OLIVES TO PAY MINOAN LABOUR

1. Introduction

The olive ideogram L49 is not very frequent in the Hagia Triada archives. It occurs in about half the cases [1] in record of delivery of a series of commodities which do not present a particularly interesting species of text. Only in two cases, HT 33 and HT 101, olives are listed in records of payment to labourers characterized by the notation $sa\text{-}ra_2$, which [2] means something like «so much to pay». The first one does not lead to quantitative analysis since too many ideograms representing unknown commodities are listed, which may be interchangeable or not. HT 101, however, is of a different nature, since it only shows the known commodities wheat, barley, olive oil and olives.

Payment of Minoan labour was made basically in cereals, in some cases partly [3] replaced by figs, to which basic pay sometimes varying amounts of wine and olive oil were added [4]. As the author has demonstrated [5], dry products were recorded in Minoan medimnoi of 120 khoinikes, liquid products [6] like olive oil, in Minoan metretes of twelve khowes each of sixty kyathoi, one such metretes having a capacity of three-tenth parts of the medimnos. Normal pay required a basic per diem allocation of one khoinix of wheat-equivalent including millet or some such cereal, figs or the double amount of barley [7]. The latter commodity was only used as pay-

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[1] HT 14, 21, 44, 116 probably HT 58, characterized by the notation *TE* in the heading. The nature of HT 50, 91 and 123 is as yet unclear.

[2] For the analysis of the function of the notation cf. the author, *Kadmos* 11, 1972, pp. 1-21; 12, 1973, pp. 17 ff.

[3] Payment in figs only is recorded on HT 88.

[4] Also, but this was rare, some other commodities of unknown nature have been recorded in pay-lists.

[5] *Op. cit.*

[6] Wine was recorded in medimnoi, but daily allotments made in kyathoi; thus a range of 2400 parts could be bridged.

[7] Cf. L. R. Palmer, *Interpretation of Mycenaean Greek Texts*. Oxford 1963, pp. 14, 96 ff.

ment to people belonging to the palace-administration, receiving in almost all cases [8] a bonus of one third of a khoinix of wheat-equivalent per diem over and above the pay of the labourers to which they were undoubtedly assigned to supervise them. The notion of «equivalent» was rendered by the ligature $K^w E$ [9], thus wheat-equivalent is presented by the symbol Lc 3.

2. The Transliteration of HT 101

Following the transcription given by Brice [10] the text of HT 101 may be presented as follows.

		heading		
(entry	1	WHEAT $+ K^w E$	40	
	2	OIL $+ RO$	8	
	3	OIL $+ MI$	8	
	4	OIL $+ KI$	2	
		sa-ra$_2$		
	5	WHEAT	40	
	6	OIL $+ RO$	35 (or 45)	
		ku-ro	[ ]	
	7	[ ]	2	
	[			]
(entry	8)	[ ]	20	
	9	BARLEY	3	
	10	OIL $+ KI$	2	
	11	[ ]	3	
	12	OLIVES	$1^1/_2$	
	13	OLIVES $+ TU$	1	

(In entry 12 the fraction as established by the author [11]).

As to this transliteration the following critical remarks must be made.

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[8] This seems to lead exception only in the text of HT 128b, which shows the labourer ideogram L 109, which may refer to a different category of palace staff, No ideogram for supervisory staff has been found.

[9] Cf. the author, *op. cit.* and *Minos*, 13, 1972, pp. 6-21.

[10] W. C. Brice, *Inscriptions in the Minoan Linear Script of Class A*, Oxford 1961.

[11] Kadmos 10, 1971, pp. 35-51.

(i) Of entry 6, which is heavily damaged, only «OIL 10» is clearly visible. Brice, in 1961 not knowing the significance of $sa\text{-}ra_2$, may have been influenced by the first entry (2) dealing with oil. However, now reading «so much to be paid» it is clear that entries 1 to 4 list the available commodities and entries 5 and 6 those due for payment. In such case an unligatured oil symbol is required for [14]. The numerals, like those following WHEAT in entries 1 and 5, should be similar or come close to one another. The addition of olives in entries 12 and 13 points to a shortage [13] of olive oil made up by olives. Also, entry 7 has numeral 2 which might indicate such shortage if we do not read 35 or 45 in entry 6, but 20. Indeed, it appears on close inspection that the text may have had 20, but in no case 18, being the aggregate of the oil listed in entries 2 to 4. Most probably, numeral 20 was followed by the syllabic symbol for either *SA* or *DI*, being the first syllable of a word continuing with *KU* [   ] on the next line of the text.

(ii) The transliteration of *ku-ro* with the well established meaning of total makes no sense as wheat and oil cannot be added. Moreover only the first syllable is clearly visible [14].

(iii) In entry 9 the barley ideogram is followed by numeral 3 written in the conventional manner, namely two vertical strokes over one. However, the first of them is crossed out by a heavy horizontal dash. Obviously, the combination of cross over vertical stroke followed by another vertical stroke does not make sense at all. Consequently the possibility that the scribe made an error which was later corrected must be envisaged, which will be done in the next section.

In consequence of these considerations a corrected transliteration is presented below.

heading

(entry 1)   WHEAT equivalent   40
      2   OIL+*RO*   8

[12]   Cf. HT 116, giving the sumtotal of amounts of different kinds of oils.
[13]   Such a shortage (of wine) is recorded on HT 114. Cf. *Kadmos* 12, *op. cit.*
[14]   Cf. J. Raison & M. Pope, *Index du Linéaire A*, Rome 1971, fig. 22, p. 23.

| 3 | OIL + *MI* | 8 |
| 4 | OIL + *KI* | |

sa-ra₂

| 5 | WHEAT | 40 |
| 6 | OIL | 20 |

heading

	[	]	
7	[	]	2
[			]
(entry 8)	[	]	20
9	BARLEY		2
10	OIL + *KI*		2
11	[	]	3
12	OLIVES		1¹/₂
13	OLIVES + *TU*		1

3. The Significance of the Notation of Cereals

For BARLEY 2 in entry 9 we may substitute WHEAT-equivalent 1, and this amount should be due to the palace supervisors either to account for their bonus or for (part of) their total pay.

Entries 1 and 5 leave us no doubt; available for payment 40 WHEAT-equivalent, and to be paid 40 WHEAT. This makes sense, if we consider that the first entry, (WHEAT-equivalent), was in fact refering to a mixed lot of cereals. That this entry does not correspond to entry 5, (only WHEAT), is in accordance with the character of the *sa-ra₂* part of the text, which lists the amount due for payment. We have seen already that this part does not record the amounts actually paid out; instead of the 20 metretes of olive oil due only 18 were listed in the first part of the text which recorded the available commodities.

In other words, the two medimnoi of barley intended for the supervisors and listed in entry 9, equal to one medimnos of WHEAT-equivalent, are included in the 40 of entry 1.

The text, in as far as it has been preserved, does not disclose how much of the WHEAT-equivalent was paid out as WHEAT, but this seems irrelevant for our purpose of interpretation as only the

supervisors would receive (part) of their pay in the form of barley, and other products were counted as equal in value.

It is clear that the section of the text starting with entry 9 deals with the pay of the supervisors. The next entry (10) repeats the information of entry 4, OIL+KI 2, and is followed by the damaged entry 11 of which only the numeral 3 has survived. It seems most economical to consider this latter entry as a record of the basic pay of the supervisors in the same kind of WHEAT-equivalent in which the labourers were paid. Indeed, 3 medimnoi of basic pay would ask for one medimnos of bonus pay or two medimnoi if it was made in barley.

We now come to the scribal error in entry 9 already referred to in the previous section. The scribe, in a moment of distraction, may have listed the numerals pertaining to the basic pay of the supervisors instead of those relevant to their bonus. I am strengthened in this belief by the information rendered by the preceding entry (8), which lists numerals 20. This figure can only relate to the payment in wheat-equivalent of one of the groups of labourers [15] and, if so, the error becomes understandable, —a sort of error which, the author has to confess, he might have made himself—, and the emotional crossing out of a digit, when he came to appreciate his mistake when arriving at entry 11 might indicate his irritation. The fact that the first digit was crossed out is perfectly understandable since a cross through either of the two other digits would have resulted in the reading of 2 1/6. In order to facilitate the understanding of the present analysis of the text, this may be schematized as follows.

entries	1-4	available
»	5-6	due
»	7	shortage of oil
»	8	instruction for group payment
»	9-11	payment of supervisors
»	12-13	compensation for the shortage of oil

For the pay of the labourers 36 medimnoi of WHEAT-equivalent were thus available (40 of entry 1, minus 2 of BARLEY and 3 of

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[15] Such added detailed instructions have also be found on HT 27 (analysed in *Kadmos* 12, *op. cit.*).

WHEAT-equivalent), and, consequently, the ratio between labourers and supervisors can be established at 12:1, which, however, does not necessarily mean that the supervised groups were of equal size. On the contrary, numeral 20 of entry 8 point otherwise and, subject to further consideration, it will be assumed that there were three groups, one of twenty and two of eight individuals, each group with one supervisor [16].

4. The Significance of the Notation of Olive Oil

The amount of oil due for payment as indicated in entry 6 amounts to 20 metretes or 14.400 kyathoi. The number of daily rations of one khoinix of wheat, according to the information in entry 5, viz. 40 medimnoi, amounts to 4800. Consequently, the average amount of olive oil to be allocated per diem to each individual is three kyathoi. However, as already indicated above, the oil available amounts to 18 metretes only (entries 2 & 4) and is therefore two metretes short. Moreover, in the cases hitherto analysed [17], supervisors did not get less than 4 kyathoi of oil per diem even if, (cf. HT 28), they were allocated to a group of labourers receiving 2 or 3 kyathoi only. The supervisors received, as we have seen, 3 medimnoi of WHEAT-equivalent or 360 khoinikes = 360 daily rations. At the rate of 4 kyathoi of olive oil per diem 1440 kyathoi would be needed, or 2 metretes, and such is the amount of OIL+KI recorded.

The shortage of oil of 2 metretes listed in entry 7 did therefore not affect the supervisors but only the labourers and, as has been suggested already, these were compensated by the two lots of olives listed in entries 12 & 13.The two groups, (see end of preceding section), receiving 16 medimnoi of WHEAT-equivalent or 1920 daily rations, would, at the rate of 3 kyathoi of olive oil per diem, need 5760 kyathoi or 8 metretes, and it is to be noted that such

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[16] It is to be understood that, as no information as to the number of pay days, nor as to the number of labourers, is available, only the number of daily rations can be exactly established. The number of groups may therefore be multiplied when coupled with a correspondign reduction of the number of days. In the above example, which has been chosen for the sake of simplicity, the number of pay days would have been 120.

[17] Cf. Kadmos 12, op. cit.

amount is listed twice. However, this does not mean that the two groups actually received one of these lots each. In the analysis of HT 28 & 100 it was found [18] that the different lots were distributed over the various groups and also in this case I prefer such approach, the more so as it is logical to assume that the two lots of olives went to two groups which were short in oil. One then arrives at the following picture of distribution [19].

Distribution of commodities to groups of labourers

Group	WHEAT in medimnoi	OIL + RO	OIL + MI in metretes	shortage	OLIVES in medimnoi
I	20	5	5	—	—
II	8	2	1	1	$1^1/_2$ (plain)
III	8	1	2	1	1 $(+TU)$
TOTAL	36	8	8	2	

Consequently, $1^1/_2$ medimnos of (plain) olives would have equalled the market value of one metretes of olive oil like one medimnos of olives of the quality TU. Such a price difference between different kind of olives is, in a negative way, attested by HT 116, listing the totals of an enumeration of wheat, barley and various kinds of olive oil $(+DI, +MI, +KI, +TU)$, but omitting such a total for the recorded amounts of plain olives and of those of the quality TU. As has been indicated in the introduction, the capacity of a metretes corresponds to 0.3 parts of the medimnos, hence the value of OLIVES $+ TU$ was 30 % of that of olive oil and that of plain olives 20 %. Olives, dependent upon time of harvesting and upon quality, yield from 20 to 30 % of their weight in olive oil, and our findings are in full accordance therewith.

5. *Consideration of the Possibility of Alternative Interpretations.*

The interpretation given in the two preceding sections rests upon the (logical) assumption that the listed available commodities included the pay of the supervisors as well. Two other assumptions present themselves, and it has to be considered wheth-

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[18]   Cf. *Kadmos* 12, *op. cit.*

[19]   The distribution is by way of illustration only; reshuffling from one group to another remains possible as long as the shortages remain.

er these make any sense. These are, primo, that only the basic
pay of the supervisors was so included, not their bonus, and,
secundo, that both basic pay and bonus were excluded from entries
1-4. As to primo, the following may be observed. The amount of
wheat-equivalent available to the labourers becomes 37 medimnoi,
(40 of entry 1, minus 3 of entry 11). As we are stuck with one group
of 20 (entry 8), we obtain a ratio of 20:1 and 17:2 between labourers
and supervisors, (or 20:2 and 17:1, which makes no sense because
of the oddity of the latter ratio). If the group of 20 of entry 8 would
include the supervisors, then another 20 remains and the ratios
become 19:1 and 18:2, which seems odd as well and should be
rejected.

There is a possibility of distributing the 16 metretes of oil in
whole numbers of kyathoi per man per diem if the 17, (see above),
form two groups of 12 and 5 respectively. I will save the reader
the relevant calculations as they are simple and present only the
following distribution scheme.

Alternative distribution scheme (case primo)

Group of 20   2 kyathoi of oil makes   4800 kyathoi
»   » 12   3   »   » »   »   4320   »
»   » 5   4   »   » »   »   2400   »
                                     ————
                                    11520   » = 16 metretes,
                                             (8 of *RO*, 8 of
                                             MI)

It will be seen that the groups decrease in size with a greater
ration of oil, thus indicating a higher standing as often found.
The small ration of only 2 kyathoi is not unique [20], and may there-
fore be accepted. A solution as to the shortage of 2 metretes of
oil is now required and this can be found on the assumption that
the second category should have received 4 instead of 3 kyathoi
as well as the third category. This would call for another 1440
kyathoi or 2 metretes, wich would have to be equal to the sum of
the two amounts of olives. Both the price difference between the
two kinds, to which we have come in the preceding section, and

[20]   HT 28 & 100, Cf. *Kadmos* 12, *op. cit.*

the alternative possibility of equal price would apply, and in the latter case that price would have been 0.24 % of that of olive oil. However as the two types of oil were not added up on HT 116, (see section 4), the first possibility is to be preferred.

Although this alternative interpretation, which as to the price of olives yields identical results as the former and allows for daily ration of oil in whole numbers of kyathoi, remains possible, I prefer the former as the two lots of olives then would go to different groups which to me, seems, more indicated [21].

With respect to the alternative referred to under secundo above, it will be appreciated that it concurs with our preferred solution: the amount of WHEAT-equivalent for the labourers becomes 40 and that of oil 18 as logic requires that the 2 metretes of OIL+KI «available» of entry 4 were destined to the labourers as well, and had nothing to do with the identical entry 10 listing the oil for the supervisors. This sort of coincidence is suspect, and for that reason this alternative solution should, in my opinion, not be retained.

6. Summary

Analysis of HT 101 has led to a corrected transliteration of the (damaged) text and yielded that supervised groups of labourers were entitled to a daily payment of 3 kyathoi of olive oil, in addition to the usual one khoinix of wheat, (or an equivalent thereof), whereas the supervisors, apart from their usual bonus of 1/3 khoinix of wheat-equivalent, (in this case double this amount of barley), received 4 kyathoi of oil. Some groups of labourers received less than their due as paid in olive oil and were compensated by an amount of olives, and the analysis suggests that the price of plain olives was 20 % of that of oil for the same capacity, and that OLIVES+TU rated as 30 %. For the latter figures, see, however, the addendum.

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[21]   Another complication of the alternative case is that the damaged part of the text, (between entries 6 & 8), needed to have information about the size of the groups of 12 and 5, expectedly in the form of listing the required amounts of cereals, and it is questionable whether that part would have had sufficient space for such information.

ADDENDUM

When working on an analysis of the series of HT texts dealing with olive oil and related commodities, and more in particular those numbered 30 to 37, it appeared from the data recorded on HT 33 that a certain detail [22] only made sense if the relative market value of plain olives, as distinct from those qualified TU, was 30 % of the same amount of olive oil. The $1^1/_2$ medimnos of such olives would be sufficient to replace $1^1/_2$ metretes of olive oil, and, consequently, the single medimnos of OLIVES + TU had to be rated so as to replace the, then still lacking half metretes of olive oil, hence their value was half that of plain olives and rated 15 % as compared with the same amount of oil. This different rating did not otherwise the interpretation given in this paper.

The preferable distribution to the three groups of labourers thed becomes as follows.

GROUP	WHEAT in medimnoi	OIL + RO	OIL + MI in metretes	shortage	OLIVES in medimnoi
I	20	4	4	2	$1^1/_2$ plain + 1 TU
II	8	2	2	—	—
III	8	2	2	—	—

In this way, the largest group (I) was compensated with olives for the shortage of olive oil, whereas the two other groups of identical size received equal treatment, and, probably, were of somewhat higher status in accordance with their smaller size.

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[22]   «Numerical Fractions in the Minoan Linear Script A. V. Olive oil and related commodities». To be published in *Kadmos* 13.