Dr E. Pfeiffer's Address

Given at the Afternoon Session of the Annual General Meeting of the Bio-Dynamic Association to which Members of the Anthroposophical Agricultural Foundation had been invited.
London, Thursday, 13th July 1950.

Dr Pfeiffer began by summing up the results of experience with the Bio-Dynamic measures, namely:- that when they are applied thoroughly they make it possible to run a financially successful farm, and to improve the soil, crops and, health.

Visiting Switzerland this summer, he had been able to see fine looking crops grown by the ordinary methods - grain, potatoes etc. Everything looked perfect; but in the background are cattle diseases such as sterility, tuberculosis and contagious abortion. Fifty percent of the Swiss cattle are tuberculous, and people are warned not to drink raw milk. The animals are diseased, and yet everything looks good. What, then, is the position about human health?

Here we have the problem of deceit in what we eat. Foods should nourish; but as regards the nourishment they supply, our foods are not true any more. This shows up in plant, animal and Man.

From experience one can say that the first effect of changing a farm over to bio-dynamic methods is seen in the improvement of health. Perhaps there may be no increase of yield on changing over but the health of the animals improves. This was observed many years ago before other evidence was available about the effect of bio-dynamic measures.

Take a few facts that illustrate the situation in the raising of cattle, There is much sterility, and one finds cases where, for instance, 40 cows produce only 5 calves. In America and in Europe there are breeding troubles. The average number of services per cow is not less than two. In Ohio it comes out at 1.85 average on good farms, 1,56 on the ten best farms, between 2.0 and 3.0 on the average and even more on poor soils. By contrast, on Dr. Pfeiffer's farm with 30 cows the average is 1.2, and 87% of the cows were in calf with one service. In fact, there are no breeding difficulties on a bio-dynamic farm when the pasture and hay are in good order.

The first thing to deal with is the manure. Here one must do the treatment well, and do it right, at once. All too often the manure piles up in the yard, till it is eventually moved, and then only treated in the field where it is made into a heap. The fermentation of manure, however, starts when it is only three days old. New manure contains vast numbers of intestinal bacteria; they make up some thing like 20% of it. The first to get to work are E. Coli, which break it down causing ammonia to escape; hence the smell of new manure, and the rapid nitrogen loss that occurs. Badly treated manure preserves only a small fraction of its original nitrogen content. This type of

breakdown lasts about six weeks and the nitrogen is then only 50% of the original content.

The bio-dynamic preparations, as well as being the bearers of fine etheric forces, contain particular types of bacteria. They are similar to those which live in stable humus and in earthworm casts. These bacteria all hinder the activities of the intestinal microflora present in fresh manure. Some of them are nitrogen assimilators, and even cause, instead of the loss, an increase of nitrogen in the manure. The best increase that has been obtained was up to four times the original nitrogen content.

This is very important for two reasons. First, because nitrogenous fertilising is expensive. Secondly, because an artificial nitrogen source added to the soil inactivates the nitrogen fixing bacteria. Every bacteriologist knows that nitrogen fixing bacteria do so only on a nitrogen free medium. Similarly, the application of nitrogen to the soil is not good for the bacteria which in turn begin to consume nitrogen instead of fixing it. Therefore we have the choice: - either to work with or against Nature.

The representatives of the mineral fertiliser theory say that the nitrogen balance can only be maintained with nitrogenous fertilisers. This is not true, as experience has shown. In actual practice with properly treated manure, for many years now, the nitrogen problem on a bio-dynamic farm does not exist. It has been found that through the action of the bacteria in the soil and with the bio-dynamic preparations, the nitrate fraction in the soil can be raised from low values to 24, 34, 44 lbs. per acre, and it has even been raised to 220 lbs. per acre. Twenty four pounds is considered high but this can easily be doubled by bio-dynamic methods, In fact one can get too much and has to adjust it the other way! No other method in the world can beat this. But many of our bio-dynamic workers do not yet properly know about it, and do not do it correctly. It is essential that the manure should be treated at once with the preparations, and compost heaps also.

This leads us to "500", all too often its use is 'forgotten' on the farm, Tests show that it is most effective when applied so that the ultimate dilution is one part of '500' to one hundred million parts of soil. It works well enough at a proportion of one to ten million, but should not be applied at more than one in a million parts of soil. This, by the way, is the typical behaviour of many growth stimulating substances, that they are effective only in high dilutions. This was illustrated in a case where a farm worker was unwilling to take the trouble to spray a field. He threw the solution in a corner, saying he had sprayed it. Later, when the field was being examined, he confessed this and said:- You see, it has no effect. That was true: there was no difference between the growth in the corner and the rest of the field. For it to work, the dilution must be right.

In that connection Dr Pfeiffer told of some tests that had been made with bio-dynamic preparations. They had been investigated as regards their bacterial content, mineral and trace'

elements and biological activity. A certain laboratory interested in yeast fermentations had made further tests on the latter. To this laboratory were sent samples of the preparations, diluted with water to one part in a thousand to prevent identification. The laboratory, supposing them to be bacterial cultures, first sterilised them for 5 minutes at 113° C under pressure. Then, on the assumption that they were concentrated samples, they diluted them further, and so it came about that the tests were made at dilutions of one in ten million to one in a billion. At the same time samples of the original herbs, from which the preparations were made, were also tested. Now they found that camomile contained some thing which stimulated the growth of yeast at certain dilutions (1:10 million, less at higher and lower dilutions), but the bio-dynamic preparations worked equally well at any dilution between one in ten million and one in a billion. They doubled the growth of the yeast. Evidently there is a true dynamic effect. The original herbs do not show it in that way.

Now this helps us to understand more of the working of the preparations, independently of dilution. As regards '500', it is important to apply it properly, and to use it straight away when changing over a farm. Otherwise, the compost preparations are not able to be come fully effective. One must do the thing right, and do it in proper sequence. '500' has to be used under all circumstances once a year.

'500' is a necessity. It should be on the land before the compost, treated with #502-507', is applied. Its use increases the bacteria in the soil, and helps it to hold and absorb the manure. Controlled tests show that "500" brings about an increase of organic matter in the soil, and a decrease of acidity. On Dr Pfeiffer's farm at Chester, N.Y., there was in 1947. an acid soil everywhere, with organic matter less than 3% in 23% of the area, and between 3% and 4% on 47% of it. Now (after 4 years) where '500' has been applied, there are no fields with less than 2% organic matter and more than half of those that formerly ranked as poor have increased to good; there is an increase in the area showing 4% to 5%, over two-thirds of the farm now being better than 4% organic matter. But this happens only where '500' is applied properly. One would be a fool not to use it.

Its use amounts to doubling the effect of the manure, reckoning this in tons per acre of organic matter applied on the root crop in the rotation. Here one should remember that in an acre of soil there will be about 1,500 lbs. of soil bacteria, 400 lbs. of earthworms and 750 lbs. of fungi. They produce, in the course of the year, some 40,000 to 60,000 lbs per acre of humus. In manuring we add, say, 20,000 lbs, which is only one half of what the soil itself produces. The pioneers in America had a virgin soil with 5% to 6% organic matter. Now the average is 1.5 - 2%. This can be considered a minimum requirement. On Dr Pfeiffer's farm it is between 4 and 5% after four years. And two thirds of this is produced by the life in the soil. This shows why '500' is essential.

To begin with, it should be applied twice yearly, in spring and autumn. Later, once a year. It should not be applied on dry soil for then there is no active soil life. The life in the soil shows a maximum about April-May, and another in October-November. The best time to apply '500', then, is about March, when the frost is out of the soil and again in the autumn, before the temperature is low enough to inhibit soil life. It should also go on with stubble or green manures, and its use then enables many of the detrimental effects of green manuring to be avoided.

Preparation '501' has a favourable effect only when it is used after 300'. If the '500' has not been applied, it is better to miss 501' for that year. Tests have shown that plants grow weak where '501' has been applied without '500'. In fact to miss '500' or to use '501' when '500' has not been applied, are two procedures equally bad.

As regards reduction of acidity, Dr Pfeiffer's farm, when taken over, showed 45% of the area 'acid' (pH 5 to 5.4.). 25% between 5.5 and 5.9, and only 18% better than 6.0. Now, after four years, only 9% ranks as acid, 20% is 'good', and 22% of the area has a pH of 6.5 to 6.9. To get this result, however, drainage is important. The types of bacteria concerned are mainly aerobic, and the biodynamic process does not work if the soil is crusted or is waterlogged. In fact drainage and aeration are most important. Now Dr Pfeiffer refuses to convert a farm unless the drainage is all right. Twenty years ago this used to be neglected, and as a result the conversion often failed. Now we know why. If there is no field drainage, the subsoiler is essential. It pays.

There was, for instance, a field in Pennsylvania, which was treated with '500' and sown with lucerne. Over two-thirds of the field the sub-soiler was used; not on the remaining third. Ten days after the lucerne was drilled a two months' drought began. It was followed by two months in which rain came every other week. On the two-thirds that were subsoiled, a thick stand of lucerne was established, pastured that year, and next year yielded four cuts followed by pasture. On the remaining third the lucerne died out completely. That was the result of not sub-soiling.

On Dr Pfeiffer's farm clover would not last when he took it over. Now, on all fields properly treated, one can find volunteer lucerne and clover. This is due mainly to the effect of '500'. There was a wet field, not workable until June. It was sub-soiled and is now workable in March and yields two to three tons of clover hay at each cut. We now insist on sub-soiling when a farm is changed over. Heavy clay soils especially, which are not responding too well to bio-dynamic methods, would respond if sub-soiled. The result lasts for 6 to 8 years. It pays

A further effect of 500' is a change in structure of the soil, with an increase of porosity. This effect of 500' has been shown by laboratory tests. It is produced by compost too, and also by the preparations '502-507' if diluted and used as sprays. This was discovered in the laboratory, accidentally. It is a remarkable discovery.

In comparing biodynamic and mineral fertilised crops, one may often note that in May the mineral fertilised ones are further forward than the B.D. At harvest time the picture has changed, for the B.D. crops have filled out and caught up. With a drought the mineral fertiliser is rendered ineffective. The live organic matter in soil holds moisture for a longer period and the B.D. crop has a chance to catch up.

Preparations '502-507' can be diluted in the same fashion as '500' and sprayed on the land in spring, before or just after seeding (sowing). They make available the otherwise unavailable part of minerals, especially the phosphorus and potash in the soil. One gets a quick and fast growth of grain, a kind of pushing action, and is enabled to beat the weather. Here we can compete with mineral fertilisers. Analyses supporting this statement will soon be published.

This procedure, however, is a two-edged sword. For it will, if applied to a poor soil, deplete the soil. It will work only on improved soils with live organic matter. Consequently, after practising this technique, Dr Pfeiffer has to speak of two different applications of the bio-dynamic methods, as follows:

First, the upbuilding of the soil to an organic matter content of not less than 3. For this it is better to apply 10 tons per acre of manure over a small area than 5 tons on a larger one. It has been found, with the lighter, wide spread applications, that often the second or third crop after manuring has been a failure. There should be no half measures about this initial step, but as heavy a dressing as possible should be given, to establish micro-life in the soil. If there is not enough manure, one field at a time must be taken, even if the whole conversion takes that much longer.

If necessary, one should even use fertilisers on the other fields in the meantime until sufficient manure or compost is available. Economically speaking, this is the only possible way. Dr Pfeiffer has tried both ways, and he has learned from his mistakes. His present farm in America paid back from the start, based on past experience. There, he did not actually need to use mineral fertilisers. The conversion phase and the full biodynamic operation are two different things. This is not a compromise. It is something dictated by the situation itself. It has no sense to be fanatical or dogmatic and to lose financially.

When the micro-life has thus been built up the second form of application of the bio-dynamic methods can follow; one can take a chance and use the preparations '502-507' to increase the availability of the phosphorus, potash etc in the soil.

Dr Pfeiffer's laboratory work shows that in this connection mineralised soils, low in organic content, and high organic soils behave quite differently. The entire Liebig theory, on which modem fertiliser practice rests, has loopholes. Liebig himself discovered this at a later part of his life. Towards the end of his life he records how, on a trip down the Danube, he was astonished to

discover that on those rich organic soils the 'NPK' balance did not apply as it did near Goettingen. In fact, the whole Liebig theory only applies to low organic soils, and not to highly organic ones.

In Dr Pfeiffer's fields soil analyses are made year by year in relation to various crops. Now the result of such analyses depends on the time of year. The available potash or phosphate is high in May, low again in August, and high in October. This is some thing that is ignored in the usual routine of soil tests and in discussion of them. One rarely over finds the date of the test given. There is, also, a difference in availability of elements where different plants are growing. The entire work on which mineral fertiliser practice rests is not conclusive.

When Dr Pfeiffer left Europe before the war, he managed to take with him a sample of the new form of wheat, evolved in Holland and Dornach. First it was grown in Maine, then on the present farm, a small piece to begin with, now eight acres. This wheat has grown for 20 years in bio-dynamically treated soils, and has never had mineral fertilisers. Samples of the 1948 crop were sent for analysis to the Institute of Technology in Chicago, Illinois.

The spectrum analysis was made both for major mineral elements and 'trace' elements. The mineral content came out the second highest of any American wheat. (The top was grown on virgin soil in Texas.) The number of elements found was 21, including all the trace elements usually recognised, and even silver. Average American wheats show only 15 - 16 elements. The chemist from Illinois reported on this wheat at a conference in Missouri, and letters began to pour in, one from a Mid-west fertiliser company. They asked to be told the formula of the mineral fertiliser used, and offered to buy the wheat at any price! There were other similar letters. Dr Pfeiffer replied that this wheat had seen no mineral fertiliser for 20 years. There is a great silence now.

A milling organisation mede baking tests with this wheat. It was the best they had tested for years, so they reported.

But to return to soils: in soils with high organic matter content, the minerals are, usually, not quite so available as in those of low organic content, but the soil holds them; they do not get lost by leaching. This is a most important result. In laboratory tests it is found that high organic soils retain their minerals even when washed with five times their volume of water. Whereas minerally fertilised soils can have their minerals (potash, phosphate) quantitatively washed out.

This leads to the concept of Vertical, or Chemical Erosion.

All this can encourage us to intensify the use of the preparations.

One sees here, going through England and Scotland, plenty of signs of Magnesium deficiency, visible at once to the observer trained in these things. Many fields show potash deficiency as well. Even over limestone there is often a lack of lime in the soil. We know that on these depleted soils the use of mineral fertilisers increases their depletion. Then, as a result, the animal manure is also

depleted. On changing over to bio-dynamic methods one needs to use fertilisers to correct this initial depletion. This is not a 'compromise'. There is an absolute deficiency and it has to be corrected. The compost, too, is then not good enough. From this state of affairs many of you have suffered. It is a dangerous situation. Mineral fertiliser is needed as a medicine, not as a fertiliser.

Rudolf Steiner mentions in the Agriculture Course the need for compromises - we need cow horns for the preparations, but not bull horns in our way of dealing with the world. He permitted the use of potassium of magnesia in the conversion phase, but emphasised that nitrogen fertiliser should be left out under all circumstances. We understand now why the sake of the earth and human health as large an area as possible should be treated with the preparations.

The depletion of the soil works through the food on human beings, causing exhaustion, nervousness and other things. To work for the sake of human health is our goal; so that human beings may be able to fulfil their spiritual duties too.

After a lively discussion a hearty vote of thanks was accorded to the Lecturer.

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