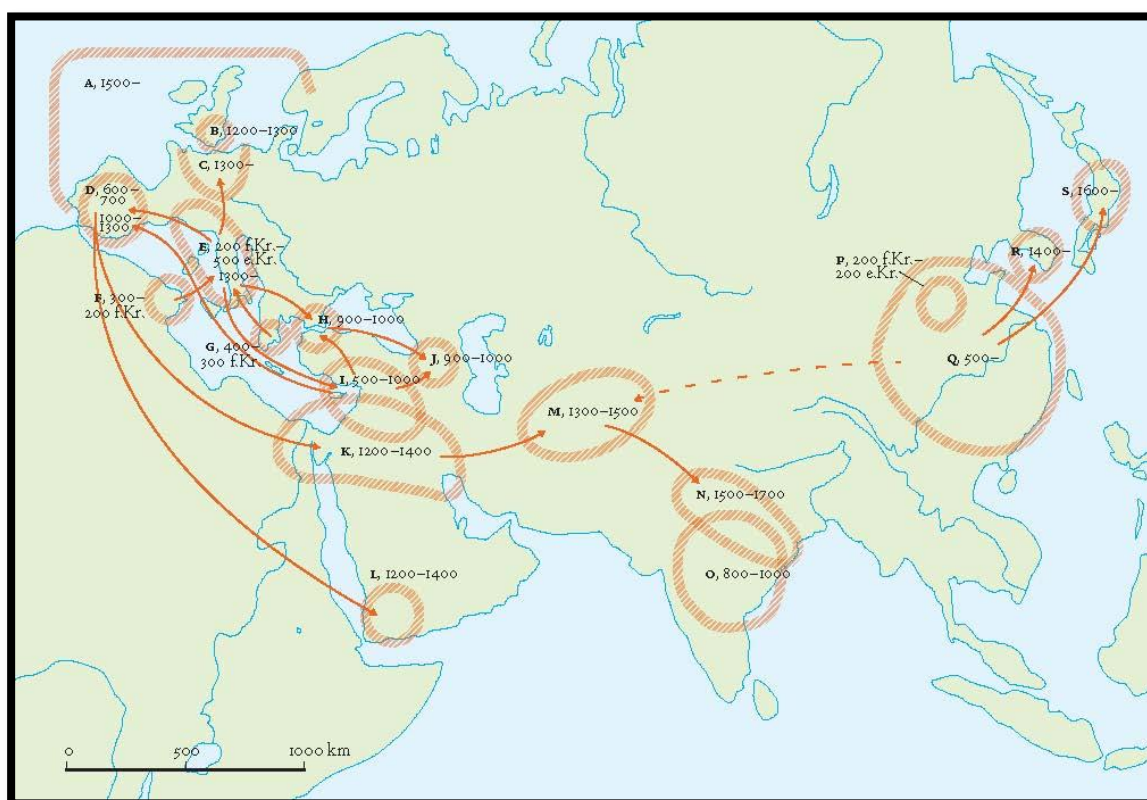


Agricultural Literature in Eurasia circa 200 BCE – 1500 CE

Janken Myrdal



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Abstract

Agricultural literature is one of the most important and oldest non-fiction genres in the world. This text gives us the first overview of extant agricultural treatises in Eurasia before c. 1500. With this overview, it is possible to give a better foundation to discussions on the role of knowledge. This literature also gives us indications about the importance of agriculture in different periods for a number of regions in Eurasia. An important part is discussion on method. The goal is to arrive at comparable numbers – to form the basis for analyze.

JEL-classification: N13, N15, N50

Key words: Agricultural history, Knowledge, Eurasia

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INTRODUCTION¹

One of the most important non-fiction genres in the world is treatises on the proper pursuit of farming, a genre that will be called “agricultural literature” here. The rise of such a genre was not always a given, but its genesis gives us, its posterity, unique glimpses into mundane life over the ages.

The aim of this text is to provide an overview of extant agricultural treatises until about 1500. The overview is confined to Eurasia for the simple reason that there was no such literature in Africa or the Americas during the covered period. (This text has been published, in Swedish, as an introduction to a translation of Cato and Varro, who wrote the earliest extant agricultural treatises in the world.)

These texts form a point of reference for all agrarian history including that of times and regions for which no such literature exists. But there is yet another reason to write an overview: to answer the question of whether interest in agriculture was more widespread during certain historical periods. Naturally, the literature primarily reflects the interest of the landed gentry in farming, but the question is whether this corresponds to wider movements in society. Is the agricultural literature evidence of generally keener interest and perhaps greater understanding?

This question is related to one of the great issues of historical philosophy: the significance of knowledge to historical development. In order to shed light on the role of knowledge, I will present two leading scholars: Joel Mokyr and Jan Luiten van Zanden. The central research theme for both Mokyr and van Zanden is the economic breakthrough in the western world. My aim is broader, but their theories provide a backdrop for interpreting the agrarian literary genre.

Mokyr has examined the growth of knowledge in a series of essays starting in the late 1990s. In one from 2002, he defines a set of terms to enable analysis of the historical development of useful knowledge. The objective is to discover how a theoretical level influences a more pragmatic one. He differentiates between ‘knowledge “how”’ or

¹ This paper is a translation of the chapter: Janken Myrdal, ”Lantbrukslitteratur i Eurasien cirka 200 f.Kr. till 1500 e.Kr.” in: Cato, Marcus Porcius, *Om jordbruket*. Varro, Marcus Terentius, *Samtal om lantbruket*. Samt Liv, *lantbruk och livsmedel i Catos och Varros värld..* Stockholm, forthcoming. The translation was made by Rosemary Nordström.

“prescriptive” knowledge and ‘knowledge “what”’ or “propositional” knowledge.² The latter also includes informal folk wisdom. Adequately organized “propositional” knowledge did not exist prior to 1800. This connects to his fundamental thesis that preindustrial technological progress was constrained, almost stochastic, and thus a rare occurrence.³ Continuous technological progress did not occur before the advent of a new mentality, a new approach. Organization of thinking paved the way for the Industrial Revolution and ongoing technological development. In a later essay, Mokyr addresses the follow-up question of why people hoped for so long that the collection of knowledge would be a transformative power, even though science did not have direct impact on the material transformation until after the mid 19th century.⁴ As an indicator he uses also agriculture literature. He argues that the change in the prevailing social mentality towards more mundane concerns began in the 18th century.

In his explication of the role of knowledge growth, Jan Luiten van Zanden goes further back in time. From van Zanden’s perspective literature is a central indicator and what he measures is the growth of knowledge and human capital, that is, the skills and knowledge of the masses. In his studies, van Zanden draws comparisons with West Asia, India, and China-Japan, where the production of written texts was greater in the Middle Ages than in Europe, but where the leap to mass production did not occur.⁵

Both authors argue in favor of the usual tipping point theory, that is, very slow change followed by sudden change. This is connected to how the transition to rapid change occurs during the period of western domination, starting in Europe.

This thesis will be tested by examining all known literature in one of the most important non-fiction genres over two thousand years. Since it was written for the elite, the self-evident answer to whether it had any impact on practical farming is generally that it did not. (I thus reject the hypothesis that innovations in technology are spread mainly from the upper classes, this has proven many times to be wrong – technology develops through practice.) The question can be restated so that one instead views this literature as a possible expression of a general interest in material growth. If such is the case, it might be an indicator that there were intermittent periods of a widespread push to improve production (in all social strata in a society), which would partially contradict the notion of a single

² Mokyr 2002, pp 2-5.

³ Mokyr 2002, p 19.

⁴ Mokyr 2009, pp 52, 487.

⁵ Zanden 2009, s. 65-86, 187-189, 254.

dramatic period when everything changed. Instead I would suggest that we try to identify several periods of dramatic change.

My overview will show not only that the theory must be developed but also that the question has to be partly rephrased. We are facing a very long development process with several possible paths. The breakthrough for agricultural literature in the West cannot be understood in isolation, but only as part of this long process.

BOUNDARIES

Method is crucial to assessing results. Clear boundaries and well-defined categories are essential in all comparisons. If your object of measurement and the material itself are not clear, your conclusions may disperse to the point of becoming general statements. The results become not much better than those arrived at when the author's method is to cherry-pick a few illustrative pieces of evidence. As we know, this is a method that can be used to "prove" just about anything. Comparisons made without methodical rigor will be determined by preconceptions, by that which the author believes he or she knows, and will rarely lead to unexpected results.

When boundaries are rigorous, the point is not to round up as much evidence as possible. There is a seductive appeal in global history studies to include copious evidence from the area that offers it. What happens then is that measure something other than what you think you are measuring. The quality of research and materials is inconsistent. If too much is included, there is thus risk that you will compare the quality of the research and materials rather than the significance of the phenomenon. (The notion that global overviews are impossible is both pointless and uninteresting and will not be addressed here.)

Geography: It is necessary to compare equivalent geographical areas and periods and I will be working with wide cultural spheres here: the Classical World; the Islamic (Arabic and Persian); the Chinese, the Indian, and the medieval European. They overlap geographically so that, for example, the Iberian Peninsula belonged in succession to the Classic, Arabic, and European cultural spheres (see map p. 47).

Chronology: All literature older than 200 BCE has been excluded from the tables, but the texts are mentioned in the regional descriptions. The later boundary is 1500, but in the

regional descriptions I continue to the 1600s. This applies particularly to Europe, where the great leap occurs.

Inclusion criteria: Three basic criteria were set for inclusion of texts in the main Table 1 (below): A/ length, B/ subject, and C/ preservation:

A/ Only longer texts have been included. One can assume that longer texts are discussed in general surveys, even those with more extensive shortcomings. Shorter texts may be omitted if the quality of modern research and its general works is inadequate. I have set a minimum limit of approximately 10,000 words. I will discuss the issue of word counts and associated problems later.

B/ The selection has been limited to texts oriented towards agriculture. In addition to works that deal with agriculture in general, I have included those that discussed specific aspects, such as tea growing or silk production. This limitation entails a few specific problems:

+ Almanacs were excluded because they deal mainly with other subjects and are, as individual works, always too short.

+ Encyclopedias may include a number of different articles about agriculture that combined add up to more than 10,000 words. However, if individual, shorter texts are put together, comparison with other treatises is impossible (and it becomes very difficult to survey all encyclopedias with such a goal). I have therefore decided to include encyclopedias only if a single text (chapter, book) is longer than 10,000 words. In practice, this means that only Pliny was included in Table 1.

+ Treatises on the care of the horse have probably had to do mainly with riding horses. Veterinary medicine, which also applies to farm animals of course, usually dominates these treatises. They should therefore be considered a collateral branch of the agricultural literature genre, but it proved difficult to acquire complete information. These treatises were common and have a partially different periodicity and geographical distribution than the rest of the agrarian literary tradition. In addition, Arabic equine literature was apparently in a class of its own in Eurasia.

C/ Only extant texts were included. This is a central limitation, and the reason is that is a more reliable measure to count extant texts than texts, that are known only through citation or quotation in other works. Extant works can be verified in terms of content and scope.

Another important reason for this limitation is that the source material and state of research would otherwise disadvantage areas other than China. I will return to this.

I have classified as extant those texts that have been largely preserved or have been preserved to such an extent that they can be considered longer texts, as above. I have not included texts that are extant only in translation to another language, but instead recorded them as having been written in the original language and at the point in time when they were conceived.

Older translations evince an interest in agriculture but have not been included in Table 1 because it is difficult to acquire a more complete list of these works. I do, however, cover those I am aware of in the regional descriptions.

The fundamental objective is to arrive at comparable numbers. One must then adjust to the weakest link, where there is the least research and fewest sources. As a result, some texts that are nearly always included in these types of overviews, such as the treatise written by Walter Henley, are not included in Table 1. They will, however, be discussed in the regional sections, which are thus an important part of the analysis and not simply dreary background information to skip over.

FINDING EVIDENCE

To my knowledge, no overview of this kind has been done before. However, more sweeping comparisons of agricultural literature in different parts of the world are done often – and then normally based on describing the literature of one of the regions, such as the Chinese or the Arabic (and often with an exaggeration of that particular region's general importance).

This overview is based on a comprehensive review of agrarian historical literature related to Eurasian agriculture (for another project). Scholarly special encyclopedias are significant to an overview such as this one. The internet has provided rich conditions for searches, but one must be aware that isolated finds must always be verified by other sources. For an overview such as this, however, the assistance of others is so critical. I mention the most important of these individuals in the main text. The assistance from the library at KSLA (The Royal Academy of Forestry and Agriculture) was utterly essential to this overview.

PRESENTATION OF THE OVERVIEW

Much of this text has to do with the basis for Table 1, since this table is “strong” in its totality, in the sense that it summarizes an extended phenomenon in a concise format. I will immediately address a few of the problems and thereafter relativize the results by discussing other bases of calculation. The regional reports are the qualitative analysis intended to balance and deepen the quantitative analysis.

It is difficult to date texts of the Late Classical period and in certain cases they are extant only as translations to languages other than Latin and Greek, a subject I will return to later.

The limited number of known major agricultural texts in India is remarkable and will be discussed in detail below. It is, after all, equally important to prove – and explain – the absence as well as the existence of these texts.

China and the Islamic world take on parallel dominance from the 11th to the 14th centuries. Printed texts existed in China starting in the 11th century. Printing broke through in Europe during the latter part of the 15th century (as well as in Korea), and Europe established dominance soon thereafter. In these regions, only printed texts are recorded after the breakthrough of printing technology.

Printed texts did not make a breakthrough in the Arabic world and India until much later, in connection with the colonial conquest. Printing techniques were known before this but rarely used. Many more post-16th century manuscripts have also been found than those mentioned in the literature.

Table 1. Number of extant agricultural texts by century

| | Rome - Byzantium | China (and East Asia) | The Islamic World | Europe | India |
|----------------|------------------------|-----------------------------|-------------------------|--------|-------|
| 200-100 BCE | 1 | | | | |
| 100-1 BCE | 2 | | | | |
| 1-100 | 2 | | | | |
| 100-200 | | | | | |
| 200-300 | | | | | |
| 300-400 | 1 | | | | |
| 400-500 | 1* | | | | |
| 500-600 | 2* | 1 | | | |
| 600-700 | 1 | 1 | | | |
| 700-800 | | 2 | | | |
| 800-900 | | 1 | | | 1* |
| 900- 1000 | 1* | | | | |
| 1000-1100 | | 7 | 3 | | 1* |
| 1100-1200 | | 5 | 2 | | |
| 1200-1300 | | 6 | 2 | | |
| 1300-1400 | | 4 | 5+ | 2 | |
| 1400-1500 | | 2# | 1 | 2 | |

Notes: During the Classical period, Italy is included in “Rome-Byzantium” and during the Middle Ages in “Europe.” Post 11th century, Byzantium essentially does not exist as a separate cultural sphere (although it did exist as a country for a few more centuries).

* Datings are uncertain for the Late Classical-Byzantine period and for the Indian texts.

+ Including one Persian work

Both from Korea

WORD COUNTS

In the table 1 above, all texts appear to be equally important but that is of course not the case. Some are dozens of times longer than others. Accordingly, the body of information is larger and thus more valuable to agrarian historical research. As well, this means that the authors who wrote these texts expected their audiences to be interested in longer treatises. Consequently, finding an indication of the scope of the texts is also significant to interpreting their significance.

In order to report the scope, I have chosen to count the number of words. This is a rough measurement, especially considering that different languages have varying numbers of words. Latin, for example, includes definite articles in the declension, while the articles remain separate words in English. Consequently, Columella's books of about 120,000 words in Latin swell to about 210,000 words in English. Each Latin word thus requires 1.75 English words in translation, which is more than normal. A more common ratio is 1:1.5 words (each Latin word requires 1.5 English words) when Latin is compared to English (such as Palladius in Latin and English).

It would have been best to use the same language, English, for the entire comparison, but I have included translations to German, French, and Spanish in order to acquire more cases. In some instances when I was aided by the research of experts, calculations have been made for the original language (Persian, Chinese).

The figures stated below should be seen only as rough size markers. They do not provide an exact measurement of size. Following the table, I address a few direct problems with the measurement.

Table 2. Word counts in a selection of texts

Roman

| | | | |
|-----------|-------------|---------|---------|
| Cato | 170-150 BCE | 26 000 | English |
| Varro | 37-30 BCE | 62 000 | English |
| Virgil | 37-29 BCE | 23 000 | English |
| Columella | 60-65 | 210 000 | English |

| | | | |
|--|-----------|---------|------------|
| Pliny | Ante 79 | 128 000 | English |
| <i>Late Classical and Byzantine</i> | | | |
| Palladius | 400-425 | 80 000 | English |
| Isidore | 620-636 | 10 000 | German |
| Geoponika | c 911 | 90 000 | English |
| <i>Arabic</i> | | | |
| Ibn Wafid | 1000-tal | 12 000 | Spanish |
| Ibn Bassal | 1100-tal | 56 000 | Spanish |
| Ibn al-Awwam | 1125-1200 | 500 000 | French |
| Ibn Luyun | 1348-1349 | 24 000 | Spanish |
| <i>Persian</i> | | | |
| Haravis | c 1511 | 110 000 | Persian |
| <i>European</i> | | | |
| Walter of Henley | c 1285 | 7 500 | English |
| Rufus | c 1250 | 25 000 | German |
| P. de Crescentiis | 1304-1306 | 220 000 | German |
| Le bon berger+ | c 1379 | 23 000 | French |
| <i>Chinese</i> | | | |
| | | | Chinese |
| C. M. Yao Shu++ | c 535 | 100 000 | characters |
| | | | Chinese |
| Nung Sang+ | c 1273 | 60 000 | characters |
| | | | Chinese |
| Wang Chen | c 1315 | 110 000 | characters |
| <i>Indian</i> | | | |
| Kashyapa+ | 800-tal | 22 000 | English |
| Krisj-Parashara | 1000-tal | 10 000 | English |

+ These texts include a large fraction of later additions.

++ Chhi Min Yao Shu

Rufus's texts from 13th century Europe have to do with horses and are thus not included in Table 1.

Source: This paper and the list of translations used in the bibliography; for China, Bray (1984, pp 56, 60, 66); and for Persian, personal communication from Bo Utas. For the three oldest texts, Sten Hedberg has provided the word counts in the Swedish translations: Cato 25,000; Varro 62,000, and Columella 170,000.

Computation of word counts in encyclopedias is characterized by the collection of text snippets from several different places. With respect to Pliny, however, these are long texts where Book 18 on crop farming alone is almost 40,000 words. I calculated the length of the work based on the books devoted to these matters: Book 14 on wine and viticulture, Book 15 on oleoculture and fruit trees, Book 17 on caring for cultivated trees (and thus much about wine and olives), Book 18 on crop farming, and Book 19 on vegetables and gardens. In addition, in Book 8 on animals, he has fairly long sections on cattle, sheep, and pigs. There are also short sections about figs and certain other trees, which I have excluded because they are so brief.

The texts on agriculture by Isidore are collected in five sections: on draft animals, on fields, on crop farming, on gardens and on implements, but no single section is more than 4,000 words. The number of words about agriculture in some of the Arabic and Chinese encyclopedias might exceed ten thousand if all sections on agriculture were put together, but I have relied on the descriptions in the secondary literature and excluded them (I have performed a verification count of one Chinese encyclopedia, see below).

I have attempted to include the largest works but some are not available in editions that make it possible to calculate the length of the text. One of the major works is, beyond doubt, the Nabatean, translated to Arabic by Ibn Wahshiyya in the early 10th century. There are 1,500 pages in the edition and the selection translated to English by Jaakko Hämeen-Antilla includes almost 100,000 words.⁶ However, this work contains a great deal of folklore and stories that cannot be considered agrarian literary text.

The number of Chinese characters in older literature is roughly equivalent to the number of words, although the relationship is different today – in modern Chinese, most words consist of several characters. The calculations were taken from Francesca Bray and in addition to those mentioned in the table there is also a third large work in the Chinese tradition, dating from the 17th century, that includes a full 700,000 characters.

Bo Utas assisted me with the calculation for the Persian book. He has calculated the edition of *Irsha al-Zira'a* (see below) at approximately 75,000 words, taking into account chapter endings, etc. There was a contemporaneous book on irrigation by the same author, *Âb-i qalb*, and based on the page count of the two works (281 and 155, respectively) I

⁶ Hämeen-Antilla 2006, p ix.

estimate their total word count at approximately 110,000 (these two works belong together).

One problem is that many texts exist in later manuscripts and thus later additions to the texts may be included. This is mentioned in particular for one of the Chinese texts and one of the Indian texts. For the Classical and European texts, there is as a rule extensive research oriented towards analyzing which parts of the text are original. The Arabic texts are often extant in early manuscripts.

The Roman agricultural treatises are thus not only the oldest extant agricultural literature in the world, they are also relatively extensive. Columella is among the very few texts longer than a hundred thousand words. There are no extant texts from the Han Dynasty, but Francesca Bray assumes based on the extent of other literature from this time and with reference to citations in later literature from the early agrarian tradition that these works may have been “nearly comparable in size and scope to the Roman agricultural treatises.”⁷

The next major works arrive roughly simultaneously in the West and the East in the 6th and 7th centuries, at about 100,000 words. The longest texts from the 11th and 12th centuries are found in the Arabic literature, when the most extensive medieval works were produced in Eurasia, at a half million words. Several major works appear in the early 14th century in various parts of Eurasia, when Europe comes into the picture with a comprehensive work for the first time.

KNOWN AND EXTANT WORKS

The next comparison has to do with known works. The Chinese tradition is distinguished by the early recording of bibliographies and a research orientation towards recording all known works. Comparison of the known Chinese works for the earliest period and those known in the Roman Empire, including those no longer extant, yields similar figures (table 3). The Chinese figures are always reported per dynasty, but have been translated here to centuries. As a result, there may be equally large differences during the Han Dynasty, from about 200 BCE to about 200 CE, as there were at the zenith of the Roman Empire. I have also rounded off the Chinese figures to whole numbers and the decline surely begins during the second century, as in Rome.

⁷ Bray 1984, p 51.

Table 3. Known agrarian historical writings of the Ancient World – Rome and China

| | Roman | Chinese |
|-------------|-------|---------|
| 200-100 BCE | 3 | 3 |
| 100-1 BCE | 4 | 3 |
| 1-100 | 6 | 3 |
| 100-200 | 1 | 3 |
| 200-300 | 1 | 1 |
| 300-400 | 2 | 1 |

A marked difference arises thereafter. Starting in the 6th century, the number of known agricultural treatises in China varies between 10 and 20 per century, rising to more than 30 in the 12th century (see below). If we also compare this to the Arabic writings that are only known but not extant, according to the literature, one does not come anywhere near these figures.

Table 4 Known works of Islamic and Chinese agricultural literature

| | Islamic | Chinese |
|-----------|---------|---------|
| 900-1000 | 4 | 10 |
| 1000-1000 | 4 | 14 |
| 1100-1200 | 3 | 33 |
| 1200-1300 | 6 | 33 |
| 1300-1400 | 5 | 32 |

The puzzle here lies more in the difference between known and extant works in China (see Table 1). Why are there so many more known works? For extant works I have chosen to record the works cited in Francesca Bray's bibliography, which may be considered exhaustive for the Middle Ages. One less likely explanation may be that Francesca Bray

has omitted a number of extant works before 1500. One conceivable explanation is that many more lost works are known in China than in the other regions due to the Chinese bibliographic tradition. A third alternative might be that more writings have been destroyed in China than in other areas.

One difference often brought to the fore, particularly in Chinese research, is the unbroken tradition in China. If we look at the connections in western Eurasia, we also have an unbroken tradition, but with a shifting geographical center (see map p 47). Italy is the Classical cradle; the center of production of writings moves to Byzantium during the Late Classical period, but production also begins shifting to the Iberian Peninsula at that time. Subsequently, Arabic production begins sliding westwards, first to West Asia (including Egypt and Yemen), then Persia, and finally to northern India. If we look instead at the connections between the Classical writings and the western European tradition, there is a distinct break, where the Classical authors are rediscovered after a thousand years.

THE CONTENTS

The orientation of the works is an important question. I will present only a general study here, based primarily on the comparisons made by environmental historian Karl Butzer. In one study of the Islamic tradition, he assessed how it differed in orientation from Roman works medieval southern European works.⁸ From the Roman tradition, he selected Varro, Columella, and Pliny, and from the Byzantine, the *Geoponica*. The selections from the Arabic world were Ibn Wahshiyya (the so-called Nabatean treatise), Ibn Bassal, and Ibn al-Awwām. From the early European period, he has chosen Petrus de Crescentius (Butzer writes Cresention) of 14th century Italy. Also included is Spaniard G. A. Herrera, who published his work *Obra de agricultura* in 1509 and is thus not included in Table 1 above.

Of particular interest may be how Butzer distributes the Roman agrarian writers (he has not included Cato), as they are the earliest. I have combined his categories. Farming is “soil, fertilizers, fieldworks.” Horticulture is “arboriculture, fruit trees, gardening.” Oleoculture and viticulture are one category. Cattle farming is “herding and fodder.” There is in addition a category devoted to almanacs and weather predictions. The figures must of course be regarded as rough estimates.

⁸ Butzer 1994, p 19, see also Butzer 1993.

Table 5. Distribution of the text by percentage in certain main categories according to Butzer 1994

| | Farming | Horticulture | Oleoculture & Viticulture | Cattle Farming | Poultry & Apiculture | Almanacs |
|-----------|---------|--------------|---------------------------------|-------------------|----------------------------|----------|
| Varro | 20 | 2 | 7 | 38 | 29 | 4 |
| Columella | 14 | 11 | 32 | 20 | 18 | 6 |
| Pliny+ | 21 | 45 | 18 | 2 | 5 | 10 |
| Geoponica | 11 | 28 | 37 | 8 | 7 | 9 |

Note: The figures have been rounded off to the nearest whole percentage point and the total may thus differ from 100 by a point or two.

+ It seems as if Butzer did not include the mentions of cattle in Book 8, while the percentage for cattle is actually 5% in Pliny.

Butzer's main interest is tied to the Arabic writers. Ibn Wahshiyya aligns partially with the Classical works – viticulture and oleoculture take one fifth, irrigation and fertilization only a twentieth – but also the later Arabic works, since horticulture is emphasized and constitutes about half the text. All three largely or entirely ignore small animal farming. Agriculture itself is on the same level as the Roman writers for all three, but there is strong emphasis in Ibn Bassal and Ibn al-Awwām on irrigation, to which about ten to fifteen percent of the text is devoted. For both of these writers, viticulture is given much less attention than by the Romans.

In both medieval southern European writers (Crescentius and Herrera), farming represents one fourth and one eighth of the texts, respectively, entirely dominated by “crop farming.” Viticulture enjoys the same strong position among the Roman writers, along with small animal farming, poultry, and apiculture. Horticulture and gardens have a strong position comprising one third to almost half the text.

One point of comparison is formed by Francesca Bray's detailed review of the most important Chinese works from the 6th, 12th, 13th, and 17th centuries, where she states the

number of books or chapters devoted to various subjects.⁹ She does not, however, state how long these chapters are. Thirteenth century treatises are divided into ten chapters only and the others vary between sixteen and fifty-eight sections. In the 6th century texts, ten percent is devoted to cattle, but the percentage declines significantly in later texts down to a few percent. Irrigation is a theme that rises steeply. In the beginning, the subject is not given a separate section, while the sections on irrigation make up one fifth of 17th century treatises. The sections on fruit trees and gardens (outside of silk cultivation) make up about one third in all writings, other than in the 12th century works, where these sections constitute only slightly more than one tenth. Between one fourth and one half of the Chinese treatises are devoted to fieldwork and grains/cereals. Silk cultivation has a very small percentage in the oldest writings, but constitutes between one tenth and one fourth in the others.

The distribution of subjects corresponds to the status enjoyed by various aspects of agriculture. Oleoculture and viticulture play a role in Roman agriculture unmatched anywhere else. In the Arabic world, small animal farming has a non-existent role, while gardens enjoy prime status (it is thus the oases that are depicted and not the pastures of the nomads). In Chinese agriculture, there is strong orientation towards cultivated plants and irrigation. Silk cultivation is found only in Chinese agricultural doctrines.

One self-evident continuation would be to study specific problems to arrive at a global overview of issues such as fertilizers or methods of working the land, but this lies outside the goal stated here.

THE ROMAN TRADITION

I will move on to indicate the basis for Table 1. I will name only a few works. K. D. White has written seminal works on Roman agriculture as well as a detailed overview of the agricultural literature.¹⁰ Environmental historian Karl Butzer published an insightful analysis in 1993 that is related to the aforementioned article on the Arabic writers. There is also an article by Eckhard Christmann in the encyclopedia *Der Neue Pauly* under the headword "Agrarschriftsteller."

⁹ Bray 1984, pp 57, 61, 66.

¹⁰ White 1970, pp 14-41, 44-46.

The major Roman agricultural writers mention a number of Greek forerunners: Varro names fifty and Columella more than forty.¹¹ White states that most are philosophers who strayed onto agrarian topics and that it is thus not true that a large number of agricultural treatises were written during these centuries, but rather that the Roman writers chose to recount these lists as a way of demonstrating their education and enhancing the credibility of the work. The odd thing is that they do not refer as extensively to agricultural literature from their own age, which further emphasizes that these lists of Greek literature can hardly be taken ad notam.

The two extant works from the Hellenic Age are relatively laconic when it comes to agriculture. They were written by Hesiod in the late 8th century and Xenophon in the first half of the 4th century. Hesiod's text is a poem on various subjects, of which about 5,000 words are devoted to agriculture (the calculation is based on translation into Swedish).¹² Xenophon's text also presents arguments on various topics and it is not easy to cull the sections devoted to agriculture. In Greek it is titled *Oikonomoikos* (Latin: *Oeconomicus*), which is usually translated as "On Household Management. It contains about 18 000 words (in the translation to Swedish), of which approximately two thirds is all about farming.¹³ The book would therefore have been included in Table 1 if the period before 200 BCE had been included.

The account of the number of works from the two centuries before the Common Era is so reliable that one can compare the number of works that have existed, and been cited, with those still extant (see above, Table 3). The extant texts are Cato, Varro, and Virgil from before the Common Era and Columella and Pliny from the first century thereafter.

The most significant of the lost works was written by Mago of Carthage, probably in the third century BCE (translated to Latin around 140 BCE). It is thought to have comprised 28 books and should have been comparable in size to Columella.

It is usually argued that the works of the Roman agrarian writers were directed at large landowners, but this is not entirely correct. Cato talks about farms of between 25 and 60 hectares and Varro takes his information from farms of comparable size. It is often assumed that Columella is referring to large estates, but his information is not unambiguous and often likely refers to several fairly large estates under the same

¹¹ White 1970, pp 15-16; Hedberg 2009, pp 456-459.

¹² Hesiodos 2003.

¹³ Xenofon 2004.

ownership.¹⁴ It is also obvious that this was partly a reflection of the changes Italian agriculture was then undergoing with increased commercialization and concentration of landownership.

Alongside Columella, Pliny provides the most detailed description. His text is of course part of an encyclopedia, his natural history, but the practical advice on how agriculture should be managed is similar – and has connections to – the other works.

The distinguishing characteristic of the Roman agrarian writers (with the exception of Pliny) is the personal form of address. This is particularly apparent in Varro and Columella of course, but is also found in Cato's manual and the poems of Virgil. There is also a clearly practical orientation, also found in Virgil and Pliny. The Roman agricultural literature thus expresses a deep interest in farming among the Roman elite. The truth of this is also emphasized by the fact that for his didactic poem on agriculture, Virgil was supported by the most prominent of all patrons, Maecenas himself.

It is difficult to determine the extent to which these works were read by people who were actively involved in farming, but there are some intimations. For example, Varro mentions that he advises his herdsman, reasonably the person responsible for cattle, to read the books of Mago. I have however not systematically compiled these indications of who read the books.

LATE CLASSICAL AND BYZANTINE AGRICULTURAL LITERATURE

In terms of research, this period lies between the Roman and the Arabic and is covered by scholars who work with both of these areas – as presented above and below. There is also research on the agricultural literature of this period as such, which is recounted in *Lexikon des Mittelalters* in the article “Landwirtschaftliche Literatur (Byzanz)” by Peter Schreiner.¹⁵ Starting in the 6th century, Italy cedes its status as the center of the agrarian literary tradition to West Asia.

¹⁴ Wikander 2009, pp 502, 514-515, 651 with reference to the discussion. For example, Butzer 1993, pp 546, 550 states figures that are too high for the estates Columella describes.

¹⁵ Schreiner also published a small but important work in 2001 on the sources of popular culture during the Byzantine Age, but oddly enough he does not mention the agricultural literature.

Many datings are uncertain during this period, partly because the texts are extant in translations more often than in the original language. They were created in the multinational melting pot of Southeast Europe-West Asia-Caucasia.

An important work was written by Palladius, in Italy. The dating was previously considered uncertain,¹⁶ but the work can now be definitively dated to 440-455.¹⁷ It was written shortly before Rome was sacked by the Vandals in 455. Palladius, who had held high positions in the city, fled thereafter to Gaul where he spent the rest of his life. Palladius based his agricultural doctrine on several forerunners, such as Columella, but also rewrote several in order to simplify the texts and achieve his pragmatic purposes. He had personal experience as a landowner with estates in Italy, southern France, and other places in West Rome. With a view to making the text more accessible, it was arranged by month according to what needed to be done.

There are a half dozen writings from the Late Classical period that are only mentioned and none seems to have been significant.¹⁸ A few works other than those only cited seem however to be extant in translation.¹⁹ One of these was written by Vindonius Anatolius from Beirut in the 4th century, who held a position in the Roman state. His book is available in several translations: to Syrian in the 6th and 7th centuries (extant fragments) and to Armenian and Arabic in the 10th and 11th centuries. The same applies to Cassianus Bassus, who wrote around 600 (possibly in the 6th century, possibly in the 7th) whose works were translated to Arabic around the 9th century and later to Persian, Syrian, and finally Armenian, post 1160.

One problematic work is the Nabatean Agriculture translated to Arabic by Ibn Wahshiyya in the early 10th century. There was extensive discussion of this work in the 19th century when an absurd overestimation of the age of the text was ultimately dismissed. Later discussion has dealt with whether the work was rewritten so extensively in the translation from Syrian that it should be regarded as an original work by the translator or whether it is older. Fuat Sezgin argued that the text was written in or just before the 6th century.²⁰ In his 2006 book on this treatise, which includes his own translations of some

¹⁶ White 1970, pp 30-32 states late 4th century, Christmann 1996 states early 5th century.

¹⁷ Bartoldus 2012, p 14.

¹⁸ White 1970, p 32, Christmann 1996.

¹⁹ Sezgin 1971, pp 315-8; Butzer 1993, p 554; Filāha Texts Project; Schreiner 1999; Hämen-Anttila 2006, pp 53-54.

²⁰ Sezgin 1971, pp 318-328. For example, Butzer 1994, pp 16-17 puts more emphasis on the original in the Arabic translation from the early 10th century.

sections, Jaakko Hämeen-Anttila agrees with this dating and shows that the treatise was created in northern and central Iraq, although parts of it refer back to Late Classical texts written in Greek.²¹ This interpretation has been accepted in the Filaha Project (see below). The text is distinguished by its extensive religious and magical elements. It later became very important in the Islamic tradition, as discussed below.

The *Hippiatrica*, an extant Greek text on the care and healing of the horse, is usually dated to the 10th century but Anne McCabe argues that the extant version from the Byzantine period is a revised version of a text written in the Late Classical period.²² While it is likely that it was conceived earlier, it contains important additions up to the 10th century. McCabe also mentions another extant text on equine medicine from the 4th century by Pelagonius, probably of Dalmatia, which forms part of the basis for the more well-known treatise.²³

A text usually included in overviews like this one was written by Isidore of Seville in the early 7th century. The first parts of the book were written before 621 and it was unfinished when Isidore died in 636.²⁴ There was obviously a library in Seville from which he could obtain quotations.²⁵ He wrote an encyclopedia of twenty “volumes.” It is usually argued that one of these is devoted to agriculture, and it is certainly titled so, but half of this volume is actually about trees that are not cultivated. Sections on agriculture are found dispersed in mainly five places: in Book XII on draft animals, in Book XV on fields, in Book XVII on crop farming and on gardens, and in book XX on implements. All of these books contain a great deal of material on other topics and in the German translation the parts on agriculture comprise about 10,000 words in total.²⁶ However the longest section is under 4,000 words, and accordingly, I have excluded this book from Table 1.

Finally there is a famous compilation made in the early 10th century, the *Geoponica*, commissioned by the Byzantine emperor. An abridged version was translated to Arabic and later to Armenian in the 13th century, while parts of it had been translated to Latin by the 11th century.²⁷ It is based on extracts from various sources, but there are also

²¹ Hämeen-Anttila 2006, summary on the dating, p 33. See also Carrara 2006, who emphasizes the roots into the past towards the Classical sources.

²² McCabe 2007, pp 13, 259-261.

²³ McCabe 2007, pp 156-159.

²⁴ Möller 2008, p 7.

²⁵ Fussel 1972, pp 49-50; Butzer 1993, p 554; Guzman 1996, p 703; Hedberg 2009, p 468.

²⁶ Isidore 2008, pp 448-453, 569-572, 609-619, 642-645, 724-727.

²⁷ White 1970, pp 32, 45-46; Schreiner 1999; Fussel 1972, p 61.

independent additions.²⁸ Angelo Alves Carrara has recently argued a retrospective link to Columella and possibly also to Mago.²⁹ I maintain here that the final compilation did not occur until the 10th century, roughly like the recently mentioned book on equine medicine. They also resemble each other in that they are comprised of “excerpt collections,” that is, lines of quotations by cited authors organized under certain main headings – and, as said, probably with independent additions slipped covertly into this form as dictated by reliance on authority.

If the translations are included, a picture emerges of a dynamic agrarian literary tradition throughout the area across Anatolia, Caucasia, Iraq, and Persia from the 10th to the 13th centuries. This corresponds to the extensive translation activities in Europe during the Late Middle Ages, which are also not shown on Table 1.

An interesting aspect of the Byzantine interest in agriculture is that a number of manuscripts of Hesiod were made, many of which were illustrated.³⁰

THE ARABIC TRADITION

There is a long research tradition related to Arabic agricultural literature, which is recounted in the major work *Encyclopaedia of Islam* (in the second edition usually referred to as EI 2, but a third edition is in the works). In addition to the headword “*filāha*” (which means agriculture), most of the Arabic agrarian writers have been given their own headwords.³¹

Articles on food and agriculture have since been collected in the volume *Food Culture and Health in Pre-modern Islamic Society*.³² There is also a website dedicated to Arabic (but not Persian) agricultural literature, which I cite as the “*Filāha Texts Project*.” The website is based largely on the articles found in the encyclopedia, but also reports new research and lists all available editions of the texts.

²⁸ Dalby 2011, p 12.

²⁹ Carrara 2009, pp 105-106, where he also calls attention to the seminal role of Swedish scholars Lundström and Svennung, who published in the late 19th and early 20th centuries.

³⁰ Schreiner 1999; Schreiner 2001, pp 615-616.

³¹ The headword “*Filāha, agriculture*” in Vol 2 of the *Encyclopaedia of Islam* from 1965 with subsections for: Middle East; Muslim West; Persia; Ottoman Empire; India.

³² *Food Culture and Health in Pre-modern Islamic Society*, 2011, David Waines, editor. The book contains some revisions compared to the *Encyclopaedia of Islam*, but sadly enough the bibliography has been deleted from this edition.

An important book was written by Andrew Watson on what he called the “Arabic Agricultural Revolution,” or “Medieval Green Revolution”: an expansion of agriculture based partly on increased diffusion of crops within the Islamic-dominated trade area.³³ Although he based his work on agricultural literature, he does not discuss it in any detail. There is however an interesting aspect in that the discussion of the Medieval Green Revolution is connected to the issue of the role of Islamic culture in world history and that he has therefore, for ideological reasons, initiated research and provided an account of the agrarian literary tradition (see the section below on source criticism).

A work that is usually included as the first major Arabic treatise in this genre was written by Ibn Wahshiyya in the 10th century, but this is the work identified above as a translation to Arabic of text compiled a few hundred years earlier and it is thus not included (as a translation) in Table 1. The work did however strongly influence later developments. It is frequently cited by the Iberian writers who wrote in Arabic and is extant in a large number of manuscripts (about forty). It also resembles the later Islamic treatises in its richness of botanical content and the very large number of plants mentioned.

In his 1971 general survey *Geschichte des arabischen Schrifttums*, Fuat Segzin wrote a chapter titled “Arabische Botaniker und Agronomen.” The chapter is about the earliest age of the learned tradition and, despite the title, discusses only botanists. Segzin shows that these writers’ texts led to the breakthrough of agrarian treatises. Segzin lists twenty-five works from the 9th and early 10th centuries which dealt with botany and medicine, but thus agriculture only to a minor extent.³⁴

This strong botanical orientation came to distinguish the Arabic agrarian literary tradition when it broke through on the Iberian Peninsula in the 11th century. An entire group of writers, often closely connected to each other as teachers and disciples, emerged. Many of them collected plants from other regions and created botanical gardens. Environmental historian Karl Butzer describes how Ibn al-Abdun made botanical observations over large parts of Spain in the 11th century, which Butzer argues were “unrivaled in Medieval times.”³⁵ Watson has discussed these botanical gardens in an article, where he shows how they preceded their equivalents in the rest of Europe by centuries.³⁶ One of these authors was Ibn Wâfid who in the mid 11th century organized a

³³ Watson 1983.

³⁴ Segzin 1971, pp 330-346.

³⁵ Butzer 1994, p 27.

³⁶ Watson 1995, pp 64-65.

botanical garden in Toledo. He also wrote an agricultural treatise. Ibn Wâfid's agricultural treatise has 35 of 106 chapters preserved, covering more than ten thousand words (c. 12,000) and it must originally been three times as long. It is included in table 1.³⁷ In a lexicon article, Thomas Glick, an expert on medieval Iberian agriculture, emphasized the influence of Indian agriculture and calls special attention to how the Islamic writers present plants that originated in the monsoon climate of South Asia.³⁸

The most famous and the longest of the Iberian treatises was written at the end of the 12th century by Ibn al-Awwam. It comprises a half million words and is more comprehensive than anything else written at this time. The book cites 112 other writers and is thus comparable to the Chinese treatises of the period, which also cite a large number of writers (see below).

A geographical shift from West to East began in the late 12th century and continued through the 13th century. Isolated agricultural treatises were still being written on the Iberian Peninsula in the 13th and 14th centuries, but the eastern Mediterranean was otherwise increasingly dominant. There was a period of intense production of translations around the 11th century, as described above. This picked up again at the end of the 12th century, this time as independent writings.

Texts were produced over the next two hundred years in West Asia, Egypt, and Yemen, along with several almanacs, but I have not included the latter. Martin Daniel Varisco has pursued research related to these almanacs and has published one of the longer examples. It is about 5,500 words in total, partly devoted to topics other than agriculture,³⁹ and so is not included in Table 1. Such almanacs existed as far back as the 9th century in Egypt and on the Iberian Peninsula. There are at least eight extant medieval Yemeni almanacs with agrarian content. The oldest is from about 1271, followed by examples from the 1320s, circa 1400, and the 15th century.⁴⁰ There are even more from Egypt, although the total count is unknown.

The number of writings from later centuries is not as thoroughly covered. A treatise by al-Ghazzi of Syria was written in the 15th century and issued in several edited editions in the 17th century. I presume, however, that the listings, for example in the *Filāha* Texts

³⁷ Vallicrosa 1943; Butzer 1994, p 22. Ibn Wâfid also wrote alonger text on medical herbs.

³⁸ Glick 2005, p 12.

³⁹ Varisco 1994, pp 23-40.

⁴⁰ Varisco 1994, pp 10-16.

Project, are not as complete for later centuries as for the Middle Ages – but that the account for the period before about 1500 may be regarded as relatively complete.

The shift of the geographical center of Islamic agricultural literature may be illustrated in a table (“West Asia” here includes Egypt, not only Yemen). The body of literature from the 16th and 17th centuries is surely underestimated – a number of agrarian treatises were written at this time that have not been listed in the general overviews. I will return to the subject of Persian literature in Central Asia and India below.

Table 6. Geographical origins of Islamic agricultural literature

| | Iberian Peninsula | West Asia | Central Asia | Northern India |
|-----------|-------------------|-----------|--------------|----------------|
| | | | | |
| 1000-1100 | 3 | | | |
| 1100-1200 | 2 | | | |
| 1200-1300 | 1 | 1 | | |
| 1300-1400 | 1 | 3 | 1 | |
| 1400-1500 | 1 | | | |
| 1500-1600 | | | 1 | 1 |

A search of the digital version of the Encyclopaedia of Islam reveals a huge number writings on horses and veterinary medicine within the Arabic cultural sphere, although they all seem to be oriented towards horses for riding, war, and status property. This information is provided in articles on Bayṭār (veterinary medicine), Faras (horses), Ibn al-Mundhīr (who wrote a famous treatise from circa 1300) and others. It seems we can count more or less poetic works about horses in the hundreds, even though most are not extant. The more scientific works are also copious and date from the 9th century and later.

PERSIAN WORKS

Texts written in Persian are included in this Islamic tradition, but are rarely included in general works on the subject. Karl Butzer argues that there is a connection between the Eastern Mediterranean and Persia and refers to a lost work from the 9th century.⁴¹ Bo Utas, professor of Iranian languages, has helped me with references after pointing out with some acerbity that a separate Persian tradition also existed and not only an Arabic one.

Živa Vesel published an overview in 1986 in which she mentions a number of texts about agriculture, although most are brief excerpts from various encyclopedias dating from the 12th through the 14th centuries. Those she mentions are dated circa 1117, 1179-80, 1270-71, and 1340. The agrarian excerpts comprise no more than 3-9 pages of printed text in modern editions.⁴² Although they were not included in the tables above, they are part of the broad agrarian literary tradition.

The Encyclopaedia of Islam under the headword “Filāha. Persia,” by Ann K. S. Lambton, mentions no agricultural literature. The Encyclopædia Iranica, which is online and digitally searchable, includes only one article specifically about agricultural manuals, “Irshād al-Zirā’a” by Maria Eva Subtelny. The article is about the agricultural manual dated 1515 that is discussed in greater detail below.

Otherwise, there is one article about equine books, “Faras-Nāma” by Īraj Afšār. A chapter from a treatise dated to the early 15th century is mentioned, a text from the mid 14th century, and one 12th century treatise on horses that comprises 55 chapters and was thus a comprehensive work. Also mentioned are a couple of treatises on horses written in Persian but produced in India in the 16th century, based on earlier texts in Sanskrit.

The first significant work on agriculture was written by the renowned historian and vizier Rashid al-Din in the early 14th century (circa 1310).⁴³ Additional parts of this writer’s agrarian texts have since been discovered. In a 1993 article about Persian agricultural manuals, Maria Eva Subtelny wrote that a previously known work had just been identified as *Āsār va-ahyā* by Rashid al-Din.⁴⁴ Ann K. S. Lambton has written a longer essay on this work, describing both content and influences, where she pointed out that in addition to a given connection to the Arabic literature perhaps also a link to the

⁴¹ Butzer 1994, p 21.

⁴² Vesel 1986, p 99.

⁴³ Tauer 1968, p 471.

⁴⁴ Subtelny 1993, p 168.

Chinese agricultural knowledge existed, but not by direct quoting but mere by hearsay about Chinese agriculture.⁴⁵ Christine van Ruymbeke has since used this agricultural treatise to analyze the botany in the works of the poet Nizami and argues that Rashid al-Din is distinguished for having created an independent and detailed depiction of agriculture.⁴⁶

Another known work on agriculture is a manual, *Irshād al-Zirā'a*, from 1515, written by Qasim Yusuf of Herat in what is now northwestern Afghanistan. He also wrote a separate work on irrigation, but both of these works have been counted together as a single work in Table 1 and Table 2. Subtelny has written a series of articles on this work and has shown how it is part of a tradition that has links backward to the Arabic writers but also forward in time to the Mogul rulers in India.⁴⁷ She also points out that both the work by Rashid al-Din and that from 1515 were written during periods of agricultural crisis when Nomadic conquerors had destroyed much of the fragile irrigation systems. Both writers wrote in an attempt to defend the threatened status of agriculture.⁴⁸ Qasim Yusuf later fled to India (see below).

INDIA

The notion that older Indian agricultural literature is relatively sparse has been questioned and thus the matter of the extent of Indian agricultural literature must be addressed in some detail – even though the result may ultimately seem meager. The work with this part of the text could not have been done without the kind assistance of Eva Myrdal, research director at the Museum of Far Eastern Antiquities in Stockholm and an expert on older South Indian agrarian history, and Erik af Edholm, professor of religious history and an expert on the cultural history of India in general.

An early overview of older Indian agricultural literature is provided in an appendix to *Agriculture in Ancient India* from 1964.⁴⁹ The title of the appendix is “Published literature found in Indian languages,” but it also includes manuscripts, primarily in Sanskrit but also

⁴⁵ Lambton 2000.

⁴⁶ Ruymbeke 2007, pp 34, 182.

⁴⁷ Subtelny 1993; Subtelny 1995; Subtelny 1996.

⁴⁸ Subtelny 1993, pp 194-196, 207.

⁴⁹ *Agriculture in Ancient India* 1964, pp 153-165. Erik af Edholm introduced this work which was previously not found in any Swedish library, but has now been acquired by KSLA.

in southern Indian languages like Tamil and Telugu. Surprisingly, many of the manuscripts are mentioned with no dates, but these are certainly later. Only one ancient agricultural treatise is mentioned here (to which I will return), along with a few writings from the 17th to the 19th centuries. M. S. Randhawa's general work *A History of Agriculture in India* from 1980 includes a chapter on two of the most important older works.

The aforementioned appendix mentions writings on horses and elephants, the earliest of which is dated circa 200 BCE. The elephant played a vital role in India not only as a war animal and riding animal for the upper class, but also as a draft animal for transporting heavy loads.

The relatively limited extent of Indian agricultural literature known early on became the basis for the first comparative interpretations. In his article on Indian agriculture, "Filhāha. India" in the *Encyclopaedia of Islam*, Irfan Habib wrote in 1983: "Very few works seem to have been written in agriculture in medieval India, to judge from their extreme paucity in modern collections."⁵⁰ When his text was reprinted in 2011 in the book *Food Culture and Health in Pre-modern Islamic Societies*, he had deleted this segment.⁵¹ In making a comparison to the rich Chinese tradition, Francesca Bray has argued that mundane technology was rarely mentioned in the written sources in India because "the literate Brahmin elite tend to pass over technology in silence."⁵² She refers to a text by Marie-Claude Mahias in a themed issue on *India in Techniques et culture* in 1989. Mahias in turn refers to Habib. She argues that the Islamic gentry were also uninterested in technical details.⁵³ It is thus not the case that the Muslim Habib is attacking the Hindu majority in India.

Partly as a reaction to this notion of the lack of literature on agrarian topics, a group of Indian scholars have argued in recent years for the existence of an agricultural literature. The Asian Agri-History Foundation was established in 1994 for the purpose of promoting "agricultural history" and "sustainable agriculture." On their website, they write that these works were unknown before 1996 but they want to call attention to "sages" who wrote agricultural treatises in Sanskrit.⁵⁴ A textbook published by this group in 2009 lists seven

⁵⁰ Habib 1965, p 910.

⁵¹ Habib 2011.

⁵² Bray 1997, p 41.

⁵³ Mahias 1989, pp 1-5.

⁵⁴ Asian Agri-History Foundation = <http://asianagrihistory.org/> (Dec 2012).

seminal works, but five are treatises on botany or statecraft.⁵⁵ Since this group's intention is to report as many agrarian literary works as possible, one may presume that there are not many more. Unfortunately, the group is part of a Hindu Nationalist movement that has systematically made use of history to assert that the Hindu Indian is superior to all other cultures and although one can use their translations of the works, the interpretations must be critically assessed.

The two agricultural texts covered by this group are also those discussed by reputable scholars. The first is *Krishi-Parashara/Krsi-Parāsara*.⁵⁶ The 2009 textbook dates this text to circa 400 BCE and identifies it as having been written by "Sage Parashara."⁵⁷ This dating is far too early and the attribution (to a mythical Hindu sage) flies in the face of all notions of scholarly rigor.

The scholarly edition from 1960 is based on three late manuscripts. Several datings are given, but one places the compilation of the text from various sources (such as proverbs) to circa 950-1100.⁵⁸ The dating is given as 500-1000 in *Agriculture in Ancient India*, which also refers to manuscripts from the 19th century and later.⁵⁹ M. S. Randhawa discussed this text in depth in *A History of Agriculture in India* from 1980 and concurs with this dating.⁶⁰ Two completely different dates are presented in *History of Agriculture in India up to 1200 AD* from 2008, the first at 11th to 16th century, the second from 6th to 11th century.⁶¹ That year, Ranabir Chakravarti also wrote a superb article about Indian agricultural techniques and dates the book to the mid 11th century.⁶² In Table 1, I have chosen to place the text in the 11th century with a note that the dating is uncertain.

In his major overview published in 1980, Randhawa writes that *Kashyapiyakrishisukti* by Kashyapa is the second longer Indian agricultural treatise. He dates it to between the 6th and 10th centuries.⁶³ Guyla Wojtilla has published an edition and translation to English. In a prefatory note he writes that there is good reason to date "the core of the work to the 8-9th centuries." He adds: "There are numerous interpolations belonging to a later age. Even

⁵⁵ Saxena, Choudhary & Nene 2009 pp 130-134.

⁵⁶ Parashara 1999.

⁵⁷ Saxena, Choudhary & Nene 2009, pp 50, 74.

⁵⁸ *Krsi-Parāsara* 1960, p xviii.

⁵⁹ *Agriculture in Ancient India* 1964, pp 154, 160-161.

⁶⁰ Randhawa 1980, p 483.

⁶¹ Ganguly 2008, p 511; Chaudhuri 2008, p 545.

⁶² Chakravarti 2008, p 232.

⁶³ Randhawa 1980, p 484.

some quite modern passages occur.”⁶⁴ The manuscripts are from the latest century and all late interpolations must be identified before the text can be used as evidence of medieval agricultural practices. The Asian Agri-History Foundation has also made a translation.⁶⁵ The text comprises 22,000 words but was thus originally much shorter. I have chosen to date it to the 9th century in Table 1, again with a note that the date is uncertain.

That these two are the only extant texts in Sanskrit is noted by several authors. The fact is that most believe *Krishi-Parashara* is the only one. This is argued in the edition published in 1960.⁶⁶ In a 2008 article, Ranabir Chakravarti has reviewed a number of texts from medieval India that discuss agriculture; in addition to *Krishi Parashara*, about ten texts, such as the 12th century lexicon *Desinamamala*. None of these are texts devoted exclusively to agriculture. He does not mention *Kashyapiykrishisukti*, perhaps because this text cannot be used as evidence of medieval conditions.

One possibility that must be kept open is that Indian research is so undeveloped that many more manuscripts are lying around waiting to be discovered. However, this seems unlikely in view of the interest in promoting very old agricultural literature found among influential groups for a couple of decades.

In summary, one must concede that Irfan Habib was essentially right. Extant texts from India are few and relatively brief. The question he formulated is therefore central: why was there such lack of interest in practical agriculture among Indian intellectuals and the Indian elite? The answer may lie in *Krishi-Parashara*. This text differs from many others in Sanskrit in that caste is simply not mentioned. The Brahmins who were the custodians of the intellectual tradition were obviously not interested in spending any appreciable amount of time on the practical matters that are the subject of agricultural literature. (That other texts that concern agriculture exist has nothing to do with the matter; such texts are found in isolated documents, laws, proverbs, etc., in all cultural spheres.)

The early Indian tradition was certainly independent and was based on an oral tradition of proverbs and other folk wisdom. However, it was adopted by the learned stratum of society only to a very minor extent and as a result, texts and manuscripts in Sanskrit are astonishingly few in number.

⁶⁴ Wojtilla 1985, p 85. (This article was also published separately.)

⁶⁵ Kāśhyapa 2002.

⁶⁶ *Krishi-Parasara*, p. xiii, cited by Chaudhuri 2007, p. 527.

PERSIAN WORKS IN INDIA

There are a few additional 16th and 17th century agricultural texts from India, but they are offshoots of the Islamic tradition. The Asian Agri-History Foundation has published one text in Persian, *Nuskha Dar Fanni-Falahat*. The preserved manuscript is dated circa 1700, and according to the modern editors, the text was written in the mid 17th century rather than the late 16th century. The basis for this assumption is weak – they want to associate the text with “a great scholar,”⁶⁷ which is ideology, not argument. I have, taking into account the age of the manuscript and the historical circumstances, assumed that it is 16th century. The text is about 11,000 words in the English translation.

In the aforementioned article “*Filāha: India*” Irfan Habib refers to an agricultural manual in Persian based on a 15th century text, *Kitab Shadjarat*, written in Persia or Central Asia. The text was revised in the 1630s and adapted to Indian conditions. (I did not find this text Late Medieval Central Asian text in either *Encyclopaedia Iranica* or elsewhere on the net and have therefore not included it in the section on Persian literature.) In a 1984 article in the *Indian Journal of History of Science*, Majumdar discusses a number of agricultural manuals in Persian in 18th century manuscripts, but these refer back to older texts. He discusses one of them, extant in a 19th century manuscript but where the text may date as far back as the 16th century.⁶⁸

Thus, three different manuscripts from 16th and 17th century India are mentioned here and there must have been many more. This interest of the Muslim rulers in agriculture is consistent with the extensive records on agriculture and the rest of the economy under the Moguls. The agrarian literary tradition in India is thus, as of the 16th century, part of the Islamic tradition. Maria Eva Subtelny provides interesting evidence of how this proceeded in her study of the Persian agricultural treatise from 1515. She shows that the writer belonged to a family that worked with laying out gardens and that they fled to India after the chaos that spread when the Nomads conquered the oasis cities so that they could continue practicing their profession.⁶⁹

⁶⁷ Nuskha 2000, p vi.

⁶⁸ Majumdar 1984 p 341.

⁶⁹ Subtelny 1995.

CHINA

The agrarian literary tradition of East Asia I am about to describe evolved with no contact with the tradition in Western and Central Eurasia – and yet is equal in size. We thus have two equivalent traditions in Eurasia that developed almost in parallel.

Research on Chinese agricultural literature benefits from the sophisticated bibliographical tradition and reaches far back into history. There is extensive research in Chinese which is beyond my reach, but I have compensated for this through the use of high-quality English-language works. Francesca Bray's seminal 1984 work was included in the major project on the intellectual history of China led by Joseph Needham. I have had the privilege of discussing the selection and other aspects of this agrarian literary tradition with Francesca Bray.

Later in 1993, Gang Deng compiled statistics over the number of texts based on Bray and Chinese research. Fan Chuyu of the Institute for the History of Natural Science in Beijing has also published an article in which the most important works are described.⁷⁰

Gang Deng discusses older bibliographical research and shows that estimates of the number of agricultural treatises vary, with the highest number according to one estimate given as more than 2,500 titles. However, Deng, in accordance with Bray, chooses to base his estimates on Wang Yuhu from 1964 who presents more reasonable figures.⁷¹ This refers to all texts “known to have been written.” The variation in estimates indicated by Deng illustrates the importance of precise boundaries and I have unfortunately been unable to review Wang Yuhu's methods in detail. (Gang Deng's table over the number of titles per dynasty is: 202 BC – AD 220 (Han) 14; 265-420 (Chin) 2; 421-580 (N. & S. Dynasties) 6; 581-618 (Sui) 24; 618-906 (Tang) 28; 960-1279 (Sung) 105; 1280-1369 (Yuan) 28; 1368-1644 (Ming) 127; 1644-1911 (Qing) 199. An additional seven are listed as predating the Han Dynasty.

⁷⁰ Fan Chuy 1983. (Oddly enough, the same book is cited as the first edition year in a printing from 2009.) It was based on a work in Chinese from 1978.

⁷¹ Deng 1993, p 3, Bray 1984, p 47. Their figures do not entirely agree; Deng 1993, p 28 for the Yuan Dynasty, and Bray 1984, p 26. The total is 540, but Wilkinson 2012 p 436 mentions 650 known titles, of which “some 260 such treatises are extant”. Editions of several of the major treatises are published in modern Chinese or Japanese, but unfortunately not in any Western languages.

As noted, this may be translated to rough figures per century and the great leap occurs in the 12th century when the number of known works exceeds thirty per century. This is concurrent with the breakthrough of printing technology. The increase continues thereafter, but not nearly to the extent as in Europe when printing technology is established (see below). There are in addition texts from the 16th and 17th centuries that were written at the private initiative of estate owners and were often not printed (according to oral information from Francesca Bray; publication of the information forthcoming).

In order to identify extant printed texts, I have used those Bray used in her exhaustive account of Chinese agriculture.⁷² She, like all researchers in the Needham project, discusses all cited texts from before 1800 and her list includes more than 600 titles. The appendix notes whether or not the texts are extant and provides a brief description of the contents. I have selected the extant texts that are devoted exclusively to agriculture. Bray has told me that her book, like all others in the major project led by Joseph Needham, was based on the collection of texts found in Cambridge. Thanks to Needham, it was one of the best in the world.

The text on agricultural literature published by Fan Chuyu based on collections found in Beijing offers a comparison. Her account agrees largely with Bray's, although she lists more texts for the older literature. Fan Chuyu mentions two extant texts dated to "Eastern Zhou: Spring and Autumn Period" 770-464 BCE, Fan Chuyu pp 295-296, where Bray writes that one of the texts is entirely lost and also mentions that there are no extant complete texts.⁷³ Fan Chuyu mentions three shorter texts from "Eastern Zhou: The Warring States' Period," 463-221 BCE.⁷⁴ I have not found these at all in Bray. So, Fan Chuyu includes four parts of an encyclopedia that according to her form a "complete set of treatises" dated to 239 BCE.⁷⁵ Bray describes this text as a "compendium of natural philosophy."⁷⁶ Since all of these texts are dated before the period covered by Table 1, the differences do not affect the results, but they do illustrate the uncertainty inherent in a compilation based on compilations.

⁷² Bray 1984, pp 621-633. Wilkinson 2012 9 437-438, in his exemplification of treatises mentions six of the treatises that Bray also mentions before 1500, and he does not mention any that Bray has not in her list.

⁷³ Bray 1984, pp 629, 632.

⁷⁴ Fan 1983, p 294.

⁷⁵ Fan 1983, p 294.

⁷⁶ Bray 1984, pp 626-627.

The oldest among the longer extant texts is from 535, *Chhi Min Yao Shu*, written by Chia Ssu-Hsieh. This comprehensive book covers agriculture in its entirety.⁷⁷ *Nung Shu*, written by Wang Chen in 1313 is even more famous. It is also very long and remarkable in that it is illustrated. This was made easier by the use of block printing, which allowed the illustrations to be identical in all copies.⁷⁸ Illustrated works on agriculture existed as far back as the 12th century, but Wang Chen did this consistently and his illustrations are usually found in all Chinese agrarian histories.

The third major book came in the 1630s, *Nung Chen Chhüan Shu*, written by Hsü Kuang-Chhi. It is extremely comprehensive and comprises 700,000 characters. Most of the text is comprised of quotations and he cites no less than 299 other books.⁷⁹ According to Bray, the wealth of citations is typical of Chinese agricultural literature,⁸⁰ but this is also found in the Arabic literature; Ibn al-Awwām for example cites a hundred works (see above). Endymion Wilkinson points out that the author (Xu Gaungqi in his transcription) was aware of the existence a Western literature.⁸¹

Distinctive for all three of the major works in the Chinese tradition, especially the two later works, is that they were written during unsettled times when agriculture was in crisis, rather than in an expansive phase. In the early 14th century, the Yuan Dynasty (the Mongols) was heading towards collapse after many years of agricultural mismanagement. The same applied to the Ming Dynasty in the early 17th century, which collapsed only a few years after Hsü Kuang-Chhi wrote his work. He as a loyal man who wrote his book in an attempt to save the dynasty. As a result, the work was ignored for a long time, or perhaps more accurately stated was replaced by briefer compendia based on Wang's text.

Alongside these major works, there are a number of less extensive texts. A brief but original treatise was written by Chen Fu in 1149 as a polemic against earlier writers such as the 6th century Chia Ssu-Hsieh. But the main reason is that he represents a different agricultural system, which became increasingly predominant – that based on rice and which was based in central China, rather than the north.

Several texts were produced at the behest of the state. The oldest among those extant is *Nung Shang Chi Yao* from 1273, which comprises 60,000 characters, but since all extant

⁷⁷ Bray 1984, pp 55-59, Fan 1983, pp 296-299.

⁷⁸ Bray 1984, pp 59-64, Fan 1983, pp 300-302.

⁷⁹ Bray 1984, pp 64-70, Fan 1983, pp 302-304.

⁸⁰ Bray 1984, pp 47-48.

⁸¹ Wilkinson 2012, p 438.

texts are later, Bray presumes that a great deal has been added, perhaps even entire sections.⁸² Other major works that were written at the order of the state but are now lost originated during the Tang Dynasty (7th to 9th centuries) and the Northern Sung Dynasty (circa 11th century).

There are also several important works on a variety of specific subjects, several of them about tea growing. A few works discuss techniques related to water regulation. They have been included in the table if they were oriented towards agriculture, but most concern flood control in general – that is, also for transportation or flood prevention. Works concerning the grain trade or state stockpiling were not included in Table 1.

The sections on agriculture in encyclopedias are too short to be included. Bray emphasizes Thien Kung Khai Wu written by Sung Ying-Hsing in 1637, as original and rich in agricultural content. Happily, it has been translated to English. The relatively large section on crop farming comprises about 6,000 words. All together, the text contains about 11,000 words on agriculture.⁸³

I presume that Bray's account up to the 16th century contains no significant underestimations, but there are many more later texts extant than the seven she uses from the 16th century and the eight from the 17th century. Owing to the repetitions in later treatises, she had no reason to use the entire body of extant texts for her description of agriculture.

KOREA AND JAPAN

The Chinese tradition of writing agricultural treatises generated offshoots in Japan and Korea. This literature is presented in works on the agrarian and economic histories of the countries; for Korea, primarily the general history by Ki-baik Lee from the 1980s, which is still one of the most copious sources of information in English, and for Japan, the works of scholars such as Thomas Smith and, in recent years, William Wayne Farris.

The first two Korean works on agriculture originated in the 15th century. A simplified writing system was developed at this time, which was related to the endeavor to spread

⁸² Bray 1984, pp 48, 71.

⁸³ Bray 1984, p 76. The English translation in Sung Ying-Hsing 1966 shows that the distribution is: crop farming 6,000 words; silkworms and mulberry trees, approximately 2,500 words, processing of cultivated plants through grinding, etc., approximately 2,500 words.

literature to wider audiences. (Korea otherwise developed printed books at a very early stage.) Producing agricultural treatises became part of this state policy and the most important of these was called “Straight Talk on Farming.” It was compiled in the 1430s and there were several later editions. An appendix was added at the end of the 15th century which may be regarded as a separate work. An expanded version of the 15th century book came in the mid 17th century, along with a couple of new and independent works. A number of studies were published in the following century, notably on the cultivation of sweet potatoes, which were disseminated across the country.⁸⁴

The Japanese works on agriculture are later. An agricultural manual included in a treatise on military events was long believed to date from the 16th century. More recent research shows that originated in the late 17th century but may contain older elements.⁸⁵ Several works originated at the end of the 17th century. The most comprehensive was compiled in 1697 and the writer himself declared that it was the first Japanese book on agriculture. He based his work on Chinese models, but adapted it to Japanese conditions. The interesting thing about the Japanese texts is that many of them were written by farmers, starting as early as the latter 17th century.⁸⁶ This may be compared to the fact that Japan has source material otherwise found only in Europe – farmers’ diaries. I will leave this intriguing similarity aside here, but with the note that further study may be worthwhile in order to discern the basis of future development.

EUROPE

The European tradition was an offshoot of the great tradition in Western and Central Eurasia that underwent distinctive development in a great leap forward during the early modern era. It reconnected first to the Classical tradition and thereafter developed independently.

Overviews have existed for a long time for the central countries in Europe – Italy, France, Germany, and England.⁸⁷ Adrian Verhulst provided a summary under “Agronomie” in *Lexikon des Mittelalters*. French art historian Perrine Mane, who has

⁸⁴ Lee 1984, pp 240-241.

⁸⁵ Smith 1959, p 89, Farris 2006, pp 224-225.

⁸⁶ Smith 1959, pp 87-93, 221; Bray 1984, pp 625, 627.

⁸⁷ Frauendorfer 1957; Fussel 1972.

specialized in pictures of farming, published a detailed overview of the current state of research in 2006 (based on her 2001 doctoral dissertation in three volumes). Since there is relatively extensive agrarian history research from all of Europe, it is likely that no significant agricultural treatises have originated in the peripheral areas of the Continent, as they would otherwise have been mentioned. I know there are none from the Nordic countries, although Peder Månsson's paraphrased translation of Columella emerged at the end of the Middle Ages and his text verges on being an independent work. I presume that similar works exist from several other countries in the periphery, but then only from the end of the Middle Ages or the beginning of the Early Modern period.

Some translations of Arabic agricultural treatises were made to Castilian and Spanish in the Middle Ages. Botanical encyclopedias were created in the 13th century in Europe that preceded the actual agricultural treatises, something like in the Arabic world, but on a smaller scale. Albertus Magnus is one example. These texts are not included in the table.

Several texts on farming in England originated in the mid 13th century that were part of a series of treatises on accounting and estate management. The fact is that there is one short text from as early as the 11th century, Gerefa, on the duties of an estate overseer.⁸⁸ In 1971, Oschinsky published an edition of the four most important 13th century treatises oriented towards agriculture. Three deal mainly with agriculture, but none has been included in Table 1 because they are too short. The oldest and most widely known was written by Walter of Henley in the early 1270s. It is almost exclusively about agriculture and comprises between 7,000 and 8,000 words in English (fewer in French). Seneschaucy, written before 1276, is about the same length and more than half the text is about agriculture. The shortest of the three is Husbandry. Although it contains long sections about agriculture, it is mainly about how a large estate should be managed and the text is only half as long as the others. (The fourth text is oriented towards accounting.)

It would be reasonable to ask whether this accumulation of agrarian literary texts might be due to the fact that British agrarian history research has been more extensive than in other countries. However, England is also distinguished by having more and better 13th century estate accounts than any other European country. Accordingly, there is much to indicate keen interest in practical agriculture and the direct management of estates among the nobility and higher clergy of this time.

⁸⁸ Gardiner 2006.

Italy was another area with early books on agriculture. As an expression of this interest in mundane affairs among the literate elite, there is a treatise on horse husbandry written by master of the horse Johannes Rufus before 1250 in southern Italy.⁸⁹ The text is explicitly about riding horses and five sixths of the text is devoted to illnesses and medicines. However, one must also be aware that many horses began their “careers” as riding horses only to be used towards the end of their lives for heavier work and this treatise (like others on horses) is thus relevant to agricultural studies. Rufus’s treatise was spread widely throughout Europe during the Middle Ages (manuscripts were even found in Swedish medieval libraries). The text is long, about 25,000 words in the German translation. A few additional books about horses and equine medicine were also written in Italy and France in the 14th and 15th centuries.⁹⁰ These equine treatises have been excluded from Table 1.

The first major work on agriculture in Europe was written early in the 14th century in Italy by Petrus de Crescentius. It was titled *Ruralia commoda* and was written in Latin.⁹¹ It comprised more than two hundred thousand words (in the German translation) and is thus one of the most extensive works of its time in Eurasia. It was spread widely throughout Europe. It was written in Latin but translated to Italian and French in the 14th century. There are more than thirty 14th century manuscripts extant (the earliest from 1339) and about a hundred from the following century. Petrus de Crescentius based much of his work on classical writers like Palladius, but had apparently not read Columella, even if he was aware of him.

When the French King Charles V ordered the translation of Petrus de Crescentius to French in 1373, it was joined by an agricultural treatise that is less often mentioned in the overviews, although Mane does mention it: “Le bon berger” – “The Good Shepherd.” The French king ordered this as a complement to Petrus de Crescentius and it is devoted entirely to raising sheep. The author was the former shepherd Jean de Brie who grew up in humble circumstances but was later able to study and eventually served the king. He wrote the book in 1379 but it is extant in print only from the early 16th century with several later interpolations according to the research. As a printed book from the mid 16th century it comprises about 23,000 words.⁹²

⁸⁹ Hiepe 1990, edition of a manuscript in Germany with a translation to German. Olrog, formerly a librarian at KSLA, also published an edition of a manuscript in Italian in 1995.

⁹⁰ Lazaris 1998, pp 150-151; Mane 2006, p 53.

⁹¹ See Vollmann 2007 in his introduction to a German translation.

⁹² Jehan de Brie 1879.

Perrine Mane mentions a couple of agricultural texts from 15th century Italy.⁹³ These texts are not however mentioned in *Lexikon des Mittelalters* (I have performed free-text searches in a digital version of this nine-volume work), but they are comprehensive works. The oldest is by Corniolo della Cornia and titled *Divina villa*. While Petrus de Crescentius is based largely on Palladius (26% of his quotations), Corniolo della Cornia employs a broader spectrum and quotes from all the major classical writers: Pliny, Virgil, Cato, Varro, Palladius, and Columella (in that order, from 18% to 5% of the quotations).⁹⁴ Towards the end of the 15th century, Michelangelo Tanaglia wrote the work *De agricultura*, which must be included in the wave of more independent treatises written after about 1500, such as Herrera's work in Spain (mentioned above regarding the contents of the texts). Both of these texts also illustrate the difficulties inherent in global overviews; new and relatively significant works may arrive that are not mentioned even in authoritative overviews like the article in *Lexikon des Mittelalters*.

A few other works mentioned in the compilations have been excluded because they were not oriented solely towards agriculture or are too short. These include a couple of 14th century German works: one treatise on wine and another on natural history.⁹⁵ I have disregarded the German so-called "Hausvater" literature; it is part of a growing interest in household economics, but there are many works which in such case must also be included in an overview.

There are about forty late medieval manuscripts of Columella extant. (Mane refers here to two Swedish scholars, Åke Josephson 1955 and Sten Hedberg 1968, as authorities concerning the number of manuscripts.) There are about a hundred known manuscripts of Palladius, and about as many complete manuscripts by Pliny as by Columella. Virgil's treatise enjoys a special status since it is more of a literary work and was therefore copied throughout the Middle Ages, although the number of manuscripts increased during the 15th century.⁹⁶ Palladius was also translated to English in 1442.⁹⁷

⁹³ Mane 2006, p 53.

⁹⁴ Comet 1998, pp 39-40.

⁹⁵ Frauendorfer 1957, pp 61-61: Gottfried von Franken wrote a text about fruit and wine around 1350 with references to personal experience but also including quotations, notably of Palladius. At about the same time, Konrad von Megenberg wrote a treatise on natural science – inspired by Thomas von Cantimpre in Flanders – and an *Oeconomia*, but the texts were not oriented towards agriculture. See also Mane 2006 p 53.

⁹⁶ Mane 2006, pp 47-50, cf Fussel 1972, p 86.

⁹⁷ Ficht 2013, p 11.

These writers' texts were printed at the end of the century. Corinne Beutler reviewed the number of editions of the most important works in her 1973 essay. If one disregards Virgil and Pliny, which were published in many dozens of editions, Columella was printed four times during the late 15th century (the first time in 1471) and an anthology including Cato, Varro, Columella, and Palladius was printed eleven times. In addition, four editions of Petrus de Crescentius were printed before 1500.⁹⁸ This reflects widespread interest in agricultural literature and constitutes part of the upturn in book production in Europe.⁹⁹ It also heralds the coming of the increasingly independent authors who wrote about agriculture in later times.

16TH CENTURY EUROPE

Conditions changed radically in Europe during the 16th century. In the aforementioned paper, Corinne Beutler reviewed all printed agricultural treatises she has found in France, Germany, Italy, and Spain, as well as England to a certain extent. Beyond the continued publication of Classical texts, a number of new writers emerged during this period. Her account includes several who wrote general botanical works or other types of works that I have not included in this overview and she mentions about twenty writers in the central parts of Europe who wrote mainly about agriculture.¹⁰⁰ Oddly enough, Beutler does not refer to Fussel, who published a general overview of English text production several years earlier. He mentions five English writers who wrote agricultural treatises in the 16th century whom Beutler does not mention. These English writers' works were printed repeatedly during the 16th century.¹⁰¹

There are also a great many manuscripts of independent texts on agriculture from the 16th century. (From Swede there is a well-known text, extant in several manuscripts, by Per Brahe, who was from the higher nobility but had a keen interest in agriculture.) As the printed texts take over as the basis for an overview, the number of titles corresponds to a much larger number of actual copies in circulation.

⁹⁸ Beutler 1973, p 1292-1297.

⁹⁹ Zanden 2009, p 77-79.

¹⁰⁰ Beutler 1973, p 1299.

¹⁰¹ Fussel 1947, pp 4-20.

In another overview of 18th century production of agricultural treatises in northwestern Europe, I have demonstrated the leap that occurred in the latter part of the 18th century in essentially every country.¹⁰² There was a veritable explosion of agricultural texts in which even the small countries produced several texts a year, while dozens of texts were produced every year in larger countries like England (in addition to all the shorter articles). By comparison, while overall Chinese production increased at this time, it never exceeded more than about one treatise per year.

In the aforementioned paper, I went back only to 1660, since the first Swedish treatises did not appear until the end of the 17th century. English production of agricultural treatises reaches back to the early 16th century, however (as in the other main heritage countries, Italy, Spain, Germany, and France). For this paper, I have therefore traced production in England back to the first printed agricultural treatises according to the database I used: The English Short Title Catalogue (ESTC). In my selection, I have reviewed each year and title, since a search by decade returns a number of duplicates.

The search keyword was “agriculture” and a comparison with Fussel’s major overview of older agricultural literature shows that certain titles were omitted. For the 16th century, he lists publications by Leonard Mascall, who wrote three books in the 1570s about poultry farming and cattle.¹⁰³ These are found in ESTC under the headings “poultry” and “veterinary medicine.” I have adhered to the more limited search because an expansion would lead to duplicate records and impede comparison to the search I performed for the 18th century.

¹⁰² Myrdal & Söderberg 2012. A longer version will be published in English in this series of working papers.

¹⁰³ Fussel 1947, pp 9-10.

The search resulted in the following table over the publication of books about “agriculture” until 1659 in England:

Table 7. Publication of agricultural literature in England, by decade, 1500-1659

| | |
|-----------|----|
| 1500-1509 | 1 |
| 1510-1519 | 0 |
| 1520-1529 | 2 |
| 1530-1539 | 9 |
| 1540-1549 | 10 |
| 1550-1559 | 5 |
| 1560-1569 | 4 |
| 1570-1579 | 9 |
| 1580-1589 | 5 |
| 1590-1599 | 7 |
| 1600-1609 | 11 |
| 1610-1619 | 13 |
| 1620-1629 | 4 |
| 1630-1639 | 12 |
| 1640-1649 | 7 |
| 1650-1659 | 22 |

--.

Source: ESTC

Thus, an average of one text about agriculture was published per year starting in the 1530s. Based on total publication in other countries, one may also presume that Italy, France, and Germany reach about the same levels.

This may be compared to the number of known agricultural treatises from China, assuming that this corresponds relatively well to the production (see above). The number is about 50 for the 16th and 17th centuries, rising to about 60 in the 18th century and about 75 in the 19th century. The figures reach several hundred in Europe by the 16th century and that number rises dramatically during the latter part of the 18th century.

IDEOLOGICAL USE – A SOURCE-CRITICAL PREDICAMENT

The ideological use of history is based mainly on actual circumstances, but distorts them. For the global historian, insistence on the importance of one's own cultural sphere is a serious problem. This equates to nationalism but in the era of globalization is often manifest in discussions of entire cultural spheres, rather than individual nations.

China certainly has a strong tradition when it comes to production of agricultural treatises. I have contended that it is not as unique and utterly dominant as has sometimes been argued. A 2012 book written by Chinese agronomists asserted that African agriculture has much to learn from the Chinese (by extension, they are thus advocating Chinese ownership and cultivation of land in Africa). The book was published by Routledge, an academic publishing house of very high repute and with sophisticated peer review procedures. The authors devote the first chapter to describing older agricultural treatises and, in line with the book's leanings, they emphasize the oldest texts – those that are lost and about which little is known.¹⁰⁴ Their arguments for the superiority of Chinese agriculture are thus largely based on an interpretation of the long and meaningful history of Chinese agricultural literature, which is also exaggerated.

From the 11th to the 13th centuries, the Islamic cultural sphere is outstanding when it comes to production of (extant) agricultural treatises. These have been dragged into the current widespread discussion of the status of Islam in world history. A frequently used way of measuring major social debates is to examine search terms in Wikipedia and their "history."¹⁰⁵ The search phrase "Arabic Agricultural Revolution" has to do with the transformation of agriculture that Andrew Watson identified and wrote a book about in 1983 (see above). This book was criticized by Michael Decker in a 2009 paper in which he rejected the notion that any such major transformation occurred – although he discusses Classical literature rather than the Islamic literature to show that phenomena existed before Islamic conquests. After his article appeared, the search term was added to Wikipedia, which generated more than a hundred posts over a couple of years. At one stage of the debate, the article was edited down to one tenth of its former length. The website was

¹⁰⁴ Li et al 2012, pp 58-61.

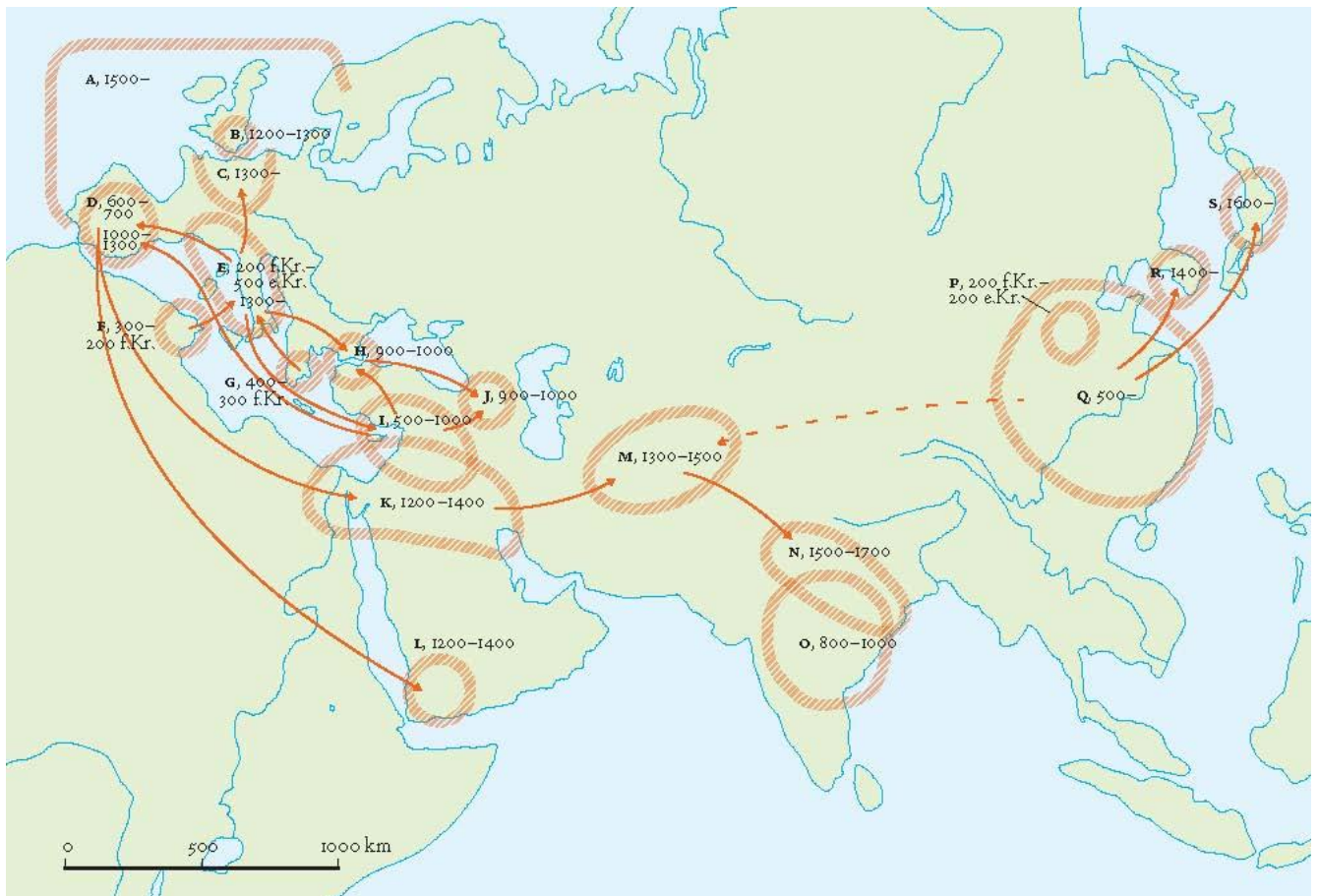
¹⁰⁵ See Wattenberg & Viégas 2010 for an analysis of the Wikipedia articles "Abortion," "Iraq," and "Islam" during the period of 2001-2003. All three of these articles were the target of frenetic activity as well as what is referred to as vandalism, and they were entirely deleted several times. By comparison, the authors present the calmer activity in the article "IBM."

created in large part due to the agricultural literature and partially as a consequence of the debate (a reference to the site was added to later versions of the article). The question is whether Islam encourages or constrains knowledge and one might argue that this is the wrong question. But that is not what is interesting here; the point is how agricultural literature came to be an aspect of major contemporary social debate.

In respect of India, I have already discussed the tendencies to exaggerate age and significance that arise when a group decides to argue the precedence of their own culture. The 2009 textbook emphasized Hindu culture (and the discussion of why this cultural sphere has written so little on agrarian subjects was dodged), while Islamic culture was ignored almost entirely (even though members of the organization have also published such texts). The warped view to which Hindu nationalist historiography leads also impacts the low-caste groups who were involved in and created the economic advances and the emphasis on individual “sages” is nearly absurd in its absence of scholarly rigor.

In a discussion like this, one should look at the beam in one’s own eye: is hailing the European “miracle” a comparable distortion intended to emphasize the superiority of our own culture? I will return to this question shortly.

Map. Major regions where agricultural literature was produced



A = Explosion of agricultural literature in Europe after 1500. First in the core countries: England, France, Italy, Spain, Germany. From around 1700, also in the periphery: Scotland, Scandinavia, Eastern Europe, etc. .

B = southern England

C = the northern French regions and really only after the mid- 1300s, after 1400 included the whole of central Europe through translations - what then becomes the area of the explosion.

D = the Iberian Peninsula, especially the southern part.

E = Only the central region of Italy, and then (by Palladius) also including the Southern parts of France. During the High Middle Ages, it is again Italy is the region.

F = Carthage and vicinity

G = Classical Greece

H = Constantinople and vicinity

I = texts in Syriac, also comprising the northern and central current Iraq

J = texts in Armenian, but only translations - no known independent works

K = core area in the Islamic world, from Egypt to Mesopotamia (now Iraq)

L = Yemen

M = texts in Persian, current northern Afghanistan is included as a core area but as these authors traveled much could also et much larger area have been marked

N = northern India ie . the area dominated by Muslim rulers

O = texts in Sanskrit, based mainly in the upper parts of South Asia, ie . an area corresponding to " n ", but extended further south.

P, Q = China, first in the old core area during the Han dynasty, since extensive also the southern areas around the rice-growing Yangtze River and other parts of the great empire

R = Korea

S = Japan

Arrows: influence proved by quotations. Dotted line: possible but weak influence along the Silk Road.

The map is published in Cato, Marcus Porcius, *Om jordbruket*. Varro, Marcus Terentius, *Samtal om lantbruket*. Samt *Liv, lantbruk och livsmedel i Catos och Varros värld*.. Stockholm, forthcoming.

CONCLUDING REFLECTIONS

The total number and the sudden European advance

To summarize the total body of agricultural literature in Eurasia: 1/ During the period around the beginning of the Common Era, we have four or five extant/well known texts per century (I have included a corresponding number for China as for the Roman Empire, even though the former are now lost). 2/ The next stage is the period of 1000-1300 when production of mainly extant texts reaches ten to fifteen per century. 3/ The great leap forward comes in 16th century Europe when England alone produces almost a hundred treatises. If Italy, France, Germany, and other countries are included, we probably reach about five hundred treatises in a hundred years and thus a yearly calculation becomes more accurate. 4/ Finally, we come to the second half of the 18th century when this growth in Europe continues and extends to the European periphery. Many thousands of agricultural texts are produced per year from the mid 18th century to the mid 19th century.

Until the 11th century, these texts are exclusively manuscripts exchanged by means of handwritten copies. Printing then breaks through in China, followed by Korea and Europe in the late Middle Ages. When printing becomes as widespread as it did in Europe, one may assume that relatively few texts are entirely lost, since many copies of each title were produced (unlike those written by hand).

The first five hundred years from 200 BCE and forward are dominated by Mediterranean Europe – the Roman Empire – and probably also China, even though we have no extant texts but only such that are known through citations. The Chinese dominance subsequently increases over the next five hundred years. This is followed by a period from the 11th century to about 1500 when the Arabic world and China dominate. Europe did not become dominant until the late Middle Ages and the last five hundred years. One might argue that these were insignificant before the mass production of texts during the “European period.”

This puts two interpretations at odds. Either the agricultural literature is an increasingly better description of existing knowledge or else this knowledge becomes increasingly better organized through the agricultural literature. To express this using two metaphors: this is either a busy stage that becomes gradually better lit, from isolated spotlights that flare up in the darkness to the point where the entire stage is bathed in light,

or it is a greenhouse where the lighting – the heat lamps – in and of itself makes things happen. As always when opposites are juxtaposed, both of these interpretations are partially true. But this also implies that the interpretations of Joel Mokyr and Jan Luiten van Zanden must be deepened. Instead of looking at how all agricultural practices are suddenly illuminated in 18th century Europe, or increasingly well organized in terms of thought, we see that these two phenomena were ongoing for a very long time and that the entire body of agricultural literature reflects a long intellectual-practical history.

The next step thus becomes an attempt to understand the periods in which this better lighting, or more effective lighting, occurs.

Phases of economic growth

The agricultural literature could be an expression of agrarian expansion and there seems to be such a correlation on one level. I will review the periods that suggest this:

+ Eurasia underwent a long period of expansion after the breakthrough of iron as a basic metal from the middle of the first millennium before the Common Era until the first century of the Common Era. The end of this period also saw the first major wave of agrarian literary texts in the Roman Empire and Han Dynasty China. An intellectual dissection and description of basic production began here. This created a genre of detailed treatises on agriculture, a genre that survives thereafter in various forms and continues to grow until the great leap forward in the 18th century.

The extent to which this is connected to the “Axial Age” when the major religions were founded and which is usually emphasized in intellectual history, remains to be investigated.

+ The next major phase of agrarian expansion occurred between the 9th and 13th centuries. Its chronological center of gravity varies somewhat, although the concordance over Eurasia is the most striking. This is notable first in the Arabic world and in China and reaches its zenith slightly later in Europe and then especially in the periphery. A second wave of agricultural literature arrived during this phase in the Arabic world, in China, and finally a beginning in Europe (the English).

+ China and Europe both underwent a new upturn in the 16th century while the Arabic world fell back. This also corresponds to the upturn in agricultural literature.

+ The major example of a connection between agrarian expansion and increased production of agricultural treatises is of course Europe in the 18th century. By the 19th century, this major expansion had spread across much of the world through colonization.

However, there are also periods of powerful expansion that are not distinguished by any increase in the number of agricultural treatises – even though such a genre was found in nearby areas. One important example is the majority of Europe from the 10th century to the 13th century. Another is India, where there was widespread agrarian expansion between the 11th and 13th centuries in Dekan, along with an increase in irrigation – which does not correspond to any known agricultural literature.

Periods of decline

It is an interesting fact that several of the profoundly significant agricultural treatises came when decline and collapse were imminent or in progress. I will provide a chronological account: 1/ Palladius from the Late Classical period is one example. 2/ The next major period of decline during the Late Middle Ages also sees several major works: the Persian work of the early 14th century is one and the first major European work by Petrus de Crescentius was also written just as the expansion ended and Europe was hit by severe crop failures that were the beginning of stagnation and (after the Black Death) decline. The second major Chinese work came almost simultaneously, in 1315, in a China that was suffering severe economic decline under Mongolian rule. This contemporaneousness in the 1310s of three major agricultural treatises in Europe, Central Asia, and China, is otherwise striking. 3/ The second major Persian work on agriculture was written during a decline in this region in the early 16th century and the third major Chinese work also appeared during a decline in the mid 17th century.

One can however see some correlation between the lack of agricultural literature and decline in agrarian activity. The foremost example is that Arabic production of texts wanes to almost nothing starting in the 15th century in parallel with the beginning and continuation of a long period of stagnation in this area.

Connections between the traditions

One frequently mentioned difference is that the Chinese tradition seems to be more constant, with ongoing linkages to earlier texts. The role of the state and state officials was critical here to the production of treatises on agriculture. The texts written at private initiative were also created under the overarching idea of the role of the state in the development of agriculture, which has furthered continuity.

However, there is an integrated movement in the West as well, unbroken for nearly two thousand years, if we regard the transition from the Roman to the Late Classical and Byzantine periods and then over to the Islamic tradition. State intervention to benefit the genre is less common, although it does happen. The Byzantine emperor ordered the compilation of the *Geoponica* in the 10th century; in Europe, the French king ordered the translation of *Petrus de Crescentius* in the 14th century. Still, it was groups and goals other than the state and its aim to reinforce the basis of the economy that made the difference.

One anomaly of the European tradition is that the Roman tradition, more than a thousand years old, was taken over almost unchanged during the Late Middle Ages. It was thought that these writers described something that could still be used. However, adaptation to local conditions quickly begins, which leads to a wave of completely original works.

For whom the writers wrote

Identifying the intended audiences of the treatises has not been a central question for this article, but some attempts at conclusions may be given. Landowners were a driving force in the Roman Empire, albeit with somewhat varied emphasis on large or medium-size landholdings. In the Arabic world, the learned elite played a central role under the protection of the prince. This also means that the genre here comes to resemble what occurs in Europe much later (with catalogs of plants and botanical gardens). In China, state officials are the writers and the target audience, but private estate owners also wrote (and in theory, their audiences were practicing farmers). In medieval England, the driving forces were private landowners, both religious and secular, and the goal was to learn to manage estate finances. When the breakthrough came in Europe at a later time, the writers' intended audiences were large groups among the literate, secular gentry – or, more accurately stated, they wrote for the slowly emerging educated middle class.

However, one could come much further and I can imagine following various lines in such a study. One such would of course be to look at intimations in the texts as such of a wider readership than one might otherwise presume – the educated upper class. Another approach would be to compare other sources, such as laws and proverbs, to determine the extent to which this literature depicts actual farming and thus may have been relevant to large population groups.

Common tendencies

Certain common tendencies may be discerned. Joel Mokyr's distinction between knowledge that prescribes how things should be done and knowledge that records reality may be relevant to understanding some of the courses of events. In the Arabic world, as in 18th century Europe, there is such a search for knowledge (about plants) for its own sake that is later linked to more practical knowledge. One could see this as a path of development of an agrarian literary tradition. But we find no direct equivalent in the Roman or Chinese tradition (although there are of course elements of such a sequence there as well). We do not find it at all in the English tradition of instructions to estate overseers. These are traditions that are strongly oriented towards immediate results. Mokyr's idea about the long periods of growth in knowledge without any goal of practical usefulness is applicable outside the European example from the 18th century and we can also find its opposite in Europe.

Another common tendency is that the writers refer back to earlier forerunners before a leap occurs into own production of agricultural treatises. This occurs in West Asia in the 10th century, and in the copious translations of the 11th century. This is followed by the Islamic leap, first on the Iberian Peninsula of course, but later also in West Asia. The same occurs in Europe in the 15th century, which also explains the emergence of an agricultural literature as part of the general growth in total literature – as Jan Luiten van Zanden pointed out – before the leap ahead to newly produced literature in the 16th century.

Upon several occasions, the major compilations come before collapse. This is not always the case – it does not apply to Columella's major work, for example – but often enough that it forms a kind of pattern. One hypothetical interpretation could be that an accumulation of knowledge occurs that reaches full maturity, and one could then see this as tidal waves coming in progressively closer to the shore. One could then see the significance of Classical literature in Europe not only as something antiquated and soon

left behind, but as a body of knowledge of such quality and magnitude that it could be inspiring. We must however also accept what several pre-collapse writers themselves wrote – that their reason for compiling their works was to preserve the current way of life. This is an indication of strong faith in knowledge and its role and must also be considered. This faith in the significance of knowledge to development thus existed long before the Age of Enlightenment and outside Europe.

No general and simple connections can be found, although certain tendencies may be identified. The global overview shows that there were several alternative paths and combinations between (extant) agricultural treatises and total agricultural production. The late European texts that were followed by a leap forward are often used as the comparative model. The Arabic upturn that came to a sudden stop and the long Chinese progression that did not reach the point of a leap are equally interesting to study and explain – not to mention the Indian, which never happened. It is in this tension between various possible paths that one can understand the role of knowledge production in world history.

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Janken Myrdal

Agricultural Literature in Eurasia circa 200 BCE – 1500 CE

Agricultural literature is one of the most important and oldest non-fiction genres in the world. This text gives us the first overview of extant agricultural treatises in Eurasia before c. 1500. With this overview, it is possible to give a better foundation to discussions on the role of knowledge. This literature also gives us indications about the importance of agriculture in different periods for a number of regions in Eurasia.

Cover illustration, map by Oskar Karlin on the basis of sketch by author

Legend to map on page 47.



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