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Unusual Accounting Practices in Archaic Mesopotamian Tablets

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§1.1. The archaic texts examined in this paper all come from the earlier Erlenmeyer Collection. As is widely known, this tablet collection was auctioned off in December of 1988 by the London auction house Christie's, and the majority of them were purchased by the State of Berlin and transferred to the Vorderasiatisches Museum as a permanent loan.[1] Many of the tablets are fully preserved and in very good condition, allowing unequivocal analysis of their administrative contents. Unfortunately, deriving from irregular excavations, the provenience of the tablets is unknown and can be only tentatively proposed on the basis of similarity with other tablets.

§1.2. The administrative accounting of grain products in the archaic texts follows in general (for the period Uruk III/Jemdet Nasr) the practice of listing on the obverse of the tablet a number of transactions, recording the quantity of each product with its corresponding derived numerical ŠE system.[2] These products are normally totaled using numerical notations that qualify them, or combined for a grand total on the reverse of the tablet and recorded generically in the numerical Š system.[3] In some instances, the total may precede the list of the detailed grain products.[4] In the following paper, a few exceptions to such administrative practices

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1 The archaic tablets (Uruk III/JN period) will be published by P. Damerow and R. K. Englund in *MSVO* 3, Berlin, but see provisionally H. J. Nissen, P. Damerow and R. K. Englund, *Frühe Schrift und Techniken der Wirtschaftsverwaltung im alten Vorderen Orient* (Berlin ^{3}2005) and the corresponding entries in *CDLI*. The corpus includes 90 texts, the majority of which (58) are currently in the Berlin Vorderasiatisches Museum; others are scattered across various museums and private collections. The textual references and the transliterations in this paper follow those of *MSVO* 3, unless specified otherwise.

2 It is assumed that the basic numerical Š(E, later Sumerian "grain") system was used for unprocessed grain/barley, the derived systems Š' for malt, Š" for emmer, and Š* for grain groats, following most recently R. K. Englund, "Grain Accounting Practices in Archaic Mesopotamia," in J. Høyrup and P. Damerow, eds., *Changing Views on Ancient Near Eastern Mathematics*. (=*BBVO* 19; Berlin 2001) pp. 1-35. For the sake of simplicity, the term barig has been used to denote the basic unit of capacity for grain products ("N_1"), according to P. Damerow and R. K. Englund "Die Zahlzeichensysteme der Archaische Texte aus Uruk" in M. W. Green and H. J. Nissen, *Zeichenliste der Archaischen Texte aus Uruk* (=*ATU* 2; Berlin 1987) pp. 153-154, n. 60 (according to later texts, representing approximately 60, here perhaps 25 liters).

3 Tablets *MSVO* 3, 55 and 70, are accounts of grain and, respectively, malt and emmer, measured and totaled separately in the numerical Š and, respectively, Š' and Š" systems. *MSVO* 3, 1, 68 and 73, are accounts of grain and emmer measured and sub-totaled in the numerical Š and Š" systems, and then combined in a numerical Š system notation. Tablet *MSVO* 1, 38, is an account of grain and emmer measured in the numerical Š and Š" systems and combined in a numerical Š system notation (on the other hand, in the similar account of tablet *MSVO* 1, 36, grain and emmer are combined in a numerical Š" notation). Grain groats and malt (both beer ingredients) are recorded in a number of texts from Jemdet Nasr together with other commodities and totaled separately, qualified by their respective derived numerical systems (Š* and Š'). In a few cases, they are reckoned together in a numerical Š system notation (see tablets *MSVO* 3, 51, treated below §6, and *MSVO* 1, 94, treated by the author in *CDLB* 2004/3). In the account *MSVO* 3, 26, grain groats are counted and totaled in a numerical Š* system notation, and then combined with grain in system Š.

4 The obverse of the irregularly fomed tablet *MSVO* 3, 41, is divided into three sections (the reverse is not inscribed). The first and third sections record a number of grain and emmer rations to individuals. The second section records a total of 180 barig of grain and 66 barig of emmer (in Š and Š" notations, respectively), which are composed of 120 barig of grain plus 24 barig of emmer qualified as ŠE U_4 GIBIL and 60 barig of grain

will be analysed, with the intention of investigating the rationale followed by the scribes in those peculiar accounting notations. For the sake of clarity, the numerical notation used for each entry or summation will in most cases be presented together with the transliteration of the texts.

§2. *Š totaled as Š**[5]

§2.1. *MSVO* 3, 55 (from Uruk?), is an account of two different entries of a grain product and malt[6] (both beer ingredients). The two entries are totaled on the reverse of the tablet and their destination is qualified as KU_{b2} $ŠIM_a$ (possibly "beer bread," see below). The first entry seems related to a month, or to a special event (EZEN AN $MUŠ_3$ = ezen ^{d}inanna ?).[7]

grain capacity system	*case*	*transliteration*
Š	obv. i 1a	$1N_{14}$ $2N_1$ ḪI*gunû*$_a$ AN U_4 SIG $MUŠ_{3a}$ ⌜NAGAR$_a$⌝ $EZEN_b$
Š'	obv. i 1b	$2N_{18}$
Š	obv. i 2a	$1N_{14}$ $4N_1$ $1N_{28}$ KINGAL
Š'	obv. i 2b	$4N_3$ $1N_{40}$
	obv. i 3	KU_{b2} $ŠIM_a$
Š*	rev. i 1	$3N_{20}$ $1N_{28*}$ ḪI*gunû*$_a$
Š'	rev. i 2	$2N_{18}$ $4N_3$ $1N_{40}$
	rev. i 3	KU_{b2} $ŠIM_a$

§2.2. The entries of malt are measured and totaled in the final Š' notation. The grain product qualified as ḪI*gunû*$_a$ is totaled in case rev. i 1 in a derived numerical Š* notation,[8] which usually denotes grain groats. The present context may therefore indicate the equivalence of the two products, probably in different phases of the beer brewing process.[9] It should be noted, however, that the grain product ḪI*gunû*$_a$ is not necessarily associated with malt, and is occasionally delivered separately as "food" (GU_7).[10]

§3. *Š* and Š' totaled as Š**

§3.1. Tablet *MSVO* 3, 52 (from Uruk?), a similar account of two grain products (ḪI*gunû*$_a$ and malt) whose destination is also qualified as KU_{b2} $ŠIM_a$ ("beer bread" ?), presents some peculiarities.

grain capacity system	*case*	*transliteration*
Š*&Š'	obv. i 1a	$2N_{47}$ $1N_{20}$ $1N_5$ $1N_{40}$ ḪI*gunû*$_a$ BA
Š*	obv. i 1b1	$8N_{20}$ $4N_5$ $2N_{42a}$ ḪI*gunû*$_a$
Š'	obv. i 1b2	$1N_{45'}$ $2N_{18}$ $2N_3$ $4N_{40}$
	obv. i 2	KU_{b2} $ŠIM_a$

§3.2. The quantities of the two beer ingredients recorded in their respective derived numerical ŠE systems are totaled in the first entry, qualified as grain rations (ḪI*gunû*$_a$ BA), and measured in the derived numerical Š* system,[11] with the exception of the least significant grain measure, represented by the numerical sign $1N_{40}$ of the Š' systsem. Accounts that combine

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plus 42 barig of emmer qualified as ŠE U_4+$2N_{57}$. There is no apparent relationship among the three sections.

5 A shortened form has been adopted in the heading of each paragraph to indicate the numerical notation, and thus to eliminate an otherwise necessary repetition of "(products counted/totaled in the) derived numerical [ŠE] system".

6 The beer ingredient identified as malt is never qualified as such in the tablets, being only distinguished from other grain products by the use of notations in the derived system Š'. See, however, the comment to text *MSVO* 3, 12, in §4.

7 EZEN AN $MUŠ_3$ may denote a month name. For other occurrence of the sign combination U_4 SIG AN $MUŠ_{3a}$ $EZEN_b$, see R. K. Englund, *BBVO* 19, pp. 21-22, n. 48.

8 See also *MSVO* 3, 3, in which a number of grain rations measured in the basic Š system are quantified and totaled in Š* and qualified as ḪI*gunû*$_a$, a grain product which in all probability is to be identified with the grain groats. The Cornell University tablet NES 00-08-073.1 (unpublished, made available to the author courtesy of D. I. Owen, curator of tablet collections) is an account of barley (ŠE), grain groats (ḪI*gunû*$_a$) and malt, measured in their respective derived numerical ŠE systems. The total, qualified as ḪI*gunû*$_a$ $ŠE_a$ and measured in a Š* notation, is divided into two subtotals, both measured in the Š notation and qualified respectively as ḪI*gunû*$_a$ $ŠE_a$ and BA KI (for a commentary on this administrative term see §7).

9 It is worth noting that *MSVO* 1, 216, records a quantity of barley (ŠE) destined for the production of beer-bread (? – KU_{b2} $ŠIM_a$) together with the two beer ingredients, grain groats and malt, measured in their respective capacity systems Š* and Š' and combined, with other grain rations, as a general grain capacity (ŠE) in the numerical system Š.

10 See, for instance, the text *MSVO* 3, 3, mentioned in note 8 above.

11 The account *MSVO* 3, 78, demonstrates the same format, having as first entry a quantity totaled as a grain product ḪI*gunû*$_a$, subdivided in a quantity of the same grain product (ḪI*gunû*$_a$) and a quantity of barley (ŠE). All the listed products are measured in the Š notation. The transaction was possibly not intended to record the production of beer.

grain products recorded in different capacity systems are not infrequent,[12] particularly in Jemdet Nasr tablets.

§3.3. The peculiarity of this text consists of its having totaled both the recorded grain products using the Š* notation, leaving one single sign in the other (Š') notation.[13] It seems evident that the reason for the adoption of such notation was due to the scribe's intention to put in evidence the mixed nature of the grain products totaled, as subsequently detailed in the rest of the tablet.

§4. Š and Š' totaled as Š'

§4.1. *MSVO* 3, 12 (from Uruk?), is an account of malt that includes a small quantity of barley measured in the derived numerical Š system, totaled with a Š' notation and delivered as "food" provisions (GU_7).

grain capacity system	*case*	*transliteration*
Š'	obv. i 1	$3N_{40}$ $1N_{24'}$ MUD $3N_{57}$ TE
Š'	obv. i 2	$1N_3$ E_{2a} U_4 KASKAL
Š'	obv. i 3	$1N_3$ $1N_{40}$ $1N_{24'}$ GA_{2a2}+GU_4+$ŠE_3$ U BU_a
Š'	obv. i 4	$2N_{40}$ $1N_{24'}$ EN_a $SANGA_a$ TUR $1N_{58}$ $ŠIM_a$
Š'	obv. ii 1	$1N_3$ $2N_{40}$ $1N_{24'}$ GA_{2a2}+GU_4+$ŠE_3$ SAGŠU
Š'	obv. ii 2a	$1N_{18}$ $4N_3$
	obv. ii 2b1	$KAŠ_c$
	obv. ii 2b2	$KAŠ_c$ SUKKAL
Š'	obv. ii 3	$4N_{40}$ $1N_{24'}$ E_{2a} $PIRIG_{b1}$+$3N_{57}$
Š'	obv. ii 4	$2N_{40}$ $1N_{24'}$ AN $MUŠ_{3a}$ DU PAP_a E_{2a} NUN_a
Š'	obv. iii 1	⌜$4N_{40}$?⌝ [$1N_{24'}$] NIN GAL_a E_{2a}
Š	obv. iii 2	$3N_{39a}$ GI_{4a}+A
	obv. iii 3	⌜GU_7⌝
Š	rev. i 1	$2N_{14}$ $ŠE_a$ $BULUG_3$ E_{2a}+KUR_a?
Š'	rev. i 2	$3N_{18}$ GU_7
	rev. i 3	SAGŠU GA_{2a2}+GU_4+$ŠE_3$
	rev. ii 1	GU_7

§4.2. My interpretation of case obv. iii 1 is based on traces of the slash, typical of the signs belonging to the derived system Š', present on the edge of the break in the upper right corner of the tablet. This break may have only included the numerical sign $1N_{24'}$, also expected by analogy with the preceding cases, with the consequential reading $4N_{40}$ of the preceding signs.[14] The listed quantities of malt, including the small quantity of unprocessed barley (ŠE) in case obv. iii 2, total 17.9 barig, rounded off to 18 barig in case rev. i 2 of the reverse. The additional quantity of barley registered on the reverse (case rev. i 1) is qualified as $BULUG_3$ (= $munu_x$, "malt") and therefore represents an additional confirmation of the correct interpretation of the derived numerical Š' system as referring to malt.

§5. *Š and Š" totaled as Š": A double-entry account*

§5.1. *MSVO* 3, 42 (from Uruk?), is a tablet in the British Museum (BM 140853) that contains an account of barley and emmer. Single entries of the two products are recorded on the obverse, together with their destinations. The reverse contains two different summations, both in terms of barley and emmer.

grain capacity system	*case*	*transliteration*
Š Š"	obv. i 1a	$6N_{14}$ $3N_{19}$ $ŠE_a$ LU_2 MUD_{3d}
Š	obv. i 1b1	$6N_{14}$ $ŠE_a$
Š"	obv. i 1b2	$3N_{19}$ U_4
Š"	obv. i 2a	$1N_{46}$ $ŠE_a$ $UNUG_a$ E_{2a}
Š	obv. i 2b1	$5N_{14}$ $ŠE_a$
Š"	obv. i 2b2	$5N_{19}$
Š	obv. i 3	$5N_{14}$ ŠUBUR SUG_5 PA_a
Š	obv. ii 1	$4N_{14}$ TI*tenû* ZAG_a
	obv. ii 2	LU_2 MUD_{3d}
Š Š"	rev. i 1a	$1N_{45}$ $1N_{46}$ $8N_{14}$ $ŠE_a$
Š	rev. i 1b1	$2N_{45}$ $ŠE_a$
Š"	rev. i 1b2	$8N_{19}$
	rev. i 2	LU_2 MUD_{3d}

§5.2. The first entry records a quantity of barley plus a quantity of emmer measured in their respective numerical systems Š and Š", followed by a separate list of the two products. The second entry records a quantity of barley in the Š" system, again followed by the separate list of the two products (and again measured in their respective systems Š and Š"). Two additional entries of barley complete the account on the obverse of the tablet. The entries are totaled on the reverse according to two criteria. First, the totals of the cumulative entries of the obverse (cases obv. i 1a, obv.

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[12] See for instance the text *MSVO* 3, 42, treated in this paper in §5.

[13] In a similar way the Cornell University tablet NES 00-08-072 (unpublished, made available to the author courtesy of D. I. Owen), which is an account of barley and emmer, totals in the Š notation both products, leaving one sign in the Š" notation, which, differently than tablet *MSVO* 3, 52, is in this instance the most significant sign-number. Such circumstance confirms the conclusions reported in § 3.

[14] Recorded as ⌜$4N_{39a}$?⌝ in CDLI (P005323).

i 3 and obv. ii 1 for the barley and case obv. i 2a for the emmer) are recorded in the same case (rev. i 1a) using their respective numerical systems; hence, the details of the quantities of barley and emmer listed on the obverse are totaled together in their respective Š and Š" systems. The following table offers a synoptic view of the double accounting in this text (counting "barig" = N_1).

grain capacity system	*Š*	*Š"*	*Š*	*Š"*
Š	36 (obv. i 1a)		36 (obv. i 1b1)	
Š"	18 (obv. i 1a)			18 (obv. i 1b2)
Š"		60 (obv. i 2a)		30 (obv. i 2b2)
Š			30 (obv. i 2b1)	
Š	30 (obv. i 3)		30 (obv. i 3)	
Š	24 (obv. ii 1)		24 (obv. ii 1)	
Š	108 (rev. i 1a)		120 (rev. i 1b1)	
Š"		60 (rev. i 1a)		48 (rev. i 1b2)

§5.3. The calculations are clearly based on a methodology compatible with the criteria of recording cumulative quantities of two different grain products under the same derived numerical systems (Š or Š"). The rationale of the adoption of such methods cannot, however, be directly deduced from the context of the tablet.[15]

§6. *Š* and Š' totaled as Š*

§6.1. *MSVO* 3, 51 (from Uruk?), is a tablet in the Louvre Museum (AO 29562) with an account of beer products (grain groats[?] and malt) totaled as a general grain measure in the capacity system Š. In contrast to most similar accounts, this tablet records first the total quantity, then the sub-totals, and finally the single entries.

grain capacity system	*case*	*transliteration*
Š	obv. i 1a	$1N_{45}$ $9N_{14}$ $2N_{39a}$ $\underline{\text{HI}}gun\hat{u}_a$
Š*	obv. i 1b1	$9N_{20}$ $1N_5$ $3N_{42a}$ $\underline{\text{HI}}gun\hat{u}_a$
Š'	obv. i 1b2	$9N_{18}$ $4N_3$ $4N_{40}$
Š*	obv. i 1c1a	$7N_{20}$ $4N_{42a}$ $\underline{\text{HI}}gun\hat{u}_a$ $NAGA_a$
Š'	obv. i 1c1b	$7N_{18}$ $4N_3$ $4N_{40}$
Š*	obv. i 1c2a	$2N_{20}$ $<4N_{42a}>$ $\underline{\text{HI}}gun\hat{u}_a$ DUB_a
Š'	obv. i 1c2b	$2N_{18}$ $4N_{40}$
	obv. i 2	KU_{b2} $ŠIM_a$

[15] See, however, the comment to the account *MSVO* 3, 75, in §8.

§6.2. The cumulative amount of grain products is recorded in the first case (obv. i 1a), qualified as $\underline{\text{HI}}gun\hat{u}_a$. The two grain products are then sub-totaled in terms of $\underline{\text{HI}}gun\hat{u}_a$ (in a Š* notation) and malt (in a Š' notation). Finally, the quantities of the two products are listed in two separate entries, qualified respectively as $NAGA_a$ and DUB_a. As in the accounts *MSVO* 3, 52 and 55 (treated in §§2-3 above), the products' destination is designated as KU_{b2} $ŠIM_a$ ("beer bread"?). The table below shows the relationships among the single cases of the tablet.

grain capacity system	*Š*	*Š**	*Š'*
	114 2/5 (obv. i 1a)	55 3/5 (obv. i 1b1)	58 4/5 (obv. i 1b2)
		42 4/5 (obv. i 1c1a)	46 <4/5> (obv. i 1c1b)
		12 4/5 (obv. i 1c2a)	12 4/5 (obv. i 1c2b)

§6.3. The quantity $4N_{42a}$ in case obv. i 1c1b, indicated as <4/5> in the table, is best disregarded as a scribal mistake due to the "dragging effect" of the presence in the other cases of the same fractional quantity.

§7. *The administrative term BA KI*

§7.1. *MSVO* 3, 67 (from Uruk?), exhibits the common practice of listing on the obverse of an account certain quantities of grain products (barley and emmer) destined for various deliveries, with sub-totals and totals on the reverse. The two types of commodities are measured in their respective numerical systems Š and Š". On the reverse are first registered the totals, divided into two quantities according to criteria not recognizable for the barley (the tablet was unfortunately effaced in the corresponding case), and finally sub-totals that correspond to the sums of the listed quantities on the obverse with an additional quantity for each type of product. The following table shows the numerical relationship between the sums on the obverse and the totals on the reverse (all quantities measured in "barig").

Case	*transliteration*	*capacity systems* *Š*	*Š"*
obv. i 1 -obv. ii 8		111	
obv. iii 1 -obv. iv 7			65 2/5 2/25
rev. i 1a	$2N_{45}$ $3N_{14}$ $3N_1$ ŠE	141	
rev. i 1b1	$1N_{45}$ $7N_{14}$ $3N_1$ X X	105	
rev. i 1b2	$6N_{14}$ [...]	36	
rev. i 1c1	$1N_{45}$ $8^{!}N_{14}$ $3N_{14}$ GU_7	$111^{!}$	
rev. i 1c2	$6N_{14}$ BA KI	30	

rev. i 2a	$1N_{46}$ $1N_{19}$ $2N_4$	68
rev. i 2b1	$9N_{19}$ [$2N_4$]	56
rev. i 2b2	$2N_{19}$ NUMUN GAN_2 NAGAR	12
rev. i 2c1	$1N_{46}$ $5N_4$ $2N_{41}$ $1N_{29a}$ $1N_{29a}$ GU_7	65 $^2/_5$ $^2/_{25}$
rev. i 2c2	$2N_4$ $2N_{41}$ $1N_{24''}$ KI BA	2 $^2/_5$ $^1/_{10}$

§7.2. It is evident that the structure of the totals and sub-totals of the two products is identical. The sub-total in case rev. i 2c1, qualified as "food" (GU_7), corresponds to the sum of the quantities of emmer listed on the obverse (cases obv. iii 1-obv. iv 7); it follows that the sub-total in case rev. i 1c1, also qualified as GU_7, should correspond to the sum of the quantities of barley listed on the obverse (cases obv. i 1-obv. ii 8), although the tablet clearly records 105 N_1 ($1N_{45}$ $7N_{14}$ $3N_1$), which I interpret to be a scribal mistake due to the "dragging effect" of the adjacent case rev. i 1b1 (a similar mistake has been noted to *MSVO* 3, 51, §6 above). In a similar way, the sum of the two quantities of emmer in cases rev. i 2b1 and rev. i 2b2 corresponds to the total reported in case rev. i 2a, and the sum of the two quantities of barley in cases rev. i 1b1 and rev. i 1b2 corresponds to the total reported in case rev. i 1a.

§7.3. The two additional quantities in cases rev. i 1c2 and rev. i 2c2 are qualified as BA KI or KI BA.[16] This term is attested in a number of Uruk III administrative[17] and lexical[18] tablets. The tablet W 20274,89 (see n. 17) from Uruk, offered below in transliteration, helps to clarify the meaning of this administrative term.

obv. i 1a	$5N_1$ DUG_c DUB_a
obv. i 1b1	$1N_1$ $ZABALAM_a$ AN BA $ZATU751_a$
obv. i 1b2	$1N_1$ SAL BA X $ANŠE_b$[?]
obv. i 1b3	$3N_1$ BA KI_a
obv. i 2a1	$1N_1$
obv. i 2a2	$1N_1$ KU_{3a}
obv. i 2b	ZATU649
obv. i 3	$1N_1$ KU_{3a} $ZABALAM_a$ AB_2
obv. i 4	$1N_1$ SI_{4a} NE_a $ŠE_a$ GI
obv. i 5	GA_a [...]
obv. ii 1	$2N_1$ ZATU648
obv. ii 2	$PIRIG_{b1}$+$3N_{57}$ AB_b SU_a
obv. ii 3	$3N_1$ SI U_4 AB_2
obv. ii 4	$2N_1$ TUR_{3a} A
obv. ii 5	GA_a BU_a ḪI
rev. i 1	[$2N_1$ ZATU648]
rev. i 2	$3N_1$ SI U_4 AB_2
rev. i 3	$2N_1$ TUR_{3a} A
rev. i 4a1	$1N_1$
rev. i 4a2	$1N_1$ KU_{3a}
rev. i 4b	ZATU649
rev. i 5	$1N_1$ KU_{3a} $ZABALAM_a$ AB_2
rev. i 6	$1N_1$ NE_a SI_{4a} GI $ŠE_a$
rev. ii 1	$1N_{14}$ $3N_1$ ZATU648 DUG_c GI+GI BA

§7.4. The total reported in case rev. ii 1 (13 DUG_c / ZATU648) includes all the quantities listed in cases obv. i 1a1–obv. ii 5 on the obverse, and recorded in cases rev. i 1–rev. i 6 on the reverse of the tablet, with the addition of the two quantities listed in cases obv. i 1b1 and obv. i 1b2. The quantity recorded in obv. i 1b3 (3 DUG_c), qualified as BA KI_a, is consequently not included in the total. The transactions recorded in the total are qualified as GI+GI BA (which can be translated "deliveries of rations," but also "deliveries" and "rations," the last term to be referred to the two first transactions, qualified as BA). Therefore, the administrative term BA KI_a should denote rations not delivered, and might be rendered with the expression "locally (supplied) rations."[19]

§7.5. The proposed interpretation of the term BA KI_a would explain the reason for the separate entries in the tablet *MSVO* 3, 67, for the "locally (-supplied) rations" recorded in case rev. i 1c2 for the barley, and in rev. i 2c2 for the emmer, as opposed to the rations delivered as "food" (GU_7), listed on the obverse and totaled respectively in rev. i 1c1 and rev. i 2c1.

§8. *A "unicum" or a rare practice?*

§8.1. *MSVO* 3, 75 (from Uruk?), is a tablet in the Vorderasiatisches Museum, Berlin,[20] that records a

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16 Whether the sign sequence in the archaic texts has any linguistic relevance is unclear.

17 Cf. *MSVO* 3, 49; *ATU* 7, pl. 60, W 20493,2, and pl. 61, W 20493,7; R. Englund in J. Bauer, R. Englund and M. Krebernik, *OBO* 160/1 (Freiburg Switzerland 1998) 163, fig. 57, W 20274,89; and Cornell University NES 00-08-073.1 (unpublished) mentioned above, n. 8.

18 Cf. *ATU* 3, pl. 52, W 20266,44-45, both belonging to the category "tribute".

19 To associate this term with ki-ba ("in the place") of later periods, although semantically compatible, would imply the use of -ba (*-bi-a) as a suffix (in the composite term KI BA and perhaps in the dubious GI+GI BA), not proved and not likely for the archaic period.

20 The interpretation of *MSVO* 3, 75, offered here has profited from an email correspondence with Damerow and Englund, both of whom, however, disagree with my conclusions. I therefore state for the record that the proposal of an implicit "weighted mean" in this account is entirely my own.

number of provisions of a grain product (emmer), all measured in the derived capacity system Š". The arrangement of the tablet would suggest that the text includes on the obverse a list of provisions structured in two separate sections, qualified respectively by N_4 (ZIZ_2 ?) and GIŠ+TE,[21] and totals and sub-totals on the reverse. The provisions are qualified as "food" distribution (GU_7).

obv. i 1	$3N_{19}$ $1N_4$ $1N_{41}$ SAL ZATU810 $KAŠ_b$
obv. i 2	$3N_{19}$ $2N_4$ $APIN_a$ MAR_a
obv. i 3	$1N_{19}$ NIN TUR_{3a}
obv. i 4	$2N_{19}$ $5N_4$ UR_{5a} NIN TUR_{3a}
obv. i 5	$1N_{19}$ $3N_{41}$ ⌜SAL⌝
obv. i 6	$2N_4$ ⌜BALAG⌝
obv. ii 1	$5N_4$ $SANGA_a$ EN_a $NAGAR_a$ URI_{3a}
obv. ii 2	$2N_4$ $MUŠ_{3a}$
obv. ii 3	$1N_{19}$ DUB_a E_{2a}
obv. ii 4	$2N_{19}$ EN_a ⌜AB_a⌝ TAR_a
obv. ii 5	$2N_4$ $3N_{41}$ ⌜SAL $ZATU751_a$⌝
obv. ii 6	$3N_4$ ⌜$3N_{57}$⌝ [GIŠ*tenû*²] ⌜E_{2a} SI TUN_{3a}⌝
obv. ii 7	⌜$2N_4$⌝ $NINDA_2$+AN
obv. ii 8	⌜$4N_4$ EN_a NI_a $PIRIG_{b1}$⌝
obv. ii 9	$1N_4$
obv. iii 1	$3N_{19}$ DUB_a E_{2a}
obv. iii 2	$2N_{19}$ $2N_{41}$ SAG TUR_{3a} $6N_{57}$
obv. iii 3	$2N_4$ $3N_{41}$ $UMUN_2$ MA $3N_{57}$ AMA_a
obv. iii 4	GIŠ+TE GU_7
rev. i 1a	$2N_{46}$ $3N_{19}$ SI_{4f} AZ GAL_a $SANGA_a$ $SANGA_a$
rev. i 1b1	$1N_{46}$ $7N_{19}$ $1N_4$
rev. i 1b2	$6N_{19}$ GIŠ+TE
rev. ii 1	$2N_{46}$ $3N_{19}$ $1N_4$ $2N_{41}$ GU_7

§8.2. In rev. i 1a, the total of emmer (138 barig), with sub-totals in rev. i 1b1 (102 barig) and rev. i 1b2 (36 barig), are recorded. The sign N_4 in rev. i 1b1 corresponds to N_4 in obv. ii 9 and should be rendered as ZIZ_2, by parallelism with GIŠ+TE in obv. iii 4 and sub-total rev. i 1b2. In any case, the position of the sign N_4 in rev. ii 1 would exclude it's interpretation there as a non-numerical qualifier, and since it was not included in the total, it shall be regarded as a reference value. The fractional quantities in obv. i 1 and 5; obv. ii 5; obv. iii 2, 3; and rev. ii 1 shall be regarded as reference ration values as well.[22] The text can be better understood in the following arrangement.

Case	*Value in "barig"*	*Reference Value*
obv. i 1	19	$^1/_5$
obv. i 2	20	
obv. i 3	6	
obv. i 4	17	
obv. i 5	6	$^3/_5$
obv. i 6	2	
obv. ii 1	5	
obv. ii 2	2	
obv. ii 3	6	
obv. ii 4	12	
obv. ii 5	2	$^3/_5$
obv. ii 6	3	
obv. ii 7	2	
obv. ii 8	4	
obv. ii 9		1
obv. iii 1	18	
obv. iii 2	12	$^2/_5$
obv. iii 3	2	$^3/_5$
rev. i 1a	138	
rev. i 1b1	102	1
rev. i 1b2	36	
rev. ii 1	138	1, $^2/_5$

§8.3. By default, all the listed entries on the obverse without a reference fractional value will be considered to have $1N_4$ as the reference ration value and thus be converted in the total at a rate of 1:1. If the quantities of emmer in all such entries without accompanying fractional values are combined, we obtain a total of 97 barig. Similarly, if the quantities of emmer qualified by reference fractional values are combined, not including those reference values, a total of 41 barig is obtained. These values do not correspond to the sub-totals in cases rev. i 1b1-2, as demonstrated in the table below.

Case	*Recorded Value*	*Expected Value*	*Reference Value*
rev. i 1a	138	138	
rev. i 1b1	102	97	1
rev. i 1b2	36	41	fractional

§8.4. The key for understanding the rationale of the reported values is found in case rev. ii 1, where 1 ($1N_4$) and $^2/_5$ ($2N_{41}$) "barig" are given as reference values.[23] It

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[21] GIŠ+TE is found in a number of tablets as a second destination of emmer: see for instance the tablets *MSVO* 3, 1 and 70. The term is also present in the Cornell University tablet NES 00-08-072 mentioned in note 13 above.

[22] In *MSVO* 3 texts, only the numerical sign $1N_4$ has been identified as a reference ration value. However, the result of the summation of all the entries listed on the obverse (including $1N_4$ in case rev. i 1b1) is equal to 140 $^2/_5$ barig, which exceeds by 2 $^2/_5$ barig the quantity recorded as the total in case rev. i 1a. This excess quantity corresponds exactly to the total of the fractional values, which evidently are not part of the provisions.

[23] Preliminary comments to this text by Damerow and Englund in *Frühe Schrift*, p. 208 (and in CDLI, see P005386), refer to this notation, that exceeds the summation of rev. i 1a by a quantity corresponding

is probable that the scribe has performed the following calculation:

$19 \times {}^{1}/_{5} + 6 \times {}^{3}/_{5} + 2 \times {}^{3}/_{5} + 12 \times {}^{2}/_{5} + 2 \times {}^{3}/_{5} = {}^{73}/_{5}$

$= {}^{(36 \times 2 + 1)}/_{5} = 36 \times ({}^{2}/_{5} + {}^{1}/_{180}) \approx 36 \times {}^{2}/_{5}$

The approximation $({}^{2}/_{5} + {}^{1}/_{180}) \approx {}^{2}/_{5}$ is due to the fact that the quantity ${}^{1}/_{180}$ is so negligible that a numerical sign for it was not considered worthy of use.[24]

§8.5. The expression above represents the calculation of the "weighted mean" of the (fractional) reference ration values of the single entries, and the resulting value ${}^{2}/_{5}$, according to this interpretation considered a standard value, was used as a reference for the calculation of the sub-total (case rev. i 1b2), and recorded together with the other reference value $1N_4$ in the final total (case rev. ii 1). As a consequence of such "standardization," the sub-total with the reference value $1N_4$ had to be calculated by difference, resulting in 138-36=102 (case rev. i 1b1).

§8.6. There is no other known evidence of a similar use of the "weighted mean" calculation in the available administrative texts from the Uruk III period. This tablet would, therefore, represent a "unicum," and should be considered as an irregular scribal exercise.

§8.7. The presence in *MSVO* 3, 42 (see §5), of a double-entry calculation for the sub-totals, whose rationale is not decipherable from the limited context of the account, suggests that a similar practice could have been the basis of this calculation.[25] Should that prove to be true, it would indicate the existence of quite complex administrative practices, although apparently infrequently used, in ancient Mesopotamia.[26]

§9. *Conclusions*

§9.1. Textual analysis has shown that administrative accounting of mixed grain products occasionally employed, in the totals, derived numerical ŠE systems that were different from the notations normally associated with the products listed in the tablet. In a number of instances, the most common adoption of the Š notation to indicate grain in general is replaced by the use of several specific derived grain capacity systems. One main reason for such practices could be the necessity to identify in the total, by adopting the appropriate numerical notation, the basic grain product used for the production of the different derived products listed and sub-totaled in the tablets.

§9.2. Another peculiarity in archaic scribal administrative practices can be found in the texts which adopt mixed notations in totals combining different grain products. The use of one numerical notation in totaling two different grain products, qualifying a single number sign with recourse to some member of the other numerical notation, can be easily explained as a means to simplify the recording of the accounts, at the same time indicating the presence of the two different products.

§9.3. More important for understanding the administrative practices in the archaic period is the apparent presence, at least in one text, of an account based on the "weighted mean" calculations. Use of the "weighted mean," or any other numerical mean, may imply the development of the concept of "statistics" and their employment in the administrative statement of accounting. It is worth noting that the use of statistics in town/state administration makes sense, expecially if its purpose is to calculate budget accounts for future expenditures based on the "mean" expenditures of past periods. It seems we may be able to trace such practices, which were certainly common in later periods,[27] back as early as in the Uruk III/Jemdet Nasr period.

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to the numerical notation $1N_4\ 2N_{41}$, as a distribution of emmer nearly equal to the presumed total of all individual entries of the account's obverse.

[24] This quantity would correspond to about ${}^{1}/_{7}$ liter according to the value of the barig estimated by P. Damerow and R. Englund *ATU* 2, pp. 153-154, n. 60.

[25] If a "weighted mean" was used, the details of the reference values should have been reported in other tablets. The account *MSVO* 3, 42, would have recorded just the summary of the results of the relevant calculations.

[26] Cf. for instance tablets *MSVO* 4, 1 and 2, treated in S. Monaco, "Revisiting Jemdet Nasr Texts: IM 55580+," *CDLB* 2004:3, where the concept of average seems implicit in the recorded accountings.

[27] We may just mention the complex "rotational turn of office" of the Ur III bala-system, which required long term planning of expenditures from the nineteen appointed governors, responsible in turn for the collection of the various commodities to be delivered as offerings to the main Sumerian gods in Nippur.