INTRODUCTION

As is well known, the Roman Empire was a world of cities. Some of these were extremely large. Rome famously might have reached one million inhabitants, Alexandria, Antioch and Carthage might have had populations of several hundred thousand inhabitants. There were also hundreds of smaller cities, some hardly more than local centres, others functioning as part of wider economic networks.

The central role of the city in Roman society raises important questions. In pre-industrial societies that experienced high levels of urbanisation, such as the Roman world, the question that dominates all others is how cities were fed. How did agricultural societies enable part of its population to live a life divorced from agriculture? Did urban inhabitants actually live a life divorced from agriculture? Or should we consider the cities in some sense as agro-towns, in which a large part of the population was cultivating land or was otherwise involved in agriculture?

For urban inhabitants, direct access to food was dependent on access to land. Inhabitants of cities might obtain their food through the market, or through distributions, but these required market transactions and created dependency. By contrast, direct access to food was provided by ownership of land, or by cultivating land in return for part of the produce. Understanding patterns of urban landholding and cultivation is therefore a necessary step before a study can be attempted of the ways cities were fed.

The relation between urbanisation and landholding can profitably be studied in Roman Egypt. Thanks to the survival of thousands of papyri we know much more about patterns of urban landholding in Egypt than we do for cities in other regions. There are some data sets that can be statistically analysed, and, what is perhaps equally important, there is much more context than elsewhere; there is an abundance of evidence about Egyptian agriculture. What is perhaps less commonly realised is that Egypt was also heavily urbanised. Alexandria looms large in discussions about Egypt, but it has become increasingly clear how numerous and populous were the other towns that dotted the banks of the Nile Valley and the Delta.

The aim of this article is to explore the question of what urbanisation in Roman Egypt meant for the way the population of the towns outside Alexandria were fed. It does so by focussing on the question of the extent to which urban inhabitants had access to land. The method followed here is to create a model on the basis of data provided by a number of papyri. These data are combined into crude calculations. Such calculations are anything but precise, but they help to limit the number of possibilities.

My argument is mixed. On the one hand it will become clear that there existed even within the larger cities a number of persons who had in one form or another access to land and hence direct access to food. Some obtained food through the ownership of land, some through the cultivation of land, and some through a combination of both. Those concerned were not only the large landowners that formed the urban elites, but also a sizable number of smallholders and urban agricultural labourers. The presence of these groups in an urban

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1 I am indebted to Brian Muhs of the Leiden Papyrological Institute for help and suggestions, as well as to the editors of this volume. This article expands the arguments of my book Fragile Hierarchies. The urban elites of third-century Roman Egypt (Leiden 2006); in particular it explores the implications of my finding in Part 1 Chapter 3 that only a small minority of urban inhabitants owned land.
context is important, for they were relatively well protected from the vagaries of the market. On the other hand it appears that such access to land by urban inhabitants was a relatively limited phenomenon. Only a tiny minority of the urban population owned land. The pool of those with access to land might have been substantially broadened by the existence of urban agricultural labourers, but even when the totals for all the groups are added up, it appears that a significant part of the population did not own or cultivate land and hence must have obtained its food by other means. This has important consequences for the way we understand the feeding of cities and hence for the nature of the urban economy.

1. Levels of Urbanisation

There is a growing consensus among scholars that levels of urbanisation in Roman Egypt were relatively high. As Alan Bowman has remarked

it is now possible, (...) to find authoritative scholars prepared to describe Roman Egypt as heavily urbanized, if not the most urbanized province of the Roman empire (though with the caveat that the ‘cities’ of Roman Egypt, Alexandria excepted, were really only ‘country towns’ by modern standards).

Part of the difficulty in understanding the patterns of urbanisation of Roman Egypt has been the status of its larger centres. The over forty district capitals that formed the backbone of the urban landscape had the status of metropoleis. Apart from these, three, later four, poleis existed: Naukratis, Ptolemais, Alexandria and Antinoopolis. By convention, the metropoleis are called towns, not cities, a term that remains reserved for the poleis. The distinction is based on constitutional criteria. The poleis would in modern parlance be considered to have had city rights, and hence to qualify as a city, whereas the metropoleis had no such rights. However, reserving the term ‘city’ to a limited number of settlements implies that the urban landscape of Roman Egypt consisted of four cities only. From an economic and social point of view, this would be nonsense. Not only the poleis, but also the metropoleis were urban in character. They were urban in terms of population size, economic complexity and their function as central places, both in an economic and in an administrative sense.

Once it is accepted that the metropoleis should be taken into account as well, their sheer number already suggests an urbanised landscape. There were some 40 to 50 metropoleis distributed over the whole of Egypt. A traveller along the Nile would encounter at regular intervals a metropolis.

We do not know how large most of these towns were, but we have an idea of the population size of five. The population of Thmouis in the Eastern Delta may have comprised over 25,000 inhabitants, that of Arsinoe in the Fayum 44,000 persons at maximum, that of Oxyrhynchos between 20,000 and 42,000, and that of Hermopolis of 45,000. Only that of

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2 What follows is a brief summary of my Fragile Hierarchies (above, n.1) Part I Chapters 1 and 2, with slightly different emphasis.
4 For distances between metropoleis, see R. S. Bagnall, Egypt in Late Antiquity (Princeton 1993) 332-335.
Apollonopolis Heptakomia was small: it comprised 9,000 inhabitants. The large size of four of the five has been taken as a further indication that levels of urbanisation were high.

The estimates for urban population size are based on extrapolation from much smaller figures that are found in the papyri. As an example, we may take the estimate for the population of Hermopolis. The example is not taken at random: it will be used later on in this article. The population of Hermopolis has been calculated on the basis of a report about a special tax-levy dating to 266/267. The report mentioned originally for each of its four quarters the number of oikiai (houses or households), and the total received sum of tax. Although the numbers of oikiai have disappeared in a lacuna, the tax rate and the totals for two of the quarters have been preserved. From these the number of oikiai can be easily worked out. There were slightly over 2,300 oikiae in one, unknown, quarter, and slightly over 1,900 oikiae in the quarter of West City. Hermopolis was divided in four quarters. Using the average of the two preserved figures for all four quarters yields a total of 8,400 oikiae. It is not certain whether oikia refers to house or to household. However, the unit of taxation was normally the household, not the house. If oikia referred to household, the 8,400 oikiae have to be multiplied with average urban household size. This yields a population of slightly above 45,000.

Many scholars have pointed out that such estimates for urban population size have wide margins of error. All estimates are obtained by extrapolation. The figures in the papyri concern the number of houses or the number of taxpayers in a particular district. These are then extrapolated to obtain a total estimate for the urban population. For example, each house is multiplied by the average number of inhabitants. Each taxpayer is multiplied by the number of non-tax paying people. Each quarter is multiplied by the total number of quarters. And so on. With each multiplication, the margin of error becomes progressively larger. Individual estimates might therefore be quite far off the mark.

There is however less reason for gloom than is often believed. As a series, I would argue, the figures are relatively reliable. The order of magnitude is not in doubt. The fact that all calculations involve similar procedures also has benefits. Most multipliers are used in more than one calculation - most notably the multiplier of average number of persons per house. Even if these multipliers prove to be in need of correction, the relative ranking would remain unaffected.

The major room for uncertainty lies elsewhere, however. Even when the figures are broadly correct, the question remains what they mean. Does the fact that four of the five estimates were high mean that large towns were the norm in Roman Egypt?

A study of the size of the nomes (districts) of which the towns were the centre is instructive. It is from these nomes that the towns were fed. For four of the five towns for which we have an estimate of its urban population we have also an estimate of its nome size. As could be expected, it turns out that the larger urban centres also have larger nomes. The one small town for which we have an estimate, Apollonopolis Heptakomia, had a much smaller nome. The crucial point is that most other towns for which we have no further estimates had a nome size comparable to the five urban centres.

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5 See for these estimates my Fragile Hierarchies (above, n.1) 39-52, with further references to the estimates of others, and D. Rathbone, ‘Villages, land and population in Graeco-Roman Egypt’, Proceedings of the Cambridge Philological Society n.s. 36 (1990) 103-142. The figures of others differ slightly from mine and from each other, but the order of magnitude is not in doubt.


7 With average household size of 5.4. If oikia refers to house, the multiplier is 7, yielding a population of 58,800. See R. S. Bagnall and B. W. Frier, The demography of Roman Egypt (Cambridge 1994) 55.
information also had small nomes. This suggests that the towns for which we lack evidence about population size were relatively small, in the order of 10,000-15,000 inhabitants.

Although the size of some towns of Roman Egypt was relatively large, it is not legitimate to use that as a direct argument for high levels of urbanisation. We should rather envisage a spectrum of town sizes, with some relatively large towns, but also with a host of much smaller ones.

Estimates of the size of individual towns give hints about the extent to which Roman Egypt was urbanised, but cannot be used to establish levels of urbanisation. To know levels of urbanisation, we do not only need evidence about the urban population, but also about the size of the total population. This is contested area, for the debate about the population of Roman Egypt is ferocious. Scholars have come up with widely diverging estimates. Instead of adding yet another set of figures, it is also possible to explore the broad band of possibilities with the help of parametric modelling.

The level of urbanisation can be defined as the proportion of the total population that is living in urban centres. This definition can be expressed as a general equation and in a form applied to Roman Egypt:

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\frac{\text{Urban population}}{\text{Total population}} \times 100 = \text{Urbanisation in } \% \\
\frac{S_{\text{Alex}} + (N_{\text{tot}} \times S_{\text{av}})}{A_{\text{inh}} \times D_{\text{pop}}} \times 100 = U
\]

In which:
- \(S_{\text{Alex}}\) = the population size of Alexandria, in pers.
- \(N_{\text{tot}}\) = the total number of urban centres, excluding Alexandria
- \(S_{\text{av}}\) = the average population size of the urban centres, in pers.
- \(A_{\text{inh}}\) = the inhabited area, in \(\text{km}^2\)
- \(D_{\text{pop}}\) = the total population density, in pers./\(\text{km}^2\)
- \(U\) = the resulting level of urbanisation, expressed as a percentage

The equation is deliberately kept simple. What counts as ‘urban centre’ is not determined on the basis of economic complexity or size or historical importance but on the basis of administrative criteria. Here it will be assumed that the category of urban centres consists of all nome (district) capitals. This has great practical advantages because it obviates the need to determine for each individual settlement its true status. However, it needs to be realised that in theory some towns included in the category of urban settlements might have been rustic backwaters, while some villages that are not reckoned to be urban might have reached the size of small towns.

The use of the equation has one major advantage. As it is the broad band of possibilities, not the exact figures, that needs to be established, there is no need to discuss in detail all the difficulties that individual estimates for each variable present. The discussion of the population size of Alexandria, for example, forms a minefield of problematical passages and hypothetical inferences. For the equation, it simply suffices to take the lowest and the highest estimates that have been offered in the literature and explore the plausibility of their results.

The scholarly literature offers the following figures:

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8 Rathbone, ‘Villages, land and population’ (above, n.5) is fundamental.
What these figures imply for levels of urbanisation can be demonstrated with the help of a matrix. A calculation that uses maximum figures for all variables, based on a population of 8 million, a size of Alexandria of 600,000 inhabitants, 50 towns and an average town size of 25,000 inhabitants, leads to a level of urbanisation of 23%. A calculation with minimum figures, based on a population of 3 million, a size of Alexandria of 200,000 inhabitants, 40 towns, and an average town size of 15,000 inhabitants leads to a level of urbanisation of 26%. Combinations of high with low estimates produce extreme results. Combining maximum values for the size of Alexandria and the towns, with minimum values for population density and inhabited area result in levels of urbanisation that on comparative grounds can be considered implausible: 61%. Conversely, in a minimum/maximum calculation, levels of urbanisation drop to 10%.

Put differently, it seems likely that this is a universe whose properties expand or contract more or less simultaneously. Increases in one variable are more likely to have been met with increases than by compensatory diminishments in other variables. The exact correlation between the different variables is impossible to determine, but it seems not very likely that, say, an increase in the inhabited area would not also imply at least some increase in the level of urbanisation. We are dealing with a balloon, not a seesaw. The corollary is that combinations of maximum with minimum estimates are unlikely to occur.

If this argument is accepted, it would be very difficult to argue that levels of urbanisation were substantially below 20% - which is a finding of real importance, given the fact that such a figure is high in comparative perspective. Even in the most extreme (and in my view unlikely) scenario with a combination of maximum and minimum estimates, levels of urbanisation are still at a respectable 10%.

In comparative perspective, such levels are high. Firstly, in early modern Europe, even the most heavily urbanised regions never reached levels of 20%. Secondly, in Roman Italy urbanisation may admittedly have reached a level of 40%, but this level can only be obtained by including in the count the ca 400 minor cities of 1,000-5,000 inhabitants each, settlements which in Roman Egypt would certainly count as villages. If these are excluded from the comparison the level of urbanisation drops to 25%.

Lastly, levels of urbanisation in 19th century Egypt might have been of the same order of magnitude, or, in fact, have been even lower than those postulated for Roman times.

The high number of towns, the large size of some of them and the parametric model all point in the same direction. To pre-industrial standards, Roman Egypt must have

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9 The arguments presented above imply that I am very much in favour of the low side of the spectrum. In the parametrical model, I am however exploring the implications of both high and low estimates of average town size for levels of urbanisation.

10 J. de Vries, European urbanization 1500-1800 (London 1984) table 3.7 and table 3.8. De Vries’ definition of ‘city’ is based on population size (10,000+ inhabitants), not on administrative criteria, but most if not all of the towns of Roman Egypt will have met that criterion.


experienced high levels of urbanisation. What then of Bowman’s caveat ‘that the “cities” of Roman Egypt, Alexandria excepted, were really only “country towns” by modern standards’?

2. THE AMOUNT OF URBAN LAND

Large cities and high levels of urbanisation must have repercussions for the way the urban economy functioned. In a simple model, the cities obtained their food through the exploitation of the countryside. This exploitation was based on the ownership of land by urban inhabitants. A crucial question is, therefore, how much land was in their hands.

Hermopolis can provide the answer. We can estimate the amount of land owned by its urban residents from two surviving registers dating to the middle of the fourth century. The most complete version preserves a full list of the landowners in one of Hermopolis’ four quarters, West Citadel. For each landholder, the name is given, usually without further status designation. This is followed by the holdings in private and public land, of which the totals per district (in fourth-century terminology, pagus) are given. A separate list contained land owned by inhabitants of the neighbouring polis of Antinoopolis in the Hermopolite nome. The precise date of the two registers is unknown, but on the basis of prosopographical identifications it is certain that they belong to the middle of the fourth century and are separated by only a few years.

The interpretation of the register is not free from problems but these need not concern us here. There is however one problem that may affect my argumentation. The registers list holdings in all pagni with the exception of one: holdings are mentioned in pagni 1 to 6 and 8 to 17, but the 7th pagus is missing. The complete absence of holdings in the 7th pagus is a mystery that has not been solved. The pagus’ existence is not in doubt: it is attested in a few texts. The sequence of pagni in the nome suggests that the 7th pagus must have been located very near Hermopolis, but no cogent explanation has been offered for its absence in the register.

The question is how the absence of the 7th pagus should be accounted for in a model of patterns of landholding. I like my calculations simple, but some scholars have made adjustments in their models. In my view, this creates unwarranted complexity. The logical corollary of the absence of the 7th pagus is that it was irrelevant to the compilers of the list. No matter how we should explain its absence, it is therefore perfectly legitimate to leave it out of consideration. However, in order not to be accused of data manipulation, I will in my footnotes present more complex calculations to allow for the putative existence of a 7th pagus. As will become apparent there, their only effect is to increase the complexity of the model, but they do not affect the argument.

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15 I base myself on Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 147 and 152, who uses the average pagus size for the 7th pagus and makes the important assumption that all of
The Hermopolite register allows us to estimate the amount of land in urban hands, and this amount can be compared to the size of the nome. The most complete register lists 16,400 arouras or 45.2 km$^2$ owned by the inhabitants of the West Citadel quarter.\textsuperscript{16} Multiplied by 4 to account for the three other quarters, Hermopolites owned 65,600 arouras or 181.0 km$^2$ in the nome.\textsuperscript{17} The territory of the Hermopolite nome was very large. It comprised about 1,000 km$^2$ or 363,000 arouras.\textsuperscript{18} Not all of this land will have been under cultivation. Evidence from the neighbouring Oxyrhynchite nome suggests that at around the same time the register was compiled about 72\% of land in the Oxyrhynchite nome was cultivated.\textsuperscript{19} If it is legitimate to apply this percentage to the Hermopolite nome, this would suggest that 261,360 arouras or 720 km$^2$ were under cultivation. This would imply that about one-fourth (25.1\%) of all cultivated land in the Hermopolite nome was owned by Hermopolite landowners.\textsuperscript{20}

A comparison with levels of urbanisation is instructive. Both in the calculation for urban landholding and in the parametric model of urbanisation there are major areas for uncertainty, but it is interesting to see that both offer roughly the same order of magnitude. If we can apply an average level of urbanisation of approximately 20\% (discussed in section 1) to the Hermopolite nome, or conversely apply the percentage of 25.1\% urban landholdings to all nomes, it means that urban landholding was roughly in the same order as rural landholding. Put differently, urban inhabitants owned on average roughly the same as village inhabitants. The ‘on average’ in the previous sentence is however important. As the distribution of landholdings over the urban population was much more uneven than in villages,\textsuperscript{21} the average urban holding was in practice much larger than the average village holding.

The average amount of land owned per capita will however have been roughly equal in villages and towns. Much depends on the way the land was exploited, but such a comparison suggests already that the amount of land in the hands of urban owners will have been sufficient to feed the urban population.

A calculation in wheat-equivalent offers corroboration. It suggests that the produce of the urban holdings of Hermopolites would be sufficient to feed a number of persons well over the urban population. With 10-fold yield the total production of 65,600 arouras would be 6,560,000 artabas of wheat. With minimum consumption of 8,3 artabas a person the holdings

\begin{itemize}
  \item \textsuperscript{16} Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 146-147 and 158 Table III. 1 aroura = 0.002756 km$^2$; 1 km$^2$ = 363 arouras.
  \item \textsuperscript{17} I deliberately ignore the land in the hands of Antinoites, as from the perspective of the Hermopolites it did not matter whether holdings were in the hands of villagers or urban residents outside their own town. The aggregate total of their holdings in the Hermopolite nome was at any rate relatively small.
  \item \textsuperscript{18} Bagnall, \textit{Egypt in Late Antiquity} (above, n.4) 334, listing 1,140 km$^2$ minus a small tract of Antinoite land; here set at 140 km$^2$ to obtain a round figure. For what follows see Bagnall, ‘Landholding in late Roman Egypt (above, n.13) 137 (with slight differences).
  \item \textsuperscript{19} See \textit{S.B.} 14 (1981-1983) 12208 (ca 350), where the editors show that the area of taxable cultivated land comprised 560 km$^2$. With a nome of 780 km$^2$ 71.8\% of land was under cultivation. The size of the nome is based on a rough estimate, but there can be no doubt about the order of magnitude.
  \item \textsuperscript{20} Following Bowman’s arguments (for which see also Bagnall, ‘Landholding in late Roman Egypt (above, n.13) 137), a putative missing 7\textsuperscript{th} \textit{pagus} could consist of 21,353 arouras or 59 km$^2$ of land of which 15,374 arouras or 42 km$^2$ would be cultivated. If all this land was owned by Hermopolites in addition to the land registered in the 16 other \textit{pagi}, 80,974 arouras or 223 km$^2$ of land was in the hand of Hermopolites. This would increase the percentage of urban land to slightly over 30\%.
  \item \textsuperscript{21} For which see Bagnall, ‘Landholding in late Roman Egypt’ (above, n.13).
\end{itemize}
would be sufficient to feed slightly over 79,000 persons before deduction of seed, export and taxes. Many uncertainties surround such a calculation. Seed, export and taxes need to be deducted, but their amounts are unknown. The consumption per person may have been higher in reality. But even if these uncertainties are taken into account, there can be little doubt that the produce of the urban holdings would be sufficient to feed a town with a population of approximately 45,000 inhabitants.

Reality was more complex, of course. The crucial assumption in the argument for urban autarky is that all produce on the urban holdings was used to feed urban inhabitants only, or, put differently, that the persons who were fed were also the persons who performed the agricultural labour. As will become clear, it is unlikely that this was the case. As the lease contracts studied in section 5 testify, not all cultivators of the urban holdings will have been inhabitants of the town – in fact, much urban land will have been worked by villagers. This implies that part of the produce went to outsiders, for it is likely that at least part of their labour was paid in agricultural produce.

However, what is interesting is that urban autarky was in theory possible. The urban inhabitants owned enough land to feed themselves and therefore were not directly dependent on the cooperation of the villagers to obtain their food. This is of importance in understanding the power relations between town and countryside. The fact that in reality complex social and economic networks were created between urban landlords and village cultivators was in this sense dependent on choice, not on necessity.

3. The Number of Urban Landowners

The land in the hands of the urban inhabitants would at least in theory have been sufficient to feed the complete urban population. However, this does certainly not mean that all urban inhabitants had access to land in equal measure. The question that needs therefore to be addressed next is how extensive urban landowning was.

Hermopolis holds again the key. The data in the Hermopolite register discussed in the previous section can be combined with the estimate for the size of the urban population discussed in section 1. The Hermopolite land register lists 238 landowners in one quarter. With quarters of more or less equal size, the implication is that approximately 1,000 inhabitants of Hermopolis will have owned land.

The figure of 1,000 Hermopolite landowners is crucial for what follows, so it is of real importance to know that it is right. There is no other town in Egypt for which it is possible to establish the total number of landowners, but indirect corroboration for the order of magnitude might be found in evidence concerning the neighbouring polis Antinoopolis.

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22 For details and references see my Fragile Hierarchies (above, n.1) 26, though in a different context. For 10-fold yields see Rowlandson, Landowners and tenants (above, n.13) 247; note that this is a conservative estimate. The inclusion of a putative 7th pagus in the calculations would only increase further the number of urban inhabitants that could be fed and does therefore not affect the argument.

23 Cf. Bagnall, ‘Landholding in late Roman Egypt (above, n.13) 138-139.

24 Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 157 Table IV.B.

25 If a 7th pagus is included another 15,374 arouras or 42 km² was owned by Hermopolites. If all this land was owned by owners not contained in the known registers (a rather unrealistic assumption), and if their average holding was the same as that of the neighbouring pagi 6, 8-10 (43.9 arouras), another 350 persons should be added to the number of landowners, resulting in a total of 1,350 landowners. The number of assumptions underlying this calculation is large, but it is difficult to see how the order of magnitude could be changed radically.
The Antinoopolite part of the same register from which the Hermopolite total is derived lists a total of 203 Antinoites owning land in the Hermopolite nome. The list is complete. The interpretation of the Antinoite patterns of landholding is complex, because we have no information about patterns of landholding in the Antinoite nome itself. However, the Antinoite nome was a relatively recent creation and was very small. It consisted of a small strip on the east bank of the Nile. Most Antinoite holdings will therefore have been located in the neighbouring Hermopolite nome, not in the Antinoite nome itself. The Hermopolite register presents in that sense a relatively complete description of the situation of the Antinoites. Even if we assume that there were many Antinoites owning land in their own nome only and therefore should be added to those listed in the Hermopolite register, the room to accommodate them in their own nome was very limited. Hypothetical calculations suggest that the number of additional landowners who in such a scenario only held land in the Antinoite nome may have run into a couple of hundreds at most. It is highly unlikely to have exceeded the figure of 1,000 of Hermopolis. Almost all assumptions in such calculations are open to debate, but it is difficult to envisage a scenario in which their number was so large as to lead to a completely different order of magnitude. The fact that the Antinoite figure is likely to have been below the total inferred for Hermopolis supports the Hermopolite order of magnitude.

Corroboration, no matter how imperfect, is important, because the Hermopolite figure of 1,000 landowners is amazingly low. As we saw earlier, the population of Hermopolis is estimated to have comprised 45,000 inhabitants. If the numbers for landowners and population size are even broadly correct, the implication is that only a tiny minority of the inhabitants of Hermopolis owned land. Of all the residents of Hermopolis, only 2 in 100 owned land, and by implication, 98, or the great majority, did not. Increases in the number of landowners, for example on the grounds that the quarters were not of equal size, would have almost no effect on the outcome, and the same holds true for changes in the estimated population size. Data massaging might change the figure but not the order of magnitude.

It may be objected that the age distribution of landowners and that of the total urban population was not the same, because the group of landowners consisted predominantly of adult males. It would therefore be more appropriate to compare the figure of landowners with adult males or with heads of households than with the total urban population. However, the register includes women and minors, and there are cases known where members of the same household are listed separately in the register. The total urban population therefore forms the best comparandum. Nevertheless, even if we were to suppose that each landowner supported a different household—in some cases manifestly untrue—, 12% of all households owned land.

26 Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 157 Table IV.B.
27 The Antinoite nome may have comprised 140 km² or 50,820 arouras. Following the Hermopolite model, we may assume that 72% of the land was cultivated, and that the round figure of 25% of the land was owned by urban inhabitants. This would result in 9,147 arouras of urban land. On the assumption that the size of the Antinoite average holding was the same as that found in the Hermopolite register (37.32 arouras), the Antinoite nome could contain 245 Antinoite owners. If all of these were new persons, the resulting total of landowners would be ca 450. There are many assumptions involved in the calculation, so it can only be taken as a presentation of the order of magnitude, not as an accurate description of reality. An additional complication is that some Antinoites had holdings elsewhere; I assume that normally they would by the middle of the fourth century have acquired land in the Hermopolite and Antinoite nome as well and hence would be included in the figures.
28 With a putative 7th pagus included along the lines sketched above, a total of 1,350 landowners results in a percentage of 3%.
while the great majority of the population, 88%, did not.\textsuperscript{29} No matter how the calculation is made, the conclusion is inescapable that the majority of urban inhabitants did not own land.

The figure of less than 12% has however its uses, for it allows a comparison of landownership with two other types of property: that of houses and slaves. Slaves were working in the households and were in that sense an item of luxury. Houses were a different matter. They were necessary, and they were relatively cheap. The declarations of the census of the first two and a half centuries of Roman rule provide information about the extent of ownership of houses and slaves. Whereas approximately 21% of all urban households owned slaves, approximately 71% of all households lived in their own houses.\textsuperscript{30} The Hermopolite percentage of less than 12% of households owning land is telling: it is even lower than that of the slave-owners in the census population. Of every 10 urban households, 7 owned their own house, 2 owned slaves, and only 1 owned land.

Much land was in the hands of urban owners, but no matter how calculated, the proportion of urban landowners was very low. Through its extensive landholding the town may potentially have been independent of the cooperation of the villagers, but only 2% of the urban population had direct access to food through the ownership of land. This is a surprisingly low figure, and its implications merit close attention.

4. DIRECT CULTIVATION

The logical corollary of the fact that there was enough land in the hands of urban landowners to feed the entire urban population, but that land was in the hands of only a small minority, is that the average urban holding was large. However, the Hermopolite land registers suggest that the reality behind the average was complex. The registers attest to a wide spectrum of holdings, with large clusters at both ends and little around the average. There were several landowners owning 100 arouras and over, and there were also many small landowners owning less than 10 arouras. In fact, almost half of all owners can be categorised as urban smallholders.

The presence of a substantial group of urban smallholders raises the question to what extent urban inhabitants worked the land themselves. Direct cultivation formed the simplest form by which urban inhabitants had access to food and it is therefore important to establish its extent. In the case of the owners of larger holdings, the amount of land will have been too large to be worked by the family alone. In addition, the status of the owners will have meant that they would not have worked the land themselves. Small holdings were a different matter. The occurrence of smallholders in the Hermopolite evidence may imply that there was a substantial group of urban farmers.

For direct cultivation, both the location and the size of holdings matters. Urban holdings that were directly cultivated had to be located within walking distance of the place where the cultivator lives, that is, the town. Plots should also be relatively small, so as to allow the owner or his (or her) family to work the land without recourse to outsiders. These two conditions can be turned into a simple model.

Let us start with walking distance. The total area of the holdings within walking distance is described by a circle of which walking distance is the radius, in formulaic form $\pi R^2$. If, as convention has it, cultivators were able to walk for not more than an hour or 5 km to

\textsuperscript{29} 1,000 landholders with 5.4 av. size household: 12% of a population of 45,000. With a putative 7th 
\textsuperscript{30} Bagnall and Frier, The demography of Roman Egypt (above, n.7) 69-71 with n.63. I do not think that the census percentages for houses and slaves of the first two and a half century changed radically in the fourth century, but the point is strictly speaking beyond proof.
their plots, the land within walking distance would be \( \pi \times 5^2 = 78.5 \text{ km}^2 \) or 28,495 arouras. Such a walking distance area is, to be sure, a theoretical construct. Not all of the territory will have been cultivated: the territory of the town itself should be subtracted from it, there will have been roads leading to the town, and so on. More importantly, much depended on the location of the town. Towns were invariably located along the river. This could easily reduce the territory within walking distance by half (if half of the theoretical area lay at the other side of the river). On the other hand, one might also envisage relatively quick access by boat to plots located further away. However, as a crude model the walking distance area has its uses.

The question is how much of the walking distance area was owned by urban inhabitants. Although it would have been attractive for the urban owners of land to have plots located near their residence for several reasons, we should not expect that all holdings within walking distance would be owned by urban inhabitants. It is certainly possible that some villages were located near the town, and their inhabitants would have owned holdings, too.

From the Hermopolite registers it appears that there was a marked concentration of urban landholdings close to the town. Landholdings can be found in all the sixteen pagi of the nome that are mentioned in the register, but the concentration in the four pagi nearest to the town is marked. 34,768 arouras or 96 km² were held in these four pagi, which amounts to about half of all urban holdings (53%).\(^{31}\) The exact boundaries of these four pagi are unknown, but it is certain that they were situated near the town. It is unlikely that all these pagi were located within walking distance, for on average a single pagus would already have approached the size of the area within the 5 km radius.\(^{32}\) For the sake of argument we may however make the radical assumption that all of the territory of these pagi was located within the walking-distance circle, or, perhaps better, that the land owned by Hermopolites within these pagi was located as close to the town as possible. On this assumption, the complete walking-distance area (78.5 km²) would be filled with urban holdings (covering 96 km²). That is to say, the complete circle around the town would be covered by urban holdings, and no room would be left for holdings of villagers. Reality will have been rather different, for not all the urban holdings of the four pagi will have been located within the 5 km radius, and it is difficult to assume that the villages close to town had no land of their own.\(^{33}\) There will certainly have existed a large amount of village-owned land. The calculation must therefore remain highly hypothetical, but the concentration of urban holdings in the pagi closest to town strongly suggests that much of the area within walking distance was filled with urban holdings.\(^{34}\) This means that the first condition was met: much of the land within walking distance was in urban hands.

The other condition for direct cultivation is that holdings should be small. We may use 10 arouras as an upper limit. How much of the area within walking distance consisted of such small plots?

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\(^{31}\) Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 160 Table VI, pagi 6, 8-10: 8,692 arouras or 24 km², multiplied by 4 for the three missing quarters.

\(^{32}\) With 16 pagi average pagus size was 22,687 arouras or 62 km². With 17 pagi (allowing for the existence of a 7th pagus) average pagus size was 21,353 arouras or 59 km² of land. But note that these are averages - individual pagus size might have differed substantially.

\(^{33}\) In addition, as Richard Alston points out to me, if one accepts that all urban holdings in the four pagi were located as close to the town as possible, there would be a substantial zone with no urban holdings before reaching the outer pagi.

\(^{34}\) The inclusion of a 7th pagus would mean that all the walking distance area would be covered by urban holdings, for the 7th pagus (21,353 arouras or 59 km²) would by itself cover most of the territory.
In the Hermopolite register, there were 116 persons with holdings between 0-9 arouras. This group owned together 520 arouras or 1.4 km² (4.5 arouras on average).\textsuperscript{35} Multiplied by 4 to take into account the missing quarters we end up with 464 persons owning 2,080 arouras or 5.7 km². Not all of these holdings will have been cultivated by their owners. Some small holdings were located in other paji than those nearest to town and hence will have been without reach. Some smallholders were women, who are less likely to have worked their holdings themselves. Some owners may for other reasons have decided not to cultivate their holdings. On the other hand, we might also assume that some holders in the higher brackets cultivated a part of their holdings themselves. We need not make adjustments, however, for the exact figures do not matter much. What becomes immediately apparent is that there is a large discrepancy between the land that \textit{could} be directly cultivated and that \textit{was} cultivated. The area within walking distance was 28,495 arouras or 78.5 km², and we saw that a large part of it may have consisted of urban holdings. The total area covered by small holdings was 2,080 arouras or 5.7 km². No matter how we calculate the extent of urban ownership within the walking distance area exactly, there can be no doubt that only a small part of it was under direct cultivation by urban owners.

The reason why so little land was directly cultivated is not difficult to find. It is implied by the statistics of the Hermopolite register. The paji in the immediate vicinity of Hermopolis had average holdings of approximately 44 arouras.\textsuperscript{36} This means that even directly around the town the average holding size was still relatively large. This implies that also some of the larger holdings were located near the town, and this is indeed what can be observed in the register. Many of the owners of large estates had their holdings located nearby.

Only a small part of the land that was located around the town consisted of small plots and could be under direct cultivation. The number of urban landowners who directly farmed their land will have run into a couple of hundred, a number sufficient to make a contribution to the food supply of the city and the agricultural regime of the urban territory. However, both from the perspective of the size of the total urban population and from the perspective of the total amount of urban land their contribution was insignificant.

### 5. Urban Lease-holding

Only a small part of the urban holdings within the vicinity of the town was cultivated by their owners. It is, of course, also possible that such land was worked by urban residents who were not the owners, through practices such as wage labour and, perhaps more importantly, leasing. Such practices may have broadened the pool of urban inhabitants with access to land, and it is therefore important to subject the indirect forms of cultivation to closer scrutiny.

By way of introduction, we may take a look at a well-documented practice, that of leasing. Lease contracts survive in abundance. They have been studied from several angles: the legal forms of the contracts, the duration of the leases and its implications for the relation between landlord and tenant, the type of crop, the type of rent and, of course, rent levels.\textsuperscript{37} My interest here is in social relations: what was the status of the tenants of the land that was held by urban owners?

Most tenants seem to have cultivated the plots themselves. The plots mentioned in lease contracts are mostly not very large, and could be worked by a single person or a family

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\textsuperscript{35} Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 159 Table IV.B.
\textsuperscript{36} \textit{Pag}i 6-10: 8,692 arouras and 198 owners = 43.9 arouras. Data derived from Bowman, ‘Landholding in the Hermopolite nome’ (above, n.13) 160 Table VI on F.Herm.
\textsuperscript{37} See Rowlandson, \textit{Landowners and tenants} (above, n.13) 202-279 with further references.
without recourse to outsiders. Nor were the plots so small as to be inefficient to work – the minute fractions of ownership often encountered in land registers and sales are absent. Moreover, where information about the place of residence is available, it turns out that tenants usually lived near the plots they leased.\[38\] There is however a significant minority of cases where the situation is more complex. In some leases the status of the tenant is significantly higher than that of the landlord, in some cases the plots are much larger than normal, and in some cases the tenants do not live near the plot. In such cases we may suspect sub-leasing or other forms of indirect cultivation; the tenant will have functioned as middle-man or agent.

It is possible to create a simple model of leasing relationships. We may distinguish three categories of persons: Alexandrians, the inhabitants of the metropoleis, and villagers. Any person of each category may be landlord or tenant. Land could be leased to persons within the group or to persons outside the own group. If we confine ourselves to the urban inhabitants, the following relations are possible: urban owners may have leased to or from villagers (urban-rural leases and rural-urban leases), they may have leased to or from inhabitants of other towns (inter-urban leases), they may have leased to or from Alexandrians (urban-Alexandrian and Alexandrian-urban leases), or they may have leased to other inhabitants of their own town (intra-urban leases).

Evidence from Oxyrhynchos allows us to analyse the relative importance of these relations. Jane Rowlandson has presented a list of lease contracts from Oxyrhynchos dating from the first century B.C. to the fourth century A.D. with a fairly full description of their contents. The major advantage of this list for our analysis is its urban bias. As the papyri from the Oxyrhynchite nome stem from Oxyrhynchos itself, many of the leases concern urban inhabitants. Of the 143 leases presented by Rowlandson, 70 yield information that is of use. These are the leases that meet the following criteria: they concern land owned by private individuals, they contain information about the status of both landlord and tenant, and at least one of the parties is an inhabitant of Oxyrhynchos.\[39\]

One small caveat should be made. The evidence about status concerns the legal status of the landlords and tenants. There is a possibility that legal status did not match residence. A villager may live in Oxyrhynchos but may still be classified as villager, or vice versa: an Oxyrhyncite may live in a village. We may however assume that such cases were exceptional. The problem is more pertinent in the case of Alexandrians. We may expect that some of the Alexandrians which we encounter in the lease-contracts were in fact upwardly mobile Oxyrhynchites who had acquired Alexandrian status but still lived in Oxyrhynchos.

The results of the analysis have been presented in figure 1, Lease Patterns in Oxyrhynchos, in which the thickness of the arrows denotes the importance of the type of relationship. As could only be expected, the majority of the leases concerns urban-rural leases. Much of the land owned by urban inhabitants was leased to villagers, who usually lived near the plot they cultivated. There is a small counter-flow in the other direction. One would expect that rural-urban leases would normally concern land held by villagers within walking distance of the town, but the examples suggest more complex situations. They are however so few in number that it is not fruitful to analyse them in detail – they are better regarded as individual exceptions.

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\[38\] Rowlandson, *Landowners and tenants* (above, n.13) 218. Rowlandson adds on 216-217 that the vague descriptions of the location of the plots imply knowledge of the local situation by the tenant.

\[39\] Data taken from Rowlandson, *Landowners and tenants* (above, n.13) Appendix 2. As it is relatively easy to extract the data from her list, I do not repeat the references here. Texts left out of consideration either concern institutional landowners, or do not allow establishing the relationship between landlord or tenant, or do not concern inhabitants of Oxyrhynchos. In the two cases where a lease shows two different relationships (e.g. urban-rural and inter-urban) these relations have both been counted as one. The total number of relationships is therefore 72, not 70.
In a small number of leases there are Alexandrians involved. Details in their contracts suggest we should consider them as upwardly members of the local elite whose families had acquired at one point or another Alexandrian status. Most of them are also known from other Oxyrhynchite texts, which suggests that they had strong ties to the town. It seems likely, then, that we should regard the leases in which Alexandrians occur as variants of the intra-urban leases, not as a completely different category. It is nevertheless useful to keep them separate, if only because part of the produce from the holdings of Alexandria may have gone off to Alexandria, not to Oxyrhynchus.

One type of relationship is completely absent: that between inhabitants of different towns, but this is hardly surprising. In modelling leasing relationships we should, however, keep ourselves open to the possibility of inter-urban relationships. There may be situations were a town would be located near the border of a different nome. If such towns contained urban tenants, there is no intrinsic objection to the possibility that they cultivated land in the neighbouring nome, and neither is there an objection to the possibility that such lands were owned by urban landowners. It seems however likely that this would occur only in special situations. It will hardly have constituted the norm.

What is surprising, however, is the extent of intra-urban leasing. The majority of leases were made between urban landlords and rural tenants, but as a good second comes the practice of leasing among urban inhabitants. Twenty-six out of 70 or 37% of all leases are intra-urban. This raises the possibility that the pool of those with access to land may have been broadened by what we may call urban agricultural labourers: inhabitants of the town that did not own the land but cultivated it.

6. INDIRECT CULTIVATION

The last question to address is the extent to which urban landowners had their land cultivated by urban cultivators. As we saw, a significant part of the tenants of the leases consisted of inhabitants of the town. There was however more than one way possible to exploit the land that was not cultivated by its owners. Leasing certainly formed a standard practice, but owners might also have opted for forms of cultivation through dependents or through wage-labourers. The relative importance of these forms of labour is impossible to establish. The major problem is formed by the large estates. Leasing occurred also on such estates, but other labour forms are equally attested. As such estates could be enormous in size, a couple of estates where cultivation took place through wage labour or dependents could easily alter the balance between lease and wage labour in the agricultural economy.40

Although the question of the relative weight of labour forms is of real importance, for our purposes it matters less than one could think. The capacity for labour will not have depended on the form of indirect cultivation. It is difficult to see how a tenant would be able to cultivate significantly more or significantly less land than a wage labourer. The incentives might have differed, but are unlikely to affect the amount of land that could be cultivated dramatically.

A crude calculation demonstrates the possibilities for indirect cultivation. What applied to direct cultivation also applies to indirect cultivation by urban inhabitants: the plots that could be cultivated by an agricultural labourer would have to be of small size, and they would have to be located within walking distance. The difference with the model of direct cultivation is that ownership of the plots is irrelevant: as long as the cultivators live in the

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40 See the balanced discussion by Rowlandson, Landowners and tenants (above, n.13) 205-208.
town and as long as they can reach their plots, it does not matter whether the owner lives in
the town or whether the owner is a villager.

The urban agricultural labourers must of necessity have cultivated land within walking
distance. We may envisage the area worked by them as the walking distance circle described
in section 4 minus the part that was under direct cultivation by urban owners. As we saw, the
area under direct cultivation formed a small part only of the total walking distance area. We
may then suppose that each non-owning cultivator cultivated on average the round figure of 5
arouras. The walking-distance area covered 78.5 km\(^2\) or 28,495 arouras. Of these a small area
of at most 5.7 km\(^2\) or 2,080 arouras that was under direct cultivation should be subtracted. The
remaining land could then be cultivated by slightly over 5,000 persons.\(^{41}\) If all of these
persons were living in the town, it means that at maximum slightly over 5,000 persons should
be added to the urban inhabitants with access to land.

It is most unlikely that all of these over 5,000 cultivators were urban inhabitants in
reality. Some villagers will also have owned land within the vicinity of the town, and it is
likely that they cultivated their plots themselves. It is also unlikely that all of the land in urban
hands was cultivated by inhabitants of the town. It is difficult to think of an intrinsic
advantage for an urban owner to have his plot cultivated by an inhabitant of town. The
deciding factor is likely to have been residence: it was preferable to use a cultivator who lived
near the plot. Depending on the exact location, this could favour both a villager whose village
was located within the walking distance circle and an inhabitant of the town. The figure of
5,000 should therefore be regarded as a theoretical maximum which in reality is likely to have
been much lower.

What the calculation demonstrates, however, is both the limits and the extent to which
the stock of those with access to land could increase. If to 1,000 landowners another 5,000
urban cultivators are added, 6,000 persons had access to land. The increase is marked. It
implies that landowning itself may not hold the key to understanding access to land. Through
tenancy and other forms of agricultural labour a great deal more people had the possibility to
gain access to land. On the other hand, on a total population of 45,000 their number is still not
large. Even under extreme assumptions only a minority of 13% of the urban population had
direct access to land.

**CONCLUSION**

In the previous sections a number of calculations was presented. None of them is precise, but
the general orders of magnitude they convey can hardly be in doubt. The argument that
follows from these calculations can be summarised as follows. Levels of urbanisation were
high. The fact that a relatively high number of the population of Roman Egypt lived in towns
presents in an acute form the question how the urban population was fed. This has been
studied through an analysis of access to land. The amount of land in urban hands was high; it
is likely to have been capable to feed the entire urban population. The number of urban
landowners was, however, very low. As could only be expected, many of the urban
landowners owned estates of considerable size, but there was also a number of smallholders.
A sizeable proportion of the smallholders will have cultivated the land themselves, but both
with respect to the amount of land that could be under direct cultivation and with respect to
their proportion within the town their presence was insignificant. This in its turn establishes
the potential importance of non-owning cultivators. It is certainly possible (if not intrinsically

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\(^{41}\) 78.5 km\(^2\) or 28,495 arouras minus 5.7 km\(^2\) or 2,080 arouras divided by 5 arouras results in
5,139 persons.
likely) that their number exceeded that of landowners by a wide margin. However, even when their presence is taken into account the number of persons who had in one form or another direct access to land was and remained low.

There can be little doubt that the limitation of the amount of persons who had direct access to land created ties of dependency between those with and those without access to food. How should we envisage such ties?

There were three categories of persons with direct access to food: a group of owners of large estates who did not cultivate the land, a group of smallholders of which a substantial number will have practised direct cultivation and a group of agricultural labourers. Within these groups, the smallholders practising direct cultivation can be considered to have been independent in the sense that their own labour provided their own food. The agricultural labourers will of course have been far from independent: their access to land depended on the larger owners. If the leases are anything to go by, the labour market was volatile: most leases were of short duration.

All three groups with access to land had of course to feed their families. We should envisage sets of close relatives around each person with direct access to land. As we saw, it is unlikely that each of the owners or cultivators represented a separate household, and it is certainly not unlikely that the average number of relatives differed from group to group. Agricultural labourers will have consisted of adult males; household size within the wealthier households will have been larger than in the smaller ones. That makes a calculation difficult.

No matter how such a calculation is made, there will always remain a group without access to land. It is this group among whom we should locate the craftsmen and traders. They were dependent on the marketing of the surplus production or on distributions, and they were much more subject to the vagaries of the market than anyone else.

The question that remains to answer is how representative the model is for other towns. The evidence used for the model came from Hermopolis and Oxyrhynchos. Both were large towns, with large nomes. Most other towns in Roman Egypt were much smaller. It is impossible to create for them models in a similar vein as the one for Hermopolis, though many of the characteristics are likely to have been similar. But the calculations point to one important feature. Access to land is likely to have been dependent in large measure on the urban agricultural labourers. They may have easily formed a larger group than the urban owners. One of the crucial points of the model is that the area within walking distance remains fixed. It is independent of urban population size, or nome size, or the proportion of urban to rural landholding. This means that irrespective of the size of the total urban population a more or less fixed number of urban agricultural labourers could be accommodated in a town. In a large town like Hermopolis the urban cultivators dwindled in comparison to the urban population. In smaller towns it is easily possible that a much greater share of its population was involved in agricultural production.

As we could only expect, vulnerability and complexity are therefore the hallmark of the larger urban centres. The population in smaller towns will have been as dependent on its larger landowners as in large towns, but the number of people who were not closely related to persons with direct access to food will have been much smaller. Smaller towns will in that respect have been less vulnerable to artificial food crises than large ones. Big might have been beautiful, but small was safe.
urban - rural (38)
intra-urban (26)
urban-Alexandrian (1)
Alexandrian-urban (4)
inter-urban (0)
other towns
urban-urban (3)
rural-urban (3)
Alexandria
Oxyrhynchos
villages