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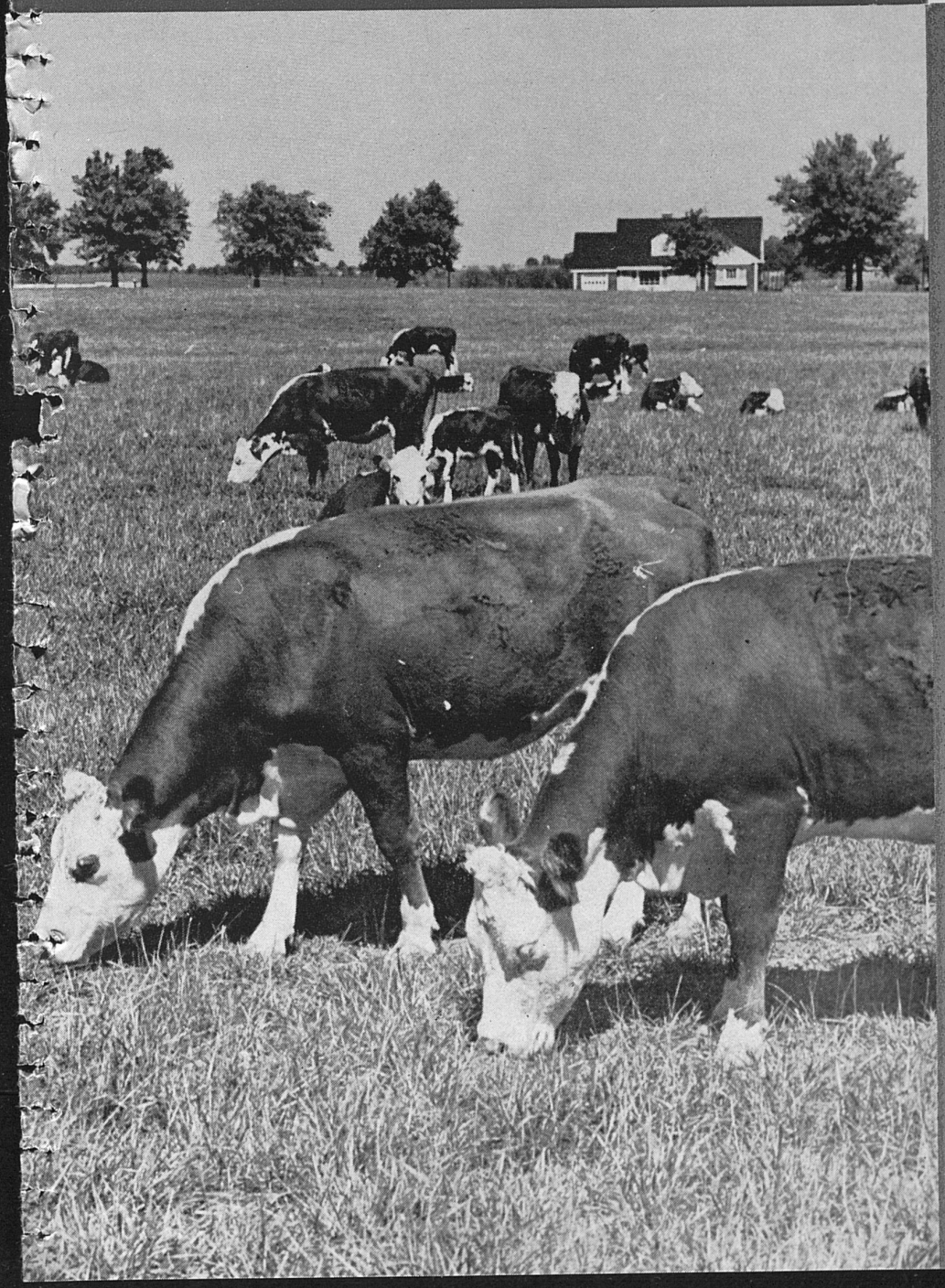

READ—

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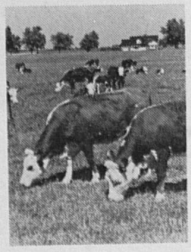
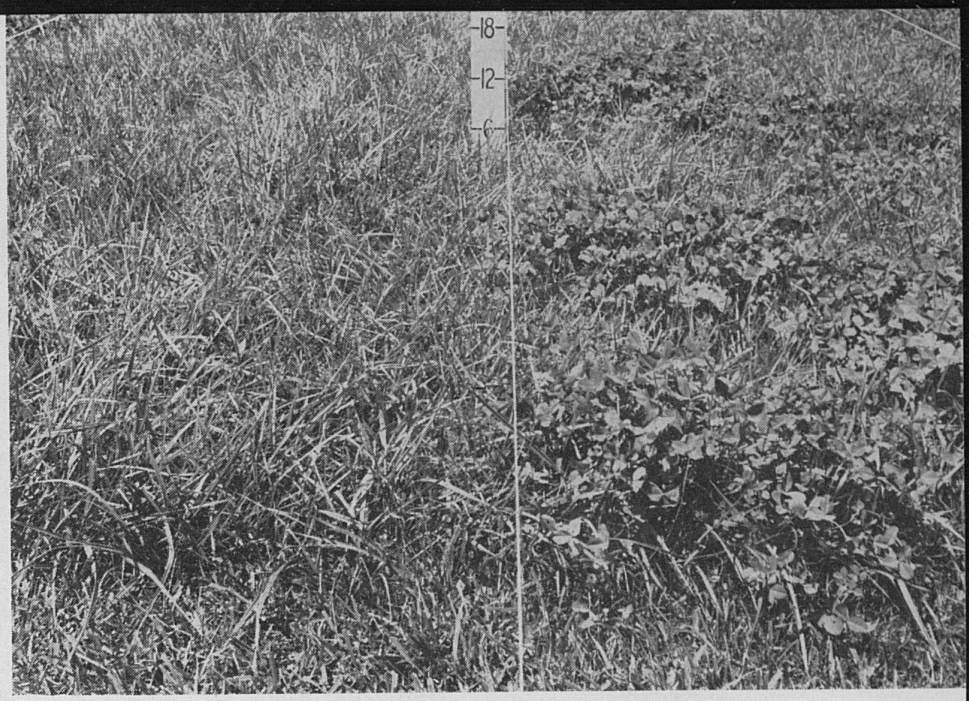
In This Issue

The Cover



This Christian county scene of Hereford cattle grazing on a desirable mixture of Kentucky 31 fescue and Ladino clover was photographed by Lyle B. Leonard. It is difficult to discern the Ladino because of drought conditions existing when the picture was made. The merits and shortcomings of tall fescue are summarized in an article starting on the next page of this issue of Kentucky Farm and Home Science.



Tall fescue grown in pure stand makes a relatively poor quality pasture for most livestock. The quality may be greatly improved by having 25 percent or more of clover. This picture of UK agronomy plots in Christian County (June 1957) shows (left) tall fescue in pure stand and (right) tall fescue with Ladino clover. Both plots had been seeded to fescue-Ladino in 1948, but the clover had gradually disappeared. The plot on the right was renovated in 1955 by fertilizing with lime, phosphorous and potassium. The Ladino is of volunteer origin.

(Photo—Timothy H. Taylor)

Tall Fescue—A Progress Report

If mixed with legumes and properly managed, Kentucky 31 fescue has possibilities for livestock and dairy use

By WILLIAM A. SEAY[1]
Vice-Director
Kentucky Agricultural Experiment Station

Since Kentucky 31 fescue was introduced in 1939, it has become an important pasture and soil-conserving grass in Kentucky. There is much interest and discussion about the merits and shortcomings of fescue, and staff members of the Kentucky Agricultural Experiment Station and the Cooperative Extension Service are asked many questions about it.

Kentucky 31 fescue is widely distributed in Kentucky and used by thousands of farmers. One should recognize that this grass will continue to be used and, if used properly, can serve very useful purposes. While it does have limitations it has many good qualities.

This report is designed to summarize our knowledge about Kentucky 31 fescue, to point out results of research completed and give information from research now underway, to point out some research needed, and to indicate how tall fescue may be used in a pasture and forage program to obtain more satisfactory results.

This deep-rooted perennial grass is widely adapted to the climate and soil conditions of this region. It is used in many parts of the upper South and lower Midwest as a pasture and forage crop. It grows well in wet soil and, yet, is quite drought resistant. It persists well on both good and poor soils. Fescue produces a sod dense enough to hold up livestock on muddy wet land even after a thaw and can be grazed in winter. It grows well in eastern and western Kentucky, as well as in the central "Bluegrass" area. It is a well adapted cool-season grass for most of Kentucky.

The ability of Kentucky 31 fescue to persist in spite of diseases, mismanagement, and competition from other species often leads to unwise use of the plant. Many farmers accept it as a grazing plant without using proper fertilization and management practices. On established fescue-legume pasture mixtures, use of nitrogen will accelerate the crowding out of the legumes. On the other hand, use of nitrogen on pure stands of fescue may increase herbage and/or seed production.

(Continued on Page 4)

[1] Research and observations reported here were contributed by several workers in the Kentucky Agricultural Experiment Station, the Kentucky Cooperative Extension Service and to a lesser extent, neighboring states, and are only summarized by the author.

Tall Fescue—A Progress Report

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Grazing and Clipping Experiments

Many experiments comparing pure fescue and fescue-legume pasture mixtures with other grasses and grass-legume mixtures have been conducted by several state experiment stations. Reported results have been contradictory and inconclusive. Some of the factors which have made interpretation difficult are the methods of calculating total digestible nutrients, the entrance of wild grasses and weeds, parasite "build-up" in pastures, and mismanagement of pastures.

In general, experiments and observations here and at other places indicate the following for Kentucky:

1. Kentucky 31 fescue alone or with legumes is relatively easy to establish, compared with other perennial grasses. It is harder to maintain legumes in fescue than in other grasses, but renovation of fescue sod to re-establish legumes can, under favorable conditions, be successfully accomplished.

2. Kentucky 31 fescue or fescue-legume mixtures will carry as much or more livestock per acre than other perennial cool season grasses or grass-legume mixtures during the growing season. It furnishes more grazing days annually.

3. Gain per animal per day on pure fescue is less than on other grasses. Animals grazing a fescue-legume mixture containing 20-25% or more legumes make satisfactory daily gains.

4. Beef production per acre per year on nitrated Kentucky 31 fescue or on fescue-legume pastures is approximately equal to that on other grasses or grass-legume mixtures.

5. Persistency of milk production on Kentucky 31 fescue is significantly less than when cows graze other grasses. On pure stands of fescue, lactating dairy animals often lose body weight. Satisfactory persistency of milk production and total milk production may be obtained if a good stand (about 25% or more) of legumes is maintained with the fescue.

6. When grown on fertile land and cut at the right stage of maturity[2] Kentucky 31 fescue makes satisfactory silage with respect to total digestible nutrients, crude protein and gross energy, but it has been found to be somewhat lacking in palatability.

7. As with some other forages under certain conditions, undesirable results may be obtained with fescue. Some cattle grazing Kentucky 31 fescue or being fed fescue hay or silage may become lame in the hind feet, usually in fall or winter, and a dry gangrene may eventually develop there and at the end of the tail. The best treatment seems to be removing fescue hay, pasture or silage from the diet if lameness appears and before gangrene develops, in which case recovery is aided. Apparently only a small percentage of cattle develop lameness. The "fescue foot" seems more likely to occur when no legumes are in the fescue pasture or when pure fescue hay or silage is the only feed.

8. Limited evidence indicates that cattle are more adversely affected by parasitism when grazing fescue pastures than when grazing other pastures. This may be due to greater survival of infective larvae on fescue pasture, as well as greater development of parasites in animals grazing fescue.

[2] Spring growth should be cut when the plants are in early boot. Subsequent growth should be cut when the tillers have two fully developed leaves with collars formed, in about 30 days.

Breeding Better Fescues

Although tall fescue is well adapted to Kentucky and has many good qualities as a pasture grass, its lower palatability and nutritive qualities than some other grasses have been recognized by the Kentucky Agricultural Experiment Station for some time. A breeding program was begun in 1950, and two methods have been followed that show promise in correcting these deficiencies.

One method is to graze spaced plant nurseries and study the inbred progenies of the best grazed plants. Nurseries are repeatedly grazed during the grazing season. Cattle consistently graze certain lines or strains throughout the growing season more than they graze Kentucky 31 fescue. After three generations of selection, the best grazed inbred lines have been permitted to cross-pollinate to form "synthetic" varieties. These synthetic varieties have been grazed in sod plots and compared with Kentucky 31 and other commercial fescue varieties for palatability as well as for seedling vigor, disease resistance, yield, winter hardiness, drought hardiness, and chemical constituents that are related to nutritive value.

These varieties are placed in the Regional Testing Program conducted by the United States Department of Agriculture, and thus they are tested throughout this region (Ohio, Indiana, Illinois, Missouri, Tennessee and Virginia and other states) to determine their general adaptation. Data obtained by the Kentucky Station show that when animals are given free choice they graze some varieties better than Kentucky 31 and

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Raising sheep and calves in cages to provide a worm-free environment helps workers to determine more precisely

The Effects of Parasitism

By STANLEY E. LELAND, JR.
Department of Animal Pathology

In addition to evaluating worm remedies, parasitologists in the Department of Animal Pathology have been conducting studies to determine more precisely what adverse effects nematode parasites have on domestic animals. These studies have included blood and plasma volume determinations, electrophoretic serum fractionation, total serum protein measurements, and observations on the non-microscopic and microscopic pathological changes.

Since horses, sheep, and cattle each serve as host to over 20 different species of parasitic nematodes and since nearly all animals become infected in their usual environment, it is necessary to obtain worm-free experimental animals. This is done in the case of sheep and cattle by taking the animals at birth and raising them in specially designed cages (Fig. 1) which provide a worm-free environment. These worm-free animals are then infected with varying but known quantities of worms of a single species. Thus, it is also possible in these pure infections to determine (1) the lethal larval dose, (2) the general course of the disease, (3) the male-female worm ratio, (4) the egg-laying potential of the female worm, and (5) the pathological effect on the host in the absence of other worm species.

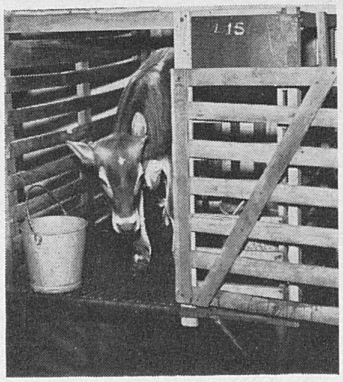


Fig. 1.— Sheep and cattle are raised in specially designed cages to provide worm-free environment. The cages are elevated from the floor on metal supports and have steel-mesh bottoms to prevent accumulation of manure.

Figure 2 shows the results of a typical experiment.[1] Originally, this experiment included four calves. Three of the calves, numbers 932, 934, and 933, were given one, one-half, and one-fourth million stomach worm larvae *(Trichostrongylus axei)*. Calf 935 was retained as an uninfected worm-free control. Calf 932, which received the largest dose of worm larvae, died of acute parasitism 19 days after infection. In this experiment a direct relationship between the number of worm larvae given and the general condition of the animal was evident in the 2½-month observation period. Calf 934 showed definite clinical signs of parasitism (note calf's rough coat and general appearance of apathy in Fig. 2).

In the aggregate of the three experiments, all calves given 209,000 or more larvae showed readily observable pathological changes at post mortem.

In the case of the blood determinations, deviations from the control were in general proportional to the number of worm larvae given. Blood and plasma volumes, total serum protein, and serum albumin all showed reductions following infection. The serum alpha globulin in infected calves showed a marked increase, while the other globulins were decreased.

(Continued on Page 8)

[1] Two replications of this calf experiment have been completed and all were essentially in agreement.

Fig. 2.— These calves (within 4 days of same age) were raised worm-free. To show the effects of parasitism, 933 and 934 were inoculated with known numbers of worm larvae. Note rough coat (934) and size differences compared with worm-free control calf (935).

Where Does the Kentucky Farmer's Dollar Go—?

Current operating expenses are the largest item of farm production outlay here and nationally

By ROBERT W. RUDD and D. MILTON SHUFFETT
Department of Agricultural Economics

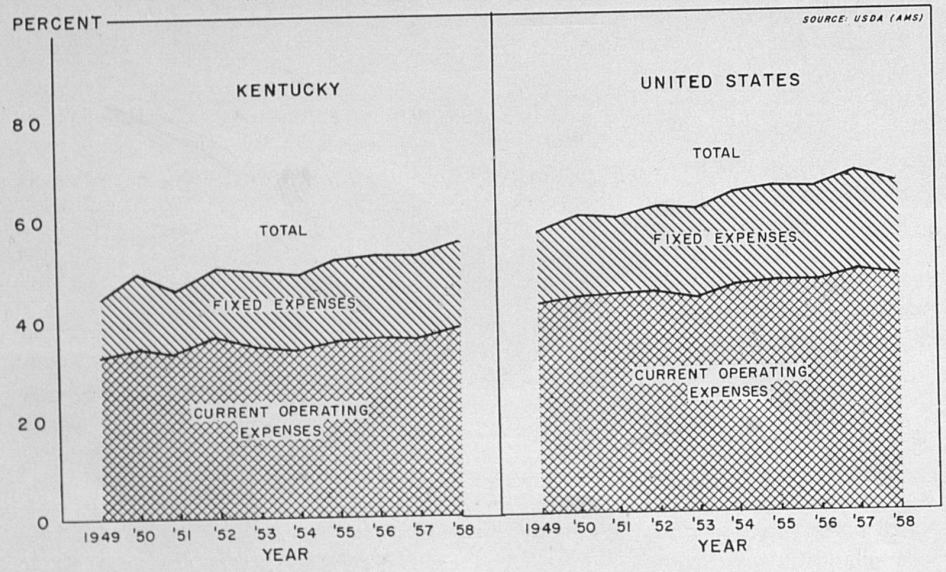
The decade of the 1950's saw agriculture's gross income remain about steady while soaring costs to farmers brought generally lower net incomes. Kentucky farmers shared in this decline with the rest of the nation's farmers. The increasing total cost situation brought changes in various categories of farm costs for Kentucky farmers during the last 10 years.

Farmers' production expenses fall in two classes: fixed expenses and current operating expenses. Fixed expenses are those costs which are incurred regardless of the level of production, while current operating expenses vary with the level of production. Items like taxes, depreciation, and interest on farm mortgage debt are viewed as fixed expenses, while outlays for hired labor, feed, or fertilizer and the like are considered as operating expenses. Whatever remains of gross income after covering fixed and operating expenses, then, is net income and includes the returns to family labor, management, and the land and capital plant of farming.

Production Expenses Compared with Gross Income

The proportion of the gross income used for operating expense is generally lower for Kentucky farmers than the national average, reflecting the use of more family labor in specialty crops like tobacco on Kentucky farms. Fixed expenses also average lower as a proportion of gross income for Kentucky farmers than for the nation mainly because of the lower capital investments in Kentucky agriculture. Total production expenses in Kentucky have averaged about 13 percent less of the gross income than for the nation. Both Kentucky and the nation's farming show about the same effects of the last decade's climbing prices of items used in farming as well as the larger amounts of off-farm purchases of production items (Fig. 1). Fixed and current expenses each take about 6 percent more of the gross today than at the beginning of the 1950's.

OPERATING EXPENSES AS PERCENTAGE OF GROSS FARM INCOME
KENTUCKY AND UNITED STATES, 1949-58*



* EXPENSES DO NOT INCLUDE PAYMENT FOR FAMILY LABOR AND INTEREST ON INVESTED CAPITAL

Fig. 1.— These graphs show operating expenses as a percentage of gross farm income in Kentucky and the United States for the decade 1949-58.

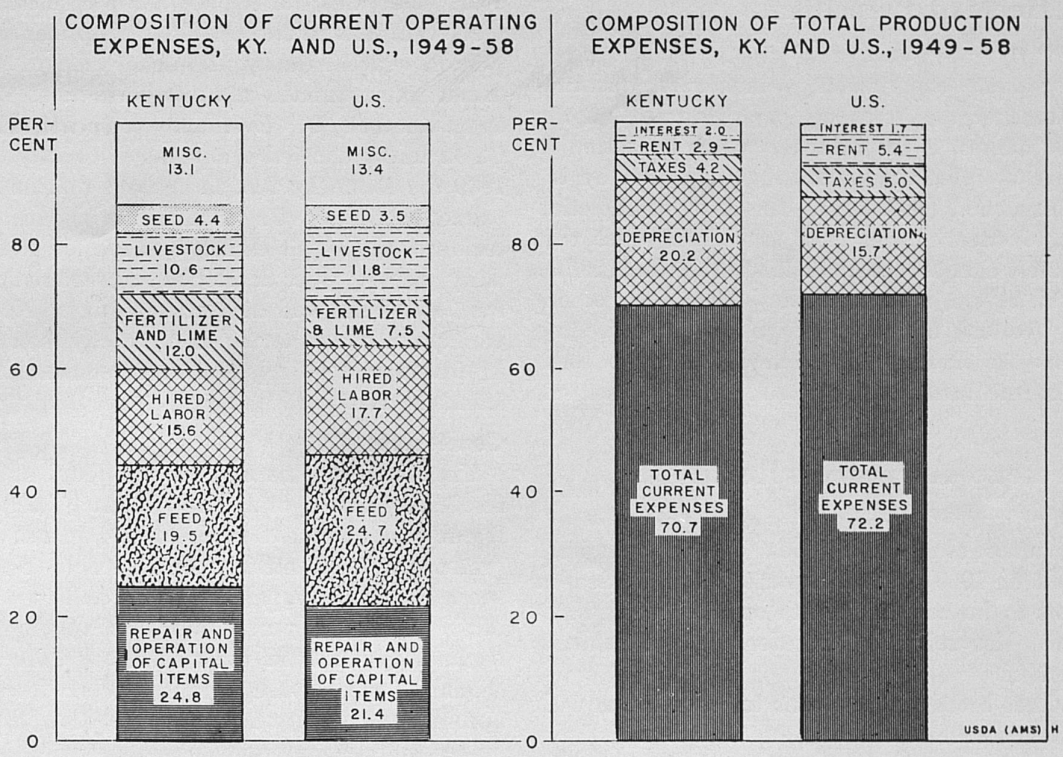


Fig. 2.— These charts show a breakdown of the items constituting current operating expenses and those involved in total production expenses for Kentucky and U.S. farmers for the decade 1949-58.

Current Operating Expenses

About one-fourth of Kentucky farmers' current expense outlay, the largest category, goes for the repair and operation of capital items (Fig. 2). This includes outlays for gasoline and oil for machinery operation and the repair and maintenance of buildings and equipment. The national outlay is a smaller proportion. The difference may be explained by the fact that Kentucky has smaller farms, and larger proportions of total investment are spent on buildings and machinery. This makes higher machine and building costs per acre of crops.

Cost of purchased feed, the next most important cost item for Kentucky farmers, makes up a smaller proportion of current expense outlay than for the nation. Kentucky's greater dependence on pastures for livestock feed and the relatively long pasture season mean lower feed outlays compared with the rest of the United States.

Hired labor outlays rank next in importance for Kentucky and average only slightly less than for the United States. The greater availability and use of family labor thus more than offset Kentucky's greater specialization in high labor crops such as tobacco.

Kentucky farmers spend substantially larger proportions of operating expense on fertilizer than the national average. Reductions in acreage allotments of tobacco have caused farmers to increase fertilizer use in Kentucky to offset acreage losses with higher yields.

Seed and miscellaneous expenses round out the current operating expenses, with Kentucky and U. S. proportions about equal for these categories.

Total Production Expenses

Current operating expenses are the largest item of farm production expense outlay, with no material difference in the proportions for Kentucky and the nation. However, fixed expenses have increased relatively more than operating expenses in the period from 1949 to 1958. Fixed expenses were about one-fourth of total expenses during 1949-50, but now they near 30 percent of the total because interest and depreciation costs have increased as the total investment in agriculture has increased.

The Effects of Parasitism

(Continued from Page 5)

The present experiments demonstrate quantitatively some of the ill effects parasitism has on the host. Of interest is the influence which is exerted in the range of infection not readily diagnosed by external inspection (calf 933). This level of infection is easily overlooked, yet most authorities agree that the greatest over-all economic loss results here rather than with severe, fatal infections. The effects of improved livestock breeds and highly efficient feeding programs are undoubtedly being nullified to some extent by this usually undetected level of parasitism.

Tall Fescue—A Progress Report

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other commercial fescue varieties. Two varieties were increased in 1958 and each variety was seeded in sod plots to be compared with orchard grass, bluegrass, and Kentucky 31 fescue for nutritive value to dairy heifers.

The other breeding method is to cross fescue with ryegrass to secure seed. Some of these hybrids have been much better grazed than Kentucky 31 fescue in spaced plant nurseries. These hybrids went into sod plots in the fall of 1959 to be grazed and further evaluated for animal acceptance and agronomic characteristics. Since, by using this method of breeding, hybrids with a large percentage of ryegrass germplasm have been secured, it is possible that the toxicity factor can be bypassed and will not be a problem in using these hybrids as a forage crop.

New Varieties Need Testing

Using animals to test and select new varieties of fescue enables researchers to check animal performance and nutritional value of the grass as well as agronomic qualities. For example, one naturalized variety found growing wild in Kentucky has been grazed consistently better than others in tests. However, when this variety, G1-43, was increased and seeded in plots to check animal performance in comparison with Kentucky 31 fescue, orchard grass and brome grass, animals did not perform as well on it as on Kentucky 31. Eventually some animals grazing G1-43 fescue showed symptoms of toxicity. Early in 1959 the Kentucky Station showed that an alcoholic extract from this G1-43 fescue forage contained a toxic material. This extract was fed for 40 days to a dairy heifer. She developed characteristic "fescue foot" symptoms and died after 55 days. Neither this variety nor others having more toxicity than Kentucky 31 fescue will be released or recommended by the Kentucky Station.

Conclusions

Until such time as improved varieties of fescue or fescue-ryegrass hybrids are released, Kentucky 31 fescue can continue to be useful to livestock and dairy production in Kentucky. In order to be of most use it should be properly managed and used *as a part* of the pasture program with other adapted grasses and legumes rather than used exclusively. It definitely should be mixed with legumes. When fescue stands become sod-bound and choke out legumes, they should be renovated to reintroduce legumes.

There is apparently little question of ill effects under some conditions from grazing pure stands of Kentucky 31 fescue. Some researchers suspect poor blood circulation and nutrient absorption in animals even before lameness or "fescue foot" develops. Research is under way concerning this, and more information is definitely needed. New varieties or strains causing harmful effects or poor performance will not be released or recommended by the Kentucky Agricultural Experiment Station.

There are still thousands of acres in Kentucky that are now primarily in broomsedge and other wild growth because of low soil productivity. These acreages could be much better used if sown to a mixture of legumes and Kentucky 31 fescue or other grasses where the latter are well adapted.

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Frank J. Welch
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