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The Price of Wheat in Roman Egypt under the Principate*

As the main source of bread, the staple foodstuff of antiquity, wheat is of peculiar interest to the economic historian of the period. Though bread is generally acknowledged to have been a vital part of the diet of the masses, the extent of its importance has not always been fully recognised.[1] The menu at dinners of plebeian colleges in Italy under the Principate appears to have commonly consisted of bread and wine.[2] Small property-owners in Egypt who disposed of their estates during their lifetime are seen to stipulate for their own maintenance at the expense of their heirs. Their only alimentary requirements are wheat and oil.[3] The dietary provision is often the same in Egyptian apprenticeship and entertainment contracts.[4]

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* The following abbreviations are used:

JOHNSON = A. C. JOHNSON, Roman Egypt, 1938 (T. FRANK [ed.], An Economic Survey of Ancient Rome, vol. II).

SCHWARTZ = J. SCHWARTZ, Les archives de Sarapion, 1961 (Inst. franç. d'arch. orient., Bibl. d'étude t. 29).

WALLACE = S. L. WALLACE, Taxation in Roman Egypt from Augustus to Diocletian, 1938.

Standard papyrological abbreviations are used.

The list of prices below adds 22 items to JOHNSON's list (JOHNSON 310–312). A few of JOHNSON's examples were found to be defective and have been discarded.

[1] Cf. e. g., P. A. BRUNT, Italian Manpower, 1971, 382: «In any event no one could live on bread alone. (The) purpose (of grain distributions at Rome) was to supplement what the poor had to buy.»

[2] R. P. DUNCAN-JONES, The Economy of the Roman Empire: Quantitative Studies, 1974, 263, n. 3; 364–5.

[3] For example P. Mich. V 321, A. D. 42; V 322 a, A. D. 46. The Egyptians were specifically said to be bread-eaters by Hecataeus (Athenaeus 418 e). Insofar as it is true, this presumably means that, unlike the Greeks who accompanied their bread with meat when they could get it (Athenaeus 141 b, 149 e-f, 412 e, 414 f, 415 b; Thuc. 4.16.1), the Egyptians actually preferred a cereal diet.

[4] E. g. P. Mich. V 355, cI A. D.; P. Oxy. XXXIV 2721, A. D. 234, where wine is also provided. Music-students at Alexandria supported by the Emperor Julian received double rations of wheat, together with oil and wine (Julian 422 a). See also papyri listed in JOHNSON 389–391; 299–300. Egyptian children were regularly reared on an even humbler vegetarian diet instead of on bread, according to Diodorus Siculus (1, 80, 5–6).

Similar indications are available from Mediterranean areas in more recent periods. Labourers on a farm in Sicily at the end of the seventeenth century lived on bread and wine, together with small amounts of cheese and oil.[5] Paupers in Languedoc in the eighteenth century seem to have been given a diet composed almost entirely of bread and very small amounts of wine.[6] An observer of conditions in Lucania under Mussolini reported that the agricultural poor in that remote corner of Italy ate bread and very little else.[7] A similar observation has been made of the diet of the poor in the Levant in the present century.[8] Although such a diet leads to malnutrition and greatly increases vulnerability to disease,[9] the evidence for its prevalence in the Mediterranean area both in antiquity and to a limited extent in more recent periods is categorical. There is no reason to assume that when ancient sources specify bread as the only solid food in the diet of the people they must be defective or incomplete.

Egyptian evidence is immensely important for any study of the price of bread in classical antiquity. Egypt provides substantially more data than all other areas put together. Most of the evidence refers to wheat in its raw state, perhaps because milling and baking were often undertaken by the consumer in the home, perhaps also because it was quite common to buy in bulk, which precluded purchases in the form of bread.[10] The present study concentrates on wheat in its unprocessed form.

Analysis of the details shows that the evidence for Egyptian wheat prices under the Principate falls into three distinct categories. The largest and most important is wheat prices and valuations belonging to private transactions in Lower Egypt. 36 out of 64 prices belong to this category (nos. 1–37). Next are 18 official prices and valuations from the same area (nos. 48–64). Finally there are 10 prices from Upper Egypt, mainly representing money dues commuted for wheat (nos. 38–47). The measure normally used in private transactions appears to have been the artaba of 40 choenices (29.2 litres or 3.33 Roman modii; see Appendix I). A larger artaba of 48 choenices equal to 4 Roman modii appears to have been usual in transactions involving the State (see nos. 49 a and 58). There are also indications at a later date of a still larger government artaba of 60 choenices (5 Roman modii; no. 63 and note).

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[5] M. Aymard-H. Bresc, Annales (ESC) 30, 1975, 597–8.

[6] J. Vedel, ibid. 486–9.

[7] C. Levi, Cristo si è fermato a Eboli, 1945, chapter 4.

[8] A. H. M. Jones, The Later Roman Empire, 1964, I 447.

[9] See n. 6.

[10] For milling in the home see e. g. Athenaeus 263 b. In a fourth century work where the high cost of bread is at issue (Julian, Misopogon 369 d, 370 a), all the prices given refer to raw wheat (369 b-c). It is noteworthy that Cato's ‹free range› slaves received their rations in the form of wheat, and only the chained slaves (who would live in a prison cell when not working) were given bread (Cato 56–8).

I Regional variation

The source of the valuations from Upper Egypt (nos. 38–47 below) is not entirely clear; but insofar as they refer to payments of taxes, the valuations are likely to be official. Evidence from Lower Egypt shows that official prices might be of the order of 30% lower than those prevailing on the open market in the same area (see Section V). But even if the prices from Upper Egypt are corrected on this basis, they still appear substantially below contemporary market prices from Lower Egypt. For the period up to A. D. 100 where there is evidence from both areas, the median average in Upper Egypt is 3.5 drachmae per artaba (uncorrected) and 5 drachmae (corrected). The corresponding median average for Lower Egypt is 8 (see Section IV), more than twice the uncorrected average for Upper Egypt and 60% higher than the corrected figure.

It appears entirely plausible that commodity prices in Upper Egypt, the area furthest from the capital and its mint, should have been markedly below those in Lower Egypt. Prices in Alexandria itself, one of the biggest cities of the Empire, may well have been even higher than those in Lower Egypt, if only because prices in large towns were characteristically higher than those outside.[11]

II Seasonal variation

It is well known that wheat prices are often volatile in agrarian societies where bread is essential to subsistence diet. Cicero happens to single out a fluctuation of two-fold or more between the price just before the harvest, and the price after the harvest in Sicily in 74 B. C. The price before the harvest was HS 20 per modius, but the price after it was so low that forced commutation of wheat-levies for money at a price of HS 12 was a severe hardship for the producer.[12] Evidence from a much later date suggests however that fluctuations did not necessarily follow a simple pattern of high prices before the harvest and low ones immediately after it. During a 15-year span throughout which weekly average prices of wheat at San Sepolcro in Tuscany are known (from 1507–1521), the price at the beginning of August when the new harvest was beginning to affect prices was lower than that at the beginning of April in 10 years out of 15. But on average during these 15 years the early August price was only 9% lower than that ruling in early April.[13] Nevertheless, overall fluctuations of up to two-fold within 12 months (perhaps partly affected by non-agrarian factors such as public security) were not uncommon. For example, maximum levels exceeded minimum levels by 106% in 1507, by 100%

[11] DUNCAN-JONES (op. cit. n. 2) 261 n, 345–6.

[12] Verr. 2, 3, 214–5.

[13] A. FANFANI, Indagini sulla «rivoluzione dei prezzi», 1940, 81–111. The averages (for the first week of each month) are April: 77.8; and August: 70.75.

in 1508, by 84% in 1509, and by 86% in 1511. There could also be years of relative stability, such as 1518 with only 20% variation and 1519 with 29% variation between the extremes.

Only three of the Egyptian sources provide price series within a single 12-month span. But all three series show some fluctuation within the span, especially the first. Attested purchases on behalf of employees of a record office at Tebtunis in A. D. 45/6 opened at 4.4 drachmae per artaba on 7 September, rising to 5.7 on 21 September. The price rose further with 3 purchases at 8 drachmae on 24 September (nos. 4–7 below). Prices fell back slightly to 7.3 and 7.6 drachmae on 26 September and after 1 October. But they had recovered again to 8 drachmae shortly afterwards (nos. 9–12). Thus overall variation of 93% occurs within a period of less than three weeks, not long after the harvest.[14]

In the second series, attested sales of wheat by a producer at Hermopolis open at 10 drachmae in September 78, sales at this rate taking place on the 10th, the 17th and the 21st. By January, when we have further information, the price had risen to 11 drachmae, and sales at this rate are made on the 13th, the (?20th) and the 27th of January, and on the 3rd of February (nos. 14–20). The fluctuation visible here is only 10%. A third price series from Karanis in 191/2 recording sales by a producer shows much higher prices, which are probably largely due to inflation in the intervening period (see Section IV). They are too few to reveal any seasonal trend. The prices rise from 18 to 20 drachmae per artaba in December, falling back to 18 drachmae in January/February, a variation of 11% (nos. 26–8).

This evidence gives the impression that fluctuations in Egyptian wheat prices from month to month could on occasion be as great as the two-fold variation indicated by Cicero, but that they did not necessarily follow a stereotyped pattern of dramatic seasonal variation. Although the direct evidence just cited is very scanty, the fact that other random ‹sightings› of prices on a particular day in a particular year (see Section III) provide few suggestions of wide price variation within a short period may also support the view that seasonal fluctuation was not customarily very great. The fact that the State was regularly prepared to pay a minimum of 8 drachmae per tax artaba (equal to 6.67 drachmae per domestic artaba, see p. 258) probably argues that prices were rarely much below this level even seasonally, since otherwise it could have been cheaper for the State to buy in the open market.

Evidence from mediaeval Egypt shows that there was a tendency in some years for the price to rise sharply in winter or spring before the main harvest.[15] Thus in

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[14] Leases of the Roman period often specify payment of the wheat rent in Pauni (26 May–24 June), presumably the earliest date at which it was available (e. g. PSI 315; P. Oxy. 910; 2188; 2351; SPP V 119, VII).

[15] E. Ashtor, Histoire des prix et des salaires dans l'Orient médiéval, 1969, 284–6.

January 1300 the price in Cairo was 10–13 dirhams per irdabb (69.9 kg), but in the spring it had more than doubled to 27 dirhams; in the summer after the harvest it fell to 20 dirhams, and fell further to 15 dirhams in the autumn. At the beginning of 1328 the price in Cairo rose from 13 to 20 dirhams. In February 1336 it rose from 15 to 50 dirhams, and official regulation of the price at a controlled level of 30 dirhams only led to black market dealings at prices of 60–70 dirhams. In 1375 the price fell after the harvest from 130 to 60 and then to 30 dirhams.

Though these prices are also from Egypt, they do not necessarily offer a very close analogy to the evidence available for the Roman period. They refer to prices in the largest city in Egypt, where there was a substantial population dependent on corn brought in from the countryside. The Roman evidence in contrast refers to small towns and villages in producing areas. Prices in a large urban centre dependent on long-distance transport for its food supplies might well have been more volatile than those in a producing area. Nevertheless, the pattern of violent fluctuations in certain years which can be seen in mediaeval Cairo may be similar to that which obtained in Roman Alexandria, about which there appears to be no direct evidence.

III Year-to-year fluctuation

There is no evidence identifiable as referring to successive harvests; the price series discussed in Section II are too short to refer to more than seasonal variation. Consequently year-to-year fluctuations are difficult to identify. The most obvious deviation from any norm is in the price of 1.9 drachmae attested in a papyrus from Tebtunis at the end of 5 B. C. (no. 2). Unfortunately it comes from a letter sent from another place whose location is unknown; conceivably it might even come from Upper Egypt where prices were generally lower (see Section I). If we assume nevertheless that it refers to Lower Egypt, it argues price levels in the winter of 5 B. C. some 4–5 times below those attested in other years in the same period, for example c. 9.3 drachmae in 18 B. C. (no. 1); 9 drachmae in May-June A. D. 16 (no. 3). Another clear variation can be seen in A. D. 99, explicitly attested as a year of famine, when the official requisition price was temporarily doubled (no. 49; see p. 256).

Year-to-year fluctuations of this order can also be found in the Tuscan evidence. For example, the average price at San Sepolcro in 1505 was 4.6 times greater than the price in 1525; and the price in 1540 was 4.3 times greater than the price in 1538.[16] There is too little Egyptian evidence to say whether variations of this order were frequent. The total range of variation indicated by the averages of the two first century price-series is considerably narrower, amounting to about 30% (see Section IV). Probably as in Tuscany, year-to-year variations of 100% or more were the exception rather than the rule.

[16] See FANFANI (n. 13 above) 68.

IV Long-term price movements

If the private evidence from Lower Egypt is divided into three periods, the averages give a consistent impression of increases in price, rising slowly between first and second centuries, and much more rapidly in the third.

				First period = 100		
	To A.D. 100	101–200	201–300	To A.D. 100	101–200	201–300
Mean	8.4	12.9	47.3	100	141	563
Median	8	12	18	100	150	225
Maximum	11	20	200	100	180	1820
Minimum	1.9	6	12	100	320	630
Total sample	19	10	6			

A further index of inflation in the third century is provided by the official wheat prices. The median of the three prices from this period, 220 drachmae (no. 64 A. D. 294) is 27 times higher than the second century norm of 8 drachmae (nos. 48, 50–61). Though the degree of inflation is much higher than that represented by the median of the private wheat prices from Lower Egypt, the discrepancy appears to be merely accidental. The private data considered here does not include any true market transactions as late as the 290's, and the apparent median actually comes from internal valuations referring to wheat consumed by estate employees as early as the 250's, which do not in any case indicate price-levels on the open market (nos. 32, 34). The likelihood is that changes in official prices represent a minimum index of inflation, and that open market prices may have risen by a larger factor (cf. Section V).

The occurrence of very large price-rises in the middle and late third centuries is incontestable, but the earlier progress of inflation is more difficult to discern. If the median prices established by the three price-series are taken as stages in the course of inflation, the progression reads: 7.8 drachmae in A. D. 45/6, 10.5 in A. D. 78/9, and 18 in A. D. 191/2. Since the last of these figures refers to the year following a year of famine and shortage in Rome it might represent an abnormal level.[17] But the only other authentic market-price from approximately the same period also shows a level of 18 drachmae (no. 31, c. 180/220; see also no. 30, 19.4 drachmae probably not later than 200). Furthermore, the rate of increase between the second and third of the median prices is actually lower than between the first and second. The progression from 7.8 to 10.5 drachmae in 33 years represents annual compound growth of 0.91%, whereas a progression from 10.5 to 18 drachmae over the next 113 years represents growth at the much lower rate of 0.5%.

[17] But the sources report the famine as being due to manipulations at Rome, not to harvest failure (Herodian 1, 12, 3–4). Cf. C. R. WHITTAKER, Historia 13, 1964, 348–369. There is no basis for JOHNSON's view (435–6) that all 3 price-series were ‹exceptional›.

But the evidence is so scanty that these indications cannot be pressed very far. Three later prices from Hermopolis, the source of the second price-series, show no advance on the levels of that series, although they are some 30–50 years later. The median average is 9 drachmae, 1.5 drachmae lower than the median in the series of A. D. 78/9, and the mean is 9.3, 1.2 drachmae lower than the earlier mean (nos. 22–24). It may thus be that the earlier Hermopolis figures for some reason represent an exceptionally high level; it is less likely that the later ones are exceptionally low, since they apparently refer to three different years. This suggests that most of the increase visible between the mid-first century and the late second century may have taken place after the early second century.

An increase of about two-fold over first century levels by the end of the second century would roughly mirror evidence from Ephesus which shows an increase of this order in bread prices between the early second and the early third century.[18]

V *Official wheat-prices*

Abundant evidence about official tariffing of wheat prices in one of the provinces appears in book 3 of Cicero's Verrines. He shows that there was a regular three-tier system of compulsory purchase in Sicily, over and above the tithe of 10% of the crop for which there was no recompense. A second tithe (*frumentum emptum*) was levied, with a refund of HS 3 per modius. In addition a further amount of wheat levied proportionately on all the cities (*frumentum imperatum*) was payable with a higher refund of HS 3½ per modius.[19] Finally, still more wheat was requisitioned, nominally for the governor's use (*frumentum in cellam*); this wheat was evidently levied in quantities so large that even governors of proven integrity could make substantial profits without incurring odium, if market conditions were favourable. Compensation here was HS 4 per modius.[20] The third levy could be varied at the wish of the governor or (sometimes) at the request of the tax-payers, to payment in money instead of in wheat (*aestimatio*). Verres followed the practice of his two immediate predecessors in commuting his personal wheat for cash at the very high rate of HS 12 per modius which they had adopted.[21]

The evidence from Egypt, consisting as it mainly does of fortuitous examples of individual transactions, does not allow any comparable synopsis of the requisition system that existed there. If the prefect requisitioned wheat for his own use, as he is almost bound to have done (or if he preferred to commute it for money), this may

[18] See T. R. S. BROUGHTON, in: T. FRANK (ed.), An Economic Survey of Ancient Rome IV, 879–80.

[19] Verr. 2, 3, 163.

[20] 2, 3, 188; 217.

[21] 2, 3, 214–5. The predecessors were C. Licinius Sacerdos and M. Antonius Creticus (BROUGHTON, MRR II, 101; 104; 111).

have been a charge on the lands nearest to Alexandria in the Delta area from which few records survive. The available papyri do not appear to show any nuance between *frumentum emptum* (category 1 above) and *frumentum imperatum* (category 2).[22] What they do attest is frequent payments for ‹synagoristic› or requisitioned wheat, generally at a rate, where anything is known, of 8 drachmae per artaba.[23] Corn was also requisitioned specifically for the military annona (nos. 48 and 63); the compensation price for this was likewise 8 drachmae in the pre-inflationary period (no. 48). Customs-dues were likewise levied on a notional value of 8 drachmae per artaba (nos. 50, 55, 60); money taxes could be commuted at this rate (no. 61); and donkey-drivers employed by the State were paid 8 drachmae in lieu of each artaba of wheat due to them (no. 59). In view of the rigid consistency of this evidence, the presumption must be that the same artaba measure was in use throughout. In the only cases where the measure is explicit (payments for synagoristic wheat at Oxyrhynchus in A. D. 100 and 154, nos. 49 a and 58), it proves to be the artaba of 48 choenices, equal to 4 Roman modii, and 1/5 larger than the normal domestic artaba (see Appendix I).

The conservatism manifested by Verres in adopting a price fixed by his predecessors is also visible here. Requisitions of synagoristic wheat were being compensated at 8 drachmae per artaba over a span of at least three generations. This rate is attested in A. D. 79, 100, 128, 137 and 154 (nos. 48, 49 a, 51, 52, 56–58). Since the likelihood is that the normal rate would only have been changed under significant inflationary pressure, the price of 8 drachmae may well go back to the early days of Roman Egypt. In this case its effective lifetime would have been at least a century and a half. The one undoubted deviation from this rate before the third century shows nevertheless that the governor might be prepared to take current market conditions into account in years of very poor harvest. In A. D. 99, attested by Pliny as a year of famine in Egypt, the compensation price doubled to 16 drachmae per artaba (no. 49).[24] But it should be noted that indulgence was not carried to the point of exempting tax-payers from forced sales, despite the evidently acute shortage of that year.

Further responses to market conditions are shown in the last three prices in the series. The second-century conversion rate had risen 5-fold to 40 drachmae per artaba by the time that some villages in the southern Fayum were being assessed for requisition, at some point between 260 and 290 (no. 62). By 293, compensation for wheat paid to the annona had reached 300 drachmae per artaba by the *metron dekaton* (probably equivalent to 240 drachmae on the artaba used in the earlier transaction, no. 63; see Appendix I). This is at least 30 times higher than the rate prevailing 140 years earlier. The attainment of such a high level almost certainly

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[22] Cf. J. LESQUIER, L'armée romaine d'Égypte, 1918, 366.

[23] For the tax, cf. WALLACE 22–3.

[24] Pliny, Pan. 31.

implies that there had been a number of piecemeal adjustments in the interim. It would be no surprise if the notion of a single standard conversion-rate had been eroded as a result. In 294 donkey-drivers were receiving payment at 220 drachmae per artaba, apparently slightly lower than the annona payments attested a year earlier (no. 64, cf. no. 63).

Cicero depicts the practice underlying the scheme of compensation for corn in Sicily as being at best generous to the taxpayer, and never less than fair. Official compensation ranged from HS 3 to HS 4 per modius, whereas the usual market price in Sicily, he frequently insists, was only HS 2, 2½, or at the very most HS 3 per modius.[25] The fact that Sicilian farmers rarely received the stipulated sums from Verres was apparently no fault of the system that he was meant to be implementing.

The Egyptian rate of compensation appears however to have sagged below the market price, at least by the date when our sources begin. Comparisons can only be made if we place the measures used on the same footing. Converting the 48-choenix tax artaba used for requisition in the second century (no. 58) to the common domestic artaba of 40 choenices (Appendix I), the standard requisition payment becomes 6.67 drachmae per artaba. This is 15% lower than the median average of the 9 prices in the series from Tebtunis of A. D. 45/6 (7.8 drachmae), and 36% lower than the average of the 7 prices from Hermopolis of A. D. 78/9 (10½ drachmae). Even if all artabae used in the Hermopolis account are identical, which seems unlikely, since the compensation of 8 drachmae paid for wheat sold to the annona implies the use of the tax-artaba in that instance (no. 48), the compensation provided would still be 24% lower than the average market price achieved by this producer. Thus it would seem that the government's practice in Egypt under the Principate was less favourable to the farmer than that reported in Sicily in the first century B. C. Since crude schematisation lies at the heart of the compensation rate, it is clear that no very close adjustment to prevailing market prices can have been undertaken (8 drachmae per artaba of 48 choenices is effectively equal to 2 drachmae or HS 2 per Roman modius). Nevertheless, if introduced in the reign of Augustus the rate may have been somewhat more favourable at the outset than it appears when compared with the free market prices of mainly later date that happen to survive.

VI Wheat marketing

In the evidence from Lower Egypt three-quarters of the private sales that occur in a known month take place within the five months from September to January.

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[25] Official compensation: Verr. 2,3,163; 188. Market prices: HS 2: 2,3,174; 2,3,189; HS 2½: 2,3,84; 2,3,90; 2,3,173; 2,3,175; cf. 2,3,72; HS 2–3: 2,3,189; 2,3,194.

This evidently reflects the fact that farmers tended to sell most of their crop soon after the harvest. The seasonal price fluctuations incorporating rises by as much as 93% discussed above, are themselves largely a function of this practice, which would cause wheat to be abundant and cheap soon after a harvest, but scarce and dear later on.

If the wheat was principally bought up by dealers who would market it throughout the year, supply-fluctuations and therefore price-fluctuations due to the harvest could potentially have been minimised. But there is little indication in the evidence here that wheat was normally sold by the producer to intermediaries (see n. 27). The two first-century price-series represent on the one hand purchases by a consumer, and on the other, sales by a producer (nos. 4–12; 14–20). The average price achieved by the producer is actually higher than that paid by the consumer. In an age before agricultural subsidies, unless price-levels in the two years concerned were markedly different, these figures leave no room for any middleman's profit. Similarly, there is no hint of the presence of corn-dealers in Cicero's lengthy account of wheat-taxation and wheat-selling in Sicily in the first century B. C. Cicero says that he can prove that wheat never changed hands at more than HS 2 1/2 per modius in a particular year, by referring to the accounts of the richest cultivators on the island.[26] In other words, a producer's sales-records would be enough to show the highest prices that wheat was selling at, again leaving no room for profit by a putative middleman.

It seems likely that the consumer who was not also a producer often bought his grain in bulk from a farmer during the season when prices were most favourable, then processing it into bread (or getting it processed) as and when required. Nevertheless, corn-dealers existed in Egypt (they were one of the categories liable to a special poll-tax), and there were also professional bakers.[27] How important they were and what role they fulfilled in the overall pattern of exchange are subjects for further detailed investigation.

VII Conclusions

Egyptian wheat prices in this period fall into three categories which must be considered separately: market prices from Lower Egypt, official valuations from Lower Egypt, and official or quasi-official valuations from Upper Egypt. Prices from the two areas show a clear regional contrast, those from Upper Egypt being substantially below those from Lower Egypt. In Lower Egypt official valuations are stereotyped at a level which appears somewhat below that of typical free

[26] Verr. 2, 3, 173.

[27] WALLACE 211; JOHNSON 369 ff. The one reference to corn-dealers in the present evidence occurs in no. 9, a purchase from ‹corn-dealers in the grain-stores (*thesauroi*)›.

market prices. But they were adjusted in years of famine, and were raised by a very large factor when ‹hyper-inflation› took hold in the late third century.

The market-prices from Lower Egypt fluctuate seasonally by as much as a factor of 2, and (in one case) from year to year by as much as a factor of 4. Average prices rose by roughly half between the first and second centuries A. D. A typical level at the end of the second century seems to have been 18 drachmae per artaba, approximately twice the normal level 100 years earlier. Prices appear to have doubled again by c. 260/270 and increased at least a further 5-fold by the middle 290's.

Comparisons between Egyptian wheat-prices and those current elsewhere in the Empire are made difficult by the dearth of evidence outside Egypt. One of the very few explicit indications of a typical level comes from Antioch in Pisidia, where HS 2 1/4 was the normal price per modius in the 90's A. D.[28] This is similar to contemporary levels in Lower Egypt (where 8 drachmae per ‹domestic› artaba approximates to HS 2 1/2 per modius), but appears to be substantially more than prices in Upper Egypt at the same date (where 5 [?] drachmae would approximate to HS 1 1/2 per modius). Prices in Africa in the late second century may have been about HS 2 1/2 per modius, apparently lower than contemporary prices in Lower Egypt (where, if typical, the price of 18 drachmae attested at the end of the second century would approximate to HS 5.4 per modius). Prices in Italy at the start of the second century of the order of HS 4 per modius were perhaps higher than contemporary prices in Egypt (a median of 9 drachmae, see p. 246, corresponds to a price of HS 2.7 per modius).[29]

If local wheat was not as cheap as we should expect from Egypt's role as a major exporter of wheat, this may well be because high levels of taxation gave Egyptian wheat a scarcity-value in its own home that it would not have had if the country had been less heavily exploited.[30]

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[28] AE 1925, 126b.

[29] DUNCAN-JONES (op. cit. n. 11) 50–51.

[30] For tax-rates see e. g. P. BOUR. 42 and WALLACE 11–19.

List of prices

Entries numbered in italics are the subject of notes on pp. 255 ff. below

I Prices and valuations from private transactions in Lower Egypt

No.	Price (drachmae per artaba)	Quantity (artabae)	Place	Date	Reference
1.	c. 9.3	60	Euhemeria	c. 18 B.C.	P. Fay. 101
2.	1.9	77.7	?	27 Nov./26 Dec. 5 B.C.	P. Teb. II 459
3.	9	–	Tebtunis	26 May/24 June A.D. 16	PSI IX 1028
4.	4.4	1.83	Tebtunis	7 Sept. 45/6	P. Mich. II 127
5.	5.7	3.5	Tebtunis	21 Sept. 45/6	P. Mich. II 127
6.	8	2	Tebtunis	24 Sept. 45/6	P. Mich. II 127
7.–8.	8	1	Tebtunis	24 Sept. 45/6	P. Mich. II 127
9.	8	3	Tebtunis	24 Sept. 45/6	P. Mich. II 127
10.	7.3	1.1	Tebtunis	26 Sept. 45/6	P. Mich. II 127
11.	7.6	2.1	Tebtunis	after 1 Oct. 45/6	P. Mich. II 127
12.	8	1.5	Tebtunis	after 1 Oct. 45/6	P. Mich. II 127
13.	8.7	1.83	Tebtunis	15 Dec. 47	P. Mich. II 123, verso XI, 26–7
14.	10	6	Hermopolis	10 Sept. 78	P. Lond. 131
15.	10	14	Hermopolis	17 Sept. 78	P. Lond. 131
16.	10	4	Hermopolis	21 Sept. 78	P. Lond. 131
17.	11	5	Hermopolis	13 Jan. 79	P. Lond. 131
18.	11	5	Hermopolis	(?) Jan. 79	P. Lond. 131
19.	11	2	Hermopolis	27 Jan. 79	P. Lond. 131
20.	11	4	Hermopolis	3 Feb. 79	P. Lond. 131
21.	12	–	Oxyrhynchus	7 Oct. 112	P. Oxy. XXII 2351
22.	9	5.5	Hermopolis	30 March/25 April 124	P. Sarap. 60
23.	7	–	Hermopolis	100/135	P. Sarap. 92
24.	12	7.8	Hermopolis	27 Nov./26 Dec. 100/135	P. Sarap. 79 b
25.	6	–	Heracleopolis	Sept./June 138/161	P. Baden 79
26.	18	1.3	Karanis	27 Nov./26 Dec. (191)	P. Cair. Goodsp. 30, col. 13
27.	20	1	Karanis	27 Nov./26 Dec. (191)	P. Cair. Goodsp. 30, col. 15
28.	18	2	Karanis	26 Jan./24 Feb. (192)	P. Cair. Goodsp. 30, col. 20
29.	8	17	Socnopaiou Nesos	100/200	SPP XXII 110

No.	Price (drachmae per artaba)	Quantity (artabae)	Place	Date	Reference
30.	19.4	0.5	(Fayum)	21 March 100/200	P. Grenf. I 51
31.	18	50	–	(c. 180/220)	P. Iand. 94
32.	12	13	Theadelphia	29 Aug./27 Sept. 254 (?)	P. Lond. III 1226
33.	16	100	(Memphis)	25 July/17 Aug. 255	BGU I 14
34.	(12)	13	Theadelphia	25 Feb./26 March 250/260	P. Flor. III 321
35.	24	1	Oxyrhynchus	(c. Aug.?) 269	P. Erl 23 (101)
36.	200?	2	Karanis	276	O. Mich. I 157 with YOUTIE, TAPhA 76, 1945, 144–6
37.	20	1	Philadelphia	100/300	BGU VII 1717

II Wheat prices from Upper Egypt

The sources for wheat prices from Upper Egypt (ostraka instead of papyri) are short and inexplicit. Most take the form of receipts for money taxes or dues paid in wheat at a rate which may or may not have been officially determined. They do not show consistent patterning such as can be seen in the government assessments of wheat prices in Lower Egypt (nos. 48 ff.).

No.	Price (drachmae per artaba)	Quantity (artabae)	Place	Date	Reference
38.	4	–	Thebes	15 Sept. 13 B.C.	O. Strassb. 46
39.	2.5	1.25	Thebes	10 B.C.	O. Strassb. 48
40.	2.5	20.5	Thebes	31 July 9 B.C.	O. Strassb. 51
41.	3.5	2	Coptos	25 Jan. 4 B.C.	O. Petr. 97
42.	3.5	1	Coptos	25 Jan. 4 B.C.	O. Petr. 199
43.	3.5?	2.12	Coptos	25 Jan. 4 B.C.	O. Petr. 201
44.	5	1/6	Thebes	24 Feb. A.D. 56	O. Wilck. 1558
45.	2.2	11.5	Coptos	1 March 65	O. Bod. 210
46.	24?	1/24	Thebes	153	O. Wilck. 1587
47.	9	2	–	–	O. Ash. 91

III Official wheat prices and valuations from Lower Egypt

The artaba in use here is likely to be one of 48 choenices (see Appendix I), 20% larger than the domestic artaba on which prices in section I are likely to be based.

No.	Price (drachmae per artaba)	Quantity (artabae)	Place	Date	Reference
48.	8 (sale to annona)	1	Hermopolis	Feb. 79	P. Lond. I 131
49.	16 (synagoristic purchase)	12	Oxyrhynchus	2 Dec. 99	P. Oxy. XLI 2958
49 *a*.	8 (synagoristic)	25.8	Oxyrhynchus	23 Jan. 100	P. Oxy. XLI 2960
50.	(8) (customs-valuation)	990	Nile shipment	before 200	P. Oxy. XIV 1650 Wallace 465 n; 41
51.	8 (synagoristic)	–	Hermopolis	128	P. Sarap. 79 e
52.	8 (synagoristic)	217.4; 3	Oxyrhynchus	137	PSI XII 1262
53.	7 (8) (synagoristic)	8.25	Tebtunis & Kerkeosiris	23 March 149	P. Teb. II 394
54.	8 (synagoristic)	–	Themistes division	100/150	P. Iand. 138
55.	(8) (customs-valuation)	5	Umm el Atl	152	P. Fay. 76 a, cf. pp. 199–200
56.	8 (synagoristic)	5.4	Oxyrhynchus	28 Feb. 154	P. Oxy. XLI 2961–2963
57.	8 (synagoristic)	10	Oxyrhynchus	15 Feb. 154	P. Oxy. XLI 2964–2966
58.	8 (synagoristic)	9 5/6	Oxyrhynchus	3–7 March 154	P. Oxy. XLI 2967
59.	8 (commutation of wheat due to donkey-drivers)	–	Theadelphia	155	P. Col. I 4; P. Berl. Frisk 1
60.	(8) (customs-valuation)	12	Socnopaiou Nesos	162	P. Ryl. II 197 with P. Fay. pp. 199–200
61.	8 (commutation of *prosthema*)	1	–	100/200?	SB I 2088
62.	40 (tax-payment)	33; 2	S. Fayum	c. 260/290	P. Stras. 295
63.	300 (240?) (sale to annona)	67	Oxyrhynchus	293	P. Oxy. XVII 2142
64.	220 (as no. 59)	–	(Oxyrhynchus)	294	P. Harris Appendix pp. 109–110 (no. 93)

Notes on the Price List

1. The papyrus indicates that 34 1/3 artabae of cummin, 50 artabae of cnecus, and 15 14/15 artabae of lentils equal 60 artabae of wheat in value. The price of cummin is stated as 7 drachmae per artaba, and that of cnecus as 4 drachmae per artaba. If lentils correspond to wheat in value in the ratio 15 : 19 (as in P. Col. I recto 6), then 47.42 artabae of wheat costs 440 1/3 drachmae, and the wheat price per artaba is 9.29 drachmae. (JOHNSON's price of 3 drachmae 2 obols is based on a misreading.)
2. The transaction, reported to a correspondent in Tebtunis, took place at another location which is not identified.
3. The figure refers to a cash payment to which the borrower becomes liable should he fail to repay an interest-free grain loan in kind after the harvest. The lender specifies the measure to be used for the wheat if repaid in kind as μέτρῳ τετραχοινείκῳ θησαυροῦ Λιβυίας Σεβαστῆς.
4. Nos. 4–12 refer to purchases of wheat on the open market by Kronion, one of the operators of the grapheion at Tebtunis.

13. The 1 5/6 artabae of wheat was used to pay for beer, but its money-valuation (16 drachmae) is stated. Like nos. 4–12, the purchase was made by one of the employees of the grapheion at Tebtunis.
14. Nos. 14–20 and no. 48 are all sales by a producer whose detailed accounts survive. For a general commentary on these accounts see A. SWIDEREK, La propriété foncière privée dans l'Égypte de Vespasien, 1960.
21. Under the terms of a 4-year lease, the half of 24 arouras that was planted with chickling was to pay a rent of 2 artabae of wheat or 24 silver drachmae, per aroura. The money-equivalent may have been set high to allow for any possible future fluctuation during the 4-year period. The landlord Phatres specified the measure to be used for wheat-payment as μέτρῳ τετάρτῳ παραλημπτικῷ αὐτοῦ Φάτρεως.
23. Eutychides reported in a letter to his father Sarapion that the price of wheat was no more than 7 drachmae (per artaba) at the time of writing. Since from what he also says in the letter Eutychides had sold the young barley, but not (evidently) the wheat, the letter may have been written soon after the harvest.
24. Though 12 drachmae per artaba is apparently high for the early second century, it should be noted that this is still a selling price by a producer (see Section VI, p. 250).
26. Nos. 26–28 all come from the same detailed set of accounts and apparently refer to selling prices by a producer. For discussion of their level, see p. 246.
29. The nature of the commodity is not stated, but the price makes wheat the most likely candidate. The small fragment does not identify the nature of the

transaction, which may even be synagoristic (cf. p. 248), since 8 drachmae was the standard price for synagoristic wheat.

30. Since the price for oil mentioned in the same accounts (1.3 drachmae per cotyle) is as low as first and second century prices (JOHNSON 316–7), the date is probably not later than 200, as suggested by JOHNSON 317 (contradicting JOHNSON 311).

31. This is a selling price by a producer, part of whose proceeds a brother of the vendor, apparently writing from the country, remits to a third brother to be used for specified purchases, presumably in a town.

32. Like no. 34, this is one of the monthly accounts submitted to Aurelius Appianus, former exegete of Alexandria, by his steward Heroninos, who ran Appianus' estate in Theadelphia. For the archive of Heroninos as a whole, cf. O. MONTEVECCHI, La papirologia, 1973, 256. The ‹sale› of wheat here was purely an accounting device representing the notional value of wheat consumed by casual employees and others. That is why it has the same value in September as in March of what may well be a different year (no. 34). See J. BINGEN, CE 26, 1951, 378–85 at 381.

33. Since it comes from a similar contemporary synopsis of estate-accounts, the wheat price may represent an internal valuation as in nos. 32 and 34, not a free market exchange. The attribution to Memphis comes from JOHNSON 311.

34. See note on no. 32.

37. This is the value of wheat received by an indentured labourer from his employer, and not strictly a market price.

44. JOHNSON 311 extrapolates the price of 5 obols for 1/6 artaba as 4 drachmae 2 obols, using the 7-obol drachma. But the 6-obol drachma more usual in official transactions would make the price 5 drachmae (cf. V. B. SCHUMAN, CPh 47, 1952, 214–8).

49. That A. D. 99 was a year of famine in Egypt is indicated by Pliny, Pan. 31. See p. 248.

49a. See note on no. 58.

50. Dues of 44 drachmae on 550 artabae and 43 drachmae on 540 artabae evidently represent a 1% tax levied on a notional value of 8 drachmae per artaba, rounded to the nearest drachma.

53. This transaction appears to represent payment of the 8 drachmae due on an artaba of 48 choenices scaled down proportionately to take account of payment in an actual local artaba of 42 choenices (see Appendix I, section 3).

58. The figures show that a 48-choenix artaba was in use (see Appendix I, section 3).

60. 3 drachmae was paid on freight of 12 artabae as the 3% duty, strictly pointing to a notional price of 8.33 drachmae per artaba. But the correct tax if the notional value were exactly 8 drachmae would be 2 drachmae 5.28 obols, a payment currency for which did not exist. This implies that 3 drachmae was

only paid as a convenient rounding-up of tax calculated on the standard valuation of 8 drachmae.

63. The ‹metron dekaton› artaba possibly contained 60 choenices, and was thus equal to 1.25 of the 48-choenix artaba used for synagoristic payments (see Appendix I section 4).

Appendix I

The artaba in the Roman period

It is perhaps paradoxical that some modern discussions of the artaba notice such diversity that they offer little guidance as to the artaba's typical size, while discussions of Egyptian wheat-prices and yields proceed as though the artaba was a standard unit about whose size there was general agreement (cf. e. g. JOHNSON 466 and JONES, Later Roman Empire, II 767). While the ‹unitarian› view of the artaba is demonstrably too simple, variation among the measures commonly used in the districts from which extensive documentation survives was probably narrower than the 25 equivalences given in the most recent list would suggest (A. SEGRÉ, Maia 3, 1950, 74; cf. D. FORABOSCHI, CE 41, 1966, 180–4).

A full survey of the measures in everyday use is probably now required. Although that cannot be undertaken here, some salient points may be noticed.

1. A 40-choenix artaba (c. 29.2 litres) is unmistakeably attested in use in private transactions at Oxyrhynchus in A. D. 147, 158/9, c. 200, and 223/4 (P. Oxy. 2868; 2591; 740; 2350). The information is fortuitous, since it takes the form of equivalences between arithmetical fractions of the artaba and the same sub-units expressed in choenices, without any formal definition being given, or any name being attached to the measure in use. The same artaba also occurs in tax-payments at Oxyrhynchus in the first century A. D. (P. Ryl. II 199). The artaba recurs in a metrological work of the third or fourth century (P. Oxy. I 9 verso). It is also found in actual transactions in the sixth and seventh centuries, described in three cases as the ‹cancellus› measure (P. Oxy. 1907; 1910; 2037; P. Iand. 63 [Arsinoite nome] with P. Oxy. 1910 introd.). The same measure is apparently implicit in the fact that the government tax of 2 choenices (*dichoenicion*) is sometimes referred to as a tax of ‹one-twentieth› (*eikoste*) (WALLACE 12 and 361; P. Tebt. II pp. 342–3). GRENFELL and HUNT also discerned traces of a possible 40-choenix artaba in fractions of $^1/_5$ and $^1/_{10}$ which occur in a Fayum papyrus (though it is a measure of the extent to which new material has accumulated since 1900 that they were able to comment that «the artaba of 40 choenices is not known to have been employed in Roman times»; P. Fay. 101 with P. Tebt. I, p. 233).

2. An artaba of 42 choenices appears at Oxyrhynchus in a document of about A. D. 200, where there is a conversion between it and the 40-choenix artaba (P. Oxy. 740). The same artaba apparently occurs at Kerkeosiris in the late second century B. C., and at Hermopolis in the Roman period (see P. Tebt. I, pp. 232–3). Use of the six-choenix measure which is sometimes attested in papyri possibly points to a 42-choenix rather than a 40-choenix artaba, since 40 is not an exact multiple of 6. It may be worth noticing that the excess of the 42-choenix artaba over the common 40-choenix measure equals the amount needed to pay the *dichoenicion* or ‹one-twentieth› tax which was «nearly universal» in Egypt (WALLACE 361 n. 10; 12).

3. Payment for corn compulsorily purchased by the government (see p. 248) is made on the basis of a 48-choenix measure in papyri of A. D. 100 and 154 (P. Oxy. 2960, 2967, nos. 49a and 58 above). Since 8 drachmae is also attested as the government price in almost all other cases before the third century (nos. 48 ff.), the 48-choenix artaba is likely to have been the standard generally in use. To suppose otherwise means assuming either that the government was indifferent to the precise amount of corn that it received or that, although actual measures and prices varied, the nominal price per artaba by mysterious coincidence almost always came to 8 drachmae. Neither assumption is plausible.

Nevertheless an isolated case of reimbursement by the government at a slightly lower price, a rate of 7 drachmae per artaba, occurs at Tebtunis in A. D. 149 (P. Teb. 394, no. 53 above). Since this falls within the period during which the normal government price was 8 drachmae (see p. 248), it is more likely to indicate variation in the size of the measure than variation in the compensation price. Simple arithmetic would make the artaba in question one of 42 choenices ($^7/_8 \times 48 = 42$). One of the localities to which this payment refers is Kerkeosiris, where there is independent evidence for a 42-choenix artaba (see section 2 above).

If government payments for corn were normally reckoned in a 48-choenix artaba, it is quite likely that this measure would also have been used for the government's other dealings in corn, such as levying taxes in kind, or granting seed corn to State tenants. It is scarcely coincidence that the 48-choenix artaba, unlike those of 40 and 42 choenices, is equal to an exact number of Roman modii (4 modii; 12 choenices = 1 modius of 8.75 litres).

In a seventh century papyrus a series of conversions are made from the 40-choenix ‹cancellus› artaba to an un-named artaba of 48 choenices (P. Iand. 67 with P. Oxy. 1910 introd.). The same measure occurs in a papyrus of the late sixth century (P. Lond. V 1718).

4. A series of papyri show corn collected by the government in the late third and early fourth centuries being measured μέτρῳ δεκάτῳ, a term not apparently attested in earlier evidence. This occurs in A. D. 280, 285, 292–3, and 348 (P. Oxy. 1192; 2285; 2142–3; P. Mert. 36; cf. P. Oxy. 907). The term would have been a needless complication unless it represented a multiple of one of the corn-measures

in common use. On this basis, it seems most likely to refer to the 4-choenix or the 6-choenix measure (cf. PREISIGKE, Wörterbuch, Index 18 s. v. *metron*). If it were the former, the government artaba would have shrunk (not very likely in itself) from its second century level of 48 to 40 choenices, and would merely be a new name for an old and already widespread measure. But if instead the base unit was the 6-choenix measure, the artaba referred to would have 60 choenices, and would equal 5 Roman modii. This is the preferable interpretation, since an artaba equal to 5 Roman modii is explicitly attested in the later Roman period by the fourth century Tabulae Oribasianae, and by a fifth century metrological source (HULTSCH, ed. Metrol. Script. Rel. I. 245, 224).

A papyrus of the late sixth century attests unequivocally a ‹heaped› modius (*modius cumulatus*) equal to 16 choenices and a ‹flat› modius (*modius xystos*) equal to 14.4 choenices (P. Lond. V 1718). The first of these relationships shows the so-called ‹provincial› modius equal to $1\,^1/_3$ Roman modii (cf. HULTSCH, Metrologie^2, 626–7) in use in Egypt in the Byzantine period. P. Cair. Masp. I 67055 and II 67138 from the same period which show an artaba equal to 3 modii are probably calculated on the same basis and thus refer to the 48-choenix artaba (3 above). Nevertheless, the rival presence of the ‹provincial› modius in some late evidence does not alter the fact that the artaba of 48 choenices was actually equal to 4 Roman modii, or the fact hat the artaba of ‹Oribasius› and others was, as explicitly stated, equal to 5 Roman modii.

Names for each of the basic range of measures discussed here may be provided by a papyrus of the late sixth century, though it is not certain that the names in use in the early Empire would have been the same. P. Lips. 97 (edited by MITTEIS) shows ratios for four artaba measures. An artaba ‹metron modion› is said to contain approximately 3.27 modii. MITTEIS took it that the modii were Roman modii, and obtained a schedule two of whose values were artabae below 40 choenices. SEGRÉ's preference for the ‹provincial› modius here leads to more plausible results, though his arithmetic is defective (A. SEGRÉ, Metrologia, 503). Taking the artaba ‹metron modion› of about 3.27 modii as a loose approximation to the modii ‹xystoi›, of which 3.33 equal 1 artaba of 48 choenices (P. Lond. V 1718, late cVI), the schedule of the four artabae, following MITTEIS' ratios, is:

‹phoric› artaba 56.7 choenices
‹metron modion› artaba 48 choenices
‹thesauric› artaba 41.9 choenices
‹metron demosion› artaba 39.7 choenices

This gives a recognisable schedule for at least three of the four values, in other words ‹target› figures of 48, 42 and 40 choenices for the three smaller artabae. The author of this papyrus was capable of giving the ‹metron modion› artaba an equivalence 5.5% short of his modal equivalence of 3.27 modii; consequently a

similar error in his definition of the largest artaba is not difficult to credit (his lowest equivalence is 3.09 modii instead of 3.27, MITTEIS, P. Lips. p. 250). The implied value given to the ‹phoric› artaba here (56.7 choenices) is 5.5% short of 60 choenices, which would make it identical with the larger of the two ‹tax› artabae.

Thus according to this sixth-century source the 40-choenix artaba appears to have been called ‹metron demosion› (but also ‹cancellus›; see section 1 above). The 42-choenix artaba appears to have been called ‹thesauric›, the 48-choenix artaba (equal to 4 Roman modii) the ‹metron modion› and the 60-choenix artaba (also perhaps referred to as ‹metron dekaton›, see section 4) the ‹phoric› artaba.

Appendix II

A minimalist view of Egyptian wheat-prices

The almost total absence of corroboration in any explicit source should warn us against accepting a modern thesis that the typical market-price of wheat in Lower Egypt was as low as 3 drachmae per artaba in the pre-inflationary period. Only one of the 29 wheat-prices from this area before 200 is as low as 3 drachmae (see nos. 1–30); and both mean and median averages, even for the period up to A. D. 100, are almost three times greater (8.4 and 8 drachmae respectively). But since SCHWARTZ's thesis has won some acceptance among papyrologists (see e. g. P. Oxy. XLI p. 39; P. Mil. Vogl. III p. 88), the arguments on which it is based merit brief consideration.

1. S.'s first argument is based on the wage of men doing harvesting. In 4 papyri the piece-rate ranges from $^1/_2$ to $^5/_6$ of an artaba per aroura (SCHWARTZ 111–2, citing P. Flor. 80; 101; PSI 789; P. Sarap. 51). He deduces from one of the same papyri that the standard harvesting rate was $^3/_4$ of an aroura per man per day (PSI 789, 11.11–12). Translated into the different piece-rates, this produces payments ranging from $^3/_8$ to $^5/_8$ of an artaba per man per day. He infers from P. Flor. 322 that harvesters were paid $1^1/_2$ times the wages of other agricultural workers (viz. 10 obols per day, S. 331). He then deduces that the implied wheat prices must range from 2 drachmae 2 obols to 3 drachmae 5 obols.

But the inference of a working rate of $^3/_4$ of an aroura per man per day in PSI 789 appears uncertain, the lines in the crucial section being incomplete. Other evidence explicitly points to a much lower working rate for harvesting. In P. Flor. 322 (cited by S. for a different purpose) it took:

32 man-days to harvest 8 arourae, a rate of .25 arourae per man-day
31 man-days to harvest 7 arourae, a rate of .23 arourae per man-day
23 man-days to harvest 7 arourae, a rate of .3 arourae per man-day

Thus, even if we agree to look for wheat-prices by such a roundabout route, a realistic assessment of the working-rate will increase the figures posited by S. roughly three-fold, leading to ‹prices› in the region of 7–11 drachmae per artaba (if 1/4 aroura per man-day is substituted for the figure of 3/4 aroura per man-day).

2. In order to escape from evidence affected by seasonal or other irregularities, S. turns to leases which specify payments both in cash and in kind. It was quite common to lease lands for a period of two or more years on a contract where the landlord specified the alternation of a wheat crop (for which rent was payable in wheat) and hay or green crops, for which rent was usually payable in cash. The basis was a deliberate two-course rotation, designed to rest land which had just produced wheat for a year before it was planted with its main crop again (cf. D. J. CRAWFORD, Kerkeosiris, 1971, 116; JONES, Later Roman Empire, II 768, exaggerates in implying that as a general rule Egyptian land was cropped with wheat every year). S. makes the assumption that in these circumstances the landlord would have wished to draw a constant revenue from his land each year, and would therefore fix the money rent for the non-wheat year at a level which corresponded to the payment in wheat for the wheat year (S. 330). Using 9 second-century leases he then deduces a range of wheat prices ranging from 3 drachmae to 5 drachmae 3 obols (S. 331).

A. But we have no evidence that the landlord who specified biennial rotation of the whole plot *did* choose to take a constant income from year to year. Were he primarily concerned about stability of income, he was more likely to adopt internal rotation, dividing the land so that in any year one half grew wheat and the other half subsidiary crops.

B. Furthermore, it is most unlikely in itself that the subsidiary crop could be made to yield income in any way corresponding in value to that of the main wheat crop.

C. As we should therefore expect, leases that specify both payments in grain show that there was far from being any equivalence between the value of the two types of crop. In a contract of A. D. 119, the rent of a first year when the land was sown with aracus was only 2 artabae of wheat per aroura, whereas the rent in the following year when wheat was sown was 10 artabae per aroura (P. Oxy. XXXVI 2776). In a contract of A. D. 112, the rent of the part of the land cultivated with chickling was 2 artabae of wheat per aroura, whereas the part cultivated with wheat paid 8 1/2 artabae per aroura (P. Oxy. XXII 2351). In a third contract of A. D. 107, the rent in the two wheat years was 10 artabae of wheat per aroura, but the payment in the non-wheat year 2 artabae of wheat per aroura (P. Oxy. XVIII 2188). These three examples indicate that so far from being equal, there could be a difference in value of as much as 4 1/2/5-fold between the two types of crop. On this basis S.'s argument leads to projected wheat-prices ranging from 15 to 27 drachmae.

D. Evidence from Hermopolis suggests that the assessment of the subsidiary

money-rent could be purely arbitrary and schematic. In a contract of A. D. 140 the wheat rent is 4 artabae per aroura and the cash rent 16 drachmae per aroura (P. Flor. I 41). The same relationship of 4 drachmae of money rent for every 1 artaba of wheat rent recurs in three bids for municipal land at Hermopolis in A. D. 266, even though by this date the price of wheat must have been substantially higher (see p. 246 above, SPP V 119 II, V, VII). There is no suggestion here that the assessment of money-rent showed any responsiveness to current wheat-prices.

3. As his final argument for a price of 3 drachmae per artaba rather than one of 8. S. suggests that a labourer with a family would need at least 3 artabae of wheat per month in order to feed his family. If wheat cost 8 drachmae per artaba, to earn 3 artabae would take him 25 days of work each month at pay of 6 obols per day. (This assumes the 6-obols drachma; the number of days' work required if the 7-obol drachma is substituted [cf. S. 143, n. 1] is 28 per month.) But payment at the full rate of 6 obols per day was, S. suggests, only available at the busiest times of year. Consequently the wheat price would need to be substantially lower if the labourer was to balance his budget. If the price was in fact as low as 3 drachmae, the labourer could feed his family, even allowing for unemployment some of the time, and for payment at a rate below 6 obols at less favourable times of year (S. 333).

But the rations and the wages assumed are both very uncertain. The standard ration of employees to whom rations were paid was 1, or at most 1 1/2 artabae per month (cf. JOHNSON 301; 226; p. 241 n. 3 above; CRAWFORD, Kerkeosiris, 130 n. 4). Apparently some farm-workers nevertheless supported families from their rations (cf. J. BINGEN, CE 26, 1951, 378–385 at 379–381). Whether children of peasant families were given much bread appears doubtful, since Diodorus gives details of a purely vegetarian diet excluding bread on which he says children were regularly reared in Egypt at very little expense (1,80,5–6). Consequently any attempt to posit a minimum wheat requirement for whole families seems doomed to failure. There is also room for debate as to the average daily wage. JOHNSON's list, now seriously incomplete, includes rates substantially higher than the 6 obols posited by S., 9 obols for pumping water and 8–9 obols for harvesting wheat as early as the beginning of the second century (P. Oxy. 871; P. Fay. 102; 331; JOHNSON 307).

Pursued in detail, two of S.'s arguments potentially offer figures for wheat-prices, though both routes appear questionable in themselves. The first suggests a projection in the region of 7 to 11 drachmae. The second leads to projected prices in the region of 15 to 27 drachmae. Neither lends any substance to S.'s view that market prices were normally as low as 3 drachmae per artaba. And even though the first set of projections happens to correspond reasonably well with actual figures, it is doubtful whether either line of argument has any value as an independent source of information about wheat-prices.