The Bio-Dynamic Treatment of Organic Manures and Composts -It's Effects on Soil Fertility and Quality of Produce

Notes From a lecture by Ehrenfried Pfeiffer delivered at Pentre, Boncath, Pembrokeshire March 12th 1936

(this text was reconstructed by a member of the audience from rough notes taken at the time. It is therefore very incomplete and the reader's indulgence is asked)

NB This was Barbara Saunders Davies as from her handwriting

The idea underlying the use of mineral fertilisers is that plants absorb certain substances from the soil and that it is therefore necessary to replace these if fertility is to be maintained. Experience in many places has shown the weak points of such a theory and its disadvantages. In Switzerland, for instance, where excess of potash fertilisers and much liquid manure have been used on the pastures, it has changed the constitution of the plants and the animals that feed on them and as such, great difficulty is experienced in the manufacture of Emmanthal cheese. The fermentation process in the milk have been altered so much that it is no longer possible to make the best quality cheese. This is due to one-sided feeding. Grass on a soil too rich in potash, takes up excessive potassium salts into itself. The normal 2% is raised to as much as 5-6%. This disturbs the balance of salts in the plant and alters its metabolism. This has then a further effect on the digestive system of the cattle. In order to maintain the balance of potassium and soda in the blood, the animal takes up more water and requires more sodium salts. As there is little sodium in its food it is obliged to take it from bone and muscle. The result is diseases such as fragile bones, inflammation of the heart, and meningitus, as well as the quality of the milk being affected.

A further danger of one-sided mineral fertilisation is the effect on the structure of the soil. This is worse in a dry climate and is not noticeable so soon under moist conditions such as prevail here. In time, the texture becomes hard and caked and the surface encrusted and closed.

The soil is also a living organic whole and requires a balance between its easily soluble substances and the heavy non-soluble silicates. If this balance is destroyed the capillarity of the soil is also destroyed. This adversely affects the root development of the plant, especially in dry weather, as insufficient moisture is conveyed to the plant's roots. In wet weather, the water is not so easily absorbed as in a good porous soil, but stands on the surface and runs invariably away, often causing serious erosion. These effects have been studied in the USA and the Alps where the rainfall is often very sudden. In experimental stations in America, stretches of virgin soil have been preserved side by side with intensively, cultivated areas and its difference is very marked. The virgin soil absorbs the rainfall immediately and retains the moisture during draught, whereas the water stands in pools on the surface of the cultivated areas, which have had years of intensive cropping and artificials added. Excessive wet produces soil acidity and results in the appearance of moss and weeds. To ensure good aeration and drainage of the soil it is necessary to increase its content of organic matter, especially humus. In very rich soils as those found in southern Russia, the Middle West, the Nile delta etc. the humus content is as high as 40-45%. Normal agricultural soil contains from 2-5% of organic matter, but of this only about 0.2-0.5% is humus. Organic matter decomposes eventually into carbonic acid, ammonia and nitrogen. What is needed is neutral humus in colloidal state. The

research of Prof. Niklowski in Poland has shown that it is under these conditions that the fine hair roots of plants develop best.

The value of organic manures is well known in England and there is much literature on the subject. Besides farmyard manure, various methods of composting such as the Isodora process are known. But organic manures can be of very different quality according to the way they are treated. Normally, dung loses 50% of its value from the time it leaves the cow till it is finally returned to the land. How can this loss be prevented?

This is one of the main considerations of the Bio-Dynamic system. Rain, Sun and Air are the principle causes of loss of water in manure. The more violent its climatic condition, the quicker the loss. A dressing, of let us say, 10 tons per acre will still be effective three years later in this country. In France, the effect of the same dressing will only last a year. In North Africa, only four months, while in parts of Southern California it will have entirely disappeared in three months.

The first step to be taken is to cover the manure so as to protect it from this loss. Many will complain that this entails more labour but against this must be balanced the increased nutritive value of the manure. Treated under the Bio-Dynamic system the loss of valuable substances is only from 5-7%. Besides, as a result of our system of cultivation there comes about a change in the condition of the surface of the soil. It becomes more pliable thus entailing less work in ploughing and harrowing. For instance, where formally we had to plough twice and harrow three times, it is now only necessary to plough once and harrow twice. This is not an isolated example but is born out of experience on over 30,000 acres of land all over Europe.

Merely covering the manure is not sufficient. All processes of decay do not produce humus and neutral humus in a colloidal state is what is wanted. Earthworms consume decaying organic matter and produce humus which is impregnated with very fine organic calcium secreted by their intestinal glands. Darwin said the fertility of the soil depended on the activity of the earthworms.

The fermentation of the compost or manure heap has to be controlled and directed towards the formation of humus. Take the example of dough. Anyone can take a lump of unleavened dough and leave it for several days. It rises and ferments but bread baked from it, is almost not worth eating being bitter, sour and hard. To obtain a good and sweet fermentation it is necessary to use a special baker's yeast and not rely on wild yeast bacteria in the air. But it is this uncontrolled, accidental fermentation that most farmers allow in their manure or compost heaps though its normal value is sufficient. We have more than twice the usual amount of food for the soil – I say expressly for the soil, for it is not the plants we feed but the organisms in the soil. We stimulate their activity and encourage life in the soil. This is the difference between the biological point of view and that of the chemist.

Quality is of the greatest importance. It is not so much a high crop yield that is wanted but a good crop. It is of little avail to obtain a very high crop of potatoes if half that crop goes bad before the end of the season. It is the same with regards to flowers and fruit for marketing. When the general keeping quality is bad, the prices aren't low, since the dealer is obliged to allow for a large percentage of loss.

When I took over 1200 acres in Holland to work on these lines, the idea was ridiculed and people assured me that quantity was the only thing that was wanted and quality would never pay as people would never take notice of it. However, we started. We also had our own stone mill and wooden bakery for our home-grown Bio-dynamic wheat. The first weeks we baked 50 loaves. Last week, just

before I came over, we were baking 700 a day. In four years, our sales of produce and vegetables etc have risen 8,000 guilders to 65,000 guilders. These facts, I think, speak for themselves.

Recently there has been a published German report stating that there is no difference to be observed between an artificially manured crop and one grown in organic manure. In order to prove the quality of produce I have recently held some lectures and cooking demonstrations in the Hague, Rotterdam and Amsterdam. Two series of vegetables were cooked, some Bio-dynamically treated and others grown in the ordinary way with artificials. The dishes were marked A and B respectively. The dishes were then passed around the audience, who were asked to taste and say which they found to be the best quality and flavour without knowing which series they were eating. 90% chose the Bio-Dynamic produce. This, I think, is a more conclusive reaction than scientific reports.

Treatment of manure, however, is not the only point. It is only half of the BD system. There are other factors to consider, especially what one may call the general biological conditions and the condition of the soil on the farm, the rotations, the balance between arable and pasture, and the types of crop grown, the surroundings and whether the land is flat open land or well wooded and protected by hedges. Hedges are extremely valuable for furthering the decomposition of the soil. A hedge 6 feet high will increase the ground temperature by 6-8 degrees Fahrenheit. (3-4 degrees cent) for a distance of 150 yards. This is very important when early crops are required, a week or so can often make a great difference in market prices. Hedges have a very beneficial effect on the condition of cattle for besides shelter, they also provide a number of wild herbs of remedial nature. Hazel leaves, for instance, in small quantities are good for the digestion and can increase the fat content of the milk from 3.5 to 4 %. We have had to plant hedges purposefully on Dutch farms, though it was not easy. Later in a question as to why hazel leaves should raise the fat content of milk, Dr Pfeiffer said that there was no known reason; but he added that there was little difference between the composition of hazel leaves and that of other plants, such as willow, yet the effect might be explained biologically. The life processes in the hazel were directed towards the ultimate formation of oil in the fruit – the hazel nut. This is not the case with willow. There is a certain analogy between the production of oil in plants and the production of fat in animals, therefore the energy in the hazel which ultimately produces oil, can, when transferred to the animal, stimulates the production of fat. Willow leaves, however, do not affect this process, their biological processes being different despite their chemical composition being very similar.

The question of rotations is extremely important for the condition of the soil and when commencing to work a farm on Bio-Dynamic principals, it is sometimes necessary to alter the existing rotations. In old fashioned countries they are often good but in new countries like America, they are very bad. There, a normal rotation is between maize, wheat, barley and oats continuously. The result is a decrease of 40% in the humus content of the soil in 30 years and the American authorities say that the old fertility can never be restored.

This question is just as important as manuring. A wrong rotation such as 6 years of grain for instance, can completely destroy the organic state of the soil. In between planting exhausting crops, crops should be grown that rest and give back to the soil. Legumes not only produce nitrogen bacteria on their roots but they also secrete certain organic acids which have a very strong action upon the decomposition of the soil. Besides these good effects, their deep roots create and bring life to the sub soil and break up impermeable layers or pans.

One cannot give fixed rules for rotations, so much depends on the individual farm and its needs. A good general rule is 1 year of roots with manure, 2 years of grain and every fifth year at least, a leguminous crop such as clover, Lucerne, vetches (seradella, alfa-alfa) peas, beans or lupins. Flax and

caraway are also extremely good for the organic condition of the soil and help loosen and break it up.

Different countries require different rotations. The system of short lays is good to rest the soil. Old pastures eventually become acid with the resulting development of moss and coarse grass. Good cultivation can, however, cure sick soils.

Our experience of this method in many countries is over a period of 13 years and has shown an especially marked increase in its vitality and resistance of both stock and crops. They become no longer viable to attacks of pests and disease. It is well known, for instance, that much dental decay is due to the eating of white bread. The remedy in this case is obviously not the dentist but attention to proper food so that the natural resistance of the teeth is maintained.

We find that we have no more trouble with fly on root crops as these pests are the result of a disturbed balance of nature and we are careful to consider this question of balance and proportion. To avoid anything in the nature of a mono-culture.

There are also natural ways of dealing with many diseases. American blight on apple trees can be cured by planting nasturtiums around the trees and scrubbing the bark with diluted extract of nasturtium. These plants give off an aromatic secretion from their roots which slightly taints the soil. A minute quantity of this is absorbed by the tree into its sap stream- sufficient to make it distasteful to the aphids. The soils about the base of the trunk where the pest lives during the winter is also made uncongenial.

Planting too deep is another source of danger as if a small part of the stem, destined by nature to be above ground, is buried, it becomes a weak spot and a breeding ground for trouble. Overcrowding is also detrimental as to develop resistance eg if trees need plenty of light and air circulation. It is true that spraying with lead arsenate will kill the blight but it also kills its bacteria in the soil which are so necessary and in time, the soil will become sour and dead. This has happened in vineyards through continuous spraying of copper sulphate. The soil is completely sterilised and poisoned and to bacterial life when used in layers in compost heaps it effectively prevents any decomposition. It requires many years to restore such a soil to normal activity.

The effect of stimulating active biological processes in soil, stock and crops, is to raise their resistance. The first year I took over our Dutch farms, our veterinary bill was £71, last year it was £6.

So, In the first year we had much trouble with heavy calving in our herd of Friesians. They were highly developed cows, fed for high milk production with large quantities of concentrates. Our aim is to be self-supporting and produce all our own fodder. We give very little concentrated foodstuffs and a little linseed cake. The result of this more normal and healthy treatment is that we now regularly have easy births. This winter 4 calves arrived without any help whatever. The cowman found them in the stable in the morning. This you will appreciate is a great saving of labour and expense when perceived, it often necessitated 4 men being on hand for two hours to assist in difficult calving.

As to the rest of running a farm on this system, it does require a little more work as collecting the compost materials and the careful treatment of the manure takes time but this is balanced by the elimination of all artificials.

(In reply to some questions the following points were noted:-)

1) With regard to the dressing of lime to the land to keep down moss in grass.

‘Some soils tend to produce acids which make them sour. Moss then appears. Lime only neutralises this temporarily. What is required is to produce a neutral activity in the soil which will maintain it in this condition. Allowing air to penetrate the soil is good as one then no longer gets the effects of the decomposition of the sour silicate. The surface should be opened, harrowed or raked and a dressing of well-rotted compost applied. The result will be visible in 2 years. (harrow once in Autumn, once in Spring and give compost in Spring.) I would also recommend the use of a BD spray about which I have not had time to speak about today. One of them made from specially treated cow dung, has a stimulating effect on fine root growth and all the active processes in the soil. The other, prepared from finely powdered quartz and subjected to a special process of radiation, acts on the assimilation processes of plants and stimulates firm, sound growth of leaf and stem. Both are sprayed in a very high dilution.

2) Compost made from potato plants or vetch straw is very good for fruit trees and strawberries for instance. It should be applied as a mulch when half rotted, helping to conserve moisture during dry weather.
3) It is important when turning compost heaps to see that the outside layer goes the middle of the fresh heap. The fermentation processes are different in the interior to what they are nearer the surface and it is necessary that all the material should be subjected to the anaerobic conditions of the interior in order to destroy all weed seeds and harmful bacteria.
4) It was asked whether any experiments had been carried out on the nutritive and health giving value for food for human beings grown with such methods.

Such experiments present many difficulties. To test bread for instance, it would be necessary for the subject to live on nothing but bread and water for 40 days. As you can imagine it is not easy to find people willing to undergo such treatment. But we have remarked on an effect on our customers in Holland as many of them have noticed it themselves. The first fortnight that they ate our food, they ate more than usual, but from then onwards their requirements did diminish till they only took two thirds of the quantity that they took normally. The demand remains constant at about this figure and they say they feel equally satisfied and nourished.

Our BD flour, with water and milk, has proved a cure for diarrhoea in babies. It is also recommended by several doctors for intestinal diseases in adults. One spoonful of BD whole-wheat flour in the morning proves to be a good laxative.

We have carried out several feeding experiments with animals such as white mice for example, tested over 3 generations, the mortality of those fed on wheat manured with artificials was 16%. Whereas the mortality of those fed on BD grain was 8%, exactly half.

Further tests with poultry who were given respectively BD wheat or artificially manured wheat as their dried feed, showed a substantial difference in laying, fertility and quality in flavour of the eggs

Chickens fed with artificially manured wheat, one hen produced over 9 months 155 eggs

Chickens fed with BD manured wheat, one hen produced over 9 months 195 eggs

With artificially manured wheat, percentage good after having been kept in straw for 90 days 24

With BD wheat percentage good after having been kept in straw for 90 days 74

With BD wheat 87% of eggs hatched from incubators.

FURTHER HANDWRITTEN NOTES FOUND WITH THE ABOVE TALK by Barbara Saunders-Davies

The interest aroused by Herr Pfeiffer's lecture last year has been maintained. This year his lecture was again well attended, some 60 -70 persons being present, including county agricultural and horticultural advisers and members of the Agricultural Educational Committees of two counties. After tea many of those present went out to inspect some compost heaps and see for themselves the different stages of fermentation. Noting the rough material including a large percentage of broccoli stumps which constituted the heap under instruction. Many found it hard to believe that the already well-rotted heaps, ranging from 5 to 8 months old, had consisted of similar ingredients.

During his stay in Wales Herr Pfeiffer made a number of visits to private farms and gardens of those beginning work on bio-dynamic principles. One of the chief problems in this county where cattle and sheep are the main consideration is the maintenance of good pasture. The natural acidity of the soil, together with its moist climate, favour the development of moss. This condition is aggravated by insufficient cultivation which in turn is partly due to general economic difficulties. Herr Pfeiffer was very favourably impressed by the natural vitality of the soil and thought the truth lay in its general management. He was critical of the practice of leaving the cattle out all winter, which though excellent for the animals, is bad for the land, since it gets no rest and is continually trampled during the wet weather thus destroying its structure. As these buildings would be inadequate to winter the whole of the stock, he suggested as an experiment, dividing the larger fields into two or more sections by means of light portable fencing in order to confine the animals to one area at a time allowing the remainder to rest. It also obliges them to eat down some of the coarser grasses which would otherwise remain untouched.

Herr Pfeiffer considered the land much too good for the large numbers of sheep on it. He thought they were detrimental and pointed out that the grass was noticeably poorer in the pastures where they were grazing due to keeping the good grass too closely grazed.