The Mycenaean Palace-Organised Textile Industry

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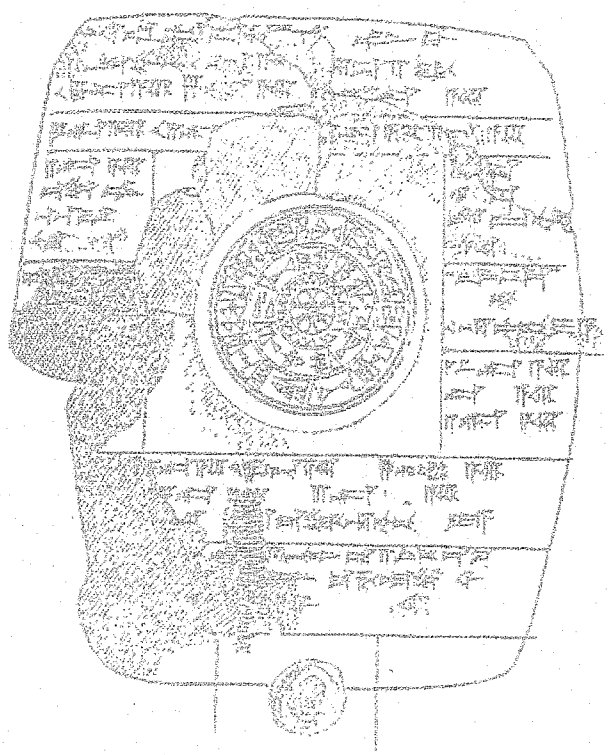

a cura di
Massimo Perna e Francesco Pomponio

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The Management of Agricultural Land and the Production of Textiles in the Mycenaean and Near Eastern Economies

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Introduzione

In occasione della pubblicazione degli atti del convegno *Fiscality in Mycenaean and Near Eastern Archives, in Studi egei e vicinorientali* 3, avevamo sottolineato che da quel convegno e dalla discussione fra studiosi del Vicino Oriente Antico e del Mondo Egeo erano nate alcune interessanti opportunità di riflessione e di collaborazione interdisciplinare.

La gestione delle terre e l'industria tessile ci sono sembrati i due settori che maggiormente potevano giovarsi di un confronto fra i testi micenei, ittiti e vicinorientali. È per questa ragione che abbiamo deciso di raccogliere una serie di contributi in un volume che potesse fornire, per i periodi più significativi della storia del Vicino Oriente antico e del mondo ittita e miceneo, un'immagine più chiara possibile di questi due fondamentali settori dell'economia.

In ogni contributo la documentazione esistente è stata presentata fornendo una trattazione delle principali problematiche, in modo da risultare particolarmente utile agli specialisti di diverse discipline, e al tempo stesso affrontando temi specifici e avanzando nuove ipotesi di lavoro.

Desideriamo ringraziare l'INSTAP (*Institute for Aegean Prehistory of Philadelphia*) che ha generosamente finanziato il volume ed i colleghi M. Marazzi, M.L. Nosch, C. Simonetti, M. Such-Gutiérrez, L. Verderame e G. Visicato che insieme a noi hanno contribuito alla realizzazione di questo volume.

Massimo Perna e Francesco Pomponio

Indice

The Production of Textiles

The Mycenaean Palace-Organised Textile Industry

Marie-Louise Nosch

Textile production is one of the world's oldest crafts. Textiles were produced before pottery and metallurgy. The development of the textile craft closely followed that of agriculture: available plant fibres such as flax, hemp and nettle were necessary for early textile production. The collection of animal fibres such as hair and wool from goat and sheep, but also silk, required domesticated animals. The development from hairy sheep to the more woolly sheep in the Bronze Age opened up new technological possibilities.

The Mycenaean textile industry has been investigated by several scholars analysing iconographic evidence, archaeological evidence and textual evidence. Two major scholarly works combine all these sources and investigate Bronze Age textile production: the monograph *Kleidung, Bart- und Haartracht,* in the series *Archaeologia Homerica* from 1967, compares Minoan, Mycenaean and Homeric textiles and costumes, presented by the excavator of Thera, Spyridon Marinatos;[1] the authoritative monograph by Elizabeth Barber, *Prehistoric Textiles*, from 1991, presents a more holistic picture of textiles, with contributions from ethnography and experimental archaeology.[2] In recent years, some Aegean archaeologists have followed this path of critically joining the various sources describing textile production into a larger picture of a region.[3]

Textual evidence concerning textile production has come mainly from the palaces at Knossos and Pylos, while the other Mycenaean palaces, including Tiryns, Mycenae, Thebes and Midea, have yielded very little textual evidence concerning the textile industry – or other sectors of the economy for that matter. The available evidence is fragmented, unequally preserved and in its nature only informs us about the palace production and other types of production in which the palace scribes had an interest. The written documentation in Linear B does not provide a general overview of the Mycenaean textile production in the Late Bronze Age. Rather, it is the palace-controlled, registered – and preserved – documentation of the last administrative year of each of the Mycenaean palaces respectively. It is through this very narrow frame that we perceive the Mycenaean palace-organised textile industry.

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[1] Marinatos 1967.

[2] Barber 1991.

[3] See the analysis of textile production in Crete by Burke 1997; Burke 1999; Militello 2007. A comprehensive analysis of textile production in Thera can be found in Tzachili 2007.

The iconographic sources for Mycenaean textile industry are also sparse. The evidence from wall paintings yields visual information that cannot be drawn from other sources: the colours and dyes. While the textual evidence is restricted to production related to the palace economy, the iconographic evidence is even more restricted: here we see elite costumes, stylised and in some cases revealing a symbolic or supernatural world. Naturally, scholars have questioned to what degree the costumes are realistic and how representative they are of the Mycenaean world. Methodological issues of interpreting costumes from iconography as well as understanding textile technology from iconographical representations have been raised.[4] Textile scholars, however, have shown that the textile technology of the Bronze Age is perfectly adapted to elaborate patterns and tailored suits.[5] Experimental archaeology and comparative approaches in recent years have provided data for and estimates of the time consumed by textile workers.[6]

Finally, the archaeological evidence for textile production has been available to archaeologists. Spindle whorls, loom weights and needles are reported for almost every Mycenaean site. Depending on the year of publication – and the preferences of the excavators – textile tools have been recorded to varying degrees in excavation reports and in works on ancient technology.

Mycenaean administration of textile production

In the Mycenaean period, textile production stood on a four-thousand-year-old tradition. The basic technology of twisting fibres into a thread and inserting the threads in a binary system – the textile – had not changed over the four thousand years. However, strategies for creating better fibres, more fibres and coloured fibres have influenced the craft.

The major change in the Bronze Age Mediterranean textile production was not a technological shift but a political and cultural shift that transformed and structured a household production into a structured, centralised palace production. An overview of palace records from the Near East indicates that this is a general feature: the textile production is very controlled and takes up much space in the archives.

The written records of Mycenaean textile production

Linear B documents are identified by 3 prefixes: first the abbreviated form of the excavated site, such as KN (Knossos),[7] PY (Pylos),[8] TH (Thebes), MY (Mycenae) and TI (Tiryns).[9] The second identifier is composed of two letters, of which the first indicates the ideograms preserved on the tablets. The four components of a successful palace-monitored textile production are:

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[4] Marcar 2005.
[5] Lillethun 2003; Trnka 2007.
[6] Andersson & Nosch 2003.
[7] Killen & Olivier 1989; Chadwick et al. 1986-1998.
[8] Bennett & Olivier 1973.
[9] Melena & Olivier 1991; Aravantinos, Godart & Sacconi 2001.

- Textile workers (series A with the ideograms for men [VIR] and women [MULier])
- Sheep husbandry (series D with the ideogram for sheep [OVIS])
- Wool records (O series with the ideogram for wool [LANA])
- Textile production (L series with the ideogram for textiles [TELA])

The second letter indicates the sub-group to which this particular tablet belongs.

The sub-groups are formed according to scribal hand, find spot, or documents that record transactions that are different from other transactions. Thirdly, tablets can be grouped in numbered sets indicating further subdivisions and links between the tablets.

The complexity of textile administration in Knossos in particular leads to numbered subdivisions in the editions of the records, reflecting the different types of transactions.

Finally, Linear B tablets are identified by a number (which does not reflect the inventory number) and, in addition, information on find place and the scribe number is often added to this. The following examples demonstrate these principles:

```
                                                                    (103/F10)
KN Lc(1)543
     .A              TELA¹+TE 11[
     .B  qa-mi-ja /          tu[-na-no

                                                                    (103/F14)
KN Le        5629 + 5867 + 8446 + 8522 + 8559 + frr. [+] 8512
     .1   e-ki[-si-]ja              TELA¹+TE  [
     .2  vest.[ ]ja / a-pu-do-si    TELA¹+TE  [
     .3   pa-i-to / ko-ma-we-to      TELA¹+TE [

                                                                    (103/F14?)
KN L(1) 594
     .a  ]    ri-ta , pa-we-a
     .b  ]da-te-we-ja          TELA¹ 1   TUN+KI 1

                                                                    (103/F19)
KN L 695
     .1a ]ti-jo       e-ta-wo-ne-wo
     .1b ]       o-pa                TELA¹ 6
     .2.3     ]   vacant
     .4  ]2  P 2   e-ne-ro 're-u-ko'  N 2

                                                                    (103/F14)
KN Ak(1)624
     .1  ri-jo-ni-ja ,       TA [ ] 'DA [ ]'[
     .2  ne di  3    ko-wa , / me-zo-e  [
     .3  ko-wo , di  3   ko-wo , / me-zo-e  1[

                                                                    (103/F11)
KN Od(1)562
     .1    ]o-pi , no-nu-we , 'a-ti-pa-mo' pe-re   LANA 91
     .2  ]si-da-jo , pe-re 'po-ro-to'              LANA 42
     .3     a-po-te , pe-re                        LANA 69
```

All these tablets are from Knossos and by scribe 103, who was the most prolific administrator of textiles. His records concern textile workers (Ak[1] 624), distributions of wool (Od[1] 562) and textiles (Lc[1] 543, Le 5629, L[1] 594, L 695). The tablets with the signature Lc are production targets for woollen textiles and the set number (1) indicates recordings for central Crete, while set number (2) represents targets for Western Crete.[10] Thus, Lc(1) 543 is a textile production target for women in a village in Central Crete called *qa-mo*. Le 5629, L(1) 594 and L 695 all record textiles, but on L 695 it is plain textiles, on L(1) 594 it is in combination with another textile, and on Le 5629 it is the textile type *te-pa* designated by the ideogram for textiles with the abbreviation *te-* inside. The four textile tablets by scribe 103 also testify to various transactions in the textile administration: Lc(1) 543 sets the production target, Le 5629 documents the receipt of the textiles, L(1) 594 records either target or receipt for linen textiles, and L 695 deals with the finishing of textiles. Ak(1) 624 is a detailed breakdown of the workers – women and children – at the place called *ri-jo-no*. Scribe 103 recorded all textile workers in central Cretan towns, whereas his colleague Scribe 102 recorded those in south-central Crete, the area of Phaistos.[11] Another colleague recorded the textile workers in western Crete.[12]

Francoise Rougemont notes that at Pylos, six scribes recorded sheep, wool and textiles, while at Knossos, at least 30 scribes recorded these activities. Rougemont explains that this was the result of fewer tablets at Pylos, fewer scribes, and also the fact that our preserved Pylian documents concerning sheep are mainly in the page-shaped form. This shape indicates the second step in the administration, in which information from the many palm-shaped tables are concentrated and synthesised on a page-shaped tablet.[13] Rougemont's observation testifies to the major differences between palace-organised textile production at Pylos and Knossos: as John Killen observed in the 1980s, textile production was more centralised in Messenia and decentralised in Crete.[14]

Today, modern management theories and centralised East-European dictatorships probably influence our way of analysing the Mycenaean society, and in terms of modern administration, one would expect decentralised production to require less administration than would centralised production. In Crete, the fact is that although textile *production* was decentralised, the *administration* of textile production was not. Cretan scribes followed sheep, lambs, tiny quantities of wool, and missing deliveries of textiles to a degree that can seem absurd today.

Basically, textile production was monitored by two parts of the Mycenaean palace administration: the raw materials – the sheep, the wool targets and the flax fields – were registered by specific scribes; the textile craft, with its requirements – the workers, their rations, the monitoring of the textiles and their storage – was a second

[10] Killen 1976.
[11] Killen 1972.
[12] Killen 1988.
[13] Rougemont forthcoming. Rougemont includes the Pylian scribes 1, 4, 13, 21 and Ciii. At Knossos, she includes 106, 117-121, 215-218 (recordings of sheep), 103, 113-116, "124", 207-214, 221, 227 (recordings of textiles), and 102, 204, 205 and 108 (lists of personnel, together with "124", 103, 207).
[14] Killen 1984.

part of the administration. This administrative structure reflects textiles themselves, which are the result of agricultural growth and selective breeding in animal husbandry, as well as the result of human ingenuity and intensive labour. When a society or culture has all these elements available, and uses them intensively, then one can speak of a textile industry.

The textile production

Textiles can be made from plant fibres or from animal fibres. In Mycenaean Greece, the texts inform about woollen textiles and about linen textiles. A recent find of archaeological textiles from Khania in Crete demonstrates that the Late Minoan inhabitants also used nettle fibres.[15]

Textiles from plant fibres

Flax was grown on a large scale in Messenia – and still is today. In the Linear B archives, the scribes recorded the harvest of a large scale flax production. The scribes used the abbreviations *SA* for recording flax. Our documentation comes mainly from Pylos, and extensive cultivation of flax must have occurred during the Bronze Age. However, the absolute values and modes of calculation of flax are still a debated question.[16]

Two totalling tablets register the amounts of linen/flax contributed by each of the two Pylian provinces, the Hither Province, *de-we-ro-a$_3$-ko-ra-i-ja*, and the Further Province, *pe-ra$_3$-ko-ra-i-ja*. As the names of the Provinces indicate, the border line between the two is the Aigalean Range.

PY Ng 319 (S106-H1)

.1 de-we-ro-a$_3$-ko-ra-i-ja *SA* 1239
.2 to-sa-de , o-u-di-do-to *SA* 457

Hither Province: 1,239 units of flax
So much, they do not pay: 457 units of flax

PY Ng 332 (S106-H1)

.1 pe-ra$_3$-ko-ra-i-ja , *SA* 200[
.2 to-sa-de , o-u-di-do-to *SA* [*qs*

Further Province: 200+ units of flax
So much, they do not pay: (?) units of flax

The syllable *SA* is used as an ideogram to indicate flax. It is plausible that *SA* is the abbreviation for an older or Minoan term for flax. When flax was processed into linen fibres, thread and textiles, the scribes either continued to use the term *ri-ta*, or they used the Greek work for linen *linon*, *ri-no*. Accordingly, the Mycenaean scribes

[15] See report by Y. Spantidaki & C. Moulherat on http://ctr.hum.ku.dk/research/tools_and_textiles.
[16] See the discussion in Rougemont 2007.

distinguished terminologically between the plant/the raw fibres on the one hand and the processed and finished materials on the other. This might indicate that plant and textile came separately into society, in different time periods. Another possibility is that in this semantic field, the scribes used a Minoan or another old pre-Greek loan word for the practical reason of distinguishing administratively between the plants and the processed fibres.

Clearly, the same distinction is found in other European languages (flax/linen, Flachs/Lin, chanvre/lin), and interestingly, no language attests to a similar semantic differentiation for wool: wool in European languages, as well as in Mycenaean Greek, is the term for both the hairy coat of the sheep and the material from which fine textiles are made.

Two hands-on reasons for distinguishing between the raw flax plant and the finished linen textile are time and labour. Flax processing is laborious: the fibres go through the processes of:

- Pulling
- Rippling
- Retting
- Breaking
- Scutching

These processes demanded much time, space and equipment.[17] Unfortunately, nearly no linen textiles have survived from the Bronze Age. The flax/linen work-spaces consisted of pits or larger humid areas for retting, outside work-spaces for the dusty breaking, scutching and hackling of fibres, and the tools were either of wood or simple knives. Thus, they have not left significant archaeological traces.

After all these processes, which can take days or weeks, the plant fibres subsequently undergo about the same procedures as wool fibres, that is:

- Sorting
- Hackling
- Spinning
- Weaving
- Finishing
- Sewing

We are not informed about who took care of the laborious plant fibre processing. However, the time consumed is apparent in the tablets: there were women and children working in groups under the designation 'linen workers', *ri-ne-ja*.[18]

[17] I thank Margarita Gleba and Linda Mårtensson for discussing this with me.
[18] Chadwick 1988.

PY Ad 326
re-u-ko-to-ro ri-ne-ja-o a-swi-ja-o ko-wo VIR 3 ko-wo 7

At Leuktron, sons of the female Asian linen workers, 3 men, 7 boys

PY Ad 295
ke-e , ri-ne-ja-o , ko-wo VIR 8 ko-wo 5

At Kee, sons of the female linen workers, 8 men, 5 boys

PY Ad 678
po-to-ro-wa-pi ri-ne-ja-o ko-wo VIR ko-wo 1 [

At Potorowapi, sons of the female linen workers, 1 man

In the same villages, flax was grown and recorded by the palace scribes: 10 units at Leuktron, 14 units at Kee and 30 units at Potorowapi:

PY Na 577
ke-i-jo , *SA* 14

PY Na 419
re-u-ko-to-ro , *SA* 10

PY Na 262
po-to-ro-wa-pi , *SA* 30

According to the palace records, various textiles were made from flax. We have two records, one from Knossos and one from Pylos, qualifying textiles as linen, *ri-no/ linon*, and of fine quality, *re-po-to/lepton*. One tablet associates fine linen with *ki-to* and *e-pi-ki-to-ni-ja*, clearly costume items related to the *khiton*. The other tablet designates the linen textiles with the ideogram *146 of the name *we-a_2-no /wehanos*.

(103)

KN L 693
.1 ri-no , / re-po-to , 'qe-te-o' ki-to , AES M 1 [
.2 sa-pa P 2 Q 1 e-pi-ki-to-ni-ja AES M 1[
.2 *-ni-* over ⟦*ja*⟧. AES over ⟦ ⟧.

(Cii)

PY Un 1322
.0]GRA [qs
.1]ṇọ[ ]ọ-no[ ] GRA ϙ *NI* [qs
.2 de-ku-tu-wo-ḳọ[ ]o-no GRA ϙ *NI* 2
.3 i-ṭẹ-wẹ , o-ṇọ[ ] GRA 12
.4 we-a_2-no[ri]-no , re-po-to **146* GRA 5
.5 we-[a_2]no[ ]E*146* GRA 15

In both these records, transactional terms such as *qe-te-o* and *o-no* may indicate that linen textiles were exchanged or traded.[19]

A set of tablets recorded another type of textile, *pa-we-a*, which in this context is made of flax, *ri-ta*. The set was written by scribe 103 and stored above F13 and F14. The set records deliveries of linen textiles from collectors (*e-me-si-jo*), from groups of women workers (*da-te-we-ja*) and from specialised finishers in workshops (*po-po*, a_2-*ka-ra*):

KN L(1) 5927 (103)
.a] ri-ta , pa-we[-a
.b]-te-we , / e-me[

KN L(1) 8159 + 8165 (103)
.a] ri-ta , ṗą[
.b]e-me-ṣị-jo-jo [
.a Probably *ṗą[-we-a*.

KN L(1) 567 (103)
.1 o-pi / po-po [
.2 o-pi / a_3-ka-ra 'ri-ṭą['

KN L(1) 594 (103)
.a] ri-ta , pa-we-a
.b]da-te-we-ja TELA[1] 1 TUN+*KI* 1

KN L(1) 648 (103)
.a ri[-ta pa-we-a
.b o-pi , / po-po[
.b *o-pi , / po-po[* over ⟦ ⟧.

Textiles from wool fibres

An impressive number of tablets from Knossos refer to flocks of sheep. In the Bronze Age, sheep were kept for their by-products, such as wool and milk, and only a minor proportion of the animals were kept for slaughter. To increase the output of wool, the Mycenaean palace kept flocks of castrated wethers since they yield the thickest fleece. Female sheep were used for reproduction and to a minor extent for their wool.

This strategy to optimise the amount of wool is reflected in the tablets. Scribe 117 kept census of the many flocks of castrated wethers; scribes 118, 119 and 120 calculated the expected yearly outcome of wool from these same flocks.[20] Scribe 119 recorded the flocks and expected output of wool of the two shepherds *a-te-i-ja-ta* and *a-ko-mo-ni-jo* from the place *ku-ta-to*.

[19] Killen 1988.
[20] Killen 1964.

According to scribe 119, they each held a flock of exactly 100 sheep, and they were expected to produce exactly 25 units of wool:

KN Dk(2)1064 (119)
.A X OVIS^{m} 100 LANA 7 M 1
.B a-te-i-ja-ta / ku-ta-to LANA 17 M 2

KN Dk(2)1067 + 5189 (119)
.A *'ki' ne* X OVIS^{m} 100 LANA 6 M 2
.B a-ko-mo-ni-jo / ku-ta-to [*vestigia*]

In the two following tablets, scribe 117 listed a more detailed breakdown of the flocks of *a-te-i-ja-ta* and *a-ko-mo-ni-jo*. The flocks in reality were app. 100 mixed sheep (OVIS^{f}) and wethers (OVIS^{m}). Some were old (*pa*) and some were missing (*o*):

Dd **1468** + 5210 + 7123 (117)
a-te-i-ja-ta / ku-ta-to OVIS^{m} 40 OVIS^{f} 52[ ]/ *pa* OVIS^{m}[

De **1472** + 5353 + 5380 + 5420 + 5517 (117)
.A OVIS^{m}[ ]5 OVIS^{f} 21[
.B a-ko-mo-ni-jo , / ku-ta-to *o* OVIS^{m} 20

Thus, we know that the herding was strictly controlled and that the scribes pre-calculated each year's outcome of wool, probably in order to predict the palace-monitored textile production.

Wool types[21]
Woollen textiles require fibre processing including:

- Plucking the animals
- Sorting
- Cleaning
- Combing
- Spinning
- Weaving
- Finishing
- Sewing

The Mycenaean scribes used a combined sign to denominate wool: it consists of the syllable *ma-* and a second syllable, either *re-* or *ru-*. This habit had been taken over from the Linear A administration and script, thus suggesting that the Minoans termed wool *ma-ru* or *ma-re* or the like. However, the Greek Mycenaeans employed the sign as the symbol of wool, in particular in all recordings of sheep and their yielded wool.

[21] Killen 1964; Nosch 2007.

When necessary in the textile records, the scribe spelled out 'woollen' in Greek, *we-we-e-a*, from *eiros*, 'wool'.

KN L **178** + 281 ("124"/RCT)
we-we-e-a 'f161' TELA[3]+*PA* 6 / u-po-we TUN+*RI* 2

KN L **870** + *fr.* (114?)
o-]ḍạ-ku-we-ta / we-we-e-a TELA[3] 1 TUN+*KI* 1

On one tablet from Cnossos, wool is recorded as either 'Cretan'/*ke-re-si-jo*, or 'Cypriote'/ *ku-pi-ri-jo*, indicating that the scribe knew of quality differences between the local Cretan wool and the Cypriote type. Such regional differences in wool qualities are well documented in Roman written sources.

KN Od **667** + 5898 + 8292 + *fr.* (/F14)
.A 'ku-pi-ri-ja' LANA 1 M 2 P 4[
.B][· ·]-ku / ke-re-si-ja M 2 P 1[
lat. inf.] sa-mu[ ] 1 qo-ja-te P 1[

We have many Linear B records of wool.[22] Some of them calculate the yearly wool output from various flocks, as mentioned above.[23] Other tablets record allocations of wool to divinities such as the goddess *e-re-u-ti-ja* /Eleuthia.[24] Others again record small quantities of wool, probably for finishing purposes.[25] Finally, some record larger amounts, for unknown purposes.[26]

However, our documentation has lacunae regarding the wool: we know nothing about who undertook the task of plucking the wool of the thousands of sheep, the cleaning and sometimes washing of the wool, and the sorting into categories of qualities and colour. From Near Eastern written sources, we know that wool was sorted into several quality categories; from experimental archaeology, we know that the wool sorting is a very time demanding task; and from textile research on Bronze Age garments in Northern Europe, we know that they were of such homogeneous fibre quality that could have resulted only from wool sorting. Thus, it is safe to assume that wool sorting took place in Mycenaean society as well, but it is relevant to ask why the documentation on the wool qualities is lacking, if this is not a coincidence of preservation.

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[22] Nosch 2007.
[23] Dk(1), Dk(2) and Dl(1) series by scribes 120, 119 and 118 respectively.
[24] Set Od (2) by 103 containing 4 tablets from G1/*Gallery of the Jewel Fresco*.
[25] The tablets by scribes 103 in the Od(1) set and by scribe 115 in the Od(4) set from the West Wing, and tablets by scribe 227 in the Od(5) set. Wool for finishing purposes is also recorded by scribe 115 on the back of tablets setting production targets for western Crete in the Lc(2) set: here the processes of textile production and textile finishing are administered in collaboration between two scribes, scribe 113 recording production targets and scribe 115 recording wool for finishing of the same textiles. See Killen 1979, 172.
[26] Od(3) set.

The textile acquisition systems

We know of several modes of textile acquisition organised by the palace. Much research has been carried out on the system termed *ta-ra-si-ja*, which is a pan-Mycenaean acquisition system employed in the sphere of crafts of metal, chariots and textiles. Another mode of acquisition of textiles is through taxation; finally, some textiles seem to enter the palace through other systems of acquisition.

Generally, the acquisition systems were administered according to the geography of the palace territory: thus we know that the textile *ta-ra-si-ja* mode of acquisition was divided into the textile production in central Crete, in south-central Crete and in western Crete.[27] At Pylos, it was the division between the two provinces that constituted the backbone of the administration. In addition, scribes at Pylos listed the Messenian place names in a more or less fixed order within the province, demonstrating an administrative tradition for a geographical framing of administrative transactions.[28] This geographical-administrative division is a common feature for all Mycenaean palace administration and for all sectors of the economy.[29]

An extreme standardisation characterises the Mycenaean textile production. The standardisation is first of all clear in the identical and standardised use of abbreviation and textile terms in all palaces.

Finally, there was clear coherence between the mode of acquisition system and the type of textile. This was combined with the extreme standardisation of textile types, and the result was that certain textiles were acquired through certain systems; this pattern was valid in all Mycenaean palaces. This fact has not been clearly emphasised previously, and needs to be included in the interpretation of Mycenaean textile acquisition systems.

Collectors

Another common Mycenaean administrative feature influencing the administrative mode of acquisition was the presence of a 'collector', a kind of supervisor or perhaps owner or manager of a unit of the production (a flock of sheep or a group of workers).[30]

The collectors are of particular interest here: although a massive amount of research has focused on their identity, we still are not sure of their function in Mycenaean economy and society. However, here it must be emphasised that they were particularly involved in sheep herding and textile production. And even though they may have been associated with other sectors of the economy, their presence in textile production was significant and must be included in the interpretation of the collectors and their function.

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[27] Killen 1966; Killen 1972; Killen 1974; Nosch 1997-2000; Nosch 2003.

[28] Chadwick 1977.

[29] Wilson 1977; McArthur 1989; See further Bennet 1985.

[30] Killen 1976; Killen 1983; Bennet 1992; Carlier 1992; Driessen 1992; Godart 1992; Killen 1995; Olivier 2001; Rougemont 2001.

The *ta-ra-si-ja* system[31]

The aim of this acquisition system was to obtain the textile types *te-pa, pe-ko-to, tu-na-no* and *pa-we-a.*[32] They were all very material intensive textiles. The proportion of wool to textile was established by John Killen long ago.[33] One unit of wool /LANA equals 3 kilos, and 1 unit of wool/LANA is obtained from 4 sheep:
1 *pa-wo* equals 1.67 units of wool = 5 kilos, or wool from 6 sheep
1 *tu-na-no* equals 4 units of wool = 9 kilos, or wool from 12 sheep
1 TELA+*TE* / *tepa* equals 7 units of wool = 21 kilos, or wool from 28 sheep
1 TELA+*TE pe-ko-to* equals 10 units of wool = 30 kilos, or wool from 40 sheep.

The *ta-ra-si-ja* system was also used in two other craft sectors of the economy, wheel production and metalwork. According to the records of *ta-ra-si-ja* metalwork, smiths were given the exact amount of raw material for their *ta-ra-si-ja* work. Some scholars believe that a similar redistribution of wool took place via the palaces, but we have no documentation for allocation of wool to textile workers that was similar to the allocation of metal to smiths. However, conceptually the *ta-ra-si-ja* system is built on ratios between amounts of raw wool and numbers of finished textiles of a particular kind. The *ta-ra-si-ja* work constitutes all processes in between. However, since not only the end products – the textiles – were defined, but also the exact amount of wool to start with, it is plausible that some kind of allocation took place but not necessarily in the palaces or through the palaces. After all, the wool was present in the countryside where the textile workers lived.

We are lucky enough to have the two total targets preserved for *ta-ra-si-ja* production in the final year before the destruction of the Knossos palace. Tablet Lc(1) 535 records the production targets under the responsibility of collectors, and Lc(1) 536 records production targets for the remaining part of the *ta-ra-si-ja* production.[34]

KN Lc(1) 535 + 538 (103)

.A	ta-ra-si-ja	pa-we-a	[
.B	ke-ri-mi-ja	tu-na-no	[
.C to-sa /		pe-ko-to	[

KN Lc(1) 536 [+] 7383 + 7731 (103)

.A]	'ta-ra-si[-ja']	pa-we-a[ ]	TELA^{x} 200	
.B]	*'vest.['*]	tu-na-no[ ]	TELA^{1} 48	a-ro-zo 'ki-to' TELA^{1} 1
.C to-]sa /		pe[-ko-to	TELA^{1} +*TE*]18	TELA^{2}+*TE* 267

These two tablets provide the frame of the dozen individual production targets for Central Cretan places with textile workers. However, many more than a dozen places in Central Crete are recorded for flocks of sheep, and it results that not all Central

31 Duhoux 1976; Killen 2001; Nosch 1997-2001; Nosch 2000; Nosch 2006.
32 Nosch 2006.
33 Killen 1966; Killen 1974.
34 Olivier 1967. Killen & Olivier 1968.

Cretan places are submitted to *ta-ra-si-ja*.[35] We know these twelve place names quite well, because the most specialised textile scribe at Knossos, scribe 103, recorded not only their production targets but also the deliveries of the finished textiles. In addition, scribe 103 with his colleagues 102 and 108 kept strict records of these villages, their work force, their degree of education and number of workers. The circuit of textile *ta-ra-si-ja* is thus well documented. An example of a delivery of the *ta-ra-si-ja* textiles is apparent in Knossos tablet Le 642.

KN Le 642 + 5950 (103/F14)

.1]ra-wo , de-ko-to 'ṭạ-ra-si-ja' ne[
.2]ja TELA[1]+*TE* 2 ri-jo-ni-ja TELA[1]+*TE*[
.3]ri-jo TELA[1]+*TE* 6 da-mo-ko[
.4] *vacat* [

The document concerns *ta-ra-si-ja* and textiles of the type *te-pa* received (*de-ko-to*) in the Knossos palace. The deliveries came from groups of women such as the *ri-jo-ni-ja*, the women from the place *ri-jo-no*, or from individual men, probably similar to the collectors who were involved on all levels of textile production.

Other systems of acquisition

In the Linear B archives, we find records of other types of textiles: *pu-ka-ta-ri-ja* textiles, also recorded in the form of the textile ideogram TELA+*PU*,[36] TELA+*KU*, and the textile type *to-mi-ka*.[37] These records are not as numerous as the records of textiles for *ta-ra-si-ja*. However, on some of these record considerable quantities are recorded.

KN L 5561 + 5656 (-)

.1]-ru-wa , TELA[3]+*PU* 980[
.2]1̣ [
inf. mut.

These types of textiles were administered by the palaces at Pylos and Knossos. These textiles were rarely associated with the places producing textiles in the *ta-ra-si-ja* mode of acquisition – on the contrary, these three types of textiles seem to be linked to another circle of place names. They were not a part of the *ta-ra-si-ja* administration because they were not recorded by the scribes responsible for the *ta-ra-si-ja* production, and the tablets were not stored together with the *ta-ra-si-ja* records. For example, the textiles designated as TELA+*PU* were recorded by scribe 207 and the tablets were stored above F7 in the West Wing.

This pattern can be seen both at Pylos and at Knossos. Thus, this seems to be another acquisition system involving another part of the palace administration.

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[35] Nosch 1997-2001.

[36] See the interpretation by Duhoux 1976, note 232 as 'folded' textiles.

[37] Nosch 1998.

The following Knossian tablet L(3) 473 is an example of a delivery of TELA+*PU* textiles that are missing from the previous year.

KN L(3) 473 + 8026 (207)
.A o-pe-ro *'pe'* TELA[2]+*PU* 38
.B qa-ra / i-se-we-ri-jo

At *qa-ra* (place name), *i-se-we-ri-jo* (the collector), missing from last year, 38 pieces of the *PU* type textile

The ideogram *168+*SE* might indicate a type of textile – the form suggests this interpretation. We are fortunate to posses the totalling record of this product:

KN Pp 499 (119/ F7a)
]to-so *168+*SE* 217

So much: 217 pieces of *168+*SE*

The production of this item also seems to be associated with a certain group of place names listed in the series, and because we posses the totalling tablet, we can be quite sure that the list of place names producing the 217 pieces of *168+*SE* on Pp 499 cannot be expanded very much.

Acquisition of textiles through taxation

The acquisition of textiles through taxation was also a standardised procedure, aiming at obtaining a standard textile, namely the type designated by the ideogram *146.[38] However, in contrast to the textiles obtained through the *ta-ra-si-ja* system, *146 was not defined through its weight. More than 500 pieces of *146 were to be delivered by the Messenian towns. There were nine major towns in the Hither Province, and one of them was *ri-jo*:

PY Ma 193 (S90-H2)
.1 ri-jo **146* 17 *RI* M 17 *KE* M 5 **152* 7 *O* M 4 *ME* 362
.2 pe-ru-si-nu , o-pe-ro **146* 2 *O* M 4 *ME* 362
.3 o-da-a$_2$, ka-ke-we , o-u-ḍi-do-si **146* 4 *RI* M 4 *ME* 40 o-da-a$_2$, pe-ra$_3$-qo **146* 1 **152* 1[ ]*ME* 10[

.1 *ri-jo*'s contribution consists of: 17 pieces of the textile *146, 17 M units of *RI*, 5 M units of *KE*, 7 pieces of *152, 4 M units of *O*, and 362 pieces of *ME*.
.2 *ri-jo*'s missing contribution from the previous year consists of: 2 pieces of the textile *146, 4 M units of *O*, and 362 pieces of *ME*.
.3 and thus, the smiths do not contribute: 4 pieces of the textile *146, 4 M units of *RI*, 40 pieces of *ME*; and thus, *pe-ra$_3$-qo*: 1 piece of the textile *146, 1 piece of **152* 1[ ] 10 pieces of *ME*.

[38] See the most recent and comprehensive work on Mycenaean fiscality, Perna 2004.

And finally: the textiles in the palace

The documents concerning the textile production process, monitored by the palace, testify to an extreme standardisation, which is attested in several palaces. For the Mycenaean scribe, textiles seemed to be standardised items, with a standardised graphic expression and standardised terminology.

However, in the documents testifying to the final products and describing the storage in the palace of the textiles, new terms, decoration and colours appear.[39] We lack information on this final finishing, decoration and dyeing process, but we suddenly see standardised textiles turned into complex commodities. It is only at this late stage that the textile researcher is tempted to search for visual parallels in the iconographic material.

Textiles are described as coloured: red,[40] white, grey or variegated. The following inventory lists the total of textiles delivered by collector groups.

KN Ld(1) 587 + 589 + 596 + 8262 (116/F14)

.1 to-sa , po-ki-ro-nu-ka TELA^{1} 24 re-u-ko-nu-ka TELA^{1} 372

.2 ko-ro-ta$_2$ TELA^{2} 14 *56-ra-ku-ja TELA^{x} 42 po-ri-wa TELA^{1} 1

lat. inf. *vac.* [ ] to-ṣa TELA 149

So much : 24 textiles with variegated edges; 372 textiles with white edges; 14 *ko-ro-ta$_2$* textiles; 42 **56-ra-ku-ja* textiles; 1 grey textile. So much: 149 textiles.

The total number of textiles on this tablet is 453 pieces of *pa-we-a*, plus the 149 textiles recorded on the edge of the tablet. Since it is a record of a delivery, it is plausible that the detailed account of the tablet reflects the actual delivery, while the unspecified 149 pieces recorded on the edge reflect the missing textiles. Thus, the palace expected a total of 602 *pa-we-a* textiles from the collector groups. This means that *pa-we-a* may be particularly associated with collectors' areas of responsibility.

Mycenaean textile production on the bureaucratic level was organised according to different parameters: geographical parameters and personal parameters (depending on the presence of collectors). Various systems were used by the admini-strators to obtain specific kinds of textiles; again, some kinds of textiles seem connected to specific areas, or to collectors. Today, we connect these parameters and systems through the study of find spots and scribal hands.

The preserved tablets provide information about the acquisition of textiles and this seems indeed to be a major concern for Mycenaean palaces. For what purpose were the textiles made? Some were traded. Others were probably distributed to dependent personnel, to workers as remuneration and to kins as gifts.[41] I believe that it is not a coincidence that the textiles' further lives – their distribution, their consumption, their use and their reuse – are nearly absent in the palace records.

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[39] Killen 1979.

[40] Nosch 2004.

[41] Palaima 1991.

Textiles in the Late Bronze Age were the result of 4,000 years of innovations and improvements, and the technology changed only very little until modern times. However, because of the many hours of work required to create textiles, societies have adapted many various strategies to optimise and secure the necessary textile production. The Mycenaean palace-organised system is in its nature a quite extreme example of one such strategy.

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