ROTHAMSTED RESEARCH

The Growing of Lucerne

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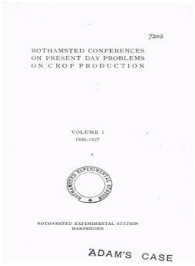

The Spread of Lucerne Growing

Sir J. Russell

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THE SPREAD OF LUCERNE GROWING

By Sir JOHN RUSSELL

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Some eighteen months ago Lord Bledisloe and I decided to take Arthur Young's advice to the farmer of his day "to view some farms in well-cultivated countries and to introduce himself to the conversation of his intelligent brethren, from whom he would be sure to learn something useful." Accordingly we travelled across Canada and the United States to see what farmers were doing and to discuss their problems with the experts on the spot. Wherever we went we found farmers and Experiment Stations busily investigating the lucerne crop—alfalfa it is called there. The developments were remarkable. When I first went to Canada in 1909 the area under lucerne was less than in England; we then had some 58,000 acres. In 1923 Canada had 391,000 acres, while ours had not increased. The United States in 1899 grew 2,000,000 acres of lucerne; in 1924 there were 10,500,000 acres: their acreage has doubled every ten years since 1899. Ours has not: it has certainly increased since the beginning of the century from 48,000 acres to 65,000 acres in 1924, but the increase does not compare with that across the Atlantic.

Inquiry into the reason for the popularity of the crop showed that it had proved of exceptional value wherever farm labour is dear, or where, as in Denmark, production is being intensified. Both these conditions can be found in Britain. The crop has long been grown in certain places; it came into this country with clover some three hundred years ago: clover spread all over the kingdom, while lucerne remained confined to the Continental highway of Kent, Essex and a few parts of the Eastern counties.

One reason for the spread of clover is that the organism living in its root nodules, on which it depends for successful growth, is native to this country and flourishes in our soils, while the organism associated with lucerne is not a native and does not generally occur in the soil, so that the crop starts handicapped if not foredoomed to failure. Those farmers in the Eastern counties who grow lucerne find it invaluable; it will stand for four or five years, giving three cuts a year, two of which can be made into hay, while the third is fed green: and finally when the crop is ploughed out the land is left so rich in nitrogenous organic matter—the costliest of all fertilisers—that it will give a succession of heavy crops with little extra help.

The trouble about the nodule organisms has been satisfactorily overcome by Mr H. G. Thornton of the Bacteriological Department

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here. He has grown the organisms in quantity and has shown how to add them to the soil where they are lacking. The method had to be based on careful laboratory studies, but the testing on the field scale has been done on a number of farms in different parts of the country, an expensive matter which, however, has been rendered possible by the generous support of the Royal Agricultural Society. The method of inoculation is described fully by Mr Thornton in a later paper. The results show that inoculation brings about an increase in crop—sometimes, indeed, makes all the difference between success and failure—and it improves the feeding value of the crop, so that 1 ton of hay from inoculated lucerne is worth as much as 25 or 30 cwt. of lucerne hay grown without inoculation.

The crop has peculiarities and troubles. It is somewhat delicate when young; of all crops it is then the most sensitive to competition: indeed at the end of its first year it often looks so bad that farmers are tempted to plough it up; yet if they would but leave it the second season shows a great difference. The secret of success is to keep down weeds in the first year.

It will not tolerate water-logged soils, nor will it stand a very wet autumn. But it does not need, as some assert, abundance of lime in the soil; only freedom from acidity. The best manures are basic slag and potash. The land must be clean, for weeds are difficult to eliminate once the crop is sown.

The varieties under test are Provence, Grimm and Hungarian. The time of sowing is on some farms the end of April, on others July; probably this latter is the better date, as it allows time for late cultivations to kill weeds.

No cover crop is necessary in the Eastern counties, but in the wetter West it seems desirable to help in keeping down weeds. Where a cover crop is grown inoculation seems especially necessary.

The seed bed should be firm, the tilth fine, and the seed should not be sown too deeply, not more than 1 in. below the surface. The best rate of seeding is not clearly known; it varies on different farms from 15 to 30 lb. per acre. The width between the drills is determined by the weed difficulty; in the Eastern counties it is desirable to set them wide enough for the horse hoe to pass—say, 10 in. apart; in the West it may be better to broadcast the seed on clean land so as to have the ground covered, especially where rain prevents the killing of weeds by the hoe. Some farmers fall between two stools and sow in narrow drills that cannot easily be hoed; this is a mistake. All experience shows that the plant once well established can be heavily harrowed and cultivated and so kept clean.

Conversation with farmers who grow lucerne shows apparently wide differences in practice. These can often be explained as ways of dealing with the weed problem in the first year. But the crop

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is so new that much still remains to be learned, and one purpose of this Conference is to obtain from practical growers accounts of their difficulties, so that the experimental programme can be made to give better and more useful knowledge.

LUCERNE INOCULATION TRIALS

By H. G. THORNTON, B.A.

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The experiments upon which I wish to open a discussion concern the treatment of lucerne seed with cultures of *Bacillus radicicola*, the micro-organism that produces nodules upon the roots of leguminous plants. It has long been known that the organisms living in the nodules are beneficial to the crop, owing to the fact that they build up from the free nitrogen of the atmosphere compounds that the plant is able to utilise.

As long ago as the nineties Nobbe and Hiltner developed the idea of artificially supplying leguminous crops with the nodule bacteria. The early trials of legume seed inoculation gave very variable and unsatisfactory results, but with the extension of our knowledge of the principles concerned there has been greater success in recent years, and the inoculation of certain crops has become a recognised practice in many parts of the world, especially in America and Scandinavia. The failure of the process in the early years of its use seems to have been due partly to faulty technique and partly to its application to unsuitable crops.

In recent years the methods of storing the bacteria in the laboratory have been improved, so that they can now be kept without loss of vitality, and the media upon which they are issued to the farmer have been modified so that, on the new media now used, fresh cultures can be prepared at very short notice.

The exact method used to apply the bacteria to the seed appears also to be of importance, as their activity in the soil may be affected thereby. Recent work in the laboratory has shown that the bacteria pass through a definite cycle of changing forms in the soil. During certain stages in their life-cycle they are actively motile and, in this condition, are able to migrate through the soil. When inoculated seed is sown the bacteria have to pass through the soil to reach the various parts of the root system where the nodules are produced. The timely appearance of the motile forms in the soil is thus of vital importance. The nature of the fluid used to convey the bacteria to the soil influences both the time of appearance and the relative members of these motile stages. It produces a corresponding influence on the migration of the bacteria through the soil,

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