Between Terra Mater and chemical analysis: on the theory and practice of dealing with the soil in 16-19th century Europe.

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Abstract

In 1883, in the Eighth Edition of his Encyclopaedia of Agriculture, which had first come out in 1829, John Claudius Loudon gave his assessment of the state of knowledge about soils: " […] but it may be truly said, that in no department of cultivation was ever so much written of which so little use could be made by practical men." (Loudon, 1883, 315) This assessment does not keep him from---two pages later---meticulously listing indicator plants for different types of soils, a practice in which Roman agricultural writers had already excelled 2000 years before him.

Soils were and are the basis of agriculture. Agricultural writers studied it and gave their assessment of fertility, the most important quality they were interested in. They also discussed soil-plant interaction, listing the suitable type of earth with each cultivar. They tested soils and had an array of methods to amend them. Nevertheless, Loudon had a point in his dismissal. The writers he mentions, John Evelyn and Richard Bradley, had written about theory and practice of dealing with soils in a way a man of the 19th century could only disapprove of.

This paper traces the long and winding history of theoretical thinking about soils from the practical standpoint of the agriculturalist. The categories we have come to think of, dividing the world into 'theory' and 'practice', are of little use vis-à-vis men who try to interpret and systematize their practical experiences with the soil. The living, natural world - and soils are ecosystems with a multitude of plants, animals and microbes inhabiting them - presents humans with formidable conceptual challenges. Soils are particularly interesting both because thinking about them was motivated by practical concerns and because they were all but invisible to the observer. We shall try to follow some of the observers of soils into the darkness of mother earth, blurring categories and establishing some focal points of observation-based concepts of nature.

Introduction

This paper traces the long and winding history of theoretical thinking about soils from the practical standpoint of the agriculturalist by looking at the agricultural library of the Benedictine monastery of Melk in Lower Austria. It does so in an attempt to study the history of knowledge not as an abstract pursuit, but as something that happened at a particular place and time, and influenced a particular nature. The categories we have come to think of, dividing the world into 'theory' and 'practice', are of little use vis-à-vis agricultural authors and their readers, men who try to interpret and systematize their practical experiences with the soil. The living, natural world - and soils are ecosystems with a multitude of plants, animals and microbes inhabiting them - presents humans with formidable conceptual challenges. Soils are particularly interesting both because thinking about them was motivated by practical concerns and because they were all but invisible to the observer. We shall try to follow some of the observers of soils into the darkness of mother earth, blurring categories and establishing some focal points of observation-based concepts of nature.

1. The Benedictine monastery of Melk, a node in a knowledge network.

The history of knowledge has often been quite abstract; the transmission of knowledge was treated as an almost disembodied phenomenon. In his 'Social History of Knowledge' Peter Burke painted a much more materialized picture, talking about books rather than about "knowledge", showing the effect of readers and writers and thus connecting people with the knowledge they produce (Burke, 2000). As environmental historians studying agricultural knowledge, we go beyond connecting knowledge and people; we seek ways to probe its connection to the biophysical reality authors are talking about. How does knowledge about 'nature', as it is constructed from physical interaction with it, but mediated by technology and cultural filters, link to biophysical, ecological reality, which exists independent of human knowledge systems in the production of agro-ecosystems as socio-natural sites? How are cultural conceptions on the one hand, and the physical experience typical for craftsmanship, on the other hand, interlaced in agricultural writing, and how is the perception of the entity called 'soil' influenced by the exchange between these two realms?

These are questions Richard Hoffmann addressed (if formulated a bit differently) for texts on fishing, which are similar to agricultural texts as they are programmatically aimed at giving instruction on how to change biophysical environments (Hoffmann,

1997, introduction and epilogue). We can safely assume that for the 16th and early 17th century, texts on agriculture would usually occupy what Hoffmann calls 'a cultural margin', that is, the zone of interaction between a rural, oral culture and learned, lettered men being part of this culture as parish priests living in rural settings, but being set apart from it by their command of learned techniques of reading and writing, and by their role as shepherds of the souls of their villagers and as being the village elite. Agricultural textbooks are programs of intervention into ecological systems.

But if and how such knowledge was applied at all remains an understudied question. Some scholars claim that agricultural books written by learned gentlemen or by parish priests were aimed not at practical application but were demonstrations of wealth and erudition. This has been argued for 13th century Pier de Crescenzi as well as for 17th century Coler, and for the genre in general (Sieglerschmidt, 1999).

In order to tackle this question, the library of the Benedictine monastery of Melk in Austria has been studied in detail. There, books are systematically arranged by subject in the order devised in mid-eighteenth century (Glaßner, 1996, 148). Under the shelf-marks 29.935-30.714 books on agriculture, silviculture, horticulture and pond management are found, as well as treatises on viticulture and animal husbandry, in short, everything which was considered a part of home economics, the *Oeconomia.* The librarian has left space for new additions, therefore a little less than the 779 works comprised by the shelf-mark-numbers are actually on the shelf, some have been lost. Only very few works (less than 5) are additions of the second half of the 20th century. In essence, this part of the library was closed around the turn of the 19th to the 20th century.

Most books in this part of the library are written in German, the agricultural library contains only very few works in Latin, Italian and French; albeit some translations, e.g. from Duhamel du Monceau or Francis Home. The agricultural part is not the most precious or famous part of the Melk library. Compared to other monastic libraries, the agricultural part is relatively small. The earliest books date from the second half of the 16th century.

The agricultural collection 1550-1800 amounts to 143 books. It contains 38 books published between 1550 and 1650, 5 published in the following century, and another 100 published between 1750 and 1800, reflecting the growing body of knowledge and the easier access to books due to prices having fallen considerably and censorship having been lifted. After 1848 the monastery ceased to be landlord in their parishes, and

the libraries of the larger parish centers were incorporated into the main library. They were included into the collection.

As the collection is preserved in a historical state, the body of knowledge incorporated in these works still shelved together today is what effectively was available to the monks interested in agriculture. One can study exactly what was available to a monastic reader around 1800, as accumulated knowledge of several centuries. Within this accumulated knowledge, controversies are abundant, but so are cross-references to other works also contained in the library. What one can see in Melk is an external order of knowledge, as devised in the baroque re-ordering of the library and available until this day, and an internal order of knowledge, contained in the works on these shelves.

There are two notable decisions concerning works of agriculture in the collection of the library. Ever since its foundation in the 11th century, Melk has been a center of learning. Since 1707 the monastery operated (and still operates) a grammar school. The library was an important teaching resource and acquisitions were geared to this purpose. Therefore, a large collection of Classical texts in Latin and Greek exists. L. Iunius Moderatus Columella's works are one of the most authoritative agricultural texts. Nevertheless both the Latin text and a German translation with a very extensive commentary by Curtius from 1769 are sorted with the Classics collection rather than with agriculture. While this does not mean that the book was not available to monks engaged in managing the estates, it is quite clear that Columella was not central to the agricultural knowledge base of the library. The Latin collection was acquired for use in the monastery school. A later example of a book not incorporated is the agricultural chemistry by Justus von Liebig, which is sorted under chemistry. This is partly due to the disciplinary dissection of agricultural knowledge for which Liebig himself stands, partly due to the fact that the monastery's agricultural operations had diminished in importance by Liebig's time, and Liebig was acquired as chemistry book for the chemistry collection rather than for supporting experimental agriculture, which was never done at large scale in Melk.

Direct signs of practical use of the books in the agricultural collection can be found. These consist of writings in the margins, underlining, cancelled text, bookmarks, sometimes pieces of notepaper with remarks or calculations on them, as well as stains and dog-eared pages. They have been systematically documented and are discussed elsewhere (Winiwarter, 2009).

The library consists solely of books, with one exception, the "Annalen des Ackerbaus" by Albrecht D. Thaer, which the library kept from the first edition in 1805 onwards. A lot of research on improvement and the agricultural branch of enlightenment in general deal with magazines and learned correspondence as main means of spreading knowledge. In the provinces of the Habsburg empire, the learned societies of agriculture were founded by the state, and at a relatively late date. The first such society was founded in Styria in 1764, the Carinthian society founded in the same year became the model for all Habsburg societies for agriculture. The "Niederösterreichische Ökonomische Gesellschaft" in Vienna was founded in 1768 (Cerman in Popplow, 2000x). Therefore, books and not journals, were the mainstay of the agricultural library.
In 1797, Ulrich Petrak, then parish Priest of Ravelsbach and a Benedictine monk from Melk, published his practical manual to grow saffron in lower Austria, "Praktischer Unterricht den niederösterreichischen Saffran zu bauen" by order of the provincial government. ("Auf Anordnung einer k.k. N.O. Landesregierung"). Petrak was one of the conventuals who had actively participated in the literary life of the enlightenment in Vienna during the abolishment of censorship under Joseph II. He is known for his satirical poems, which he published in the Viennese "Musenalmanach", and for a collection of music. He continued to participate in enlightenment discourse and book exchange after he had become parish priest in Ravelsbach and the short period of uncensored writing was over; his saffron manual can be seen as a return to the kind of pursuit seen fit for a monastic priest, but it is also a document of the role of enlightened agriculture in the monastery (Frimmel, 2001)
The monastic library with its distinct readership – rather than an elusive commons of enlightenment knowledge shall serve as the case to study knowledge about soils.

2. Knowledge about soils

Knowledge about soils has been gathered by humans engaged in procuring their living from it probably ever since the advent of agriculture. Written testimony of such knowledge gained through experience and physical interaction by working with soils has existed for thousands of years (Blume, 2003). Fertilizers are mentioned e.g. on Egyptian papyri, in medieval encyclopedias and Early Modern tractates on embalming. In the course of European history, soil knowledge has been gathered, written down, copied, refined, misunderstood, corroded and gathered again, in processes of discursive

formation (Foucault, 1972), influenced by power structures. Feudal elites had a vivid interest in making their farms and estates productive, and soil knowledge was instrumental in being able to accomplish this goal. While this is principally known, the processes of formation of knowledge on soils have never been studied in any detail. Several important elements of this process can be identified. A first step in creating communicable knowledge about soils is to create **a terminology** for them, to find words to describe them. Soil terminology is a prerequisite for sharing knowledge about soil fertility improvements and about soil-plant interactions, which in turn is necessary to identify the optimal plant for a given soil. To develop such terminology is by no means trivial, as soils, in contrast to water and air, come in a wide range of differently looking, tasting, smelling, and feeling varieties. Even one particular soil is not a stable entity: It shows very different properties depending on its humidity (which in turn depends on weather conditions and season), and on its own recent and long-term history, most important from an agriculturist's side, its cultivation history. Several parameters in the soil contribute to its fertility, such as the physical structure, the capacity of soil minerals to retain water, and the amount of organic matter in it, and soil terminology has to encompass all these parameters.

A next step in knowledge formation is to try to systematize the perceived diversity of soils: Terminology is developed into a **taxonomy.** This can only be done on the basis of conceptual considerations - particularly important among those is the choice of relevant qualities, which have to be distinguished from unimportant ones. Soil taxonomies are embedded into concepts of nature and theories of nature. These can be contradictory to the practical experience someone has with soils, or can fit with theory. Perception of relevant, important categories of soils is driven by theoretical models and by the practical interest one has in soils.

No writer can hope to cover all soils and give a description of them useful for other agriculturists at different places and times. Soil catalogues can only be made for a very small area, one farm, or one experimental station. Therefore, **methods to determine soil quality** are another important part of soil knowledge. To enable such tests, indicators for soil quality have to be developed. Indicators are among the most complicated issues in knowledge production, as they have to work *pars pro toto*, and have to transform invisible qualities into measurable entities (Winiwarter, 2006a). Soil tests have been described in great detail from Roman antiquity onwards (Winiwarter, 2006b). Adding to the complexity, soil quality is not a useful category as such. A soil

excellent for one type of crop might be of very limited value for another one. So to be useful, soil knowledge has also to be **differentiated with respect to crops**.
Production of written knowledge is not usually undertaken by those working the soil, although many of the writers on agricultural matters claim that they have practical experience, and of many we know this to be true. Agricultural writers refer to the people living in and on the land as their source of practices and terminology. This leads us to two more factors important in knowledge formation. One regards the sources of written and transmitted knowledge. Books on agriculture are written by combining older texts with the writer's own experience and with information he claims to have heard - the latter often a qualifier for knowledge the writer himself regarded as unsure. Each author had to create authority for his writings. The authority of knowledge and its changes over time is one of the main questions in writing knowledge history (Tiles, 1993). One way to create authority was (and is) the reference to older, famous writers. Within the realm of agriculture, the Classical Roman writers are those credited with authority. Referring to them could be turned into a low-risk strategy, too. One could always point out that their knowledge, while true, was not applicable as it had been written for Mediterranean circumstances. Not all writers quote their predecessors correctly, and not all of them distinguish between what they have heard and what they have experienced themselves, and if they so do, this can be a rhetorical strategy to enhance credibility as much as it can be a reflection of the writing process. Another, different strategy to create authority can be the reference to practitioners, such as to *'rustici'* , the people living in rural places (Columella) or to '*pawren*', peasants (Coler). By referring to knowledge from a predominantly oral culture, folk terminology is introduced into written soil knowledge systems. Authors have to relate folk terminology, systematic terminology encountered in other writings and the terminology devised by the author himself.
The multitude of languages a writer would usually encounter and have to deal with adds to the complexity of the task. In Ancient and Early Medieval Europe Greek, Latin and Arabic were the only languages written down. The use of the vernacular languages in writing created an even wider array of terminology, shaped in each language not only by local soil conditions but also by the grammar and vocabulary of each language. Johannes Coler, the Early Modern writer whose work we will encounter in detail below, used Latin, Hebrew, Greek and his own vernacular, German, in his work. In addition, we can assume that he used previously made translations of works written in any of the Classical languages into his vernacular. All these translations are already products of

decisions about equivalence between notions and concepts across languages, decisions which were by no means easy or unambiguous, and each new author would again face them when using sources in several languages.

These problems are known for plant and animal names, but are perhaps even more complicated when talking about soils, as these entities change more gradually and call for more interpretative creativity.

Two more considerations with regard to knowledge about soils merit mention. Firstly, the form and intended audience of the works are of concern. Richard Hoffmann discerns isolated recipes, unstructured memoranda, brief, organized tracts and consciously integrated treatises as main categories for late medieval writings on fishing (Hoffmann, 1997, 322). The agricultural writings of Early Modern Europe can be tracts (such as Grosser and Tumbshirn, and perhaps also the unpublished Haushaltungsbüchlein of the Grünthaler family in Upper Austria) or treatises, such as Coler's Oeconomia. Within each category of texts the question arises, how soil knowledge was organized within the respective text. Agricultural treatises have either been organized by theme, by time, or in combination of both systems (Winiwarter, 2005). Soil knowledge also had to be communicated in books generally organized by time, as calendars. In Palladius' influential 4th cent. AD book, soils are the theme of the second of 14 chapters, 12 of which are dedicated to a month each. But there are finer subtleties in the treatment of soils in different context, such as agriculture proper, vineyards, orchards, gardens and ponds, to name but a few of the contexts in which soils are treated within agricultural writings.

Beyond the scope of this paper, one needs to think about the incorporation of soil knowledge into contexts other than agriculture, too. Soil knowledge was not confined to one genre. The diversity of contexts for soil knowledge is astounding. Not only did agricultural writers focus on soils, soil matters are discussed in economic, geographic, botanical and other proto-scientific contexts as well as in Alchemy and Medicine, to name the most important ones. Concepts of soils had to be brought into connection with humor theory, fitted into elemental and planetary systems of affinity and soil concepts changed along with changes in the overall views of the world. Members of the rural aristocracy, such as Wolf Helmhard von Hohberg, learned parish priests such as Johannes Coler and Martin Grosser, or men of letters who had hardly ever experienced agriculture themselves, such as (medieval) Albert the Great contributed their parts to

soil knowledge from different vantage points as to possible audiences, cultural frameworks and incorporation into larger theoretical constructs.

A last factor of importance in the study of soil knowledge over time is to bear in mind the limited availability of books in a world where each book, printed or manuscript, was still a very valuable possession and quite scarce.

Overviews of the agricultural literature for Early Modern Europe have e.g. been published for England by Fussell (Fussell, 1947, and Fussell, 1972) and for the German speaking countries by Güntz (Güntz, 1897-1902, 1977). These annotated and commented bibliographies do not contain all the available literature. Translations of "classical" writers into the vernacular are not listed in the overviews. Translations did, however contribute in important ways to what was available. Translations were also made from one European language to the other, e.g. from French into German[1].

An interesting historical overview from the viewpoint of a soil scientist concerned with soil conditions for their effect on plant growth on soils is Wild (1988). The prevailing wisdom of the advancement of soil science and plant growth knowledge is captured in the chapter headings of the historical overview in this classic and widespread textbook, called Russell's 'Soil Conditions and Plant Growth' after the original author. It was originally published in 1907 and since then has been reprinted, enlarged and amended more than a dozen times (Wild, 1988). As far as I can see, the historical chapter has not been changed since the book's first publication. The historical overview commences with 'The search for the 'principle of vegetation'. 1630-1750' as the first full chapter, all earlier history is summarized in one printed page. Next follows 'The search for plant nutrients', divided into 'The Phlogistic period, 1750-1800', and 'The period 1800-1860'. The latter chapter is subdivided into 'The foundation of plant physiology' and 'The foundation of agricultural science'. Russell completes this historical overview with chapters on 'The beginnings of soil bacteriology', and 'The development and application of modern knowledge of soils'. When one studies material from 16th to 18th century it becomes clear that the systematic suggested by Russell has been developed retrospectively from modern soil knowledge, seeking "roots" and thus deciding about 'right' and 'wrong' in predecessors rather than studying the complexity of conflicting bits of knowledge over time. The famous agricultural historian George E. Fussell falls prey to similar misconceptions in an otherwise fascinating article on soil concepts in the

[1] For example, Johannes Adam Külbel's Dissertatio qua quaestionem physicam quenam sit causa fertilitatis terrarum of 1743, published originally in Latin and French was published in an abbreviated version in German.

17th and 18th centuries, as he treats the agricultural writers as predecessors to soil science, and scolds them for their practical approach (Fussell, 1933).
Arthur Young connected folk soil name and a systematic description of soil constituents when stating ".. a loamy brick earth, called in this neighbourhood, a loose woodcock soil..."[2]. The first part of the quote is dedicated to the identification of soil constituents. It is a prerequisite to describe a variety of soils without having to invent as many names as there are soils. The identification of soil constituents depends on the underlying concept of soil. But folk taxonomy had its merits, too. A loose woodcock soil has its name from the European Woodcock, a crepuscular bird with a long beak poking into the soil to find earthworms, its main diet. Woodcocks need loose soils of medium humidity for procuring their food, so the soil description of a 'loose Woodcock soil' is quite detailed and specific, combining soil texture and humidity.
All authors concerned with the practice of agriculture had to make similar conjectures between different bodies of knowledge, negotiating oral and written cultures, theoretical frameworks and singular practical experience and conflicting taxonomies of soils.

3. Three books in the agricultural library of Melk: Coler, Hohberg, Schreber

Turning back from the general to the specific, three books from the agricultural library of Melk have been chosen to study the different concepts, recipes and recommendations that would have been available in the Melk library to a late eighteenth century reader. Johannes Coler's Oeconomia printed in 1641, Wolf Helmhard von Hohbergs Georgica Curiosa in the edition of 1682 available at the library, and Christian Daniel Schreber's 1765 Allgemeine Gründe der Düngung [General principles of manure.], edited as part of his Sammlung verschiedener Schriften welche in die oeconimischen, policey- und cameral auch andere verwandte Wissenschaftten einschlagen, Vierter Teil, Halle, 1765.
Three copies of one of the most famous German handbooks on agriculture, Johannes Coler's Oeconomia, are kept in the Melk library. Two of them bear signs of use; writings in the margins, underlining, cancelled text, bookmarks, sometimes pieces of notepaper with remarks or calculations on them, as well as stains and dog-eared pages. Two of the books were

[2] Arthur Young, A course of experimental agriculture: Containing an exact register of all the business transacted during five years on near three hundred acres, London 1770.

incorporated into the library from dissolved parish libraries. For one of the books the owner and reader can be identified as P. Robert Wolfart, who used the book in 1715. Two other books in the agricultural library have also been used by P. Robert, who worked as Vicar in Ravelsbach and Vicar and later parish priest in Weikendorf, one of the most important parishes for Melk. He was also *princeps oeconomus*, principal economist, of the monastery, a quite central role for the economic well-being of the convent. Wolfart has written an Ex Libris, detailing that he bought the book while working in Weikendorf: *In usum P. Roberti Mellicensis. Comparavi hunc librum Weickendorff 1715*.
Being able to study the use of a book printed in 1641 by a reader situated in an economically important parish in 1715 of whom he was in charge offers a rare chance of proving that agricultural texts were used in a very practical context.

Johannes Coler's Agricultural Treatise: The Oeconomia or:Cherishing and ignoring humor theory

Johannes Coler's Oeconomia, whose theories of soil and soil fertility are at the center of this article, is a complete 'Hausbuch', with pharmacopoeia, calendar of markets and agricultural calendar, and a dreambook. Its main part are books on viticulture, agriculture proper, forests, gardens, and several on animals. The author, Johannes Coler (1566-1639), studied theology in Wittenberg and Frankfurt/Oder. He received his Magisterium in Rostock and died as preacher and senior of his church in Parchim in Mecklenburg. His father Jacob (1537-1612), also a protestant minister, had collected the works from which his son compiled the *Oeconomia*. The first part, an agricultural calendar (Calendarium Oeconomicum et perpetuum) was published in Wittenberg in 1591. Coler understood the rest of his multi-volume tome as supplemental material to the calendar. His 1715 reader, P. Robert Wolfart, used the book in this way, underlining many items in the Calendar and then studying the detailed books for more information on those subjects which interested him in particular. The work was published between 1591 and 1606, when an extension to the Calendar closed the work. The book was very successful, with 14 reprints of the entire work in the 17th century alone (Frühsorge, 1988). One of the 17th century editions, present as copy without perceptible use marks in the Melk library, is a catholicized version which is dedicated to a Catholic bishop. The editor explains that he has taken the book because it contains so much useful knowledge, and ridded it of the heresies so it might be put to good use.

But what about soils and fertility? A contemporary reader interested in studying the entire book would have encountered some contradictory information on soils, but most importantly, he would have encountered several classification systems within one work. In some instances, these systems are being matched by Coler, but mostly he lets them stand side by side, giving readers some idea about commonplace taxonomies for the simple-minded peasant and a more learned, theoretically grounded systematic aimed at a learned audience able to study the movement of sun, moon and stars through the zodiac.

Selective reading of one or the other book apart from book 7, to which we will turn in a moment, would yield no systematic knowledge of soils, but some on manures. The most important soil classification is between sandy and loamy land, with a preference for the former only for vines and specific plants. Fat, black earth, unless boggy, is considered the most suitable for most crops. Other than the recommendation to plant crops on fertile land, the only detailed descriptions are with regard to the texture of soils, using crumbly, loose and dense as qualities. The reading of any of the detailed books as well as the reading of the agricultural calendar alone would offer information on regional differences in terms of location, humidity and soil qualities.

In the rich terminology and taxonomy Coler offers, the absence of color as a soil quality is striking, apart from the frequent references to black, fertile, or a few to black, boggy soils, there is only one instance where he describes a soil as a bit brownish or blackish, in his chapter on the cultivation of teasel. He qualifies marl as white, fat earth, once, and has one description where he describes the look of a field as that of burned ash, which might be accepted as a description of color. But no reds, ochres, ashens or yellows like other writers. Soils in Coler can be mellow or tough, sweet or bitter and salty, droughty or humid and wet, sandy or loamy and clayey, strong or weak, fertile or infertile, rich or meager, bad or good, fine or coarse, loose or hard, and mossy, unclean or clean. These are the polarities in which Coler arranges soils. In addition, there is an array of descriptions for bad soils. Notions range from watery, sulfuric, nitrous, and *unlustig*, depleted, to dead, rough, wild, marginal, ashy and boggy. Dirty and muddy are additional qualifications of bad soils in connection with ponds. Apart from summary qualifications such as good vs. bad, fertile vs. infertile, and rich or meager, Coler distinguishes soils for their tenacity, crumb structure, degree of cohesion, water content, structural stability, and grain size and thus has a fairly complete toolbox to describe a wide array of soils, with categories not unlike those of modern soil science, categories which encompass the most important soil qualities. What Coler does not have, is a particular

theoretical framework for these categories. His theoretical framework is the theory of the four qualities, which does not easily fit with the actual soil descriptions.

The seventh book is devoted to agriculture proper, to the treatment of fields. After giving a list of previous authors on the subject in chapter one, with reference to the Roman goddess Ceres as the one bringing the cultivation of grains to mankind, the second discusses its cultural framework from a Christian point of view. Here, the balance between accepting what god has given as a soil to live from and thus being content and trying to put as much labor into it as possible to procure more than a lazy person on better soils would, is a recurring theme (Coler, VII, II, 212-215). The landlord, being the person in charge of the well-being of the entire household, has to make an effort to learn the circumstances and nature of the fields he has to till, to optimize his use of them. Quoting Aristotle, Coler advises that the landlord's eye fattens the horse and his manure fertilizes the fields better than what falls from his feet, meaning that the landlord should be personally present and oversee everything, be the first and the last one on each task, ranging from breeding horses to tilling the fields. A field, Coler goes on in his proverbial lecture, is like a debt. If it is not often and in earnest demanded, it gets rusty, and likewise does a field not regularly attended to (Coler, VII, III, 217).

To give you a feel for a typical part, advice usually covers manuring, plowing and distinguishes per soil type. Good and well manured soil is to be sown later than sandy soils, and the seed has to be plowed under lest it be blown away by the wind. Alternatively, sheep can be driven around on the freshly sown field, as they stamp the seed into the soil (Coler VII, XXVIII, 243). Erosion is a problem on hillslopes. As hills consist predominantly of hard soils with stones, they have to be well manured and dug, or if it is possible to plow, plowed deeply. To prevent erosion by rainwater, plowing should never be done up- or downslope. Coler understands that the rainwater washes away the fertile soil, stating: *'Denn, wenn die Bethe die quere gemacht sein / so kann die geile nicht wegschwimmen.'* (Coler VII, XXVIII, 244). .

Coler gives approximate amounts for manure application, and explains that less weed will grow if manure is applied on the stubble, in particular if the moon is waxing. The eighth point recommends to burn the stubble, with a little wood added so it burn better, and because the wood ashes are adding to the effect. Quicklime or marl fattens the fields and clears it of all weeds. Point ten recommends the use of the ashes from saltpeter production as fertilizer, eleven mentions road dust collected through the summer as a good grain growth supplement. The 12th and last point mentions moss, litter and soils which is collected under big trees, which should have an effect comparable to manure (Coler, VII, XXI, 246).

The following chapters (22-29 and 49-56) are different from the rest of the book in terms of the treatment of soil matters. The latter chapters explain the course of sun and moon, planets and their course through the hours of night and day over the week. In the short chapter 53, the connection between qualities of fields, seeds, and the basic four qualities cold and warm, dry and wet, is made in a table. This table is at the very heart of the theoretically guided practice recommended in this part of the book. The first block of 7 chapters is hard to put into practice without the knowledge presented in the later ones. But as we want to follow a potential systematic reader through Coler's work, we shall start with the first block. In chapter 22, the four basic principles for good agriculture are given: First is to pay close attention to the qualities and nature of the fields, second to pay attention to the nature and quality of the seed, third to pay attention to the timing within the year, which is regulated by sun and stars, and fourth, to the daily weather, ruled by the moon and the planets. In chapter 23, the qualities of fields are explained. Fields can be either warm and dry, as is the case with those fields which look like burned ash, or they can be gravelly, with lots of fine gravel and sand. They can also contain lots of marl, or lastly, be a mixture of sand and earth. Fields can be warm and humid, a s is the case with good, fat land which has a lot of sun, such as good valleys, which are not shielded from the sun by high mountains, or fat water-meadow along the water. Coler uses some Latin terminology in his following descriptions. Fields which are cold and dry, such as mountainous fields, stony, cold fields, gravelly, sandy, coarse ground, *terra sabulosa et glareosa,* which means sandy and gravelly land. The fourth type, cold and wet land, is clayey or loamy, *argillosa et limosa terra* (clayey and muddy soils), cold valleys, or cold, watery meadows alongside the water. What Coler attempts here is the connection between a theoretical system, humor theory, and practical knowledge about the different qualities of fields. In the following chapter, seeds are qualified using the same system.

Warm and Dry: Rye, oats, vetches, hemp, radish, saffron, hops, juniper, garlic, horse-radish, capers, lentils and white mustard.

Warm and Wet: Wheat, spelt, roots, rapeseed, buckwheat, carrots and yellow carrots, Swedish turnip, onions.

Cold and dry: Barley, millet, peas, black poppy seed and *Pintzerkorn*

Cold and wet: white poppy seed, beans.

The next chapter gives the qualities of the seasons. The first part of spring, in March, is cool and wet, the middle part, in April, is warm and wet[3], and the last part, in Mai, is warm and wet, but temperate. June is warm and wet, July is warm and dry, and the third part is dry, with

[3] One would assume it should be dry, but the text has wet.

warmth and coldness balanced. The first part of autumn is alike the last part of summer. October is unsteady, November is cold, and tempered between wet and dry. December is like the end of autumn, January is cold and wet, and February is like the beginning of spring (therefore cool and wet).

The last missing part laid out in chapter 22 is the weather. The first quarter of the moon is warm and wet, the second quarter is warm and dry, the third is cold and dry, and the last quarter is cold and wet. The following chapter is titled "How to use the four preceding chapters". In it, Coler qualifies the classification he has just made. After explaining the principle of similarity using warm and dry seeds, which need warm and dry conditions to grow, he modifies this dictum somewhat: There must be humidity, but not too much, and these seeds want a warm and dry time during the year. He goes on explaining in detail what must have seemed a difficult problem to him: Everything that grows, grows from warmth and humidity, and both are needed for growth. But, and this is needed to reconcile the rules of the four qualities with this basic principle of growth, each plant needs these according to their own measure, therefore they grow in different fields, and the dry seeds want drier fields than the wet seeds. Manuring can change the quality of a field. If a warm and dry field is manured with horse, donkey, or sheep manure, the field grows stronger in its nature, and bears the stronger what is sown. This is due to the fact that 'the like will to like', as Coler puts it. If a field is warm and dry, and manure of a warm and wet nature is added, the fields *complexion* changes, so that warm and wet seed will likely grow best there. The same is true vice versa, if a warm and wet field is manured with warm and dry manure, the field is the best for warm and dry seed. If a cold and wet field is treated with warm and wet manure, warm and wet seed will grow on it. The next paragraph implies yet another possible treatment for fields, the addition of new topsoil to infertile ground. If a wet and cold field is overlaid with new cold and wet soil, warm and dry seed, if sown in a warm and dry zodiacal sign and at a warm and dry time of day, will likely grow there. Cold and wet seed, sown in such a field without manure will also grow. Coler summarizes his systematic, albeit in a very general way, at the end of the chapter, stating, *'und also ists mit allen Eckern / wie ihre Complexiones seyn / also mus man sich darnach richten.'* (Coler; VII, XXVI, 247-48).

The following chapter is devoted to the question how one can help fields with a bad *Complexion* to become of good *Complexion*. All growth is due to warmth and humidity, and without it, nothing can grow, therefore one can reasonably follow that warm and wet soil is the fertile soil per se. As not all fields are like that, the question arises how one can aid a warm and dry field to become such good *Temperatur* of being warm and humid. Temperature

obviously would be mistaken to be a matter of degrees, the notion is derived from the theory of four qualities, denoting temperament, but not temperature in the modern sense. This can be established from one of Coler's soil test methods. He recommends to take a clod of soil with grass on it and wash the soil thoroughly. If one then finds the soil tough, and sticking to the fingers when touched, and if the clods do not break up when thrown to the ground, the field has a good *Temperatur* (Coler, VII, XIV, 233).

The right timing to prepare and plow such fields are warm and wet zodiacal signs, when the moon is in Gemini, Libra or Aquarius, in its first quarter. Then manure of the right *Complexion* has to be applied, that is cow, oxen and pig manure. Other possibilities to manure such a field are the addition of the black muck from ponds, of black, moldering soil used for making turf, black earth from heath and forests, which is wet and nevertheless grows nice grass, all these types of soil are as good as warm and wet manure and have immense power. Coler then gives detailed descriptions of the exact timing for wintergrain, grain, vetches, oats, hemp and other summer-fruit. These prescriptions combine the zodiacal position of the sun, of the moon, and the planet ruling the time of day at which sowing is to be performed. Each of these paragraphs concludes with a reference to God: If the timing is observed, plants will grow well with God's blessing. Coler then repeats what he has said in the preceding chapter, that a warm and wet field, manured with warm and wet manure, is likely to grow even stronger and bear winterfruit of its *complexion* even better, given the right zodiacal timing for operations, detailed for winter and summer sowings. The final paragraphs of this chapter are of completely different character, more closely resembling the many instances in which soil and manuring are mentioned unsystematically before and after the systematic treatment in Book 7. A cold field can be made warm, as a meadow with a rough and hard surface can be improved, by adding cold sand and good manure and then plowing it in. Coler explains: under the sun, the sand will warm up, manure makes the field more humid, and therefore barley and rye can be sown, and then, after another addition of manure, it will bear well. The chapter concludes with a reference to Mizaldus. The writer, Antoine Mizauld (1510-78) French astronomer and medical doctor, is frequently quoted by Coler, this time for his observation that the water raining during a thunderstorm, or when lightning can be seen without the storm is very fertile and helps field and seed.

The following 28th chapter is specifically devoted to cold and dry fields. Coler announces that there are three ways to help them. They have to be worked and plowed in warm and wet zodiacal signs, and then either fat and good pond-muck mixed with cow and oxen manure or warm and wet soil from another field shall be added. The third possibility is to hurdle sheep

on such a field. As the field takes over the nature and quality of the manure, such fields can then be sown successfully. Coler details the zodiacal prescription for winter and summer sowing in the remainder of this chapter.

Chapter 29 is devoted to the treatment of cold and wet fields. The prescriptions differ from those given for cold and dry fields. Marl, horse dung, fine sand, pulverized limestone, quicklime, saw mill waste, and coal-dust as found on places where charcoal piles are made, added and plowed under, make the field mellow and fat (*geil*). These fields should not be used for winter sowing.

The 30th chapter discusses the preparation of fallowed fields for use. In this chapter, the first distinction made is the one between a good and a bad field, which have to be plowed differently. The main difference between those two types of fields seems to be the thickness of the topsoil layer, as can be inferred from Coler's prescriptions. A good field can be plowed deeper than a bad one, as in the latter case the field would get even less fertile. Light plowing, with small amounts of soil on the plowshare not only cut the field better, so it be more fertile, it is also cheaper, as plowing can be done with 4 oxen rather than with a team of oxen and horses. Plowing should be done criss-cross, especially on the strong, stiff (*streng*) grounds of Meissen and Silesia. Plowing should be done five times, as should be harrowing. It is not recommended to plow a wet field, as large clods will form through plowing, which can hardly be broken up later. Plowing the stubble under after harvest is seen as an excellent means to sustain fertility (Coler, VII, XXIX, 249).

Additional facts to be borne in mind with regard to fields are given in the following chapter. Coler talks about the amount of time necessary to plow. Timing for plowing, harrowing and manuring is broken down geographically and by quality of fields, but this time without any zodiacal information and without mention of the four qualities. Fields in Meissen, good fields, marginal fields, bad, unclean or very grassy fields, and mellow and clean fields are distinguished (Coler, VII, XXXI, 249-50). The following chapters give prices for manure, the estimate of manpower necessary for operations, prescriptions for sowing and in Chapter 34, the treatment of vegetables and fruits to be hoed is detailed. In it, the rotting of grass on a place designated for sowing vegetables is connected to the moon phase, hoeing and plowing shall make the field mellow, and manure is to be added before the winter to prepare the ground. Beets should be sown into a mellow ground, as they will grow bigger therein. The rest of the prescriptions deals with the correct phase of the moon for sowing. Information of the right timing for propagation of different crops is given in the following chapter (Coler, VII, XXXVI, 251). Tanning liquor, ashes and limedust are recommended against flee beatles,

which harm these seeds, so this chapter is again of practical character, and timing is given in two ways in it, both zodiacally and by the names of saints' days, which was obviously the common way of knowing one's time. Apparently, Coler tries to merge two systems of knowledge, the theoretical, astrological system and the theory of the four qualities, and a practical system in which field qualities are discerned other than by the four basic qualities, but rather by their physical properties such as crumbliness, and timing is either given by zodiacal signs of sun, moon and planets or, in contrast, by the names of church festivals such as Pentecost and Easter, or by named saints' days. The following chapters give details on sowing times in both systems. A chapter on the special properties of the *Christnacht*[4], which can be used for forecasting the upcoming year's condition finalizes the chapters devoted to sowing. In it, Coler refers to his *Calendarium*, which does have a long article of the same content (Coler, VII, XL, 253-54). The next chapters give estimates for the feeding of the servants, prescriptions of how to store grain without loss of quality, and other economic considerations.

Chapters 49-56 are an introduction into agricultural astrology. Here the reader can look up which planet rules which hour of the day, information needed to comply with the rules for sowing detailed before. The 55th chapter tries to explain how the information given in the preceding chapters should be used, the chapter is entitled *Brauch*, usage. In it, a general rule to observe the zodiacal sign of the day, the quality of the seed and the planets in combination is given, and three examples are laid out. The principle behind the whole system, that like will to like, is the basis of consideration. A field takes up the quality of the seed, and balances itself with it. Air, water and seed are important for a field's *complexion*. The first example is about a warm and dry seed, grain. It should be sown in a warm and dry sign, that is in Aries or Leo, in the hour of the Sun, Mars or Mercury, as these are warm and dry planets, which give the ground more of their nature. Barley, the second example, cold and dry by nature, is to be sown in Taurus, because this sign is also cold and dry. But, as cold and dry are infertile, warmth and wetness are missing. Therefore, sowing should be done in the hours of Jupiter and Venus, warm and wet planets, which give moisture and warmth to the soil. The third example is similar to the second. Peas, by nature cold and dry, are to be sown in the signs of Aries or Leo, as these are warm and dry. Sown at the hours of Jupiter or Venus, their warm and wet nature adds such quality to the soil. Apparently, not even the examples are really consistent, as barley, in the same category as peas, is to be sown in a similar sign as is its nature, whereas peas are sown in an opposite sign.

[4] The night from December 24th to 25th.

The effect of the moon is the theme of the following chapter, and Coler sets out to give a prescription for the simple-minded people, to whom everything has to be explained in a more childish fashion than to savants. Coler suggests that village pastors should adopt a custom he traces back to Roman times, to point the moon's cycle out to peasants after church on Sundays, so they can sow and plant accordingly (Coler, VII, LVI, 263).

After several chapters dealing with other issues, Coler comes back to soils in chapter 63, which is devoted to sandy fields. In it, Coler shows concern about the organization of his work, stating that he should have dealt with sandy soils right after Chapter 23, where his discussion of the qualities set in, but that he has forgotten to write about it as other material tempted him. He refers back to Chapter 18, where he has treated sandy soils (which is true), and announces that will give a comprehensive treatment now. Coler is concerned with wind erosion on sandy soils, a problem in particular when the winds blows off seed and soil. Therefore, seed should be plowed or harrowed under quickly. Sheep can be used to trample the seed in, too. If such a field is to be helped, fat earth such as loam has to be brought and spread two fingers high, then manure is added, and the seed is sown without further plowing. Only after the first crop, hence a year later, the top layer should be plowed under. Alternatively, manure can be brought to a sandy field, with an early crop of oats sown in spring, and rye in the following winter, this should double the harvest. A chapter on help for other types of 'sick' fields follows. Likening fields to the nature of humans, them being more prone to one or the other disease, fields are described as either too wet, like those in the Netherlands, to warm and droughty, that is marginal or meager (*mager*), or being too fat, like those in Thuringia, or being mossy, sandy or gravelly, like the fields around Nuremberg. A mossy or wet or boggy field (this is the first time that the word *Gebrüchig* is used in the text to describe a soil) is to be treated by adding better earth and thus increasing its height, or by digging trenches to drain off excess water. Sandy, gravelly or otherwise marginal land is helped by adding loam, clayey soil (*Lette*), manure and other fat stuffs, such as the sludge or muck extracted from ponds. Land which is too fat, can be helped by adding sand or gravel; if it is gravelly, beech-ash' slime can be added, so that the mossy and gravelly nature will be changed and fat clover will grow instead of wild heath. Rough, wild land, as is found on slopes and mountains, can be made to bear good grain if all the bushes are burnt, so that the roots are also burned, and then dug or harrowed and sown. Recipes against various kinds of weeds conclude this chapter (Coler, VII, LXIV, 271-72). The last chapter of the 7th book is devoted to the ways manure is kept in different locations, depending on the layout of houses and manors for each region (Coler, VII, LXV, 272).

Wolf Helmhard von Hohberg's Georgica Curiosa of 1682

Hohberg (1612-1688, Nuremberg) was the epitome of an aristocratic landlord, he had pursued a military career and in his 70th year started to put together a formidable book on agriculture. He was a member of the "fruchtbringende Gesellschaft" and mentions a series of friends whom he consulted in writing the book.
Hohberg does give astrological information but it is not linked to agriculture.

I would like to trace the long and winding history of fertility theory with his book as an example. For that, we need to travel to Rome for a moment.
The Flamen Dialis, Jupiter's priest in Ancient Rome lived under severe restrictions. His vital force had to be protected, so, among a host of other regulations, he was not to mention or touch anything that had to do with the dead, such as goats, ivy, or beans, which all played a role in funeral rites. The same taboo was on him with regard to mentioning or touching raw flesh – it was too close to the dead animal before cooking. But why was his vital force so important? A closer look at his official duties can shed light on this question. The Flamen Dialis was never to leave Rome for longer than one day, because he had to sleep in his own bed. The bedposts of this bed were always to be covered with *lutum*, loam, a sticky earth. Compared to the strong regulations on his life, the Flamen Dialis had a relatively small role in the various festivities honouring gods. But he was to be married, and if his wife, the Flaminica, died, the Flamen Dialis lost his priesthood. The explanation for the role of the Flamen Dialis lies in the role of soil fertility for the Roman Empire: Jupiter's priest was to guarantee the fertility of Rome's agriculture by means of his live, not by a particular ritual, but by symbolically sleeping on the earth and fertilizing it via intercourse with his wife.
To the readers of Hesiod's Theogony and the Erga Kai Hemerai, the Works and Days, one of the oldest extant descriptions of agricultural pursuits, the story of the Flamen Dialis might sound familiar. It has been shown that Hesiod's poetic program is based on an immanent god. The divine will is not discovered by reading sacred or philosophical texts, but rather in the day-to-day world in which Hesiod lives. The life of people manifests Zeus will. What succeeds in the world is what Zeus has prescribed for humans. Farming, which is the necessary way in which humanity procures food, is, therefore, necessarily also the will of Zeus. (Nelson, 1998: 63) Farming knowledge in such a belief system is knowledge necessary to perform the will of the divine beings, and has, therefore, a sacred dimension (Cf. Winiwarter & Blum, 2006).

When Michal Pollan characterized the agricultural revolution that has come to be associated with the name of Justus von Liebig as the end of the prevailing of a 'quasi-mythical' concept of soil fertility, he overlooked that the agricultural textbooks of Early Modern Europe had kept remnants of the world-view of primal European religions, in which successful faming was the way to manifest the will of the gods (Pollan, quoted in Cohen). Tellus, the primal Roman goddess of the Earth, had been exorcized on the level of direct reference in Christian authors, but not on the conceptual level. Tellus is a female goddess, later she was addressed as Terra Mater. She was the goddess of fertility but also responsible for earthquakes. The soil brings forth fruit but is also the burial place for humans, thus the Goddess is connected to life and death, embodying the ambivalence inherent in human relation to the land. Tellurus (or Tellumo), a male god, is a later addition to Tellus (Wissowa, 1912:161ff).
The long shadow of a fertile Earth as goddess and of proper agriculture as a means to worship her must not be forgotten when tracing concepts of soil fertility in the agricultural literature of the 17.-19th centuries.
Such a concept is the basis of considerations such as the one offered by Wolf Helmhard von Hohberg in his book on wine-growing: *„indem ein Erdreich/ das von sich selbst weder Gras noch Kräuter trägt / die Anzeigung gibt / daß ihre Schoß ganz erkaltet/ von widerwärtigen mineralischen schädlichen Vermischungen an der Tracht verhindert seye /"* (Hohberg, 1716: 462) [as a soil / which does not carry grass or herbs by itself / gives indication / that her womb has grown cold / due to unsavorable, mineralic, detrimental mixings she is hindered from pregnancy/]
Conceptualizing the pursuit of proper agriculture as a "moral" undertaking ignores the deep roots of spiritual embedment of working the ground. This holds true even when clergy writes or the readers are monks.
We shall now turn to the 18th century for our last example.

Johann Christian Daniel Schreber, Allgemeine Gründe der Düngung, Part 4, 1759

Schreber (* 1739) was not only secretary of the Ökonomische Gesellschaft zu Leipzig, he was a Professor of Cameralwissenschaft in Leipzig and later on in Erlangen. He published a periodical, which found its way into the Melk library as a volume in which the different installments were bound together. "Schrebers Sammlung verschiedener Schriften, welche die ökonomischen, Polizei- und Kameral- und andere Wissenschaften einschlagen" was published

in 16 parts between 1755-1765. It is a miscellany and binds together works from several authors. The part on fertilization we are interested here now contains an ink stain, hence we can assume that it has been looked at. Before we turn to it, let me for once refer to a book not in the Melk library. Christian Friedrich Germershausen systematically sorted out the differences in approach to soil taxonomy encountered in 1783, when his "Hausvater" was published.[5]

Germershausen starts his chapter on soil types with an observation about the different disciplinary approaches. Economists differ, so the author, from physicists. And while he wants to spare his readers the physicists' universe, he finds the third discipline concerned with soils useful. Mineralogists, he argues, are of some interest to economists, who were, of course, engaged in home economics and pursuing agriculture. At a slightly earlier date, such categories were just in the making.

Schreber refers to the different authors and their contradicting explanantions of soil fertility. Some would say that an oily and sulfuric entity is to be introduced into the plant via manure. He agrees with them at least partially. But others claim that a salty substance is responsible for manuring, and some identify this salt with saltpeter, which some would have as manure. Schreber, quoting Ambrosius Zeiger, 1733 sides with Zeiger's opponent Kuenhold, who, in his Oeconomia experimentali, disproved the assumption [which we now hold as true]. Schreber then goes on to debunk the alchemical myth that fertility of soils is connected with a metallic and mercuric entity. The Dutch in the East Indies, who, in complying with this theory, treid – in vain- to fertilize their fields with arsenic are mentioned as a case in point to disprove the myth.

Schreber then turns to his own theory, which puts him fiercely into the camp of the adherents of humus as fertilizing principle. As plants are organic, only an organic entity can nourish them. In accordance with scientific requirements, he then analyzes the humus to find that it can only be produced by putrefaction, and that it contains of oil, a fugitive, alkaline salt and earth (sand). A good humus has the right proportion of these three constituents. The sandy part is necessary for the physical stability only [we agree with that today] the oil is the fertilizing principle; the role of salt is to connect the aquatic with the oily. This is as theoretical as the Melk agricultural library would get.

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[5] Germershausen, Christian Friedrich, Der Hausvater in systematischer Ordnung. Kapitel V, Kenntniß des verschiedenen Erdreichs, Leipzig 1783, 534-584.

Conclusion

Readers of the agricultural library in Melk had access to some of the most renowned works on agriculture, written by recognized experts in their field. The library owned an abbreviated Krünitz, the economic-technical encyclopedia of the time, in addition to a full, if cheaply bound copy of the Encyclopedie by Diderot and D'Alembert. The authors in their library are frequently quoted in Krünitz' work, testifying to the fact that they did belong to the established body of knowledge. The books on the shelves were practical treatises, handbooks dedicated to experience-based, or, if you will, evidence-based knowledge, which was systematically presented but did not define itself primarily as "scientific". The dominant message of all works is that fertility of the soil has to be replenished, as plants nurture themselves from the soil which is depleted of its fertile agent, even if the details vary. A reader of the late 1700s would encounter a whole host of manures, with detailed explanations on their proper use, such as the proper age of manure, its correct treatment to minimize weed growth and maximize fertility, they would be informed of the most suitable manure for each cultivar and soil type, they would also find information about the timing of manuring, about preparation of manures by mixing or other steps, they would be treated to references to ancient and contemporary literature and be told to observe nature closely, to test soils by tasting, feeling and working it.

In the 17th century works, humor theory was as much a guiding principle as it was not. Soil taxonomy more often than not came in pair of opposites, the negative pole often be much more elaborately described than the positive one. Readers of the Melk library would be informed of the presence of different layers in a soil profile in Franciscus Philippus Florinus, Oeconomus prudens et legalis, oder Allgemeiner Klug- und Rechts-verständiger Haus-Vatter. 1722, they would be presented with theoretical considerations by Schreber and others, and they would find congruencies and contradictions. By using their expertly established library, they had no reason to concur with John Claudius Loudon's assessment on the state of knowledge about soils. In 1883, in the Eighth Edition of his Encyclopaedia of Agriculture, which had first come out in 1829, Loudon had given a dire assessment of the state of knowledge about soils: " […] but it may be truly said, that in no department of cultivation was ever so much written of which so little use could be made by practical men." (Loudon, 1883, 315) Knowledge about soils to readers of the Melk library was pretty much geared to the interest of practical men. It was rich in practical matters, but it was also, as I have tried to

show, rich in contradictions and irreconcilable conceptual approaches. Readers knew how to handle that, some of the readers we can follow marked books with plusses and minuses, superimposing their own measures of credibility on the printed knowledge and thus deciding which side they were on. Just like them, who blurred the boundaries between the printed and the written, we need to blur the boundaries between our categories of theory and practice to be able to meaningfully encounter the rich diversity of soil-related knowledge.

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Addendum (Enzyklopädie von J.G. Knünitz, online Verfügbar)

KRÜNITZ: * ***Acker*****,** L. *Ager,* Fr. *Champ,* oder *Terre labourable;* darunter verstehet man überhaupt ein Stück Landes oder Feld, welches mit dem Hacken, Pfluge und der Egge zugerichtet, und sodenn mit allerlei Saamen oder Gewächsen zu verschiedenen Zeiten besäet wird. Das Meiste kommt hierbei hauptsächlich auf die Lage und Beschaffenheit des Bodens, und auf dessen Bestellung an. Der Acker, nach seiner Lage, ist **hoch** oder

niedrig. Jener liegt auf Höhen, da kein Wasser zukommen kann; dieser in der Ebene, oder in niedrigen Flächen, da das Wasser entweder aus dem Grunde bald aufsteigen, oder von der Seite eintreten, oder von den Höhen sich sammeln kann. Nach seiner Eigenschaft ist der Acker **sandig, lettig, steinig, mohrig, fett,** oder **mager.** Nach seiner Beschaffenheit ist er **fruchtbar,** oder **unfruchtbar, artig** oder **unartig, leicht** oder **schwer zu bestellen.** Nach seiner Beschickung ist er **läde,** der lange Zeit ungebaut geblieben; **brache,** der ein Jahr ausgeruhet; **in der ersten, andern** oder **dritten Art,** das ist, vor so vielen Jahren gedünget, oder auch so vielmahl gepflüget, und zur Sommer= oder Winter=Saat zugerichtet worden. Alle diese Eigenschaften und <1, 290> Umstände muß ein verständiger Hauswirth wohl verstehen, und nach denselben seinen Acker zu brauchen oder zu verbessern wissen.

Das Ackerfeld wird insgemein in drey Sorten eingetheilt, nach deren Beschaffenheit man von der Güte oder schlechtem Zustande desselben urtheilet. Ist zuvörderst der Acker schwarzgrau, dabey locker und mürbe, jedoch in etwas schwer, und die Feuchtigkeit gern an sich ziehend, so ist derselbe unter die guten Ackersorten zu setzen. Desgleichen, wenn derselbe gelbgrau, in etwas leimigt ist, und fett aussiehet, doch aber zusammenhängt, und im Drücken mürbe ist, so ist er gleichfalls unter das **gute Ackerfeld** zu rechnen; ingleichen, wenn derselbe hellgrau und blaß aussiehet; doch wenn er trocken, mürbe und in der Hand schwer ist, und wenn er feucht und naß, auch etwas schmierigt ist, und glänzet, so wird er ebenfalls für gut gehalten, und pflegt man ihn einen **starken Boden** zu nennen. Zu starkem und gutem Boden werden auch endlich diejenigen Aecker gerechnet, welche keine von erwähnten Farben haben, sondern röthlich=braun aussehen, jedoch ohne schieferig zu seyn, etwas leimigte und schwere Erde führen, im Zerreiben aber doch mürbe sind. Die andere Sorte **mittelmäßigen Bodens** entdecket ein kluger Hausvater, wenn der Acker schwarzgrau, locker, jedoch dabei etwas fett, und mit gröblichem Sande vermischt ist, und dabei schwer fällt; oder, wenn er leimigt, gelb=bräunlich und mit grobem Sande vermischt ist; oder, wenn er grau, locker, mülbigt, kleyigt ist, und gern zusammenhängt, doch aber schwer ist; oder, wenn er grau ist, und fast aus lauter Sande bestehet, dabei aber schwer ist, und Erde vorstellet; oder wenn der Acker gelbfahl von Leim, gröblichem Sande, und mülbigt=kleyigtem Erdreiche zusammengesetzt ist, und dabei kleine Steine bei sich führet; oder, wenn er sehr steinigt ist, dabei aber schwärzlich oder grau Erdreich führet; oder, wenn der Acker von <1, 291> grauen, gelben und rothbräunlichen Erdreiche

bestehet, und kleine Steine, fast den Erbsen gleich, und noch größer, bei sich führet, dabei aber die übrige Erde etwas fett scheinet; oder, wenn er aus lauter schwarzen und grauen, jedoch schweren und fetten, Sande bestehet, und im trocknen Wetter nicht vom Winde zerstäubet, so sind solches Anzeigen eines mittelmäßigen Ackerfeldes. Die dritte Sorte **leichten und schlechten Bodens,** wird aus folgenden Kennzeichen beurtheilet: Wenn der Acker weiß, schmierig und kalkigt ist, und dabei wie ein weisser Schmirgel aussiehet, und steinigt, plattschiefrig und läufig ist; oder, wenn er weiß, steinigt, kiesigt, grob und schneehorstig ist; oder, wenn er bergicht von roth oder eisenrostigen Gestein und weißlichten Schiefern, welche bei nassem Wetter klebrig werden; oder, wenn er aus vielen und lauter gelblichen Sande bestehet, und dabei leicht zerstiebet; oder, wenn der Acker aus grauem Sande, und lauter Fasern und kleinen Wurzeln bestehet, und dabei nicht schwer ist; doch durch Ruhen und Düngen noch zu nutzen; oder, wenn er lauter weissen Sand führet; oder wenn er schwarz=staubicht, leicht und zerstäubend ist. Diese Art von Ackerwerk ist schlecht, und werden dergleichen Aecker **Mistrauber, Mistfräßiges Land,** genennet, weil alles Düngen fast umsonst verschwendet wird, und kann demselben durch die beste Wartung nichts abgewonnen werden, und wird daher auch von den Naturkundigen *Terra damnata* genennet.

Wo der Schleedorn, Klee, Brombeeren, und dergleichen Gewächse von selbst ausschlagen, solches wird auch für ein Zeichen eines guten Ackers angenommen.

Die Feinde des Ackers sind: 1) Bäume und Sträuche, wo sie zu dick stehen, und mit ihren Schatten oder Wurzeln die Fruchtbarkeit hindern; 2) Steine, wenn sie zu dick und häufig darauf liegen; wiewohl die zähen und lettigen Felder durch kleine Steine gebessert werden; 3) Wasser, wenn es von dem Schnee oder Feldfluthen <1, 292> in den Senken stehen bleibet, oder aus dem Grunde stauet, oder aus einem nahe gelegenen Flusse übertritt. Die Bäume und Sträuche werden ausgereutet; die Steine aufgelesen, und über einen Haufen, in die Raine, oder, welches besser ist, in die Wege, geworfen. Die Wasser werden entweder durch gezogene Wasserfurchen abgeleitet, oder durch aufgeworfene Gräben abgezapft, oder durch aufgeführte Dämme abgehalten. Die gewöhnliche **Verbesserung der Aecker** geschiehet durch die **Düngung mit Miste,** welcher entweder aus dem Hofe auf den Acker geführet, oder durch **Lagerung des Viehes,** vornehmlich **der Schafe,** welches man den **Hordenschlag** nennet, darein gebracht wird. Gewisse Aecker können auch mit **Mergel** verbessert werden. Die Bestellung des Ackers

geschiehet, wenn erstlich gepflüget, hernach gesäet, denn abgeerndtet, und das darauf gewonnene Getraide eingeführet wird. Gemeiniglich werden hier zum Sommer=Getraide die Aecker um Michaelis gestürzt, um Fastnacht gerühret, und um Ostern zur Saat bereitet; zum Winter=Getraide aber stürzet man sie im Brachmonat, rühret sie zwischen *Jacobi* und *Laurentii,* und pflüget sie zur Saat um Creuzes=Erhöhung. In Ansehung dessen aber bekommt der Acker oder das Feld mancherlei Benennung, und heißt bald **Läde=** bald **Brach=** bald **Stürz=** bald **Rühr=** bald **zugesäeter** und **besäeter Acker.**
Siehe auch die Artikel ➪**Acker=Arbeit,** und ➪**Feld.**