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TREBLING THE WHEAT YIELD.

Lime as a Factor.

By W. A. Hamilton.

The striking lectures by Dr. A. E. V. Richardson should be read by every land worker throughout the State. It would be difficult to express in a few words the full value of Dr. Richardson's addresses, but it is most interesting to hear that if our farmers adopt more scientific methods there is at least a possibility of trebling our wheat yield. This increase does not apply to wheat only, but might be obtained in the production of meat and wool, as well as in wheat. Still further, it might be said, although the matter was not dealt with by Dr. Richardson, that in fruit and vine culture much better results could be obtained if more attention were paid to the practical discoveries of science in relation to these matters. When we are told that Germany during the last 30 years has increased her wheat, oats, barley, and rye yield from 20.5 to 35.6 bushels to the acre, it makes us think that if Germany can make that huge increase, Australia should obtain similar if not equal results. And so she should.

A Prominent Point.

But if there is one point that is more prominent than another in Dr. Richardson's lecture it is in his statement of the deterioration of grass lands, as follows:—"It was a matter of common observation that many of their native pastures showed signs of deterioration, and in some cases the live stock showed evidence of malnutrition. Natural pastures deteriorated through overstocking and injudicious grazing, and the continued removal from the soil of the elements of nutrition by the annual crop of wool, lambs, and fat stock without the replacement of these nutritive elements by means of fertilizers. In addition, in the heavier rainfall districts mineral nutrients, e.g., nitrates and lime, were actually leached out of the soil by the heavy rains." Further, he says:—"The amount of mineral nutrients removed from the land by the annual crops of live stock was considerable. Of these nutrients, the phosphates were of special importance on account of the low phosphate content of Australian soils." It is clear from these two quotations that our natural pastures and cereal lands have an enormous quantity of nutrients, such as nitrates and lime, taken out of them year by year, and it should not be difficult to understand that if we continue to take certain elements out of the soil by cropping or stocking the soil must deteriorate in exact proportion of the amount taken out, unless we put them back again.

Two Causes of Exhaustion.

Later on in the address the doctor points out that while phosphoric acid and potash are firmly held by the soil, nitrates and lime suffer by leaching out as well as by growing crops. Thus it appears that while phosphoric acid and potash have one drain on them, and one only, nitrates and lime suffer from two causes of exhaustion, and this bears out the theory I have promulgated for a long time that while it is undoubtedly necessary to replenish the store of phosphates in the soil it is often more necessary to replace the nitrates and lime. Although it is well known that nitrates may be produced by such plants as clover and peas, and the nitrate content of the land greatly improved by the rotation of crops, there is no natural method known to science that will replace the lime unless it rises from greater depths of the soil, which is doubtful. One of the things that scientists are agreed on is that lime is an essential element for the production of healthy plant life, and as it leaches out by rainfall and is consumed by the growing plants and carried away it seems a logical deduction that if the correct proportion of lime is to be maintained in the soil it can be done only by artificial methods. There is indubitable evidence of a shortage of lime in many of our pastures and wheat lands. About 12 months ago I was in the Bald Hills (Inman Valley) district, which for some years was recognised as the finest grazing land in the State.

Local Producers' Experiments.

An Englishman there, Mr. J. B. Roberts, showed me a paddock on which he had spread about a ton of lime to the acre that year, and he declared that he had fattened more stock on that small paddock than on a much larger area on other parts of his estate. He showed me that the grass there was of a rich and greener nature, also that it was eaten down short, and he then drew my attention to a paddock near by where the grass was more than a foot high, and said that if he turned his stock into the last paddock they would not stop there if they could get on to the paddock that had been limed. The paddock with the long grass had been treated with superphosphate only, and the paddock with the short grass, where he had fattened his stock had been treated with lime. He recommended me to see several of his neighbours. I did so, and they all told me that, although they got large quantities of grass, it seemed to lack the power of fattening the stock. In several cases that I have heard of, and which I know to be true, excellent results have been obtained by using superphosphates only, but I think the weight of evidence will support the theory that if lime be added to the grass lands the superphosphate will have a much better effect than if the lime be omitted. If the soil is lacking in lime super may, and probably will, cause a rank growth of grass, but it will not produce fat, healthy stock. Another sheep farmer in a large way told me a few days ago that on an estate he had recently bought in the Barossa district he had grass from 6 to 12 in. high with sheep running about in it as poor as crows, and he was making efforts to prove that that estate could carry double the number of sheep that it had been carrying the last few years.

Deficient in Essentials.

Although I urged the use of lime, he seemed to think that superphosphate was the thing requird. I fully agreed that there was every probability of a shortage of phosphoric acid in the soil, but pointed out that there was even a greater probability of a shortage of lime. In the absence of an analysis one would be fairly safe in saying that the land was deficient in both of these essentials, and that was why his sheep could not fatten. It seems to me to be utterly impossible to expect rich succulent grass to grow on those lands that have been grazed for many years without lime and phosphoric acid being added to them. Precisely the same argument applies to our wheat lands, and in an article of mine which you were good enough to publish some weeks ago I urged the same point. There is no radical difference between a crop of grass and a crop of wheat, and land must become exhausted by constant cropping or grazing. Towards the end of his lecture Dr. Richardson says:—"The only way to secure a genuine and permanent increase in the output from the land was to improve the farming methods of the country, and apply the teachings of science to every branch of primary production."

Improved Farming Methods.

I think there is little doubt but the farming methods in South Australia have enormously improved the last 30 years, but the question is "Are farmers doing some of the simple things that were well known to practical farmers of the Old Country, who had nothing in the way of artificial manures to help them? I am certain they are not. It is true that the methods of these old farmers were slow, but it is also true that in England alone for at least 1,000 years they almost continually obtained good crops without any of what we to-day would call scientific knowledge. But there was one important thing they did know and practised continually, and that was the use of lime. It is no exaggeration to say that long before the expiration of even 100 years by our present neglect of lime the soils of South Australia will have deteriorated to such an extent that we shall get no crops at all unless the farmers pay attention to at least one simple thing that has been proved for ages, and that is the replacement of lime in the soil. I do not mean by that they should neglect the use of super. That would be nothing short of madness, but it should not be forgotten that while soil is composed of many elements, some of which are unknown, the one thing that should be better known perhaps than any other is lime, and that is the one that is, and has been, the most neglected in Australia.

Neglectful Farmers.

In addition to the addresses by Dr. Richardson, mention should be made of the fine contribution by Professor Perkins at the Agricultural Bureau Conference held at Second Valley on August 6. I regret to say that my experience among the farmers has convinced me that the valuable information concerning the use of lime which has for years been given by the professor has not been taken advantage of to the extent that might reasonably have been expected. Still, there is hope for the future, and as constant dripping will wear away a stone, it is just possible that the farmers are at last waking up to the professor's advice. The following quotations from his last address should be pasted on the outside of every farmer's hat. Referring to the subject of liming the soil he said:—"Lime was an essential constituent of practically all plants, which could only get it from the soil. It was an essential constituent of all the higher animals, and, apart from the soft tissue requirements of the flesh, bones were comprised almost entirely of phosphate of lime. Animals derived their lime ultimately from plants, and also indirectly from herbivorous animals. It was essential to the healthy development of soil micro-organisms in influencing general soil fertility. It was an important fac'or in that it affected the availability to plants of some essential soil constituents, such as phosphoric acid. Lime exercised an important action on the mechanical condition of soils, and particularly heavy soils. When lime was absent soils generally became sour. Some sour soils were characterized by special types of plants that were able to thrive under such conditions. Most plants, and especially cultivated ones, suffered in sour soils."

Striking Proof.

For a striking proof of these words let any one visit Strathalbyn, Belvidere, Langhorne's Creek, Milang, and many other places in the wet, hilly country, and he will see thousands of acres of beautiful land covered with sorrel, a most destructive and useless weed which some farmers are trying to kill with cultivation, and not succeeding worth a cent, as the Americans say. There is only one way to kill sorrel, and that is by sweetening the soil with carbonate of lime, and it requires, as Professor Perkins says, a ton to the acre. But the money so expended will give a rich return to the farmer, and will keep his land in good heart for eight or ten years. I was much impressed with a remark one farmer in the Strathalbyn district made to me last year. "This infernal sorrel," he said, "has got all over my land and I can't get rid of it. I've ploughed it, scarified it, and put sheep on it, and done everything I could think of to kill it, but it seems to grow stronger than ever." I mildly suggested that lime would kill it. "I don't know about lime," he said impatiently, "I've never tried it, but I know jolly well that if I don't get rid of this sorrel, it will get rid of me."

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LIME WILL HELP.

Mr. W. A. Hamilton writes:—

"The striking lectures by Dr. A. E. V. Richardson should be read by every land worker throughout the State. I am afraid, however, that they will not be nearly as widely read as they should be. Judging from my experience among the farmers the last few years it seems to me that the great amount of literature that is poured out for their benefit falls to a large extent, on unheeding ears. It is with a view to stimulating interest in the great subject of increasing our primary production that I venture to offer some remarks on the subject.

"I have often found that where a report of a highly scientific lecture is ignored by the majority a few comments on the lecture itself will draw attention to it, and cause it to be read afterwards with great interest. Hence my reason for this article. It would be difficult to express in a few words the full value of Dr. Richardson's addresses, but it is most interesting to hear that if our farmers adopt more scientific methods there is at least a possibility of trebling our wheat yield. This increase does not apply to wheat only, but might be obtained in the production of meat and wool as well as in wheat. Still further, it might be said, although the matter was not dealt with by Dr. Richardson, that in fruit and vine culture much better results could be obtained if more attention were paid to the practical discoveries of science in relation to these matters. When we are told that Germany during the last 30 years has increased her wheat, oats, barley and rye yield from 20.5 to 35.6 bushels per acre, it makes us think that if Germany can make that huge increase Australia should obtain similar, if not equal, results, and she should. But if there is one point that is more prominent than another of Dr. Richardson's lectures it is in his statement of the deterioration of grass lands, as follows:—

'It was a matter of common observation that many of their native pastures showed signs of deterioration, and in some cases the livestock showed evidence of malnutrition. Natural pastures deteriorated through overstocking and injudicious grazing, and the continual removal from the soil of the elements of nutrition by the annual crop of wool, lambs, and fat stock without the replacement of these nutritive elements by means of fertilisers. In addition, in the heavier rainfall district mineral nutrients, e.g., nitrates and lime, were actually leached out of the soil by the heavy rains.'

"Further on he says:—

'The amount of mineral nutrients removed from the land by the annual crops of livestock was considerable. Of these nutrients, the phosphates were of special importance on account of the low phosphate content of Australian soils.'

"It is clear from these two quotations that our natural pastures and cereal lands have an enormous quantity of nutrients, such as nitrates and lime taken out of them year by year, and it should not be difficult to understand that if we continue to take certain elements out of the soil by cropping or stocking the soil must deteriorate in exact proportion to the amount taken out unless we put them back again. Later on in the address the doctor points out that while phosphoric acid and potash are firmly held by the soil, nitrates and lime suffer by leaching out as well as by growing crops. Thus it appears that while phosphoric acid and potash have one drain on them and one only, nitrates and lime suffer from two causes of exhaustion, and this bears out the theory I have promulgated for a long time, that while it is undoubtedly necessary to replenish the store of phosphates in the soil, it is often more necessary to replace the nitrates and lime.

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