosoted posts that also served as gateposts. Braces were used to hold the roof in place. A 2 x 4 crosspiece 5 ft. above the ground was fitted with 6 porch swing hooks to hold the bags of insecticide.

Each dust bag was made by placing one burlap bag inside another. Ten-oz. 40 cut x 42-in. bags appeared to be most suitable. Four grommets were installed in the open end of each bag to support it. Two bags containing insecticide were suspended from the hooks in the opening of each pen.



Dusting stations must be located in areas frequented by the cattle.

Each station was located in an area frequented by cattle. Mineralized salt was placed in each pen to encourage the animals to enter. Most animals entered the pen often enough to keep some insecticide on their hair at all times. Best control was achieved when the animals passed through the device once each day.

Insecticides compared were 3% Gardona®, 10% Methoxychlor, 5% Co-Ral®, 5% Tiguvon®, and 5% Malathion®. Ten lb. of insecticide was placed in each burlap dusting bag before hanging. The bags were placed in use in April and May 1968.

It appears from 1 year's data that 1 dusting station is sufficient to control horn flies on up to 50 head of cattle in pastures of 40-100 acres. It also appears that salt is sufficient inducement to lure the cattle under the dust bags; however, it is believed that these dusting devices would be more efficient if the shelter and bags were placed in gaps in fences between pastures or in the gates of pens surrounding water so cattle would pass under the bags more often.

Not all of the insecticides tested were equal in effectiveness. Co-Ral and Gardona provided almost complete horn fly control during the spring, summer, and fall. Tiguvon was almost as effective. Malathion and Methoxychlor were not satisfactory and provided some control only during the summer months.

In most cases, 10 lb. of insecticide was enough to last all summer. The burlap bags appeared to wear well and all except one lasted all summer. This observation was on polled or de-horned animals, however, and horned cattle may have a tendency to destroy the bags.

On the basis of the limited data from this Station and other states it appears that the dusting station has a place in parasite control programs on beef cattle. Currently, few insecticides are available that have been cleared by the Federal Food and Drug Administration for application to cattle from dust bags. Of the insecticides compared in these tests, only 5% Co-Ral and 10% Methoxychlor are cleared. Several companies are in the process of applying for clearance and a number of insecticides should be on the market soon. Some of these will be prepackaged in bags ready to hang. Winter observations indicate that this method may also control cattle lice.

High Density Planting of Tomatoes for Mechanical Harvest

SAM T. JONES and JACK L. TURNER, *Department of Horticulture*
CHARLIE STOKES, *Department of Agricultural Engineering*

MECHANICAL HARVESTING of tomatoes, long a dream of grower and scientist alike, is now a reality. But when it arrived, mechanical harvesting was far different from what was generally visualized when it was first considered.

Mechanical fingers do not carefully probe among the vines for ripe fruit to be gently removed and placed into padded containers. Instead, vines are cut and vigorously shaken to remove all fruit, and vines and green fruit are discarded while ripe tomatoes are conveyed to large bulk containers holding 1,000 lb. or more.

New Cultural Methods Required

Ripe tomatoes are handled gently enough, but vines and green fruit are damaged beyond salvage. Therefore, cultural practices must be changed so that enough ripe fruit is available from one harvest to make this production method economical. Varieties are needed that set all their fruit at one time. Also needed are fertilizer practices that encourage a heavy early fruit set and that discourage later setting of fruit.

Since there is a limit to the amount of fruit a plant can set and mature at one time, heavier plant populations should allow more fruit to be set and to mature at one time. To test this theory, a 1968 experiment at the Gulf Coast Substation, Fairhope, evaluated plant populations of from 6,000 to 48,000 plants per acre.

Close spacing of tomato plants proved necessary for highest yields when the crop was once-over harvested with this machine.

Three Spacings Tried

Plants were spaced either 4½, 9, or 18 in. apart in single rows 5 ft. apart, and in double rows 12 in. apart on 5-ft. center. The Chico Grande variety was used, with transplanting March 27. Forty-eight lb. of N, 64 lb. of P (144 lb. P_2O_5), and 120 lb. K (144 lb. K_2O) were broadcast per acre before planting. A sidedressing of 50 lb. of N per acre was made April 24.

EFFECT OF PLANT DENSITY ON YIELD OF TOMATOES AND PROPORTION RIPE

Plant density		Fruit per plant				Machine harvested yield per acre
Plant spacing	No. per acre	Total	Ripe[1]	Weight[2]	Ripe[2]	
		No.	*Pct.*	*Lb.*	*Pct.*	*Tons*
Single row						
18. in.	6,000	71	42	10.2	62	13.9
9 in.	12,000	34	55	5.6	76	17.9
4½ in.	24,000	19	63	2.9	79	21.9
Double row						
18 in.	12,000	46	49	6.0	73	18.8
9 in.	24,000	24	55	3.0	82	23.4
4½ in.	48,000	14	59	1.6	85	23.9

[1] Considering those ripe, green, and rotten culls.
[2] Considering those ripe and green, but excluding rotten culls.

Ten ft. of each plot was harvested once-over by hand and the remaining 40 ft. of row was gathered with an FMC tomato harvester on June 27. When grown in single rows, plants spaced 18, 9, and 4½ in. apart produced 71, 34, and 19 fruits per plant, respectively. As shown in the table, proportion ripe at harvest was 42, 55, and 63% for the three spacings. In double rows, number of fruit per plant was 46, 24, and 14 – of which 49, 55, and 59% were ripe – for the 18-, 9-, and 4½-in. spacing.

Density Affects Tomato Size

Since fruit size was also affected by plant density, the weight of fruit produced per plant is more meaningful than number produced. Single-row plants spaced 18, 9, and 4½ in. apart produced 10.2, 5.6, and 2.9 lb. of fruit per plant, with 62, 76, and 79% ripe. In double rows, the yields were 6.0, 3.0, and 1.6 lb. per plant from the 18-, 9-, and 4½-in. spacings, with 73, 82, and 85% ripe.

Although yield per plant dropped with higher plant populations, increasing numbers of plants more than compensated for the loss. Thus, yields per acre increased as plant densities went higher. Yields of tomatoes harvested by machine were 13.9, 17.9, and 21.9 tons per acre, respectively, for the 18-, 9-, and 4½-in. spacings on single rows. Double rows made 18.8, 23.4, and 23.9 tons per acre for the same spacing.

LABELS Replace PINCH and SNIFF in MEAT SELECTION

RUTH A. HAMMETT,
Department of Agricultural Economics and Rural Sociology

WITHIN THE MEMORY of older homemakers was the time when the butcher cut meat and poultry to order, provided advice, and saved the choicest cuts for his favored customers. Poultry was purchased live or with only the feathers removed to make possible inspection for age, health, size, and freshness by the purchaser.

But times have changed – no longer is pinching and sniffing part of the housewife's tools in meat selection. The presence of grade and inspection labels now certify that the food is wholesome and of known quality.

Meat Grade Label Study

A study made in three Alabama cities in 1963-65 included some questions related to recognition of inspection and meat grade labels. This was before passage of the Wholesome Meat Act of 1967 and the Wholesome Poultry Products Act in 1968, with the accompanying publicity. Meat inspection with Federal standards will now become mandatory within states as well as in interstate commerce.

As indicated in the illustration, the shield carries the grade for poultry, meat, eggs, and a growing list of other foods. The inspection seal is round. The inspection seal refers only to the wholesomeness of the product. The grade mark indicates the quality, and is placed only on products that have been inspected. However, not all products that have been inspected and graded carry labels at the consumer level.

In the study respondents were shown an outline of the shield used as the background in meat grades, and to a limited extent, in continuous inspection of processed fruits and vegetables. A third of the 3,361 homemakers failed to recognize the shield emblem, a third thought it represented a brand name or a seal of approval, while most of the remainder said it showed that the meat had been inspected. Only 61 women, or 2%, identified the shield outline as a background for meat grades.

Among homemakers with per capita incomes over $3,000, about half thought it was an inspection label, a fifth did not remember seeing it, and about the same number gave incorrect answers. Half the homemakers with per capita incomes under $900 did not remember seeing such a food label, a third gave incorrect answers, and a fifth thought it an inspection symbol.

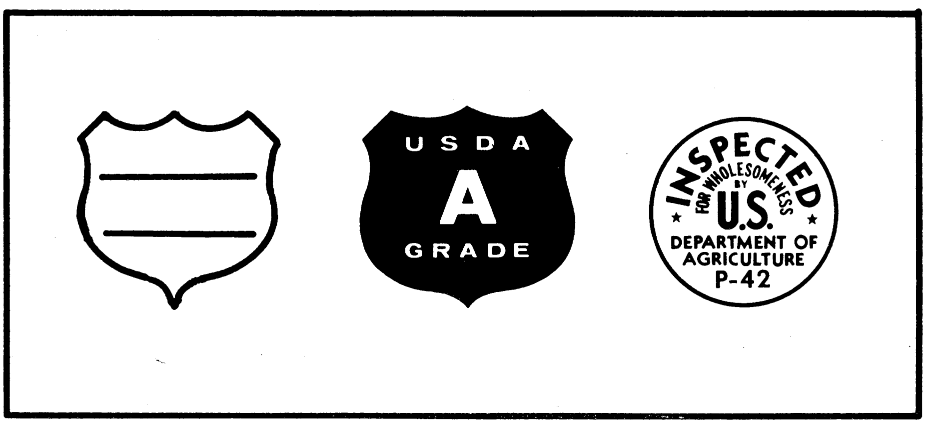
A second question concerned the naming of five consumer grades of beef. Only 10% of the homemakers in the lowest per capita income level could recall one grade, while 54% of those in the highest income group did so. The remainder in each group were about evenly divided between those who gave a wrong answer and those who did not know. A wrong answer was such grades as A-1, Grade A, Excellent, Best, U.S. Certified, Premium, or First Quality. In the total sample, 11% named one beef grade, 14% named two, 7% named three, while 1% or 31 women named four consumer beef grades.

Respondents in the largest city were drawn from shoppers in cooperating stores. Meat in these stores was advertised and sold by grade. A third of these women named three or more beef grades as compared to 22% in the smallest size city who could name but one or two grades.

When grade labels were placed on cartons, many more homemakers named the proper grade. In the total sample, 83% gave the correct grade for eggs and 60% named Grade A for milk.

If consumer food grades are to be useful in decision-making, the general design of the label must be recognized, and what it signifies clearly understood. The food purchasers must be aware that the symbols are used for protection, that they certify food is wholesome, and that the quality is identified. These labels provide the consumer with a basis for discrimination in the market place presently more reliable than the old way of look, pinch, and sniff.

Consumers should insist that all foods have adequate inspection for wholesomeness and support this practice by their purchases. Grade labeling aids in purchasing food to fit food preparation methods and ultimate use. Processors of food products and retail stores should feature inspection and grade labels in their advertising, for their own and their customers' protection, if these symbols are to perform their full function.



An outline of the shield indicating USDA meat grades, left, was shown to the homemakers for identification. An actual shield from graded poultry meat is at center. The inspection mark, which refers to wholesomeness, is shown at right.

Pelleted Soil Sterilant in Forest Management

SHERMAN D. WHIPPLE, *Department of Forestry*

Pelleted soil sterilants show promise for honeysuckle and kudzu control and precommercial thinnings of pine. Research involving the use of Tordon 10K® pellets was started in 1964 on the Fayette Experiment Forest.

The first test was made on stands of Japanese honeysuckle interspersed with small pines and hardwoods. On August 3, 1964, the Tordon pellets were broadcast at rates of 6 lb. and 8 lb. of active ingredient (ai) per acre. On January 14, 1965, the area was planted with loblolly pine seedlings.

Results as of September 1965 indicated complete kill of honeysuckle on 1 of the 4 plots treated with 6 lb. (ai) per acre and on 3 of the 4 plots treated with 8 lb. (ai) per acre. Overall kill of honeysuckle by the 2 treatments was 96% and 98%, respectively, as shown in the table. The 2 treatments also killed 98% and 97%, respectively, of the pine and hardwood trees over 4.5 ft. in height. In the fall of 1965, survival of pine seedlings planted the preceding January averaged 66% on areas treated with 6 lb. and 52% on areas treated with 8 lb. (ai) per acre. There was very little mortality of planted seedlings on the treated areas during the next 2 years, while nearly all seedlings planted in the untreated honeysuckle died.

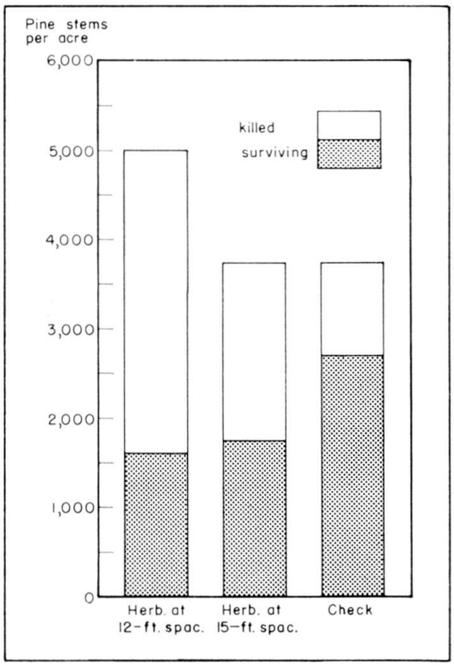
During April 1965, the herbicidal pellets were broadcast at rates of 2 lb., 4 lb., and 6 lb. (ai) per acre on thick beds of kudzu. Regardless of the rate of application, complete kill of kudzu was apparent by the following fall. During the spring of 1966, no new stolons appeared on areas treated with 4 lb. and 6 lb., and only 3 weak stolons were found on areas treated with 2 lb. (ai) per acre.

Stand of natural loblolly pine thinned 67% by application of 8.25 lb. (ai) of herbicide per acre in narrow bands spaced 12 ft. apart.

A dense, semi-stagnated, natural stand of 18-year-old loblolly pine containing 3,500 to 5,600 trees per acre was selected in April 1965 to be thinned with the pelleted soil sterilant. Pellets were applied in narrow bands spaced 12 and 15 ft. apart at rates of 104 g. (ai) per 100 ft., for totals of 0.833 lb. and 0.666 lb. (ai) per acre.

After 2 years, rates of thinning attained at the 2 treatment levels were 67.0% and 51.1%, respectively, Figure 1. The 1,500 to 1,600 live trees ranged through all sizes, and the thinned stand was more satisfactorily stocked than the check. All residual trees appeared healthy.

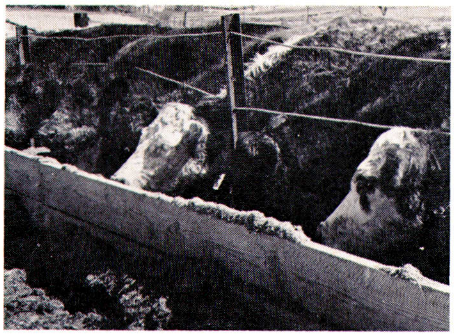
Tordon herbicide, when applied to the soil in a pelleted form, effectively controlled honeysuckle and kudzu infestations, permitting successful establishment of pine by planting. This herbicide also showed promise for possible use in pre-commercial thinning of overly dense, young stands of pine.



Number of trees present when treated with Tordon pellets and number surviving 2 yrs. later.

Effects of Pelleted Soil Sterilant on Forest Stand Heavily Infested with Honeysuckle

Treatment applied 8/3/64	Honeysuckle control		Pine and hardwood over 4.5 in. kill		Survival of pines planted 1/14/65	
	Complete	Overall				
Lb./A	*Pct.*	*Pct.*	*1965*	*1967*	*1965*	*1967*
6	25	96	98	98	66	65
8	75	98	97	100	52	52
Untreated check	----	----	----	----	55	4



WASTELAGE— Something New in Cattle Feeding

W. B. ANTHONY, *Department of Animal Science*

IN ALL RECORDED HISTORY, the cow has been man's most useful servant, serving as a source of food and a beast of burden. But all too frequently in today's modern world, the cow's importance is forgotten. With current urbanization and the rapid shift to managing livestock in confinement, the cow is likely to be viewed as a major source of environment pollution by today's space-age man. Nevertheless, the lowly cow continues to serve man by providing him with pleasurable and healthful food.

The reason that the cow served early man, continues to serve him now, and will serve future generations is that she is a ruminant. Being a ruminant, the cow's food can be coarse and fibrous materials that man could not otherwise use as food.

Living in the rumen of the cow are billions of microorganisms – protozoa and bacteria – which produce enzymes that digest cellulose, as well as other foods, and synthesize vitamins and amino acids. These rumen microbes create their own special environment that is not conducive to growth of pathogenic organisms, and finally the rumen microbes pass to the lower digestive tract to be digested and absorbed by the cow. This "teamwork" of rumen microbes and the cow establishes a fundamental element of man's security that is often taken for granted and misunderstood.

The philosophy described is the reasoning behind Auburn experiments in which "wastelage" is fed to cows, and helps explain why such materials can be used as feed. Wastelage is made by combining feedlot manure with ground Coastal bermudagrass hay and storing in a silo. Fermentation occurs and the product acquires an excellent silage odor. It contains (dry matter basis) about 13% crude protein and 60% TDN, and proved to be a valuable feed.

Manure from a cow is a composite of ration components and microbial matter from the rumen. That from a grain-fed steer contains an appreciable amount of undigested feed and feed residues. The mineral and protein portions of manure were increased appreciably by feed passage through the digestive tract. Also, the nondigested cellulose was modified in the rumen, thereby enhancing its feed value. Both processes make manure a valuable feed.

Of utmost importance is that manure fed to cows is fermented by rumen microbes so that it is changed into the usual products of digestion, just as conventional feeds. Not only do the rumen microbes change the products of manure, but they prevent the growth of harmful bacteria in the rumen. Furthermore, manure used in wastelage is collected daily and there is no opportunity for putrifying bacteria to develop.

Value of wastelage for breeding stock or fattening cattle was established in feeding trials with ewes, heifers, and steers. Breeding ewes were fed either Coastal hay or wastelage made with the hay. During this 389-day trial the ewes went through breeding, gestation, and lactation periods, followed by rebreeding and another gestation and lactation season. Lambs were creep fed and grew normally. At the end of the study, the wastelage-fed ewes were more vigorous and appeared healthier than the hay-fed ewes. And feeding wastelage saved an average of 1.74 lb. of hay per ewe daily.

In the feeding test with open Angus heifers, animals were fed either wastelage or corn silage, plus 227 g. of a protein-mineral-vitamin A supplement per animal daily. The feeding period lasted 332 days during which time the heifers bred, calved, and nursed young. The only noticeable difference between the two groups was that heifers fed corn silage gained more weight while nursing calves. Limit-feeding during gestation kept weight about constant in both groups.

Wastelage was also found valuable in steer fattening rations. One pen of steers was fed a high energy fattening mixture made of 75.5% ground shelled corn, 8% soybean meal, 5% dehydrated alfalfa, 10% cane molasses, 1% salt, and 0.5% defluorinated phosphate. (Additives, per lb., were 1,000 I.U. vitamin A, 250 I.U. vitamin D, 2.8 mg. aureomycin, and 0.4 mg. stilbestrol). The second pen was fed a mixture of 2 parts wastelage to 3 parts whole shelled corn. Cattle getting the wastelage ration also received 2 lb. daily of a 30% protein liquid supplement.

The wastelage-fed pen made the best gain during the 126-day feeding period, as shown below:

Ration	*Av. daily gain, lb.*	*Dry matter per lb. gain, lb.*
Standard	2.42	7.45
Wastelage-corn	2.57	9.28

Carcasses of the two groups were equal, all grading Choice. All cattle on the standard fattening ration suffered from rumen parakeratosis and all tripe was lost. None of the wastelage-corn steers had this disorder.

AGRICULTURAL EXPERIMENT STATION
AUBURN UNIVERSITY
AUBURN, ALABAMA 36830
E. V. Smith, Director
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