LANDHOLDING IN LATE ROMAN EGYPT:
THE DISTRIBUTION OF WEALTH

By ROGER S. BAGNALL

I. THE CHALLENGE OF HERMOPOLIS[1]

One of the most revealing aspects of any society is the distribution of wealth.[2] In the ancient world, the stratification of landholdings essentially determined the stratification of wealth. There were, to be sure, many other kinds of wealth: funds and commodities for lending, urban rental property, productive enterprises,[3] slaves, ships, and so on. To some extent these were no doubt owned by the same people who owned agricultural land, but the almost total absence of quantifiable data makes generalization difficult.[4] Land, moreover, occupied a unique position in the economy and government of the Roman Empire, both practically and ideologically. The great bulk of taxation fell on the land, and almost all of the burdens of public service both in the cities and in the villages were attached to its ownership. That these disadvantages of land as a form of wealth were insufficient to deter the élite from desiring land is in some measure the result of the enormous ideological preference that all of classical antiquity attached to land as a form of wealth, an ideology connected in part to the relative stability of returns from landed property compared to those from other, more volatile, forms of wealth.

It is the official preference for land as a basis of taxation, however, that gives it a place of honour in the study of the distribution of wealth. The need for an accurate basis of taxation led to the creation of detailed records of landholdings, records which probably did not exist for any other type of wealth.[5] It is only rarely, however, that complete enough examples of this type of evidence survive to allow even the beginning of a quantitative approach to this problem. One of these rare cases is the set of Egyptian land registers republished in 1978 by P. J. Sijpesteijn and K. A. Worp[6] and analysed with care by A. K. Bowman in a fundamental article.[7] These list the holdings by residents of Antinoopolis and of one of the four quarters of Hermopolis throughout the entire Hermopolite nome, with the very important exception of the *pagus* nearest to Hermopolis itself.[8] The records are organized by individual landowner, and within each entry holdings are classified by the *pagus* in which land was located and then by the taxation category of the land. Bowman remarked (p. 151), after studying the distribution of land in these registers of *c.* A.D. 350, that

> the very high degree of inequality of distribution of land is certainly significant and seems to contrast quite markedly with such evidence as is available for other places and other periods in the Roman Empire ... What our Hermopolite lists will not allow us to do, however, is to fit the evidence for the town-dwelling landholders into a picture of the landholding pattern of the nome as a whole, in which as much as three-quarters of the land may still have been held by village residents (Table III). There is no means of telling whether this land was divided much more equally

[2] It is, of course, only one of the determinants and symptoms of particular social structures, and it is true that similar distributions of wealth may result from different social and economic situations, as M. Lewuillon-Blume points out (*Proc. XVIII Int. Congr. of Papyrology* II (1988), 279 n. 5).
[3] Probably more in inventories at various stages of production than in equipment or plant.
[4] See H. W. Pleket, 'Urban elites and the economy in the Greek cities of the Roman Empire', *Münstersche Beiträge z. antiken Handelsgeschichte* 3 (1984), 3–36 for a balanced discussion and extensive bibliography of this vexed question.
[5] We have no means of controlling the accuracy of such records as do survive, and one might well be suspicious of the great precision with which they record holdings, down to minute fractions of an aroura. But landowners had a

powerful incentive to see that their holdings were neither overstated (too high a tax bill would result) nor understated (the register might be evidence against their ownership), and there is abundant surviving evidence of protests on both counts when owners thought the official records were wrong.
[6] *Zwei Landlisten aus dem Hermupolites (P. Landlisten)*, Stud.Amst. 7 (1978). The two codices are referred to below as F (P.Flor. I 71) and G (P.Giss.inv. 4).
[7] 'Landholding in the Hermopolite Nome in the fourth century A.D.', *JRS* 75 (1985), 137–63, where other reviews and literature are cited. The results of a simultaneous investigation by Marianne Lewuillon-Blume are published in the article cited above (n. 2), and in *Cd'E* 60 (1985), 138–46.
[8] See Bowman's discussion of this *pagus*, op. cit. (n. 7), 152–3; it is difficult to know how much an accounting of the land in it might alter some of the conclusions about the distribution of land, but I argue below that the effect for the entire nome would not be material.

between large numbers of relatively poor landholders in the villages or whether the village pattern displayed a similar degree of differentiation (which one would expect to occur over a smaller range of wealth).

The present article is devoted to an attempt to reconstruct—with, I hope, all due reserves—a model of such a landholding pattern for an entire hypothetical nome. It has as well the goal of assessing through comparative evidence the utility and limits of the standard statistical measures for inequality of wealth.

II. MEASURING INEQUALITY

The statistical test used by Bowman for measuring inequality of landholdings was the Gini index, generally represented as R in equations. The Gini index itself provides only a handy single-number summation of the Lorenz curve and permits quick and simple comparison of a wide variety of different data sets. It is important to understand what the Lorenz curve and Gini index are and what their limitations are as measures of inequality. The Lorenz curve, the more fundamental measure, is described by plotting cumulative percentage of (e.g.) ownership of property (on the y axis) against cumulative percentage of persons (on the x axis). On this scale, perfect equality would be expressed by a diagonal line from south-west to north-east, showing that 10 per cent of the population owned 10 per cent of the property (or received 10 per cent of the income, or whatever), 50 per cent owned 50 per cent, and 90 per cent owned 90 per cent. Perfect inequality, on the other hand, would be represented by a line running horizontally along the x axis to the right end, at which point a vertical line would rise, showing a population in which one person owned all of the property. Fig. 1, below, gives a Lorenz plot in which both the line of equality ($R = 0$) and a very high line of inequality are plotted.

The Gini index then computes the amount of actual inequality as a ratio (always expressed as a decimal, e.g., .753, rather than as a percentage, 75.3%) to a hypothetical state of total inequality. It is essentially arrived at by adding the amounts by which individuals cumulatively diverge from an even share of wealth or income. By this measure, zero would be perfect equality of distribution (the two congruent lines described above) and 1.0 complete inequality. In geometric terms, on a Lorenz curve graph of population vs. wealth, it may be equated to the percentage of the triangular area under the diagonal line which falls between that line and the Lorenz curve of actual inequality.[9]

The Lorenz curve is thus a usefully graphic description of the distribution of some good (property, income, voting power, etc.), and the Gini index a convenient single-figure expression of it. Together, as Dollar and Jensen put it, they offer 'two satisfactory measures of inequality which take into account the holdings of every unit'.[10] All the same, they are not free of difficulty. Most notably, the Gini index used in isolation conveys only a limited amount of information about the distribution of wealth, because Lorenz curves of very different shapes can yield the same R. Inequality may be greater at one point in the scale in one society, and at another in a second, so that a society with a higher Gini may actually distribute more of its income to the lowest 10–20 per cent than one with a lower Gini.[11] For this reason, although the

[9] Bowman cites C. M. Dollar and R. J. Jensen, *Historian's Guide to Statistics* (1971) for a description of the index; pp. 121–5 describe it and show how to compute it. As they put it (122–3): 'The first step in drawing the Lorenz curve and calculating the Gini index is to arrange the sections in ascending order, from poorest to richest on the basis of the ratio Y/P [Y = income, P = population]. ... Two new values are shown for each section, $CumP_i$ and $CumY_i$, which are the cumulative subtotals of P and Y for all sections poorer than section i, together with i. ... The Lorenz curve is drawn by plotting the ... points $CumP_i$ and $CumY_i$ on a square graph, with $CumP_i$ (the population factor) always on the horizontal axis, and $CumY_i$ (the good that is distributed) always along the vertical axis.' The Gini index is arrived at by summing all the figures for P_iCumY_i and for P_iY_i (simple multiplications for each item in the list) and computing $R = 1 - $

$(2\Sigma P_i CumY_i) + (\Sigma P_i Y_i)$.

[10] op. cit. (n. 9), 122.

[11] See A. B. Atkinson, *The Economics of Inequality* (1975), 45–7 with graphic illustration of just this point. His claim that the Gini therefore embodies 'implicit judgements about the weight to be attached to inequality at different points on the income scale' seems to me unjustified. Rather, it is the use of the Gini for policymaking that carries the implicit value-judgement that all inequality is equal, so to speak. (Atkinson's book, like much of the literature on inequality, *assumes* both that it is a bad thing and that it is the business of government to reduce it, particularly at the bottom of the scale.) The problem with the Gini is not that it has judgemental freight but that (being a single figure) it cannot express complexities.

Gini index is useful, it is more useful if accompanied by a Lorenz curve or at least a distribution of holdings by deciles, so that it is possible to see how a particular Gini index came about.

The Gini index, although laborious to compute in an era before computer spreadsheets, has long been a standard tool in the economic history of the modern period and in the literature of economic development for the reasons suggested above. It was introduced into the study of the Roman world in 1976 by Richard Duncan-Jones in an important paper, in which he analysed several documents from different parts of the Roman Empire.[12] Apart from the Hermopolite evidence (cited by Duncan-Jones from earlier and less complete editions), these data sets offer many problems. They include many fewer holdings than the Egyptian data and, more importantly, 'do not all refer to the same range of landed wealth', as Duncan-Jones says. His careful description shows, in fact, that each data set offers major difficulties of interpretation and probably omits some part of the spectrum, usually the bottom; some list estates rather than the holdings of individuals.[13]

In comparison of Gini indexes from different times and places, certain broad characteristics of the measure must be borne in mind.[14] It is a general fact about Gini indexes that as one moves to larger orders of entities, the index rises. That is, the index of inequality among countries is generally higher than that within any given country; the index for the country with the highest inequality of income, Honduras, is .630, which is lower than that for the world as a whole (.650).[15] Similarly, one may expect that an entire country will show greater inequality than a single region, and a region than a village. It is natural to expect, therefore, that the index for a nome would be significantly higher than for a village if the nome is not fully homogeneous.[16]

Apart from the inherent limitations of these measures, therefore, they have meaning only to the extent that the nature of the data from which they are derived is clearly understood. In particular, comparability of data is critical. A number of specific cases in point will be discussed later in this paper.

III.   APPLYING THE GINI INDEX TO EGYPTIAN DATA

The Gini was taken up by Bowman as his principal tool for assessing inequality in the Hermopolite registers. Bowman computed the Gini index for the more complete register, that of Hermopolites, as .815, an extraordinarily high figure. Bowman's caveat here is important: the figures show the distribution of landholdings in a population of city residents, many of whom may not have depended on those landholdings for their primary source of income or wealth. The members of the group are thus not fully comparable to one another. Fig. 1 shows the Lorenz curve for this population, and Fig. 2 gives the distribution of property by deciles of the population.

A similar pattern emerges, Bowman indicates, from the unpublished P.Yale III 145, a register from Philadelphia in the Fayum, dated to A.D. 216, in which all owners of private land in that village are listed with their holdings. There a figure of .737 is computed by Bowman.[17]

[12] 'Some configurations of landholding in the Roman Empire', in M. I. Finley (ed.), *Studies in Roman Property* (1976), 7–33, now reworked in *Structure and Scale in the Roman Economy* (1990), 121–42; cited by Bowman, op. cit. (n. 7), 151. His results will be referred to below for comparative purposes. The reworked version does not replace the figures for the Hermopolite registers, drawn from the earlier edition, with those computed by Bowman.

[13] Duncan-Jones, *Structure and Scale* (n. 12), 129 n. 40, remarks of the Gini: 'Though widely used, the Gini coefficient is a crude measure which takes no account of the shape of the curve. In the present figures, histograms are used as the form of illustration because they reveal more details.' He does, however, give the Gini along with the histograms.

[14] These will show why Duncan-Jones' caution about comparisons of land registers, though rejected by Bowman, op. cit. (n. 7), 150 n. 75, has some validity.

[15] See Atkinson, op. cit. (n. 11), 27 and 237–51. These

figures come from E. W. Nafziger, *The Economics of Developing Countries* (1984), 85.

[16] Obviously this may not be true in any given case; the wealthy extremes will stand above the overall *R*, as Hermopolis does over the nome as a whole. The smallness of the samples may also cause some individual units to deviate from the overall pattern. The *R* for wealth in Wisconsin, measured county by county, ranged from .520 to .900, when the state *R* was .750. A map in Lee Soltow, *Patterns of Wealthholding in Wisconsin since 1850* (1971), 63, shows three concentrations of counties which had higher averages than the state as a whole. Only eight had .800 or higher, out of fifty-six total counties. The Wisconsin data are discussed more fully in VII, below.

[17] It should be pointed out that this figure does not distinguish between land owned by village residents and that owned by absentee landlords. A fairly full description of this papyrus was given by J. F. Oates in *Atti dell'XI Congresso Internazionale di Papirologia* (1966), 451–74, at which time publication was foreseen in P.Yale I.
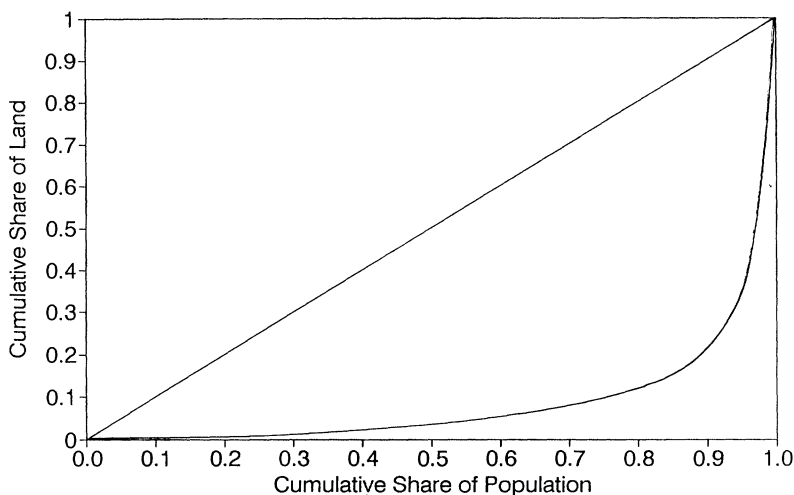
FIG. 1. HERMOPOLITE
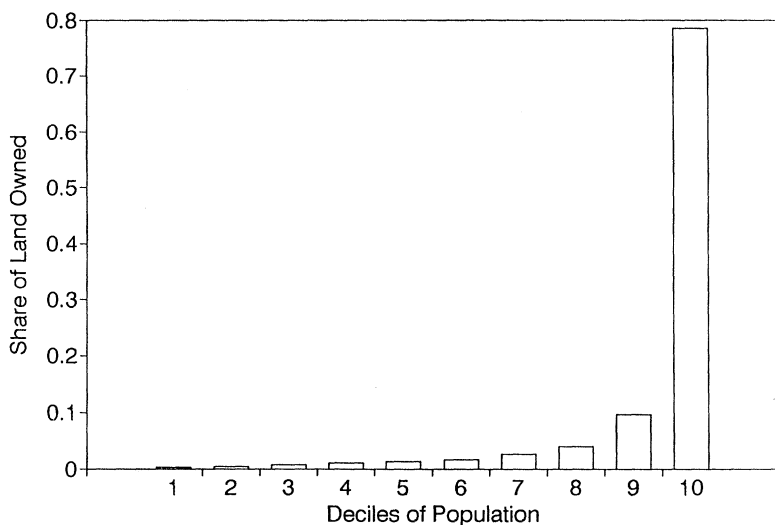METROPOLITANS: LORENZ CURVE
DISTRIBUTION OF LAND

FIG. 2. HERMOPOLITE
METROPOLITANS: DISTRIBUTION
OF LAND BY DECILES

A closer look, however, reveals problems. I have recomputed the Gini index and found that the correct figure is much lower: .532 using all persons listed, .516 limiting ourselves to cases with complete data (the latter figure is probably more reliable, though it leaves out some large holders).[18] A distinction is in order, however. The Philadelphia list is composed mainly of 183 villagers, plus a minority (17) of Alexandrian or metropolitan citizens. The index for the Philadelphians is .518 for the cases with complete data, or very close to that for the entire list. That for the city-dwellers, however, is harder to discern. Because of physical damage to the papyrus, the portion with city-dwellers is badly preserved; the index is .438 using all seventeen cases, but only .248 using the fully preserved ones. It is hard to say which is the more realistic, if either; at any rate, the sample is too small for much meaning. These figures are theoretically more readily comparable than the village ones to the Hermopolite index. But there is again an important difference, in that the Hermopolite index reflects total (except around the city) landholdings of a portion of city residents, while the Philadelphia register includes the holdings of all city residents but only in one village. A further complexity, probably more important, is that the Philadelphia list includes only private land (both grainland and orchards); public land is not included, and it is a reasonable bet that this land, leased out, was held in much more equal parcels than the private land, which was presumably acquired by

[18] Bowman's own recalculations now agree (letter of 18 March 1991); the source of the original error is obscure to both of us, but it was unique to this calculation, as my own computations have confirmed all of his other calculations.

inheritance and purchase.[19] By the fourth century, public land had been privatized, but there is no guarantee that the contents of these categories had not changed in the intervening years.[20]

Bowman cites a third data set from which he computes a Gini index, 'the only other place in Egypt which permits a comparison', late Ptolemaic Kerkeosiris. There, he finds a lower R (.374). This population's holdings include both allotments to military settlers and leaseholds of crown land, and the data are virtually complete. It is thus partially comparable to the Philadelphia villagers' index, but could be expected to be lower as a result of the inclusion of royal land leased to peasants. As Bowman says, 'it is hardly possible to generalize from such sparse data and even without the evidence of Kerkeosiris we would be tempted to suppose that the increased scale of private ownership of land in the Roman period had the effect of exaggerating the inequality of ownership' (151–2).

IV.   DATA FROM KARANIS

In point of fact, however, there is one other source for the distribution of ownership of village land in the fourth century, the cluster of taxation reports from A.D. 308/9 (though submitted several years later) from Karanis published in *The Archive of Aurelius Isidorus*. These are not land registers,[21] but rather accounts of the assessment and the collection of wheat and barley taxes for the village. For the majority of the taxpayers, we know the amounts in both grains, but for a minority we know only the amount of wheat paid, and for a handful we know only amounts in barley. Now barley taxes were assessed at a fixed amount (.75 artaba per aroura) on both 'private' and 'public' land,[22] and it is thus a fairly simple procedure to calculate the total area of land for which barley taxes were paid where that figure survives. But this does not help with the distribution between private and public land, and of course it does nothing for those taxpayers for whom only a wheat figure survives. Worse still, there is clear evidence in these reports that the collection of barley did not come up to the assessed level, unlike the wheat collection. Some of the barley figures will therefore generate distorted numbers for landholdings.

The problems in using these reports are thus not trivial, and it is perhaps for this reason that no one has ever analysed them systematically. But it is possible, I believe, to derive a very good approximation of the structure of wealth in Karanis from them through a series of adjustments and calculations. Some uncertainties and inaccuracies are introduced at each stage, but I shall argue that they have no material effect on the outcome. First, it is an easy matter, where both wheat and barley payments are preserved, to calculate the distribution of the payer's land between public and private. If we use x to represent the number of arouras of private land held, y those of public land, w the number of artabas of wheat paid, and b that of barley, the total landholding $(x + y)$ can be found by dividing b by .88 (i.e. 1 aroura per .75 artaba).[23] The formula for public land is $y = ((w/1.1)(2) - (x + y))/2$. In Table 1 (tables are given at the end of the article) the landholders are listed, in the order in which they are given in P.Cair.Isid. 9, with their payments and the imputed amounts of land owned. Where names appear in the lists but the amounts are lost, a blank is left; where the name does not appear under one of the grains, a zero is entered. Missing fractions are disregarded, and where a ones digit is lost but a tens is preserved, the latter is given.

Now it is immediately apparent that the lack of barley values leaves many lines with meaningless numbers. It is also clear that even where both figures are preserved, they produce

irreconcilable results in some cases, principally because the barley payments are too low for any possible combination of landholdings which could generate the wheat taxes paid. Since we know from P.Cair.Isid. 11 that of a total assessment for the village of about 3,715 art. of barley, only about 3,531 art. were collected and handed over to the government, it is a natural conclusion that barley taxes were underpaid by these people. There are only a few cases in which the wheat taxes are too low for the land represented by the barley, a fact in keeping with the observation that wheat collected actually exceeded the assessment by almost 44 art. (P.Cair.Isid. 11, introduction).

In Table 2, therefore, I have corrected for all of these deficiencies by a series of operations. First, where the figure for barley taxes is missing, it has been set at .815 of the wheat taxes. This figure approximates the ratio of the barley assessment to the actual wheat taxes. For any individual, of course, this is a levelling procedure, since it assumes that his or her proportion of private to public land was the average. In very few cases, probably, will this be exactly true, but the resulting inaccuracies should not affect the distribution materially. Nor would taking a somewhat different figure (based on actual barley, or the wheat assessment) make a difference of more than a percentage point or so. Second, the reverse operation has been carried out where the wheat figure is lacking: the index of 1.227 has been used to convert the barley figure into an imputed wheat one. These affect only a few cases and all of them are small, so any inaccuracy can have no significant effect on the overall picture. Where barley and wheat figures are present but impossible—that is, where together they indicate landholdings with a significant (over 0.5 aroura) negative amount of one class—I have followed the same procedure. A small group (four persons) for whom no data survive is omitted from the calculations, but they were probably all small holders. A few landowners would have higher figures if all numbers were preserved, but they would not alter the picture materially either.[24]

All of these proceedings assume, naturally, that people did not pay more taxes in either grain than they were required to; this commonsense presumption may of course be inaccurate on occasion, but if it were significantly wrong we would find that the totals of the 'corrected' list would differ substantially from the actually collected amounts. This is in fact not the case. The totals in Table 2 are within about 1 per cent of the amounts reported in P.Cair.Isid. 11, in the case of both grains running slightly high. A divergence of this order of magnitude is very unlikely to affect the validity of the calculations. The total amounts of land imputed, about 2,251 private plus 2,020 public, 4,271 in all, compares to the actual 2,212 plus 2,007, or 4,219 in all, a little over 1 per cent off again.[25]

These owners can now be listed in descending order of total landholdings, metropolitans first and villagers afterward. The results can be categorized summarily as follows:

METROPOLITANS		VILLAGERS	
200+	1	150+	1
100–199	1	100–149	2
50–99	0	90–99	2
40–49	1	80–89	2
30–39	1	70–79	4
20–29	1	60–69	4
15–19	4	50–59	6
10–14	2	40–49	12
5–9	2	30–39	15
0–4	5	25–29	14
		20–24	8
TOTAL	18	15–19	6
		10–14	16
		5–9	10
		1–4	4
		No data	4
		TOTAL	110

[24] For example, I computed Gini indexes including the four with no data and excluding them; the difference was only .022.
[25] It may be worth adding that I will gladly make any of the spreadsheets for data presented in this article available on standard diskette on request; they were prepared on Borland's Quattro Pro and should be usable on any Lotus-compatible spreadsheet programme for an IBM or compatible computer.

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A distribution of ownership by deciles and a cumulative distribution by deciles are given as Figs 3 and 4.
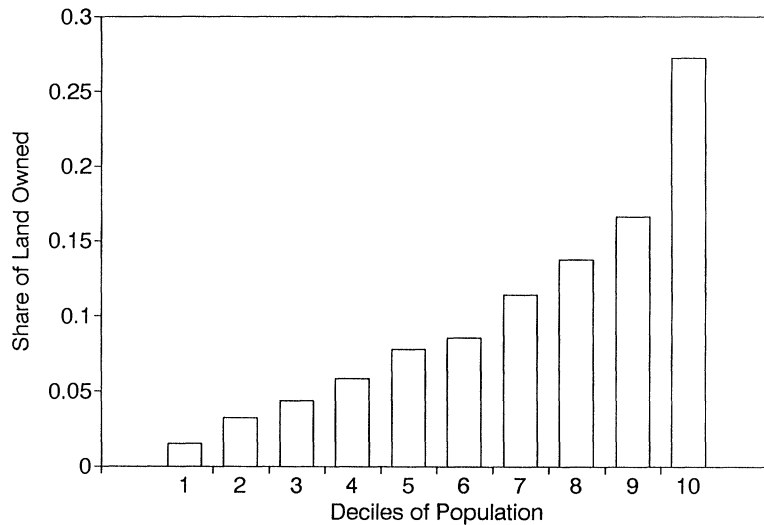
FIG. 3. KARANIS VILLAGERS:
DISTRIBUTION OF LAND BY
DECILES
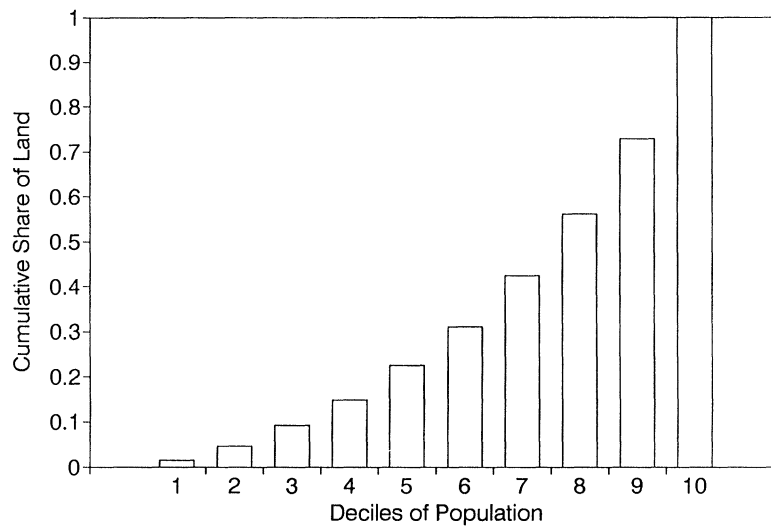
FIG. 4. KARANIS VILLAGERS:
CUMULATIVE DISTRIBUTION OF
LAND

The results for metropolitans are interesting but of limited applicability. For one thing, the number is small. For another, it must be kept in mind that the metropolitans included in this roster may well have had landholdings elsewhere; indeed, they are almost certain to have had. Among the Hermopolites analysed by Bowman, those owning over 100 arouras were very likely to have held land in multiple locations, particularly when it is remembered that their holdings in the *pagus* nearest the city are not included. There were two large metropolitan accounts at Karanis, people with really extensive holdings (133 and 205 ar.); we have no evidence for the character of these estates, whether single tracts or fragmented, and the owners do not appear in the archive of Aurelius Isidoros as lessors. The remaining holdings are much smaller, with one each at 47, 36, and 28, then six in the teens and seven under 10. The large range and radical inequality described by Bowman for the Hermopolite city residents in their country estates is manifested here again, with a Gini index of .638. It is clear that any given data set involving urban ownership in a particular village may vary greatly from others; we would expect the results from one village to another to be less consistent than those from one nome to another. Above all, however, as in the case of Philadelphia these figures can

legitimately be compared only to other data for metropolitan land in a particular village, not to data for metropolitan ownership over an entire nome (as in the Hermopolite registers).[26]

For the villagers, however, the situation is rather different and more meaningful. There is a continuum, with the main bulk of the population (71 of 106) in the range of 10 to 50, fourteen below that range and twenty-one above it. The source of our documents, Aurelius Isidoros, had holdings of about 36, but was part of a family with more extensive holdings. The median holding of those holding tax-collection liturgies seems to have been in the 20s, with men owning as little as about 12 arouras sometimes chosen.[27] By that standard, there were about eighty-five landowners eligible for liturgical service, or more than three-quarters of all landowners. It is, of course, possible that some of the villagers also owned land in another village's territory. The Gini index for landowners for whom full or partial data are preserved (omitting the four cases mentioned above) is .431, somewhat (10 per cent) higher than that at late Ptolemaic Kerkeosiris but markedly lower than the metropolitan figures. There was a broad middle ground among the villagers. The Lorenz curve, shown in Fig. 5, is similarly strikingly different from that for Hermopolis.
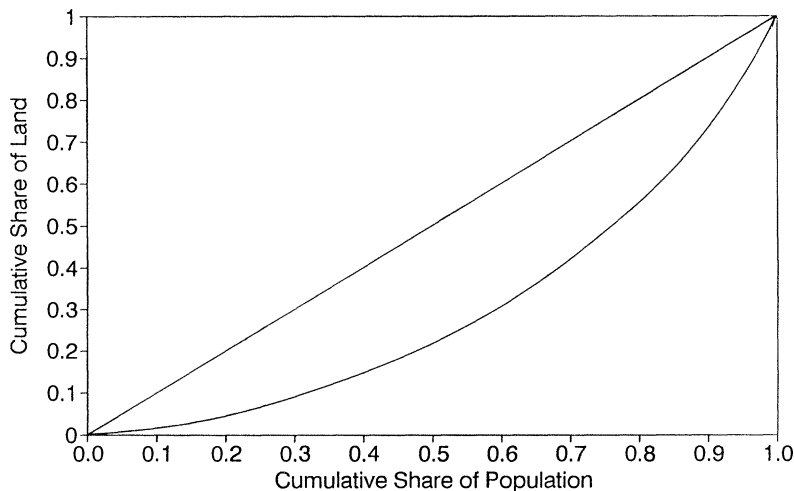
FIG. 5. KARANIS VILLAGERS: LORENZ CURVE DISTRIBUTION OF LAND

It is important to underline that our findings for Karanis cannot be considered typical without further evidence. For one thing, this was a village in trouble, as has long been recognized. The archive here is full of complaints about the failure of the irrigation system and the dryness of large parts of the fields. Karanis was only a shadow of its former self, and a landowner with 35 arouras may have had only a fraction that many in cultivation. It was certainly not the only Fayum village in this kind of trouble, but there are no good grounds for thinking that their difficulties were typical of the rest of the Fayum or of Egypt as a whole.[28] The official figures in P.Cair.Isid. 11 show that about 9.5 per cent of the private land and 24 per cent of the public land was categorized as unsown; but in all likelihood the land assigned by *epinemesis* for compulsory cultivation was largely unsown as well. If so, the percentages of unsown land rise to about 13 per cent for private land but 46 per cent of royal land. Overall, 29 per cent of the land would then be unproductive. The average holding, then, high as it may seem, must be discounted by about 30 per cent to allow for unproductive land.[29] For these reasons, calculations about the estate necessary for a reasonable livelihood are even more difficult than normal.

[26] By the same token, of course, the reservations expressed about the metropolitan data from Karanis are irrelevant to the Hermopolite figures.

[27] See Bagnall, 'Property-holdings of liturgists in fourth-century Karanis', *BASP* 15 (1978), 9–16.

[28] cf. my 'Agricultural productivity and taxation in fourth-century Egypt', *TAPA* 115 (1985), 290–308 for a detailed discussion of this problem.

[29] It is entirely possible that this is too pessimistic, as Alan Bowman points out to me. No doubt the actual figure fluctuated substantially from year to year. If the correct figure were instead 15 per cent (for example), the consequences would be that the village holdings in the nome model (below, IV) would be increased in size by about 21 per cent from the figures I have used, lowering R for the nome to some degree. The figures for R within the village, however, do not depend on any assumption about unproductive land, being computed from the gross holdings.

Moreover, investment in land in such a village was less attractive for anyone interested in stable income than it would be elsewhere; only an entrepreneur active on the spot would have found the risks worth taking. Absentee landlords were, as Dennis Kehoe has pointed out in the case of Pliny, on the whole averse to risk and change; predictability, avoidance of need to invest in improvements, and stability were their aims.[30] The relatively small percentage of outside ownership (about 13.7 per cent in Table 2) compared to the 25–30 per cent computed by Bowman for the Hermopolite districts may well be a reflection of the unattractiveness of Karanis to metropolitans. Some middle-range villagers could have picked up additional land cheaply, particularly in the late third century when things seem to have been worse in Karanis than a couple of decades later.

The issue of typicality of villager distribution remains. The closeness of the Kerkeosiris figures to the villagers' index at Karanis seems the most significant fact. One possible test is to distinguish 'public' from 'private' land, i.e., land now owned by farmers but formerly leased from the state (which I have argued should have been more equally distributed when it was leased) vs. land which had been private for three centuries or more. It turns out that for the non-residents the distinction is minor; private land overall has a .626 index (vs. .638 for all land together). That is not surprising, since the non-residents had presumably acquired virtually all of their land by purchase or inheritance from a purchaser, and private land preponderates.[31] Among the villagers, the Gini index rises from .431 to .478 when only private land is considered: significantly closer to the Philadelphia figure, it is noteworthy, although still somewhat more equally distributed.

Even with all due reserves, this evidence suggests that the landholdings of Egyptian villagers tended to have only a moderate degree of inequality, an inequality least in holdings of 'public' land and greater (by about .100, perhaps) in holdings of 'private' land; and there is no particular trend visible over the more than four centuries across which our evidence is scattered. Landholdings of village land by non-residents have a wider range of possible degrees of inequality, particularly where small numbers of persons are involved; the upper range is perhaps almost double the index for village residents' holdings of public land.

V.   SIXTH-CENTURY APHRODITO

Another interesting data set, though from a later century, has become available since Bowman wrote, the land register from Aphrodito in the Antaiopolite Nome, from c. 525/6.[32] It lists 1,470.875 arouras of land in the category of astika onomata, subcategorized by arable land (93.5 per cent), reed land (.8 per cent), vineyards (1.5 per cent), and orchards (4.2 per cent). The astika were holdings on which the taxes were paid to the treasury of Antaiopolis, as distinct from the kometika, taxes on which were paid to the village treasury. The editors deny any comparison with the distinction of politai and kometai in the Karanis fourth-century accounts.[33] A study of the list, however, shows that of the holdings owned by individuals or personal estates, as opposed to institutions, 70 per cent were the property of persons identified as citizens of a city or holders of an imperial office and thus presumably not villagers. The remaining 30 per cent are not identified; there is no one identified as a villager in the register. Now some of these are likely to have been villagers, but I do not think it can be denied that the holders of the astika were in fact largely urban residents. On the other hand, it is true that some urban holders had property classified as kometika.

[30] 'Allocation of risk and investment on the estates of Pliny the Younger', Chiron 18 (1988), 15–42. Some of the same attitudes can be found in the British landed élite in early modern times; see Lawrence Stone and Jeanne C. Fawtier Stone, An Open Elite? England 1540–1880 (1984), 11–15 for the landowners' willingness to accept a low return in exchange for security and prestige.
[31] It is true that some metropolitans or Alexandrian citizens may have been resident at some time in a village where they had landholdings. There is very little evidence for this in the fourth century, but it may have been more common a century earlier.
[32] Jean Gascou and Leslie S. B. MacCoull, 'Le cadastre d'Aphroditô', Travaux et Mémoires 10 (1987), 103–58, pls 1–10.
[33] eidem, 113.

The *astika* amount to 24.9 per cent of the total area of holdings in the village. That percentage, very much in the range attested for urban holdings in the fourth century, combined with the names of the categories and the identities of the known holders, suggests to me the hypothesis that at some unknown point property ceased to change from one status to another when ownership changed. That is, once *astika*, always *astika*. The proportion of tax revenue which was supposed to flow through the different collecting agencies would in this way be stabilized; if an urbanite bought *kometika* in the future, he would continue to pay to the village treasury (which was in turn responsible to the imperial government), no matter what his own status. Conversely, a villager who bought *astika* would pay to the city treasury for it. Between them, institutions and urbanites own more than 84 per cent of all of the land in this register, a strong sign that little land had passed from urban to village ownership since the fixing of the categories. In effect, the terms would on this view be frozen terminology, perhaps analogous to 'public' and 'private' in the fourth century in having some fiscal significance but no other meaning.[34]

Of the sixty-four accounts attested in the register (many of which appear several times), forty-nine are individuals and fifteen institutions. The latter, only 23 per cent of accounts, own 46 per cent of the land. For such a small number of 'persons' computations of R are subject to many cautions, but because of one very large account the figure is .710. For the forty-nine individuals, $R = .623$. For individuals and institutions together, if the figure has any meaning, $R = .684$. The most interesting figure, I think, is that for individuals, which is very close to the Antinoite figure in the fourth-century register (.631). It must be remembered, however, that once again we have the holdings of some urbanites in a particular village, rather than a global picture of the holdings of that group. All the more striking, then, to recall that at Karanis holdings of metropolitans have $R = .638$.

VI.   A NOME MODEL

The general consistency of village results encourages the attempt I shall now make to construct a model of an idealized Hermopolite Nome as a whole. That model rests on a series of assumptions, all of which I believe to be roughly correct but each of which introduces some uncertainty. These are as follows:

1.   The total area of the Hermopolite Nome (including the Antinoopolite chora) was about 1,140 km², or 413,820 arouras.[35] On an Oxyrhynchite analogy, we will suppose that 72 per cent of this was arable, taxable land, or about 298,000 ar.[36] Somewhat arbitrarily, we will then assign about 10 per cent of this to the small Antinoopolite chora, leaving 270,000 ar. of arable land in the Hermopolite.[37]

2.   Bowman's figures for landholdings by urban residents are essentially accepted: 10,000 ar. for Antinoites, 65,000 ar. for Hermopolites, and 20,000 ar. in the seventh *pagus*, around Hermopolis, all of which is assumed to be owned by city residents. (That assumption no doubt is excessive and distorts figures somewhat.)

3.   The remaining 180,000 ar. were owned by village residents. This is certainly an over-simplification. Corporate holdings by cities may not have been significant (F lists several totalling just under 150 ar., which would extrapolate to 600 ar. for the nome, not counting the seventh *pagus*). A single entry for church property in G 534 is less than 30 ar. The imperial estates were probably significantly greater, but F 747–752, where they are concentrated, totals

[34] The extensive struggle of the village of Aphrodito to maintain its *autopragia*, of course, shows that it took the matter seriously. Even though the taxes ultimately wound up in the same place, there were considerable consequences for control of the flow and for responsibility implicit in the distinction.

[35] The basic figure is derived from Karl W. Butzer, *Early Hydraulic Civilization in Egypt. A Study in Cultural Ecology* (1976), 74, but adjusted for the fact that most of the territory of the Kynopolite nome on the West Bank was divided between the Oxyrhynchite and Hermopolite by the Roman period. Factors of uncertainty are the precise dividing point and shifts in the Nile's bed in this period.

[36] R. S. Bagnall and K. A. Worp, 'Grain land in the Oxyrhynchite nome', *ZPE* 37 (1980), 263–4.

[37] These are somewhat lower than the figures offered by Bowman, op. cit. (n. 7), 147, who does not subtract for the difference between gross and net area.

about 395 ar., which would extrapolate to about 1,600 ar. leased to urban residents. Even with the extrapolations for missing data described in the next paragraph, none of these would be major factors. It must be admitted, however, that the land registers do not preserve the portion for Alexandrians or other outsiders to the Hermopolite Nome. Moreover, land belonging to the imperial house but leased to villagers is not included. None of these gaps affects the distribution of land ownership among the population at issue here, but clearly they had some impact on the total distribution.

4.   Patterns of distribution are assumed to be those of F Ant., F Herm., and Karanis. The individual holdings in F Herm. are increased by .46 (probably too much in some cases) to adjust for the absence of data for the seventh *pagus* and for incomplete data in F Herm.; those for Karanis are reduced by .30 to allow for the fact that those holdings include as much as 30 per cent unproductive land. This is clearly the most questionable assumption, given that patterns in the Fayum and in the Hermopolite may well not have been identical, but I can see no basis on which to correct it.[38]

5.   It is assumed that F Herm. represents a quarter of all Hermopolite (metropolitan) landholders. We have no way of knowing if the correct figure is a fifth or a third instead.

6.   A model population is supposed in which there are 7,400 rural landowners with an average of 24.3 ar. each (Karanis average discounted by 30 per cent); 952 Hermopolite holders with 89.3 ar. each (actual F Herm. average increased by 46 per cent); and 256 Antinoites, with an average of 39 ar. each.

This population shows $R = .560 \pm .002$, significantly higher than the village index but far below the Hermopolitan.[39] It can be argued that it is almost certainly exaggerated somewhat by the treatment of the seventh *pagus*, part of which was probably owned by villagers and part by urban residents who held no land in other *pagi*, but it is unlikely that accurate figures for that would change the result by more than .002, which is trivial.[40] Far more serious concerns are the representativeness of the populations we know and are using, a question unanswerable at present. If this quarter of Hermopolis proved unrepresentative, and Antinoopolis much closer to normal, overall R would be lower (somewhere around .500, depending on assumptions).[41]

An interesting sidelight is provided by the male:female ratio of landholdings. At Karanis, women own about 17 per cent of the villager-owned land (and about 18 per cent of the metropolitan-owned land, but that is a small sample). At Philadelphia, women owned about 25 per cent of the land reported in the register.[42] By contrast, Hermopolite women own only about 8.5 per cent of the land in F Herm., and Antinoite about the same (8.4 per cent). And the bulk of that belongs to a handful of women who are part of major families and whose male relatives are known. The combined model has men owning 86 per cent, women 14 per cent, of the total.

The very considerable concentration of wealth in the overall model has significant implications for the generation of surplus income after taxes. On the reasonable assumption that 10 arouras was sufficient to support the average household, 59 per cent of the villagers' holdings were surplus to their personal requirements.[43] For the urban population, the concentration of surplus is of course even greater, some 88 per cent for Hermopolites.[44] In all, the nome's landowners may have generated a surplus (not counting tax revenue) of some 380,000 art. at a conservative figure of 2 art. per ar. We have no means of computing how much of this was used to feed the non-landowning population, much of which worked the land of the

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[38] The relatively high Greek settlement in the Fayum may have had some impact on patterns, but it is hard to know precisely what that may have been.

[39] I have computed it in two ways. A 10 per cent sample of this hypothetical population was constructed, using 1 in 8 of the Antinoites, 2 in 5 Hermopolites, and 7 times the Karanidians; that yielded $R = .558$. A simple calculation weighting the separate R's yielded .561. (Herm., .829, weighted at .309; Ant., .631, weighted at .0363; Kar., .431, weighted at .6545.)

[40] Within the computational error range induced by different sampling procedures.

[41] Assuming a lower percentage of urban-owned land,

of course, would lower it further, perhaps another .020 if the real split were 25 per cent urban, 75 per cent village.

[42] Remembering that this does not include public land.

[43] This figure is derived by adding the holdings of those with more than 10 ar., subtracting the number of individuals multiplied by 10, and dividing the remainder by total holdings.

[44] I have used 11 as a floor for urban residents, since their net yield was no doubt lower than that of villagers who actually worked much more of their own land. Moreover, 10 ar. at Karanis is equivalent to 7 ar. of productive land, probably close to what it actually took to support a family.

owners, and how much was exchanged for other purposes, but if all of it were used as wages for non-owners, it would have supported something like 16,000 households, or perhaps 80,000 persons. We have supposed about 8,600 landowners in the model, which would imply that in this case only 35 per cent of all households owned any land. The figure of 16,000, however, is undoubtedly too high, since not all surplus was spent on labour.

<div style="text-align:center">VII.   COMPARATIVE PERSPECTIVE</div>

It remains to try to put all of these figures into some kind of perspective.[45] What constitutes a high or low index of inequality? Just how tricky matters can be may be seen from an elaborate study of wealth in mid-nineteenth-century Wisconsin.[46] The figures most closely comparable to the Karanis figures are the indexes for the distribution of farm sizes, or land acreage, which stood at .400 in 1860. Despite a near-tripling in the size of the average farm over the next century (from 54 acres to 153), and numerous other social and economic changes, this index had fluctuated in a narrow zone, ending up at .360 in 1959.[47] These figures are not greatly dissimilar from .431 for Karanis villagers and .374 for Kerkeosiris, and even the .518 index for Philadelphia is not grossly dissimilar if one bears in mind that it represents only private land; if we had the royal land figures, its overall distribution would probably be reasonably close. And they have in common that they all exclude the zero cases, i.e., the landless. That, it should be pointed out, is an important exclusion and reminds us that we are not dealing with the totality of the rural population. In Wisconsin, including non-owner adult males in the reckoning of land ownership drove the Gini index from .400 to .670.[48] We have no way of reckoning the number of such adult males either at Kerkeosiris or at Karanis.[49] It is not likely to have been so large, nor the step from land to wealth so steep, because a significant share (about 40 per cent) of inequality in Wisconsin was attributable to the distinction between native and immigrant. That is, recent immigrants to the United States tended to have much less wealth than natives.[50] This factor is not likely to have been operative in any significant way in Roman Egypt.[51]

That caveat aside, we must next point out that the distribution of landholdings and the distribution of landed wealth are not necessarily identical. The Gini index for the distribution of the value of farms in Milwaukee County was 15 per cent higher than that for the acreage (.440 vs .380). Some land is inherently better, and some has a more valuable working capital in buildings and equipment added to it. It is certainly likely that this was true also in Roman Egypt. For example, if one assumed that orchard land was worth twice as much as arable land at Philadelphia, R for villagers would rise from .518 to .552. The divergent value of land does not in itself, of course, lead to a higher Gini index, since such inequalities *could* be distributed in the same pattern. Whether the Gini index for value of farms in Roman Egypt would be the same as for acreage we cannot know with present evidence, but the Philadelphia register suggests not.

In the case of only the urban population of a nome (or, as we actually have, a portion of it), another factor enters in, namely that landed wealth is only a portion of total wealth, and it produces only a portion of total income for at least some of the people involved. These factors have complex effects. It might be thought that adding in non-landed property would help to balance out differentials in landholdings and reduce the index. This is not necessarily the case. In 1860 Wisconsin, non-farmers had a substantially higher Gini than farmers (R = .830 vs .690, measuring wealth for all adult males in each group), and inequality in Milwaukee

[45] The other figures for R in the Roman Empire derived by Duncan-Jones, op. cit. (n. 12), do not seem to me very useful, for reasons he pointed out himself, quoted above (at n. 13). The best of the lot is probably that from Ligures Baebiani, which gives R = .435, close to that of Karanis.

[46] Soltow, op. cit. (n. 16).

[47] idem, 121–4. It was .410 in 1870 and .380 in 1910. These are for not quite comparable sets; that for 1860 is 'improved' land; the Gini for all farmland was .364 (p. 57).

[48] idem, 124; his table there for Milwaukee County alone shows a similar rise from .380 to .640 when zero cases are included.

[49] Their absence significantly limits the significance of the Gini index; cf. Soltow, op. cit. (n. 16), 11.

[50] The average native-born farmer aged twenty or higher had 169 per cent of the wealth of the average foreign-born farmer aged twenty or higher. See Soltow, op. cit. (n. 16), 47.

[51] Soltow, op. cit. (n. 16), 127, makes the general point that Wisconsin in the middle of the last century was not yet a stable society. On the other hand, his overall findings are that income inequality has decreased greatly (by a half, roughly) since then, while wealth inequality has decreased very little (p. 139).

County, the most urbanized part of the state, was still higher, at .890. In other words, non-agricultural assets tended to be distributed still more unevenly than land.[52] That does not show that the same was true for a metropolis of Roman Egypt, but it at least suggests the possibility. As to the land itself, it is apparent that no more than a fraction of the urban population owned any at all: 20 per cent would be a reasonable guess.[53] A Gini calculation putting all the rest in as zero would drive the index close to its theoretical limit. There is nothing inherently improbable in that. The Gini index for landowners of 1 acre or more (*excluding* both zero cases and those with plots smaller than 1 acre) in the England of 1875 was .858.[54]

Wealth, to be sure, is not the same as economic welfare. Income is probably a better measure of well-being than assets. In an agricultural economy, there is a substantial correlation between wealth in land and income, because most income is derived from the land.[55] A distinction should be made, however, between rural and urban populations, and within the urban population, between those dependent mainly on income from land and the landless.[56] The rural population, which works the land, will see a major distinction between those whose income depends solely on labour—hired hands—and those who own land. Within the latter group, landed wealth will be the largest single component in inequalities of income. The urban rentier class will have a still higher correlation between wealth and income, since their own labour is not involved. The non-rentier remainder of the urban population, however—and we have seen that it is the vast majority of city residents in Roman Egypt—will not necessarily find much correlation between wealth and income.

Historical trends of the last few centuries underline this point. Numerous studies have documented a significant fall in the R for income in all developed countries (they are much higher in the underdeveloped countries[57]). But a similar decline in R for wealth has not been found; inequality of wealth has declined much more slowly, if at all.[58] The reason lies mainly in a decline in the wealth to income ratio, which indicates in the main a rise in the proportion of income derived from salaries and wages (as well as transfer payments) and a decline in the proportion derived from property (rents, dividends, interest).[59] The decline in the Gini for income is almost entirely a product of a growth in the income received by the middle classes; lower-income groups have not gained significantly. For these reasons, the structural importance of the very high Gini indexes we find for Hermopolite urban landowners depends very largely on what role we suppose that wage labour and income from businesses with little capital needs (cabbage-sellers, for example) played in the economy. The absence of income data with which to test the wealth data is thus particularly damaging to our ability to use the latter.

A comparison of distribution of landholdings by deciles of the populations studied above helps to flesh out the bare number provided by the Gini index. In the 'decile' column are shown the tenths of the village population (1 = the poorest tenth, and so on), while the columns for Philadelphia, Karanis, FHerm., and the Hermopolite Nome list the percentage of the land (private land in the case of Philadelphia, all land in the case of the others) owned by that tenth. For the sake of perspective, the figures for *income* in modern Honduras (the country with the most unequal distribution of income, and $R = .630$) and Britain (with a

[52] idem., 5–7.
[53] There are 234 Hermopolite owners recorded in one quarter of the city; quadrupling would give at most about 1,000. For an estimate of 7,000 houses in Hermopolis, see G. Roeder, *Hermopolis, 1929–1939* (1959), 107. Since two quarters are known to have had over 4,200 (East and West City, see *SPP* v 101), that estimate may be too low. But we do not know how far women listed as landholders may be part of the same households as listed men. And some houses held multiple households. At all events, a total urban population of 35,000 (perhaps too high) would imply 7,000 households.
[54] Soltow, op. cit. (n. 16), 126. The exclusions comprise 73 per cent of the landowners. These were, to be sure, 'cottagers', not farmers, averaging about a fifth of an acre each.
[55] See Lee Soltow, *Toward Income Equality in Norway* (1965), 61.
[56] Within these groups there are also distinctions (not recoverable with present evidence) between those who

own urban property and those who do not, and even those who own property other than their residence and those who own just a place to live.
[57] cf. Atkinson, op. cit. (n. 11), 247.
[58] See Soltow, op. cit. (n. 55); Soltow, op. cit. (n. 16), 128–39; Atkinson, op. cit. (n. 11), esp. 22–7, 251; Jan Tinbergen, *Income Distribution, Analysis and Policies* (1975), 17. For example, various Norwegian towns' income Ginis fell from .470–.560 in 1865 to .280–.293 in 1960 (Soltow, op. cit. (n. 55), 17). The US in 1967 is estimated by Atkinson at .380 (income from all sources); Tinbergen (17) gives a drop from .500 to .330 for the US (wages only) from 1903 to 1956, essentially in line with data for other developed countries. Atkinson (25–6) points out that the US and UK had essentially similar income inequality, but the UK had a higher inequality of wealth.
[59] Soltow, op. cit. (n. 55), 42, gives wealth–income ratios for Norwegian towns, showing a decline in the median from 5.4 in 1855 to 1.2 in 1950.

relatively equal distribution of income and $R = .400$) are given.[60] A graphic summary of the cumulative effects is given in Fig. 6.

DECILE	PHILADELPHIA	KARANIS	FHERM.	HERM.NOME	HONDURAS	UK
1	1.1	1.5	0.2	1.0	1.4	2.0
2	1.9	3.2	0.4	2.1	1.6	3.1
3	2.8	4.3	0.6	3.0	1.8	4.2
4	3.9	5.8	0.9	4.3	2.5	6.0
5	5.3	7.7	1.3	5.5	3.4	7.5
6	7.2	8.5	1.7	6.6	4.8	9.1
7	9.6	11.4	2.6	8.3	6.7	11.0
8	14.1	13.7	4.0	10.0	10.1	12.9
9	19.1	16.6	9.7	13.7	16.8	14.9
10	35.1	27.2	78.6	45.5	50.9	29.3

It can be seen that the difference in Gini index between Philadelphia and Karanis derives from Karanis' higher figures for the first 70 per cent of the population and lower figures for the top 30 per cent. It is striking that in the case of Honduras the inequality is produced largely by the concentration in the top 10 per cent; the next two deciles do not (as at Philadelphia) share in the concentration very much.
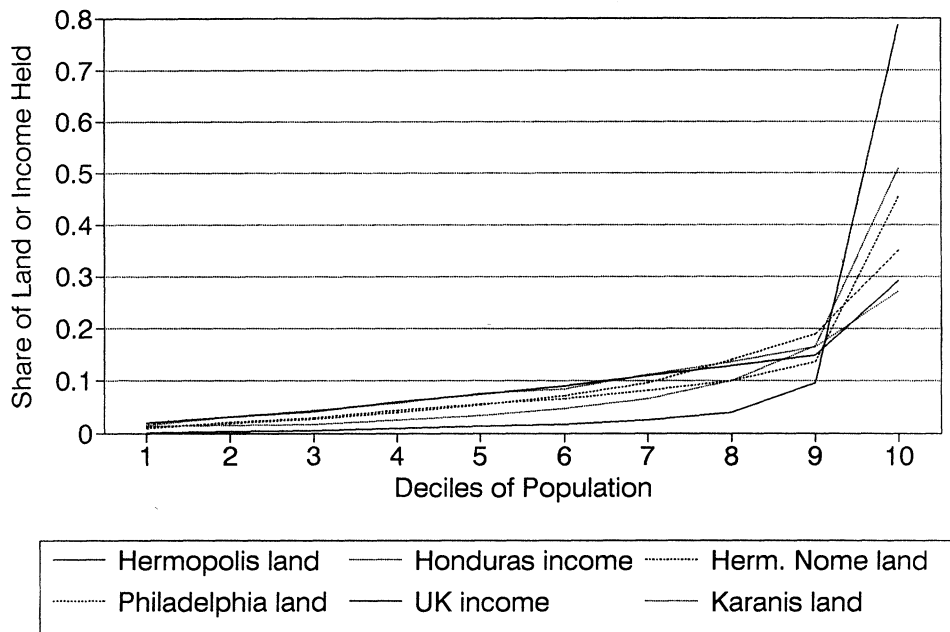
FIG. 6. COMPARATIVE DECILE DISTRIBUTION OF LAND AND INCOME

Modern Egypt also offers some interesting points of comparison, but once again considerable caution is necessary to be certain that figures are truly comparable. The system of landholding in the late nineteenth and twentieth centuries is of nineteenth-century creation, but by 1896 it had led to considerable stratification, with $R = .696$ for landholdings in 1896.[61] By 1950, just before agrarian reform, it had risen to .758.[62] This may perhaps include zero cases, for elsewhere a figure of .611 before reform is cited.[63] The latter, though not perfectly

[60] The Honduran figures are taken from Nafziger, op. cit. (n. 15), 85. The British come from Atkinson, op. cit. (n. 11), 46. Note that income and wealth may diverge considerably; cf. above.

[61] Samir Radwan, *Agrarian Reform and Rural Poverty, Egypt, 1952–1975* (1977), 3–4.

[62] idem, 4; in Samir Radwan and Eddy Lee, *Agrarian Change in Egypt* (1986), 7, however, the figure is given as .785; one of these is clearly a misprint. Radwan cites (25) a

figure of .889 for R of *landholdings* (separate holdings, not totals held by an individual) in 1950; this is explicitly said to include zero cases, but it is not obvious how that can be true for a set of plots of land rather than of people.

[63] Ilya Harik and Susan Randolph, *Distribution of Land, Employment and Income in Rural Egypt* (1979), 22; Radwan, op. cit. (n. 61), 20. This figure, according to Radwan, relates to properties rather than people but includes some aggregation.

comparable to the ancient evidence, is probably the more useful for our purposes, since it excludes zero cases just as the papyrological evidence does. It is thus about .050 higher than the figure I have computed for the overall index in Egypt. Reform, in which the ceiling dropped first to about 300 ar.,[64] then to 150 ar. per person, then to 75 ar. per person and 150 ar. per family, had dramatic effects, bringing R down to .492 in 1961 and .383 in 1965.[65]

The relationship of any of these figures to income remains difficult. In the industrial England of the late nineteenth century, the prosperity of agriculture began a long slide which reduced its role in the national income to a small fraction of what it had been.[66] Modern Egypt, in the throes of rapid transition from its largely agricultural character in 1952[67] to a more urban and industrial economy, presents a moving target. By 1977, variation in assets explained only 29 per cent of income variation, and income was far more evenly distributed (R = .393 in the sample population studied, only .313 if the 'purest' measure, ungrouped per capita income, is considered),[68] but for land area R was .556, for land value .579, and for all assets .725.[69] The situation was thus similar to that in nineteenth-century Wisconsin, with non-agricultural assets much more unevenly distributed than agricultural, but (as also in Britain) with income much more evenly distributed.

It is hard to know if the same was true of incomes in ancient Egypt.[70] While the tendency of large urban landowners to accept a lower than maximal return on their property probably gave them a lower per-aroura income than many village residents enjoyed, no pre-industrial society can have generated the kind of wage income for a broad middle class that produces the relatively low Gini indexes of incomes in modern developed economies. It may be a fair guess that typical nineteenth-century income distributions in the West, which generally fall in the range of .500 to .600, are closer to the mark.[71]

Though there is much we cannot know, then, analysis and comparison suggest that a set of measures of inequality spread over an apparently wide range can fit reasonably into a single economic and social system. The villages had a broad base of landholders with a relatively equal distribution of land and, probably, wealth and income. Inequalities were not eliminated by any means, but most landowners had enough land to support a family, and there was a broad band of middle-range men capable of bearing public obligations. The distribution certainly varied from place to place and was less egalitarian in the more attractive (lower-taxed) land than the less attractive, but differences kept within a fairly modest band from about R = .375 to .525, roughly comparable to Wisconsin in 1860.

The city, on the other hand, shows a radically skewed distribution of land owned by its residents. More than half (128 of 240) of those at Hermopolis owned so little that it is unlikely to have supported them, and the top tenth of the *landowning* urban population held some 78 per cent of the land, virtually identical to the percentage of land in the UK owned by the top tenth in 1875. The difference, and it is an important one, is that the UK figures reflect *all* persons and land (above 1 acre holdings), while those for Hermopolis reflect only urban residents and the percentage of land they owned (25–30 per cent of the total). There is no obvious way to adjust for the interrelatedness of the wealthy. In F Herm., for example, it appears that 38.8 per cent of the total is owned by six members of a single family, and another 17.5 per cent is owned by two additional families.[72] It is perhaps unlikely that England, where

[64] That is, 200 feddan. I use a conversion of 1.5 ar. per feddan here; the feddan is actually .42 ha., or 1.524 aroura.

[65] Radwan, op. cit. (n. 61), 20; Harik and Randolph, op. cit. (n. 63), 22. For the progress of reform, see Radwan, 14.

[66] The slide and its consequences are vividly described in David Cannadine, *The Decline and Fall of the British Aristocracy* (1990).

[67] Harik and Randolph, op. cit. (n. 63), 2: a typical Third World country. On the other hand, Radwan, op. cit. (n. 61), 6 points out that Egypt had already been transformed from subsistence farming to 'commercialised and profit-maximizing' agriculture by the introduction of cash crops, integration into world markets, the development of transport, trade, and financial structures. In this regard it resembled, *mutatis mutandis*, the situation in the third and fourth centuries.

[68] Radwan and Lee, op. cit. (n. 62), 44.

[69] idem, 46–53.

[70] Even the nineteenth-century data are often spotty and of doubtful reliability, after all, and we have none at all for antiquity.

[71] cf. above, n. 58, and Lee Soltow, 'Long-run changes in British income inequality', *Economic History Review* 21 (1968), 22. Much of the data is insecure, but the gross consistency of the figures obtained from many different sources suggests that the true figures are likely to be in this range.

[72] Lewuillon-Blume, op. cit. (n. 2); I am accepting the connection of the children of Aelianus to the family of Hyperechios' descendants. Her percentages are based on inaccurate totals and may be disregarded. It is, of course, possible that some of these families include still other landowners who cannot be identified with them given the information provided—husbands of women, for example. Eulalia, daughter of Aelianus, for example, registers some of her land through a Hymnos, known from G to be the son of Deios. Is Dios the bishop (who owns nearly 500 ar.) their son?

legal restrictions on partible inheritance made estates less likely to be divided up than in Egypt, witnessed this phenomenon to such a degree, though intermarriage within the landowning élite was normal. The overall concentration of land ownership in late nineteenth-century England, taking all of these factors into account, was thus apparently much higher than that in Egypt.

The degree of concentration manifested in the Hermopolite urban population's ownership of land may thus seem in context less extreme than it otherwise would. Perhaps the most striking feature of all, in fact, is the absence of really great landed fortunes in the hands of members of the curial class, fortunes that might support a rise from municipal status to the aristocracy of the empire. It has long been noticed that Egypt contributed disproportionately few persons to that aristocracy, even in the fourth century and later. The lack of great fortunes underlying this state of affairs seems to have been deeply rooted in patterns of land ownership.

<div align="center">APPENDIX: SKAR</div>

I have considered the possibility of using one other Egyptian source, the payments recorded in the great codex (*CPR* v.26) of the Hermopolite village of Skar, to be dated around the middle of the fifth century or a bit later.[73] We find in this text a series of columns of names and figures in talents,[74] organized by eight phyl( ), resolved by the editor as phyl(ai), 'tribes',[75] and described only as the 'collection of the village of Skar for the 1st *meros* for [or 'of'] the 2nd indiction'. The term for 'collection', *eispraxis*, generally refers to tax collection, but that can be either of money taxes or of grain taxes. The text does not tell us. None the less, since virtually all taxes collected in the period after Diocletian were based on landholdings, the tax collections should in some sense reflect landholdings.[76]

There are, however, many reasons to treat the figures with some reserve. First, we do not know if *meros* here refers to a portion of the tax for this indiction or to a division in the village. There are 260 payers with names and amounts identifiable[77] in what is preserved, and perhaps another twenty-five have names or data lost. That could be the entire population of landowners; but it might not be. Secondly, it is impossible to say if this is a collection of money instead of wheat, of money instead of wheat arrears, of money instead of gold bullion or coin, or of money assessed originally in talents. Thirdly, the head person, evidently the *gnoster*, listed for each *phyle* is usually a large payer, and some of them are among the very largest. Are some of their payments on behalf of others, or were they chosen for their posts precisely because of their wealth? Fourthly, there are large numbers of people with identical payment amounts, a salient contrast to the situation at Karanis. Fifthly, women account for only 5 per cent of the payers in this document, a much lower figure than in any of the other populations for which I have been able to compute the figure, even urban (cf. above).

If one could overcome all of these difficulties, it would be interesting to observe that Skar shows a range of payments from 700 to 403,500 talents, a very large spread indeed.[78] At one point we learn that the solidus was worth 28,000 talents at this date, so that the payments range from .025 solidus to 14.4 solidi. Of the payers, 212 pay amounts equal to less than one solidus, only forty-eight a solidus or more. It is highly unlikely that this can represent total land taxes for most of these people. It is hardly surprising that the Gini index for this data set, omitting persons for whom data are lost, comes to a relatively high .573. For all of the reasons given above, however, I do not believe that we can press this figure and describe it as characterizing accurately any particular population.

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[73] See my 'Conversion and onomastics: a reply', *ZPE* 69 (1987), 243–50 on recent work concerning the date of this text.

[74] See R. S. Bagnall and P. J. Sijpesteijn, 'Currency in the fourth century and the date of CPR V 26', *ZPE* 24 (1977), 111–24 for the unit used.

[75] He remarks on the oddity of this organizational unit in a village; but I cannot offer anything better.

[76] See my 'P.Oxy. xvi 1905, SB v 7756, and fourth century taxation', *ZPE* 37 (1980), 185–96 and Bagnall, op. cit. (n. 28), for details.

[77] Assuming that all homonyms are the same person; there are twenty-two appearing in more than one *phyle*, and some of them might be different, though with some the names are uncommon enough that this is unlikely.

[78] A brief note on procedures followed: I omitted any amounts for which the entire entry was crossed out, but not numbers if the name was left. Entries in the same name are totalled. In a significant number of cases, names are lost but patronymics preserved. Some of these are probably to be identified with persons appearing elsewhere, in which case the number of very small holders would diminish (but some medium-sized payments would also be added to existing totals). It is not obvious that small holders would gain if we had more entries; the reverse may in fact be true, since the largest payers appear more often in general and the damaged entries are thus perhaps more likely to be theirs.

TABLE I.   KARANIS TAXPAYERS AS IN THE REGISTER
The data are derived from P.Cair.Isid. 9.
Under 'status', $P = \pi o\lambda i\tau\eta\varsigma$(metropolitan), $K = \varkappa\omega\mu\eta\tau\eta\varsigma$ (villager). Art. = artabas; Ar. = arouras.

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Abok gymnasiarch	P	51.5		24.73	22.97	47.70
Tiberinos bouleutes	P	221.5		−201.36	201.36	0.00
Souchiaina & Horion	P	144.33	14	−107.35	123.25	15.91
Sarap., Horion, Maron.	P	15		−13.64	13.64	0.00
— s. Maron	P	14.5		−13.18	13.18	0.00
Valeria d. Agrippinos	P	16.25	16.5	13.35	5.40	18.75
Heron gymnasiarch	P	20		−18.18	18.18	0.00
— s. Demetrios	P	3		−2.73	2.73	0.00
Heros s. Asklepiades	P	2	4	5.00	−0.45	4.55
Herakles & Alexandros	P	57	32.5	3.58	33.35	36.93
Gemellos s. Rufus	P	1.5	2.5	2.90	−0.06	2.84
Ptolemaios s. Ammonianos	P	21	7	−7.16	15.11	7.95
Serenilla d. Ptolemaios	P	15.25	16.75	14.69	4.35	19.03
Philadelphos s. Nemesinos	P	6.5	7.5	6.88	1.65	8.52
Neilos veteran	P	5.625	5	3.41	2.27	5.68
Didymos s. Proklos	P	4.5	4	2.73	1.82	4.55
Apollonios veteran	P	31	25	14.43	13.98	28.41
Palladia alias Libelaria	P		2	3.41	−1.14	2.27
A...nous	K	69		−62.73	62.73	0.00
Apous s. Ptolemaios	K	48	30	7.50	26.59	34.09
Apollonios & partners	K	82		−74.55	74.55	0.00
Isidoros s. Horos	K	27.67		−25.15	25.15	0.00
Serenos s. Horos	K	28.67		−26.06	26.06	0.00
Achillas s. Antoninos	K	39.5		−35.91	35.91	0.00
Seeis s. Paianos	K	3	0	−2.73	2.73	0.00
Adora d. Aboikis	K	82		−74.55	74.55	0.00
Atia d. Paesios	K	22.75		−20.68	20.68	0.00
Aion s. Papeeis	K	37		−33.64	33.64	0.00
Apollos s. Apollonios	K	9.125		−8.30	8.30	0.00
Atiaina d. Tourbon	K	4.5		−4.09	4.09	0.00
Arabikos s. Ptollas	K	68.75		−62.50	62.50	0.00
Aunes s. Harpokration	K	35.5		−32.27	32.27	0.00
Hatres s. Petoubestis	K	43		−39.09	39.09	0.00
Ammonios s. Papeeis	K	32	23.3	10.63	15.85	26.48
Achillas & Korous	K	58		−52.73	52.73	0.00
Alema d. Saumaus	K	95		−86.36	86.36	0.00
Ariston s. Serenos	K	53	42	23.41	24.32	47.73
Alexandros s. Alexandros	K	47		−42.73	42.73	0.00
Ammonios s. Papeeis	K	39.3		−35.73	35.73	0.00
Atisis s. Orsenouphis	K	6	12.75	16.28	−1.79	14.49
Ammonios s. Leein	K	16.5	11.5	4.60	8.47	13.07
Atous s. Neas	K	11.75	5.25	−1.73	7.70	5.97
Amis s. Horion	K	14.5	13	8.98	5.80	14.77
Antonios s. Antonios	K	9	10	8.86	2.50	11.36
Harpalos s. Harpaeieg	K	6	8.375	8.82	0.70	9.52
Atisis s. Paianos	K	11		−10.00	10.00	0.00

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Didyme d. Ptolemaios	K	46		−41.82	41.82	0.00
Dios s. Kastor	K	45.3		−41.18	41.18	0.00
Doulos s. Aionis	K	27.625		−25.11	25.11	0.00
Doulos s. Polydeukes	K	6.3		−5.73	5.73	0.00
Demetrios & Taeias	K	38	20	−0.45	23.18	22.73
Euhemeros s. Artemidoros	K	15.5	10	2.95	8.41	11.36
Eirene d. Polion	K	12.3	6	−0.95	7.77	6.82
Heron s. Heron	K	33	32	24.55	11.82	36.36
Heron s. Aion	K	30.25	9.5	−11.31	22.10	10.80
Heron s. Aponis	K	31	23.125	11.24	15.04	26.28
Theonas s. Antoninos	K	31.67	33	27.46	10.04	37.50
Isidora d. Ptolemaios	K	93.625	61.75	20.14	50.03	70.17
Kasis & Isidoros	K	63.75	59.3	43.12	24.26	67.39
Kasianos s. Sapros	K	17	10.75	2.87	9.35	12.22
Kopres s. Orsenouphis	K	4.5	4.75	4.01	1.39	5.40
Kapeeis & Apilla	K	49.75	20	−11.14	33.86	22.73
Kollouthos & brothers	K	42.67	43.5	35.36	14.07	49.43
Leonides s. Papeeis	K	35.5	22	5.23	19.77	25.00
Melas s. Sokrates	K	36	45	43.98	7.16	51.14
Melas s. Eudaimon	K	26	24.25	17.70	9.86	27.56
Maronis d. Palemon	K	94.25		−85.68	85.68	0.00
Venaphris s. Aionis	K	15.5		−14.09	14.09	0.00
Venaphris s. Atisis	K	100		−90.91	90.91	0.00
Papeeis s. Isidoros	K	25.75	20	10.68	12.05	22.73
Pleein s. Eudaimon	K	40	28	11.36	20.45	31.82
Pankrates s. Ptolemaios	K	66	57	37.16	27.61	64.77
Ptolemaios s. Dioskoros	K	18.25	15	8.98	8.07	17.05
Priskos s. Eudaimon	K	44.375	33	15.91	21.59	37.50
Ptollas s. Germanos etc.	K	141	118	72.95	61.14	134.09
Pelalis s. Kasios	K	32.125	12.5	−7.90	22.10	14.20
Patieis s. Isidoros	K	19.3	11	1.20	11.30	12.50
Pannous & Tasoucharion	K	85	109.5	109.38	15.06	124.43
Markellas s. Ptolemaios	K	3.5	6	7.05	−0.23	6.82
Ptollas s. Sarapion & br.	K	51.75	40.375	21.78	24.11	45.88
Pantel s. Papeeis	K	24	20	12.27	10.45	22.73
Palemon s. Ptollas	K	51.75	16	−19.77	37.95	18.18
Paulos s. Isidoros	K	24	27.5	25.06	6.19	31.25
Palemon s. Teiouk	K	16.625	12	5.34	8.30	13.64
Ptollarion s. Polydeukes	K	86.25	49.3	5.62	50.40	56.02
Pankrates & Alolas	K	23.5	23	17.84	8.30	26.14
Ptolemaios s. Ptolemaios	K	46	40	26.36	19.09	45.45
Melas s. Horos & Ision	K	65	38.5	6.53	37.22	43.75
Paeianis s. Aphelis	K	26.125	17.5	6.08	13.81	19.89
Paesis s. Masculinus	K	113.5	138	132.05	24.77	156.82
Anouphis s. Masculinus	K	21	0	−19.09	19.09	0.00
—diou	K	16.5	0	−15.00	15.00	0.00
Pelenis s. Kastor	K	9.67	11	9.96	2.54	12.50
Serenos s. Ekysis	K	43.5		−39.55	39.55	0.00
Palemon s. Ptolemaios	K	31.5	19.67	4.89	17.46	22.35

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Pekysis s. Anothios	K	9	4	−1.36	5.91	4.55
Panesates s. Aunes	K	20.3	15.5	7.97	9.65	17.61
Sarapammon s. Chairemon	K	15.5		−14.09	14.09	0.00
Sotas s. Apollonios	K	5.67		−5.15	5.15	0.00
Sarapammon s. Horion	K	20	21.25	18.04	6.11	24.15
Seuthes & Harpalos	K	36	36.5	29.49	11.99	41.48
Sokrates s. Aianos	K	25.3	33	33.25	4.25	37.50
Sempronia d. Melas	K	23	19.125	11.69	10.04	21.73
Syrion s. Sotas	K	101.3	65.75	19.98	54.73	74.72
Seuthes & Neilos	K	14	15	12.84	4.20	17.05
Sarapion s. Artemidoros	K	34	30.67	21.37	13.48	34.85
Tanouphis d. Patas	K	38	20.5	0.40	22.90	23.30
Taesis d. Ptolemaios	K	53.3	48.3	33.88	21.01	54.89
Timotheos s. Timotheos	K	4.5	6.5	6.99	0.40	7.39
Horion s. Kastor	K	14	12	7.73	5.91	13.64
Moros, priest	K	57	34.75	7.41	32.07	39.49
Atisis s. Hatres	K	12	81.3	127.67	−35.28	92.39
Isidoros s. Ptolemaios	K	48	32	10.91	25.45	36.36
Heron s. Ptolemaios	K	31.5	22.75	10.14	15.71	25.85
Demetrios s. Ptolemaios	K	31.5	22.75	10.14	15.71	25.85
Heras s. Ptolemaios	K	38.75	26.125	9.30	20.38	29.69
Pesouris s. Kallonios	K		2	3.41	−1.14	2.27
Paesis s. Ision	K	64		−58.18	58.18	0.00
Ioulios s. Psenamounis	K	29		−26.36	26.36	0.00
Serenos s. Dioskoros	K	64		−58.18	58.18	0.00
Kyrillous d. Kopres	K	11	10	7.05	4.32	11.36
Taesis d. Nikanor	K		0	0.00	0.00	0.00
Didyme d. Aboikis	K			0.00	0.00	0.00
Isidoros s. Hatres	K		5.67	9.66	−3.22	6.44
Moros s. Isidoros	K		0	0.00	0.00	0.00
Heron s. Ammonas	K		6.3	10.74	−3.58	7.16
Abok s. Melas	K			0.00	0.00	0.00
Pemes s. Hermias	K		1.5	2.56	−0.85	1.70

TABLE 2. KARANIS TAXPAYERS SORTED BY LANDHOLDINGS

In this table the missing or incomplete data have been normalized as described above (p. 133), then sorted by status and by size of total landholdings.

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Tiberinos bouleutes	P	221.50	180.52	106.35	98.79	205.14
Souchiaina & Horion	P	144.33	117.63	69.29	64.37	133.67
Abok gymnasiarch	P	51.50	41.97	24.73	22.97	47.70
Herakles & Alexandros	P	57.00	32.50	3.58	33.35	36.93
Apollonios veteran	P	31.00	25.00	14.43	13.98	28.41
Ptolemaios s. Ammonianos	P	21.00	17.11	10.08	9.37	19.45
Serenilla d. Ptolemaios	P	15.25	16.75	14.69	4.35	19.03

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Valeria d. Agrippinos	P	16.25	16.50	13.35	5.40	18.75
Heron gymnasiarch	P	20.00	16.30	9.60	8.92	18.52
Sarap., Horion, Maron.	P	15.00	12.22	7.20	6.69	13.89
— s. Maron	P	14.50	11.82	6.96	6.47	13.43
Philadelphos s. Nemesinos	P	6.50	7.50	6.88	1.65	8.52
Neilos veteran	P	5.63	5.00	3.41	2.27	5.68
Didymos s. Proklos	P	4.50	4.00	2.73	1.82	4.55
Heros s. Asklepiades	P	2.00	4.00	5.00	−0.45	4.55
Gemellos s. Rufus	P	1.50	2.50	2.90	−0.06	2.84
— s. Demetrios	P	3.00	2.44	1.44	1.34	2.78
Palladia alias Libelaria	P	2.45	2.00	1.18	1.09	2.27
Paesis s. Masculinus	K	113.50	138.00	132.05	24.77	156.82
Ptollas s. Germanos etc.	K	141.00	118.00	72.95	61.14	134.09
Pannous & Tasoucharion	K	85.00	109.50	109.38	15.06	124.43
Venaphris s. Atisis	K	100.00	81.50	48.01	44.60	92.61
Atisis s. Hatres	K	99.76	81.30	47.89	44.49	92.39
Alema d. Saumaus	K	95.00	77.42	45.61	42.37	87.98
Maronis d. Palemon	K	94.25	76.81	45.25	42.04	87.29
Adora d. Aboikis	K	82.00	66.83	39.37	36.57	75.94
Apollonios & partners	K	82.00	66.83	39.37	36.57	75.94
Syrion s. Sotas	K	101.30	65.75	19.98	54.73	74.72
Isidora d. Ptolemaios	K	93.63	61.75	20.14	50.03	70.17
Kasis & Isidoros	K	63.75	59.30	43.12	24.26	67.39
Pankrates s. Ptolemaios	K	66.00	57.00	37.16	27.61	64.77
A. . .nous	K	69.00	56.23	33.13	30.78	63.90
Arabikos s. Ptollas	K	68.75	56.03	33.01	30.66	63.67
Paesis s. Ision	K	64.00	52.16	30.73	28.55	59.27
Serenos s. Dioskoros	K	64.00	52.16	30.73	28.55	59.27
Ptollarion s. Polydeukes	K	86.25	49.30	5.62	50.40	56.02
Taesis d. Ptolemaios	K	53.30	48.30	33.88	21.01	54.89
Achillas & Korous	K	58.00	47.27	27.85	25.87	53.72
Melas s. Sokrates	K	36.00	45.00	43.98	7.16	51.14
Kollouthos & brothers	K	42.67	43.50	35.36	14.07	49.43
Palemon s. Ptollas	K	51.75	42.18	24.85	23.08	47.93
Ariston s. Serenos	K	53.00	42.00	23.41	24.32	47.73
Kapeeis & Apilla	K	49.75	40.55	23.89	22.19	46.08
Ptollas s. Sarapion & br.	K	51.75	40.38	21.78	24.11	45.88
Ptolemaios s. Ptolemaios	K	46.00	40.00	26.36	19.09	45.45
Melas s. Horos & Ision	K	65.00	38.50	6.53	37.22	43.75
Alexandros s. Alexandros	K	47.00	38.30	22.57	20.96	43.53
Didyme d. Ptolemaios	K	46.00	37.49	22.09	20.52	42.60
Dios s. Kastor	K	45.30	36.92	21.75	20.20	41.95
Seuthes & Harpalos	K	36.00	36.50	29.49	11.99	41.48
Serenos s. Ekysis	K	43.50	35.45	20.88	19.40	40.29
Hatres s. Petoubestis	K	43.00	35.04	20.64	19.18	39.82
Moros, priest	K	57.00	34.75	7.41	32.07	39.49
Theonas s. Antoninos	K	31.67	33.00	27.46	10.04	37.50
Sokrates s. Aianos	K	25.30	33.00	33.25	4.25	37.50
Priskos s. Eudaimon	K	44.38	33.00	15.91	21.59	37.50

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Achillas s. Antoninos	K	39.50	32.19	18.96	17.62	36.58
Ammonios s. Papeeis	K	39.30	32.03	18.87	17.53	36.40
Heron s. Heron	K	33.00	32.00	24.55	11.82	36.36
Isidoros s. Ptolemaios	K	48.00	32.00	10.91	25.45	36.36
Sarapion s. Artemidoros	K	34.00	30.67	21.37	13.48	34.85
Aion s. Papeeis	K	37.00	30.15	17.76	16.50	34.27
Apous s. Ptolemaios	K	48.00	30.00	7.50	26.59	34.09
Aunes s. Harpokration	K	35.50	28.93	17.04	15.83	32.88
Pleein s. Eudaimon	K	40.00	28.00	11.36	20.45	31.82
Paulos s. Isidoros	K	24.00	27.50	25.06	6.19	31.25
Pelalis s. Kasios	K	32.13	26.18	15.42	14.33	29.75
Heras s. Ptolemaios	K	38.75	26.13	9.30	20.38	29.69
Heron s. Aion	K	30.25	24.65	14.52	13.49	28.02
Melas s. Eudaimon	K	26.00	24.25	17.70	9.86	27.56
Ioulios s. Psenamounis	K	29.00	23.63	13.92	12.93	26.86
Serenos s. Horos	K	28.67	23.37	13.76	12.79	26.55
Ammonios s. Papeeis	K	32.00	23.30	10.63	15.85	26.48
Heron s. Aponis	K	31.00	23.13	11.24	15.04	26.28
Pankrates & Alolas	K	23.50	23.00	17.84	8.30	26.14
Demetrios s. Ptolemaios	K	31.50	22.75	10.14	15.71	25.85
Heron s. Ptolemaios	K	31.50	22.75	10.14	15.71	25.85
Isidoros s. Horos	K	27.67	22.55	13.28	12.34	25.63
Doulos s. Aionis	K	27.63	22.51	13.26	12.32	25.58
Leonides s. Papeeis	K	35.50	22.00	5.23	19.77	25.00
Sarapammon s. Horion	K	20.00	21.25	18.04	6.11	24.15
Tanouphis d. Patas	K	38.00	20.50	0.40	22.90	23.30
Demetrios & Taeias	K	38.00	20.00	−0.45	23.18	22.73
Papeeis s. Isidoros	K	25.75	20.00	10.68	12.05	22.73
Pantel s. Papeeis	K	24.00	20.00	12.27	10.45	22.73
Palemon s. Ptolemaios	K	31.50	19.67	4.89	17.46	22.35
Sempronia d. Melas	K	23.00	19.13	11.69	10.04	21.73
Atia d. Paesios	K	22.75	18.54	10.92	10.15	21.07
Paeianis s. Aphelis	K	26.13	17.50	6.08	13.81	19.89
Anouphis s. Masculinus	K	21.00	17.11	10.08	9.37	19.45
Panesates s. Aunes	K	20.30	15.50	7.97	9.65	17.61
Ptolemaios s. Dioskoros	K	18.25	15.00	8.98	8.07	17.05
Seuthes & Neilos	K	14.00	15.00	12.84	4.20	17.05
—diou	K	16.50	13.45	7.92	7.36	15.28
Amis s. Horion	K	14.50	13.00	8.98	5.80	14.77
Atisis s. Orsenouphis	K	15.64	12.75	7.51	6.98	14.49
Sarapammon s. Chairemon	K	15.50	12.63	7.44	6.91	14.36
Venaphris s. Aionis	K	15.50	12.63	7.44	6.91	14.36
Horion s. Kastor	K	14.00	12.00	7.73	5.91	13.64
Palemon s. Teiouk	K	16.63	12.00	5.34	8.30	13.64
Ammonios s. Leein	K	16.50	11.50	4.60	8.47	13.07
Pelenis s. Kastor	K	9.67	11.00	9.96	2.54	12.50
Patieis s. Isidoros	K	19.30	11.00	1.20	11.30	12.50
Kasianos s. Sapros	K	17.00	10.75	2.87	9.35	12.22
Eirene d. Polion	K	12.30	10.02	5.91	5.49	11.39

Name	Status	Art. wheat	Art. barley	Ar. Private	Ar. Public	Ar. Total
Antonios s. Antonios	K	9.00	10.00	8.86	2.50	11.36
Kyrillous d. Kopres	K	11.00	10.00	7.05	4.32	11.36
Euhemeros s. Artemidoros	K	15.50	10.00	2.95	8.41	11.36
Atous s. Neas	K	11.75	9.58	5.64	5.24	10.88
Atisis s. Paianos	K	11.00	8.96	5.28	4.91	10.19
Harpalos s. Harpaeieg	K	6.00	8.38	8.82	0.70	9.52
Apollos s. Apollonios	K	9.13	7.44	4.38	4.07	8.45
Pekysis s. Anothios	K	9.00	7.33	4.32	4.01	8.34
Timotheos s. Timotheos	K	4.50	6.50	6.99	0.40	7.39
Heron s. Ammonas	K	7.73	6.30	3.71	3.45	7.16
Markellas s. Ptolemaios	K	3.50	6.00	7.05	−0.23	6.82
Isidoros s. Hatres	K	6.96	5.67	3.34	3.10	6.44
Doulos s. Polydeukes	K	6.30	5.13	3.02	2.81	5.83
Kopres s. Orsenouphis	K	4.50	4.75	4.01	1.39	5.40
Sotas s. Apollonios	K	5.67	4.62	2.72	2.53	5.25
Atiaina d. Tourbon	K	4.50	3.67	2.16	2.01	4.17
Seeis s. Paianos	K	3.00	2.44	1.44	1.34	2.78
Pesouris s. Kallonios	K	2.45	2.00	1.18	1.09	2.27
Pemes s. Hermias	K	1.84	1.50	0.88	0.82	1.70
Abok s. Melas	K			0.00	0.00	0.00
Taesis d. Nikanor	K	0.00	0.00	0.00	0.00	0.00
Didyme d. Aboikis	K	0.00		0.00	0.00	0.00
Moros s. Isidoros	K	0.00	0.00	0.00	0.00	0.00
		4,570.89	3,758.69	2,251.50	2,019.73	4,271.24

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