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In this issue . . .

On the cover. Alabama's lagging interest in white clover pastures may be rekindled because of a new ladino variety, named Regal, that was developed by Auburn University Agricultural Experiment Station. The new clover overcomes the usual weakness of other white clovers — failure to last through the summer. Regal was found to have good summer persistence in tests made before its 1962 release. This plot of the new ladino, at the Station's Plant Breeding Unit at Tallassee, was photographed in late March 1964.

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Auburn, Alabama

New and Timely PUBLICATIONS

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

Bul. 347. Coastal Bermuda Pastures Compared with Other Forages for Dairy Cows reports how this popular forage performed under different management conditions.

Cir. 136. Nitrogen for Dallisgrass Pastures in the Black Belt points up value of applying nitrogen to dallisgrass.

Cir. 138. Soybeans for Oil in Alabama summarizes results of studies on production practices for this important crop.

Leaf. 63. Cooler Homes from Attic Ventilation reveals how homes can be more comfortable during summer by use of attic fans and ceiling insulation.

Leaf. 68. Biology and Control of Spider Mites on Cotton in Alabama gives detailed information on this pest's life history and reviews effective control measures.

Prog. Rept. 79. Controlling Chinch Bugs on St. Augustine Grass Lawns tells how damage from this pest can be avoided.

Prog. Rept. 87. Summer Annual Grasses is a report of performance of the new sorghum-sudan hybrids that are now available.

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

Typical plant characteristics of Regal ladino are shown here. Although it looks like other varieties, its performance is different.

REGAL—

New Ladino White Clover

WILEY C. JOHNSON, *Dept. of Agronomy and Soils*

REGAL IS A NEW NAME in Alabama, but it could become important in the vocabulary of the State's farmers.

Regal is the name of a new white clover that was released by Auburn University Agricultural Experiment Station in January 1962. The new variety is a ladino type white clover, which means it is a giant type that flowers sparsely or not at all in Alabama.

Appearance Alike, Performance Different

In appearance, Regal is not distinguishable from other ladino varieties. The white "V" mark on the leaflets is highly variable – it may have no mark, a single V, or a double V.

Although Regal looks like other ladinos, it is distinctive in performance. In the humid Southeast ordinary ladino behaves as an annual, or at best a weak perennial. Typically, ladino pastures are lush until dry, hot weather stops growth. During this period of stress many plants die. In most years the clover is gone when favorable weather returns in the fall. Not so with Regal. It was developed to provide the needed summer persistence.

Development Dates to 1952

Selection was begun in 1952 of superior parent lines that were persistent through the summer and were high forage producers. Numerous lines were tested. Many of these were later discarded. After 4 years of testing, the following five lines remained:

Clone number	*Origin*
Ala. 269	Iowa
Ala. 2682	Alabama
Ala. 3757	Georgia
Ala. 3763	Pennsylvania
Ala. 4249	Alabama

These five lines were used as parents to produce a synthetic variety that was both persistent and high yielding. The original five selections, or clones, have been maintained in the greenhouse at Auburn and are used each year to produce the pure "Breeder" seed of Regal.

Looked Good in Tests

Before release, Regal was tested extensively in Alabama and to a limited extent in other Southeastern States. Comparative yields of Regal and two other common ladino varieties are given below:

Variety	*Dry matter/acre*
Regal	4,667 lb.
California ladino	4,021 lb.
Pilgrim	4,090 lb.

Seed of the new ladino clover are being grown in California. Shown is the first field to produce Foundation Regal seed.

Superior yield of Regal is the result of higher production after the first year. Regal's superiority over intermediate types, such as "white dutch," is much greater than that shown for ladino.

All seed of Regal except Breeder seed are grown in California by Caladino Farm Seeds, Inc. This is necessary since Alabama conditions prevent ladino seed production. Breeder seed are grown at Auburn using the five original clones. These are grown under screen cages with confined bees for cross fertilizing to ensure purity. Electric lights are used to force flowering.

The Auburn-produced Breeder seed are sent to California where they are increased for two generations only (Foundation and Certified). Each year Breeder seed are sent to California to establish new Foundation seed fields. All seed of Regal are certified by the California Crop Improvement Association.

Limited quantities of Regal seed will be available for planting in 1964. Prospects are good for abundant seed in 1965. It is essential that only certified seed are planted – this is the only guarantee of purity.

PLANT SHORTENERS have many uses

TOKUJI FURUTA, *Department of Horticulture*

You can now tailor your plants to meet specific needs!

Plant shorteners can make it unnecessary to tolerate plants that are "too tall" or "too large." Also repeated pruning or cutting back plants to keep them "in bounds" can be eliminated. For the homeowner and commercial grower, the struggle to keep plants in bound with pruning shears and control the environment may be replaced with timely applications of chemicals.

Development of effective plant growth retardants, a group of chemical plant growth regulators that inhibit stem elongation without undesirable side effects, now permit tailoring plants to specific needs. These have been effective at the Auburn University Agricultural Experiment Station on herbaceous annuals and perennials, and on woody ornamental shrubs and trees. In addition to retarding stem length, many beneficial plant growth responses have been noted and recorded.

Principal Retardants

Many chemical compounds have been evaluated but only four are available commercially. They are best known by these trade names: Amo 1618, Phosfon, Cycocel, and B-nine.

Amo 1618 was the first material available. It is effective on only a few plants; thus it is not widely used.

Phosfon is available as a dust or a liquid. It will injure plants if sprayed on foliage – chlorophyll is destroyed – but can be used safely if incorporated into the soil. Phosfon is effective on a limited number of plants and persists in the soil for years. The necessity of soil incorporation and long persistance has generally limited the use of this compound to plants growing in containers.

Cycocel, known as CCC before commercial release, is effective when applied as a spray or a soil drench. Cycocel is effective on many plants but the effectiveness lasts only a few months. Overtreatment appears as a yellowing of young foliage.

B-nine was known as B-995 before commercial release. It is effective on many types of plants, may be applied as a soil drench or a foliar spray, and persists for a few months.

Growth Influences

The results of experiments at Auburn on ornamental plants have shown that control of plant height comes primarily from reduced elongation of the stem between leaves. The number of leaves is only slightly reduced. For example, these results with the poinsettia variety Elizabeth Ecke are typical:

	No Treatment	*Cycocel Treatment*
	In.	*In.*
Plant height	21	7
Number of leaves	18	17
Length between leaves	1.2	0.4

Increased number of flowers has been another response of some plants. Plants of Coral Bell azaleas without treatment had 303 open flowers while plants treated with B-nine had 384 open flowers.

Other plant responses noted have been induced flowering of young plants, increased resistance to cold and smog injury, increased resistance to moisture stress, and delayed flower anthesis. Treated plants generally have darker green leaves.

Factors Influencing Effectiveness

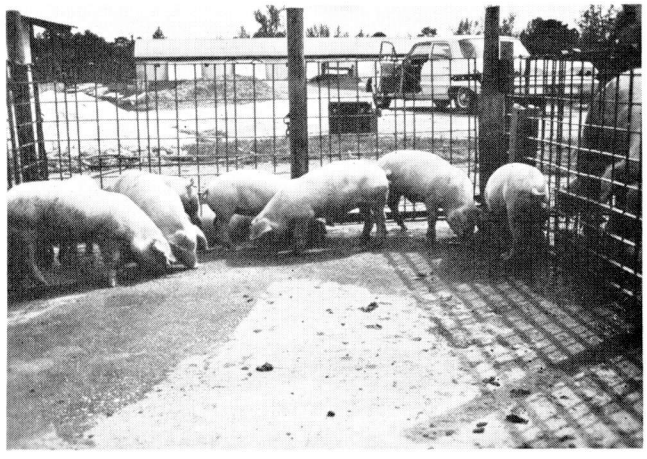
There are many factors other than concentration influencing the effectiveness of various retardants. The type of plant is important since some are responsive to all retardants, while others are responsive to only a few. Chrysanthemum plants were retarded by all the chemicals, but petunias were responsive only to phosfon and B-nine. Varieties or cultural varieties of a given plant species may also vary in response. Thus the white poinsettia is retarded less by cycocel treatment than the red forms as follows:

Variety	*Retardation Pct.*
Ecke White	28.0
Improved Albert Ecke	52.8
Elizabeth Ecke	65.3

All chemicals are most effective when plants are in a state of rapid growth and stem elongation. Maximum retardation is achieved when application is made immediately prior to rapid growth.

Temperature, light intensity, and length of daylight influence plant growth and effectiveness of the chemicals. There also seems to be an influence of the time of day the material is applied. Cycocel applied during the early part of the morning retarded Bonnafon Deluxe chrysanthemum 27.5%; whereas an application made late in the afternoon retarded stem elongation 36.8%.

The group of plants at left are potted azaleas. Cycocel treated, and at right B-nine treated. The plant in left of group is check, center, left, Ecke white, right, improved Albert Ecke. Poinsettias were both treated with Cycocel,



This litter of 10 early weaned pigs averaged 40 lb. at 56 days of age.

EARLY WEANING may boost PIG PERFORMANCE

LAVERN BROWN, *Supt. Lower Coastal Plain Substation*
HOWARD TUCKER, *Dept. of Animal Science*

PIGS CAN be conveniently weaned at 35 rather than the customary 56 days.

This has been proved in tests at the Lower Coastal Plain Substation of the Auburn University Agricultural Experiment Station.

This practice could lower the amount of expensive lactation ration needed by the sow, and would provide for more efficient utilization of farrowing and preweaning facilities.

Procedure Used

In the tests 24 gilts were divided into 2 equal groups to produce pigs for evaluation of the 2 systems of weaning. These gilts were selected so that litter mates were paired (one gilt from each pair assigned to each treatment). Gilt pairs were hand mated to the same boar to minimize hereditary difference.

All gilts were run together during gestation. They were moved to the farrowing house 107 days post breeding, weighed, washed, and confined to individual farrowing pens. Pigs were weighed individually and identified at birth. Creep ration was made available to the pigs at 5 days of age and fed free choice to 56 days, Table 1.

All sows and pigs were subjected to the same treatment until pigs were 35 days of age. Any small difference in feed consumption to that time is not important. Feed consumption and animal performance as affected by treatment are given in Table 2.

Summary

Pigs remaining with their dams to the age of 56 days were slightly heavier than pigs weaned at 35 days. This small difference in weaning weight, however, was offset by improved post-56 day performance of the early weaned pigs. The total feed cost (pig and sow feed) was virtually the same in both treatments.

TABLE 1. CREEP RATION FED TO PIGS

Ingredient	Lb.
Corn	448
Soybean oil meal, 44%	120
Meat and bone meal, 50%	90
Fish meal	30
Dried whey	50
Dried skim milk	150
Sugar, sucrose	100
Salt, swine formula	5
Antibiotics[1]	20g.
Vitamins[2]	

[1] Antibiotics: grams activity of Aureomycin.

[2] Vitamins: Riboflavin, 2g.; Calcium Pantothenate, 4g.; Niacin, 9g.; Vitamin A, 300,000 USPU; B12, 9mg.

The difference in number of pigs farrowed the second litter is not considered important in view of the difference in average performance with first litter. Sows left with pigs 56 days were full fed a concentrate ration, and in most instances gained slightly in weight from 35-56 days post partum while nursing. Under a different nutritional regime, early weaning might show more difference.

The greatest apparent advantage at this time is the more efficient utilization of facilities afforded by early weaning. The number of sows handled per farrowing unit in a multiple farrowing system can be increased by 33% with early weaning at 35 days. After weaning, sows are usually managed less intensively and the problem of cleaning and individual feeding is eliminated.

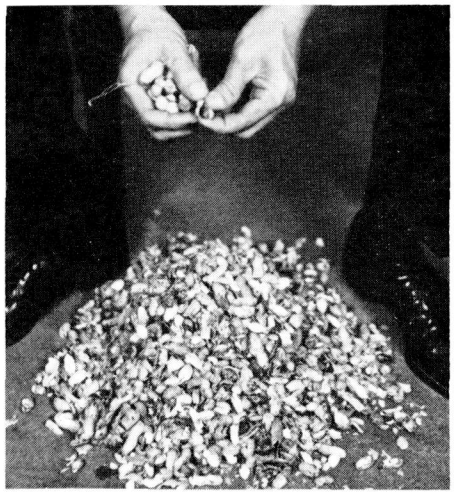
All sows and pigs were subjected to the same treatment until pigs were 35 days of age. Any small difference in feed consumption to that time will not be important. Feed consumption and animal performance as affected by treatment are given in Table 2.

TABLE 2. COMPARISON OF PERFORMANCE OF PIGS WEANED AT 35 AND 56 DAYS OF AGE

	35-day pigs		56-day pigs	
	Farrowed winter 1959-1960	Farrowed summer 1960	Farrowed winter 1959-1960	Farrowed summer 1960
Pigs farrowed per litter, av. No.	9.1	10.8	8.9	9.8
Av. birth wt. lb.	2.9	3.0	2.4	2.8
Av. 56-day wt. lb.	38.5	39.43	42.8	39.51
Feed consumed/sow 35-56 days, post-partum lactation ration, lb.			388.8	387.8
roughage ration, lb.	147	147		
Pounds creep ration consumed per pig	43.3	40.2	24.2	24.6
Feed cost per pig dollars[1]	3.17	2.98	2.98	2.97
Av. post 56-day performance A.D.G., lb.[2]	1.60	1.57	1.60	1.45

[1] Feed cost included cost of creep ration at $120.00 per ton and pro-rata cost of lactation or roughage ration at $70.00 per ton.

[2] Pigs were allotted to four test groups at 56 days of age. Average daily gain as shown is average performance of all pigs from the four groups.



Peanut Hulls Replace Hay in Livestock Fattening Rations

W. B. ANTHONY, R. R. NIX, J. G. STARLING, and R. R. HARRIS[1]

AROMA OF ROASTING nuts is about the only waste product of the peanut plant. Everything else has a use!

Value of peanut vine hay has been known for a long time, but it has just been learned that peanut hulls can be used in livestock feed. These hulls can replace part of the hay in mixed rations, thereby utilizing the 600 lb. of hulls that remain when a ton of peanuts is shelled.

A 1960 feeding test at the Wiregrass Substation compared Coastal bermudagrass, cottonseed hulls, and peanut hulls in rations for fattening cattle. The basal ration contained 58.5% ground snapped corn, 10% cane molasses, 10% cottonseed meal, 20% Coastal hay, 0.5% dicalcium phosphate, and 1% trace mineralized salt. (One lb. of Stilbosol Premix[2] was added per ton.) To make the experimental rations, cottonseed hulls and peanut hulls replaced the Coastal hay. Two pens of 8 calves each were fed the basal mixture and each of the experimental rations for 183 days.

[1] Anthony, Nix, and Harris are on staff of Department of Animal Science; Starling is assistant superintendent, Wiregrass Substation.

[2] Supplied by Eli Lilly & Co., Greenfield, Ind.

Good Gains Recorded

Performance data for the three groups were: control pen – 2.52 lb. average daily gain and 1,003 lb. feed per cwt. gain; cottonseed hull ration – 2.54 lb. daily and 984 lb. feed per cwt. gain; and peanut hull ration – 2.25 lb. average daily gain and 1,090 lb. feed per cwt. gain. Average carcass grades were essentially the same among the three treatment groups, and there was no difference in selling price. Feed costs per cwt. gain were $19.36 for the Coastal ration, $18.79 for cottonseed hull, and $19.73 for those on the peanut hull feed.

In terms of feed replacement value, 218 lb. of peanut hulls replace 201 lb. of Coastal hay or 197 lb. of cottonseed hulls. Calves fed each of the test rations outperformed those on all-concentrate feed in the same test. Thus, peanut hulls can be effectively used in rations for fattening cattle to substitute for either Coastal bermudagrass hay or cottonseed hulls.

TABLE 1. COMPOSITION OF TEST RATIONS

Item	Composition by ration	
	Alfalfa corn	Peanut hull
	Pct.	*Pct.*
Snapped corn	49.25	48.3
Alfalfa hay	49.25	9.7
Peanut hulls		29.0
Cane molasses		9.6
Urea		1.9
Salt	1.00	1.0
Dicalcium phosphate	0.5	0.5
Vitamin A, I.U./lb.	1,000	1,000

The peanut hull ration probably will not support gains equal to Coastal or cottonseed hull containing rations. However, it may be profitable to use peanut hulls in mixed rations when Coastal hay and cottonseed hulls are scarce and relatively expensive.

Low Cost Lamb Gain

In a lamb fattening study, a ration containing peanut hulls was compared with a control feed of equal parts corn and alfalfa, Table 1. The peanut hull ration was formulated to simulate the alfalfa hay-corn mixture, with additions being made based on chemical composition of the hulls and on other feeding results.

Lambs fed the peanut hull mixture gained just as well as those fed the alfalfa hay-corn, Table 2. However, feed efficiency of the control ration was better. Both rations were palatable and there were no digestive disorder problems.

Feed cost per pound of lamb gain was slightly less when the peanut hull ration was fed because of low cost of the hulls and because lambs gained well on the feed. These results reveal that a satisfactory lamb finishing ration can be formulated using peanut hulls as a source of roughage.

Not Milk-Making Feed

Rations containing peanut hulls did not measure up to Coastal bermuda hay and cottonseed meal as a ration for beef cows nursing calves. During a 100-day test, cows fed Coastal hay and 2 lb. of cottonseed meal daily maintained their weight and their nursing calves gained an average of 100 lb. Cows full fed the peanut hull containing ration during the same period lost an average of 142 lb. and their calves gained at the rate of 70 lb. each.

Composition of the peanut hull ration was 60% peanut hulls, 3% urea, 15% Coastal hay, 15% cane molasses, 5% ear corn, and 1% each salt and steamed bone meal. During the last 30 days of the test, corn was increased to 15% and peanut hulls were cut to 50%.

Potential use of peanut hulls in fattening feed mixtures is pointed up by results of the Auburn University Agricultural Experiment Station study. Earlier Station trials show that feeds containing up to 30% roughage are best for fattening cattle, and the new tests reveal that peanut hulls can effectively replace at least a portion of hay in such mixtures.

TABLE 2. PERFORMANCE OF LAMBS FED ALFALFA-CORN AND PEANUT HULL-CONTAINING MIXTURES

Item	Resultant, by ration	
	Alfalfa corn	Peanut hull
Lambs per lot	8	8
No. lots	2	2
Days on feed	84	84
Av. daily gain, lb.	0.37	0.38
Feed/lb. gain, lb.	8.75	9.97
Feed cost/lb. gain	$0.23	$0.22

Changes in FLUID MILK CONSUMPTION

LOWELL E. WILSON, *Dept. of Agricultural Economics*

NATIONWIDE, Mr. and Mrs. Consumer are becoming more low fat conscious.

Demand for dairy products rich in milk-fat is declining, while market demand for low-fat milk products is increasing. Although consumption in Alabama has not changed much, increased use of low-fat dairy products could bring about more income to its industry.

Changes in kinds and quantities of dairy products used by U.S. consumers have resulted in different trends in the use of milk-fat and nonfat milk solids. Per capita consumption of whole milk products declined 8% since 1956 and cream consumption dropped 21% since 1950, while use of skim and low-fat products increased 78%, Table 1.

Skim and low-fat milk products include plain skim milk, fortified skim milk, flavored milk drinks, low-fat items (usually 2% fat), and buttermilk. Most of these have a higher proportion of nonfat milk solids than whole milk products.

Whole Milk Sales Drop

The sharp drop in whole milk sales and fat solids since 1956 has been attributed to a number of factors. Introduction of fortified skim and low-fat milk products in many markets is an important factor. These products were heavily promoted by processors and sell for several cents a quart below whole milk. Skim and low-fat milk sales increased from 5.2% of fluid sales in Federal Order Milk Markets in 1956 to 6.6% in 1962. In some markets as much as 10% of fluid milk sales were in these items. Increased use of nonfat dry milk for drinking and cooking purposes probably affected whole milk consumption. Also, declining whole milk consumption has been associated with health issues, increased use of semi-prepared foods, and competing beverages.

TABLE 1. PER CAPITA CONSUMPTION OF FLUID MILK PRODUCTS, UNITED STATES, 1950-62[1]

Year	Whole milk products	Skim milk and low-fat products	Cream products
	Pounds	*Pounds*	*Pounds*
1950	277	14.7	11.2
1951	281	16.5	11.2
1952	284	17.5	10.6
1953	283	18.3	10.3
1954	286	18.4	9.9
1955	292	19.3	9.8
1956	295	19.8	9.9
1957	294	20.4	9.7
1958	288	20.6	9.4
1959	284	21.8	9.3
1960[2]	279	23.1	9.3
1961[2]	271	25.1	9.0
1962[2]	270	26.0	8.8

[1] Data are on a product weight basis.
[2] Includes Alaska and Hawaii.
Source: *Dairy Situation,* USDA, ERS, June 1963.

Variation Among Markets

The proportion of milk sold as whole milk varies little among markets, Table 2. Although skim and low-fat products account for a sizeable share of fluid milk sales in the United States, a large variation exists in consumption of specific products in this group among market areas. In Alabama and adjoining Southern States, much of the milk used in these products is consumed as buttermilk. Traditionally, buttermilk sales have been high in the South. In markets in other areas, buttermilk sales are often less than 1% of fluid milk sales.

A survey conducted in 1958 of dairy products use by urban homemakers in Alabama showed that buttermilk was used by 58% of the survey families and accounted for more than 20% of fluid milk consumption. Skim and flavored milk products were used by only 8% of the families and was under 4% of fluid milk consumption.

Opportunity to Increase Sales

Per capita consumption of fluid milk, including other dairy products, in Alabama is less than the amount recommended by nutritionists. The dairy industry is interested in increasing milk consumption. Both producer and distributor organizations actively participate in educational and promotional programs aimed at this goal. Such products as fortified skim milk and low-fat milk offer opportunities to expand milk consumption in Alabama.

Increases in milk consumption are likely to occur slowly. However, consumer research by Auburn University Agricultural Experiment Station indicates that milk product consumption can be increased through educational and promotional programs. For these programs to be effective in expanding milk consumption, they must be directed at individual groups of people. Promotional programs introducing new dairy products that are aimed at consumers in general are likely to change milk consumption patterns instead of increasing the total amount of milk products used.

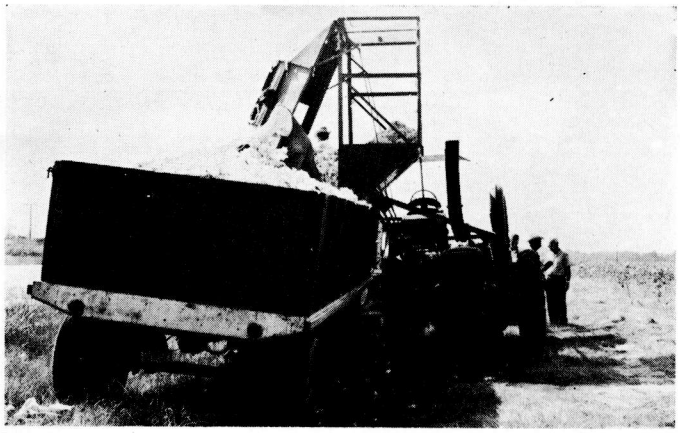
Consumer studies show that lack of income restricts dairy product purchases of many families. However, a lack of knowledge of the nutritional value and relative cost of dairy products as compared with other foods and beverages may be a more important factor.

Most families purchase some whole milk; therefore, expanded consumption should be encouraged by present user families. Such products as skim milk, flavored and low-fat milk, dried milk, and cottage cheese are used by less than one-third of all families in Alabama. Increased sales may be made by getting additional users of low-fat products.

TABLE 2. PERCENTAGE OF FLUID MILK PRODUCTS SOLD AS WHOLE MILK AND LOW-FAT MILK PRODUCTS IN SELECTED MARKET AREAS, 1962

Market	Whole milk and cream	Low-fat items		Total fluid items
		Buttermilk	Skim and other	
	Per cent	*Per cent*	*Per cent*	*Per cent*
Alabama markets[1]	86.0	11.0	3.0	100.0
Tennessee Federal Order Markets	86.6	8.7	4.7	100.0
Mississippi Federal Order Markets	89.8	7.4	2.8	100.0
67 Federal Order Markets	91.3	2.1	6.6	100.0

[1] Partially estimated.
Source: Alabama data from Alabama Milk Control Board. Federal Order data from *Federal Milk Order Statistics,* USDA, AMS, Stat. Bul. 335, 1963.



Farm Machinery CUSTOM RATES

TOM D. NOLEN
Dept. of Agricultural Economics

CUSTOM WORK or machine hire may make better use of limited capital on many Alabama farms.

Average investment in farm machinery and equipment per farm has risen from $1,841 in 1950 to $4,591 in 1963.[1] Many farmers with small farming operations cannot economically justify ownership of certain farm machines. Investment in other essentials for economic production, such as fertilizer, seed, or feed, could yield a higher return.

In 1961, a USDA survey showed that custom services accounted for about 20% of the acreage covered in all harvesting operations, and that 6 to 7% of all field work was custom hired.[2] In Alabama, the extent of machine hire appears to be increasing, as shown by the following data on amount spent by farmers: 1950, $9,384,069; 1954, $8,503,284; and 1959, $13,019,241.[3]

With rapid decline in number of farms from 1950 to 1959, the amount spent per farm for machine hire increased greatly. The trends toward larger and better equipped tractors, more self-propelled machines, and fewer farm workers may result in further dependence on custom work by farmers. Also, owners of machines may do custom work to justify machine ownership.

Rates and Comparisons

In the fall of 1963, 374 farmers, some in all counties of Alabama, supplied information for a study of custom rates paid or charged. Based on this information, the most common rate and the usual range in rates for the State in 1963 were determined. (See table.)

The most common rate was the one reported most frequently. The usual range in rates was determined by the high and low rates reported provided more than one farmer or custom operator reported such rates.

Custom operators normally charge rates to cover costs of depreciation, interest, repairs, taxes, supplies furnished, and labor. Also, the operator generally expects a reasonable profit. In some cases, the custom operator is primarily interested in volume of work or increased hours of machine use to reduce his per hour or per acre costs.

To the farmer who hires custom work performed, the major concern may be in avoiding ownership costs of a certain machine but still have the services of the machine. The capital not tied up in a machine of limited use may be spent for other things. In some cases, custom hire may be a way of obtaining skilled machine labor for the job. Labor on the farm may or may not be reduced.

Disadvantages cannot be overlooked. Custom services may not be available when most needed. Sometimes quality of custom work may be below standard. Or, costs of hiring custom work may be higher than machine ownership costs. In some cases, a farmer hiring custom work may not be able to release labor or to use profitably full-time hired labor. Another disadvantage is possible spread of noxious weeds and plant diseases.

Changes in Rates

Custom rates apparently are slow to change. The first survey of custom rates in Alabama was in 1951. The most common rate charged for breaking land in 1951 was reported as $4 per acre. In 1958 it was $3, and in 1963 the most common rate was $4. The most common rate for combining small grain in 1951 was $10 per acre, whereas in 1958 and 1963 it was $6 per acre. Other rates reported, generally, showed little change.

The 1963 survey included a question on expected rates to be charged or paid in 1964. One out of five of those reporting expected custom rates to increase. Almost 80% reported that they expected rates to be about the same. Less than 1% indicated an expected decline in rates in 1964.

Decisions about ownership and use of farm machines are an important part of management. Alternatives, including custom hire and custom work, must be carefully weighed from an economics standpoint.

CUSTOM RATES PAID OR CHARGED, SELECTED FARM OPERATIONS, ALABAMA, 1963

Operation	Unit	Most common rate	Usual range in rates
Breaking land	Per acre	$ 4.00	$2.00-$6.00
	Per hour	4.00	2.00- 6.00
Planting row crops			
2-Row equipment	Per acre	2.00	1.50- 3.50
	Per hour	4.00	3.00- 6.00
4-Row equipment	Per acre	2.00	1.50- 3.00
Planting small grain	Per acre	2.00	1.00- 3.00
Raking and baling hay	Per bale	.20	.15- .30
Mowing, raking, and baling hay	Per bale	.25	.20- .40
Corn picking	Per acre	6.00	5.00-10.00
	Per bushel	.15	.10- .25
Corn picking and shelling	Per acre	10.00	6.00-10.00
	Per bushel	.20	.15- .25
Combining small grain	Per acre	6.00	2.00-10.00
	Share	1/4	1/6- 1/2
Digging and shaking peanuts	Per acre	3.00	2.00- 5.00
Combining or picking peanuts	Per ton	20.00	20.00-25.00
	Per acre	15.00	10.00-15.00
Mechanical picking of cotton	Per pound lint	.06	.06- .07
Spraying for insect and disease control	Per acre	1.00	.50- 2.00

[1] *The Balance Sheet of Agriculture,* 1963. Inform. Bul. 281, Econ. Res. Ser., USDA.

[2] *Farm Machinery: A Survey of Ownership and Custom Work.* Agr. Stat. Bul. 279. USDA. 1961.

[3] *Census of Agriculture, Alabama* 1950, 1954, 1959. U.S. Census Bureau.

Mechanized Production of Irrigated Cotton

T. E. CORLEY*, *Agricultural Engin. Dept.*
J. K. BOSECK, *Tennessee Valley Substation*

IRRIGATION will increase your cotton yield – likewise your management problems.

For best results from irrigation, attention must be given all management practices. Machinery problems associated with furrow-irrigated cotton were studied at the Tennessee Valley Substation of the Auburn University Agricultural Experiment Station. The effects of variety and spacing on picker performance were reported in last winter's issue of HIGHLIGHTS, Vol. 10, No. 4. Other practices studied including tillage, planting, insecticide and defoliant application, topping, and harvesting are reported here.

Tillage and Planting

After land shaping for furrow irrigation, all subsequent seedbed preparations were done without changing the graded surface. A two-way plow was used to prevent dead furrows, back furrow, and elevated field borders. Plowing was followed by harrowing and land planing.

Planting flat and cultivating to form a furrow was as good as planting on a preformed bed and cultivating to form a furrow. After the post-emergence oiling operation, all sweep cultivations threw soil to the row to form a furrow about 5 in. deep at layby time. Fruiting height of the flat-planted cotton was about 1 in. below that of bed-planted cotton. This, however, did not affect efficiency of picker in this test.

Application of Insecticides and Defoliants

Irrigation was started about mid-July with applications at 7-day intervals unless there was rain. Water was applied at 1- and 2-in. rates per irrigation, averaging four applications per year. At times the high-clearance sprayer could not move through the wet middles. Also, as the cotton foliage became dense, it was difficult to follow the rows. It became necessary to use an airplane for about half of the insecticide applications and for defoliation. Excellent defoliation was obtained with one application of liquid or dust each year except 1959. In that year two applications of dust 10 days apart were needed to obtain good defoliation of dense foliage.

TABLE 1. YIELD, BOLL ROT LOSS, PICKER PERFORMANCE FOLLOWING BOTTOM DEFOLIATION TREATMENTS, 1961

Treatment	Date	Yield lint/acre	Boll rot loss lint/acre	Harvesting efficiency	Trash content
		Lb.	*Lb.*	*Pct.*	*Pct.*
Bot. def.	Aug. 22	790	56	97.3	3.5
Bot. def.	Aug. 28	786	44	96.8	4.0
Bot. def.	Sept. 6	870	49	96.5	4.0
Check		1,011	40	96.5	4.0

TABLE 2. PLANT CHARACTERISTICS AND MACHINE PERFORMANCE DATA FOR TWO VARIETIES AT THREE IRRIGATION LEVELS, TENNESSEE VALLEY SUBSTATION, 1962-63 AVERAGE

Variety and irrigation level[1]	Harvested lint per acre	Harvesting efficiency[2]	Earliness rating[3]	Trash content
	Lb.	*Per cent*		*Per cent*
Empire				
I_0	804	93.0	87	3.3
I_1	1,104	96.6	76	3.8
I_2	1,110	96.5	76	4.3
Auburn 56				
I_0	796	94.0	77	3.3
I_1	1,112	95.1	65	4.1
I_2	1,034	95.2	64	4.2

[1] I_0—No irrigation; I_1—1 in. per application; I_2—2 in. per application.
[2] 1962 only.
[3] The percentage of total yield harvested at first picking.

Bottom Defoliation

In an attempt to reduce boll rot and aid harvesting, a high-clearance spray rig with a bottom defoliating boom was used to apply defoliants to lower part of the plants. Good leaf drop was obtained. A defoliant applied to the bottom 24 in. of 57-in. plants August 20, 1959, reduced yield and did not affect boll rot or picker efficiency. Based on boll count, the boll rot loss was equal to 275 lb. of lint per acre.

Bottom defoliation of 43-in. plants on August 31, 1960, did not affect yield, picker efficiency, or boll rot loss. The boll rot loss amounted to 250 lb. of lint per acre; considerable boll rot had occurred at the time of defoliant application.

In 1961 a defoliant was applied to the lower 19 in. of 39-in. plants on three different dates. The plants were small but there was a dense canopy of leaves and conditions were favorable for boll rot. Although all bolls in the botton 19 in. of the plant appeared to be mature at time of first treatment, the results in Table 1 show that all defoliation treatments reduced yield. Picker efficiency and boll rot loss were not affected. These data show that bottom defoliation often reduced yields.

Topping at Two Heights

Although the cotton in this test received high rates of fertilizer and water, the plants did not grow very tall and there was little plant lodging. In two tests, topping at 42 and 48 in. did not improve picker efficiency or affect yield and boll rot. Topping was done with a 4-row rotary topper mounted on a high clearance spray rig when average plant height was 6 in. greater than topping height. Average height at maturity was 56 in.

Harvesting with Picker

Irrigation presented no problems from standpoint of harvesting. Two harvestings were made each year with a high-drum picker. The picker efficiency of the irrigated cotton was slightly better than that of the nonirrigated cotton, Table 2. Irrigation increased harvested yield and trash content. There was no difference in picker efficiency, yield, trash content, or maturing date between the two irrigation levels.

* Cooperative USDA, ARS, AERD.

This pecan orchard may not show nutritional deficiencies to the casual observer but leaf analyses told a different story.

Determining PECAN FERTILIZER NEEDS through LEAF ANALYSIS

HARRY AMLING and J. L. TURNER
Department of Horticulture

PECAN GROWERS can lower fertilizer costs by using leaf analyses to determine nutritional status of trees.

Intensive research was begun at Auburn University Agricultural Experiment Station in 1960 to gather data to make possible a leaf analysis service for Alabama pecan growers. Many growers have already used results of this research to an advantage.

Basis for Leaf Analysis

Leaf analysis is a means of diagnosing nutritional status of perennial woody plants. This analysis is based on the principle that for each nutrient element there is an adequate concentration or concentration range in the leaf below or above which nutrient disorders can be expected. Also that the ideal concentration of a nutrient element in leaves of similar age will be the same regardless of soil type or cultural practice. However, under different cultural practices or soil types, different rates of fertilizer will be required to obtain the same desirable nutrient concentration in the leaf.

Sampling Conducted

Nutrient elements fluctuate as leaves become older. Therefore, initial research consisted of seasonal sampling of Stuart pecan leaves bimonthly during the growing season to determine when leaves could be sampled and analysis data correctly interpreted. The sampling period selected from this study was the last week in May through the first 2 weeks in June.

Deficiencies Found

Only deficiencies of nitrogen, magnesium, zinc, and iron have thus far been correlated with visible foliage disorders. Phosphorus has never been found to be deficient and low leaf levels of potassium rarely occur. Zinc fixation has been found to be associated with high application rates of phosphorus. Potassium problems have been primarily associated with excess levels inducing magnesium deficiency. Toxic levels of manganese and possibly aluminum were found to accumulate naturally in pecan foliage. Responses obtained from maintaining a soil pH of 6.5 may be that of counteracting the natural manganese and aluminum accumulation.

One of the most severe nutritional disorders found throughout the State is magnesium deficiency. Since correction of magnesium deficiency generally takes at least 3 years, early detection of "hidden" shortages by leaf analyses will enable growers to use corrective measures before severe economic losses occur. This is also true for other "hidden" element shortages or excesses as well. It is easier to prevent a deficient or excess nutrient element condition than to correct one.

Fertilization Recommendation

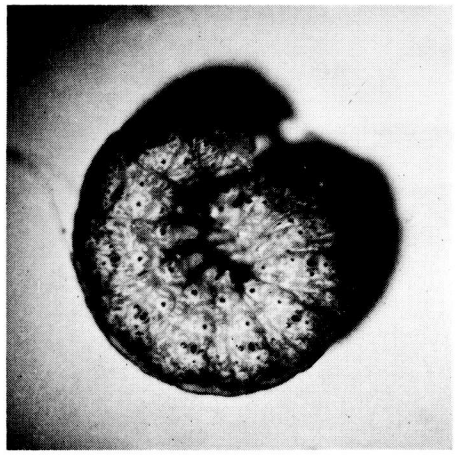
The basis for making fertilizer recommendations to correct or maintain the nutritional status of pecan orchards as diagnosed by leaf analysis is from grower-cooperative fertilizer experiments currently in progress and from accumulated knowledge obtained in the process of correcting pecan nutrient element disorders.

Information on procedures for taking and handling pecan leaf samples and cost of running the analysis can be obtained by writing Dr. Harry Amling, Department of Horticulture, Auburn University Agricultural Experiment Station, Auburn, Alabama.

LEAF ANALYSES DATA FROM SELECTED PECAN GROVES IN SOUTHEASTERN ALABAMA

Code number	Dry weight					Zn	Fe	Mn
	N	P	K	Mg	Ca			
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*p.p.m.*	*p.p.m.*	*p.p.m.*
378	2.88	.19	1.13	.22	.75	48	112	645
379	2.87	.18	1.14	.18	.54	37	87	555
380	2.78	.19	1.06	.39	.83	57	151	552
383	2.78	.20	.98	.52	1.11	105	112	487
432	2.76	.19	.98	.29	.70	46	87	596
433	2.92	.18	1.10	.29	.76	75	91	530
434	2.67	.19	1.19	.17	.63	84	83	460
438	2.61	.18	.97	.24	.70	59	72	470
439	2.68	.18	1.21	.24	.74	56	90	440
440	2.77	.19	1.02	.24	.79	25.2	84	221
442	2.79	.19	1.07	.17	1.01	96	73	428
Normal concentration*	2.70	.14	.75	.40	.70	50	100	350
Range	2.90	.30	.95	.60	1.50	99	250	1,000

* Normal range refers to nutrient element concentration in leaves above or below which nutrient disorders can be expected.



This is the larva stage of the granulate cutworm. It is this stage that does the damage to peanut plants.

The GRANULATE CUTWORM in PEANUTS and its CONTROL

W. G. EDEN, *Department of Zoology-Entomology*
C. A. BROGDEN, *Superintendent, Wiregrass Substation*
MAX SCONYERS, *Asst. Superintendent, Wiregrass Substation*

THE GRANULATE CUTWORM has become a pest in peanut fields of the Wiregrass area of Alabama.

Appearance and Seasonal History

This cutworm is the larva of a stout dull-colored moth that has about a 1-in. wing expanse. The mature larva is about 1½ in. long and grayish brown in color. The larva is subterranean and comes to the soil surface at night. It can be found under piles of debris early in the morning or on cloudy, humid days.

The insect has at least 5 generations per year in southern Alabama; however, only 3 of them appear in peanut fields. Periods of peak numbers in peanut fields are late June, late July, and late August.

The granulate cutworm, like most other cutworms, feeds on a wide range of plants, particularly vegetable and leguminous crops. It cuts off small plants at the surface of the soil, climbs plants and feeds on the foliage at night, and feeds on underground portions of plants. It causes the worst damage in peanut fields by feeding on the underground parts of the plants.

Control Experiments

Experiments on control of the granulate cutworm in peanut fields were begun at the Wiregrass Substation in late summer, 1960. Heavy applications of DDT, toxaphene, endrin, and carbaryl (Sevin) to infestations of grown larvae in the field, as well as in laboratory tests, failed to satisfactorily control the insect.

Control studies in the field were complicated by the subterranean habit of the larvae. Screening of soil samples and the use of plywood boards for larvae to hide under failed to give consistent counts in the field tests. This problem of determining populations of larvae was finally solved by making counts in the field between midnight and dawn.

Experiments with multiple applications of insecticides in 1962 and 1963 show promising results for control. This is illustrated by data presented in Table 1. Treatments begun in mid-June and continued until the last of July were more effective than those begun in mid-June and stopped before the last of July. Indications were that an additional treatment in mid-August would have further reduced the number of cutworms. There were highly significant negative correlations between the numbers of cutworms and peanut yields. *The reader is cautioned that the two insecticidal compounds given in Table 1 have not yet been approved for use on peanuts after pegging time.*

[1] *Feltia subterranea* (F), Family Phalaenidae.

TABLE 1. NUMBERS OF CUTWORMS AND YIELDS OF PEANUTS FOLLOWING TREATMENTS WITH GRANULAR INSECTICIDES

Treatment	Cutworms[1] per 6 ft. of row	Yield per acre
	No.	*Lb.*
Untreated check	6.7	625
Stauffer N-2790, 2 lb./a.		
Applied 6/12	5.3	875
Applied 6/12 and 7/9	3.1	1,032
Applied 6/12, 7/9, and 7/31	2.1	1,318
Diazinon, 2 lb./a.		
Applied 6/12	4.3	710
Applied 6/12 and 7/9	2.3	1,115
Applied 6/12, 7/9, and 7/31	2.0	1,023

[1] Seasonal mean from June 20 to August 26.

Results of an experiment with carbaryl, DDT, and toxaphene, all of which have been approved for use on peanuts, are presented in Table 2. Information in this table indicates that cutworm numbers can be held down by a seasonal spray program with any of these 3 insecticides. For best results the rates should be increased as the season progresses.

TABLE 2. NUMBERS OF CUTWORMS AND PEANUT YIELDS FOLLOWING INSECTICIDAL SPRAYS

Treatment[1]	Cutworms[2] per 6 ft. of row	Yield per acre
	No.	*Lb.*
Untreated check	4.4	951
Carbaryl, 1 lb./a.	1.4	1,136
DDT, 1 lb./a.	1.3	1,176
Toxaphene, 2 lb./a.	1.2	1,073

[1] Sprays were applied on June 13, 26, July 8, 22, August 2, and 12.
[2] Seasonal mean from June 20 to August 26.

Low Soil Potassium Sets Up Coastal for Leafspot Disease

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DISEASE PROBLEMS of Coastal Bermudagrass during late summer or early fall have been widely reported. Areas affected have ranged from small isolated spots to occasionally an entire field.

Such things as insect attack and fungus-incited root and crown rots are among the factors that may contribute to the serious and complex problem. These types of damage are not always associated with soil fertility, occurring on fields of high and low fertility.

During the past 3 years, however, severe leafspotting has occurred on research plots of known fertility. This has been definitely linked with fertilizer treatment, specifically a low soil supply of available potassium.

Found in Three Areas

Leafspot injury showed up in research plots in three Alabama areas: in 10 of 18 fields within a 50-mile radius of Auburn, all of Norfolk sandy loam soil; on a similar soil at the Lower Coastal Plain Substation; and on Kalmia loamy sand at the Brewton Experiment Field.

Symptoms developed in a typical pattern. Older leaves developed small tan to purplish-brown spots, and young plant tops either turned lemon yellow or appeared wilted. Later the lower leaves died and the younger portions became spotted, turned a darker yellow, and finally appeared scorched. Severity was directly related to degree of potassium deficiency.

Stands of grass were reduced and did not fully recover until the following growing season was well advanced. On the most severely affected plots stands did not fully recover.

Major disease injury was confined to the no-potash and high-nitrogen plots. Each of these treatments resulted in the soil being low in potassium. Incidence of leafspot following different treatments is revealed by the following data: (N = 200 lb. N, P = 100 lb. P_2O_5, and K = 100 lb. K_2O per acre annually; L = lime to bring pH to 6.5):

Fertilization	*Spots per leaf, av.*
NPKL	13.5
N½PKL	19.9
NP½KL	23.1
NKL	16.0
NPK	19.6
NPL	147.5

Leafspotting shown for the NPL treatment is typical of that on no-potash plots. Disease was not a serious factor on plots getting potash with the 200 lb. annual rate of nitrogen.

TABLE 1. EFFECT OF POTASSIUM AND NITROGEN ON COASTAL YIELDS, BREWTON

Fertilizer per acre[1]		Dry forage yield per acre		
		1963		4-year average
N	K_2O	1st cut	Total	
Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*
200	0	819	5,846	7,609
200	50	1,452	8,314	8,921
200	100	1,654	8,255	8,653
200	200	1,942	8,791	9,719
400	200	379	9,986	11,823

[1] All plots were limed initially according to soil test and received 200 lb. per acre P_2O_5 annually, plus fertilizers shown.

TABLE 2. EFFECTS OF COASTAL FERTILIZATION ON SOIL POTASSIUM STATUS, BREWTON

Fertilizer per acre		Potassium status of soil profile zones, K_2O per acre			
N	K_2O	0-6 in.	6-12 in.	12-18 in.	18-24 in.
Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
200	0	32	25	19	22
200	50	37	25	28	37
200	100	47	28	31	28
200	200	68	46	40	40
400	200	48	31	31	31

Two Fungi Involved

At least two species of fungi have been implicated. Ability of these organisms to cause leafspot was established in greenhouse experiments with Coastal bermuda grown under several levels of potassium. Most spots developed on inoculated leaves of plants grown in a medium without potassium. There were no spots when plants were not inoculated with the fungi, regardless of potassium level.

Production and growth distribution of the grass were affected by the interaction of potassium deficiency and disease, Table 1. Yields at the first cutting reflected effects of the disease on Coastal stands. No-potash plots averaged 42% and the high-nitrogen ones 19% as much forage as those well supplied with potash.

Stand recovery is indicated by seasonal total yield – no-potash plots made 60% as much as plots getting potassium and the same rate of nitrogen. The 50-lb. annual rate of potash prevented development of obvious disease symptoms during the 4-year study.

Potassium status of soils is affected by forage removal and leaching. Nitrogen rate not only greatly influences yield, it also markedly affects soil potassium level. Data in Table 2 illustrate these effects in 1962.

Fertilizer treatment affected the soil potassium status throughout the 2-ft. depth sampled. With all potassium put on in a single application, the nutrient became deficient at the 200 lb. K_2O annual rate when 400 lb. of nitrogen per acre was applied each year. There is evidence that "luxury" consumption is lessened and soil potassium status better maintained on the sandy soil by split applications of potassium. Results show that more potassium is needed when high nitrogen rates are used.

How leafspot affects Coastal bermudagrass is shown by this contrast. The plot at left got only phosphorus and lime, whereas the healthy grass at right received 50 lb. per acre of K_2O annually in addition to lime and phosphorus.

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Peach Packing COSTS in Alabama

PEACHES CAN BE GROWN in all areas of Alabama, but large-scale commercial production is confined to Chilton and Blount counties. In these counties peaches are an important source of income for many farmers.

Damage from frost, insects, and diseases are production problems facing peach growers. Major marketing problems in Alabama are limited volume, seasonality in production and labor requirements, and competition from other production areas. Volume grown in the State exceeds that which can be sold fresh on local markets, but there is not yet a dependable quantity large enough to supply peaches to processing firms. Success of the packing operation is not only of value to present peach growers, but can be a primary factor contributing to expansion of the industry.

Packing Costs Create Problem

Cost of packaging peaches – a highly perishable commodity that has many substitutes – is a major problem to successful marketing of the product. This is further complicated by the desire of consumers for products in attractive packages. These factors combined make costs of preparing peaches for market a prime factor in decisions to produce peaches as a major farm enterprise.

Results of a 1962 study of packing peaches in Chilton County showed that peaches were packed in two types and

Labor was generally the second highest cost item, accounting for about 20% of total costs. A major reason for differing labor costs was the variation in percentage of No. 1 peaches in a given lot. Fluctuating labor costs were responsible for much of the variation in total costs.

Overhead and operating expenses accounted for approximately equal proportions of total costs.

Container Size, Type Important

Comparisons made on the basis of size and type of container revealed that ½-

in various sizes and types of containers were:

Container size, type	*Total cost/bu.*
1 1/9-bu. crate	93.2¢
1-bu. crate	101.5¢
¾-bu. crate	106.6¢
½-bu. crate	139.0¢
1-bu. basket	98.7¢
½-bu. basket	141.5¢

Four Factors Affect Cost

Data from Chilton County packing sheds revealed four major factors that contributed to packing costs:

(1) Inadequate supervision and coordination of work crews within the shed caused operational delays and reduced output per man-hour.

(2) Variations in percentage of culls among individual lots of peaches resulted in high labor costs for packing peaches.

(3) Physical facilities used in packing peaches were in use a limited period of time. This caused high fixed costs per unit of output. Packing shed owners had limited opportunities for making adjustments to this factor.

(4) Fluctuations in volumes of peaches delivered daily to packing sheds added to the problem of obtaining and keeping adequate experienced labor.

Opportunities for reducing per unit packing costs appear limited for the volume now being grown.

Control of AQUATIC WEEDS *with* FISH

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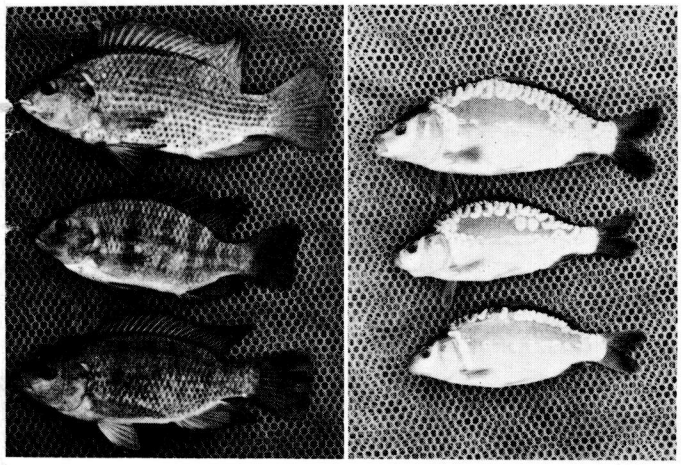

Aquatic weed control research includes use of such fish as (L) tilapia and (R) Israeli carp.

THE FARM POND OWNER still faces problems of weed control!

To combat weeds in ponds, the owner has a choice of using chemicals (herbicides), cutting mechanically, controlling by fertilization, or combining these methods. However, there are disadvantages associated with any one of them.

In recent years use of herbivorous fish (pond weed eaters) has been added as another control method. As a result of converting weeds into fish flesh, total production is higher than of fish that feed on water animal life. Also, effectiveness may last longer than other control methods. Furthermore, problems resulting from use of toxic compounds are not encountered.

Scientists in farm pond research at Auburn University Agricultural Experiment Station have conducted experiments on use of fish for aquatic weed control since 1957. Since then several species of herbivorous fish have been stocked on an experimental basis in about 200 ponds throughout Alabama and adjoining states.[1]

Although several of our native fish are known to eat a certain amount of plant materials, few of them consume enough to make them effective as controls of aquatic weeds in ponds. However, there are fish in other parts of the world that use plant materials as the major item of their diets. Several of these were brought to Auburn for use in this research program. The Israeli strain of the common mirror carp and three species of tropical tilapia from Java, Indonesia, Central Congo Valley, and Nile Valley have been used in experiments.

All species of fish tested are effective in eliminating aquatic weeds from ponds containing only those species. However, when stocked in ponds containing established populations of largemouth bass and bluegills at rates that do not interfere with population balance, the effectiveness of the herbivorous fish is somewhat reduced.

The Israeli carp is effective in controlling several types of submerged and emergent aquatic weeds and filamentous algae when stocked at a rate of 25 to 50 fish per acre in ponds containing largemouth bass and bluegills. However, to obtain control the stocked carp must be at least 7 in. in length. Smaller fish are easy prey for bass in the pond.

Of the three tilapia species tested, the Congo is the most promising. Stocked at a rate of 1,000 to 2,000 fish per acre, this species will control filamentous algae and several rooted aquatic weeds. The Nile tilapia stocked at the same per acre rate is effective in controlling the algae but not the rooted aquatic weeds. The Java tilapia is not a promising species for control of either algae or rooted weeds. For best results both the Congo and Nile tilapias must be stocked by early May.

Although the two species of tilapias appear to offer promise in control of aquatic weeds, some economical method for maintaining these fish through the winter must be developed before they can be used widely. Neither the Nile nor Congo can withstand minimum winter temperatures in Alabama ponds. Procedures must be devised by suppliers for holding these fish in springs, artesian well overflows, or water warmed by other means. Water temperature must not go below 50° F. if these fish are to survive.

An added advantage obtained from use of fish for controlling weeds can be measured by the weight these fish add to the angler's stringer. Israeli carp reach a size of 25 to 30 lb. after 3 or 4 years in ponds. The tilapia grow faster and to larger size than bluegill. Tilapia are easy to catch on hook and line.

[1] Supported in part by research grants from National Institute of Health, The Sport Fish Institute, and Alabama Department of Conservation.