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# DEVELOPMENT OF IMPROVED PASTURES ON THE ROUGH AGRICULTURAL LAND OF SOUTHERN INDIANA

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A project was initiated in 1950 to study methods for improving pasture production on the rough agricultural uplands of Southern Indiana. Experiments were conducted at four locations in Harrison, Lawrence, Spencer and Martin counties. Studies included fertilizer trials with an alfalfa-Ladino clover-bromegrass mixture and species trials with grass-legume combinations and with winter small grains. Yields were below normal during much of the period from 1950-55 due to drought. Plots at the Harrison County location had to be seeded four times during the five year period.

SPECIES MIXTURES: Forage yields of 20 different grass-legume mixtures (cut at the hay stage) showed that the highest yielding mixtures were those which included alfalfa as the principal legume. Mixtures containing Ladino clover or birdsfoot trefoil as the only legume yielded, on the average, only 60% as much as those containing alfalfa; this difference would have been even greater in favor of the alfalfa mixtures if undesirable species had been separated out. Much of the poor showing of Ladino clover and birdsfoot trefoil was due to poor stands of these species established during years of drought.

Considering all years, all field locations and all legume companions, the five grasses tested (bromegrass, orchardgrass, timothy, alta fescue and bluegrass) yielded about equally well; however, bromegrass was the highest yielder when grown in combination with alfalfa plus Ladino clover. It produced about 700 lbs. more forage per acre than tall fescue, timothy or orchardgrass and 1,000 lbs. more than bluegrass. In 1955, the best season with respect to moisture supplies, yield differences among the different grasses were smaller. All grass mixtures in combination with alfalfa or alfalfa plus Ladino clover, yielded nearly four tons of dry forage per acre in 1955 and averaged about three tons per acre for the 1950-1955 period. Yields of the various mixtures during different years are shown in table 1.

*Project 569 - Published for Mimeo ID-9, "Report of Progress in Research on the Southern Indiana Forage Farm - May, 1956"

Table 1. Yield Results of Species Trials in Southern Indiana 1952-1955 Project 569

| Mixture | Lbs. dry forage per acre | | | | |
|---|---|---|---|---|---|
| | Lawrence County Average 1952-55 | Harrison County 1955 | Martin County Average 1953-1954 | Spencer County 1954 | Average all locations-all years 1952-55 |
| Al-La-Fe | 6199 | 8248 | 4347 | 4762 | 5812 |
| Al-Fe | 6235 | 8042 | 4048 | 5360 | 5805 |
| Bf-Fe | 3568 | 5919 | 4235 | 3216 | 3782 |
| La-Fe | 3864 | 4763 | 3247 | 4047 | 3845 |
| Ave | 4967 | 6743 | 3766 | 4346 | 4811 |
| Al-La-Br | 7621 | 8450 | 4137 | 5054 | 6533 |
| Al-Br | 6921 | 8055 | 3947 | 4585 | 6027 |
| Bf-Br | 3766 | 4345 | 2677 | 4024 | 3599 |
| La-Br | 4112 | 3631 | 3528 | 3161 | 3787 |
| Ave | 5605 | 6120 | 3572 | 4206 | 4986 |
| Al-La-Ti | 6736 | 7163 | 3887 | 4591 | 5809 |
| Al-Ti | 6854 | 7708 | 4381 | 5457 | 6167 |
| Bf-Ti | 3950 | 5530 | 2496 | 4201 | 3815 |
| La-Ti | 4188 | 5122 | 3719 | 2940 | 4031 |
| Ave | 5432 | 6380 | 3621 | 4297 | 4956 |
| Al-La-Bg | 6306 | 7567 | 3478 | 4359 | 5513 |
| Al-Bg | 6386 | 7669 | 4921 | 4726 | 5973 |
| Bf-Bg | 3114 | 3992 | 2772 | 3421 | 3177 |
| La-Bg | 3403 | 3510 | 3163 | 3175 | 3328 |
| Ave | 4802 | 5685 | 3584 | 3920 | 4498 |
| Al-La-Or | 6347 | 7751 | 4348 | 5019 | 5856 |
| Al-Or | 6296 | 7560 | 3812 | 5244 | 5701 |
| Bf-Or | 3864 | 5637 | 3173 | 4208 | 3956 |
| La-Or | 5583 | 5954 | 3094 | 3693 | 4770 |
| Ave | 5523 | 6692 | 3607 | 4541 | 5066 |
| Ave For All Mixtures | 5265 | 6324 | 3630 | 4262 | 4863 |

Al-alfalfa; Bf-birdsfoot trefoil; La-Ladino clover; Fe-tall fescue; Br-bromegrass; Ti-timothy; Bg-bluegrass; Or-orchardgrass.

With poor legume stands (Ladino clover or birdsfoot trefoil) yields of grasses were greatly reduced due to nitrogen deficiency, but those of bromegrass, bluegrass and timothy were decreased more than those of orchardgrass or fescue. When legumes were absent, the first three grasses were yellowed and weak, although all three are good yielders when adequate nitrogen is supplied.

SMALL GRAINS FOR FORAGE: Evidence was gained that rye, winter wheat, winter barley, and winter oats may extend the grazing season both into late fall and early spring. In clipping studies a ton or more of dry forage was obtained between the middle of March and the middle of May. Rye gave the earliest growth, followed by wheat, barley and oats. It appears that these cereals can be successfully interplanted into established sods, thus reducing the possibility of serious erosion on steep land and also affording better footing for late fall and early spring grazing.

FERTILITY STUDIES:

a. Fertilization at seeding.

Phosphate - Fertility studies with an alfalfa-Ladino-clover-bromegrass mixture showed that the low level of available phosphate in soils is an important limiting factor in the productivity of grass legume mixtures in this area. Phosphate additions at seeding were observed to increase yields by as much as 2,000 lbs. of dry forage per acre, doubling yields in some instances. Most of this response was obtained with the first 100 lbs. of $P_2O_5$ added per acre. Increases were more pronounced at the first and second cuttings than at the third. Phosphate also had a marked effect on the botanical composition of the plots. The plots with no added phosphate lost most of their alfalfa stand by the second year and were taken over by lespedeza, while the phosphate treated plots had a good stand of alfalfa.

Potash - Potash also becomes limiting in established stands of legumes and grasses which are producing high yields, but the soil supply of this element seems adequate for stand establishment in the area studied. Potash response obtained in these experiments was confined to the second harvest.

Nitrogen - Nitrogen added at seeding (50 lbs. per acre broadcast as ammonium nitrate) had no significant effect on yield, but did seem to increase seedling vigor of grasses and give better stand balance.

b. Maintenance Fertilization

The data obtained are inconclusive regarding yearly maintenance requirements for phosphate and potash on grass-legume mixtures. It is estimated that a minimum of 60 lbs. of $P_2O_5$ and 60 lbs. of $K_2O$ per acre per year will be needed to maintain maximum yields, but this will depend upon how much fertilizer was applied at seeding. An experiment designed to study this question was initiated on the Southern Indiana Forage Farm during 1955.

PLANS FOR FUTURE RESEARCH:

1. A study has been started at the Southern Indiana Forage Farm to determine the most efficient combinations of phosphate and potash for establishment and maintenance of high forage yields, using alfalfa -- orchardgrass mixture.

2. For 1956 a study is planned to determine the value of rock phosphate in forage fertilization for Southern Indiana.

3. Another project planned when funds became available will involve a study of the value of nitrogen fertilized grasses as substitutes for grass-legume mixtures.

4. A study of the nutritional requirements of birdsfoot trefoil is planned also for 1956. More specifically, this study will investigate why this plant is better adapted to some soil types than others.