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Effect of Leys or Fallow Before Wheat

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The low recovery of the nitrogen of farmyard manure in the crop is associated with a loss of nitrogen and also an accumulation of nitrogen in the soil, only part of which subsequently becomes available to the plant. Thus the fate of 100 parts of nitrogen applied to the soil in the farmyard manure is somewhat as follows :

			<i>Woburn Continuous Barley.</i>	<i>Rothamsted Continuous Barley.</i>	<i>Wheat.</i>
In Crop	..	..	30	20	20
In Soil	..	..	40	25	25
Lost	..	..	30	55	55

Each pound of nitrogen taken up from farmyard manure by the barley crop at Woburn is associated with the production of about 90 lb. of total produce and 60 lb. of grain. For nitrate of soda the figures for total produce are approximately the same, but the quantity of grain appears to be somewhat less.

LEYS AND FALLOW BEFORE WHEAT

In the 1932 experiment in Long Hoos (pp. 142-6), there was little difference in yield whether the wheat followed clover alone or clover mixed with rye grass, but the nitrogen content of the straw, as well as the slight superiority in yield, showed that clover left rather more nitrogen in the soil than clover and rye grass. It made no difference to the yield of wheat whether the clover or the mixture was left growing till autumn to furnish two cuts of hay, or whether it was cut in June and the ground immediately ploughed and given a bastard fallow. The young wheat at first appeared greatly to benefit by the bastard fallow, but it soon lost this early advantage.

So far as the farm is concerned, the clover and rye grass has the advantage that where the clover has failed the rye grass may succeed so that a crop can still be obtained. The rye grass has, however, the disadvantage that it shelters some of the insect pests of wheat, notably the Frit fly *Oscinella (Oscinis) frit* Linn., which may lead to a reduction in the wheat crop. It was indeed, for this reason that many Hertfordshire farmers gave up adding rye grass in spite of its other advantages.

The yields of hay in 1931 and of wheat in 1932 were :

	<i>1 cut ley and bastard fallow.</i>		<i>2 cuts ley, no bastard fallow.</i>		Standard Error.
	Clover.	Clover and Rye Grass.	Clover.	Clover and Rye Grass.	
1931 Seeds, Hay—					
Hay, cwt. per acre	39.8	37.3	52.3	53.4	—
1932 Wheat, cwt. per acre—					
Grain	26.6	26.0	27.6	27.2	0.96
Straw	52.2	50.2	53.1	49.5	1.20
Nitrogen, as per cent of dry matter—					
Grain	2.02	2.00	2.00	1.94	—
Straw	0.61	0.56	0.60	0.57	—

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After neither ley did nitrogenous manuring increase the yield of grain, whether applied in autumn or in spring, indeed the autumn applications somewhat depressed the yield. The straw benefited from the spring applications but not from the autumn applications. Throughout the experiment calcium cyanamide showed a slightly less depressing effect than sulphate of ammonia in the production of grain.

Time when Fertiliser was given.	None	In autumn.	In spring.	In autumn & spring.	Standard Error.
Grain, cwt. per acre ..	27.6	26.3	27.8	25.8	0.56
Straw, cwt. per acre ..	48.7	49.6	54.2	52.2	1.00
Extra yield of wheat from cyanamide over that from sulphate of ammonia—					
Grain, cwt. per acre ..		+0.8	+1.2	+1.5	0.44
Straw, cwt. per acre ..		+0.7	-1.4	-0.3	0.62

This lack of response of wheat to differences in previous treatment and to nitrogenous manuring is probably associated with the circumstance that the yields are all high for Rothamsted (over 52 bushels per acre). The essential features of the experiment are repeated in 1933 in an experiment on Fosters Field, where the level of production is lower and where the conditions therefore approximate more closely to those of ordinary farming. The new experiment also includes a comparison of a dead fallow with the leys and bastard fallows.

The particular design adopted for these experiments has not proved satisfactory. The original treatments—ley and fallows in 1932-3—were in a few (16) large plots each of which was subsequently split up into eight small sub-plots. In spite of the large final number of plots there was low replication of the original plots, and the errors on the comparisons of the different ley effects were necessarily high.

EFFECT OF BASTARD FALLOW IN REDUCING WINTER KILLING OF WHEAT

Dr. Watson has made some interesting observations on the winter killing of wheat. As is well known, wheat plants begin dying soon after they appear, and the fall in number continues throughout the winter and the spring. It was, however, much less marked after a bastard fallow following clover or clover and rye grass cut once only and then ploughed in, than when the crop was allowed to grow so as to give a second cut. The numbers of wheat plants per metre row at the different dates are given in Table V.

TABLE V.—Number of wheat plants per metre row after different crops and manuring.

Date.	After Clover.		After Clover and Ryegrass.		No Nitrogenous manure in seed bed.	Nitrogenous manure in seed bed.
	Cut once.	Cut twice.	Cut once.	Cut twice.		
Jan. 22 ..	45.7	35.7	44.9	38.0	41.9	40.3
Feb. 25 ..	44.0	28.3	41.2	31.3	36.1	36.3
March 22 ..	38.7	27.6	36.8	33.3	33.6	34.6
Aug. 16-20	32.7	26.4	31.1	27.5	29.4	29.5

Approximate number of seeds sown : 60 per metre.

The effect does not appear to be due to the nitrate accumulated during the bastard fallow, since addition of sulphate of ammonia as fertiliser did not alter the numbers of plants. As the summer advanced certain differences set in which entirely compensated for the differences in plant number. The plants in the less densely populated plots tillered better, produced more ears per plant with more grains per ear than those on the more densely populated plots, with the result that at harvest there was no difference in yield between any of the four treatments, in spite of the initial differences in plant number. The later measurements are given in Table VI.

TABLE VI.—Further particulars of wheat plants of Table V.

	<i>After Clover.</i>		<i>After Clover and Ryegrass.</i>		
	Cut once.	Cut twice.	Cut once.	Cut twice.	
<i>Number of Shoots—</i>					
Feb. 25	per metre ..	48.7	31.0	44.9	34.4
	per plant ..	1.11	1.10	1.09	1.10
Mar. 22	per metre ..	64.3	43.2	58.3	52.5
	per plant ..	1.66	1.57	1.59	1.58
April 29	per metre ..	78.7	69.1	71.9	69.6
	per plant ..	3.45	3.58	3.35	3.49
<i>Number of ears at harvest—</i>					
	per metre ..	45.5	44.7	43.5	41.5
	per plant ..	1.39	1.69	1.40	1.51
	<i>Weight of grain per ear, grams</i>	1.136	1.198	1.161	1.204
	<i>Yield, cwt. per acre, grain</i>	26.6	27.6	26.0	27.2

This compensation of winter killing by extra tillering has been observed before on our fields, and is one of the most important factors in steadying the yield of wheat.

BARLEY

Sowing barley late tends to lower the yield and the 1,000 corn weight and raises the nitrogen content. Experiments were made to see if treatment with sulphate of ammonia or superphosphate would mitigate these ill effects, but it did not; neither fertiliser benefited the late sown crop. (Table VII.) A similar result was obtained some years ago with sugar beet; indeed, up to the present we know of no way in which the harmful effects of late sowing can be overcome.

TABLE VII. Effect of date of sowing on properties of Barley Grain. (Plumage-Archer)

	No Fertiliser.	Sulphate of Ammonia	Super-phosphate.	Sulphate of Ammonia and Super-phosphate.
<i>Yield, cwt. per acre.</i>				
Sown—early	25.9	32.9	28.2	32.8
late	23.2	25.3	25.3	26.4
<i>1,000 corn weight (grams) dry.</i>				
Sown—early	47.0	47.2	47.4	46.5
late	44.4	44.2	44.4	44.7
<i>Nitrogen per cent. on dry grain.</i>				
Sown—early	1.70	1.68	1.67	1.70
late	1.80	1.90	1.82	1.84