

LINEAR A COMMODITIES: A COMPARISON OF RESOURCES *

The Linear A tablets and other administrative records found in Crete before LM II have not been used to establish extent or types of resources of the sites where they have been found, primarily because the values for the phonetic elements and the systems of measure of Linear A have not been satisfactorily established. The main criteria to date for determining the importance of a Minoan center relative to the other centers have been size, building material and layout, not information from administrative records. Because of its layout and location close to Phaistos, Hagia Triada (where the greatest number of Linear A tablets has been found) has been called 'domainal', *i.e.* at a lower administrative level¹, and Zakros, which has far fewer and less sophisticated records but has a palace layout, is usually considered a major center. In contrast, since the decipherment of Linear B, it is through the tablets that the extent of the resources commanded by Pylos and Mycenaean Knossos has been revealed, not only by reading the place and personal names in the texts, but by studying the types and amounts of goods listed there². What information about resource management at Minoan centers can be gained through the Linear A texts? By analyzing the quantities of the most securely identified ideograms on the Hagia Triada tablets, Palaima has recently proposed that the amounts of certain commodities recorded by this center were comparable to (although not equal to) the same types of commodities from Pylos and Knossos³. This present study carries the process one step further, by looking at the formats of the tablets, and

* The research for this study was carried out at the Program in Aegean Scripts and Prehistory at the University of Texas at Austin, under a research grant from INSTAP and PASP. I thank T.G. Palaima, Director of PASP for his continued help and guidance, and the students of the Department of Classics at the University of Texas at Austin as well as C.R. Hershenson at the University of Cincinnati for their comments. Any mistakes are my own.

Abbreviations:

GORILA 1-5: L. GODART and J.-P. OLIVIER, *Recueil des inscriptions en linéaire A*, Vols. 1-5 (EtCrét XXI.1-5, 1976-1985).

Docs.²: M. VENTRIS and J. CHADWICK, *Documents in Mycenaean Greek*, 2nd ed., 1973.

ASSA: *Aegean Seals, Sealings and Administration, Proceedings of the NEH-Dickson Conference of the Program in Aegean Scripts and Prehistory of the Department of Classics, University of Texas at Austin, January 11-13, 1989*, *Aegaeum* 5 (1990).

- 1 J.-P. OLIVIER, "Cretan Writing in the Second Millennium BC", *World Archaeology* 17:3 (1986), 230-234; J. WEINGARTEN, "The Sealing Structures of Minoan Crete: MM II Phaistos to the Destruction of the Palace of Knossos. Part II: The Evidence from Knossos until the Destruction of the Palace", *OJA* 7 (1988), 12-13; T.G. PALAIMA, "The Development of the Mycenaean Writing System", *Texts, Tablets and Scribes: Studies in Mycenaean Epigraphy and Economy offered to Emmett L. Bennett, Jr.*, *Minos Supl.* 10 (1988), 324-327.
- 2 J. BENNETT, "Approaches to the Problem of Combining Linear B Textual Data and Archaeological Data in the Late Bronze Age Aegean", *Problems*, 509-518 sets out the theoretical correlations between textual and archaeological data.
- 3 T.G. PALAIMA, "Seal-Users and Script-Users / Nodules and Tablets at LM IB Hagia Triada", *Archives Before Writing. Proceedings of the International Colloquium di Ricerche Archeologiche Antropologiche e Storiche, Oriolo, Italy, October 23-25, 1991* (1994), 302-305. I thank T.G. Palaima for making this article available to me.

the kinds and amounts of commodities found together in the texts. Linear A tablets have been found in thirteen sites on Crete and three in the Cyclades but survive in numbers large enough to reveal variations in format and commodities at only three LM IB sites—Haghia Triada (147 tablets and fragments), Khania (93 tablets and fragments) and Zakros (31 tablets and fragments) ⁴.

Although the Linear A script has not been deciphered, and the structure of the Neopalatial Minoan administrative system is not the same as the Mycenaean system ⁵, the ideograms for basic commodities, and the formats of the Linear A texts are similar enough to their Linear B counterparts to allow valid comparison of the types and amounts of commodities which appear in specific contexts ⁶. Even if we cannot interpret most of the words on the Linear A tablets (including unfortunately most transaction terms except for the terms for 'total'; see below), this type of analysis can give an idea of the *focus* of the economy—which resources are handled in systematic and specialized ways, and which commonly appear in no set context. The Linear B mixed commodities tablets which list a wide variety of ideograms and which were drawn up for diverse purposes provide the best parallels in formats and subjects to the Linear A tablets. The formats of the tablets and the quantities listed can indicate the scale and complexity of the transactions and the administrative levels involved, although unfortunately we cannot know the exact nature of the transactions (collection, distribution or inventory) from the format alone. I present here an internal analysis of the information in the texts from the contemporary sites of Haghia Triada, Khania and Zakros, in order to compare the types and amounts of commodities listed at each site, and the way in which they are handled. Difference in treatment of commodities may reveal different economic strategies. This paper will focus on total amounts per tablet of these commodities, and not on amounts of a commodity in individual entries ⁷.

For this comparison of Linear A commodities, I chose twelve ideograms that were either the most common, or whose identities were known from the Linear B tablets, or both. The nine ideograms with exact or close Linear B parallels are: AB 100/102—*100, VIR (humans; hereafter designated AB 100); AB 30—*30, NI (figs); AB 120—*120, GRA

4 The Linear A tablets from Haghia Triada, Zakros, and Khania discovered before 1984 are published in facsimile, and indexed in transcription in *GORILA* 1-5. J. RAISON and M. POPE, *Corpus transnuméré du Linéaire A* (1980) presents in transcription all tablets known before 1980. The five Linear A tablets, KH 92-96, discovered at Khania since 1985 have been published in *Kadmos*: E. HALLAGER and M. VLASAKIS, "New Evidence of Linear A Archives from Khania", *Kadmos* 25 (1986), 108-118; E. HALLAGER, M. VLASAKIS and S. MARKOULAKIS, "New and hitherto unpublished Linear A Documents from Kastelli, Khania", *Kadmos* 30 (1991), 34-41.

5 For the ways in which the two systems differ, see T.G. PALAIMA, "Preliminary Comparative Textual Evidence for Palatial Control of Economic Activity in Minoan and Mycenaean Greece", *Function Palaces*, 302-305; and "Origin, Development, Transition and Transformation: the Purposes and Techniques of Administration in Minoan and Mycenaean Society", *ASSA*, 93-99; J. WEINGARTEN, "Three Upheavals in Minoan Sealing Administration: Evidence for Radical Change", *ASSA*, 107-114.

6 Godart and Olivier in *GORILA* 1-5 have already made the correlations between the forms and functions of signs used as ideograms in Linear A and B, and have set out the probable format for each text.

7 Although the quantities within individual entries are equally important to our understanding of administrative use of commodities in the Linear A system, such an investigation is beyond the scope of this present paper. In his study of the Haghia Triada nodules and tablets, Palaima presents quantities from individual entries in the tablets for the commodities AB 120, AB 30 and A 302, and gives an overview of entries with AB 100/102 (PALAIMA [*supra* n. 3], 302-306). In his presentation of the Khania texts, Godart lists in full detail the quantities per entry for all the commodities and their variants found at Khania, and gives parallel ranges and quantities from the Haghia Triada texts: L. GODART - I. TZEDAKIS, *Témoignages archéologiques et épigraphiques en Crète occidentale du Néolithique au Minoen récent III B* (1992), 129-178.

(barley)⁸; AB 131—*131, VIN (wine); AB 122—*122, OLIV (olives); AB 21—*21, OVIS (sheep); AB 22—*22, CAP (goats); AB 23—*23, BOS (cattle); AB 85—*85, SUS (pigs). The remaining three common ideograms, A 302, A 303 and A 304, do not have close Linear B analogues (see Pl. XXI). A 302 and 303 occur frequently in mixed commodity lists, and each sign has many variants. Palaima has proposed that A 302 is the sign for olive oil, because the sign for olive oil in Linear B also appears with many different ligatures⁹. The form of A 303 resembles grain, and in one entry (KH 27) this sign was erased and replaced by the grain ideogram AB 120, but Hallager has remarked that it also resembles the Linear B sign for cyperus¹⁰. One aim of this study is to see in what contexts and amounts A 302 and A 303 appear, and evaluate these proposed identifications.

The Linear B bookkeeping system developed from the Linear A system¹¹, and we can see the basic features which Linear B administrative texts share with the Linear A tablets. First, both systems distinguish in format between sign sequences with phonetic values used as words, single or combined signs used as ideograms to represent a commodity, and signs used as whole numbers and fractions. Both Linear A and B use the same system of whole numbers. The forms of many of the Linear B phonetic signs and ideograms are identical or recognizably related to the forms of many of the Linear A signs (see Pl. XXI). The majority of the words in Linear B are place names, ethnics and personal names, so we assume that the same is true for Linear A¹². In Linear B, a significant percentage of words also signify transactions and commodities. There are major differences between the two scripts; the most important one is that the language of the Linear B script is Greek, and the language of the Linear A script is not Greek and has not been deciphered. Because we know the language of Linear B, we can usually identify whether a Linear B word is a transaction term, object, person or place, but in a Linear A tablet, a word followed by a number can be any of these things, and most of the time there is no way to distinguish between these categories.

The formats of the Linear A tablets are complex and varied. In order to analyze how commodities are handled in all the Linear A tablets from these three sites, I needed to establish the basic elements of all Linear A tablets. In their monumental work, *GORILA* 1-5, Godart and Olivier have presented in graphic form their analysis of the formats for each tablet, and several other scholars have at various times described the formats of individual tablets¹³. Since there exists at present no commonly used terminology to describe the various elements which make up the format of a Linear A tablet, I have created a system using the

8 In this study, I identify AB 120—*120, GRA as the grain barley, in accordance with my earlier analysis of the grain ideograms in the Linear B tablets: R. PALMER, "Wheat and Barley in Mycenaean Society", *Mykenaiika. Actes du IXe Colloque international sur les textes mycéniens et égéens* (1990), *BCH Suppl.* XXV (1992), 475-492.

9 PALAIMA (*supra* n. 3), 304-305.

10 E. Hallager, personal communication; cf. E. HALLAGER, "Roundels among Sealings in Minoan Administration", *ASSA*, 127.

11 For the development of the Linear B system from Linear A, see PALAIMA (*supra* n. 1), 269-342.

12 J.T. HOOKER, "Problems and Methods in the Decipherment of Linear A", *Journal of the Royal Asiatic Society* (1975), 165; J. CHADWICK, *Linear B and Related Scripts* (1987), 45-46.

13 J.L. MYRES, "The Purpose and the Formulae of the Minoan Tablets from Hagia Triada", *Minos* 1 (1951), 29, for HT 116; M. POPE and J. RAISON, "Linear A: Changing Perspectives", *Études minoennes I* (*BCILL* 14, 1978), 46-47, for HT 118; J.T. HOOKER, *Linear B: an Introduction* (1980), 12-14, for HT 88, HT 114; HALLAGER and VLASAKIS (*supra* n. 4), 114, for KH 92; CHADWICK (*supra* n. 12), 46-47, for HT 13, HT 35a; Y. DUHOUX, "Le linéaire A: problèmes de déchiffrement", *Problèmes in Decipherment* (*BCILL* 49, 1989), 77-79, for HT 117, HT 122, HT 123; L. GODART, *Le pouvoir de l'écrit* (1990), 188-189, for HT 117. D. Was discusses format in his studies of individual Linear A tablets, but has focused primarily on interpreting individual words and assigning values to fractions. For an evaluation of Was' results, see E.L. BENNETT, Jr., "A Strange Linear A Wine Measure", *Minos* 18 (1983), 7-32, and "Linear A Houses of Cards", *Πεπραγμένα τοῦ Ε' Διεθνoῦς Κρητολογικοῦ Συνεδρίου* (1981) I (1985), 47-56.

entry as the basic unit and have classified the tablets according to how the entries are formulated¹⁴. There are two types of entry: either ideogram+number (Type A) or word+number (Type B). Entries combined together form a section. A section is usually (but not always) introduced by a word or series of words and/or an ideogram; and a totalling term, when it appears, ends the section. Usually all the entries in a section are either Type A or Type B, but occasionally the two kinds of entries occur in the same section.

The word *ku-ro* is the most frequent word in the Linear A tablets, appearing *ca.* forty times in tablets from Haghia Triada, Phaistos and Zakros¹⁵. We know that it signifies a total from the contexts in which it appears in the tablets. A second term *po-to-ku-ro* means grand total; it occurs on only two tablets, HT 122 and HT 131, but in contexts where the amount in its entry is the sum of *ku-ro* totals. *Ku-ro* is usually found at the end of a section, and from the presence of this word in a list, we can assume that the items in the section are all the same commodity. Another word *ki-ro* also appears frequently, in contexts that show it refers to an aspect of a transaction, but its exact meaning is unknown¹⁶.

In order to compare the use of resources in the tablets at Haghia Triada, Khania and Zakros, it is necessary to deal with the problems of Minoan measurement. The Linear B systems of dry and liquid units of volume were comprehensively revealed by Bennett in his 1950 article¹⁷; each subunit in the Linear B system has an absolute value which never changes. In the same article, Bennett also analyzed how the Minoan measuring system worked. Instead of having subunits of set absolute sizes, the Minoan system uses fractions that can combine to express different amounts; we have no idea what the values of these fractions are¹⁸. Part of the problem is that the Minoan scribes made identifiable adding mistakes on several of the tablets we do have, which were discovered by modern scholars who added up the whole numbers on tablets where all the entries have survived sufficiently (*e.g.* on HT 102). In Mediterranean civilizations, the largest unit of dry measure tends to be connected with the amount a pack animal can carry¹⁹. Because liquids are much denser than dry commodities such as grain or figs, and have to be transported in heavy containers, the

14 Myres in his 1951 article (MYRES [*supra* n. 13], 27-30) described the formats of the Haghia Triada texts according to eight 'formulae'. This article was published before the decipherment of Linear B in 1952, and most descriptions of Linear A tablet formats now draw upon Linear B parallels, not Myres' categories. A. FURUMARK, "The Linear A Tablets from Hagia Triada. Structure and Function", *OpRom* 11 (1976), 1-10 distinguished primarily between entries and headings, and secondarily between types of entries; he did not discuss sections *per se*.

15 HOOKER (*supra* n. 12), 166; FURUMARK (*supra* n. 14), 10; GODART (*supra* n. 13), 189; DUHOUX (*supra* n. 13), 77; see *GORILA* 5, under AB 81-02 in the index for exact references. *Ku-ro* is a transliteration of Linear AB 81-02, using the phonetic values of the equivalent signs in the Linear B script. About half of the 90 phonetic signs in Linear A have Linear B counterparts which resemble them closely or exactly. But although they resemble Linear B signs in form, they may differ in phonetic value (HOOKER [*supra* n. 12], 164; DUHOUX [*supra* n. 13], 115, Fig. 7). Careful internal analyses of sign sequences in Linear A compared to words in Linear B have established the phonetic value of a number of signs, but has also shown that several other Linear A signs definitely do not correspond in value to their Linear B equivalents. DUHOUX (*supra* n. 13), 74-75 lists 30 phonetic correspondences, while GODART (*supra* n. 13), 182-183 accepts only 15 correspondences. Both Duhoux and Godart accept the phonetic value of *ro* for AB 02, but have not acknowledged a valid value of *ku* for AB 81. For the present, the transcription *ku-ro* is accepted with the proviso that this may not be the actual phonetic value of the signs.

16 In some contexts, *ki-ro* seems to be used like Linear B *o-pe-ro*, 'owing', especially since items called *ki-ro* can be added up, as on HT 123, but in other contexts, it cannot have that meaning. HOOKER (*supra* n. 12), 167; DUHOUX (*supra* n. 13), 78-79.

17 E.L. BENNETT, Jr., "Fractional Quantities in Minoan Bookkeeping", *AJA* 54 (1950), 204-222.

18 This remains true to the present, although many scholars have tried to assign values and test them. See E.L. BENNETT, Jr., "Linear A Fractional Retraction", *Kadmos* 19 (1980), 12-23 for a more recent reappraisal.

19 W. GALLAGER, "A Reconsideration of *o-no* in Mycenaean Greek", *Minos* 23 (1988), 86-87.

liquid volume that a pack animal can carry would be much less than a dry volume. On this basis, we would expect that the Minoan major dry and liquid units should be similar to their Mycenaean equivalents. The Minoans greatly influenced the developing Mycenaean culture through trade, so I am assuming that the major Minoan dry unit is close in size to the main Mycenaean whole dry unit (96 liters). And although there is no way of telling how large the Minoan liquid unit is in relation to the volume of the dry unit, I shall assume that it is roughly one-third the size of the Minoan unit used in dry measure, close to the 28.8 liter value of the Mycenaean liquid unit ²⁰.

Linear A phonetic, ideographic and numeric signs are attached to ideograms and so affect their meanings far more frequently than in the Linear B system. In some cases, it is hard to tell what is the primary sign, and what is the adjunct. Should one count each variant of an ideogram as essentially different, in that the added sign completely changes the meaning of the ideogram, or should one group all variants according to the main commodity sign, as in the Linear B system? The internal evidence of tablets listing totals for three of these commodities suggests that the scribes always placed variants in the category of the main commodity sign. HT 102 records plain AB 120 and its common variant AB 120+03. At the bottom of the tablet, *ku-ro* 1060 is the total for both variants combined ²¹. The format of ZA 15 a and b shows variants of the wine sign AB 131a in each entry. The quantities listed in the first two sections of ZA 15 add to 95, and the quantities in section 3 which are introduced by *ku-ro* also add to 95; both sides probably refer to the same wine (first perhaps by location, second by type). HT 116 provides the best evidence for A 302 (which habitually occurs in several variants per tablet) since it lists and then totals three varieties of A 302. On HT 116b, all varieties of A 302 are added together to produce a *ku-ro* total of 17.

The tablets from the three sites of Haghia Triada (HT), Khania (KH) and Zakros (ZA) vary greatly in number, location, state of preservation and association with other forms of records, *i.e.* sealings and roundels. The HT tablets number 147 in all and are the best preserved and most numerous of the tablets from the three sites. These tablets can be divided into two groups of *ca.* 70 each, from storage areas in the villa itself, and from storerooms in the Casa del Lebate ²². The largest groups of sealings were found separately from the largest groups of tablets, which implies that the function of these sealings was complementary to but not an integral part of the tablet recordkeeping system ²³. The Khania tablets, along with roundels and sealings, were found primarily in two different but adjacent rescue excavations in the town, at Plateia A. Aikaterini: KH 1-4, 79+89, 88, 90, 92-96 and Odos Katre: KH 5-87,

20 The values given for Mycenaean dry and liquid whole units (96 liters and 28.8 liters respectively) are themselves estimates based on a number of assumptions (see *Docs.* ² 393-394). Until we find an official measure, there is no way to determine the exact value of either Linear B or Linear A volume measurements. Moreover, even if we can estimate the size of the Minoan whole units, we have no good idea about the values of the fractions. Furthermore, some ideograms (primarily AB 120 and A 303) have fraction signs ligatured to them. This may indicate that the commodity in particular instances will be counted in fractional units rather than in whole ones, *e.g.* counting 3 half-liter units of barley rather than 1.5 full liters of barley. If this is the case, then it is impossible to compare totals of goods listed on different tablets from the same site, let alone from different sites. Patria argues for different sizes of whole units based on the size of containers mentioned in the heading of each section (E. PATRIA, "The Misunderstanding of Linear A", *Minos* 23 [1988], 22-29). Bennett mentions the possibility that fraction signs ligatured to ideograms (in particular to AB 120 and A 303) indicate the size of the unit, but says that there is also evidence for a single basic unit of measurement (E.L. BENNETT, Jr., "The Ideograms Common to the Minoan Scripts and to Mycenaean Linear B", unpublished manuscript).

21 PALAIMA (*supra* n. 3), 303. This is one of the tablets where the scribe apparently made an arithmetical mistake; the amounts in the entries on the tablet actually add up to 1070.

22 For findspots, I have followed Militello's and Palaima's suggestions that HT 1-84 were found in the villa, and HT 85-154 are from the 'Casa del Lebate' and nearby (PALAIMA [*supra* n. 3], 310, n. 26).

23 PALAIMA (*supra* n. 3), 294-296; WEINGARTEN (*supra* n. 5), 108.

91. Although these tablets are extremely fragmentary and originate from at least two administrative deposits ²⁴, they are very homogenous in appearance, subject matter and hand. At Zakros, the single tablet ZA 1 was discovered in Hogarth's House A at the edge of town, in the same room as one roundel and 525 impressed but uninscribed nodules ²⁵. The remaining 30 tablets ZA 4-33 (where their findspots are known with certainty) were found in three different magazines in the palace proper ²⁶. These tablets are very fragmentary and worn on the surface.

From each site, I selected for study those tablets which bore one or more of the twelve ideograms I had chosen; I also selected tablets which contained only Type B sections with no ideograms whatever, because these sections were most likely personnel records. Of the 147 Hagia Triada tablets, 100 (68%) contain these ideograms and Type B sections. Of the 93 KH tablets, 56 (60%), and of the 31 ZA tablets (and one inscribed pithos), 17 (55%) do also. The percentage of tablets with these ideograms would probably be higher if the most fragmentary tablets at all three sites which have only a sign or number on them were eliminated.

All these tablets chosen for study vary greatly in complexity of format, types of ideograms and amounts. But tablets from each site present similarities and differences in how each commodity was handled. Certain ideograms appear on single commodity as well as mixed commodity tablets, while others are never recorded as single commodities, or on totalling tablets. Some appear in larger quantities per tablet, or with markedly greater frequency per tablet than others. However, in only a few cases do any of these of these ideograms recur in fixed formats and amounts on tablets which could be said to form a series.

The ideograms AB 120, AB 30, A 302 and A 304 appear at all three sites, but AB 21, 85 and 122 were not found on the Khania tablets, and AB 100, 22, 23, 85 and A 303 were not found at Zakros. Type B word+number entries without an ideogram in the heading (hereafter known as W+N) occur in whole sections and/or single entries at all three sites. Livestock represented by the four animal ideograms AB 21 (sheep), 22 (goats), 23 (cattle) and 85 (pigs) usually occurs in small amounts on mixed commodity tablets at Hagia Triada and Khania, but pigs appear on a specialized tablet from Hagia Triada and sheep are the subject of single commodity tablets at Zakros. Tables 1-3 present the types and amounts of the twelve commodities, as well as the Type B word+number entries without ideograms in the heading, for those Linear A tablets from the three sites which have one or more of these elements. The capital letters in the tables represent Minoan fractions, according to the established convention ²⁷. The following section presents a synopsis of my findings concerning these commodities. Total amount per tablet refers to all variants of each ideogram added together; cluster refers to a pattern where the majority of tablets listing a commodity present a limited range of quantities. For fragmentary texts (of which there are many), my reconstruction of both formats and quantities may not be that of other scholars.

HAGIA TRIADA (Table 1)

W+N (Type B entries): 21 tablets have either sections of Type B with no ideogram in the heading, or a single word+number entry in a section with Type A entries.

24 *GORILA* 3, xvi-xix; *GORILA* 5, 10; HALLAGER and VLASAKIS (*supra* n. 4), 108-118; WEINGARTEN (*supra* n. 5), 109; GODART-TZEDAKIS (*supra* n. 7), 126-127. The roundel Wc 2122 and the tablet KH 92 may have originated in administrative deposits separate from the other tablets from Plateia A. Aikaterini; HALLAGER, VLASAKIS and MARKOULAKIS (*supra* n. 4), 36, 39.

25 WEINGARTEN (*supra* n. 5), 109.

26 *GORILA* 3, xxii-xxiii.

27 For Linear A fractional signs and their transcription into capital letters, see *GORILA* 5, xxvii, and BENNETT (*supra* n. 18), 13.

1. 7 tablets, HT 1, 3, 4, 5, 29, 87, 117, have only W+N entries with no ideograms. 2 tablets, HT 25, 85 have W+N sections, and a separate section headed by AB 100. The Linear B personnel tablets provide the best parallel to the format and quantities on these tablets (although the Linear B examples almost always contain the VIR ideogram); the W+N entries with the numeral 1 probably record personal name or ethnic (cf. KN As 40, MY Au 102), while entries followed by larger numbers signify personnel listed by ethnic, place name or profession (cf. PY An 1, 207). Totals on these tablets range from 3 to 533, and cluster on 8 tablets between 1 and 20.
2. 12 tablets, HT 8, 9, 12, 30, 41, 62, 67, 88, 94, 95, 98, 108, have a W+N section or single entry and other sections listing mixed commodities by ideogram. The W+N amounts range from a fraction to 420, and cluster on 8 tablets between 6 and 16. The majority of these W+N entries may record personnel. In HT 12, the context of the W+N entry is unclear; W+50 appears as the last entry in the tablet, and is preceded by two sections with mixed commodities, whose amounts add up to 49+. This final entry *may* refer to all the items, or it may record 50 of something else. HT 8, 30, 41, 98 all record W+fraction, so these cannot be personnel entries. The W+N section in HT 8 follows a Type B section with the heading A 302+67, so the W+N entries could also record A 302+67, or some other bulk commodity. On HT 98, the top half is missing, and the 7 Type B entries on the recto all have amounts in fractions or 1. The section on the verso of HT 98 records wine, AB 131, in fractional amounts, so perhaps the recto also records wine. Both HT 30 and 41 have a single W+N entry following Type A ideogram entries which also have fractional amounts. Here the word in the entry probably signifies a commodity.

AB 100 (humans): 20 tablets list one or more examples of AB 100 and its 4 variants.

1. 7 are personnel lists only: HT 7, 25, 66, 85, 97, 122, 127 (usually Type B, in a section headed by the human ideogram, and/or have a separate W+N section on the tablet also); these often have a totalling (*ku-ro*) entry at the bottom of the section, cf. KN As 1517, 1519. In this first category, tablets which are only personnel lists, the totals of AB 100 range from 3 to 292 persons and do not really cluster in any limited range.
2. 10 are personnel lists with AB 100 in one section and commodities (the most common ones, perhaps for rations) in the remaining section(s). 7 of these are connected by format, commodity and quantities, and have the strongest claim to being a series: HT 26, 27, 88, 89, 94, 100, 108. 3 tablets, HT 68, 105, 119 have a section with AB 100, and possibly other sections with commodities. In this second category, the personnel lists tend to have larger totals, which range from 1 to 469 persons, and on 8 tablets, cluster from 52 to 469 persons.
3. In 2 tablets (HT 58, 93), AB 100 appears in a section as one of several commodities; these tablets are the least homogenous. In HT 93, the amount after AB 100 was fractional: 10 F, and on HT 58, no number has survived. One fragment, HT 84, has preserved only the ideogram, and no number.

AB 120 (barley): AB 120 and variants appear on 42 tablets. There are 14 variants of AB 120, equalled in number only by the 14 variants of A 302²⁸.

1. AB 120 and variants appear as the only commodity in 9 tablets: HT 36, 40, 43, 61, 86, 102, 115, 128, 133. A 10th tablet (HT 95) *may* list only AB 120, if the Type B entry in section 4 also refers to AB 120. Amounts on these single commodity tablets range from 5+ to 1060 units (480 to 101,760 liters); they do not really cluster in any limited range.
2. AB 120 and variants appear with other commodities on 28 tablets: HT 14, 15, 18, 21, 22, 28, 34, 44, 50, 62, 90, 91, 92, 93, 96, 99, 101, 108, 110, 114, 116, 121, 125, 129, 131, 137, 139, 154A, and possibly on 2 tablets: HT 52, 120. HT 52 is a fragment and could have had other sections, and HT 120 has a Type B entry. 2 fragments, HT 82 and 154B, have only a single example of AB 120 preserved; there may have been other ideograms. The amounts in the mixed commodity tablets range from AA to 1254 units (less than 96 liters to 120,384 liters), and cluster on 18 tablets between 21 and 264JA units (2016 to 25,344+ liters). In mixed commodity tablets with AB 120, the amount of this commodity tends to be larger than the amounts of each of the other commodities, cf. HT 21, 92. AB 120 and its variants tend to be listed first in each section, since AB 120 usually has the largest amount.
3. 4 tablets, HT 22, 15, 40, 92, have only one section and one or two entries with large amounts listed (from 230 to 1254 units: 22,080 to 120,384 liters); these are probably totalling tablets, as they are very similar in format and quantity to the Knossos Linear B harvest tablets.

28 See *Docs.*², 34 Fig. 7 for the range of variants of AB 120 and A 302. In this figure, L42 = AB 120, and L89 = A 302.

AB 122 (olives): AB 122 and 1 variant appear on 11 mixed commodity tablets: HT 14, 21, 44, 50, 58, 91, 101, 116, 123, 131, 154A. It appears most frequently with AB 120, AB 302 and variants, and A 304. AB 122 occurs in amounts which range from A to 93J units (less than 96 to 8928+ liters), but 6 of the tablets contain amounts clustering between 1 and 5 units (96 to 480 liters). In one tablet, HT 123, AB 122 appears in a unique format; here in five sections on the recto, AB 122 and AB 308 appear as pairs whose quantities are proportional, and the total of AB 122 on this tablet, 93 units (8928 liters), is the largest in the Haghia Triada tablets. In half the tablets, the quantities of AB 122 are within the same range as the quantities of the other commodities, except for AB 120 which is always larger, and in three of these tablets, HT 21, 116 and 131, the quantities are very small compared to the other items on each tablet.

AB 30 (figs): AB 30 appears as an ideogram on 25 mixed commodity tablets; it has no variants. Since the sign also can appear in a word as a phonetic element, it is sometimes difficult to tell how AB 30 is used in fragmentary tablets.

1. In 4 tablets, HT 6, 70, 88, 103, AB 30 appears in the heading of a section with Type B entries; HT 88 also lists personnel. The totals range from 7 to 182ff units, 672 to 17,472 liters. There are 2 totalling tablets with AB 30 in large quantities: HT 131 (92 units, 8832 liters) and HT 67 (400 units, 38,400 liters). AB 30 at HT does not occur as frequently as figs in the Pylos Ab ration series, but it is an important commodity on mixed commodity tablets.
2. AB 30 appears in mixed commodity sections on 19 tablets: HT 12, 18, 27, 28, 30, 44, 90, 91, 94, 96, 99, 100, 110, 114, 121, 125, 129, 130, 154E. AB 30 appears with other commodities, most frequently AB 120 and A 302, on 24 of these tablets; the 25th tablet, HT 154E, is fragmentary and may originally have had other ideograms. Totals range from A to 400 units (less than 96 liters to 38,400 liters), and on 16 tablets, cluster between 1 and 16J units (96 to 1536+ liters).

AB 131 (wine): AB 131 and 5 variants are found on 21 tablets.

1. AB 131 and/or variants are found on 3 single commodity tablets: HT 13, 17, 19, all of which list AB 131 in Type B sections; the amounts are quite large, ranging from 53 to 130JJ liquid units (1526.4 to 3744+ liters). HT 17 and 19 share formats and words. 2 more tablets, HT 9 and 98 have AB 131 as a single commodity in one section, then Type B entries in the other section. The amounts in the Type B section of HT 98 are fractions, so this too probably lists wine; the amounts in the Type B section of HT 9 are all whole numbers, and so could be personnel, wine, or any other commodity.
2. AB 131 and variants appear with other commodities in 16 other tablets: HT 23, 27, 28, 30, 35, 44, 60, 62, 89, 91, 99, 100, 114, 121, 130, 131. The amounts range from fractions to 147 liquid units (less than 28.8 liters to 4233.6 liters), but cluster on 8 tablets between 1H and 10 liquid units (28.8+ to 288 liters). Several of these tablets have specialized formats: HT 89 and 100 list AB 100 in one section, and common commodities including wine in the next section; and HT 114 and 121 are mixed commodity tablets very similar in format, commodities and quantities to HT 89 and 100. HT 27 begins like a personnel/commodity tablet, except that in the last two sections it becomes like a single commodity tablet for varieties of wine, with quantities per entry ranging from 1 to 70 liquid units (28.8 to 2016 liters). The format of HT 27, and its use of adjunct signs modifying the wine ideogram and amounts, has no parallel within the Linear A tablets.

A 302 (olive oil): A 302 and 14 variants are found on 32 tablets.

1. A 302 and variants are found on 2 single commodity tablets: HT 2 and 42. A third tablet, HT 8, has first a Type B section listing A 302+67, then a W+fraction section which probably also lists A 302. The quantities in these three tablets are 17ff (489.6+ liters), 20+ (576 liters) and 141+ liquid units (4060.8 liters).
2. A 302 and variants are found on 29 mixed commodity tablets: HT 12, 14, 18, 21, 23, 28, 30, 32, 35, 44, 50, 53, 56, 58, 60, 90, 91, 96, 100, 101, 114, 116, 121, 125, 129, 131, 137, 139, 140. HT 56, a fragment with a single entry, may originally have had other entries. The tablet totals of A 302 and variants range from fractions to 32 liquid units (less than 28.8 liters to 921.6 liters), and on 19 of the tablets, cluster between 1 and 20 liquid units (28.8 to 576 liters).

A 302 has a large number of variants, equalled only by the variants of AB 120; it usually appears in more than one variant per tablet (which is why it rarely occurs in Type B sections), and in more than one section per tablet. The quantities in each entry tend to be small, often expressed by fractions, but the combination of amounts for the variants in each section tends to match the average quantities of the other commodities in the sections. The total amounts per tablet of A 302 on the mixed commodity tablets do not exceed 32 units (921.6 liters). In contrast, on two of the single commodity tablets, HT 2 and 42, variants of A 302 appear in larger quantities, with a greater total and in nearly a set order. A large number of variants of A

302 occur repeatedly, much more than the variants of AB 120 or AB 131, which implies that the information expressed by the ligatured signs was considered natural or essential to the collection or distribution of the variant forms of this commodity.

A 303 (grain?): A 303 occurs with a single variant, A 303 'E', on 13 mixed commodity tablets: HT 12, 23, 27, 30, 35, 89, 94, 99, 100, 106, 110, 112, 130. The total amounts per tablet are usually small, ranging from fractions to 21 units (less than 96 liters to 2016 liters) and clustering on 11 tablets between 1 and 9JEB units (96 to 864+ liters). The ideogram tends to appear at the head of the list, in the spot which AB 120 normally occupies. It heads the commodities sections in three of the personnel-commodity tablets, HT 27, 89 and 94. A 303 and AB 120 are listed together on only 2 tablets: HT 99, where they are found in the same section, and HT 110, where they head two different sections. The major differences between the two commodities lie in the number of tablets where each is listed, and the quantities per tablet: AB 120 on 42 tablets, with amounts per tablet ranging from fractions to over 1000 units, and A 303 on 13 tablets, with amounts ranging from fractions to 21 units.

A 304 (unknown): A 304 is found as a commodity sign with no variants²⁹ on 15 mixed commodity tablets: HT 12, 14, 18, 21, 28, 41, 50, 90, 91, 92, 101, 116, 125, 129, 131. Amounts range from A to 20 units (less than 96 liters to 1920 liters, if it is a commodity measured in the dry measure system), and cluster on 9 tablets between 1 and 10 units (96 to 960 liters). It appears in fractional amounts, so it is not a commodity like livestock to be counted by individual unit. It most frequently occurs with the commodities AB 30, AB 120 and A 302, in quantities among the lowest in the entries. Usually only one entry of A 304 per tablet is found, while AB 120 and A 302 and their variants are frequently listed in more than one section. This indicates that A 304 is an agricultural product associated in the minds of the administrators with figs, barley and olive oil, to be collected and distributed with these items, but not as frequently or in such large quantities.

AB 21, 22, 23, 85 (livestock): The signs AB 21, 22 and 23 appear phonetically in words, and ideographically in entries. In fragmentary tablets, or tablets whose context is otherwise unclear it can be difficult to determine if the sign is used to represent an animal or something else. For instance, AB 21 in HT 112, and possibly HT 132, and AB 23 in HT 23, 26 and 127 do not seem to denote animals. The ideograms for sheep (AB 21 and 21^f in HT 38, 136, and possibly 132), cattle (AB 23^m on HT 30, 114, 121) and pigs (AB 85 in HT 38, 118) are definitely found on the HT tablets; the sign for goats has been tentatively identified on HT 64. Animals can appear in lists with other common commodities (HT 30, 114, 121) or uncommon commodities; in HT 38, 3 sheep and 1 pig are listed with one vase and two kinds of cloth. One tablet seems to specialize in pigs; HT 118 records AB 85 in its heading, followed by four entries with a number in each entry, followed by *ki-ro* and a smaller number. The record ends with *ku-ro* 30 *ki-ro* 15. No one knows what *ki-ro* means in this context or other contexts. The total number of animals in all the tablets combined is very small compared to the total amount of AB 120, A 302, or AB 131; there are 3 sheep, 31 pigs, 8 bulls and possibly 6 goats listed at Haghia Triada. Animals appear with mixed commodities in several Pylos Linear B Un and Ua tablets, but the contexts show that these tablets record primarily collection of offerings—goods to be eaten at religious festivals, or inventories of palace resources³⁰. The Haghia Triada mixed commodity tablets with livestock may have been drawn up for purposes other than religious offerings.

KHANIA (Table 2)

W+N (Type B entries): W+N entries occur on two tablets: KH 59 and 92. In both tablets, the preserved portions of the tablets record only W+N entries with whole numbers, and no ideograms in the headings. Totals on both tablets range from 10 to 11. These are most likely personnel tablets.

AB 100 (humans) AB 100 and 3 variants occur on 7 Khania tablets; one of the variants (AB 100+313b) is found also at Haghia Triada.

1. One tablet, KH 25, contains two entries for AB 100, with a total of 150+. But this tablet is fragmentary, and may have had other sections and commodities.

29 One variant, A 304+03, appears in the personnel list HT 100, where it represents a group of men rather than an agricultural item.

30 R. PALMER, *Wine in the Mycenaean Palace Economy* (1994), 101-115.

2. 6 tablets record AB 100 and variants, usually with other commodities: KH 7, 8, 9, 14, 19, 26. All but KH 8 have several sections of mixed commodities preserved, and when AB 100 appears in the sections, it leads the list of mixed commodities. In KH 7, three sections list AB 100+313b first, and then A 303D in a format very similar to Pylos Ab ration tablets. The totals per tablet of AB 100 in the mixed commodity tablets range from 2 to 60+ persons, but do not cluster.

AB 120 (barley): AB 120 and 2 variants appear on 8 tablets; both variants also occur at Haghia Triada.

1. One tablet, KH 10, has two entries with large amounts of AB 120 for a total of 100 units (9600 liters). This tablet is fragmentary and may have listed other commodities.
2. AB 120 is found on 7 mixed commodity tablets: KH 1, 8, 27, 28, 54, 61, 91. 2 tablets, KH 54 and 61, also list A 303, and on a third, KH 27, A 303'J' was erased and AB 120 written over it. KH 1 lists a large quantity of AB 120 (70 units, 6720 liters) on a totalling tablet. Total amounts range from J to 70 units (less than 96 liters to 6720 liters), but quantities on 5 of the 8 tablets cluster between J and 4 units (less than 96 liters to 384 liters).

AB 122 (olives): AB 122 is not found on the Khania tablets.

AB 30 (figs): AB 30 occurs on 22 tablets. It has no variants.

1. One tablet, KH 88, is a Type B tablet with AB 30 in the heading, and two entries, which list a total of 18 units (1728 liters). Another tablet, KH 65, is a fragment with only the portion of the sign AB 30 preserved; the sign may not have even been used as an ideogram.
2. AB 30 appears on 20 multiple commodity tablets: KH 1, 5, 8, 9, 11, 14, 15, 17, 20, 21, 26, 27, 30, 34, 55, 58, 61, 73, 75, 91. Usually the ideogram occurs in only one entry per tablet, and in most of these tablets, the quantities are usually the same size or less than amounts in individual entries for the other commodities. Quantities range from fractions to 10 units (less than 96 liters to 960 liters), and on 12 tablets, cluster between fractions and 2+ (less than 96 liters to 192+ liters).

AB 131 (wine): AB 131 and 2 variants (AB 131b and 131c) occur on 9 tablets. 8 are mixed commodity tablets: KH 5, 9, 11, 18, 60, 61, 85, 91; one fragment, KH 46, may also have listed other commodities. The variants of AB 131a are formed by altering the shape of the sign, not by adding ligatures; neither form is found at Haghia Triada. 131b is probably vinegar³¹, but the identity of 131c is unknown. The five tablets where quantities are preserved have totals ranging from W to 3A liquid units (less than 28.8 liters to 86.4+ liters). AB 131a, b and c occur mainly in one entry per tablet with other basic commodities.

A 302 (olive oil): A 302 and 2 variants (also found at Haghia Triada) appear on 7 tablets. 5 are mixed commodity tablets: KH 19, 55, 61, 82, 85, and 2 tablets, KH 39 and 80, are fragments which may also have listed other commodities at Khania. On tablets which have more than one ideogram preserved, A 302 usually occurs with two or more other commodities. A 302 appears only in ligatured form at Khania, as A 302+59 (5 times) and A 302+53 (once). There are no secure examples of plain A 302. The amounts of A 302 which are preserved are all fractions (less than 28.8 liters). Godart suggests that the trace ideogram which precedes the numeral 30 on the fragment KH 66 *might* belong to the variant A 302+59³². If this is so, the amount of oil listed would exceed the individual tablet totals for all other commodities except personnel and barley.

A 303 (grain?): A 303 occurs with 8 variants, 3 of which (A 303D, 303E, 303K) are formed by appending a fractional sign to the main sign. Two of these 3 fractional variants also appear at Haghia Triada. A 303 and its variants appear on 31 mixed commodity tablets: KH 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 20, 21, 22, 29, 33, 34, 35, 38, 54, 57, 58, 60, 61, 75, 76, 84, 85, 86. 2 fragments, KH 23 and 77 which presently have only the A 303 ideogram, may originally have listed other commodities. The ideogram A 303 and variants appear most frequently of all the ideograms on the Khania tablets. In the tablets where it appears, A 303 seems to be the main commodity. In two tablets with multiple sections, KH 6 and 7, A 303 and its variants appear one or twice in every section, while the other commodities (including personnel) occur far fewer times. Most of the quantities of A 303 in these entries are fractional (hence less than 96 liters); the entry 303D=J occurs at least 12 times and may represent a standard disbursement. When A 303 is listed with AB 120 on two tablets (KH 54 and 61), the amount of A 303 is equal to or greater than AB 120 in these tablets, but is still small (not exceeding 2 units, 192 liters). The high occurrence of A 303 in the Khania tablets may

31 PALMER (*supra* n. 30), 88-91.

32 GORILA 3, sv. KH 66; GODART-TZEDAKIS (*supra* n. 7), 158, 167.

reflect the purpose of the tablets found at Odos Katre and Plateia A. Aikaterini—perhaps disbursement of small amounts of common commodities as individual rations. The small quantities of A 303 and the figs and olive oil occasionally listed along with A 303 are reminiscent of the PY Fn tablets.

A 304 (unknown): A 304 and one variant, A 304+03, definitely occur as ideograms for an agricultural commodity³³ on 4 mixed commodity tablets: KH 7, 8, 9, 73, and as an adjunct to A 303 on one tablet, KH 85. The ideogram usually occurs in only one entry per tablet, like AB 30 and 131. The range of quantities is extremely small, from fractions to 1 unit. On KH 57, a related sign AB 20 appears; this is similar in form to A 304 except that it has a single horizontal line across its stem. This sign is unique in Linear A and was given the sign number AB 20 because it has the same form as the phonetic Linear B sign *20—zo, but in the context in which this sign appears on KH 57, as sign+number after a break, it could act as either an ideogram or a phonetic sign. It is just as likely that this sign in Linear A is a variant of the ideogram A 304 than that it is a completely separate sign.

AB 21, 22, 23, 85 (livestock): 5 tablets at Khania record animals, using AB 22 and 23, as well as the ideogram A 336. AB 21 is found on roundels but not tablets, and Godart suggests that the ideogram A 306 *might* also represent sheep³⁴. KH 6 lists 1 goat (AB 22^m) and 1 bull (AB 23^m), while KH 81 perhaps lists a goat (the sign is damaged) and KH 87 records a bull. No tablets on pigs were found. Two tablets, KH 14 and 82, contain an ideogram shaped like an animal's head, designated A 336. The identity of the ideogram is unknown, but it possibly represents a dog³⁵. On KH 6, 14 and 82, the tablets also record A 303 as the main commodity. Overall, the extant tablets from Khania show animals listed in ones and twos, not in larger groups as at Haghia Triada and Zakros. These animals on the mixed commodity tablets were most likely for eating.

ZAKROS (Table 3)

W+N (Type B): W+N sections occur on 6 tablets.

1. 2 tablets, ZA 14 and 20, have only W+N entries with whole numbers, with preserved totals of 61 and 156+³⁶ respectively. A third tablet, ZA 27, is a fragment which contains a single whole entry—W+2. These whole numbers could indicate personnel lists.
2. 3 tablets, ZA 4, 7, 10, have a W+N section on the recto of the tablets and a Type B commodity section on the verso, similar to several Haghia Triada W+N tablets. The W+N totals of these three tablets are 7, 10 and 106.

AB 100 (humans): AB 100 does not appear on the Zakros tablets.

AB 120 (barley): AB 120 and 2 variants, AB 120+03 and '78'120+03 (found also at Haghia Triada) appear on 5 mixed commodity tablets: ZA 1 from Hogarth's House A at the edge of town, and ZA 6, 11, 18, 28 from the palace magazines. The variant AB 120+03 perhaps appears on ZA 1 (the sign is very worn). ZA 1 records 47 units of AB 120 (4512 liters) as well as 42J units of figs (4032+ liters); this is a totalling tablet for figs and barley presumably stored in House A, and for which the nodules and roundel from the house might be collection or disbursement records. The four palace tablets record mixed commodities, of which AB 120+03 appears most frequently, and in the largest quantity. The amounts range from 1+ to 90 units (96 to 8640 liters), but do not cluster; the total amount of AB 120 in each tablet is usually much larger than the total amount of any other commodity (as at Haghia Triada and Khania).

AB 122 (olives): AB 122 is listed on 3 mixed commodity tablets: ZA 6, 11, 18, in quantities of 25+ (2400+ liters), 3 (288 liters) and E (less than 96 liters) respectively. In ZA 6 and 11, entries of AB 122 appear in several sections with AB 120+03.

AB 30 (figs): AB 30 appears in 2 tablets, ZA 1 and 8. ZA 1 is the mixed commodity totalling tablet from Hogarth's House A, which lists 42J units of AB 30 (4032+ liters). ZA 8 is a single commodity tablet with

33 I do not count VAS⁴⁰¹+304 as a variant of the commodity A 304, since it represents a type of pottery.

34 GODART-TZEDAKIS (*supra* n. 7), 171.

35 GODART-TZEDAKIS (*supra* n. 7), 172.

36 The top part of ZA 20 is missing. The last entry on the tablet is large—130 units, and *could* represent the total of the previous entries. The total quantity listed on this tablet is either 130 or 156+.

seven Type B entries following the fig ideogram; quantities range from J to 4BB (less than 96 liters to 384+ liters), possibly a ration record?

AB 131 (wine): AB 131 and 6 variants, including 131b, appear on 6 tablets and a pithos, ZA Zb 3. One of the variants, AB '31'131a, also occurs at Haghia Triada.

1. 4 of the tablets are Type B single commodity tablets or have single commodity sections: ZA 4, 5, 10, 15. These are the most complex tablets from Zakros. ZA 4 lists a single entry of 104+ liquid units of wine (2995.2+ liters) after a W+N section. ZA 5 contains 5 entries in a Type B section headed by AB 131+58, with a total amount of 37J liquid units (1065.6+ liters). ZA 15 records the same 95 units of wine (2736 liters) in two different ways. ZA 10 has a Type B section with 10 entries and 131b in the heading; the numbers add to 39J liquid units (1123.2+ liters), a very large amount of vinegar. Quantities in these tablets range from 37J to 104+ liquid units (1065.6+ to 2995+ liters). The pithos from Epáno Zakro can also be considered a single commodity text; on its neck, the entry AB 131a=32 (921.6 liters) precedes a long inscription.
2. 2 tablets are mixed commodity tablets. Two entries in ZA 6 record large amounts of different types of wine, totalling 50 liquid units (1440 liters), while ZA 11 lists fractional amounts of plain wine (less than 28.8 liters) in two of its sections.

A 302 (olive oil): The variant A 302+67 appears in one entry of the mixed commodity tablet ZA 18. The quantity is a fraction, BB (less than 28.8 liters).

A 303 (grain?): A 303 does not appear at Zakros.

AB 304 (unknown): AB 304 is found in one entry of the mixed commodity tablet ZA 6, along with AB 120, 122 and 131. The amount is missing but the quantities of the other commodities on ZA 6 are large.

AB 21, 22, 23, 85 (livestock): AB 21 is the only livestock ideogram to appear at Zakros, but it occurs in 3 varieties on 3 single commodity tablets: ZA 9, 22 and 26. ZA 9 and 22 each have at least 5 entries of sheep; the final entry in ZA 22 lists 100 female sheep. The fragmentary tablet ZA 26 has at least two entries of sheep. The ideogram 21^f for female sheep is most common, occurring 7 times, but 21^m signifying male sheep occurs once on ZA 22, and ZA 9 has 3 entries of the complex sign 21+41, whose meaning is unknown but most likely signifies a type of sheep. The sheep tablets from Zakros are most similar to the Cn sheep tablets from Linear B Pylos, where lists of sheep from different places are compiled, although the numbers of sheep are much smaller on the Zakros tablets. At Zakros, livestock ideograms do not appear on mixed commodity tablets.

The identities of 9 commodities in the Linear A tablets are secure, based on the resemblance of the 9 Linear A signs to their Linear B counterparts in both form and function within the texts. Thus we know that Linear A tablets deal with humans (AB 100), sheep (AB 21), goats (AB 22), cattle (AB 23), pigs (AB 85) and four major vegetable products—barley (AB 120), figs (AB 30), olives (AB 122) and wine (AB 131). Most of the W+N entries refer to human beings, as is inferred from Linear B parallels. In certain kinds of personnel lists, the human ideogram and its variants may always have been needed, but in straight lists of personal names and ethnics in Type B sections, it may have been the choice of the individual scribe whether or not to use AB 100 in the heading. That leaves wheat, olive oil and cyperus as agricultural commodities listed frequently in the Linear B mixed commodity tablets, but which are not securely identified in the Linear A texts. Only A 302 and A 303 appear often enough and in large enough quantities to be candidates for any of these commodities. Godart suggests that one of the two ideograms has to represent olive oil, because of its great importance to the Minoan economy³⁷. Consequently the other should be emmer wheat or cyperus.

Palaima has persuasively pointed to similarities between A 302 and Linear B *130 OLE in form (see Pl. XXI) and function; OLE has a relatively large number of variants for a Linear

37 GODART-TZEDAKIS (*supra* n. 7), 168-170.

B ideogram, and consistently appears in small quantities on offering tablets³⁸. But while A 302 appears in the Linear A tablets in mixed commodity contexts, in the Linear B texts, OLE and its variants are listed mainly on single commodity tablets in series. Only the KN Fs series lists OLE for eating, along with other foods. The ligatured OLE signs signify varieties of perfumed oil, which in all cases but one are destined as offerings. Only MY Fo 101 and PY Fr 1205 list perfumed oil, issued to workers. Moreover, the Linear B tablets do not record perfumed oil being collected; instead it is clear that the palaces manufacture their own scented oil. In contrast, A 302 and its variants appear consistently in the Linear A tablets with common goods such as barley, olives and wine; this suggests that plain and perfumed oil was habitually collected from and/or distributed to personnel in these Minoan centers. A 302 is most likely olive oil, but the contexts presented by the Linear A tablets suggest a pattern of management for olive oil very different from the Linear B pattern.

A 303 appears with 8 variants, and is the most frequently listed commodity at Khania. There are two possible interpretations for this ideogram: emmer wheat, or cyperus. The Linear B emmer wheat ideogram *121—HORD³⁹ does not resemble A 303 (although both look vaguely like stalks of grain or grass), nor does it have any variants. But A 303 most resembles HORD in its use pattern; it appears frequently and in small quantities in ration and handout tablets, along with olives and figs. When it occurs with other commodities, A 303 tends to head the list in each section; the barley ideogram AB 120 is also listed first when it appears in mixed commodity sections. Moreover, A 303 rarely occurs in the same lists as AB 120, and in one tablet, KH 27, A 303 was erased and AB 120 was written over it. In Linear B, HORD and GRA almost never appear together, and in one tablet, KN F 193, the HORD ideogram was written over an erased GRA⁴⁰. AB 120 and A 303 are the only major agricultural commodity ideograms to appear ligatured with fractions⁴¹, which implies that the Minoans saw the two commodities as very similar in type and use.

On the other hand, Hallager has remarked that A 303 looks like Linear B *125, CYP—cyperus, and its 4 variants⁴². A 303 has three straight shoots rising from a node at the top of a straight stem, pointing to the right (see Pl. XXI). The CYP ideogram resembles a plant with two (or less often three) curving shoots rising from a straight stem and pointing to the right; it has the highest number of variants of any of the crop ideograms⁴³. Cyperus is a marsh grass which is found in Crete in three different species; it grows in wet soils on river banks, and the edible portion is the root⁴⁴. It appears most often as a perfume ingredient, but can also be used as a food; cyperus is listed as one of the festival foods on PY Un 2. In a significant

38 PALAIMA (*supra* n. 3), 304-305; 311, n. 63. For forms of OLE, see J.-P. OLIVIER, L. GODART, C. SEYDEL and C. SOURVINOU, *Index généraux du Linéaire B (Incunabula Graeca LII, 1973)*, sv. *130 OLE.

39 For the re-identification of HORD as emmer wheat, see PALMER (*supra* n. 8), 484-487.

40 PALMER (*supra* n. 8), 486.

41 GORILA 5, sv. AB 120, A 303; HALLAGER (*supra* n. 10), 127, n. 46 for AB 120. The other ideograms which are ligatured with fractions are vases, skins, and (once) the ideogram A 316, which *may* represent an agricultural product, but also appears as an adjunct sign.

42 See n. 10 above.

43 For forms of CYP, see OLIVIER *et al.* (*supra* n. 38), sv. *125 CYP. *124 PYC is the mirror image of CYP, and is used in the same way; both Melena and Sacconi argue that these two ideograms represent the same commodity: J. L. MELENA, "KU-PA-RO en las tablillas de Cnoso", *Emerita* 42 (1974), 320-321; A. SACCONI, "Le rôle et la valeur des idéogrammes *124 et *125 dans les textes mycéniens", *Colloquium Mycenaeum: Actes du 6e Colloque International sur les textes mycéniens et égéens* (1975) (1979), 347-348. Since the shoots of A 302 point only to the right, what is its relationship to Linear B PYC, whose shoots point to the left, if the CYP and PYC signs both denote cyperus?

44 For the habitat and types of cyperus, see MELENA (*supra* n. 43), 327-329, and SACCONI (*supra* n. 43), 351-352.

number of harvest/collection texts, KN F 157, 852, 5043, 7050 and MY Ue 652, varieties of cyperus are recorded with other crops—barley and olives. Cyperus was an important crop and a valued food, but not a staple. In the Linear B harvest texts, the amount of cyperus listed is far smaller than the quantities of barley and olives, which is understandable since the areas of wetlands suitable for cyperus are far smaller than the land available for growing wheat. It seems to me that A 303 is more likely to represent emmer wheat than cyperus, because of the use pattern it exhibits as a main commodity, and because we would expect the Linear A texts to list an important crop like wheat. However, there are still many questions to be answered concerning the form of the ideogram and its variants.

The analysis of A 304 shows that it occurs on the Linear A tablets more frequently than olives, AB 122, and in quantities equal to or greater than olives, but is not a major commodity. The form of the sign does not immediately suggest its identity; it resembles a simple arrow pointing up. It is probably a plant commodity rather than a manufactured item, since it is found principally with common agricultural commodities. It could represent a grain, or cyperus, or even beans, which appear frequently in the archaeological record although they have no known Linear B ideogram(s); but A 304 is not listed frequently enough to be emmer wheat.

In conclusion, the Linear A tablets can provide information about the resources of a center, and how these resources were used, with some stipulations. First, it is clear that part of the pattern produced by the extant tablets is due to accident of preservation. For instance, at Khania, simply because no sheep are recorded on the tablets we have found does not mean that the administration was not concerned with sheep. Similarly the Zakros tablets have no ideogram for humans preserved. One single commodity tablet for olive oil means perhaps one time specialized treatment of that commodity; however, a number of single commodity tablets for personnel, barley or wine points to more habitual specialization.

What we do not have in Linear A are series: single or multiple section tablets linked by the same format and formulae, recording set commodities over and over. The presence of series in the Linear B bookkeeping system points to a degree of specialization of information not matched in the Linear A texts. The Linear A texts in contrast deal with multiple transactions in mixed commodities that change in identity, frequency and quantity from tablet to tablet. Complex Linear A tablets deal with several different types of information, perhaps related through a system, but perhaps related only by circumstance (*i.e.* a day's business?). This type of tablet occurs relatively rarely in the Linear B corpus. Moreover, the vast number of variants for the Linear A signs for barley, wine, and olive oil reinforce our impression of the local nature of the records; administrators sensitive to the different qualities of olives from one estate versus olives from another might make distinctions in the records, but administrators concerned with regularizing a system of recordkeeping and collection over wide areas (as in LM II-III Knossos) would use generic ideograms more.

The Linear A tablet system at these three sites coexists with systems of information management based on nodules and roundels impressed with sealstones or rings. The information they conveyed is centered upon the seal impression which indicated the person or office responsible for the transaction. On the nodules, supplementary information such as commodity or transaction type(s) was often incised on the unimpressed surfaces, but since many nodules were uninscribed, this information cannot be considered essential to the function of these nodules. Roundels inherently contain more information since the number of impressions in the side of the roundel probably indicated the amount of the commodity in whole units provided by or connected with the sealholder. Roundels could also bear a commodity ideogram, or word or even fraction sign, but like the nodules, not all roundels

were inscribed⁴⁵. Each nodule and roundel with its seal impressions represents a single transaction: the collection or delivery of goods. In contrast, the Linear A tablets frequently record multiple transactions. The single commodity tablets in particular show how the administrators at each site pulled commodities from different sources (most likely represented by the sealings and roundels) into a single resource pool, then reassigned them, in a sense by redefining them as coming from central control. Although the nodules and roundels can suggest aspects of this process, only the Linear A tablets can reveal the complexity of these transactions. Moreover, the characters of the nodule and roundel systems and their degree of interconnection with the Linear A tablet system vary according to site⁴⁶.

Because the tablets from Haghia Triada contain the most information, they provide the basis for comparison with tablets from other sites, despite the problems in interpreting the exact role that the site played in Southern Crete (second order center, or seat of power eclipsing Phaistos?). At Haghia Triada, the tablets were found both in the central building (the villa) and in subsidiary buildings (the Casa del Lebete); the two groups of tablets are not differentiated by subject or format, as is characteristic of the Linear B tablets at Knossos, but share much in subject, formats, and scribal hand. Only a few tablets were found with roundels and nodules; the largest groups of tablets and of nodules were stored separately⁴⁷. The Haghia Triada tablets reveal the complex organization of data several degrees removed from the receipts represented by the roundels and some nodules. Of the 100 HT tablets in this study, 53 are single commodity tablets or have single commodity sections, which indicates specialized treatment of a range of resources, in particular barley and personnel. The personnel tablets form the largest group of specialized tablets and have the greatest internal consistency. Personnel/commodity tablets tend to list larger groups of personnel, while the W+N tablets list more individuals. The personnel sections end in *ku-ro* totals twice as often as all the other commodity sections (13 or more times, vs. 6 times for the other commodities studied here; see Table 1). Since the tablets probably list the same individuals and groups more than once, it is not feasible to add all the totals to find out total manpower available, but two tablets, HT 1 and 105, each list *ca.* 500 people. This amount of personnel is comparable to the personnel totals on individual tablets from Knossos and Pylos.

At Haghia Triada, barley was the most important crop, occurring on the highest number of tablets, and in quantities relatively larger than the amounts of other ideograms. In mixed commodity tablets, it is placed first in the list. The entries of barley on totalling tablets such as HT 15, 22, 36, 40, 52, 92, 102 and 133 are comparable in quantity to the entries on the KN E and F harvest and inventory tablets, where each entry probably represents crops collected from a locality⁴⁸. It is possible that some of the AB 120 entries denote land area rather than actual grain. Figs are also an important commodity, appearing frequently in large amounts. But when barley and figs are listed together, the quantity of figs is usually half to a third the

45 HALLAGER (*supra* n. 10), 127, 130, 135 Table 1.

46 For roundel systems: HALLAGER (*supra* n. 10), *passim*; for sealing systems: WEINGARTEN (*supra* n. 5), 107-109, and "The Sealing Structures of Minoan Crete: MM II Phaistos to the Destruction of the Palace of Knossos, Part I", *OJA* 5 (1986), 293-294.

47 See n. 23 above; for find spots, see PALAIMA (*supra* n. 3), 297 Fig. 3.

48 The Knossos harvest/inventory tablets have the word *a-ma* 'harvest' and/or large and unproportional entries of GRA and other commodities. The tablets I have used for comparison are: KN E (2) 668, 669, 670; E 749, 843, 846, 848, 850, 1035, 5000; F 157; F (2) 844, 845, 851, 852, 853, 854, 7050; Uc 161. Except for F 852 which records 10,300[units of GRA (an amount unparalleled in any other Linear B text), the amounts in the individual entries of these tablets are comparable with the amounts of AB 120 in the individual entries of the HT tablets cited above. For a fuller comparison of the GRA tablets from Knossos and the AB 120 tablets from Haghia Triada, see C. ANTONELLI, "Il grano nei documenti in Lineare A e nei testi in Lineare B di Cnoso", *Πεπραγμένα τοῦ ΣΤ' Διεθνoῦς Κρητολογικοῦ Συνεδρίου* (1986) A¹ (1990), 105-111.

amount of the barley. This is closer to the pattern presented by the KN Fs series, where the amount of figs is half the size of the grain allotment, than to the pattern at Pylos, where the palace sends out equal amounts of grain and figs (barley and figs on the Ab ration texts, and emmer wheat and figs on the Fn handout texts). Wine also received specialized attention in single commodity tablets, and was listed frequently on mixed commodity tablets; the number of tablets recording wine at Haghia Triada (21) is greater than the number of wine tablets at Knossos or Pylos, although the totals of wine per tablet are smaller⁴⁹. Olive oil was most commonly listed in more than one variety per tablet or per section and in small quantities, indicating that the difference between the varieties was very important to the palace and the recipients. The variant ideograms most likely indicate perfumed oil in different flavors, but could also refer to quality, *i.e.* virgin oil, or from second pressing. This pattern for olive oil is very different from the Linear B records, where oil is first and foremost a specialized product, and appears most frequently as offerings to gods (KN Fp, PY Fr series). A 303 never occurs on totalling tablets but only on mixed commodity tablets, in the contexts of collection or distribution. It is listed in quantities much smaller than AB 120, clustering at 1 to 20 units in mixed commodity tablets while AB 120 clusters at 21 to 264+ units, but it too appears often as the first commodity in the list. Although the form of A 303 is distinctly different from Linear B HORD—emmer wheat, the quantities, frequency and contexts it appears in suggest that A 303 is emmer wheat. The Linear B handout, ration and inventory lists at Knossos show that HORD had entries with a range of quantities similar to A 303, from 1 unit (96 liters) to 9 T8 V3 (945.6 liters). AB 122—olives, and the unknown commodity A 304 appear the least frequently of these 12 ideograms, and are listed in a wide range of quantities. This implies that A 304 and olives are available, but considered less important as foods (because of scarcity? expense?) than grains or figs. As evidence for animals at Haghia Triada, the Linear A records are definitely incomplete. The extant tablets record 3 sheep, 8 bulls, 1 pig and possibly 6 goats on mixed commodity tablets; there had to be more sheep at least, because other tablets list wool and textiles. There is only one tablet specializing in livestock, the single commodity tablet HT 118, which records 30 pigs in an unusual format. The other animals are listed as part of normal mixed commodities, or with unexpected items: in HT 38, 3 sheep and a pig are listed with a vase and two types of cloth. The number of animals in mixed commodity texts is low, between 1 and 3; the parallel Linear B Un records suggest these are animals for eating.

At Khania, the tablets were not found in an identifiable center, but scattered in secondary contexts among houses. The majority of the tablets, roundels and nodules were found at the Odos Katre site, and were perhaps stored together because the tablets described either the transactions represented by the sealings and roundels, or the disposal of the commodities represented by the sealings and roundels. Thus the sealing systems at Khania may have been more integrated with the tablet system than at Haghia Triada.

The information from the Khania tablets at first glance seems very different from the HT tablets. Only three of the 56 tablets studied are single commodity tablets, or have Type B single commodity sections, and two of these (KH 88 and 92) are from Plateia Ayia Aikaterini. The tablets from the Odos Katre site are almost entirely Type A multiple commodity texts (however, some of the scraps of Khania tablets with only one or two signs might have belonged to single commodity tablets). At Khania, AB 100 occurs only within mixed commodity sections, instead of in single commodity sections, as at Haghia Triada. The number of variant forms of AB 120, AB 131 and A 302 is much lower at Khania. The most striking difference lies in the number of times AB 120 and A 303 are listed: at Khania, 33 tablets (59% of tablets studied) list A 303, while only 8 tablets (14%) have AB 120, while at

49 For totals of wine on Linear B tablets, see PALMER (*supra* n. 30), 196 Table 9.1.

Haghia Triada, 42% of the tablets studied have AB 120, and only 13% list A 303. But the forms ligatured with fractions, AB 120'F', A 303'D' and A 303'E' occur at both Khania and Haghia Triada. The large quantities of AB 120 recorded at Khania are fully comparable to the middle range of AB 120 at Haghia Triada, even if no tablets listing over 1000 units of barley survived at Khania. Moreover, the range and cluster of tablet totals for A 303 is almost identical at both sites. Even though at Khania, tablets with A 303 outnumber tablets with AB 120, the total preserved quantity of A 303 calculated from all the tablets is *ca.* a third of the total quantity of AB 120 preserved (see Table 2). A large number of the Khania tablets seem to record multiple disbursements of A 303 and other commodities in small quantities, rarely more than a fraction per entry. In fact the entry 303'D'=J occurs more than 12 times, and may represent a standard disbursement. AB 131 appears with some variants unknown outside of Khania in a relatively large number of tablets, so it seems that wine was as important at Khania as at Haghia Triada. A 302 occurs less frequently than at Haghia Triada, but in two variants common at that site, which implies that the meaning of these variants crossed territorial boundaries. Animal ideograms occur rarely, and mainly in mixed commodity tablets. Khania has bulls, goats, and an obscure sign 336 that looks like an animal head which appears only twice in the whole Linear A corpus. As at Haghia Triada, the tablet data concerning animals is probably skewed. In general, the pattern of commodity amounts per tablet matches Haghia Triada. The high frequency of A 303 at Khania may exist because the deposit at Odos Katre included a group of tablets specializing in disbursement of rations of A 303. The roundels and nodules found with the Odos Katre tablets may be connected with the transactions on these tablets. Overall, the tablets from Odos Katre show a wide range of formats and commodities similar to the mixed commodity tablets from Haghia Triada: the same commodities in the same range of quantities appear in the tablets from both sites, even if the number of tablets with large quantities recorded is greater at Haghia Triada⁵⁰. The fact that the majority of the Khania tablets record relatively small amounts of commodities does not preclude that the resources of Khania equalled or exceeded those of Haghia Triada.

The pattern presented by the Zakros tablets differs yet again from the Haghia Triada and Khania groups. The tablets from the palace proper show far more specialized formats. Of the 16 tablets from the palace magazines, 11 have single commodity sections. The ideogram AB 100 does not appear at Zakros; instead personnel are listed in Type B sections without ideogram. On the mixed commodity tablets with AB 120, barley is the most important and most frequently listed commodity. A 302 occurs once, and A 303 does not appear at all. The specialized tablets found in the palace magazines at Zakros deal with personnel, wine and sheep. Four of the six tablets with wine are Type B single commodity tablets, and are the most complex tablets from the site. Sheep appear only in single commodity tablets in quantities larger than the livestock totals from Haghia Triada and Khania: the final entry of ZA 22 lists 100 female sheep. Records showing specialization in other commodities or processes (such as rations of A 303 at Khania) may have been kept elsewhere. The tablet with the largest quantity of barley (ZA 1) is a totalling tablet from House A outside the palace, where one roundel and 525 nodules were also found. The roundel and some (but not all) of the nodules may directly represent deliveries or disbursements of the commodities listed on ZA 1⁵¹.

50 L. GODART, "L'économie de la Crète occidentale à partir des documents en Linéaire A et B", *Πεπραγμένα τοῦ ΣΤ' Διεθνoῦς Κρητολογικοῦ Συνεδρίου* (1986) A¹ (1990), 333-334.

51 Most of the nodules from House A were types that sealed documents (J. WEINGARTEN, *The Zakro Master and his Place in Prehistory* [1983], 41 and n. 20), and so might have had little or no direct connection with the delivery or disbursements of the actual commodities.

The tablets from the palace site at Zakros point to a greater degree of specialization in certain commodities, which is reflected in the format and subjects of the tablets, and in the storage places of these tablets. The single commodity tablets for wine and sheep were found within palace boundaries, while the totalling tablet ZA 1 which listed basic commodities came from a house at the edge of town. But this pattern may be illusory, since we cannot know how many other tablets bearing what information were lost at Zakros. The surviving tablets show the same focus upon personnel and barley as at Haghia Triada. On the other hand, the attention paid to sheep and wine is unparalleled at the other two sites. The numerous wine press installations found in the houses of the town support the tablet evidence that the region of Zakros may have specialized in wine⁵². Without this archaeological evidence, the pattern presented by the Zakros tablets might be considered inconclusive, because of the low number of tablets found at Zakros.

Only at Haghia Triada is the number of tablets and other documents large enough, and the texts well enough preserved, to begin to address the problems posed at the beginning of this paper concerning the focus and the scale of the economy as recorded in the Linear A tablets. The Haghia Triada tablets focus primarily upon personnel and barley, but the majority of tablets dealing with these two resources are mixed commodity tablets, which habitually if unsystematically include other important agricultural commodities: figs, wine, olive oil, olives, emmer wheat, and livestock. The tablets specializing in single commodities show that the administrators could and did focus on a single category of resources. Mixed commodity tablets form the majority of texts, which suggests that in general the administrators combined information about goods and personnel according to the needs of the moment, rather than separating information into exclusive categories. Such a system might be considered 'domainal' in that it is best suited to small scale operations, but in terms of basic agricultural commodities, the scale of resource management at Haghia Triada is not that of a 'second order' center, but comparable to Knossos or Pylos. The Haghia Triada totalling tablets list large entries of AB 120 comparable in amount to most GRA entries in the Knossos harvest/inventory tablets. This suggests that the individual districts controlled by Haghia Triada were close in size or productivity to individual districts under Knossian rule. But Linear A must be deciphered first to find out how many districts belonged to Haghia Triada. Only parts of the archives have been recovered from Khania and Zakros, but these tablets confirm that the most important resources in all three centers were manpower, and barley. All three sites relied upon the same basic Mediterranean crops, but from the available evidence, each had its own preferred formats and specialized commodities. In the Linear A tablet system, as in so many other ways, the centers of Minoan Crete shared methods of administration, but within the system, each center developed its own approach to resource management.

Ruth PALMER

52 PALMER (*supra* n. 30), 20-22.

Table 1: Linear A Commodities in the Haghia Triada Tablets ⁵³

Tablet	W+N	100	120	122	30	131	302	303	304	21	22	23	85	other
HT 1	533													
HT 2							141+							
HT 3	21													
HT 4	3													
HT 5	40													
HT 6					182ff									X
HT 7		13												
HT 8	9ff						17ff							
HT 9	24*					31JE*								
HT 12	50?				1		5	3	5					X
HT 13						130JJ*								
HT 14			57	27			15		15					
HT 15			1254											X
HT 17						53								
HT 18			30		10		2		3					
HT 19						78ff								
HT 21			161	1E			14JE		7JE					
HT 22			230											X
HT 23						10	ff	ff						X
HT 25	16*	52*												
HT 26		28												X
HT 27		355*			10B	147		9JEB						
HT 28			30		10	22	25ff		2					
HT 29	13													
HT 30	J				7ff	8ff	ff	8+				2+		X
HT 32							JK+							X
HT 34			200+											X
HT 35						D	B+	1						X
HT 36			51ff											
HT 38										3			1	X
HT 40			341											
HT 41	12DD								20					
HT 42							20+							
HT 43			5+											
HT 44			x	1+	1+	x	13+							X
HT 50			x	3EF			1ff+		1J					
HT 52			201											X
HT 53							x							X
HT 56							20							X

- 53 W+N: Type B entry, word followed by number, with no commodity ideogram present in the section heading.
- +: the number after the commodity sign is damaged or missing, so the amount originally recorded is equal or greater than the amount actually preserved.
- x: the commodity ideogram is present in only one entry on a tablet, but the number is missing.
- A, B, D, E, F, H, J, K, L, W etc: transcription of fractional signs.
- ff: two or more entries of the commodity have fractional amounts, with unknown values.
- *: preserved *ku-ro* total as given in the tablet. Some *ku-ro* totals show wrong addition by the scribe.
- ***: preserved *po-to-ku-ro* total.
- ?: there is some problem concerning the interpretation of this entry.
- other: X indicates that there are or could have been other commodities or entries on the tablet, especially if the tablet is a small fragment.

Tablet	W+N	100	120	122	30	131	302	303	304	21	22	23	85	other
HT 58		x?		41			22+							X
HT 60						K	5K							X
HT 61			6											
HT 62	6		15E			x								X
HT 64											6?			
HT 66		3												
HT 67	420*				400									
HT 68		x												X
HT 70					35E+									X
HT 82			K											
HT 84		x												
HT 85	11	66*												
HT 86			110											
HT 87	6													
HT 88	6*	26			7									
HT 89		87*				6		2JE						
HT 90			21		11		4		1					
HT 91			AA	A	A	A	ff		A					X
HT 92			680						12					
HT 93	?	10F	61ff											X
HT 94	7	110*			3Hff			5DD						X
HT 95	60		67											
HT 96			49EJ		24K		4							X
HT 97		192												
HT 98	2ff					ff								
HT 99			x		14	1H		4+						
HT 100		97*			2DD	2J	5ff	5E						
HT 101			81	2J			32		3					X
HT 102			1060*											
HT 103					46J+									X
HT 105		469												X
HT 106								6						X
HT 108	16	1	70											X
HT 110			x		16J			21						X
HT 112								5+		x?				X
HT 114			10		1	10	7					3		
HT 115			9ff											
HT 116			109	5			17*		15*					
HT 117	17													
HT 118													30*	X
HT 119		160*												X
HT 120			264JA											X?
HT 121			5		2	3	14					3		
HT 122		97**												
HT 123				93J*										X
HT 125			29J		23		3f+		1					X
HT 127		292*												
HT 128			45J											
HT 129			73ff		22		7+		10					
HT 130					6	3		8+						X
HT 131			58	2	92+	x	12J		12JE					X
HT 132										27				X

Tablet	W+N	100	120	122	30	131	302	303	304	21	22	23	85	other
HT 133			55											
HT 136										30				X
HT 137			3+				8							X
HT 139			1				J							X
HT 140							13ff							X
HT154A			x	x										X
HT154B			x											
HT154E					14									X

Table 2: Linear A Commodities in the Khania Tablets

Tablet	W+N	100	120	122	30	131	302	303	304	21	22	23	85	other
KH 1			70		x									X
KH 2								E+						X
KH 4								B						X
KH 5					2JB	2		5A						
KH 6								2JBff			1	1		X
KH 7		32						4ff	1					X
KH 8		x	J		E			ff	E					X
KH 9		x			EB	x		ff	1					X
KH 10			100											X
KH 11					1	3A		3ff						X
KH 12								2						X
KH 13								B+						X
KH 14		2+			E			6ff+						X
KH 15					ff			J						
KH 16								KL ² +						X
KH 17					1+									X
KH 18						2								X
KH 19		13+					B							X
KH 20					E			J+						X
KH 21					2+			W						X
KH 22								x						X
KH 23								x						X?
KH 25		150+												X?
KH 26		60+			2EL ⁴									
KH 27			4+		x									
KH 28			x											X
KH 29								J+						X
KH 30					9									X
KH 33								x						X
KH 34					x			2						
KH 35								x						X
KH 38								J+						X
KH 39							x							X?
KH 46						x								X
KH 54			1+					1						X
KH 55					x		B							X
KH 57								E+	1?					X
KH 58					x			9ff						X
KH 59	10													X?
KH 60						W		x						X

Tablet	W+N	100	120	122	30	131	302	303	304	21	22	23	85	other
KH 61			1W		10?	1	L ²	2						X
KH 65					x?									X?
KH 73					1				1					X
KH 75					B			KL ²						X
KH 76								EL ²						X
KH 77								W+						X?
KH 80							x							X
KH 81											x?			X
KH 82							L ²							X
KH 84									J					X
KH 85						x	J+	D						X
KH 86								1ff						X
KH 87												1		X
KH 88					18									
KH 91			1		x	x								X
KH 92	11?													

Table 3: Linear A Commodities in the Zakros Tablets


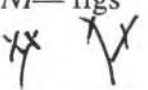

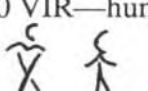
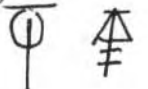
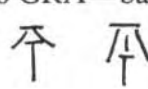

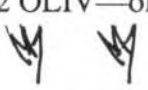
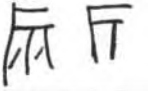
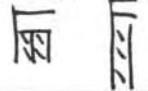

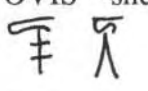
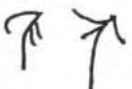
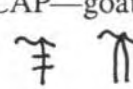
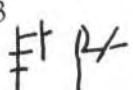
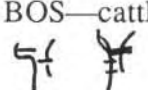




Tablet	W+N	100	120	122	30	131	302	303	304	21	22	23	85	other
ZA 1			47		42J									X
ZA 4	106+					104+								
ZA 5						37J								
ZA 6			90+	25+		50			x					X
ZA 7	7													X
ZA 8					9ff									
ZA 9										14+				
ZA 10	12					39J+								
ZA 11			9+	3		ff								X
ZA 14	61													
ZA 15						95*								
ZA 18			4ff	E			BB							X
ZA 20	156													
ZA 22										102+				X
ZA 26										20				X
ZA 27	2													X
ZA 28			1+											X?
ZA Zb3						32								

ILLUSTRATION

Pl. XXI Linear A and Linear B ideograms.

Linear A

Linear B

Definite Identification	AB 30 	*30 NI—figs 
	AB 100 	*100 VIR—humans 
	AB 120 	*120 GRA—barley 
	AB 122 	*122 OLIV—olives 
	AB 131 	*131 VIN—wine 
Probable Identification	AB 21 	*21 OVIS—sheep 
	AB 22 	*22 CAP—goats 
	AB 23 	*23 BOS—cattle 
	AB 85 	*85 SUS—pigs 
	A 302 olive oil 	
No Linear B Parallel	A 303 grain? 	
	A 304 unknown 