

Alex Podolinsky

IFOAM¹

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With the exception of some very limited pockets, the Continent Australia suffers a critical deficiency of the essential element Phosphate.

Viewed with the background of the total known remaining Phosphate reserves of Earth (which, at present usage, are quoted to run out in one to two hundred years), the future of Australian farm production is precarious. Especially so, as ever increasing amounts of Phosphate have been applied by farmers - as advised by Government and Company experts - with later additions of Potash, Nitrogen and trace elements. Farmers were encouraged to apply 30% more Phosphate than the theoretically proposed requirement, "to look after the fertility of their soil". Such is ongoing to this day.

No notice seems to be taken regarding the finality of Phosphate reserves. By comparison most other countries of Earth are liberally supplied with Phosphate, and there is less need for the alarm bells to ring. It could well be assumed that even within twenty years Phosphate will become so expensive that wide acreage, low production grain farming in Australia will be unable to compete on world markets.

The large areas of high pH (8 and over) Mallee type, sandy, water repellent soils, both in East and West Australia pose the additional problem of rock phosphate - soluble in acid soils - not becoming available.

The Australian Bio-Dynamic Research Institute (BDRI), and farmers of the Bio-Dynamic Agricultural Association of Australia (BDAAA), and the Bio-Dynamic (Demeter) Marketing Company, accept the responsibility to pioneer biologically and commercially sustainable natural farming systems requiring a low, and mostly recycled, Phosphate input, i.e. not depending on irreplaceable new rock phosphate.

¹ International Federation of Organic Agriculture Movements

Conventional agricultural science has established a system detailing the ideal quantities of major and minor elements to be expected in a “fully supplied soil”. On typical soil analysis report sheets this ideal list appears in one column, whilst other columns show relative amounts present in the particular soil tested. In establishing this ideal, as in analysing individual soils, little or no attention is given to the biological development of soils - which is not adequately accounted for by such as ionic exchange testing.

Conventional science increasingly relies on hypothetical, mechanically inspired models assembled to suit a particular theorem. The basic factors of such agricultural model include:

- Soil seen as medium to hold plants in an upright position;
- a supply of all known major and minor elements in a water soluble form;
- chemicals to treat plant diseases or pests.

One most essential factor lacking in this model is a “Bank” to store the water soluble elements, so they don’t drain into rivers causing well recognised problems such as blue-green algae or poisonous chemical spray residues.

Science can proceed by either establishing hypothetical mechanical models, or by researching into the infinite intelligence of the organization Nature offers.

The Bank lacking in the model of conventional agricultural science (which would be very difficult to conceive or construct mechanically) is not met by so called “slow release” fertilisers. It exists in the organization of Nature as **Humus Colloids** - a substance much maligned as muck and mystics, perhaps, because of lack in attempting to understand it, or of being able to create such humus in soils.

An insight into the humus substance is provided by recognising that humus is a colloid i.e. like a substance encased in a biologically active membrane, able to take in and hold up to 70% of its volume as water, in which soluble elements can be stored. - Worms, for example, digest plant matter containing elements which remain unavailable whilst contained in the leaf or root. During the worm’s digestive process these elements become soluble, but are stored in the colloidal humus of the worm cast.

Nature’s design provides for water soluble elements, taken from parent rock or from recycled substances, to be incorporated into humus colloids. In a biologically active soil no water soluble elements remain within the soil water for any length of time before being encased in colloids. In such active soil, even applied soluble NPK is taken up by worms and microbes and placed in humus. However, this activity reduces with repeated NPK applications and eventually ceases. As result, soil compaction increases.

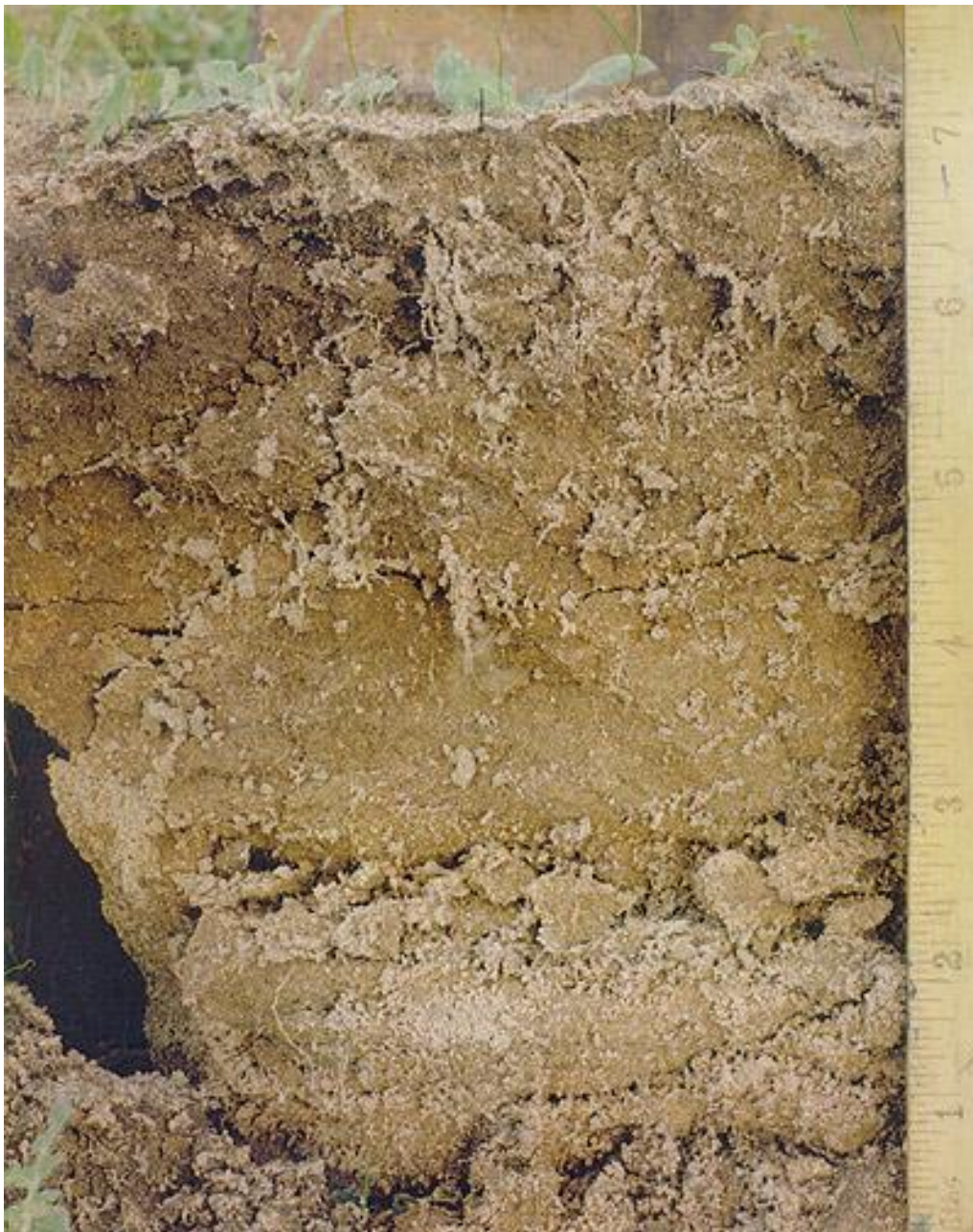
Unlike man or animal, plants have no independent Warmth organization. They rely on Sun Warmth for metabolic stimulation and send white feeder roots to consume the required elements contained in humus. However, the transpiration process should be independent

of this activity. When in leaf, plants have to constantly take in water for transpiration even when Sun Warmth is absent and coldness decrees not to take in elements. That reveals the need for soil water to be free of water soluble elements - unlike the condition created by “artificial” fertilisers or by equally water soluble “organic” manures.

Justus von Liebig was correct in establishing that plants can only take in water soluble elements. But at the end of his life he was disheartened by the evident beginning signs of “mechanising” his discovery by overuse, i.e. by pushing excessive, and, quality wise, defective plant growth with an artificially forced supply of elements.

Wise Nature’s design avoids oversupply.

Picture 1 shows a very compacted clay loam. Sparse weed growth on top; hardly a root; like a rock face with cracks.



Picture 1: Compacted Sandy Loam

Picture 2 shows the same soil as Picture 1, **one** year later. The soil was ripped approximately 30cm deep, to make access for the most important substance in biologically active soil - air. A seed mixture was broad cast and harrowed in, and the biodynamic 500 spray inclusive of the biodynamic compost preparations was sprayed in Autumn and Spring. The newly established soil structure and a darkening made up of humus colloids is visible.



Picture 2: Same soil of Picture 1 after one year under Bio-Dynamic management.

50 years ago interested and communicating Victorian Agriculture Department scientists queried as to what part of humus could be taken in by plants and suggested it could only be the humic acid. I filled a glass jar with pure 500 humus and buried it, open, 8cm below pasture in Spring time. Six weeks later the entire humus substance had disappeared and was fully replaced by white hair roots similar to those visible in Picture 2.

We distinguish between the older, darker, mostly vertical brown water intake roots, and the newer white feeder hair roots. The latter take up humus, inclusive of the soluble elements contained, only when Sun Warmth revs up the plant metabolism.

But look to the bottom of the white hair roots in Picture 2. You will see the beginnings of darker humus development below the root tips. Exudation from white roots stimulate new humus development.

In Nature's organization, the dark water intake roots constantly supply the leaves with transpiration water which should not contain soluble elements. Whilst only when Sun Warmth so decrees, do white roots take up soluble elements out of humus. Thus, according to Nature's design plants assimilate, say Nitrogen, only under the controlling jurisdiction of Sun Warmth. Then Nitrogen is converted to valuable protein. No excess of Nitrogen appears as oversized, dark green-blue leaves indicative of Nitrates and Nitrites: tasting bitter and causing methaemaglobinaemia, acetonaemia, sterility, blue babies - all documented for decades.

When, with artificial or false organic fertilisation, soluble elements are placed into the soil water and are taken in with the uptake of water for transpiration (i.e. outside of Sun jurisdiction) plants are force fed with indiscriminate quantities of elements beyond their capacity of assimilation. Such unhealthy plants are attacked by bugs and fungae, which is Nature's positive response to get rid of what is sick.

Not assimilated elements are stored in plant cells as salts. Cells need to maintain a balance between salt and water, or the salt poisons. With forced salt intake, cells have to store excessive water. This explains the oversized and artificial blue-green leaves of many plants today. Such oversized plants transpire considerably less water than the smaller, unburdened by salt, equivalent plants grown to nature's design.

Plants are made up to approximately 3% from elements taken up by roots. The largest component of a plant is water. All that is combustible on Earth, inclusive of coal, gas and oil, originated in the leaf, where Cosmic Sun Energy combines with CO₂ from the air and transpired water. With reduction of transpiration the leaf function is affected.

The leaf is the only physical organization on Earth creating new physical substance. A vital function, which not only creates all

combustible matter, but, all the vital plant substances essential for human health, and for future existence on Earth.²

Widely recognised and pictorially shown in “Bio-Dynamics Agriculture of the Future” and in the “FIBL Lecture 2004”, soil compaction has become an enormous problem. The soil volume of the top meter on the Volga flats has reduced by 30%, which would mainly be the air component. For this reason compacted soils can not perform as Nature designed, i.e. poor structure; very little worm or microbial activity; poor water intake and water holding capacity (also causing flooding); poor drainage (causing salt to rise due to Sun induced capillary activity); etc, resulting, most importantly, in very little, if any natural humus production.

Such “soils” suit the explanation for the purpose of soil used in the conventional “model”, and are utterly dependant on the inputs conventional agriculture proposes. But a biologically active soil, with a constantly active humus base, does not. Research into plant food requirements would show: how little plants require, not the conventional: how much.

A comparative test undertaken in the early 1990’s by the then senior Victorian Agriculture Department soil researcher, and an associated Government Veterinarian, compared over 40 soil, 40 plant and 40 carcass tests taken from 10 biodynamic dairy farms to those from 10 conventional dairy farm neighbours, with results as follows:

- Bio-Dynamic farms for average of 16 years no inputs of fertilizers or chemicals. Conventional farms all the common inputs;
- No NPK or chemical discharge from Biodynamic farms, plenty from conventional;
- One irrigation on Biodynamic farms, 2½ - 3 on conventional;
- No deficiencies found on Biodynamic farms of any major or minor elements etc.;
- Gross milk output on conventional farms slightly higher, but net income on Biodynamic farms better (only poorly researched);
- No ecological assessment made or costed;
- No examination of CO₂ stored in root mass or as humus in biodynamic soils, compared to the compacted soils which contribute to a colossal CO₂ pollution in air. (A comparative ratio of 500:1 has been measured.);
- Cattle on Biodynamic farms healthier, with longer productive lives;
- No liver fluke without drenches being used, compared to conventional heavily drenched cattle;
- A “mathematical” loss of Phosphate on Biodynamic farms “calculated” without a deficiency being established. (A Sydney University dissertation elucidated the soil researcher’s report.)

These results were denied publication by the Victorian Agricultural Department.³

² For more detailed explanation, please refer to “Cosmo-Earthly Ecology and Green Manure” DVD

There are many Biodynamic farms even on Mallee sands, producing grain and wool without inputs for many years or decades, and some with occasional small inputs of Phosphate or Potash as a “medicine”.

A large Mallee grain and sheep farm - accessible to you by car or bus in 3½ hours on the Victorian/South Australian border - before converting to Biodynamics in 1984, had a soil Organic Matter level of 0.33% (as assessed by an independent laboratory in Adelaide). After two years of Biodynamic Management this had risen seven times and has stabilised over the years at 2½ to 3%.

Conventional testing is unable to adequately differentiate between “organic matter” and humus. In our assessment the increase to 2½ - 3% is as humus colloids, distributed throughout, not as “organic matter”.

On this farm, with an annual average rainfall of 30cm, a summer green manure volunteers after crops are harvested. On neighbouring conventional farms weeds are sprayed out “to stop competition for water”. Conventional neighbours apply 22kg of Phosphate per hectare per crop. On the Biodynamic farm 2kg of recycled Phosphate per hectare are applied. If summer green manure did not volunteer, due to lower than average rainfall, 3kg per hectare are used.

Recently this farmer reported: “At sowing time in early May with good moisture levels in subsoil but dry in top 8cm, three neighbours and I sowed wheat at the same time. My wheat germinated and was out of the ground in 10 days. After 15 days none of the neighbours had germinated. We received no further rain till 15th July. At this stage still none of the neighbours had germinated. I asked one whether they had used a chemical incorrectly. “No” was the reply. “It just wasn’t wet enough to come up”. It is now 15 days since the rain and still very little of the neighbours’ crop has emerged. Maybe the seed has reduced in viability as it has sat so long without germinating. By contrast my crop is 25 to 30cm high, weed free, and promising.”

This speaks for the water holding capacity of humus colloids. On a similar sand farm in Western Australia a Latrobe University dissertation assessed, amongst much else, the humus water holding capacity of a Biodynamic farm in comparison to a conventional neighbour.

District agronomists of the Victorian Mallee farm recently called a widely attended meeting regarding the economy of each farm – in drought times. Only the Biodynamic farm was improving. The highest quality grain (produced in spite of drought) receives premium reward from the Biodynamic Marketing Company.

Due to results on the Biodynamic farm these agronomists have adopted the term “colloidal organic matter”. Here I hold a typical sample of “organic matter”, namely dry peat moss. You see me pouring it out. (Dust falls.) Even if wetted this substance is like sand and would not hold moisture. By comparison, here is a lump of

³ Further details of this study, and also CO₂ sequestration may be found at www.demeter.org.au, Case Studies 2 & 3.

colloidal humus – biodynamic preparation 500. It would not dry out in many weeks. To speak of colloidal organic matter avoiding the term humus is nonsense.

Salt redemption on the mentioned Western Australian farm shown on government aerial photos taken over years are published in my lecture “Living Agriculture”. Once soil structure has been established, and therewith renewed drainage, salt recedes to below the root zone, where it was held before modern farming caused soil compaction.

Apart from the Mallee farm already discussed, I have offered the conference organisers for visits by conference guests – a 3000 layer chicken farm on Kangaroo Island, which has been Demeter certified for grains, cattle and sheep over 2 decades. Chickens are held overnight in home made portable sheds of ideal design, with Maremma dog guards. An entirely “closed” production unit - all grain, lots of pasture (rotationally managed), and pulses, home produced. Also offered is a 600 acre orchard and market garden farm near Mildura. I expect that the “Four Leaf” farm and mill at Tarlee just north of Adelaide is also offered to guests of IFOAM. It is one of the best managed large properties in Australia, inclusive of pioneering work in engineering, mill and other important equipment design, and wide ranging grain and associated product developments, and marketing of top quality products

If Agri-**Culture** is to have a future, an unbiased realistic assessment of the scientific and educational direction of Agriculture is required. The design of Nature has to be viewed seriously. The “cleverness” technology provides, enabling gene manipulation across Kingdoms of Creation, causing, for one, root exudation, releasing poisons used to force plants to accept foreign genes, have been proven to hinder soil biology, i.e. affecting the humus forming natural white hair root exudation visible in Picture 2. And further extension of abstract proposals such as “Genetic Algorithm Programs” will only prolong the agony.

60 years ago science was still about systematic knowledge on the basis of an exact observation. The latter has been replaced by a “working hypothesis” and “knowledge” has been replaced by eventual “statistical evidence”.⁴ Thalidomide stopped nausea in pregnancy. “Side effects” were not known. The same applies to the vast majority of medical drugs and agricultural chemicals.

⁴ This subject is addressed in detail in the Lectures “Living Knowledge” and “Ad Humanitatem”.