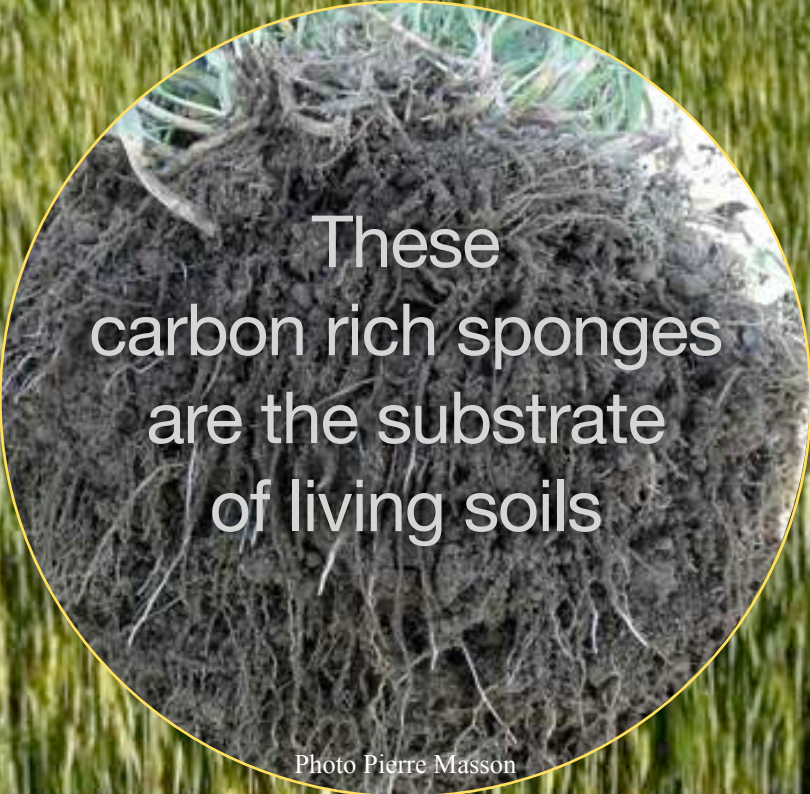


# *Biodynamics*

a promising road to tomorrow's  
sustainable agriculture



These  
carbon rich sponges  
are the substrate  
of living soils

Photo Pierre Masson



Ulrich Schreier





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## The first consciously organised organic movement

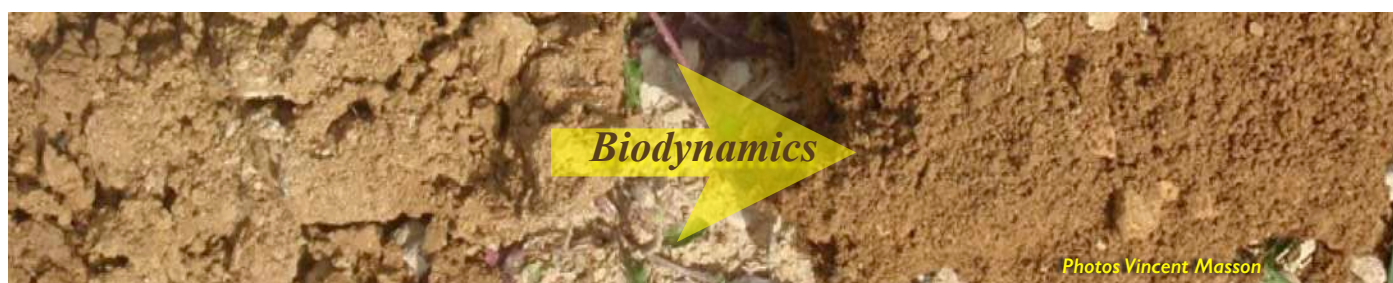
Inspired by Rudolf Steiner in 1924, biodynamics was the first consciously organised organic and agroecology movement and first in 1928 to certify its products by creating the Demeter trade mark. Through a more profound and holistic vision of nature, biodynamic agriculture tries to work in close harmony with its laws in an attempt to improve both the quality of its products and its environmental impact.

In some respects the elder brother of organic agriculture, biodynamics continues to be an important source of inspiration for many farmers and gardeners. This is the case in particular with respect to plant extracts, certain weed and pest management techniques and the work with the biodynamic solar, lunar and planetary calendar.

Present on all five continents biodynamics is well established in Australia, India and in the German speaking countries. In France it is well known for its excellent results in viticulture and is now practiced by many internationally renowned vineyards. The results are often spectacular: improved soil life and plant health, increased humus levels and improved behaviour of the vines during wet or dry spells, less soil erosion, a favorable environmental impact, as well as enhanced taste, aromas and overall quality of the wine.

As can be seen from the results in viticulture where it is a great help in running a vineyard organically, but also in many other areas, biodynamic agriculture is able to restore worn-out soils with minimal resources and in a very short period of time. In addition, by building up soil structure and humus levels, it helps trap large amounts of carbon dioxide.

Being a prime candidate for to developing a truly sustainable and largely autonomous agricultural system, it appears urgent that biodynamics gets to be more widely known not only by farmers, consultants and researchers but also by government representatives and the general public. It is with this goal in mind that the present document has been put together. Enhanced by many photographs, illustrations, references and internet links, it deals with the origins of biodynamics, the vision it is based on, some of its key aspects and most importantly it shows many of the **outstanding results with regard to soil development, vigour and health of plants, taste and nutritional value of its products** (see pages [15](#) to [27](#) for soil and plant photos).





## Healthy soils for a healthy life

"No activity, not even medicine,  
is as important for our health, as agriculture"

[Pierre Delbet](#) (1861-1957),

Member of the French Academy of Medicine

This basic principle which has guided biodynamics right from the start, is making headway and is being confirmed by more and more scientific studies. With the slogan "**healthy soils for a healthy life**" in its "**2015 International Year of Soils**" campaign,



the [FAO](#) is sending a strong message across the planet. Soil, agriculture and food are not just a matter of proteins, carbohydrates and calories for nourishing our physical bodies. They also have a direct bearing on the environment as well as our health, feelings and psychological well-being. This in turn affects

our thoughts, emotions, our choices and priorities, our behaviour and the way we organise our lives. Is it far fetched then, to imagine, that the same may be true at other levels namely a family, a social group, a region or even a whole country?

## Restoring life and fertility to our soils

"The history of every nation  
is eventually written in the way  
it cares for its soils."

Franklin D. Roosevelt, U.S. President 1933-1945

Biodynamic Agriculture tries to establish a good balance and optimum health at all levels of the biological pyramid. Considering that Mother Nature and our soils have deteriorated to such an extent that they are unable to recover by themselves, Biodynamics feels that it is high time that we acquire a new and more profound un-



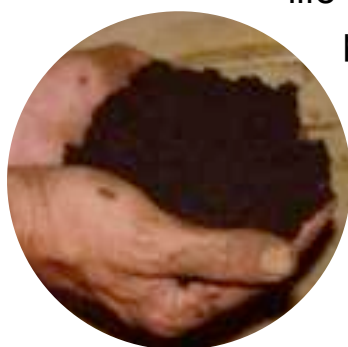
**Australian Pasture** (see also page 16) : with its improved structure the soil gains in nitrogen compounds and organic matter content (carbon sequestration) which in turn increases fertility (improved productivity and crop quality), porosity (better air and water circulation), stability (less erosion) and water retention (less prone to drought and flooding). Between the soil on the right side image which has reached a high level of auto-fertility and the one on the left from the neighbor's paddock under conventional management, the difference in carbon storage is more than 100 t/ha of C or more than 360 t/ha of CO<sub>2</sub>. For just one hectare of well managed agricultural land this works out to the equivalent of the annual CO<sub>2</sub> emissions of about 200 cars !

derstanding of the laws governing Life and Nature. This is crucial for restoring the vitality and fertility of our soils, the foundation of the good health of both plants and animals, the two basic pillars of the physical and emotional well-being of Man, ... and, for that matter, of any prosperous nation and civilisation.

It is an open secret known by most agronomists and farmers who have experienced the ease of growing crops after the land has been rejuvenated by perennial crops such as alfalfa or long term pastures: well balanced soils teeming with life are easier to cultivate and combine good water retention and drainage, minimum erosion, good productivity and ***little pressure from weeds, diseases and predators***. Since only animals, in particular herbivores, can turn rough forage from pastures and certain crops into food for humans, livestock seems to be an important part for developing an economically viable and truly sustainable agricultural system.

## The Biodynamic Preparations are the corner stone of Biodynamics

An enlarged view of Life and Nature has led to the elaboration and use of a series of catalytic substances which are a key part of Biodynamics. By improving soil life and fertility they act on various essential processes at work in Nature, notably



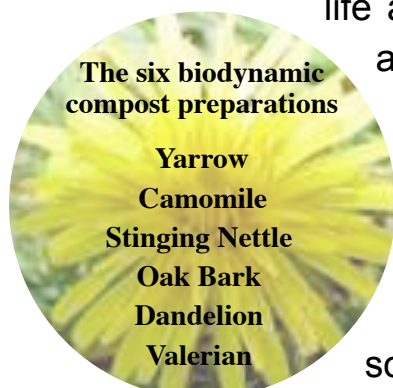
Preparation 500P (horn manure)  
made from cow dung.  
Destined for the soil, it acts  
on life and structural forces.

those related to key elements in agriculture, such as Silica, Lime, Potash, Phosphorus, Sodium, Nitrogen, Hydrogen, Oxygen, Carbon and Sulphur. These biodynamic preparations are added to compost heaps or liquid manure to improve the quality of the fermentation and recycling process, or, stirred in water (potentised), are sprayed on the soil and on plants.



Quartz crystals for producing the  
preparation 501 (horn silica).  
Applied to plant leaves it is  
related to light, photosynthesis  
and structural forces

The various preparations which are derived from the plant, animal and mineral realms, specifically from quartz, cow manure and certain medicinal plants, stimulate the life and organisational forces of plants



The six biodynamic  
compost preparations

Yarrow  
Camomile  
Stinging Nettle  
Oak Bark  
Dandelion  
Valerian

and soil and help compensate for imbalances between Earthly and Cosmic influences — climate shocks or a lack or excess of rain or sunshine, for example. By stimulating root development and soil life they also help improve soil structure, humus build-up (carbon



Added to between 30 and 40 liters  
of water the preparation 500 (100 g/  
ha) and 501 (4 g/ha) are stirred  
for one hour and then sprayed on the  
soil (500) or on plants (501).

sequestration) and a more harmonious plant-soil interface. This leads to better plant health and more nutritious crops having more refined aromas and taste as well as better keeping qualities.<sup>1</sup>

Biodynamics also proposes a series of innovative methods and remedies that aim at reducing weeds and pests. In addition to the biodynamic preparations which already help in this respect, they include substances derived from these potential trouble makers as well as an attempt to organise the work schedule in harmony with solar, lunar and planetary influences as referenced in the biodynamic calendar.

The methods for making the biodynamic preparations are in the public domain and are not subject to the drawbacks of a commercial secret or exorbitant costs. They can be purchased or made individually or collectively by joining a group of biodynamic practitioners. For optimum results, they should be of good quality and be associated with sound agricultural practices such as low till cultivation techniques, minimum soil compaction by heavy machinery, [agroforestry](#) and sound crop rotations including companion cropping, cover crops, multi-species green manures, perennial crops and long term pastures. In addition, the presence of livestock on the farm, in particular a herd of cattle, is a great asset for achieving an optimum economical and ecological balance.

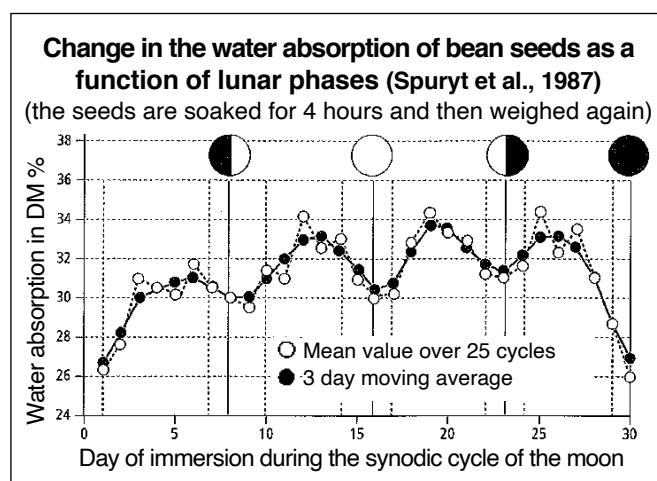
## Cosmic influences

“What drives life is a little electric current, kept up by the sunshine”

Albert Szent-Györgyi

Without turning it into a dogma and whenever it is compatible with weather conditions, the work load and sound agronomical principles, biodynamics tries to take advantage of certain cosmic influences.

The sun of course is the dominant force nourishing life on our planet. But by taking a closer look, we notice that most living organisms also react to the much subtler influences related to the moon, the planets and certain stellar constellations. Even though they are secondary and quite subtle, their impact on water and on living systems can be shown easily with standard analytical tools and/or holistic methods such as morpho-chromatography, copper-chloride crystallisation or bioelectronics (measurement of changes in pH, redox potential and resistivity). In particular moon phases, lunar nodes, eclipses, planetary constellations and the passage of the



<sup>1</sup> Appendices A, B and C on page [15](#), [24](#) and [28](#) have numerous images showing typical biodynamic soil, plant and root development when working with horn manure (500P) and horn silica (501).





moon in front of the twelve signs of the Zodiac can give rise to measurable reactions (see appendix F on page [32](#) for more information).

Since the sun's influences are dominant, its daily and seasonal rhythms are an important element in running the farm. Work directed towards above ground parts of plants is done if possible in the morning when the sap rises. On the other hand, if the soil and the roots are concerned, the preferred time is after 3 pm and in the evening. Leaf sprays e. g. are applied early in the morning, whereas soil sprays are put on in late afternoon. As a result, horn silica (501) is sprayed in the early morning hours and horn manure (500 and 500P) late in the day. The grass for making hay is cut early in the morning when the sap rises. The same is true for harvesting leaf vegetables and many medicinal plants. Root vegetables such as carrots and potatoes, on the other hand, are picked preferably late in the day when the sap descends. For tillage, hoeing, planting and sowing late afternoon and evening hours are best.

The lunar and planetary influences which are the most obvious, the most widely studied and the most widely observed are related to seed germination, plant development, fermentation processes and the keeping quality of agricultural products.

## **Agricultural practices that respect Nature and Animals**

An enlarged view of nature taking into account supersensitive and cosmic influences creates a heightened sensitivity and respect towards the Living World and makes us aware of the strong ties that connect man to the plant and animal kingdoms.



Farm animals, the faithful companions and servants of man since the dawn of time, are at the heart of the farmer's concerns. Their well-being is a top priority and he does his very best to nurture and protect them, making sure that their basic needs are met in a way that reflects respect and gratitude at all levels, including

their bodily integrity: cattle keep their horns, pigs and sheep their tails and poultry their beaks. Cow horns, for example, are considered to be an important organ that contributes fully to the physiological health of this ruminant. By being linked to the digestive processes, they appear to have a beneficial influence on the nutritional and organoleptic qualities of milk, butter, cheese and meat.

The level of production is geared to the biological capacity of an animal. For most breeds of dairy cows, for example, an annual milk volume of 4 to 5,000 liters appears reasonable and makes it possible to feed them with mostly rough forage. This type of fodder, in particular if it has had the benefit of the biodynamic preparations, is ideally suited for their digestive system and promotes not only good health but also yields high-quality milk which, without the use of sophisticated technology, can be easily turned into a large variety of dairy products.

### **Each farm has its unique personality**

The vision of a farm as an independent, living organism and integral part of the agricultural and social landscape leads inevitably to a new way of looking at farming methods, the farm setting and of course, the role of the farmer. Forests and wetlands, hedges and copses, flora and fauna, social and cultural aspects are all considered to be important parts of the farm organism and deserve similar attention as do fields and meadows, livestock and crops, orchards and beehives, machinery and economic factors. The farmer does not only think of himself as just a technical expert, but also as a keen observer — a kind of “Symphony conductor”, striving to establish harmony in the overall farming organism and to endow it progressively with its own unique personality.

### **A better balanced and more autonomous farming organism**

Biodynamics tries to limit inputs from outside the farm by adopting cultivation, crop rotation and fertilisation techniques which promote a high level of soil life and soil fertility. Paired with an approach to livestock management and nutrition which respects the physical requirements and the well-being of animals, this leads to a well-balanced farm organism and a high degree of self-sufficiency. In addition, it protects the farm from all sorts of problems from the exterior: seed and fodder contamination, mad cow disease, hoof and mouth disease, bird flu, swine fever, and all sorts of other bacterial and viral infections or major genetic defects.

Striving towards a high degree of autonomy, market gardening is often of prime importance on biodynamic farms (see page [21](#)). Much more productive than open field agriculture and potentially less resource intensive and with a more favorable environmental impact, this form of vegetable production has many strong points that



make it a prime candidate for feeding the World. In addition, in part aided by the high quality of the food produced, it is an ideal vehicle for building strong ties with consumers and the local community. In this regard, many biodynamic farms are linked to [CSA](#) groups. Born in the US out of biodynamic movement in the mid 1980s, these groups usually participate in organisational tasks, may take part in farm work and often help with land ownership and investments issues, pre-financing of the production process and risk sharing. Introduced in France in 2001 under the name [AMAP](#) (Agriculture pour le Maintien d'une Agriculture Paysanne), there are now close to 2000 of these groups here, totaling around 350 000 members and providing food for close to a million people.

Land surface needed for the production of one kilo of :		
Boeuf, y compris forage production	Beef including forage production	323 m <sup>2</sup>
Boeuf de pâturage	Pastured Beef	269 m <sup>2</sup>
Poisson	Fish	207 m <sup>2</sup>
Cochon	Pork	55 m <sup>2</sup>
Poulet d'élevage	Chicken	53 m <sup>2</sup>
Œuf	Eggs	44 m <sup>2</sup>
Riz / Pâtes	Rice and Pasta	17 m <sup>2</sup>
Pain	Bread	16 m <sup>2</sup>
Légumes / Pommes de terre	Vegetables & Potatoes	6 m <sup>2</sup>

Source : WWF Suisse

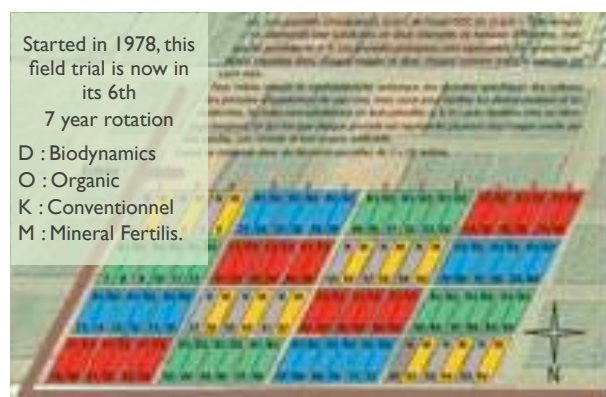
With biodynamics the surface areas are much smaller but the general tendencies are similar.

## The value of Biodynamics is confirmed by many studies

"No one can deny the reality of a fact" <sup>2</sup>

Over the past 90 years, Biodynamics has amply demonstrated its effectiveness, the undeniable reality of cosmic influences and the often startling effects of tiny quantities of its preparations on both soil conditions and on the development and health of plants (see Appendices A , B, C, D and F - pages [15 to 23](#), [24 to 26](#), [27](#), [28](#) and [32](#)). Beyond clear evidence seen on farms or reported by scientists who have contributed to the development of this form of agriculture and gardening, the great value of the biodynamic approach is confirmed through numerous studies conducted by private and government backed organisations in several European Countries, North America and Australia.

In 1978 the Research Institute for Organic Agriculture in Frick, Switzerland ([FiBL](#)) has started a long-term comparison between biodynamic, organic and two modalities of



conventional agriculture ([DOK-Trial](#). [DOK-Trial-Update](#) The study which is now conducted in partnership with the Federal Institute of Agroecology is laid out on a 4 hectare field with 96 subdivisions. Despite conventional cultivation techniques and the small size of the plots, biodynamics comes out on top on many key parameters: higher organic matter content, lower

<sup>2</sup> The lack of a satisfactory theory to explain a phenomenon does not mean that it does not exist. Or else, there would be neither gravity, nor energy, nor life!

acidity (higher pH), better soil structure and stability (lower tendency to erosion, compaction and crusting), a higher level of microbial and enzymatic activity, better root development and a greater presence and diversity of soil organisms. In addition, the biodynamic plots receiving only the preparations but no fertiliser for over 20 years challenge the input-output theories of conventional agriculture (see Appendix C - page 27). Holistic analytical methods — including [Copper chloride crystallization](#), morpho-chromatography (im-



Organic matter ties soil particles together resulting in a good and stable structure. In the spring when the soil is not yet completely covered with vegetation, the soils in the **DOK study** show a clear difference in structure and tendency to crusting, compaction and erosion. The difference in structure is particularly pronounced between the biodynamic plot (on the left) and the conventional/mineral plot (on the right).

Photos : Thomas Alföldi (FiBL)

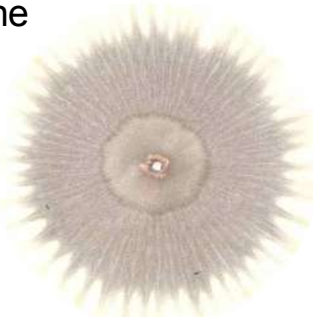
age forming methods developed by [Ehrenfried Pfeiffer](#) – see Appendix



Copper-chloride crystallization:  
Image of a white wine from a  
biodynamic vineyard  
© Helen Mortensen

D -page 29) and [Alfred Popp's](#) photoluminescence, designed to highlight organisational forces and the constitutional harmony of plants and agricultural products —led to a clear and reproducible distinction of biodynamic products ([SCIENCE Vol 296 , 31 May 2002 : Soil fertility and Biodiversity in Organic Farming](#) ; Report on DOK study) .

Other studies show the positive effects of the biodynamic preparations on wheat germination ([Hagel 1988](#)) — carbon dioxide absorption by plant leaves (photosynthesis effect ([König 1988](#)) — nutritional and keeping qualities of vegetables ([Abele 1978](#), [Elsaidi 1982](#)). A recent study on the consumption of Demeter certified food in a German monastery showed an improvement in health parameters as well as in the physical and emotional well-being of the participants ([Monastery Study K.Huber and al. 2005](#)).



Morpho-chromatogram  
of a biodynamic vineyard soil  
© Soin de la Terre

## Biodynamic farming around the Globe

Biodynamics is the oldest consciously organic approach to farming and gardening, and possibly the most sustainable there is. Present on all five continents, it has influenced many of today's major organic movements. Starting out in Switzerland and Germany in the mid-twenties, its early development has been mainly in the German-speaking countries, Scandinavia and Australia. In 1947, [Alex Podolinsky](#), one of the pioneers of Biodynamic farming, emigrated to Australia, a country known for its poor soils and difficult climatic conditions. Based on his work, biodynamics covers now around a million hectares with farms ranging in size from small market gardens with a few acres up to large ranches covering in excess of 10.000 hectares. In a relatively short time soils which were worn out and compacted due to poor



management have been turned into fertile pastures and crop land (see page [16](#)). Part of the crops harvested on these rejuvenated soils are exported to Japan and Europe where they are sought after by quality conscious buyers.

SEKEM in Egypt is another initiative where biodynamics plays a key role. Founded in 1979 by [Ibrahim Abouleish](#), an Egyptian Medical Doctor and Chemist and the recipient of the 2003 [Alternative Nobel Prize](#), this unique project unites cultural, social and economic initiatives and includes more than 800 small farmers and several enterprises and partner organisations. [SEKEM](#) ([www.sekem.com](http://www.sekem.com)) has inspired many innovative projects around the globe sharing freely its experience and unique know-how.



This is farm owner and member of the Sekem cooperative

## Demeter: world wide trade mark for biodynamic products since 1928

Precursor of the organic movement and first to clearly identify its products, biodynamic agriculture has created the [Demeter](#) Trade Mark named after the Greek Goddess of fertility. Conforming to the organic standards of the various host countries, its guide lines go considerably beyond and include additional criteria addressing farm organisation, seed selection, animal care and the application of the various biodynamic preparations.



Especially in the German speaking countries and in Scandinavia, Demeter is well known. Enjoying an excellent reputation, prices for its products can be 20% or more above those for regular organics. The premium for bread wheat, e.g., is often between 10 and 25%.



## Biodynamic agriculture in France

In France, where biodynamics is practiced on about a thousand farms<sup>3</sup>, a multitude of associations and private organisations are involved in its development. Helped greatly by the Australian impulse of [Alex Podolinsky](#) which brought notable improvements in the quality of the biodynamic preparations, in the effectiveness of the



Photo Internet

<sup>3</sup> **No need to adopt any particular believe system or ideology:** Motivated by the results seen at some of their peers, more and more farmers and in particular wine growers adopt biodynamic principles in a highly pragmatic way, often limiting their approach to some of the guide lines from the biodynamic calendar and the application of certain of its sprays : horn manure (500 or 500P), horn silica (501), herb teas, plant decoctions or plant macerations. Part of Rudolf Steiner's Agricultural Course in 1924, cosmic influences (biodynamic calendar) and plant extracts are now common place with many organic and even a few conventional farmers.

stirring equipment, in many of the basic practices and, above all, with regard to the results in soil and plant development, its progress has accelerated considerably since the late 1990s. Thanks to the great help in managing a vineyard organically, and the improvement of the quality and the authenticity of the wine ([AOC](#)), Biodynamics has acquired a certain prestige in viticulture where more and more vineyards, including some of the big names<sup>4</sup>, have gone to biodynamics. In an effort to promote "authentic" wines which truly express local geological and climatic conditions ([Terroir](#)), Nicolas Joly, owner of the famous "[Clos de la Coulée de Serrant](#)" and well known protagonist of biodynamics, set up "[La Renaissance des Appellations](#)" ([Return-to-Terroir](#)), an association which now includes more than 200 wine-growers from around the world.



Photo  
Romanée-Conti

Biodynamics is also making major inroads into market gardening in particular on farms with direct marketing as well as [CSA](#) and [AMAP](#) involvement. Being close to their customers, food quality and taste as well as financial, economic and social ties tend to be important factors in these situations. They often include joint investments, interest free loans, pre-payments, risk sharing arrangements and new forms of land ownership.

In January of 2015, ***Soin de la Terre***, an association whose roots go back to 1995, has set up a research laboratory near Cluny. Engaged in field trials and in the further development of biodynamics, it is also attempting to build a bridge between conventional analytical techniques and holistic methods such as [Bioelectronics of Vincent \(BEV\)](#), Observational Soil Assessment, and [Morpho-Chromatography](#) which give a better insight into the overall functioning and the organisational forces of living systems (see page [29](#) and [32](#)).

## Outlook

A [holistic](#) view which is the corner stone of Biodynamics makes us realise that ***nature and agriculture are intimately related to all human endeavours*** and that they are the basis not only of food, clothing, housing and our economy in general, but also of the environment we live in, our physical and emotional well-being, our social and cultural life.

<sup>4</sup> **Le Figaro** of 22-01-2013 : [Mythe des mythes : la Romanée-Conti](#) : The vineyard is organic since 1985 with 7 ha in biodynamics for a long time. Since 2007 all grapes are grown biodynamically without using this fact as a commercial argument, but because 'it results in a better wine'. (note : [Romanée-Conti](#) is considered by many wine connoisseurs to be the World's top vineyard!)

**Decanter Magazine** ([Internet issue October 13, 2014](#)) ; Since last vintage, [Roederer's](#) Cristal and Cristal Rosé have been exclusively produced from biodynamic vineyards. —The house's chef de cave, Jean-Baptiste Lecaillon, said biodynamic methods 'add a pureness and extra vibrancy to the wines'. (note : [Cristal de Roederer](#) is considered by many experts as being the World's foremost Champagne.)



Being interested not only in agronomical, ecological and economical issues but also in social and cultural aspects, biodynamics is uniquely positioned for making constructive contributions towards solving many of the problems which take center stage in today's debates on agriculture, food, health, environment and social issues: soil regeneration and fertility — choice and safekeeping of seeds and cultivars — control of weeds, crop diseases and predators — animal well-being — food quality and conservation — the soil-food-health connection — contamination of food, water and air with toxic chemicals — malnutrition and hunger issues — proximity agriculture with localised food processing and distribution — social organisation and the role of farmers in the food production and landscaping process — preservation of our rural heritage — economic and financial imbalances — sustainable agriculture — carbon sequestration — climate change — droughts and floods — water shortages — energy and raw material waste — depletion of world's phosphate deposits — protection of the environment and natural resources, in particular biodiversity, agricultural land, water and air. Only through holistic approaches as they are proposed by biodynamics can we hope to come up with credible cures for the headaches, entanglements and dilemmas that keep haunting us.

Based on its ability to regenerate worn-out and compacted soils in a very short time and with very few resources, Biodynamics seems destined for a major role in perfecting current organic systems, as well as in helping develop ***the truly sustainable Agriculture of tomorrow***, an Agriculture where life, balance and health dominate over fighting diseases, predators and weeds.



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[Lily & Eugen Kolisko](#) were two outstanding scientists in the early phases of biodynamic research

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Active Perception (Gavemer Publishing 1990 available from [BD Growing](#))

[Bio-Dynamics : Agriculture of the Future](#) (Biodynamic Research Institute)

[2011 Conference](#) (Biodynamic Research Institute)

DVD : [Wine the Green Revolution](#), Prize Winning Documentary Film by Guillaume Bodin

[Biodynamic Growing Magazine](#), PO Box 315, Dumbalk, Victoria 3956, Australia; 2 issues per year as paper or E-versions

 The French version of this document: [La Biodynamie : un chemin prometteur vers l'agriculture durable de demain](#)

 The German version of this document: [Biodynamik: ein vielversprechender Weg zur nachhaltigen Landwirtschaft von morgen](#)

## Internet Links

[Biodynamie Services](#)   [BD Growing](#)   [Demeter International](#)   [Biodynamic Research Institute](#)

[Ecodyn](#)   [UK-BD Association](#)   [US-BD Association](#)   [Soin de la Terre](#)

## Note

In view of its rapid development and its favorable impact on soil, the environment, plant and animal health as well as the quality of our food, ***it appears urgent that biodynamics gets to be better known*** not only by farmers, consultants and scientists but also by government officials and by the general public. Put together with this goal in mind, this document can be shared freely over the internet or in print form. To make sure that people always have access to its latest version, it is recommended to share it via its [URL link](#) rather than a PDF file. In case of using only certain parts of the document, please always always cite the source of the information and in particular the names of the people who took the photographs.

Commentaries, “**Practical Experiences**” and comparative studies are always welcome. These should contain a detailed description, important observations, photographs and, whenever possible, analytical data.

Taking into account the rapid development in Biodynamics and to give the document a "living" hue, its e-version will be updated on a regular basis. The latest version is always available at the following URL address: [http://www.vernoux.org/biodynamie/Biodynamic\\_Agriculture.pdf](http://www.vernoux.org/biodynamie/Biodynamic_Agriculture.pdf)

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2015 - updated September 2021





## Appendix A : Impact of the Biodynamic Preparations



Soil cores from an Alsatian vineyard (Silica rich soil).

[Enlarge](#) ↑

Above : biodynamic soil

Below : adjacent conventional plot

photo Pierre Masson 2003

Excerpt of the FIBL Science publication [Science Vol 296 - May 31,](#)

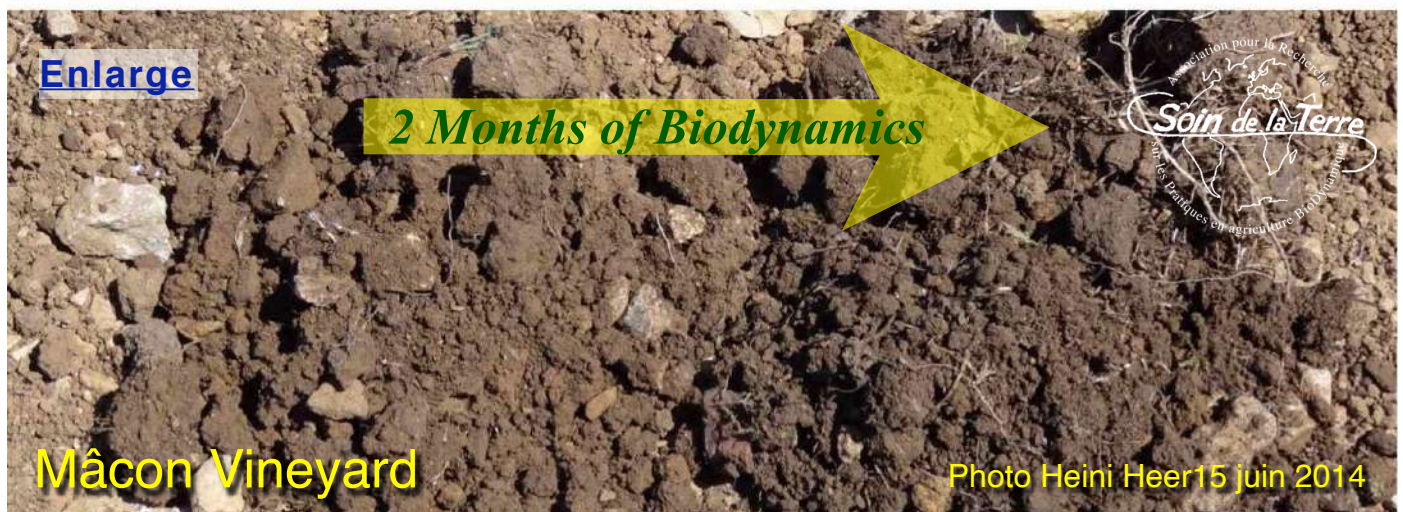
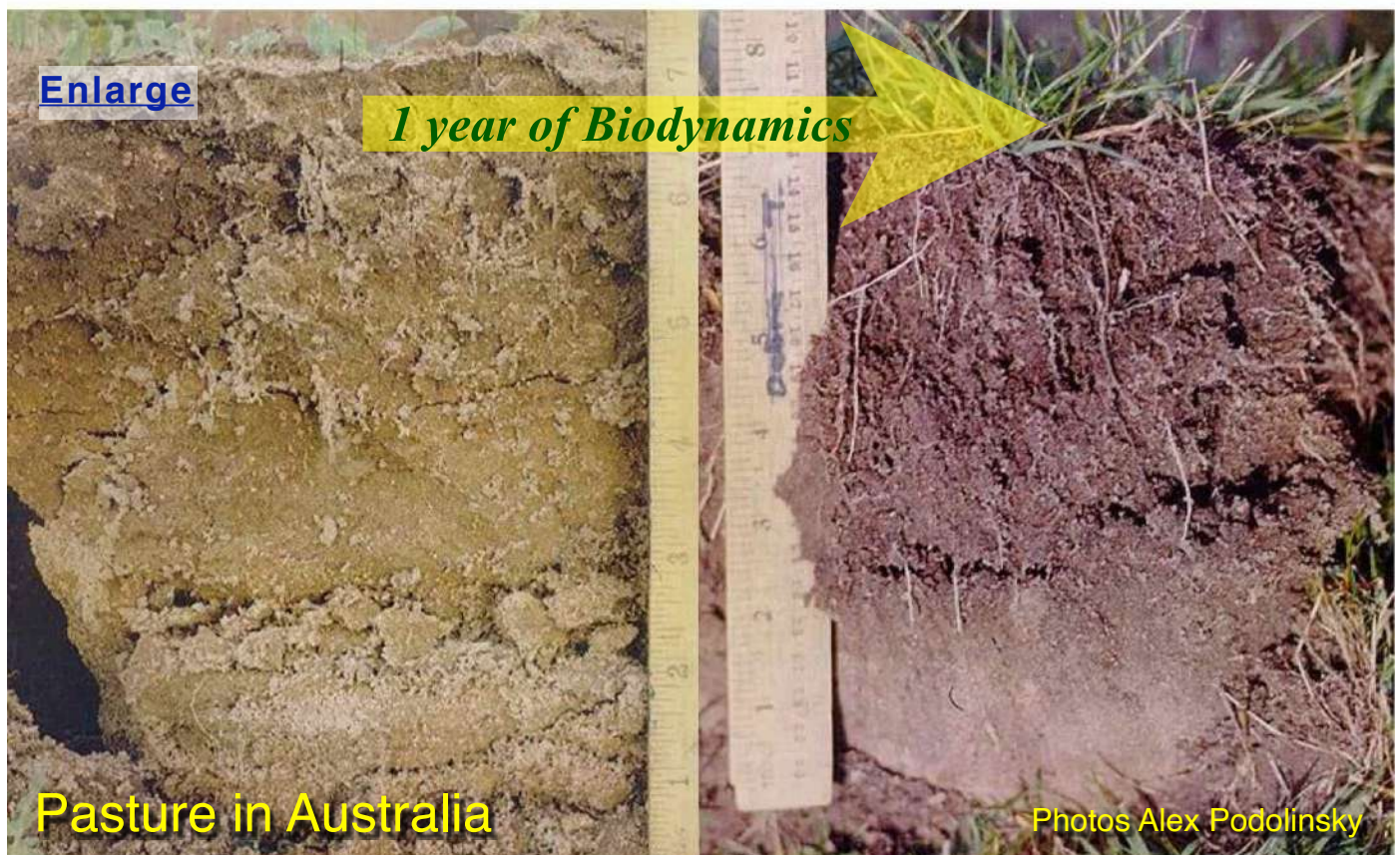
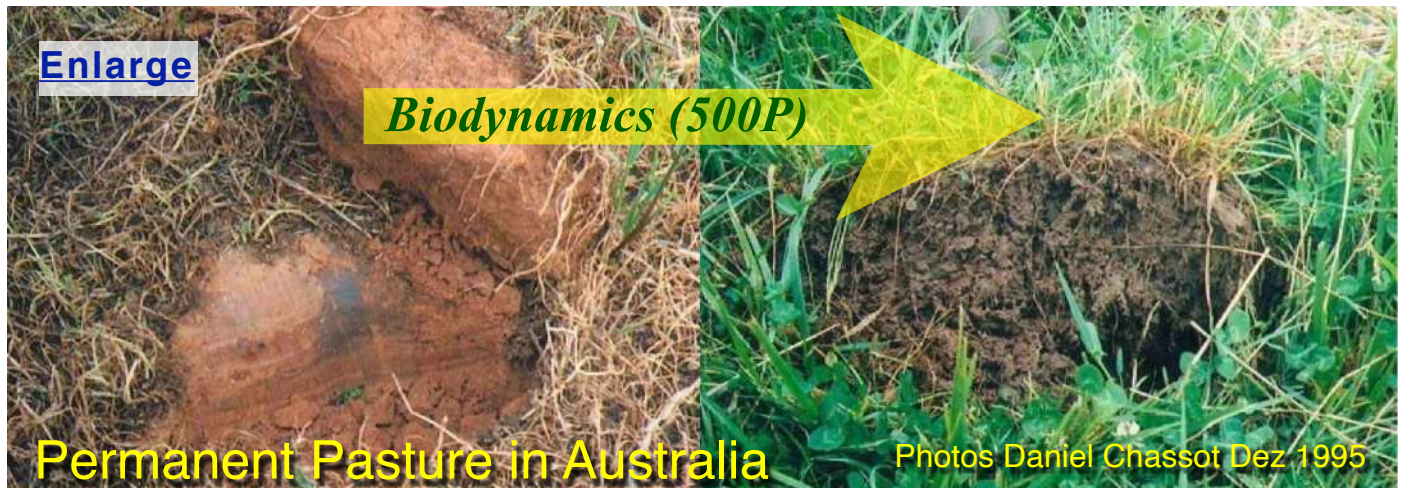


**Fig. 3.** Biodynamic (A) and conventional (B) soil surface in winter wheat plots. Earthworm casts and weed seedlings are more frequent in the biodynamic plot. Disaggregation of soil particles in the conventional plots leads to a smoother soil surface. Wheat row distance is 0.167 m. Source: T. Alföldi, Research Institute of Organic Agriculture [Forschungsinstitut für biologischen Landbau (FiBL)].





# Soil Regeneration with Prepared Horn Manure





## Champagne Region (chalky subsoil) - Soil Development after 3 Years of Biodynamics

Crop Rotation : Wheat (2010/11), Flax (2011/12), Einkorn (2012/13)



### Comparison plot (organic)

- without 500 or 500P
- 06-06-2013 : preparation 501

#### Commentary

- compact structure
- relatively light color
- poor root development
- few olfactory aromas

[Enlarge](#)



### Preparations 500 et 501

- 09-11-2012 : preparation 500
- 24-04-2013 : preparation 500
- 06-06-2013 : preparation 501

#### Commentaries

- improved soil structure
- darker color
- improved root development
- more olfactory aromas
- some non-decomposed straw

[Enlarge](#)



### Preparations 500P et 501

- 09-11-2012 : preparation 500P
- 24-04-2013 : preparation 500P
- 06-06-2013 : preparation 501

#### Commentaries

- good porous soil structure
- dark color
- good root development
- rich and refined aromatic smell
- good digestion of straw

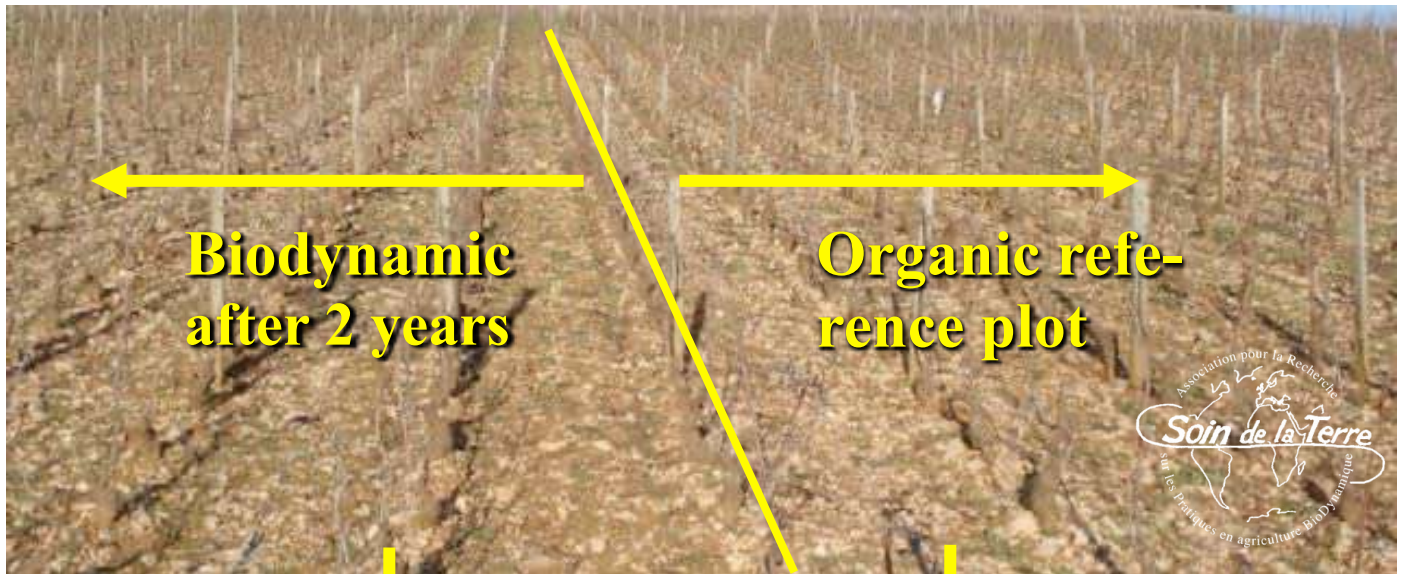
[Enlarge](#)

Profiles taken on July 30 2013 under very dry conditions

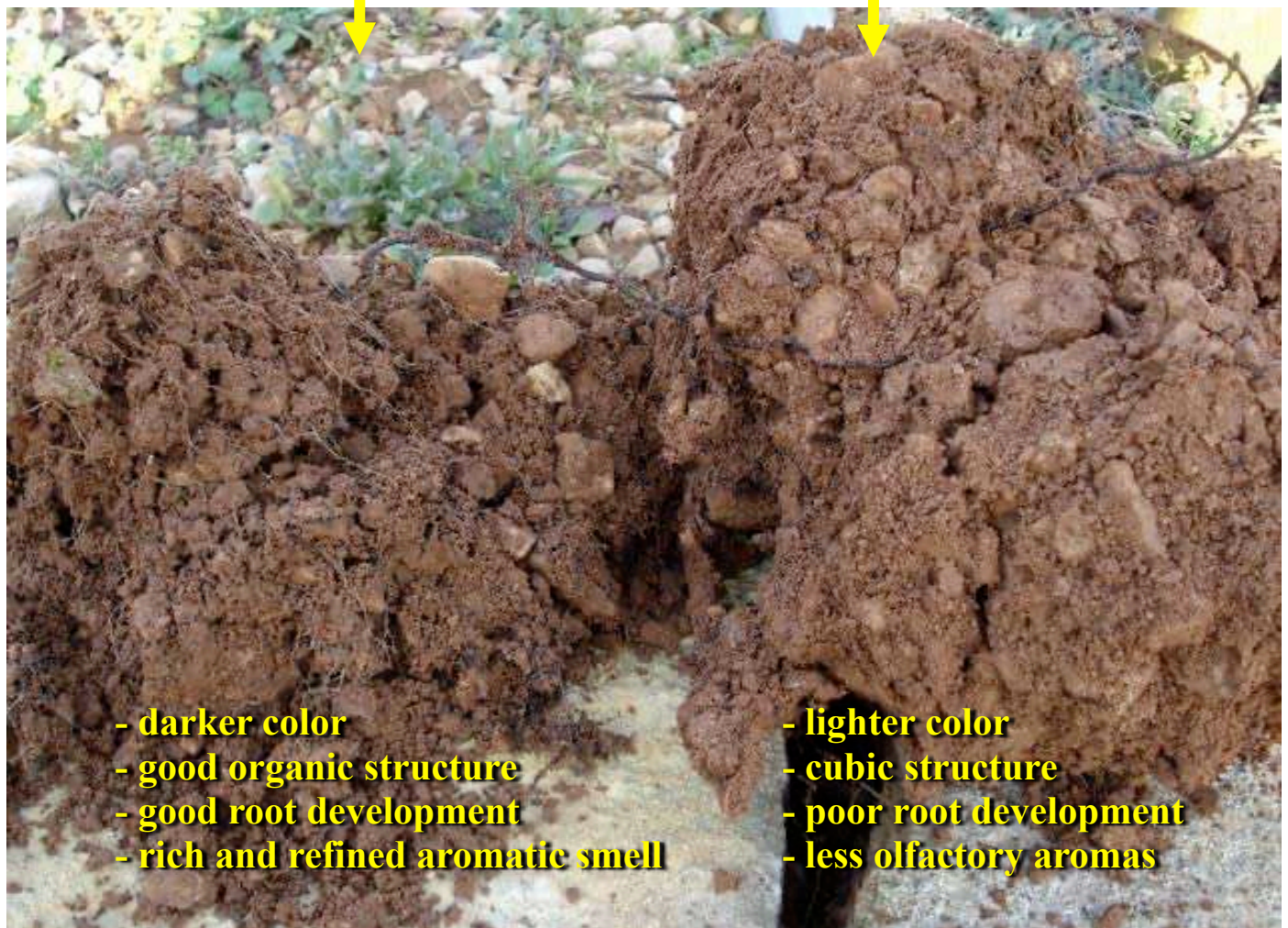
Trial Participants: R. & O. Devalance (Farm Owners), Technical Support : A. Gouez et M. Leclaire, photos A. Gouez



# Burgundy Vineyard



[Enlarge](#) ↓



In 2 years the biodynamic plot has received 3 applications of 500P (prepared horn manure - 100g/ha in 35 liter of water) and 5 applications of 501 (horn silica - 4 g/ha in 35 liter of water)

Photos Pierre Masson 16/02/2007



# Mâcon Vineyard

Biodynamic vineyard  
weeded mechanically  
photo Alex Podolinsky



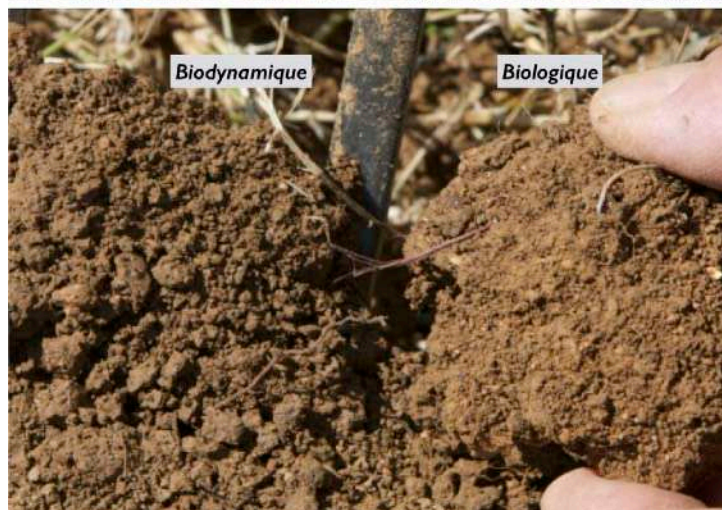
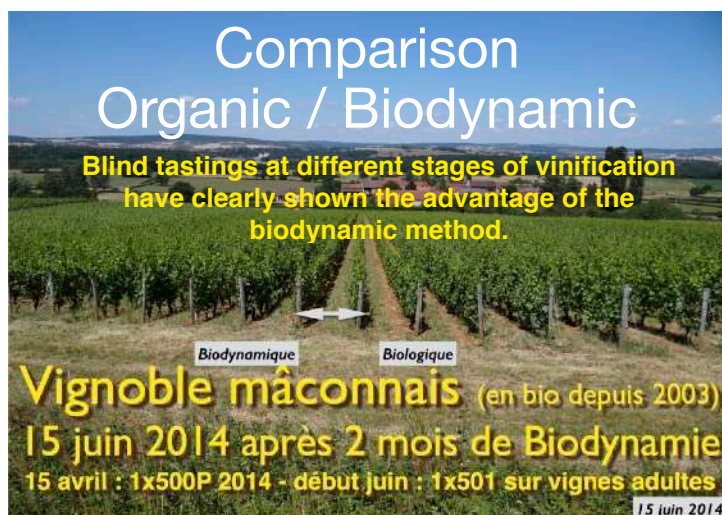
[Enlarge](#) ↑

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Conventionally managed vineyard 50 m away  
chemically weeded with glyphosate  
photo Alex Podolinsky







From the very first harvest, the development of the soil and the health of the vines are reflected in the quality of the wine!

### Soil Analysis after 8 months by LCA



Paramètre /Parcelle	Couleur	MO %	N total %	C/N	PH eau	pH KCl	Calc total	CaO g/kg	CEC Metson	P2O5 Joret	K2O	MgO	K/Mg	K2O/MgO	Mn ech	Na2O	Cu mg/Kg
Plantion BIO	Rouge	3,41	0,19	10,4	8,1	7,3	13	9,31	19,6	0,58	0,58	0,18	1,36	3,18	2,7	0,02	4,1
Plantion Biodynamie	Marron	5,11	0,28	10,6	8	7,3	13	8,13	23,6	0,04	0,32	0,22	0,63	1,47	3,86	0,02	0,36
Vigne Bio	Rouge	2,7	0,17	9,2	8,4	7,6	86	12,3	17,6	0,12	0,46	0,15	1,34	3,14	2,57	0,02	3,35
Vigne Biodynamie	Marron	4,15	0,22	11	8,3	7,6	78	12,8	20,3	0,12	0,56	0,19	1,23	2,88	4,09	0,02	1,01

### Microbial Soil Analysis after 8 by Celestalab



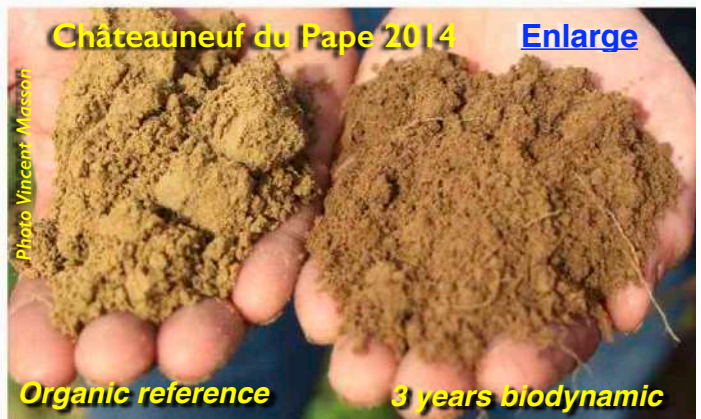
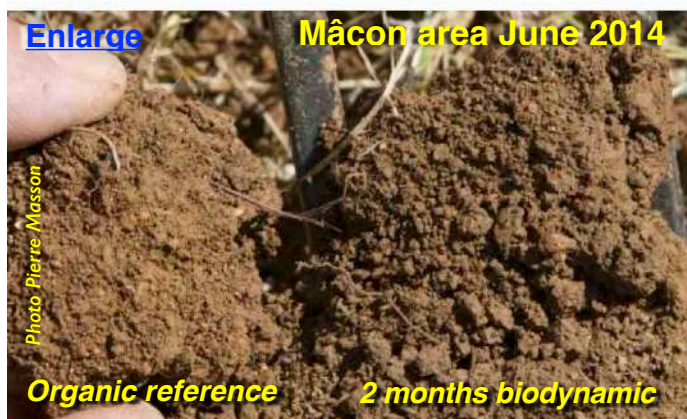
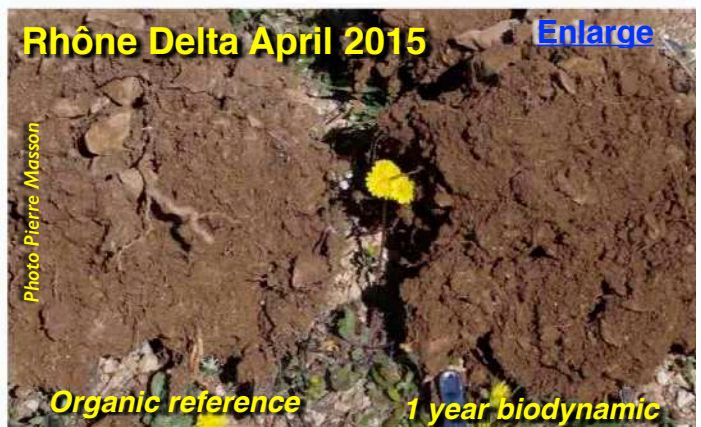
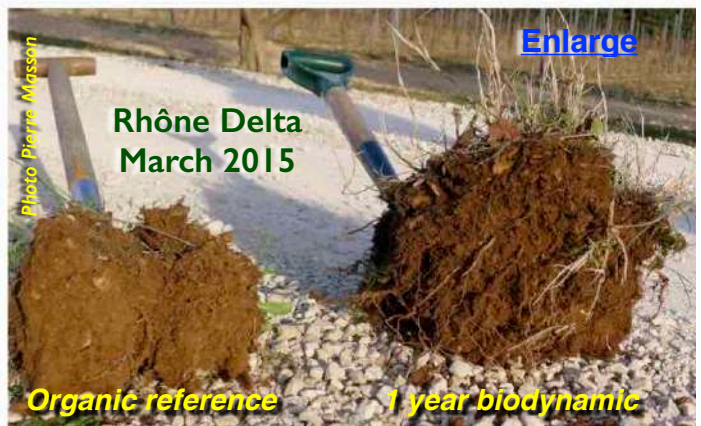
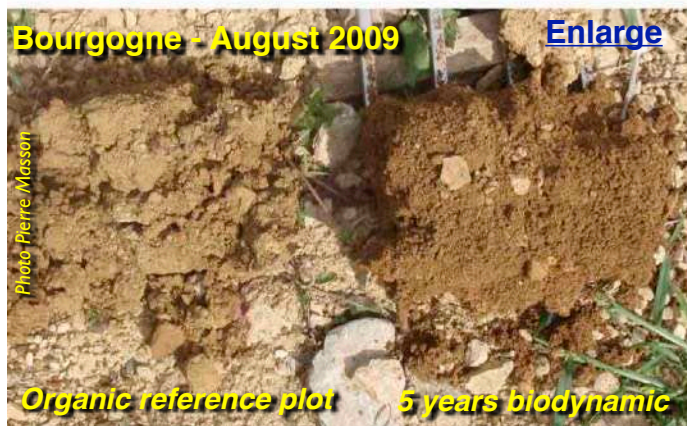
	Carbone (g/kg terre)	Biomasse Microbienne (BM)		Éléments minéraux stockés dans la BM (calculés en kg/ha)					CARBONE				AZOTE			
Paramètre/ Parcelle		mgC/kg terre	en %C	N	P	K	Ca	Mg	C organique (g/kg TS)	C minéralisé (mg/kg/28j)	Ind. de minéralisation (%)	Cm/ BM	N total (g/kg)	N minéralisé (mg/kg/28j)	Ind. de minéralisation (%)	Fourniture annuelle N (U)
Plantation bio	19,8	326	1,6	86	66	56	8	8	19,8	339,4	1,7	37,1	1,7	18,7	1,1	49,1
Plantation Biodynamie	29,7	600	2	158	122	103	15	15	29,7	493,1	1,7	29,3	2,7	32,1	1,2	72,2
Vigne bio	15,7	338	2,2	89	69	58	8	8	15,7	338,1	2,5	41	1,7	19,2	1,2	50,4
Vigne biodynamie	24,1	570	2,4	150	116	98	14	14	24,1	631,9	2,6	39,6	2	30,6	1,5	80,3

For more details see [Scientific report of Soin de la Terre](#) (Boisseau study)



# Various soil profiles in viticulture

Biodynamic soils have a better structure,  
are deeper and darker in color (more humus)





## Côtes du Rhône Vineyard

**Côtes du Rhône - Mourvèdre : leaf behavior is typical for biodynamics with Horn Manure (500P) and Horn Silica (501): shiny leaves standing up with individualized positioning.**



*Côtes du Rhône - Mourvèdre : comportement foliaire caractéristique de la biodynamie avec bouse de corne préparée (500P) et silice de corne (501) : brillance des feuilles, redressement, positionnement individualisé.*

Pierre Masson  
Agriculture Bio-Dynamique  
formation conseil

[Enlarge](#) ↓

[Enlarge](#) ↑

**Côtes du Rhône - Mourvèdre : same plot at the same time but without the biodynamic preparations: the leaves are matt and fall like a curtain resulting in poor air circulation.**



*Côtes du Rhône - même parcelle, même heure Mourvèdre témoin ne recevant pas les préparations biodynamiques : feuilles mates tombant en rideaux*



Pierre Masson  
Agriculture Bio-Dynamique  
formation conseil



## Vineyard in the Jura Region

Jura - Montaigne - 19 juin 2009 - Port dressé et flexibilité (emploi de bouse de corne préparée (500P), de silice de corne (501) et de tisanes de plantes (ortie, prêle, etc.) La 4<sup>e</sup> silice de corne a été passée le matin même.

Jura - Montaigne - June 9, 2009 - Vines are flexible and stand upright (use of the preparations 500P, 501 and herbal teas (stinging nettle, equisetum, etc)) The fourth application of 501 was done on the morning this picture was taken.



[Enlarge](#) ↑

[Enlarge](#) ↓





## Appendix B : Market Gardening



### Root development on salad seedlings

**On the left: organic** (without biodynamic preparations)

**On the right: biodynamic with 2 x 500P** (prepared Horn Manure) during soil preparation - dipping of naked roots in 500P prior to planting - 1 x 501 (Horn Silica) sprayed on leaves after planting - a second application of 501 is planned 2 weeks before harvesting).

photo Adriano Zago Spring



# Market gardening with mulch

Grass-Clover Mixture  
without additional fertilizer

Preparations 500 et 501  
on all Végétales



Harvesting and spreading mulch

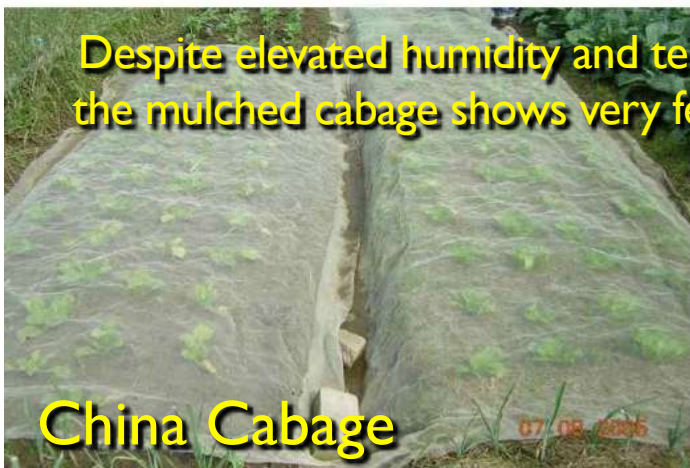
On the Left always without  
on the Right with Mulch



Fennel



Despite elevated humidity and temperatures underneath the cover  
the mulched cabbage shows very few signs of fungus attack on leaves



China Cabbage



Cultivation and photos Stefan Funke





# Mulched tomatoes

Grass-Clover Mixture  
without additional fertilizer

Prép. 500 at sowing and bef. plantation  
50l every 4 weeks after first flowers



Cultivation et Photos Stefan Funke



The roots feed on decomposing grass



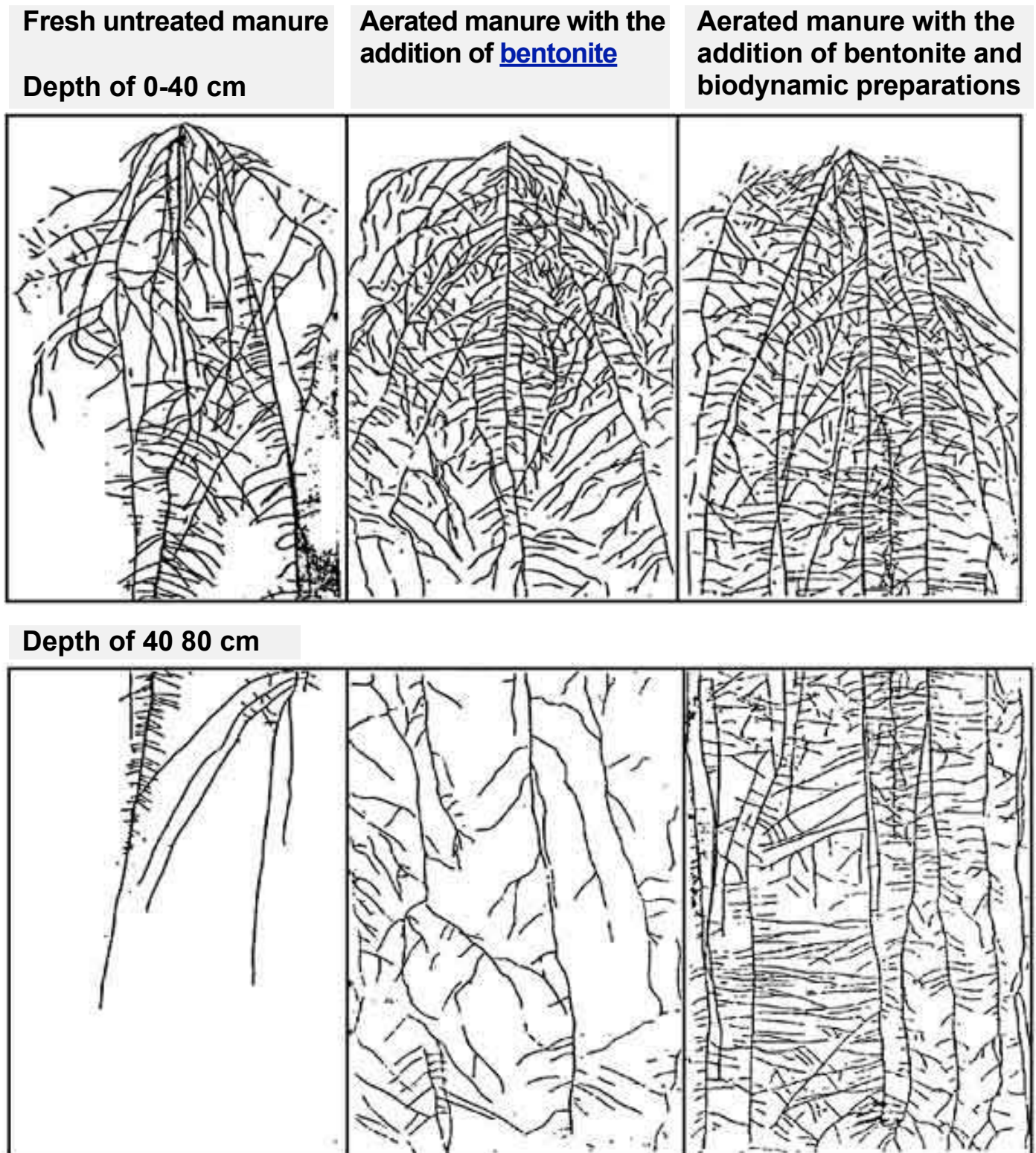
[Click here for album  
with 56 slides](#)





## Appendix C : Biodynamic Root Development

The influence of untreated and treated liquid manure on the root development of bush beans (U. Abele 1978)



Fresh liquid manure hampers germination and plant development and results in a very weak and disorganised root system. Aerating the manure and adding [bentonite](#), a colloidal clay powder with a very large internal surface area, greatly improves the situation. But by far the most extensive and harmonious root system is obtained by also adding the biodynamic compost preparations.



## Appendix D : Improved fluidity and fertilising value of liquid manure



Photos Ulrich Schreier 24-11-2014



### The thick slurry full of straw becomes fluid and loses its unpleasant smell

#### Statement from a dairy farmer

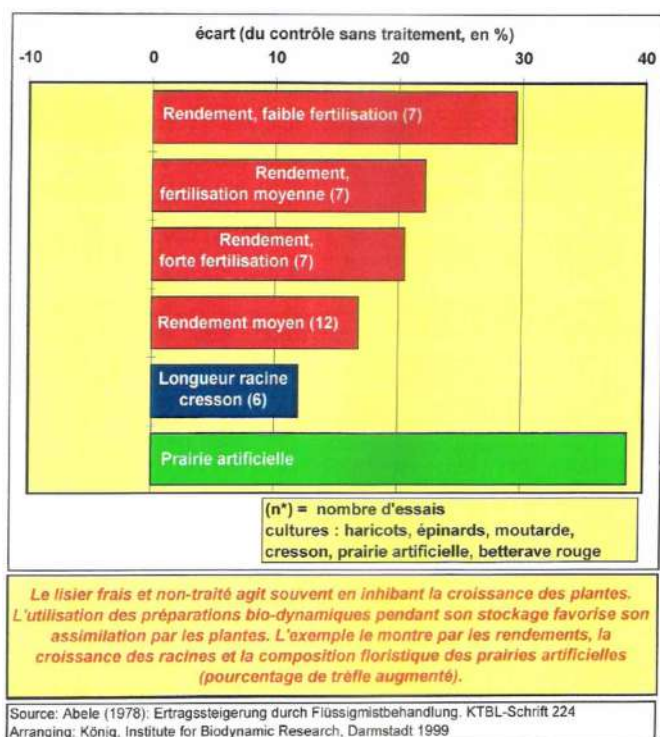
We applied the biodynamic compost preparations to our liquid manure pit in view of improving the quality of our pastures. Since our slurry pit is equipped with a mixing-aeration system, we made pellets out of the preparations and, with the mixer turned on, tossed them into the pit sequentially. Following the advice of Vincent Masson we started off on the first morning with a series of 502 pellets, one every 10 seconds. In the afternoon we did the same thing with the 503 preparation, the next morning, the 504, ..... At the end of this process, we sprayed the valerian preparation over the entire pit while letting the mixer run for 4 hours.

Since we did not keep a reference plot for comparison, we cannot pretend having observed an effect on the vegetation of the pastures, but in less than 3 weeks the liquid manure in the slurry pit has changed considerably. It has now a smooth and homogenous texture, is easy to stir and gives off a vanilla like odour.

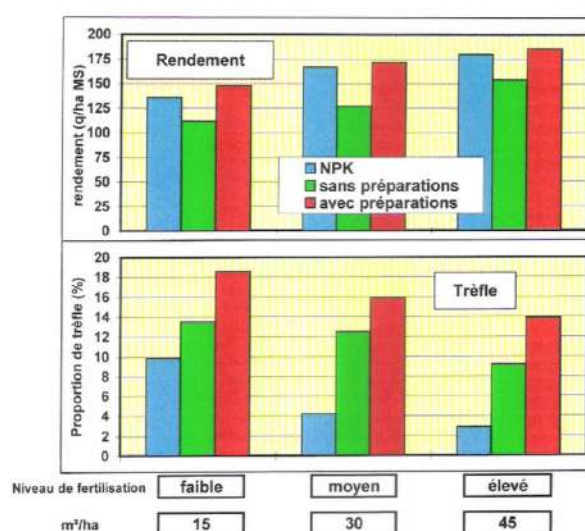
This experience has convinced us of the great value of the biodynamic approach.

Patrice Lefevre

### The treatment of liquid manure with the biodynamic preparations improves plant development and yield



### The treatment of liquid manure with the biodynamic preparations improves pasture productivity and clover development





## Appendix E : Morpho-chromatograms of vineyard soils

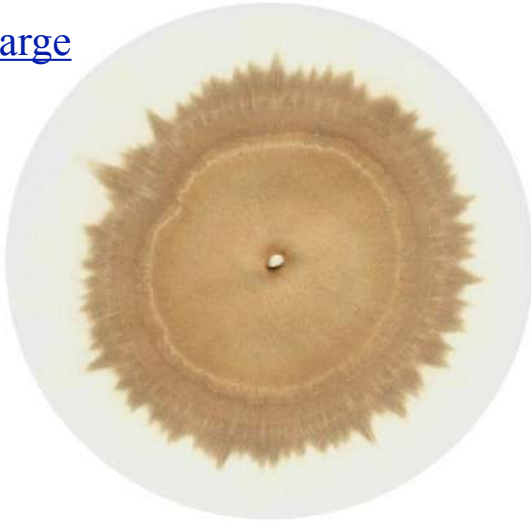


**Morpho-chromatography** shows the life forces and the constitutional harmony of soil, compost, plants and agricultural products. It is also an interesting tool for getting rapid feedback on the effect of foliar sprays with herb teas, compost teas or biodynamic field sprays (see the two examples with 500 and 501 on the next page).

For a description of the method see [Agriculture of Tomorrow by L. and E. Kolisko](#)



[Enlarge](#)



Conventional vineyard

[Enlarge](#)



Adjacent biodynamic vineyard

[Enlarge](#)



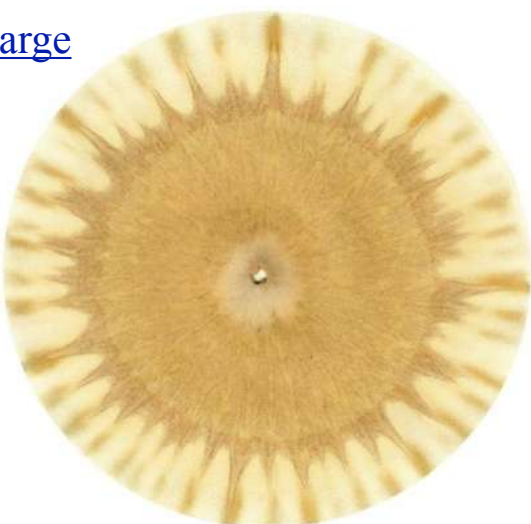
Biodynamic vineyard before  
spraying horn manure

[Enlarge](#)



2 hours after  
spraying horn manure

[Enlarge](#)



Biodynamic vineyard before  
spraying horn silica

[Enlarge](#)



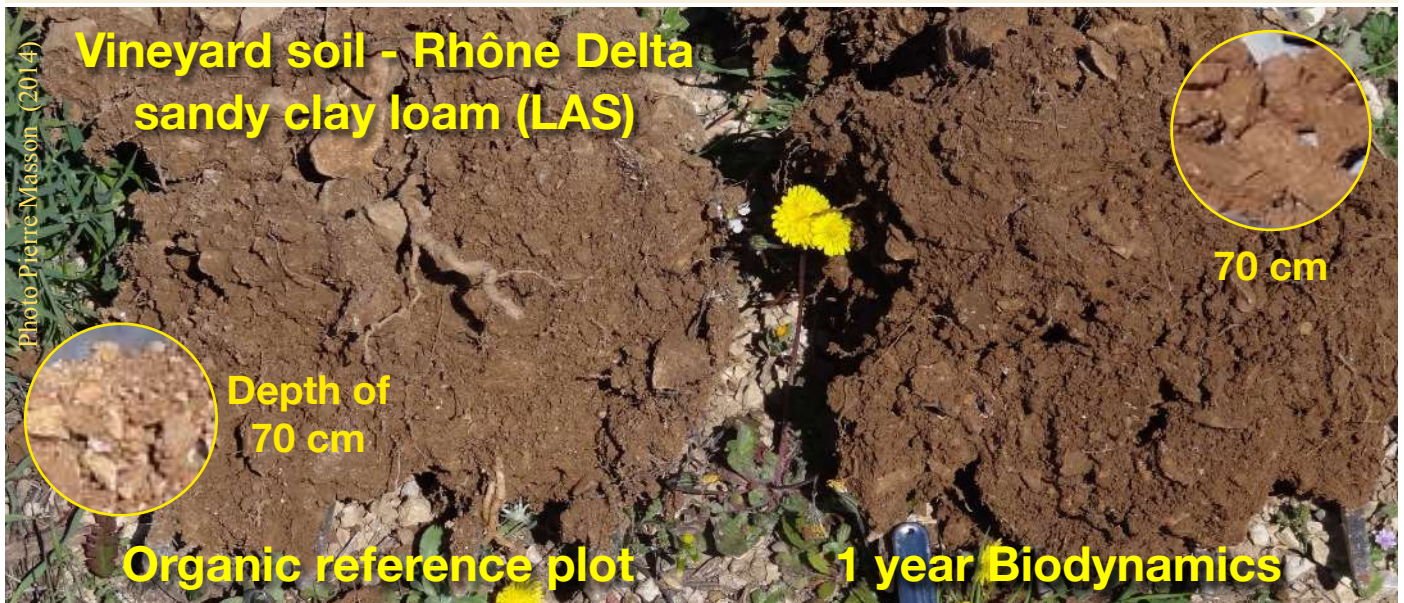
2 hours after  
spraying horn silica

Biodynamic Vineyard of the Coulée de Serrant

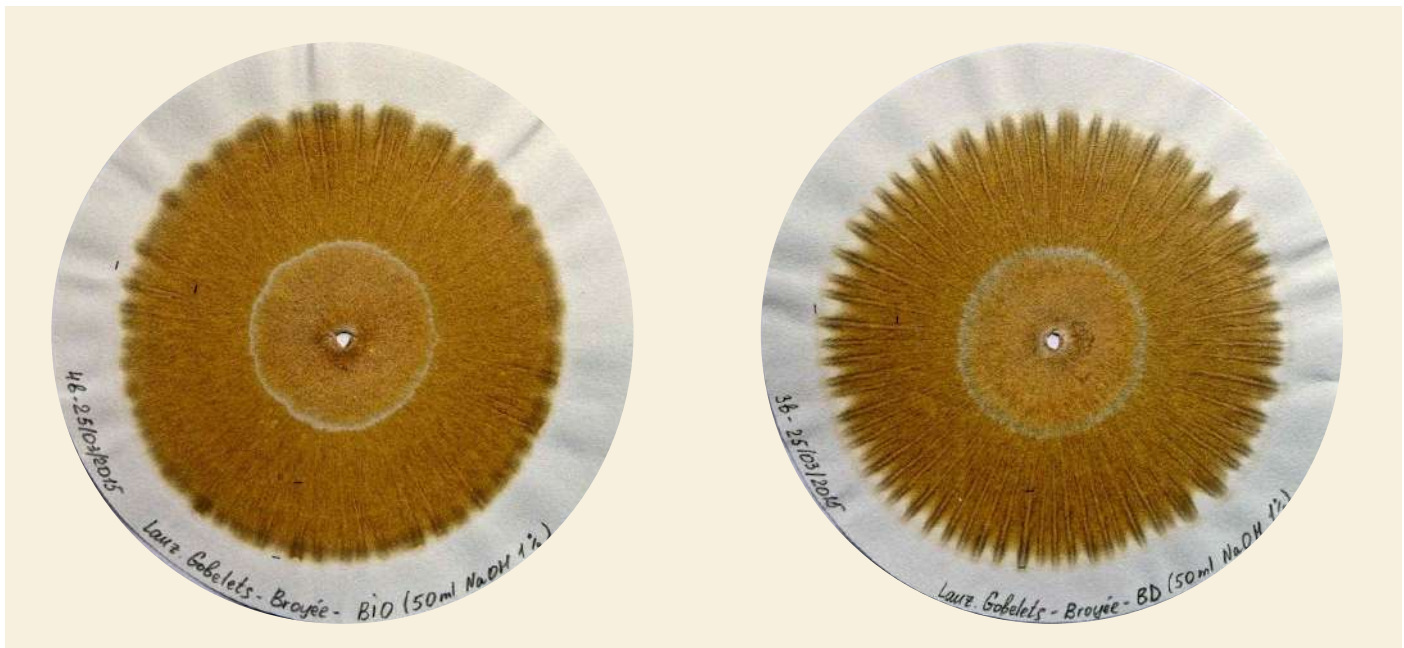
Images by Helen Mortensen and Kim Roos of [BioChromaLab](#)



# Morpho-chromatography to complement conventional soil analysis



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• the color of the soil is fairly light</li> <li>• average soil structure</li> <li>• poor root development</li> <li>• limited olfactory aromas</li> <li>• sticks to fingers when wet</li> <li>• dries fast</li> <li>• organic matter content : 2,96%</li> <li>• pH<sub>KCL</sub> 7,4 – N = 1,662 mg/g – C/N = 10,4</li> <li>• P<sub>2</sub>O<sub>5</sub> = 0,179 mg/g – K<sub>2</sub>O = 0,184 mg/g</li> <li>• MgO = 0,191 mg/g – CEC = 10,3 cmol+/kg</li> <li>• microbial biomass : 264 mg/kg</li> </ul> | <ul style="list-style-type: none"> <li>• dark brown color</li> <li>• good organic structure</li> <li>• good root development</li> <li>• rich and refined aromatic scent</li> <li>• sticks much less</li> <li>• holds back water, dries slowly</li> <li>• <b>3,27%</b> (+10% = +7 t C = +26 t CO<sub>2</sub>)</li> <li>• pH<sub>KCL</sub> 7,3 – <b>N = 1,741 mg/g</b> – C/N = 11</li> <li>• P<sub>2</sub>O<sub>5</sub> = 0,183 mg/g – <b>K<sub>2</sub>O = 0,229 mg/g</b></li> <li>• <b>MgO = 0,244 mg/g – CEC = 12,9 cmol+/kg</b></li> <li>• <b>347 mg/kg (+ 83mg/kg = +31 %)</b></li> </ul> |
|--|---|



The morpho-chromatograms provide additional information on humus quality as well as on the organizational and life forces of the soil. Like the observational findings and the quantitative measurements, they clearly show the positive influence of the biodynamic preparations.



\*) Quantitative analysis by Laboratoires LCA and CelestaLab ; Morpho-chromatograms by Soin de la Terre



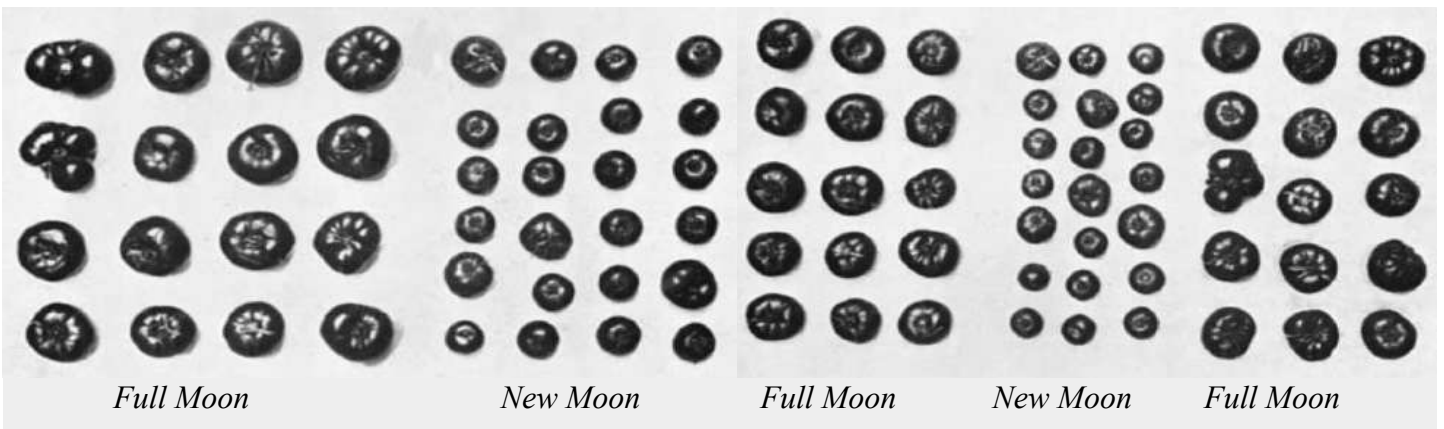
## Appendix F : effect of the moon and of homeopathic dilutions

### Carrots

Sowing 2 days before full moon and 2 days before new moon



### Tomatoes



Hyacinthus candicans watered with  
homeopathic dilutions of  
silver nitrate ( $\text{AgNO}_3$ )



From the book "Agriculture of Tomorrow" by E. et L. Kolisko

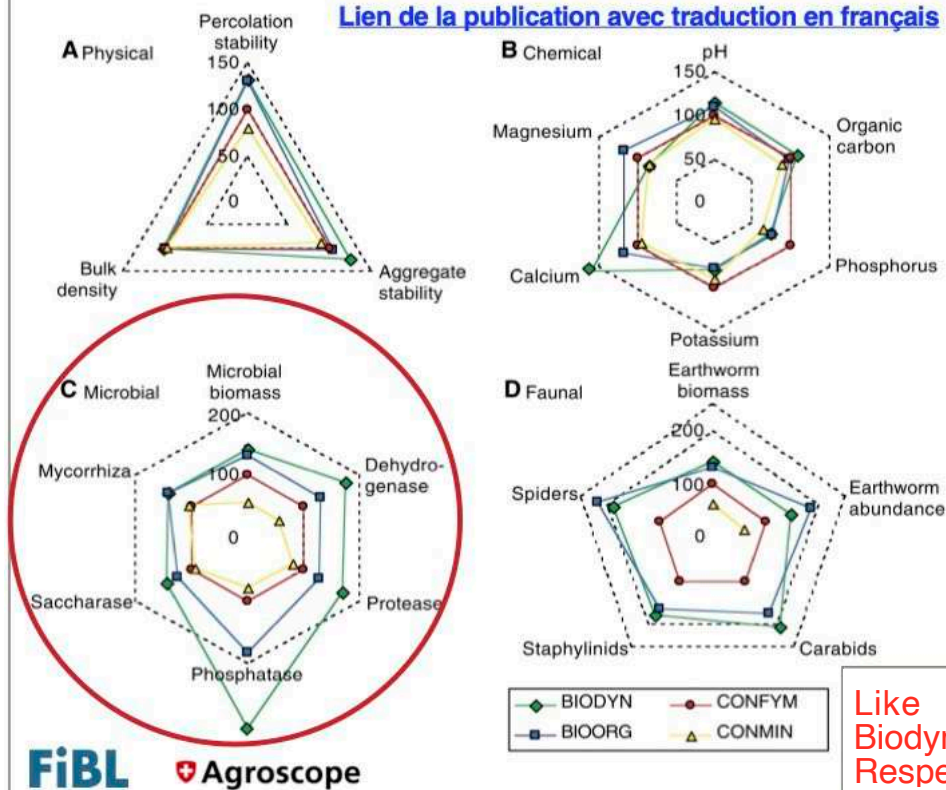
This book can be downloaded using the following link <http://www.soilandhealth.org/>



## Appendix G : DOK Trial and Research on microbial networks

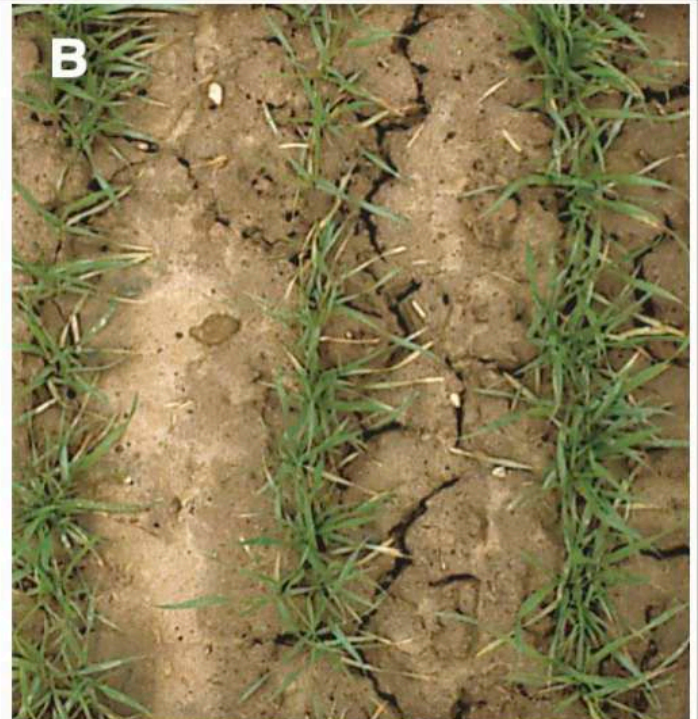
Soil Fertility and Biodiversity in Organic Farming - publié dans Science Vol 296 - 2002

[Lien de la publication avec traduction en français](#)



**Fig. 2.** Physical, chemical, and biological soil properties in soils of the DOK farming systems. Analyses were done within the plough horizon (0 to 20 cm) except for soil fauna. Results are presented relative to CONFYM (= 100%) in four radial graphs. Absolute values for 100% are as follows. (A) Percolation stability, 43.3 ml min<sup>-1</sup>; aggregate stability, 55% stable aggregates > 250 µm; bulk density, 1.23 g cm<sup>-3</sup>. (B) pH(H<sub>2</sub>O), 6.0; organic carbon, 15.8 g C<sub>org</sub> kg<sup>-1</sup>; phosphorus, 21.4 mg P kg<sup>-1</sup>; potassium, 97.5 mg K kg<sup>-1</sup>; calcium, 1.7 g Ca kg<sup>-1</sup>; magnesium, 125 mg Mg kg<sup>-1</sup>. (C) Microbial biomass, 285 mg C<sub>mic</sub> kg<sup>-1</sup>; dehydrogenase activity, 133 mg TPF kg<sup>-1</sup> h<sup>-1</sup>; protease activity, 238 mg tyrosine kg<sup>-1</sup> h<sup>-1</sup>; alkaline phosphatase, 33 mg phenol kg<sup>-1</sup> h<sup>-1</sup>; saccharase, 526 mg reduced sugar kg<sup>-1</sup> h<sup>-1</sup>; mycorrhiza, 13.4% root length colonized by mycorrhizal fungi. (D) Earthworm biomass, 183 g m<sup>-2</sup>; earthworm abundance, 247 individuals m<sup>-2</sup>; carabids, 55 individuals; staphylinids, 23 individuals; spiders, 33 individuals. Arthropods have not been determined in the CONMIN system because of the field trial design. Significant effects were found for all parameters except for bulk density, C<sub>org</sub>, and potassium (analysis of variance; *P* < 0.05). For methods, see table S3.

Like in the EcoVitiSol Research, Biodynamics Comes out Ahead with Respect to Microbial Soil Life.



**Fig. 3.** Biodynamic (A) and conventional (B) soil surface in winter wheat plots. Earthworm casts and weed seedlings are more frequent in the biodynamic plot. Disaggregation of soil particles in the conventional plots leads to a smoother soil surface. Wheat row distance is 0.167 m. Source: T. Alföldi, Research Institute of Organic Agriculture [Forschungsinstitut für biologischen Landbau (FiBL)].

Science Vol 296 - 2002

**Fig. 3** Surface des sols bio-dynamique (A) et conventionnel (B) dans les champs de blé d'hiver. Les déjections de vers de terre et les pousses de mauvaise herbe sont plus fréquentes dans le terrain bio-dynamique. La désagrégation des particules du sol dans les terrains conventionnels mène à une surface plus lissée. L'écartement des rangs de blé est de 0.167 m. Source: T. Alföldi, Institut de Recherche d'agriculture biologique [Forschungsinstitut für biologischen Landbau (FiBL)].





[Agrandir](#)

conventionnel

biodynamique

Photo prise par Heini Heer le 28 juin 2000

Parcelle de gauche :

**Blé d'hiver conventionnel (IP)  
Avec fertilisation minérale et fumier**

Parcelle de droite:

**Blé d'hiver en Biodynamie  
sans fertilisation depuis 22 ans**

Chaque année pendant 22 ans, la parcelle a reçu  
uniquement les préparations 500 (bouse de corne)  
et 501 (silice de corne)



Photos T. Alföldi, FIBL, novembre 2002

conventionnel (IP)

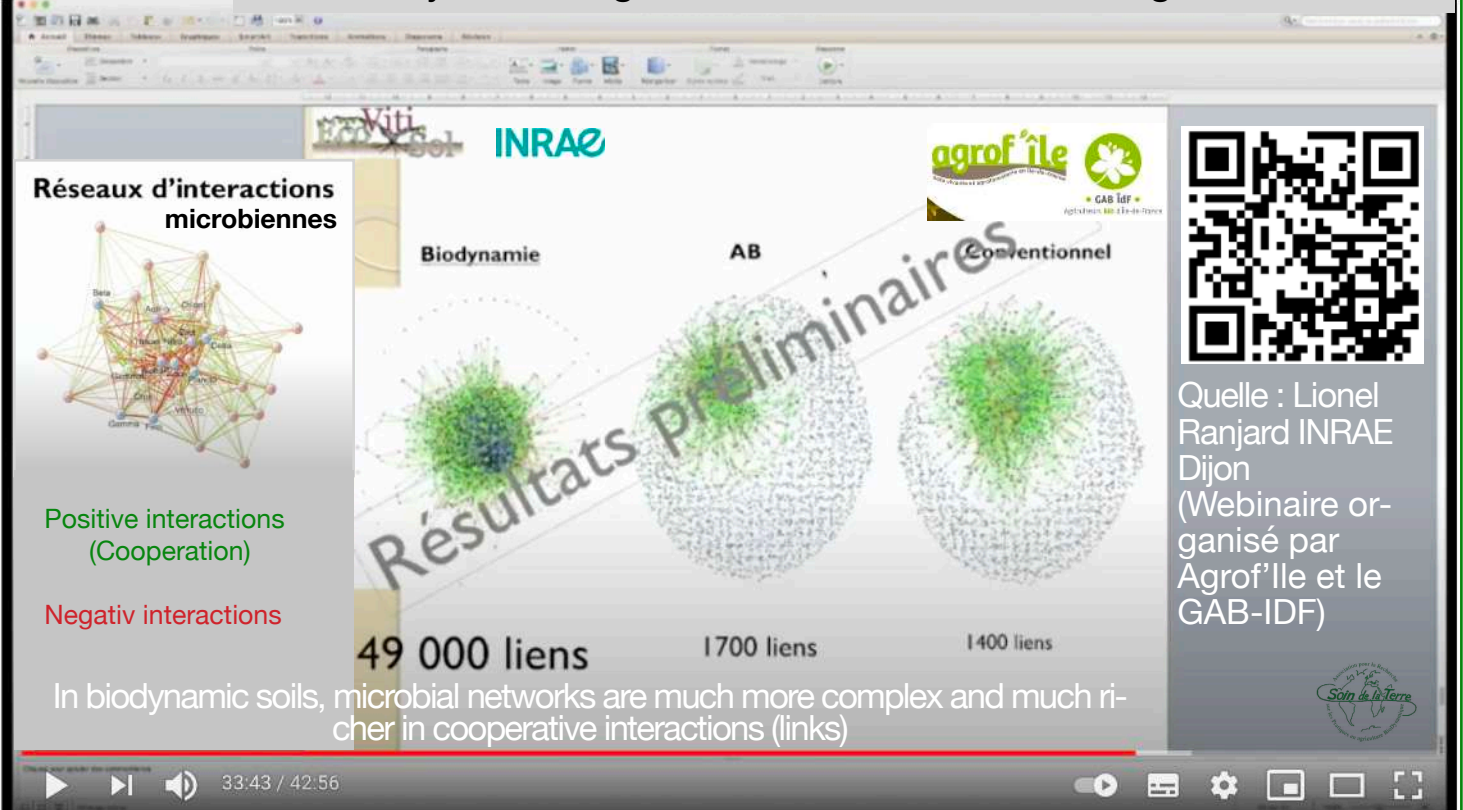


biodynamique

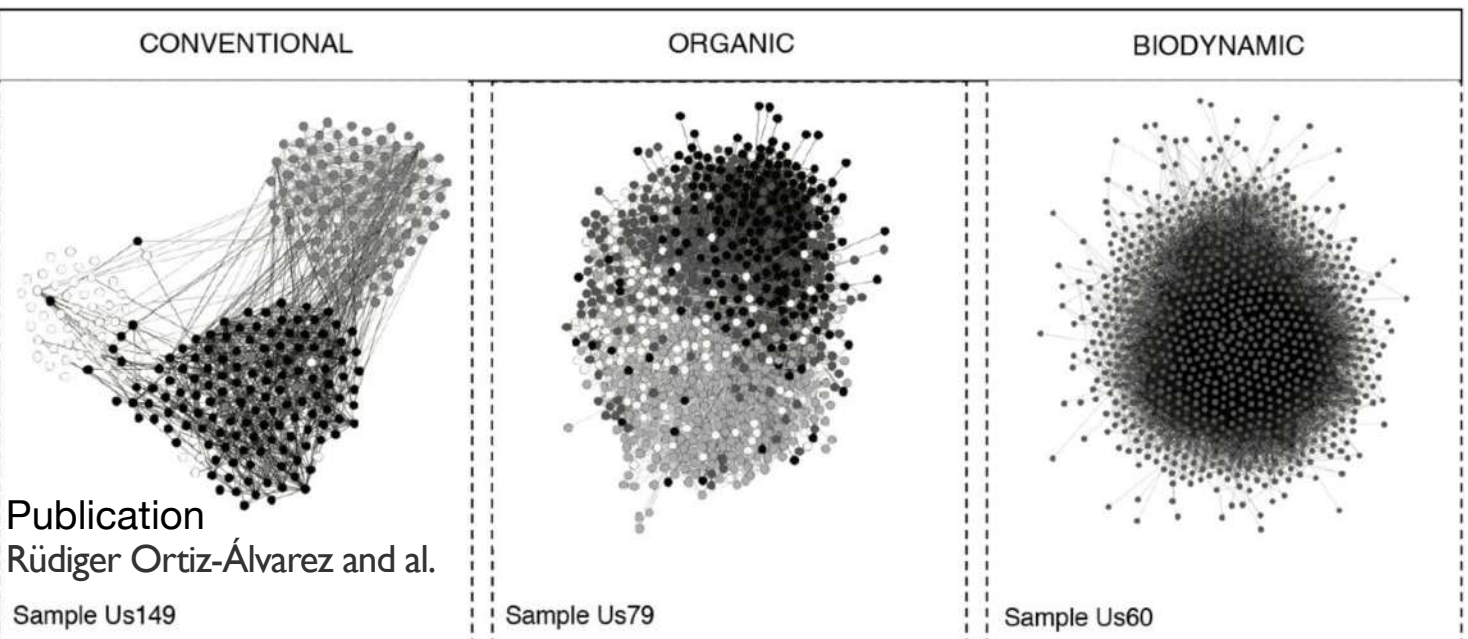
**Parcelles après une pluie  
Blé d'hiver conventionnel (IP)  
fertilisation minérale et fumier**

**Blé d'hiver en Biodynamie  
cultivé avec du compost et les  
préparations biodynamiques**





## Microbiology in the vineyard : which management approach for a living soil?



### NICHE SPECIALIZATION (Modularity)

### SMALL-WORLD PROPERTIES (Clustering coefficient)

### COMPETITION (Co-ex. proportion)

Representation of microbial networks in vineyards from the publication "Emergent properties in microbiome networks reveal the anthropogenic disturbance of farming practices in vineyard soil fungal communities" by R. Ortiz-Álvarez et al. (<https://doi.org/10.1101/2020.03.12.983650>). This study is based on 350 plots of table grapes in Spain and in the United States and shows the same tendencies in favor of biodynamic farming as those of INRAE in the context of the EcoVitiSol project.



# Appendix H: Historic roots and scientific concepts

## An early answer to major concerns of German farmers

In response to the first negative effects related to chemical fertilisers combined with the insistent demands of a group of German farmers concerned with lowered food and fodder quality, diminished seed vigour and signs of degeneration in crops and livestock, [Rudolf Steiner](#) laid the foundation of biodynamic agriculture in an eight day course held in 1924. Proposing a wider and more in-depth view of nature, life and the different levels of existence, his approach assumes that all observable phenomena in our physical environment are in effect tied of a much broader, immaterial reality. According to this enlarged vision of the Universe, plants, animals, but also inert matter such as lime, silica, carbon, oxygen, hydrogen, nitrogen, potassium, phosphorous or sulphur are some sort of local condensation of a cosmic principle. In other words, they are not the root cause but merely the outward manifestation, the physical expression of a much broader spiritual reality.<sup>5</sup> To fully grasp and understand them, localised physico-chemical analysis is not sufficient: just as it is essential to include the far away magnetic poles of our planet to understand the movement of a compass needle, we have to broaden the scope of our investigation —both in space and in time — to include spheres that are not readily accessible to our five senses. We cannot choose to ignore them just because they cannot be measured directly using conventional instruments. In the world of life which modern science “*knows only by its symptoms*”<sup>6</sup> supra-sensible phenomena play a key role. Belonging to a realm which lies beyond the physical plane, they are a fundamental part of life and nature. Indeed, what a difference there is between a vigorously growing tree and a dead wooden pole, an animal bursting with vitality and a lifeless decaying body!



Rudolf Steiner, scientist, philosopher, visionary and inspirational source of various cultural, social, medical and educational initiatives, as well as founder of a school of thought called [anthroposophy](#).

---

<sup>5</sup> This point of view reminds us of the wave-particle duality in modern physics and of the way Quantum Physics deals with matter by attributing to each particle "a wave which, extending to infinity, has a mobile singularity of permanent existence" ([Louis de Broglie](#)), or of the morphogenic fields and [morphic resonances](#) postulated by [Rupert Sheldrake](#) and Emile Pinel ("champs de forme" or "form field").

<sup>6</sup> [Albert Szent-Györgyi](#), Nobel Prize in Medicine and discoverer of vitamin C.

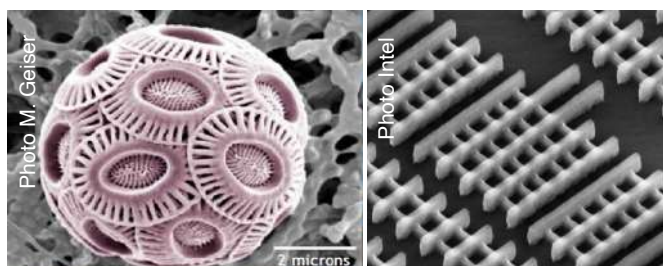


## Broadening the scope of our scientific concepts

It is premature to have wanted to reduce life processes to the insufficient physico-chemical concepts of the nineteenth or even the twentieth century.

[Louis DE BROGLIE](#), Nobel Prize in Physics.

Biodynamics seeks to broaden the scientific concepts with regard to both organic and conventional agriculture, considering that the mater-bound and mechanistic theories of modern science, dominated by mathematics, physics and chemistry, are way too narrow to understand life. Although highly sophisticated and powerful when dealing with inert matter and electromagnetic phenomena, they are far from giving satisfactory insights into the world we live in. For a better understanding of the dynamic, interdependent and hierarchical organisation of Nature, we have to enlarge our reductionist view of the Universe to include spheres related to Life and Consciousness. To fill this gap, biodynamics goes beyond the mechanistic framework of conventional science. By promoting biology to its rightful place in the scientific hierarchy, it adds the notion of immaterial principle such as life force, formative force and rhythmic development to that of substance and physicochemical process — the notions of wholeness, [homeostasis](#), coherence and symbiosis to that of mere analysis of individual parts — subjective aspects such as health, well-being, beauty, harmony, balance, flavour and culinary enjoyment to those of easily measurable parameters. Only by adopting a broader vision of the World and by taking into account these more subtle criteria, can we hope to make progress in understanding Life and Nature which, holding secrets that are far more complex than those governing the physical world, cannot be summed up nor understood based only on electromagnetic fields, physical matter and mechanistic concepts.



[Emiliania huxleyi](#)

unicellular marine algae

[Microprocessor](#) (detail)

2013/22 nm technology-

**"Hi-Tech" of Mother Nature and Hi-Tech of man:** this unicellular, photosynthetic algae (phytoplankton) of an immense refinement and complexity has been producing huge quantities of calcite and oxygen for millions of years. Reproducing itself by the trillions, it does not pollute, uses no electricity and requires no costly plants and infrastructures ! Like the trapping of carbon in the soil by increasing humus levels, this algae also contributes to CO<sub>2</sub> sequestration by producing large amounts of calcium carbonate which then drop to the ocean floor. In addition to this important function which contributes to climate regulation and the deacidification of seawater, it is also at the basis and a major food source of the oceanic food web.

It is only because of the creative building forces of life which relentlessly oppose the destructive and leveling forces inherent in physical substances and purely material processes, that nature and Man exist. It is also these same organizing



forces that are behind the well-ordered Universe and behind the fact that it doesn't degenerate into some sort of formless, atomic chaos, perfectly homogeneous in both structure and temperature (the thermodynamic equilibrium and [Heat death of the Universe](#) postulated by thermodynamics in the mid 19<sup>th</sup> century). When it comes to all the creatures that live on this planet, their bodies decompose and turn to dust, water and air as soon as they die. But even then, life forces still intervene to make sure that their decay follows an orderly path so that their remains will be suitable to nourish new Life.

Already in his 1924 Agricultural Course, Rudolf Steiner warned about the ill effects of chemical fertilizers on proper soil functioning and on the health of plants, animals and man. By short-circuiting important natural processes, in particular at level of micro-organisms, these substances eliminate many soil organisms and can create havoc in the poorly understood "soil food web". Only recently have scientific studies started to address this issue and confirm the dangers and the mechanisms which Steiner talked about over 90 years ago! <sup>7</sup>

Based on a deeper understanding of the laws of Nature and by paying close attention to fundamental differences and close relationships between the Mineral World, Plants, Animals and Man, Biodynamics has been able to develop a series of unique practices and substances which promote a balanced development at all levels of the biological pyramid. Being thus capable of restoring dead and worn out soils with very few resources and in a short period of time, this form of farming has much to offer towards perfecting current organic systems and the development of the truly sustainable agricultural systems of tomorrow. In addition, based on its positive carbon and energy balance, it has the ability to trap large amounts of carbon dioxide and mitigate the negative effects related to climate change.

“All the essential ideas in science  
were born in a dramatic conflict  
between reality and our attempts at understanding”

Albert Einstein

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<sup>7</sup> Back in 1923, Rudolf Steiner explained in detail why herbivores would go mad if they were to eat meat. Despite this early warning, it took more than 60 years and a world wide panic before this simple truth became a generally accepted fact ([Rudolf Steiner and mad cow disease](#)). For similar reasons Steiner warned of the danger of shortsighted interventions dominated by purely mechanistic thinking, including the indiscriminate use of chemical fertilizers and pesticides. In addition to immediate toxic effects, these substances may have many secondary consequences including at the human level. By changing the intestinal microbiota e. g., they can be the source of poor digestion and a multitude of health problems including many chronic and degenerative diseases.