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Legumes may be harvested for hay or seed, or grazed, or turned under for soil improvement. Hairy vetch, the winter legume most widely grown in Mississippi, is utilized almost exclusively for soil improvement.

An investigation conducted by the Mississippi Agricultural Experiment Station in cooperation with the Tennessee Valley Authority sought to more definitely determine practical answers to questions farmers are asking, relating to the production of vetch, the utilization of vetch produced, and the place of vetch in the farming program.

The experiments were conducted over periods of 4 and 5 years, at 4 locations, and on several soil types. Some of the results are summarized below.

1. Contrary to the somewhat prevalent belief that vetch "plays out" or decreases in yield after a few years, vetch yields in most of the experiments were greater in the last 2 years than in the first 2 years.

2. Since phosphorus increased the yield of vetch much more than did potash or lime, phosphorus was indicated as the fertilizer principally needed for maximum vetch production. In a long-time vetch program a more acute need for potash and lime may develop.

3. In a rotation of cotton and vetch, little difference was noted whether the 0-8-4 fertilizer was applied to the vetch or to the cotton. That is, the fertilizer required by both vetch and the following crop of cotton, may be applied either to the cotton or the vetch.

4. When vetch is removed for hay and the roots and stubble turned under, soil building benefits nevertheless occur. Removal of the first crops of vetch as hay did not materially reduce the yield of the following crops of cotton when compared to cotton supplied with commercial nitrogen. However, continued removal of vetch did reduce yields of following crops of cotton.

5. Nitrogen supplied by vetch turned under produced a yield in the following crops of cotton almost equal to the yield of cotton which did not follow vetch but which received 200 pounds nitrate of soda (32 pounds actual nitrogen.) A good crop of vetch turned under was therefore approximately equal to 200 pounds of nitrate of soda or 100 pounds ammonium nitrate.

PRODUCTION AND UTILIZATION OF HAIRY VETCH

By J. L. ANTHONY

Legumes are widely grown throughout Mississippi, summer legumes largely for hay or grain or other direct utilization, and winter legumes largely for soil improvement. There is no doubt a place in Southern agriculture for many legumes for use as cover to prevent erosion, for grazing, hay, and seed crops, and as soil builders.

Hairy vetch is perhaps grown on more acres than any other winter legume and in comparable quantities with most of the summer legumes, and its use is increasing from year to year. Its popularity is attributable to its ability to establish stands, to withstand unfavorable weather conditions, to resist disease, to produce good crops of green manure year after year. Numerous experiments have shown hairy vetch to be as good as, or better than, any other legume when turned under and measured by the following crop of corn or cotton.

Many farmers and agricultural workers think of vetch only as a soil builder, and ordinarily it is used for that purpose only. Vetch can be used, however, for grazing and hay. Perhaps vetch is not so good for grazing as some of the winter clovers, but livestock of all kinds will graze it and do well, especially during the early stages of vetch growth. Vetch hay is of excellent quality and is relished by most livestock. The amount of hay per acre produced compares favorably with that produced by other winter legumes.

Perhaps one of the greatest hindrances to the use of vetch is the expense of obtaining seed. So far, very few farmers have been able to grow and save their own seed, and the out-of-pocket cost of northern-grown seed has somewhat limited the amount of vetch grown on Mississippi farms. Then, too, the small number of farms in the hill section having necessary equipment for turning a good crop of vetch is also a somewhat limiting factor. Many farmers have been discouraged because of vetch failures. In many cases the farmers themselves are responsible for poor crops of vetch. There is no reason why there should be any more failures with vetch than any other crops, even cotton or corn, because there is but one factor that cannot be controlled by man, and that is weather conditions. This one factor may cause failure of any crop regardless of man's attention.

To secure factual data concerning the production and utilization of vetch, the Mississippi Experiment Station, in cooperation with the Tennessee Valley Authority, set up several experiments a few years ago to prove or disprove the value of a winter legume such as hairy vetch. These experiments were so arranged that a few of the many questions pertaining to the production and value of vetch might be answered. Below are some of the questions which farmers are justified in asking and which these cooperative experiments seek to answer:

1. Will vetch yields increase or decrease if grown year after year on the same land?
2. What are the fertilizer requirements for vetch?
3. Which should receive the commercial fertilizer, vetch or the following crop of cotton?
4. How do cotton yields following vetch removed for hay compare with cotton yields following vetch turned under for green manure?
5. If vetch is removed for hay, is commercial nitrogen needed for cotton production?
6. How does vetch nitrogen compare with 200 pounds of nitrate of soda for cotton production?
7. If unfertilized vetch is removed for hay, how will 3-8-4 fertilizer applied under cotton compare with 6-8-4 fertilizer?

In the absence of research information, it was necessary to conduct experiments over a period of years to prove the answers to these and other questions. For instance, many farmers are of the opinion that vetch yields progressively decrease if planted on the same land year after year. This is no doubt the case in some instances, and there are several factors that have caused this trouble. Some of the major ones are methods of planting, dates of seeding, inoculation, fertilizers, and weather conditions. All of the above problems can be somewhat controlled, except the last.

Will vetch yields decrease if grown annually on the same land?

To determine whether vetch yields increased or decreased if planted on the same land year after year, experiments were conducted at four locations. The experiment conducted on the farm of T. F. Richards, Columbus, Mississippi, was begun in the fall of 1938 and is being continued. Five crops have been grown and turned under to date.

Table 1A shows year-by-year data for a period of 5 years during which eight different fertilizer treatments and one no-fertilizer treatment were used. These data show the first 2 years were by far the lowest in respect to yields. An average for all fertilizer treatments (with the exception of lime alone) gives yields of slightly over a ton of green vetch per acre during the first 2 years. Yields for the last 3 years (with the same exception for lime alone) are slightly above 4 tons per acre, and the average for the 5-year period is about 3½ tons of green vetch per acre.

At another location, on the farm of H. H. Porter, Columbus, Mississippi, a similar experiment was begun at the same time and is being continued. Table 1B shows yields by years for the different fertilizer treatments. The results are similar to those at the T. F. Richards' farm in that the average yields for the first 2 years are slightly over 1 ton of green vetch per acre. The 1941 yields practically double the average yields for the years 1939 and 1940. The 1942 vetch crop was a complete failure, due largely to shallow planting the latter part of September 1941. Perhaps enough moisture was in the soil to germinate the seed, but several weeks of dry weather followed planting and most of the vetch died. The 1943 yields were far superior to those of any other years. All fertilizer-treated plots (with the exception of lime alone), produced more than 5 tons of green vetch per acre. Even including the complete failure for 1942, the 5-year average yields were slightly over 2 tons of green vetch per acre.

A somewhat different type of experiment is being conducted on the farm of R. M. and W. C. Stinson, Columbus Mississippi. This experiment was begun in the fall of 1939 and will be continued for several more years. Table 1C presents year-by-year results for a 4-year period. These data show an average production of 1 ton of green vetch per acre for all fertilizer treatments during the year of 1940. Vetch was a complete failure in 1941, perhaps due to the method and date of seeding, as it was planted shallow and late in October.

The 1942 and 1943 yields were excellent for all fertilizer treatments. All of the 1943 yields were slightly superior to yields from the same treatments in 1942. The 4-year average yields for all fertilizer treatments were better than 2 tons per acre, even including in the average one complete failure during the 4-year period.

The experiment at the Holly Springs Branch Station, Holly Springs, Mississippi, was the same type of experiment as that at the R. M. and W. C. Stinson's farm; it was begun in the fall of 1939 and is also being continued. Results in table 1D present annual yields for a 4-year period. These data show slightly over 1½ tons of green vetch per acre for the first year, and approximately 3½ to 5

tons for the different fertilizer treatments the second year. The third year yields were superior to the first year, in that about a 4½-ton average for all fertilizer treatments was obtained. The greatest yields were obtained the fourth year, when 4½ to 5 tons of green vetch were produced per acre. These data

Table 1. The effect of vetch on soil fertility, 1938-43

A. Savannah fine sandy loam; farm of T. F. Richards, Star Rt., Columbus

Year	1938	1939	1940	1941	1942	1943		5-year average increase
Planting date	Nov. 10	Oct. 27	Oct. 29	Oct. 16	Oct. 26	Oct. 6	5-year	over no
Turning date	.....	Apr. 21	May 2	Apr. 22	Apr. 15	Apr. 12	average	fertilizer
Fertilizer treatment*		Yields in pounds of green vetch per acre						
Superphosphate	.....	2,508	2,332	10,720	8,192	9,600	6,670	4,340
Basic slag	.....	2,100	1,992	10,704	10,448	10,688	7,186	4,856
Triple super	.....	1,768	1,822	9,584	7,488	10,240	6,180	3,850
Super + dolomite	.....	2,680	2,434	10,560	9,728	9,432	6,966	4,636
Basic slag + dolomite	.....	2,148	2,320	10,320	9,680	10,744	7,042	4,712
Triple + dolomite	.....	2,220	2,240	10,672	9,024	11,152	7,061	4,731
Super + KCl	.....	2,332	2,568	11,200	9,600	11,472	7,434	5,104
Dolomite	.....	1,037	825	3,904	2,912	3,096	2,354	24
No fertilizer	.....	934	789	4,016	2,921	2,992	2,330	.....

B. Ruston fine sandy loam; farm of H. H. Porter, Columbus

Year	1938	1939	1940	1941	1942	1943		5-year average increase
Planting date	Nov. 10	Oct. 27	Nov. 6	Sept. 26	Sept. 29	Oct. 6	5-year	over no
Turning date	.....	Apr. 20	May 12	Apr. 23	failure	Apr. 12	average	fertilizer
Fertilizer treatment*		Yields in pounds of green vetch per acre						
Superphosphate	.....	2,556	2,044	5,232	.....	10,320	4,030	2,170
Basic slag	.....	2,592	2,292	5,136	.....	15,507	5,105	3,245
Triple super	.....	2,136	1,886	4,947	.....	11,232	4,040	2,180
Super + dolomite	.....	2,828	2,578	6,672	.....	12,416	4,898	3,038
Basic slag + dolomite	.....	2,880	2,602	6,656	.....	12,416	4,910	3,050
Triple + dolomite	.....	2,264	2,416	5,520	.....	12,696	4,579	2,719
Super + KCl	.....	2,088	2,242	4,256	.....	11,352	3,987	2,127
Dolomite	.....	1,472	1,451	3,872	.....	4,616	2,282	422
No fertilizer	.....	1,427	1,081	2,864	.....	3,928	1,860	.....

C. Savannah fine sandy loam; farm of R. M. and W. C. Stinson, Star Rt., Columbus

Year	1939	1940	1941	1942	1943	
Planting date	Oct. 27	Oct. 29	Sept. 16	Sept. 22	Sept. 13	4-year
Turning date	.....	May 2	failure	Apr. 13	Apr. 13	average
Fertilizer treatment*		Yields in pounds of green vetch per acre				
500 lbs. 0-8-4 super	.....	1920	.....	8348	10000	5067
500 lbs. 0-8-0 basic slag	.....	2036	.....	6648	7920	4151
500 lbs. 0-8-4 triple super	.....	1816	.....	8072	10640	5132
500 lbs. 0-8-4 super + lime	.....	2228	.....	8996	10080	5326

D. Grenada silt loam; Holly Springs Branch Experiment Station, Holly Springs

Year	1939	1940	1941	1942	1943	
Planting date	Oct. 23	Oct. 24	Oct. 17	Sept. 24	Oct. 11	4-year
Turning date	.....	Apr. 28	Apr. 14	Apr. 20	Apr. 15	average
Fertilizer treatment*		Yields in pounds of green vetch per acre				
500 lbs. 0-8-4 super	.....	3205	6666	3956	9120	5736
500 lbs. 0-8-0 basic slag	.....	3984	8709	5300	10320	7078
500 lbs. 0-8-4 triple super	.....	2517	6373	3736	9280	5476
500 lbs. 0-8-4 super + lime	.....	5077	11461	5476	11280	8323

*Fertilizer treatment: 43 lbs. P_2O_5 per acre, 400 lbs. dolomite, 50 lbs. muriate of potash.

further show a 4-year average yield of 5,000 to 8,000 pounds of green vetch per acre for the different fertilizer treatments.

The data shown in the four experiments do not indicate regularly increased yields year-by-year for the different fertilizer treatments, largely because of weather conditions, methods and dates of seeding, and fertilizers. However, yields during the later years were much higher than in the earlier years, and the average of yields throughout the experiments is nearly twice as high as during the first year of the experiments. It is possible that the low yields the first 2 years of most of the experiments were due in part to incomplete inoculation, even though the seed were inoculated each year. Since in every case the yields were better during the last 2 or 3 years than on the first year of the experiments, it is perhaps safe to expect yearly increases, provided proper fertilizer treatment, inoculation, and methods and dates of seeding are practiced.

What are the fertilizer requirements for vetch?

Results of fertilizers applied to legumes are somewhat conflicting. A general opinion is that legumes do not need nitrogen fertilizers, while research results more or less agree on the acute need for phosphorus on most hill soils. The data are not conclusive with respect to the value of lime and potash.

The results of an experiment conducted for a 5-year period on Savannah fine sandy loam soil in Lowndes County, Mississippi, are shown in table 2A. These data show the value of applied phosphate, alone and in combination with both potash and lime, and of lime alone: the treatments may be compared with each other and with unfertilized plots. Results are shown by years for the purpose of studying yearly trends, which may or may not be due to fertilizer treatments, since weather conditions play an important role in the production of vetch. For example, the increases for superphosphate over no fertilizer do not show definite trends year after year; however, the increases are on the upgrade, amounting to approximately 3/4 ton in 1939 and approximately 3½ tons in 1943. The 5-year average increase for phosphate over no fertilizer was more than 2 tons.

The addition of muriate of potash to the superphosphate increased yields only slightly, but definite trends for increased yields were followed. In 1939 no increases were obtained, but thereafter a gradual increase was shown year-by-year. The 1943 increase in yields due to potash added to the superphosphate is slightly less than 1 ton, which is about 2½ times the 5-year average increase in yields due to potash added to the phosphate fertilizer.

The increased yields resulting from the application of dolomite in combination with superphosphate are extremely low and show no yearly trends. In only 1 year out of 5 was an increase of as much as 3/4 ton shown as due to lime. The 5-year average increase is also low. Results from the use of lime alone are similar to those for lime used in combination with superphosphate; practically no increased yields were obtained from either use of lime.

Another experiment of the same type as the above is being conducted on the farm of H. H. Porter, Columbus, Mississippi, using Ruston fine sandy loam soil. Data in table 2B show rather low yields for applied phosphate for all years tried, with the exception of 1941 and 1943 when approximately 2½ and 5 tons were produced, respectively. The 1942 crop was a complete failure. The 5-year average increase due to applied phosphate is slightly more than 1 ton per acre.

Potash in combination with phosphorus apparently was of little value, since in only 1 year out of 5 was an increase of over 1,000 pounds of green vetch produced by the potash treatment. The

5-year average yield showed no increase attributable to the use of potash.

The combination of phosphorus and lime treatments shows increased yields year after year, with the exception of 1942, when there was a vetch failure. The yearly increases as well as the 5-year average increases for lime are somewhat low; but, excepting the vetch failure of 1942, the trend was for larger increases, due to the lime-phosphate treatment. The 5-year average increase attributable to

Table 2. The effect of fertilizers on the production of hairy vetch, 1939-43.

A. Savannah fine sandy loam; farm of T. F. Richards, Star Rt., Columbus

Fertilizer treatment* / Year	1939	1940	1941	1942	1943	5-year average
	Yields and increase yields in pounds of green vetch per acre					
Superphosphate	2,508	2,332	10,720	8,192	9,600	6,670
No fertilizer	934	789	4,016	2,921	2,992	2,330
Increase over no fertilizer	1,574	1,543	8,704	5,271	6,608	4,340
Super + potash	2,332	2,568	11,200	9,600	11,472	7,434
Super	2,508	2,332	10,720	8,192	9,600	6,670
Increase over super	—176	236	480	1,408	1,872	764
Super + dolomite	2,680	2,434	10,560	9,728	9,432	6,966
Super	2,508	2,332	10,720	8,192	9,600	6,670
Increase over super	172	102	—160	1,536	—168	296
Lime alone	1,037	825	3,904	2,912	3,096	2,354
No fertilizer	934	789	4,016	2,921	2,992	2,330
Increase over no fertilizer	103	36	—112	—9	104	24

B. Ruston fine sandy loam; farm of H. H. Porter, Columbus

Fertilizer treatment* / Year	1939	1940	1941	1942	1943	5-year average
	Yields and increase yields in pounds of green vetch per acre					
Superphosphate	2,556	2,044	5,232	.....	10,320	4,030
No fertilizer	1,427	1,081	2,864	.....	3,928	1,860
Increase over no fertilizer	1,129	963	2,368	.....	6,392	2,170
Super + potash	2,088	2,242	4,256	.....	11,352	3,987
Super	2,556	2,044	5,232	.....	10,320	4,030
Increase over super	—468	198	—976	.....	1,032	—43
Super + dolomite	2,828	2,578	6,672	.....	12,416	4,898
Super	2,556	2,044	5,232	.....	10,320	4,030
Increase over super	302	534	1,436	.....	2,096	873
Dolomite alone	1,472	1,451	3,872	.....	4,616	2,282
No fertilizer	1,427	1,081	2,864	.....	3,928	1,860
Increase over no fertilizer	45	370	1,008	.....	688	422

C. Savannah fine sandy loam; farm of R. M. and W. C. Stinson, Star Rt., Columbus

Fertilizer treatment* / Year	1940	1941	1942	1943	4-year average
	Yields and increase yields in pounds of green vetch per acre				
0-8-4 super + lime	2,228	.....	8,996	10,080	5,326
0-8-4 super	1,920	.....	8,348	10,000	5,067
Increase over super	308	.....	648	80	259

D. Grenada silt loam; Holly Springs Branch Experiment Station, Holly Springs

Fertilizer treatment* / Year	1940	1941	1942	1943	4-year average
	Yields and increase yields in pounds of green vetch per acre				
0-8-4 super + lime	5,077	11,461	5,476	11,280	8,323
0-8-4 super	3,205	6,666	3,956	9,120	5,736
Increase over super	1,872	4,795	1,520	2,160	2,587

*Fertilizer treatment: Approximately 200 lbs. 20 percent phosphate, 50 lbs. muriate of potash, 400 lbs. dolomite.

the use of lime was less than 1,000 pounds of green vetch per acre, but the increase over phosphate alone was 1,438 pounds in 1941 and 2,096 pounds in 1943.

Lime alone in this experiment was of little value to the vetch, since the average increase in yield due to lime was only slightly over 400 pounds of green vetch per acre.

Table 2C shows the results of another experiment on Savannah fine sandy loam soil located in Lowndes County, Mississippi, and is a comparison of 0-8-4 and 0-8-4 plus lime under vetch. These data indicate that lime was of minor importance at this location. The 4-year average yield for 0-8-4 plus lime was 5,326 pounds of green vetch, and for 0-8-4 without lime it was 5,067 pounds, a difference of only 259 pounds of green vetch per acre in favor of the lime treatment.

A similar experiment was begun in 1940 at another location on a soil of Brown loam origin classed as Grenada silt loam. The results (table 2D) show annual green vetch yields on 0-8-4 plus lime plots of over 2¼ tons for each of the 2 low years and approximately 5½ tons for each of the 2 high years. The average yield for the 4-year period is slightly above 4 tons per acre for the 0-8-4 plus lime treatment. The 0-8-4 (no lime) treatment produced approximately an average of 1¾ tons for the 2 low years and slightly less than 4 tons for the 2 better years, and the 4-year average yield was slightly less than 3 tons per acre.

The limited data obtained from all experiments indicate that phosphorus is far more important for the production of hairy vetch than either potash or lime. It is perhaps possible, however, that after a long period of continued vetch cropping, both lime and potash will be needed for good vetch production. Soils having a clay or silt texture usually make use of more lime for the same crops than do soils with a sandy texture.

Two methods are usually used in applying lime: broadcast and drilled. As with other fertilizers, most soils require less of the material drilled than broadcast, as the drilled material is more concentrated. Then the problem of how often to apply lime is in the picture. Should it be applied annually in small amounts or in larger amounts every 2, 3, or 4 years? Apparently, much more research work with lime on the hill soils of Mississippi will be welcomed.

It should be emphasized that these data refer only to the fertilizer requirements of vetch, as measured by vetch yields. When cotton follows immediately after the vetch is removed or turned under, the fertilizer requirements for cotton must also be considered. On most hill soils potash is required for optimum cotton production. This section should therefore be studied in conjunction with other sections of this report, particularly the section which follows.

Which should receive the commercial fertilizer, vetch or the following crop of cotton?

If phosphorus is the major fertilizer for vetch, and potash and lime play less important roles, what are the fertilizer requirements for the following crop of cotton? Should the fertilizer be applied to the vetch or to the cotton?

To find an answer to the above question, the results of two experiments for a 4-year period at two locations are appropriate for use (table 3). Since the results were taken from two different soil types, the results are presented separately. At the Holly Springs Branch Station (table 3A) on Grenada silt loam soil, cotton following vetch fertilized with 500 pounds of 0-8-4 per acre (no fertilizer under cotton) yielded 728 pounds of seed cotton per acre in 1940; whereas 896 pounds of seed cotton was produced when 500 pounds of 0-8-4 was applied

Table 3. Comparison of the effect on cotton yield of fertilized vetch followed by cotton with unfertilized vetch and fertilized cotton, 1940-43

A. Grenada silt loam; Holly Springs Branch Experiment Station, Holly Springs

Year	Fertilized* vetch	Cotton after fertilized vetch	Unfertilized vetch	Fertilized* cotton	Differences
	Yields and increased yields in pounds of green vetch and seed cotton per acre				
1940	3,205	728	1,328	896	168 lbs. increase for fertilized cotton
1941	6,666	940	4,953	1,046	106 lbs. increase for fertilized cotton
1942	3,956	1,436	3,065	1,356	80 lbs. increase for fertilized vetch
1943	9,120	740	7,520	768	28 lbs. increase for fertilized cotton
4-year av.	5,736	961	4,216	1,016	55 lbs. av. inc. for fertilized cotton

B. Savannah fine sandy loam soil; farm of R. M. and W. C. Stinson, Columbus

Year	Fertilized* vetch	Cotton after fertilized vetch	Unfertilized vetch	Fertilized* cotton	Differences
	Yields and increased yields in pounds of green vetch and seed cotton per acre				
1940	1,920	272	1,064	332	60 lbs. increase for fertilized cotton
1941	-------	-------	-------	------	----------
1942	8,348	1,280	4,880	1,328	48 lbs. increase for fertilized cotton
1943	10,000	936	7,840	1,080	144 lbs. increase for fertilized cotton
4-year av.	5,067	622	3,446	685	63 lbs. av. inc. for fertilized cotton

*Fertilizer treatment: 500 pounds 0-8-4 per acre for fertilized vetch, 500 pounds 0-8-4 per acre for fertilized cotton.

under cotton (no fertilizer under vetch) the same year.

This was a difference in 1940 of 168 pounds of seed cotton in favor of fertilizer applied to cotton. The increase for 1941 was 106 pounds of seed cotton in favor of the fertilizer applied to cotton. In 1942 the situation was reversed, and 80 pounds more of seed cotton was obtained where the fertilizer was applied to vetch. In 1943 there was an increase of 28 pounds of seed cotton in favor of the fertilizer applied to cotton. The 4-year average increase was 55 pounds in favor of fertilizer applied to cotton.

There seems to be a trend of gradual increase in cotton following fertilized vetch, and it is possible that in a long time rotation of the two crops a decided advantage may be shown for fertilizing the vetch rather than the cotton.

On Savannah fine sandy loam soil (table 3B) in Lowndes County, Mississippi, a somewhat different answer to the question was given. The 1940 yields of both vetch and cotton were very low. However, by fertilizing the cotton following unfertilized vetch, 60 pounds more seed cotton was obtained than for the fertilized vetch followed by unfertilized cotton. The year of 1941 was a complete failure for both vetch and cotton. The cotton failure was due to lack of sufficient moisture to establish stands until after the 4th of July; the late cotton made good growth, but because of boll weevils there was not a mature boll in the field.

The 1942 yields were excellent for both methods of applying fertilizer. Plots on which the fertilizer was applied under cotton produced 48 pounds more seed cotton than those on which fertilizer was applied to vetch. Also, in 1943 the fertilized cotton was the best, leading with 144 pounds seed cotton increase. The 4-year average, however, was only 63 pounds increase in favor of fertilized cotton following unfertilized vetch over unfertilized cotton following fertilized vetch.

The results of the two experiments are somewhat inconsistent in that the response of cotton to applied fertilizer at the two locations do not agree in every respect; however, the 4-year average increases for the two locations are about the same, 63 pounds and 55 pounds, respectively, in favor of fertilized cotton following unfertilized vetch. Perhaps it makes little difference whether the fertilizer is applied to cotton or to vetch since it is apparent that both vetch and cotton will feed on the residual fertilizer of the preceding season.

How do cotton yields following vetch cut for hay, compare with cotton yields following vetch turned under?

When a full crop of vetch is grown and turned back to the soil, benefits are derived from the leaves and stems above the ground and from the roots in the soil, as well as from the nitrogen the legume has stored in the soil during its growing season. If the leaves and stems are removed for hay, the benefits are from the stubble and roots and stored nitrogen only.

Table 4 shows results of two experiments for 4-year periods which make comparisons of vetch removed for hay and vetch turned under, as measured by the following crops of cotton. The data for crops grown on Grenada silt loam soil (table 4A) show little or no difference in cotton yields following turned vetch or vetch cut for hay the first year, 1940, when the difference of 40 pounds of seed cotton was secured when vetch was removed for hay. For 1941, 248 pounds more seed cotton per acre was secured from turned vetch than from vetch removed for hay. The increase for cotton following turned vetch was 376 pounds more seed cotton in 1942, and 68 pounds more in 1943. The 4-year average increase for cotton following turned vetch was 163 pounds more seed cotton than for cotton following vetch removed for hay.

The data for crops grown on Savannah fine sandy loam soil (table 4B) show somewhat similar results to those obtained on Grenada soils, in that little or no advantage was shown the first

Table 4. The effect of the removal of vetch hay on the following crop of cotton

A. Grenada silt loam soil, Holly Springs Branch Experiment Station, Holly Springs

Year	Turned vetch	Vetch removed for hay	Cotton yield following turned vetch	Cotton yield following vetch removed for hay	Increase
	Yield and increase yields in pounds of green vetch and seed cotton per acre				
1940	3,221	3,205	728	768	—40
1941	7,280	6,666	1,210	962	248
1942	3,380	3,956	1,436	1,060	376
1943	8,880	9,120	740	672	68
4-year average	5,690	5,736	1,028	865	163

B. Savannah fine sandy loam soil, farm of R. M. and W. C. Stinson, Columbus

Year	Turned vetch	Vetch removed for hay	Cotton yield following turned vetch	Cotton yield following vetch removed for hay	Increase
	Yield and increase yields in pounds of green vetch and seed cotton per acre				
1940	1,920	1,920	272	276	—4
1941	failure	failure	failure	failure	
1942	8,348	7,944	1,280	1,128	152
1943	10,000	9,600	936	864	72
4-year average	5,067	4,866	622	567	55

Fertilizer treatment: 500 pounds 0-8-4 fertilizer applied to vetch, no fertilizer under cotton.

Table 5. The effect of commercial nitrogen applied to cotton following vetch removed for hay, 1940-43

A. Soil type, Grenada silt loam

Year	0-8-4* under vetch	No fertilized cotton	0-8-4 under vetch	3-0-0* under cotton	Differences
	Yields and increased yields in pounds of green vetch and seed cotton per acre				
1940	3,221	728	3,504	920	192 lbs. increase for 3-0-0
1941	7,280	940	6,869	982	42 lbs. increase for 3-0-0
1942	3,380	1,436	4,496	1,284	—152 lbs. decrease for 3-0-0
1943	8,880	740	9,440	684	—56 lbs. decrease for 3-0-0
4-year av.	5,690	961	6,077	967	6 lbs. average increase for 3-0-0

B. Soil type, Savannah fine sandy loam

Year	0-8-4* under vetch	No fertilized cotton	0-8-4 under vetch	3-0-0* under cotton	Differences
	Yields and increased yields in pounds of green vetch and seed cotton per acre				
1940	1,920	276	1,992	328	52 lbs. increase for 3-0-0
1941					
1942	7,944	1,128	6,588	1,120	—8 lbs. decrease for 3-0-0
1943	9,600	864	9,120	856	—8 lbs. decrease for 3-0-0
4-year av.	4,866	567	4,425	576	9 lbs. average increase for 3-0-0

*Fertilizer treatment: 500 pounds 0-8-4 under vetch, 500 pounds 3-0-0 under cotton.

year for turned vetch over vetch cut for hay. Both vetch and cotton were complete failures during the second year, 1941. Third year results show an increase of 152 pounds of seed cotton in favor of turned vetch over cotton yields following vetch cut for hay. The fourth year results were also similar to those on Grenada soils in that only 72 pounds more seed cotton was obtained from turned vetch than from vetch cut for hay. The 4-year average results show only 55 pounds more seed cotton following turned vetch than when vetch was removed for hay. It is entirely possible that at both locations the low increases for turned vetch in 1943 were due to dry weather, since it was possible to find undecomposed vetch at harvest time. There was not enough moisture during the growing season to cause decomposition.

Chemical analyses show that considerable quantities of plant food are removed in any hay plant, thus tending toward decreasing cotton yields following such removal of vetch for hay. The decreased yields of cotton were perhaps not enough during the 4-year period to offset the value of vetch hay harvested, but continued over a long period of time the soil might be badly depleted of its plant food nutrients by the annual removal of hay crops.

If vetch is removed for hay, what is the value of commercial nitrogen applied to the following crop of cotton?

When vetch is removed from the soil as hay, the only benefits remaining to the soil are secured from the stubble and roots and from nitrogen stored during the life of the vetch. The question then arises, what is the value of commercial nitrogen applied to the following crop of cotton? Table 5 shows results of two experiments over a 4-year period.

The data obtained on Grenada silt loam soil (table 5A), where fertilized vetch had been cut for hay, show an increase of 192 pounds of seed cotton per acre for approximately 100 pounds of commercial nitrogen (nitrate of soda) for the first year of the experiment. The same

amount of nitrogen the second year increased cotton yields only 42 pounds. During the third and fourth years of the experiment, the unfertilized cotton produced about as much increase as did the cotton receiving 100 pounds of commercial nitrogen the first two years. The 4-year average increase for 100 pounds of commercial nitrogen fertilizer was only 60 pounds of seed cotton. At this location, commercial nitrogen applied at the rate of 100 pounds per acre to cotton following vetch fertilized with 0-8-4 and cut for hay, had but little value over a period of 4 years.

Results of the experiment conducted on Savannah fine sandy loam soil are similar to those on Grenada silt loam. These data (table 5B) show 52 pounds of seed cotton per acre increase the first year for the 100 pounds of nitrogen fertilizer applied to cotton following vetch cut for hay, over unfertilized cotton following vetch cut for hay. Both vetch and cotton failed the second year. The third and fourth year results show no increases for applied nitrogen; and the 4-year average increase was only 9 pounds of seed cotton per acre. At this location, as at the one on Grenada soil, commercial nitrogen alone appears to be of little value to cotton following vetch removed for hay.

How does nitrogen supplied by a crop of unfertilized vetch plowed under, compare with 200 pounds of nitrate of soda per acre?

Complete fertilizer for cotton has been considered a good practice on most of our hill soils for some time. Some farmers practice growing vetch without fertilizer and following it with cotton treated with a complete fertilizer. The question then arises, will unfertilized vetch removed as hay produce nitrogen equal to one-half the amount supplied in commercial 6-8-4 as measured by increased yields of cotton? Stating the question another way, will vetch cut for hay supply half the nitrogen needed by the following crop of cotton?

Table 6 shows results of two experiments for a period of 4 years each, giving annual yields of cotton in a com-

Table 6. A comparison of the effect of 3-8-4 fertilizer under cotton following unfertilized vetch removed for hay, with 6-8-4 under cotton not following vetch, 1940-43

A. Soil type, Grenada silt loam

Year	Unfertilized vetch	3-8-4* under cotton	6-8-4* under cotton	Increase over 3-8-4 under cotton following unfertilized vetch removed for hay
	Yields and increased yields in pounds of green vetch and seed cotton per acre			
1940	1,045	1,080	1,280	200
1941	4,192	982	1,254	272
1942	2,828	1,456	1,696	240
1943	6,960	660	784	124
4-year average	3,756	1,044	1,253	209

B. Soil type, Savannah fine sandy loam

Year	Unfertilized vetch	3-8-4* under cotton	6-8-4* under cotton	Increase over 3-8-4 under cotton following unfertilized vetch removed for hay
	Yields and increased yields in pounds of green vetch and seed cotton per acre			
1940	980	452	524	72
1941	----	----	----	----
1942	4,820	1,272	1,300	28
1943	6,800	1,032	1,084	52
4-year average	3,150	689	727	38

*Fertilizer treatment: 500 pounds 3-8-4 per acre, 500 pounds 6-8-4 per acre.

parison of (1) 500 pounds 3-8-4 applied under cotton following a crop of unfertilized vetch cut for hay and the roots plowed under, and (2) 500 pounds 6-8-4 fertilizer applied under cotton not following vetch. The nitrogen in 500 pounds 3-8-4 fertilizer is equal to nearly 100 pounds of a 16 percent nitrogen fertilizer, such as nitrate of soda; and the nitrogen in 500 pounds of 6-8-4 fertilizer to nearly 200 pounds nitrate of soda.

These data show from 200 pounds to 272 pounds increase in seed cotton per acre for 3 of the 4 years, 124 pounds increase for the fourth year, and a 4-year average increase of 209 pounds of seed cotton, in favor of the 6-8-4 fertilizer treatment without vetch, over the 3-8-4 fertilizer under cotton following unfertilized vetch removed for hay. It is evident that cotton grown on Grenada silt loam soil (table 6A) shows a much greater response to 200 pounds of commercial nitrogen in a complete fertilizer than it does to 100 pounds of commercial nitrogen in a complete fertilizer plus vetch nitrogen obtained from unfertilized vetch removed as hay.

Results of the experiment conducted on Savannah fine sandy loam soil are given in table 6B. These data show 72 pounds of seed cotton increase for 500 pounds 6-8-4 applied under cotton not following vetch, over 500 pounds 3-8-4 fertilizer applied under cotton following unfertilized vetch cut for hay. The 1941 vetch and cotton crops were complete failures. Increases for the full nitrogen ratio in fertilizer applied under the cotton not following vetch, over the half-vetch-nitrogen, half-commercial nitrogen treatment, were 28 pounds and 52 pounds of seed cotton, respectively, in 1942 and 1943. The 4-year average increase was 38 pounds in favor of the 6-8-4 over 3-8-4 plus nitrogen obtained from unfertilized vetch removed as hay.

Even though the increased yields are low and possibly not significant, there is some indication that not enough nitrogen is obtained from unfertilized vetch removed for hay to supply one-half the amount of nitrogen applied in a 6-8-4 complete fertilizer on Savannah fine sandy loam soil. It is definitely not enough on Grenada silt loam soil, when cotton is used as the indicator crop.

It is difficult to obtain data enough and over a long enough period of time to evaluate the efficiency of vetch nitrogen as measured by pounds of seed cotton produced after vetch. It is necessary to have some kind of a yardstick to measure with. For instance, most of the hill soils of Mississippi do not produce good crops of vetch without fertilizer, especially phosphate. Therefore, if the fertilizer is applied to the vetch in the fall, this fertilizer treatment is not directly comparable with spring application of phosphate under cotton.

Then, too, if fertilizers other than nitrogen are applied to the cotton following unfertilized vetch, the vetch yields may not be enough to furnish the amount of nitrogen to be compared with commercial nitrogen applied in complete fertilizer. The question of lime for both vetch and cotton also enters the picture and may play an important role when legumes are grown on the same soils for a long period of time.

If the vetch crop is turned under, will the vetch nitrogen made available to the following crop of cotton, be as good as or better than commercial nitrogen in 500 pounds of 6-8-4 fertilizer applied to cotton not following vetch?

Table 7 shows results of two experiments comparing vetch nitrogen with commercial nitrogen as measured by the following crop of cotton. Comparisons are made of cotton yields following vetch fertilized with 0-8-4, of cotton yields following unfertilized vetch, and of yields of cotton fertilized with 6-8-4 and not following vetch. Results of vetch ferti-

Table 7. A comparison of vetch nitrogen with commercial nitrogen for the production of seed cotton, 1940-43.

A. Soil type, Grenada silt loam

Year	0-8-4 fertilizer under vetch				No fertilizer under vetch			0-8-4 plus lime under vetch			No fertilizer
	1	2	3	4	5	6	7	8	9	10	11
	Yields in pounds of green vetch and seed cotton per acre										
1940	3,205	728	1,280	552	1,328	896	348	5,077	1,056	224	872
1941	6,666	940	1,254	314	4,953	1,046	208	11,461	1,106	148	812
1942	3,956	1,436	1,696	260	3,064	1,356	340	5,476	1,548	148	792
1943	9,120	740	784	44	7,520	768	16	11,280	696	88	560
4-year average	5,736	961	1,254	293	4,216	1,017	237	8,323	1,102	152	759

B. Soil type, Savannah fine sandy loam

Year	1	2	3	4	5	6	7	8	9	10	11
	Yields in pounds of green vetch and seed cotton per acre										
1940	1,920	272	524	252	1,064	332	192	2,228	316	208	276
1941	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1942	8,348	1,280	1,300	20	4,880	1,328	—28	8,996	1,424	—124	584
1943	10,000	936	1,084	148	7,840	1,080	4	10,080	1,192	—108	536
4-year average	5,067	622	727	105	3,446	685	42	5,326	733	—6	349

Fertilizer treatment, 500 pounds per acre; lime treatment, 500 pounds dolomitic limestone per acre.

Column 1. Vetch yields, 0-8-4 fertilizer under vetch.
Column 2. Cotton yields following vetch fertilized with 0-8-4.
Column 3. Cotton yields, 6-8-4 fertilizer (no vetch).
Column 4. Increased cotton yields for 6-8-4 under cotton over vetch nitrogen and residual 0-8-4.
Column 5. Unfertilized vetch yields.
Column 6. Cotton yields following unfertilized vetch plus 0-8-4 under cotton.
Column 7. Increased cotton yields for 6-8-4 under cotton over no fertilized vetch and 0-8-4 under cotton.
Column 8. Vetch yields, 0-8-4 plus lime under vetch.
Column 9. Cotton yields following vetch fertilized with 0-8-4 plus lime.
Column 10. Increased cotton yields for 6-8-4 under cotton over cotton yields following vetch fertilized with 0-8-4 plus lime.
Column 11. No-fertilizer cotton yields.

lized with 0-8-4, with 0-8-4 plus lime, and of no fertilizer for cotton, are also shown.

Grenada Silt Loam Soil

Column 1, table 7A, shows annual and 4-year average yields of vetch on Grenada silt loam soil. These data show fairly good yields for the 4-year period, with a 4-year average yield of 5,736 pounds of green vetch per acre. Column 2 of the same table shows yields of seed cotton following fertilized vetch. These data show yields of 728 pounds of seed cotton per acre for the low year and 1,436 pounds the high year, with a 4-year average of 961 pounds. Column 3 shows cotton yields fertilized with 500 pounds of 6-8-4 per acre (no vetch). These data show 784 pounds of seed cotton for the low year, 1,696 pounds for the high year, and 1,254 pounds for the 4-year average.

Column 4 shows an annual increase in cotton yields and 4-year average increased yields in favor of cotton fertilized with 6-8-4, over cotton following vetch fertilized with 0-8-4. These data show increased yields of 44 pounds of seed cotton per acre for the low year, and 552 pounds for the high year, with a 4-year average increase of 293 pounds. It is interesting to note that at this location the annual increased yields decrease annually from 552 pounds the first year to only 44 pounds the fourth year. This may indicate that over a period of time. fertilized turned vetch might increase

cotton production as well as or better than commercial nitrogen.

Column 5 shows annual yields and 4-year average yields for the unfertilized vetch, the 4-year average yield being slightly more than 2 tons per acre. Column 6 shows cotton yields following unfertilized vetch, 0-8-4 fertilizer was applied under cotton. This is perhaps the only direct comparison of vetch nitrogen with commercial nitrogen, since in both cases the fertilizer was applied directly to the cotton. The vetch was no doubt able to feed on the residual phosphate and potash applied to the cotton, but the cotton grown on the no-vetch plots also had residual phosphate and potash on which to feed. It will be necessary to study columns 3, 5, 6, 7, and 11 in table 7A for this comparison.

During the first year of the experiment the unfertilized vetch (column 5) produced only 1,328 pounds of green vetch per acre. Cotton following this vetch and fertilized with 500 pounds of 0-8-4 per acre (column 6) produced 896 pounds of seed cotton. The 500 pounds of 6-8-4 (column 3) produced 1,280 pounds of seed cotton, a difference of 348 pounds of seed cotton (column 7) in favor of commercial nitrogen over vetch nitrogen. The no-vetch, no-fertilizer plot (column 11) produced 872 pounds of seed cotton, which was almost as good as the vetch nitrogen plot but inferior to the commercial nitrogen.

The second year of the experiment shows 4,953 pounds of vetch (column 5) for the unfertilized vetch plot. Cotton following the unfertilized vetch but receiving 500 pounds of 0-8-4 produced 1,046 pounds of seed cotton (column 6). The 6-8-4 treatment (column 3) produced 1,254 pounds of seed cotton, a difference of 208 pounds (column 7) in favor of commercial nitrogen. The no-vetch, no-fertilizer plot (column 11) produced 812 pounds of seed cotton, or 234 pounds less than the vetch nitrogen and 442 pounds less than the commercial nitrogen plots.

The third year results show 3,064 pounds of green vetch (column 5) for the unfertilized vetch and 1,356 pounds of seed cotton from the plots (column 6) following the unfertilized vetch but receiving 500 pounds of 0-8-4. The 6-8-4 treatment (no vetch) produced 1,696 pounds of seed cotton (column 3), a difference of 340 pounds of seed cotton (column 7) in favor of commercial nitrogen. The unfertilized cotton (column 11) produced 792 pounds, which was 564 pounds less than the 0-8-4 treatment following vetch and 904 pounds less than the 6-8-4 treatment not following vetch.

The fourth year results show 7,520 pounds of green vetch per acre (column 5) for the unfertilized vetch, which is the largest yield of unfertilized vetch during the trial. Cotton following this vetch and receiving 500 pounds of 0-8-4 produced 768 pounds of seed cotton (column 6), whereas cotton without a preceding crop of vetch but fertilized with 500 pounds of 6-8-4 produced 784 pounds (column 3), a difference of 16 pounds of seed cotton in favor of commercial nitrogen over vetch nitrogen. The unfertilized cotton produced 560 pounds of seed cotton, which was 208 pounds less than the 0-8-4 vetch production treatment when the nitrogen was applied, and 224 pounds less than the yield on the 6-8-4 no-vetch plots. The cotton yields were reduced considerably during the fourth year by the preceding vetch and 500 pounds of 0-8-4 was applied per acre, because of extreme drought.

The 4-year average yield for the unfertilized vetch was 4,216 pounds of green vetch per acre. Cotton following unfertilized vetch and fertilized at the rate of 500 pounds of 0-8-4 per acre, produced an average yield of 1,017 pounds of seed cotton. The 500 pounds of 6-8-4 with no vetch produced an average yield of 1,254 pounds, a difference of

237 pounds in favor of commercial nitrogen over vetch nitrogen. The 4-year average yield for the no-vetch, no-fertilizer plots was 759 pounds of seed cotton, which is 258 pounds less than the 0-8-4 treatment following vetch and 495 pounds less than the 6-8-4 treatment not following vetch.

Column 8 shows yields of vetch fertilized with 500 pounds of 0-8-4 plus 500 pounds of dolomitic limestone per acre. These data show yields from 2½ to 5½ tons of green vetch per acre and a 4-year average yield of more than 4 tons. Cotton following this vetch treatment (column 9) produced 1,056 pounds of seed cotton the first year, 1,106 pounds the second year, 1,548 pounds the third year, and 696 pounds the fourth year. The 4-year average yield was 1,102 pounds. Column 10 shows increased yields in pounds of seed cotton in favor of 500 pounds of 6-8-4 without vetch, over 500 pounds of 0-8-4 and 500 pounds of dolomitic limestone under vetch followed by unfertilized cotton. Annual increases were 224 pounds, 148 pounds, 148 pounds, and 44 pounds of seed cotton, respectively. The 4-year average increase was 152 pounds. The increased yields showed a tendency toward a downward trend; that is, the vetch-fertilizer-lime treatment improved in relative position during the later years of the test. Where commercial nitrogen was used as the source of nitrogen, with one exception the increased yields were less than the year before, and the third year increase was the same as the second year increase.

A summary of the results in table 7A shows 4-year average yields as follows:

Cotton fertilized with 500 pounds 6-8-4 (no vetch) produced 1,254 pounds of seed cotton;

Cotton following vetch fertilized with 500 pounds of 0-8-4 plus 500 pounds lime, produced 1,102 pounds of seed cotton;

Cotton following unfertilized vetch but fertilized with 500 pounds of 0-8-4, produced 1,017 pounds of seed cotton;

Cotton following vetch fertilized with 500 pounds of 0-8-4, nothing under cotton, produced 961 pounds of seed cotton;

Cotton neither fertilized nor following vetch produced 759 pounds of seed cotton per acre.

Savannah Fine Sandy Loam Soil

A similiar comparison of vetch nitrogen with commercial nitrogen on Savannah fine sandy loam soil is shown in table 7B. Column 1 shows annual and 4-year average yields of vetch fertilized with 500 pounds 0-8-4 These data show very low yields for the first 2 years of the experiment; however, the yields for 1942 and 1943 were 8,348 pounds and 10,000 pounds, respectively, which are very good yields. The 4-year average was 5,067 pounds.

Column 2 of the same table shows cotton yields following the vetch fertilized with 500 pounds of 0-8-4 per acre. These data, like the vetch yields in column 1, show low yields during the first 2 years of the experiments; however, the yields for 1942 and 1943 were 1,280 pounds and 936 pounds of seed cotton per acre, respectively. The 4-year average yield was 622 pounds of seed cotton per acre.

Column 3 shows yields of cotton fertilized with 500 pounds of 6-8-4 per acre (no vetch). Yields were 524 pounds of seed cotton per acre during the first year and zero for the second year because of cotton failure. Yields for 1942 and 1943 were 1,300 pounds and 1,084 pounds, respectively. The 4-year average was 727 pounds.

Column 4 shows annual and 4-year average increased yields for 500 pounds of 6-8-4 under cotton without vetch, over 500 pounds of 0-8-4 applied to vetch and the cotton unfertilized. These data show increased yields of 252 pounds, 20 pounds, and 148 pounds, respectively, for

the years 1940, 1942, and 1943 in favor of 6-8-4 under cotton. The 4-year average increased yield was 105 pounds of seed cotton per acre in favor of 6-8-4 under cotton. At this location the greatest increase in yields was obtained the first year; and even though the fourth year showed a greater increase than did the third, there was some indication that the nitrogen in the 6-8-4 fertilizer under cotton did not sustain cotton yields from year to year as well as did vetch nitrogen.

Column 5 shows annual and 4-year average yields for the unfertilized vetch in pounds per acre of green weight. Figures in this column are comparable with those for fertilized vetch in column 1, and the differences—an average of about ¾ ton of green vetch—are due to 0-8-4 fertilizer treatment.

Column 6 shows cotton yields following unfertilized vetch, with 0-8-4 fertilizer applied under cotton. This column permits a direct comparison of vetch nitrogen with commercial nitrogen by study in conjunction with columns 3, 5, 6, 7, and 11 in table 7B. During the first year of the experiment the unfertilized vetch (column 5) produced only 1,064 pounds of green vetch per acre. Cotton following this vetch and fertilized with 500 pounds of 0-8-4 per acre (column 6) produced 332 pounds of seed cotton. The 500 pounds of 6-8-4 (column 3) produced 524 pounds of seed cotton; a difference of 192 pounds of seed cotton (column 7) in favor of commercial nitrogen over vetch nitrogen.

The no-vetch, no-fertilizer plot (column 11) produced 276 pounds of seed cotton in 1940, a difference of 56 pounds of seed cotton in favor of cotton fertilized with 0-8-4 following unfertilized vetch, and 248 pounds in favor of cotton fertilized with 6-8-4 (no vetch). The second year, 1941, was a failure for both vetch and cotton. The third year results show 4,840 pounds of green vetch (column 5) for the unfertilized vetch and 1,328 pounds of seed cotton (column 6) receiving 500 pounds of 0-8-4 and following the unfertilized vetch. The 6-8-4 treatment (no vetch) produced 1,300 pounds of seed cotton (column 3), a difference of 28 pounds of seed cotton (column 7) in favor of vetch nitrogen.

In 1942 the unfertilized cotton (column 11) produced 584 pounds, which was 744 pounds less than the 0-8-4 treatment following vetch and 716 pounds less than the 6-8-4 no-vetch treatment. The fourth year results show 7,840 pounds of green vetch per acre (column 5) for the unfertilized vetch. Cotton following this vetch and fertilized with 500 pounds of 0-8-4 produced 1,080 pounds of seed cotton (column 6); whereas cotton not following vetch but fertilized with 500 pounds of 6-8-4 produced 1,084 pounds of seed cotton (column 3), a difference of 4 pounds of seed cotton in favor of commercial nitrogen over vetch nitrogen.

In 1943 the unfertilized cotton produced 536 pounds of seed cotton, which was 544 pounds less than the 0-8-4 treatment and 548 pounds less than the 6-8-4 treatment. The 4-year average yields for the unfertilized vetch was 3,446 pounds of green vetch per acre. Cotton following unfertilized vetch and fertilized with 500 pounds of 0-8-4 per acre produced an average yield of 685 pounds of seed cotton. The 500 pounds of 6-8-4 (no vetch) produced an average yield of 727 pounds; the difference was 42 pounds in favor of commercial nitrogen over vetch nitrogen. The 4-year average yield for the no-vetch, no-fertilizer treatment was 349 pounds of seed cotton, which is 336 pounds less than the 0-8-4 treatment and 378 pounds less than the 6-8-4 treatment.

Column 8 table 7B shows yields of vetch fertilized with 500 pounds of 0-8-4 plus 500 pounds of dolomitic limestone per acre. These data are referred to

elsewhere in this report, but to compare the cotton yields following this fertilizer treatment with 500 pounds of 6-8-4, they are referred to again. Cotton following this vetch (column 9) produced 316 pounds of seed cotton the first year; whereas, cotton fertilized with 500 pounds of 6-8-4 (no vetch) produced 524 pounds, a difference of 208 pounds in favor of 6-8-4 over 0-8-4 plus lime.

The third year, 1942, cotton following the limed-fertilized vetch produced 1,424 pounds of seed cotton, a difference of 125 pounds of seed cotton in favor of 0-8-4 plus lime over 6-8-4.

During the fourth year, 1943, the limed-fertilized vetch was followed by a yield of 1,192 pounds of seed cotton, and the 6-8-4 (no vetch) treatment produced 1,084 pounds, a difference of 108 pounds of seed cotton in favor of 0-8-4 plus lime under vetch. The 4-year average yield for 0-8-4 plus lime was 733 pounds, and the average yield for 6-8-4 treatment was 727 pounds; a difference of only 6 pounds of seed cotton in favor of 500 pounds of 0-8-4 and 500 pounds of lime under vetch over 500 pounds of 6-8-4 under cotton.

A summary of the results in table 7B shows the 4-year average yields as follows:

Cotton fertilized with 500 pounds of 6-8-4 (no vetch) produced 727 pounds of seed cotton;

Cotton following vetch fertilized with 500 pounds of 0-8-4 plus 500 pounds of dolomitic limestone (applied in drill) produced 733 pounds of seed cotton;

Cotton following unfertilized vetch but fertilized with 500 pounds of 0-8-4 produced 685 pounds of seed cotton;

Cotton following vetch fertilized with 500 pounds of 0-8-4, nothing under cotton, produced 622 pounds of seed cotton;

The no-fertilizer, no-vetch plots produced 349 pounds of seed cotton per acre.