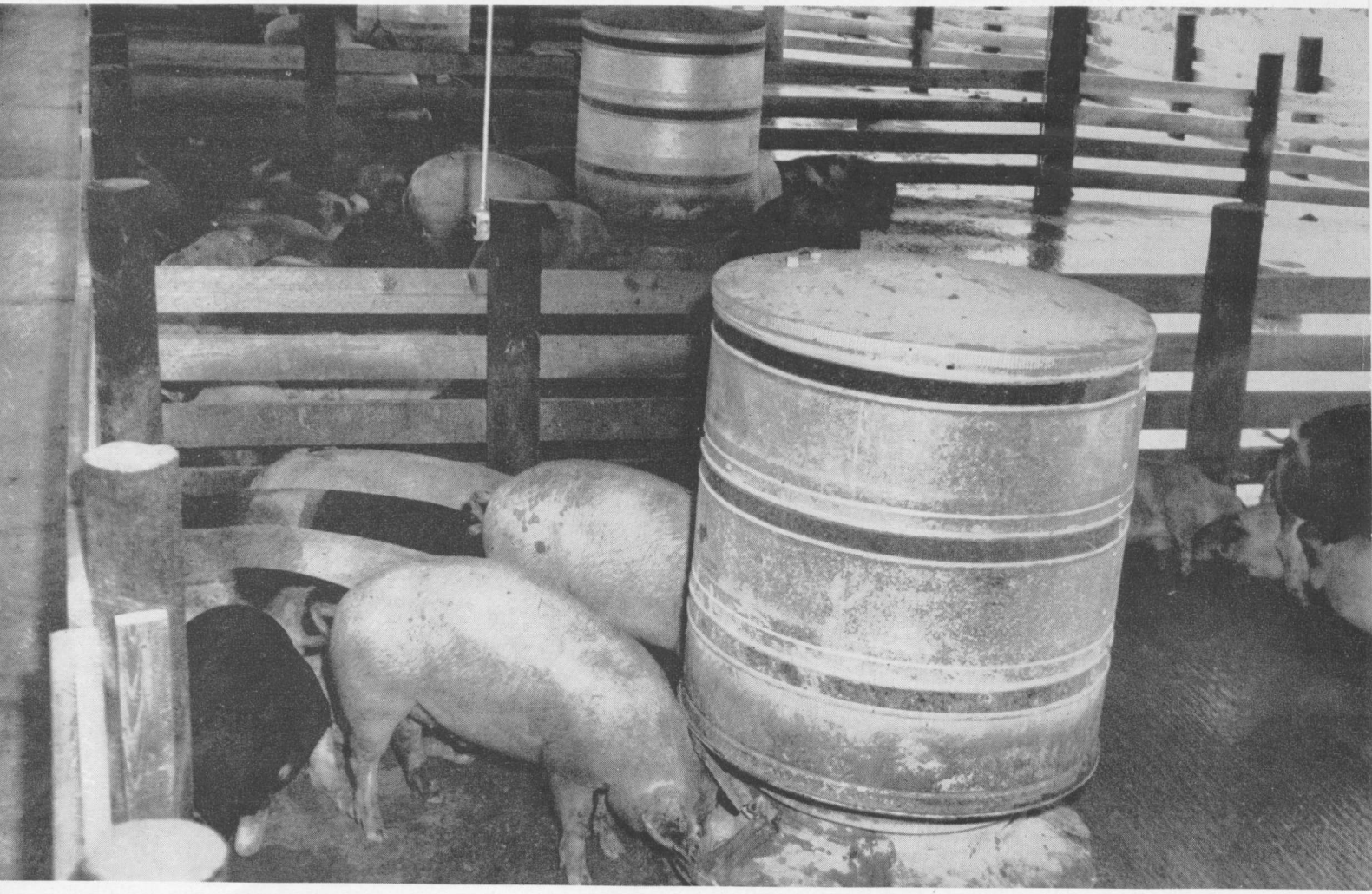
Highlights OF AGRICULTURAL RESEARCH

a quarterly report
of research serving
all of Alabama



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AGRICULTURAL EXPERIMENT STATION SYSTEM
AUBURN UNIVERSITY

HIGHLIGHTS of Agricultural Research

VOLUME 7, No. 3 FALL, 1960

In this issue . . .

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New and Timely PUBLICATIONS

Listed here are timely and new publications reporting research by the Agricultural Experiment Station.

Bul. 300. Alfalfa Production in Alabama presents experimental data on varieties, fertility requirements, seeding, and management of alfalfa.

Bul. 327. Establishment and Maintenance of White Clover-Grass Pastures in Alabama gives results of fertility studies and recommends production practices.

Cir. 133. Cost of Clearing Land is a report of comparative expenses of land clearing with dozer and shearing blades on crawler-type tractors.

Leaf. 62. Warrior Vetch—A New Variety for Alabama reveals detailed information on the new vetch variety developed by the Agricultural Experiment Station.

Prog. Rept. 79. Controlling Chinch Bugs on St. Augustine Grass Lawns tells how this serious lawn pest can be controlled.

Free copies may be obtained from your County Agent or by writing the Auburn University Agricultural Experiment Station, Auburn, Alabama.

FIELD SIZE *and* MACHINERY EFFICIENCY

E. S. RENOLL,
Associate Agricultural Engineer

How many acres per day can your 2-row cultivator handle? What field capacity does your combine have? Do field size and shape affect machine capacity and machine efficiency?

These and many other questions are continually being asked by farmers. Answers are needed as guides in buying suitable equipment. Field capacity of farm machines varies greatly from farm to farm and from field to field. Machine efficiency is influenced by a number of factors. Many have been analyzed and their influence determined. Other factors, such as lost time, row length, field shape, and turning time at ends of rows have not been as carefully measured, and their effects have not been as well defined.

Lost Time

The amount of lost productive time materially influences a machine's field capacity. Time spent in making field adjustments and repairs, adding seed, fertilizer, chemicals, and water, and turning at ends of rows is lost time and as a result influences field capacity of the machine.

Lost time for typical farm machines ranges from about 10% for an 8-ft. tandem disk harrow to as much as 50% for a 12-ft. combine. A 2-disk plow might have 25% lost time, whereas the 2-row corn picker may have as much as 40%. Recent studies at Auburn Agricultural Experiment Station show that a 2-row planter equipped with a fertilizer and pre-emergence spray attachment may have lost productive time as high as 65%.

Field Layout and Shape

The physical size of the field plus contour and row length will affect machine capacity. In 1959 a comparison of two fields was made to determine relationship between field layout, row length, turning time, and machine field efficiency.

The machine used for the study was a 2-row cultivator. All operations on the two fields were identical, including driver, tractor, cultivator, and speed of operation. Neither field had any lost time operation other than that used for turning at ends of rows.

The two fields are shown in Figure 1. Field A was irregular in shape with the longest row being 400 ft. The shortest row was 165 ft. long. Field B was long and narrow. The row length averaged 1,050 ft., the longest and shortest rows being 1,060 and 1,000 ft.

The results of the field layout study are as follows:

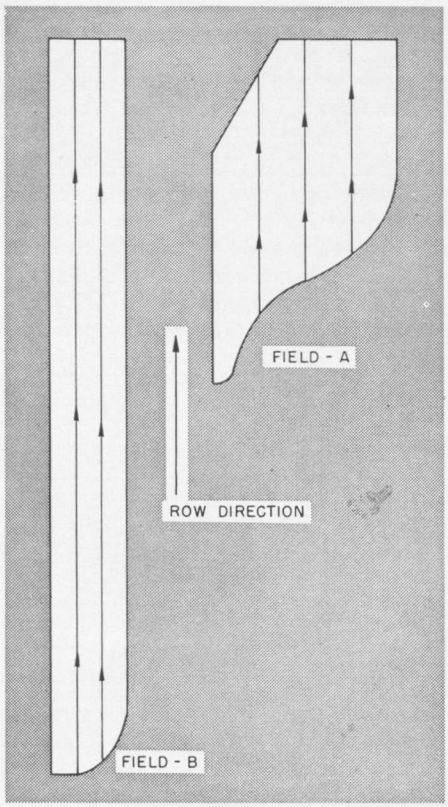


FIGURE 1

Item measured	*Field A*	*Field B*
Machine capacity, acres per hr.	1.9	2.9
Turning time, pct. of total	20.0	3.0
Field layout efficiency, pct.	80.0	97.0

Under the conditions of the test, the machine capacity in field B was 1 acre an hour greater than in field A. The additional capacity represents an increase of about 50%. The long rows in field B account for the increase in field efficiency. Field A with its short rows was 17% less efficient than field B.

Summary

Field machine capacity as affected by field shape, row length, and turning time points up the following:

1. By combining small adjoining fields into larger areas, row length can be increased, which in turn will result in greater operation efficiency and machine capacity.

2. Fields with parallel terraces have a higher field efficiency than fields with conventional terraces. One reason for this greater efficiency is the elimination of short rows commonly found in fields having customary non-parallel terraces.

3. Turning space at ends of rows should be wide enough to permit the operator to complete the turn without having to back the tractor. Backing the tractor may take five times as much time as it does to make a full semi-circle turn.

4. Ditches and other obstructions in the turn space will increase turning time and will decrease field efficiency.

Increased field efficiency obtained by reducing lost time and by using good field layout will make it possible for you (1) to handle more acres with a given size implement, or (2) to use smaller and less expensive implements for a given acreage. In turn, this will lower your cost per acre for each operation.

RATIONS *for fattening* STOCKER STEERS

W. B. ANTHONY, *Assoc. Animal Nutritionist*

J. G. STARLING, *Asst. Supt., Wiregrass Substation*

J. K. BOSECK, *Supt., Tennessee Valley Substation*

IT TAKES LONGER to fatten a calf than it does to fatten a yearling – a hundred days longer. However, calves of beef type can be fattened immediately after weaning.

An important advantage of fattening calves as compared with fattening yearlings or 2-year-olds is that less feed is required per cwt. of gain. Calves make less rapid daily gain than do yearlings, but when an adequate feeding and management program is followed, calves gain 2.25 lb. per day or more over a feeding period of 200-250 days.

Rations Tested

Extensive testing of rations for fattening yearlings and 2-year-olds has been conducted by the Auburn Agricultural Experiment Station System since 1953. Research has been conducted at the Wiregrass and Tennessee Valley Substations.

A ration developed at the Wiregrass Substation in 1953 and used extensively as a control diet in later work contains the following percentages of ingredients: ground snapped corn, 51; cottonseed meal, 8; cane molasses, 10; ground peanut hay, 30; and salt, 1. This formulated ration has been successfully used chiefly for fattening yearlings and 2-year-olds. Since this is a high roughage (about 43%) mixture, it could be considered unsatisfactory for fattening calves.

Research designed to test this and other feed mixtures for fattening calves was carried out last fall and winter at the Wiregrass Substation. Composition of the mixtures tested and lot designations for the test are given in Table 1.

Fall- and winter-dropped steers and heifer calves were purchased from one herd and used in the test. Each ration was fed to one lot of eight steers and one lot of eight heifers. All rations were fed free choice from the first day of the test. Some of the performance data for the steers are summarized in Table 2. Rations ranked the same on the basis of performance for both steers and heifers. Differences noted were that heifers were finished and sold about 20 days ahead of the steers; their average daily gain was less than steer gain; and they required a little more feed per cwt. of gain.

TABLE 1. FEED MIXTURES USED FOR FATTENING CALVES

Composition	Lot 1	Lot 2	Lot 3	Lot 4
	%	%	%	%
Ground snapped corn	49	69	44	72
Cottonseed meal	10	10	---	6
Soybean oil meal	---	---	---	6
Ground cottonseed	---	---	15	---
Cane molasses	10	10	10	10
Coastal Bermudagrass hay	30	10	30	---
Dehydrated alfalfa meal	---	---	---	5
Salt	1	1	1	1
Stilbosol Premix[1] 0.8 lb. per ton (all mixtures)				

[1] Supplied by Eli Lilly and Company, Indianapolis, Indiana.

The control diet, containing about 43% roughage (30% hay), fattened the calves just as rapidly and to the same degree of finish as did the high grain ration, Lot 1 vs. Lot 4. In addition to containing less roughage, the high grain ration was superior to the control lot because it contained more and better quality protein and mineral elements in dehydrated alfalfa. Feed per cwt. of gain was reduced 24 lb. for Lot 4, but the feed cost per cwt. of gain was less for Lot 1.

Cottonseed has frequently been used successfully at the Station as a substitute for cottonseed meal in the control fattening mixture when used for fattening yearlings and 2-year-olds. Results of this test, Lot 3, show cottonseed may also be substituted for cottonseed meal or a combination of cottonseed meal and soybean oil meal in rations used to fatten calves.

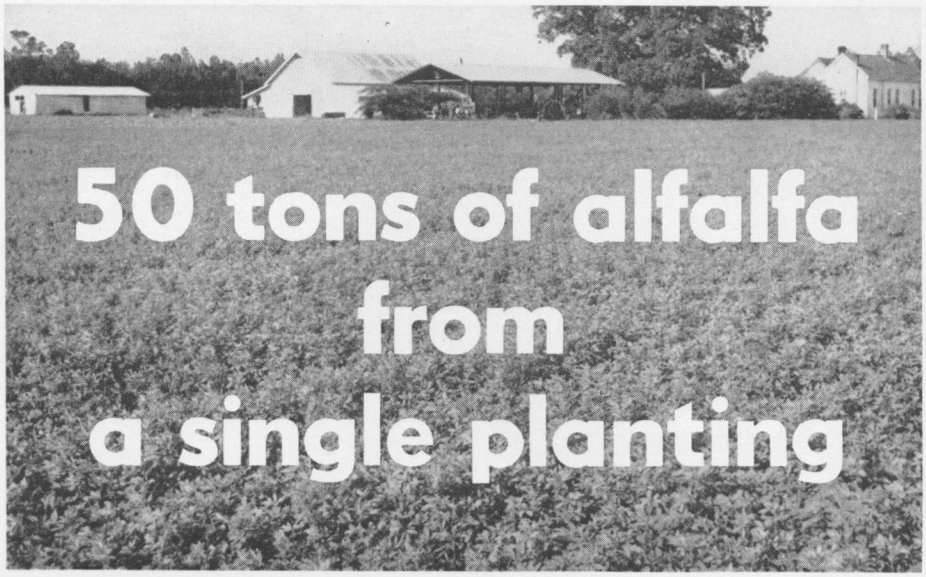
Although calves may be successfully fattened immediately after weaning, results of other experiments show that, when practical, beef calves should be grown out on corn silage and cool-season pasture feeds prior to finishing in drylot. Beef calves can be grown out on corn silage and small grain pastures for a feed cost as low as 11¢ per lb. of gain.

In tests at the Tennessee Valley Substation calves grown from early fall until late spring on either corn silage or a combination of silage and small grain-clover pasture gained almost 300 lb. before they were placed in the feedlot for finishing. Drylot feeding for about 120 days after the growing out phase finishes these young cattle to high Good and Choice slaughter grades. The final carcasses produced by this feeding system satisfy the present consumer demand.

TABLE 2. FEEDING RESULTS FOR SEVERAL RATIONS USED FOR FATTENING STOCKER STEER CALVES

Item	Control diet-30% hay	Hay 10%	Cottonseed for CSM	High energy no hay
Animals per treatment, no.	8	8	8	8
Feeding period, days	202	202	202	197
Averages per steer, lb.				
Initial weight	456	451	468	454
Final feedlot weight	894	880	878	875
Total gain	438	429	410	421
Daily gain	2.17	2.12	2.03	2.14
U.S.D.A. carcass grades, no.				
Good	8	7	7	7
Standard	0	1	1	1
Dressing percentage[1]	61.16	62.54	57.96	61.58
Feed consumed per steer, lb.	4,281	4,300	3,694	4,012
Feed per cwt. gain, lb.	977	1,002	901	953

[1] Chilled carcass weight expressed as a per cent of final feedlot weight minus 3%.



50 tons of alfalfa from a single planting

E. M. EVANS, *Associate Agronomist*
L. A. SMITH, *Supt., Black Belt Substation*

FIFTY TONS of alfalfa hay per acre from one planting. . . .

Such production may sound impossible, but it has been done in Alabama. This rate of production was obtained in an experiment on a well-fertilized, well-drained Sumter clay at the Black Belt Substation during 1948-58.

Weather was not ideal either. The winter of 1950-51 was one of the most severe on record and few farmers can forget the bad droughts of 1953-54. Although weather conditions are reflected in yields during or following periods of stress, lowest annual yield for the plot was slightly over 2½ tons per acre. Highest was 6.37 tons per acre and the 11-year average was 4.57 tons.

There was no big secret involved in this production. The keys to success were selection of a suitable soil, good seedbed preparation, adequate fertilization for establishment and maintenance, and good clipping management.

Good soil drainage is essential for success with alfalfa. In the Black Belt Prairie, this usually means "chalky" upland or Sumter clay. The site chosen for this experiment was a calcareous soil, pH 7.7, and required no additional lime.

The area was plowed in July and fallowed through the summer of 1947 to make a settled, weed-free seedbed. Fertilizer was applied August 20 and worked into the soil. On September 16, 25 lb. of inoculated seed per acre of a recommended hardy variety, Kansas common, was seeded. A cultipacker was used immediately after seeding and an excellent stand was obtained.

Maintenance Fertilization

Except 1949, maintenance fertilizer was applied each year in the fall to avoid working the plots when wet. Early spring applications are impractical on this heavy soil. The fertilizer treatment per acre for the high yielding plot was 150 lb. of P_2O_5, 360 lb. of K_2O, 15 lb. of fertilizer borax, and additional minor elements. This is more phosphorus and potassium and less borax than is generally recommended.

Response to other treatments in the experiment shows that the generally recommended treatment of 1,000 lb. of 0-10-20 containing 25 lb. of borax is adequate for high yields and for maintaining soil fertility level. Response to minor elements other than boron was not significant.

Soil tests at the end of the experiment showed 100 lb. of available P_2O_5 and 280 lb. of available K_2O per acre in the surface 3 in. of soil. These amounts are considered "medium" for phosphorus and "high" for potassium. Analyses from a border strip that had not been fertilized during the experiment showed 17 lb. of P_2O_5 and 76 lb. of K_2O per acre. This is "low" for both nutrients. These data indicate that the fertilization was adequate to supply crop needs and to provide for some buildup of mineral fertility in the soil.

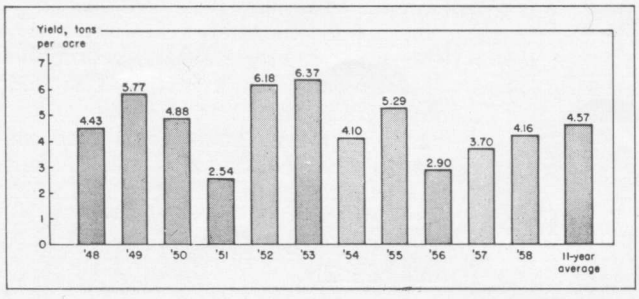
Clipping Management

The alfalfa was cut at the bloom stage, with an average of three to four cuttings per year. Only one harvest was obtained in 1951 because of severity of the preceding winter and the dry spring and summer following. Five cuttings were made in 1955, the most in any year. Four harvests were made during 5 of the 11 years, three cuttings during 3 of the years, and two harvests in 1950. Growth for the third 1950 harvest was consumed by blister beetles.

Harvests were usually spaced 4 to 6 weeks apart. Only once was a harvest made after September 1. When normal dormacy had not occurred by November 11, 1957, the experiment was clipped on that date. Harvesting after September 1 is not recommended for this area since it is likely to seriously deplete root reserves and may cause severe winter killing.

Level of production was excellent on adequately fertilized plots for the first 8 years and satisfactory for the last 3 years of the test. It is pointed out that the treatment receiving inadequate potassium lost its stand at the end of 3 years. This 11-year longevity of stand is somewhat unusual even under good management. If a grower maintains a strong stand for more than 5 years, it should be a "feather in his cap."

While maintaining adequate fertility is of first importance for good alfalfa production, other good management practices must be followed. Among these are not overstocking if used for grazing, not harvesting after September 1, and controlling insects that may damage the stand.



Annual yield of alfalfa hay during the 11 years of the test at Black Belt Substation are shown here. Although there was wide variation in yields during the 11-year period, good production was made every year of the test.

FATHER-SON FARMING

a business arrangement for management

ALLEN J. BROWN and E. D. CHASTAIN, JR.,
Department of Agricultural Economics

THE AVAILABILITY and effective use of management and capital open the door to farm profits.

The young farmer is faced with the problem of availability of both capital and management. The older farmer is faced with the problem of maintaining effective use of these resources during the last decades of his life.

Research Opportunities

Research at the Auburn Agricultural Experiment Station is in progress that focuses attention upon opportunities for problem solutions for both age groups. These solutions may be reached by the two parties farming together on a father-son farming arrangement, placed on a *business basis*. The father-son expression may include similar situations as mother-son, father-son-in-law, and other such arrangements to even include non-relatives of two different generations.

Many father-son arrangements exist in Alabama today. Although many have worked satisfactorily, all have been less than desired from the business standpoint. At one extreme, the son spends his life farming with his parents and receives the same reward as his brothers and sisters who left the farm. The other extreme is the situation where the parents suffer because they transferred property too rapidly to a child or children who remained at home.

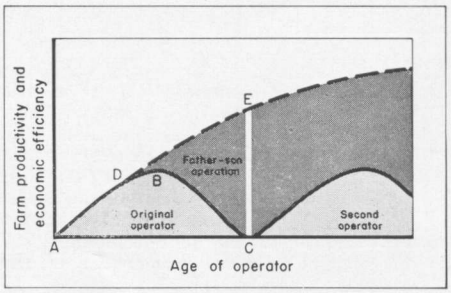
Traditional Cyclical Pattern

The typical rise and fall in farm productivity and efficiency is portrayed in the chart. The father generally comes into possession of a low-producing farm early in life, at point A. He builds up the farm during his young, vigorous years as illustrated by segment AB. As the operator becomes older and less active, productivity and economic efficiency declines, eventually passing through retirement and estate stages as illustrated by segment BC. At point C, traditionally, someone of the next generation acquires the property in its low state of production and starts the cycle again.

The well-planned and properly executed father-son farming arrangement smooths out the inefficient fluctuations and even facilitates a continued improvement in the farm efficiency and profit status, as represented by line DE.

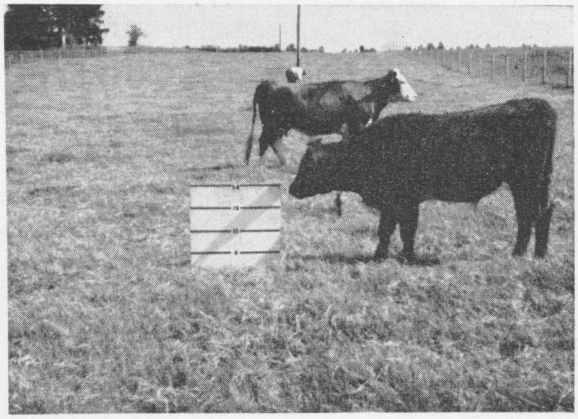
Benefits to Parties

An orderly transfer to alleviate or eliminate the hardships of the cyclical movements conveys a message considered highly important. The benefits of such a transfer arrangement, again with proper planning and execution, can be rewarding to all the parties involved. The son and his family benefit by acquiring capital and management from the parents to permit the receipt of greater income in a short time and higher equity over a longer period than would be true under alternative farming plans. The parents have an opportunity for greater profits than when farming alone, see the farm continue as a productive business, and have the pleasure of seeing their son become established in farming. Many of the problems of father-son arrangements come from other heirs. However, benefits are theirs too since such arrangements can enhance their inheritance and they have the pleasure of seeing the home farm continue as a profitable business.



Legal vs. Agricultural Aspects

How does one go about setting up an arrangement on a business basis? The usual answer is to go to a lawyer for a written agreement. While such an answer focuses attention upon the legal aspects, it tends to ignore the complexity of agricultural and business aspects. The legal aspects can be handled easily by any competent attorney. The agricultural and business information, which must be supplied to the attorney to construct the desired document, is more difficult. Information on the sharing of costs and returns, sharing managerial responsibility, and the ownership pattern for livestock, equipment, other personal property, and the real property need to be supplied the attorney. The parents need to think through the provisions being made to assure equitable treatment of all the children. Equal treatment of all the heirs may not be equitable treatment. The son remaining on the farm expects a reward for his efforts. Other heirs expect to be treated fairly.



This is one of the pasture paddocks where production of Coastal-vetch-crimson was measured.

COASTAL-VETCH-CRIMSON good for cows and calves

C. S. HOVELAND, *Associate Agronomist*
W. B. ANTHONY, *Animal Nutritionist*
E. L. MAYTON, *Supt., Piedmont Substation*

SOD SEEDING A mixture of vetch and crimson clover on Coastal Bermuda looks good for low cost grazing!

Results of a 1959 grazing trial with brood cows and calves on an upland soil at the Piedmont Substation show value of this pasture combination. It gave nearly 400 lb. per acre calf gain and carried an average of 1.21 cow-calf units per acre from April 8 to October 5. This was accomplished without application of commercial nitrogen.

In the test, cows of mixed breeds and their fall-dropped calves were grazed on four forage combinations: Coastal Bermuda-vetch-crimson clover, Pensacola Bahia-vetch-crimson, Dallis-orchard-white clover, and sericea-oats.

Vetch at 25 lb. per acre and crimson clover at 15 lb. were seeded in the grass sod during mid-September. The Pensacola Bahia had been established the preceding year but had not formed a complete cover. Suregrain oats were drilled at rate of 3 bu. per acre in 16-in. rows in sericea sod on October 7.

Good stands of all sod-seeded crops were obtained. The pastures were fertilized liberally with phosphate and potash. Oats were topdressed with 50 lb. of nitrogen per acre at planting and again in February.

Three 1¾-acre paddocks of each forage combination were used. Paddocks were stocked to capacity, with cow and calf units added or removed as needed.

The Coastal Bermuda-vetch-crimson clover mixture was by far the most productive, in terms of total forage produced, carrying capacity, and animal performance. As shown in the table, over 8 tons of dry forage per acre was produced under grazing. Average calf gain per acre was 387 lb. The average stocking rate of 1.21 cow-calf units per acre was fairly uniform over the season except for a somewhat higher level during June.

DRY FORAGE PRODUCTION, CARRYING CAPACITY, AND ANIMAL PERFORMANCE ON PASTURES DURING 1959

Pasture mixture	Production/acre		Acre carrying capacity
	Forage	Calf gain	
	Lb.	*Lb.*	*Units*[1]
Costal-crimson-vetch	16,645	387	1.21
Bahia-crimson-vetch	11,749	341	0.95
Sericea-oats	11,954	327	0.73
Dallis-orchard-white clover	5,009	226	0.61

[1] A unit is one cow and one calf. Values are grazing season averages.

The graph shows that calf gains per acre varied considerably over the season, whereas forage production of Coastal Bermuda-vetch-crimson clover remained high from early April to September. High vetch production in March and early April indicates that grazing could have been started earlier than April 8.

There are two reasons for the low calf gain in late June and early July. Just before this period there was a change in type of sward from vetch to Coastal Bermudagrass. Second, there was a loss in fill of animals following excessively high daily gains on vetch.

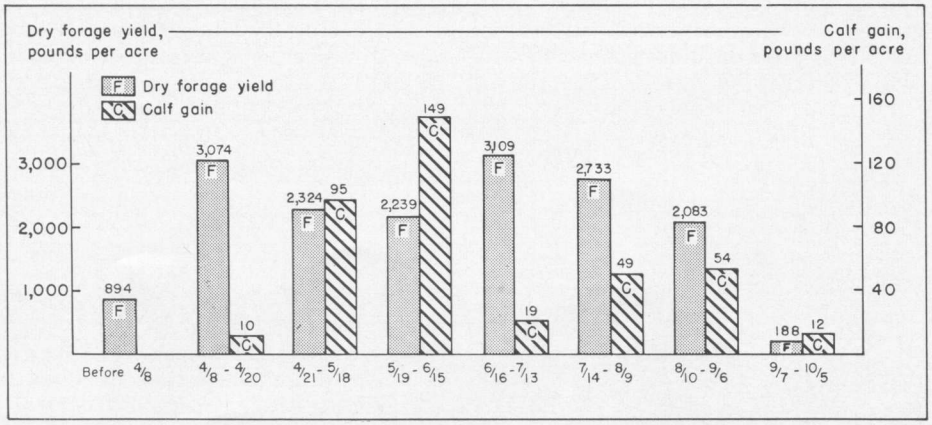
From April 21 to June 15, average daily gain of all calves on Coastal-vetch-crimson was about 3 lb. per day as contrasted to ½ lb. per day in late June and early July. However, the other forages performed no better.

Length of grazing period was longest for the oats-sericea combination – January 13 to February 10 and April 1 to October 5. On Coastal Bermuda-vetch-crimson and Dallis-orchard-white clover it was April 8 to October 5. Vetch comprised most of the legume growth on Coastal Bermuda and Pensacola Bahia sods. Crimson clover was seriously depleted in early April by crown rot.

Vetch and clover seeded in the warm-season grass swards gave two important advantages. They furnished excellent grazing early in the year and supplied nitrogen for grass that followed.

Coastal Bermuda sod was almost completely free from weeds. In the other three mixtures, weeds composed 25% or more of the swards after the vetch matured in May. Usually, well-established Bahiagrass has a dense sod that prevents weed encroachment. Crabgrass furnished a large part of the grazing in sericea paddocks after oats matured.

The high 1959 yields were made under good conditions. Lower yields can be expected in unfavorable years.



Seasonal forage yield and calf gains produced by the Coastal Bermuda-vetch-crimson clover combination at the Piedmont Substation are illustrated by the graph.

The LOWER COASTAL PLAIN SUBSTATION

a report of accelerated research that is providing timely results

R. E. STEVENSON, *Associate Editor*

V. L. BROWN, *Superintendent*

W. J. WATSON, *Assistant Superintendent*

ELEVEN YEARS is a short time where research is concerned. Although some projects yield useful results in 1 or 2 years, most studies take a lot longer. In the case of livestock, a long time is needed to grow and finish an animal for market. Even then, the data are for a single generation only and must be considered preliminary.

This time disadvantage emphasizes accomplishments of the Lower Coastal Plain Substation in its 11 years of operation. Established in 1949 on 1,790 acres near Camden in Wilcox County, the unit has provided needed information to improve farming in the region. With donation of 539 acres by the County in 1951, the Substation now has 2,329 acres in use.

Results of Substation studies are not confined to short-term research, but include data on livestock projects that are being put to use by the area's cattlemen and sheep and hog growers. The surrounding area has cashed in on the research in their continuing shift from row crops to a livestock economy.

Livestock and timber are major sources of income in the Camden area and much research effort has been expended on these subjects. Livestock studies have been aimed at learning best uses of forage and grain crops in growing and finishing cattle. In forestry, stress has been on learning management methods that will give best returns in the area where timber covers more than half the acreage.

Early Work

Some of the Substation's early work filled a big need in the Lower Coastal Plain area. Learning how to control cherokee rose in pastures by using chemicals is a good example of such work. This pest was "taking over" much pasture land when the Substation began operation. No effective method of control was known before a Substation project revealed that 2,4-D would do the job.

Value of irrigating pasture crops has been studied extensively at the Substation since 1951. Early results indicated that irrigation would substantially increase forage yield and beef gain of white clover-Dallisgrass-fescue pastures. However, a study begun in 1956 has shown no advantage from irrigating several warm- and cool-season forages and combinations. Although irrigation increased carrying capacity of some forages, it did not increase beef gain per acre.

Livestock Studies

During the past 4 years high beef yields have been made on pasture in a study evaluating warm- and cool-season crops. Permanent, warm-season crops were grazed until early fall, with rye and crimson clover seeded in the sods for late fall and early spring grazing. In other paddocks, warm-season annuals were grown in sequence with cool-season annuals and clover.

Beef gain of yearling stocker steers grazing the warm-season test pastures in 1957-59 is given in the following table.

Pasture	*Gain/acre*
Starr millet	224 lb.
Coastal Bermudagrass	212 lb.
Sudangrass	157 lb.
Dallis-white clover	120 lb.

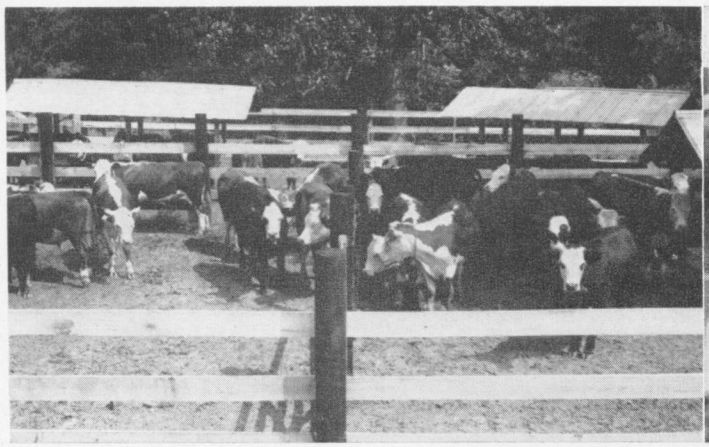
On the cool-season pastures, the following beef gains were recorded:

Pasture	*Gain/acre*
Crimson clover-oats	382 lb.
Crimson-rye-ryegrass	366 lb.
White clover-rye	246 lb.
Crimson-rye	244 lb.

Irrigation showed no advantage in beef gains in this test. The cool-season annuals planted on prepared seedbed produced over 100 lb. more beef than annuals seeded in pasture sods. Combined production of cool- and warm-season crops was 37% higher when planted on prepared land than when sod seeded on permanent pasture.

Another current study of particular interest is on effect of winter feeding level on beef cow performance. One group of cattle is on a feeding program designed to be optimum for the area. The other has their feed restricted. Cows of both groups have lost weight during the winter, but the low-level group has lost more. However, weight losses of the low-

Left — Testi pine species ing done a Substation. left to right loblolly, lon and slash. Ri this bambo planted from zomes M 1959. Photo made June 1



These groups of steers are being used in the study on practices to increase slaughter grade of cattle after grazing.

Learning more economical feeding regimes for hogs grown and fattened on concrete is an important phase of the Substation's work.

level group have not been excessive. This study is being continued to learn effects of restricted winter feeding on heifers saved for replacement and on post-weaning performance of steer calves that are fed out for slaughter.

Use of salt to control intake of protein supplement self fed to wintered beef cows has become a standard practice in the Lower Coastal Plain as a result of a Substation study. No harmful effects were noted on the cows or in performance of their nursed calves when cottonseed meal containing 25 to 30% salt was fed for three consecutive winters. With this mixture, cows consumed about 2 lb. of meal per head daily.

New Livestock Work

A new project is aimed at developing management practices that will ensure satisfactory slaughter finish of cattle at end of grazing season. Although pastures are the cheapest source of feed for beef cattle, young cattle grow but do not fatten on summer pasture. Thus, there is a definite need for information on improving slaughter grade while maintaining economy of pasture feed.

In this new project, five treatments are being compared using grazing and supplementary feeding. The treatments are (1) grazing alone, (2) grazing plus 2 lb. per head daily of protein supplement, (3) grazing plus 2 lb. per head daily of ground shelled corn, (4) grazing plus a complete mineral mix, and (5) grazing plus 2 lb. per head daily each of protein supplement and ground shelled corn and minerals as fed in No. 4. The test steers are finished to predominantly Good and Choice grades after grazing to determine how treatments affect post-grazing, as well as grazing performance.

It has already been established that hogs can be grown and fattened economically in confinement on concrete. Thus, most of the Substation efforts with hogs are directed towards establishing more economical feeding regimes. Rations with and without animal protein and different levels of both animal and plant protein are being compared with hogs on concrete.

An experiment begun in 1956 revealed that pasture is of little value for pork production. Hogs on concrete gained 1/10 lb. per day faster and required 11 lb. more feed per 100 lb. gain than hogs on pasture. However, the savings in feed was not enough to cover cost of establishing and maintaining the pasture.

Sheep research has been directed at learning how to get early lambs that will be ready to sell when prices are highest. This includes a comparison of breeds as well as nutrition work. Since most lambs are dropped late in the Lower Coastal Plain, another study is aimed at learning best methods for handling late lambs.

Forestry Important

Forestry research fills an important spot in the Substation's program. This work includes projects on conversion of upland hardwood stands to pine; comparison of several methods of land preparation, planting dates, and depth of seeding for direct seeding of loblolly and slash pine; and pine species testing. Another study is on controlling tip moths in young pine plantations.

Because of the growing interest in bamboo as a source of pulp, a study is being carried out to learn if it is feasible to produce timber bamboo for pulp. A replicated experiment has been begun to compare yield of pulp from loblolly pine, yellow poplar, and bamboo on the same site class land.

Many, Varied Projects

New experiments are being designed and put into operation as needs of the area change. General interest in pelleting Coastal Bermuda for better utilization has led to a new project just beginning. It is designed to learn effects of clipping frequencies, curing procedures, and pelleting on utilization of nutrients by yearling cattle.

The projects reviewed in this article are far from being complete coverage of important work done at the Substation. They are merely examples of contributions made to the region's farming. Other experiments that have yielded valuable information include: effects of large scale insecticidal treatment of imported fire ants on wildlife; back rubbers for controlling flies on livestock; fertility requirements for corn; value of nitrogen for corn after vetch-crimson clover; variety testing; and poison baits for fire ant control.

By working cooperatively with specialized researchers from the Main Station, maximum utilization of the Substation's facilities are being realized.

This is not a complete story. It is an account of a beginning, of what has been done in a short time. Farmers of the area are already reaping benefits of work done at the Lower Coastal Plain Substation in its 11 years of work. Based on past accomplishments the future looks bright.

MANAGEMENT *meets challenge of changing times*

L. A. SMITH, *Superintendent, Black Belt Substation*

J. H. BLACKSTONE, *Agricultural Economist*

RESULTS from an 80-acre farm unit producing milk for manufacture tell a story of management in a period of changing times.

The research unit was begun in the spring of 1941 on the Black Belt Substation near Marion Junction. Its purpose was to find a practical and economical system – ways of producing manufacturing milk as cheaply as possible in the Alabama Black Belt.

All phases of feed production and dairy management were involved in the research. Eighty acres of open land was used for the dairy herd and buildings. The project began with 25 grade Jersey heifers. Heifer calves from the best cows were saved and grown out for replacements. The labor needed to operate the dairy and produce the feed crops has been less than that of one full-time man the year around. Of the total land area, about 55% has been used as permanent pasture. The remainder has been used for temporary grazing crops, small grain, hay, and buildings, homestead, and roads.

First 4-Year Period

During the first 4 years of operation (1941-45), the herd averaged 25 cows. Cash receipts from the sale of milk, cull cows and calves, and surplus seed and grain averaged $2,335 per year. Cash operating expenses for fertilizer, feed, machinery and equipment, hauling milk, seed, taxes, and other operating expenses averaged $1,175 per year. This provided a net cash income of $1,160 per year in that first 4-year period. At that time the average investment in land, buildings, equipment, and cattle amounted to $3,913. Average milk production per cow was 3,340 lb. Milk was sold at an average price of $2.28 per cwt.

Last 3-Year Period

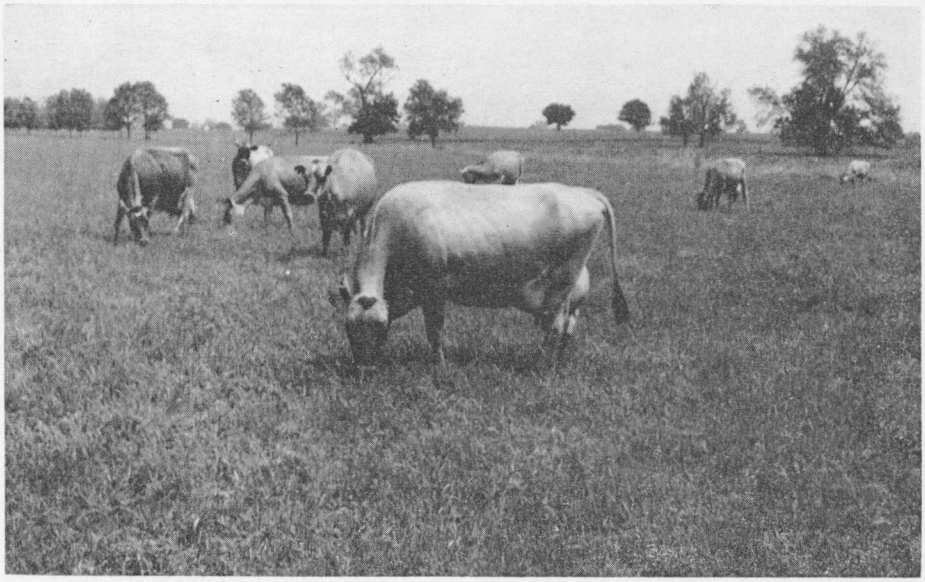
During the last 3 years of operation (1957-59), cash receipts from the sale of milk, cull cattle, and surplus feed averaged $6,696 per year. Average cash operating expenses for all purposes totaled $4,233 per year. This left an average net cash income of $2,463 per year. During this latter period, the total investment amounted to an average of $17,330 per year. Production per cow averaged 7,136 lb. of milk. The price of milk sold averaged $3.29 per cwt.

Comparing the two periods, 1941-45 with 1957-59, the net cash income increased by 112%. This, however, is not the complete story. Over the entire study period, the land area of 80 acres has remained the same. Also, the number of producing cows averaged 25 in both periods. However, economic conditions changed greatly. The last period has been one of a cost-price squeeze. Total cash sales had increased by 187% in the second period over the first one. However, cash operating expenses had increased by 260%. The sales price of milk had increased by 44% or $1.01 per cwt. The cash cost of producing a cwt. of milk sold had increased $1.05 – from $1.51 to $2.56. This cost-price squeeze has been overcome largely by a 114% increase in milk production per cow and an actual increase in total farm sales of milk of 113%.

Improvements

During the interval between the first and second period, many things were done to improve the farm and family living. A new home was built, an elevated milking parlor was added, milking machines were installed, and the farm was mechanized. At the same time land values and market values of cows had increased. Also, quality of the cows on the farm had improved. As a result the value of all inventory items on the farm had increased by $13,417 from the first to the last period. The net cash farm income had increased from $22 per week to $47 per week. Also the farm operator still had only about two-thirds of a full-time, year 'round job. In other words, the small 80-acre farm with 25 cows was able to meet all the changing conditions over the past 15 to 18 years. It provided the farm family with improved living conditions, better working conditions, a 343% growth in capital investment, and more funds to meet a higher family living standard.

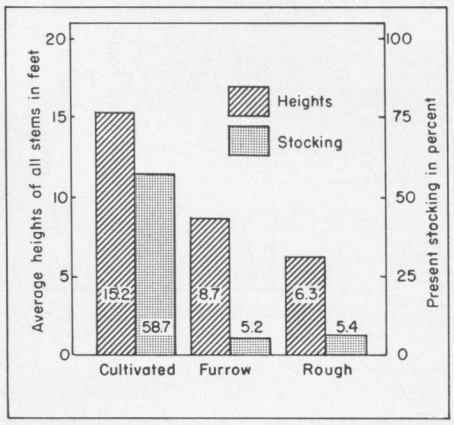
During the past 15 years, few other agricultural enterprises have been able to respond to management to meet changing economic conditions as well as has the dairy industry. This 25-cow manufacturing milk farm can look to the future with the assurance that good management can continue to increase production per cow to a 12,000-lb. level or higher. Increased production will enable the farm operator to meet the future outlook of higher costs without fear of the whole impact falling on the farm family.



Through management of the 80-acre unit, milk production per cow and total sales in 1957-59 period were more than double those of the 1941-45 operations. This increased efficiency largely offset the cost-price squeeze of recent years.

Effects of site preparation on YELLOW POPLAR *growth*

SHERMAN W. WHIPPLE, *Associate Forester*



The 1960 average heights and present stocking of yellow poplar including all plantings are shown above. Present stocking is the per cent of the 240 original spaces that have live trees.

WOODLOT OWNERS may be overlooking a real opportunity by not regenerating or planting yellow poplar on good hardwood sites. Well-drained bottoms recently cut over or lands formerly cleared but reverting to trees can produce good stands in many instances.

Yellow poplar is one of the most valuable hardwoods in Alabama. It is adapted to well-drained, moist bottomland sites. It seeds prolifically after reaching an age of 15 to 20 years. Since the per cent of seed that germinate is low, planting of nursery grown stock should be considered when a seed source is not available. Once established as a seedling, height growth is rapid. It must be grown without overhead shade. Trees harvested from stands in which wild fires have been excluded produce wood of good quality. It is in demand for veneer, construction lumber, furniture, and other specialty products requiring a soft, straight-grained wood.

In 1953 a study of the effects of site preparation and cultivation on old field plantings of yellow poplar was begun at the Fayette Forestry Unit of the Auburn Agricultural Experiment Station. The experiment was on a branch head area of fine sandy loam soil (Mantachie soils, local alluvium) that had been planted to sericea in 1944. The field also contained Johnsongrass, broom sedge, trumpet vines, and briars.

Treatments

Three degrees of preparation for planting were used. One treatment was a double disking prior to planting followed by three separate diskings between the rows and hand hoeing around each plant the first year. The second treatment was a single furrow plowed for each row and planting in the furrow. Furrow plots were not cultivated. The third treatment was the check plots, where seedlings were planted in the rough without site preparation or cultivation. All plots were repeated four times. Plots were 1/10 acre in size. Seedlings were planted at spacings of 4½ ft. by 9 ft., with a total of 60 stems per plot.

Original planting stock was small, averaging about 5 in. in height. During April of the first year, a heavy frost killed all leaves and new growth, but by May 99% of all stems had sprouted. The 1953 summer period was extremely dry with rainfall far below average. By November survival after one growing season for cultivated plots averaged 45.4%, furrow plots 27.5%, and check plots 17.1%. After two growing seasons in the field, survival averages were 38.7%, 7.9%, and 2.1%, respectively, for treatments 1, 2, and 3. Heights averaged 2.1 ft., 1 ft., and 1.4 ft., respectively, for the three treatments.

In the spring of 1954, all dead stems were replaced with new seedlings. Planting stock was very small averaging about 2½ in. in height. In 1954, another dry season, this planting was also a failure, with a survival of 1% on cultivated plots and none on either furrow or check plots. A second replanting in 1956 again replaced all dead stems. Seedlings were larger than those used previously averaging about 7 in. in height. Drought conditions were broken, but weed competition was still strong. Early survival and growth were nearly the same as during the 4 years following the original planting. Four-year survival rates for the 1953 plantings averaged 38.3%, 7.9%, and 1.2% for cultivated, furrowed, and check plots, respectively. The 1956 plantings averaged 33.4%, 5.4%, and 9.7%. Heights after 4 years averaged 7 ft., 3 ft., and 3 ft. for the 1953 plantings, and 9 ft., 8 ft., and 5 ft. for the 1956 plantings.

Final measurements in 1960, which combines measurements for both the 1953 and 1956 plantings, indicated small differences in survival and growth between furrow plots and check plots. However, there were considerable differences between these and the cultivated plots. After two replantings cultivated plots had 58.7% survival, a satisfactory stocking in its present condition. Furrow plots have 5.2% and check plots have 5.4%. Growth response was greatest on cultivated plots with stems as tall as 36 ft. and averaging 15.4 ft. Furrow and check plots had maximum heights of 20 ft. and averages of 8.7 and 6.3 ft., respectively.

Yellow poplar cultivated for 1 year following planting is at left. Replanted stems were hoed only. Trees are 4 and 7 years old. Stand in center is furrow plantings including replanted stems. Stand planted in rough, right, includes replanted stems.

Maturity • Preservative Affect Value of Sudan Silage

G. E. HAWKINS, *Dairy Husbandman*[1]
L. A. SMITH, *Black Belt Substation*
H. W. GRIMES, *Black Belt Substation*

CUTTING AT right maturity and using a preservative are keys to good silage from grass crops like sweet Sudangrass.

This was learned in one phase of a study at the Black Belt Substation concerned with forages adapted to silage making, best stage of maturity for cutting, and whether a preservative is needed.

In this project, sweet Sudangrass was cut in the boot stage (88 days after planting) and in the dough stage (110 days after planting). Two 15-ton silos were filled with forage cut at each stage. One silo had 100 lb. of ground corn added per ton of forage. The other got no preservative. The silages were compared with Johnsongrass hay as a source of nutrients for milking cows.

Findings

Yield of green forage was 10,300 lb. for the boot stage and 10,400 lb. per acre for the Sudan cut at dough stage. These yields are much lower than from many silage crops. However, sweet Sudan can be a valuable emergency crop for making silage.

Milk production was higher for the cows fed the boot-stage Sudan than for those fed the dough-stage silage, both with and without preservative. As shown in the graph, cows fed the boot-stage silage consumed more energy and produced more milk than cows fed silage cut at dough stage. Adding ground corn as a preservative increased energy intake and milk production. Milk production was similar from cows fed Johnsongrass hay as from those on boot-stage silage.

The results show that net energy content of sweet Sudangrass was higher when cut in the boot stage than when ensiled in the dough stage. Energy content of both maturity stage silages was increased by adding the preservative. The boot-stage silage without preservative had about the same energy content as good Johnsongrass hay.

Yields of hay equivalent per acre, adjusted for seepage losses, were 1,760 lb. for boot-stage and 2,459 lb. for dough-stage silage. Thus, harvesting in the boot stage lowered hay equivalent yield by 28.4%. However, yield of net energy was reduced only 13.9%.

Project Details

Digestibility of the forages was determined by feeding to dairy heifers. Composition and digestibility are given in the table. The TDN (total digestible nutrients), digestible protein, and ENE (estimated net energy) contents were higher when cut at boot stage. Adding the preservative increased TDN, digestible protein, and ENE contents.

In the milk production study, five cows were used on each experimental forage. Feeding procedure for the experiment was: (1) the four silage groups were fed all the silage they would eat plus 1.1 lb. of Johnsongrass hay per 100 lb. of body weight; (2) cows in the control group received Johnsongrass hay as the only roughage and were fed all they would eat; (3) cows in all groups were fed 1 lb. of a 19% protein concentrate mixture for each 4 lb. of 4% FCM (fat corrected milk) they produced during the 2-week standardization period before the experiment. In addition, each cow in first lactation (two per group) was fed an extra 2 lb. of concentrates daily.

Low production on dough-stage Sudan silages was associated with inadequate energy intakes. Intakes of estimated net energy from hay and concentrates by cows on the four silage rations were similar. Most differences in energy intakes in these four groups were caused by (1) greater dry matter intake of the boot-stage than the dough-stage silages, and (2) higher energy contents per lb. of dry matter for the silage cut in boot stage. Digestible protein was adequate to support a higher level of production than obtained on any ration.

Based on energy intake above body maintenance requirements, cows on the boot-stage silage with preservative produced as much milk as could be expected. Cows fed the other silages produced more than was expected. On the other hand, cows on Johnsongrass hay produced less milk than was expected.

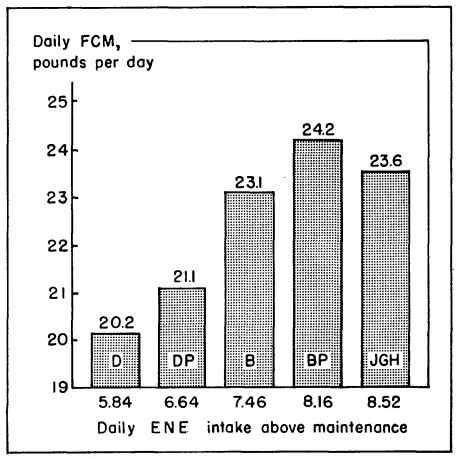
When sweet Sudangrass is grown for silage it is recommended that (1) it be cut in the boot stage, and (2) 100 lb. of ground corn or other grain be added per ton of green forage as a preservative.

[1] Other project leaders of this cooperative study are C. A. Rollo, associate agricultural engineer, and R. M. Patterson, associate agronomist.

DIGESTIBILITY, ENE, AND COMPOSITION OF THE FORAGES, DRY MATTER BASIS[1]

Forage	Digestibility and energy			Composition				
	TDN	DP	ENE	CP	EE	CF	NFE	Ash
	Pct.	*Pct.*	*Therms*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Boot stage	56.9	3.7	44.5	9.5	4.1	35.1	41.4	9.9
Boot with preservative	61.1	5.2	50.6	10.4	3.4	31.6	46.8	7.9
Dough stage	51.7	2.9	37.0	8.0	2.4	38.3	43.2	8.1
Dough with preservative	58.3	3.4	46.6	8.0	2.7	37.0	44.8	7.5
Johnsongrass hay	55.8	6.4	42.9	12.3	2.7	26.0	51.1	7.9

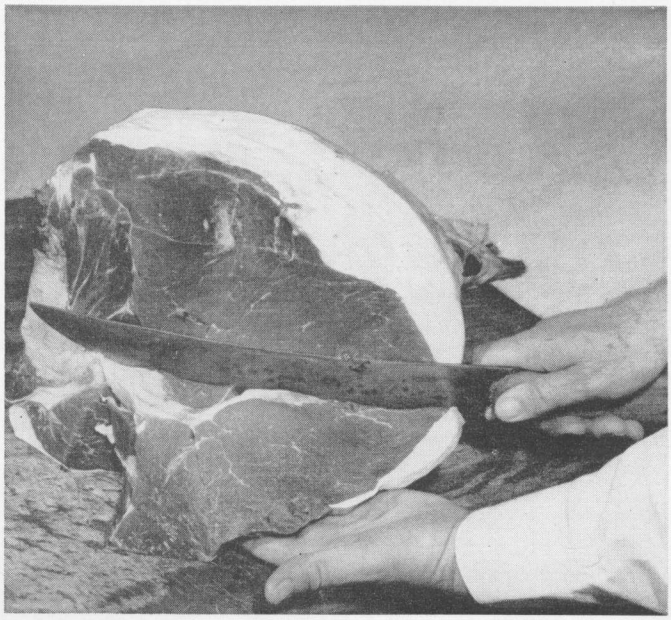
[1] TDN is total digestible nutrients, DP is digestible protein, ENE is estimated net energy, CP is crude protein, EE is ether extract, CF is crude fiber, and NFE is nitrogen-free extract.



The graph shows relation between energy intake above maintenance needs and milk production. Sudan silages tested were D, dough stage; DP, dough stage with preservative; B, boot stage; and BP, boot stage with preservative. JGH is Johnsongrass hay, which was compared with the silages.

FACTORS *affecting housewives' meat-buying* DECISIONS

A. C. HUDSON, *Assistant Agricultural Economist*



MEAT SELECTION, buying, and preparation are important continuous decisions facing both suppliers and housewives.

A more complete understanding of the basic reasons for a housewife's meat-buying decision would enable meat producers, meat packers, and meat retailers to better serve their customers.

Survey Conducted

A 1959 survey by agricultural economists of the Auburn Agricultural Experiment Station revealed many overlapping factors affecting the housewife's meat buying decisions. These factors were divided into two groups; those that were not likely to be changed by store influences, and those that influenced a housewife's decision after she entered the food store. Housewives were aware of many of these factors, but meat-buying decisions were often made with little awareness of influencing factors.

Home Influences

One-third of the housewives interviewed gave reasons of health and nutrition as a major factor in meat selection. For most, this is a problem of selecting between many alternatives available, since only a few are confronted with the problem of getting enough to eat. When asked to select a single kind of meat to eat for the next month if forced to, one-half the housewives did so on the basis of health and nutritional considerations.

A major factor in meat selection by two-thirds of the housewives questioned was desires or preferences. For example, 90% of those that chose pork as the one meat did so on the basis of taste preference.

Budget limits were a major factor in the housewife's decision as evidenced by the fact that one-half reported serving chicken more often than other meats because of cost.

Other Factors

Meat advertisements influence most housewives' decisions. Ninety-five per cent of the households contacted had radio and/or television sets, three-fourths read daily papers, and two-thirds read magazines that contained food advertising.

Thirty-five per cent of the housewives were working outside the home and 46% participated in organizations other than church. As a result of the large amount of activity outside of the home, these women had less time to plan and prepare meals. Another indication of the influence of haste in preparation was that about 50% of the housewives, when asked to select a meat for the next month, chose meats normally fried. New household equipment has enabled housewives to prepare meals quickly and easily. More than three-fourths of the households had some type of freezer enabling housewives to buy frozen foods.

Family background such as area reared, educational level, religion, and nationality backgrounds influenced buying. For example, only 46% of the nonwhite housewives as compared to 77% of the white housewives preferred beef over chicken.

Other factors were size of family, special meals, experience in food selection and preparation, and attitude toward cooking.

Store Influences

Meat appearance has proved to be a factor in the housewife's decision. Appearance features most frequently mentioned, and the percentage of housewives that cited them were: color of lean, 65%; minimum fat, 55%; and freshness, 46%. More than one-half of the housewives said they were not familiar with grades; hence, they relied on some combination of appearance factors in selecting meat.

Even in the day of self-service more than one-third of those interviewed depended on the butcher for assistance in meat selection. Sixty-three per cent of the housewives who did not need the butcher's assistance shopped only once a week. Only 50% of those who needed help shopped once a week. This indicates that housewives who shop more frequently are influenced by the butcher more than those who shop only once a week.

The effect of price is strongest when the housewife enters the store. Four-fifths of those interviewed said that price was the major factor in their meat-buying decision and 92% said that they did not buy what they really wanted because of price.

The relative effects of the various elements of consideration are different for each housewife. The meat industry uses these factors in planning their merchandising programs. By evaluating demand in areas, cities, and areas within cities, meat retailers can concentrate on cuts of meat desired by various groups.

NOW—*a vaccine for coccidiosis in turkeys*

S. A. EDGAR and D. S. BOND
Department of Poultry Husbandry

Coccidiosis is a constant threat to the turkey grower!

There are some who believe that the disease is of little importance in turkeys and can be adequately controlled by good sanitation and proper management. Yet reports of serious losses from coccidiosis indicate that management and sanitation under commercial conditions often are not adequate. The disease can occur among any flock of poults reared under ordinary floor management methods.

During severe outbreaks, death losses occasionally exceed 15% but usually are less. More important, however, are losses from retarded growth, lowered feed conversion, and unthriftiness. On the other hand, mild outbreaks often are not noticeable if only a small portion of the flock is affected at any one time. Yet, such mild attacks may prove costly.

Causes

There are at least seven species of turkey coccidia in this country. These are tiny, one-celled protozoan parasites. They affect the small intestine and/or cecal pouches.

Typical symptoms include chilling, ruffled feathers, loss of appetite, unthriftiness, and mild diarrhea. Intestinal lesions even in severely affected birds are not as marked as those of chickens infected with chicken coccidia. Hence, the disease in turkeys often is not suspected and cannot be determined without a microscope. Failure to recognize and diagnose the disease probably has contributed to the common belief that turkey coccidiosis is unimportant.

Progress has been made in the control of the disease from use of better equipment, management, sanitation, nutrition, and medicines. Some drugs effective in preventing chicken coccidiosis have not proved effective against the disease in turkeys. For this reason, the number of such drugs for combatting the disease in turkeys is limited.

Research in Alabama

The Auburn Agricultural Experiment Station began coccidiosis research in 1947. One of the objectives was to develop a practical method of immunizing chickens against the disease. Since that time coccidiosis vaccines for broilers and laying stock have been developed, which are now available on the market. More recently a vaccine has been developed for control of the disease in turkeys.

In general, those species of coccidia that affect chickens do not infect turkeys and visa versa. Therefore, vaccines for control of the disease in chickens are not effective against coccidiosis in turkeys.

Results of research at Auburn reveal that at least four of the seven species are widespread in this area. However, only three of the four cause disease (pathogenic). Severe infections of the three cause retarded growth, poor feed conversion, and even death of turkeys. One of these occurs mainly in the small intestines, whereas the other two infect the lower intestinal tract and cecal pouches.

The disease caused by any one of the three species is self-limiting. Severity of infection is in proportion to inoculating dosage. It has been said that turkeys 3 months and older are seldom affected by coccidiosis. However, Auburn research results show that turkeys infected for the first time at 3 months can be killed by infection. Furthermore, growth of the survivors may be retarded more than 1 lb. Floor-reared turkeys under 3 months of age are most likely to be exposed and suffer from coccidiosis. Yet, so far as is known, they are susceptible until such time as they develop immunity.

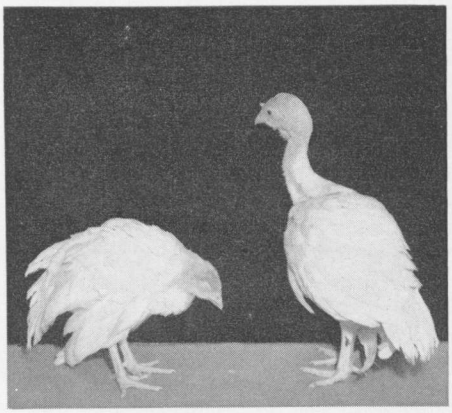
Just as in chickens, immunity in turkeys develops promptly after two or three cycles of mild infection. However, immunity to one species does not give protection against another. Therefore, an effective vaccine should contain oocysts of the most important coccidia species.

In an early experiment vaccinated poults made consistent gains after being given a dosage of oocysts (challenged) at 19 days of age. On the other hand, untreated poults challenged at the same age weighed ⅓ lb. less than the inoculated group 2 weeks after exposure.

These and subsequent results at this Station led to development of a turkey coccidiosis vaccine somewhat similar to that developed for chickens. The vaccine can be given by drop method in the mouth at 1 to 4 days of age, or administered in the feed or drinking water when the poults are 4 to 5 days old. Depending on which is used for administering the vaccine, the poults are water- or feed-starved for 2 to 4 hours before inoculation. After administering the vaccine, the birds are continued on feed and water as usual. For best results, the poults are fed continuously a medicated ration containing 1/8 lb. of sulfaquinoxiline and 1/4 lb. of aureomycin per ton of feed. This medicated feed is started when the birds are a day old or 48 to 72 hours after inoculation, and is continued through the first 5 weeks. Thereafter, the regular ration is used. By 5 weeks of age the poults usually have enough immunity to withstand natural exposure. This method of immunization applies only to birds raised on litter. The litter must be damp enough to allow the oocysts passed by the inoculated birds to become infective so that the poults reinfect themselves repeatedly until full immunity is developed. The drugs supply protection during this period of immunization.

Field trials have been conducted in several states during the last 2 years. Vaccinated flocks had lower death rate and better growth and feed conversion than those not vaccinated.

According to plans, the turkey vaccine will be commercially available by January 1961. Authority to produce the vaccine commercially will be released through the Auburn Research Foundation. Cost of the vaccine will probably be less than 1¢ per bird.



Left, typical non-immunized poult suffering from coccidiosis 1 week after exposure. Immunized, healthy poult at right received the same artificial exposure at same age.

CAN PIGS TASTE?

HOWARD F. TUCKER,
Associate Animal Husbandman

DO YOU FEED baby pigs rations that you want them to have or do you try to cater to their taste?

Many feeders use their own judgment because experience has shown that many commonly available feed ingredients in proper proportions will result in good performance of the pig.

It is known, however, that pigs show preferences for different feed ingredients. These preference characteristics are spoken of as acceptability or palatability. Acceptability of a ration is influenced by such things as shape and size of feed particles, feed flavors, prior experience, and texture of the ration.

Problem Solution

Why be concerned with such a problem? The answer is important – but not simple. Today, many farmers are weaning pigs at an average of 40 lb. at 8 weeks of age. One way to increase the average weaning weight is to increase consumption of feed by the pig. Increased palatability is a possibility. In general the pig that daily consumes the largest amount of a balanced ration: (1) gains faster, and (2) adds a lb. of gain for the least amount of feed.

There are stress conditions produced by sickness or castration when specific drugs and nutrients are needed by the pig. Feeds readily acceptable would speed recovery and prevent setbacks imposed by stress conditions. In essence, time is important; maybe not to the pig but to the producer.

In tests at the Auburn Agricultural Experiment Station, pigs were removed from the sow at 35 days of age and fed a test ration for a period of 21 days. While on the sow, the pigs were not creep fed but did consume some of the sow's feed.

The basal ration used contained corn, soybean meal, dried skim milk, fish meal, vitamins, minerals, and antibiotics. This basically is a good baby pig ration. Several hundred pigs at the Station fed this ration have averaged over 40 lb. at 56 days of age.

Results of feeding various sources and levels of sucrose (table sugar) containing substances are given in the table. When given a choice between no sugar and 10% sugar in the ration, the pigs showed a very marked preference for the sugar-containing ration, Group I.

Levels of sugar additions at 5% increments were studied to find the desired sugar level in the ration. Only a small difference was noted between the 15% and 20% levels, Group II. For reasons of economy the 15% level was chosen.

Blackstrap molasses was compared with sugar, each at the 10% level. A very marked preference was shown for the sugar ration, Group III. Because molasses is unpalatable and excessive amounts cause diarrhea, it is doubtful that it should be included in a baby pig ration.

Rations containing unrefined sugar would be more economical than those containing refined sugar. Therefore, 10% brown sugar and 10% table sugar were compared. The pigs showed a preference for the refined sugar ration by consuming more than twice as much of the feed.

The average daily gains were good in all cases. Feed efficiencies were very good. The least efficient group required only 2.2 lb. of feed to produce 1 lb. gain.

Various agents used in human foods were tested for their acceptability by the pig. The addition of 1% cocoa to a 15% sugar ration with one group failed to improve palatability. Substituting .05% saccharin or a combination of saccharin and cocoa resulted in almost complete rejection by the group.

Cheese rind, which is used to increase palatability of dog foods, failed to improve acceptability by pigs in another group. Only small amounts of rations containing two commercial flavoring materials were consumed by the third group.

Increasing levels of lard resulted in an increased acceptance of the ration by a third group. Since palatability was increased without an accompanying increase of performance, further investigations are being made.

In a fourth group, comparison was made using a 15% sugar ration with 15% sugar rations containing drugs used to treat non-specific scouring in pigs. The inclusion of either 3-nitro or arsanilic acid resulted in decreased consumption.

COMPARISON OF FEED CONSUMPTION RATES

Ration	Consumption	Pigs	Av. daily gain	Feed per lb. gain
	%	*No.*	*Lb.*	*Lb.*
Group I				
No sugar	6	10	1.21	2.20
10% sugar[1]	94			
Group II				
5% sugar	4	25	.85	1.84
10% sugar	11			
15% sugar	40			
20% sugar	45			
Group III				
10% sugar	91	15	.99	1.58
10% molasses	9			
Group IV				
10% sugar	69	11	1.15	1.69
10% brown sugar	31			

[1] Sugar refers to table sugar.

Perennial Legumes IMPROVE SOIL FERTILITY

D. G. STURKIE, *Agronomist*

GROWING PERENNIAL legumes will make your soil more productive. This has been shown by 18 years of research at the Auburn University Agricultural Experiment Station.

Such deep rooted legumes as alfalfa, kudzu, sericea, and sweet clover are especially well suited for soil improvement. Kudzu and sericea have been grown extensively in the Southeast for this purpose and for forage in recent years.

To determine the value of kudzu and sericea as soil improving crops, a test was begun in 1942 on a Norfolk sandy loam of low productivity. Objectives were to determine: (1) to what extent crop yields would be increased following kudzu and sericea; (2) how long increased yields could be obtained; and (3) whether any increase in production could be maintained with a good cropping system.

The test was designed to run for three periods: (1) 3 years in which the perennial legumes would be grown; (2) 6 years in which the effect of the perennial legumes would be measured and, in addition, perennial legumes would be grown for use in the third period; and (3) 9 years in which the effect from growing the perennial crops for 6 years would be measured.

All plots received the same rate of phosphorus and potassium annually – 54 lb. P_2O_5 and 48 lb. K_2O. Soil was kept at pH 6.0 to 6.5 by adding dolomite as needed.

The kudzu was cut for hay once each year about June 1-15. Sericea was cut once for hay when 12-15 in. high and for seed at maturity. After seed harvest the straw was left on the ground. Results averaged by periods and for the first and last year after turning the perennial legumes are given in the table.

First Period, 1942-44. Yields of all crops were low or average during the first 3 years of the test. Corn that received 36 lb. N averaged 40 bu., cotton that received 36 lb. N averaged 1,090 lb. seed cotton, sericea averaged 1,216 lb. hay, and kudzu averaged 2,902 lb. of hay.

Second Period, 1945-50. Following 3-year growth of kudzu or sericea, yield of corn was good but that of cotton was only average (769 lb.). If the plots continuously in corn are considered, it is evident that yields were high the first year following turning of the crops (1945) but declined to a low level by 1950. This indicates that the level of nitrogen was too low.

Where a 3-year rotation of cotton-peanuts-corn was used, yields also declined but not as fast as for continuous corn. This further indicates the level of nitrogen was low when the perennial had been grown for only 3 years.

Third Period, 1951-59. The test during this period was designed to study effect of a good cropping system: cotton, 48 lb. N; peanuts; and vetch-corn when grown after 6 years of kudzu. In addition, corn was grown continuously following kudzu or sericea for 6 years.

Yields in the 9-year period were excellent. Average yields were 72 bu. of corn and 1,835 lb. of cotton. The largest yield during this period was 124 bu. of corn in 1958 and 2,870 lb. of cotton in 1955.

When corn was grown continuously following 6 years growth of kudzu or sericea, yields were high but slowly declined. At the end of 9 years, the average yield was about 30 bu. per acre.

The lessons learned from this study are:

1. Perennial legumes increase yield of crops following, but do not supply enough nitrogen for maximum yields except for a few years.
2. A good cropping system, including use of nitrogen, should be used following perennial legumes after the first year.
3. Perennial legumes should occupy the land for several years for maximum effect on soil fertility.
4. Corn following a perennial legume that had been on the area for 6 years produced more the first 2 or 3 years than did corn receiving 80 lb. of nitrogen.

YIELD OF COTTON AND CORN IN PERENNIAL LEGUME ROTATION, AUBURN, 1945-59

Cropping system[1]	1945-50 yield		
	1945	1950	6-yr. av.
	Bu.	*Bu.*	*Bu.*
Continuous corn			
36 lb. N applied	33	25	33
Following 3 yr. kudzu	50	17	30
Following 3 yr. sericea	47	8	26
3-yr. rotation, cotton-peanuts-corn, following 3 yr. kudzu			
Corn	52	20	35
Lb. seed cotton	769	1,467	1,076

Cropping system[1]	1951-59 yield		
	1951	1959	9-yr. av.
	Bu.	*Bu.*	*Bu.*
Continuous corn			
40 lb. N applied	40	52	39
80 lb. N applied	47	66	52
Following 6 yr. kudzu	61	31	39
Following 6 yr. sericea	66	28	45
3-yr. rotation, cotton, 48 lb. N-peanuts, vetch-corn, following 6 yr. kudzu			
Corn	63	76	72
Lb. seed cotton	2,244	1,561	1,835

[1] All plots received annual application of 54 lb. P_2O_5 (superphosphate) and 48 lb. K_2O (muriate of potash). K_2O was increased to 96 lb. in 1956. Lime was applied in 1942, 1951, and 1956 to keep pH at about 6.0 to 6.5. N used was from ammonium nitrate.

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