The urban systems of the Balkan and Danube Provinces (2nd – 3rd c. AD)

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Chapter V: The agricultural territories

Introduction: The approach and the major problems in the data-set

In the opening chapters of this study it was demonstrated that at least two-thirds of the settlements in our study-area were founded after the Roman conquest, at micro-locations that had not been occupied during the preceding period. Casting a brief glance at the distribution of the central places prior to the Roman conquest, it was observed that in some provinces, - Dacia, parts of Dalmatia -, the newly established settlement network had almost no overlap with its predecessor. What are the implications of these major shifts in the regional settlement maps? In what aspects did the old settlement locations differ from those of the newly founded settlements? Was there an overall shift to a different type of micro-location and how were these placed in relation to the various categories of natural resources? Furthermore, we have seen that the newly founded segment of the network was composed of settlements that differed in terms of their geneses, size and juridical status. What are the relations between these parameters and the micro-locations of the settlements? Can we give some rough indication of the factors that determined the siting of the different settlement categories? It is the aim of this chapter to address at least some of these important questions. As always, a host of theoretical and methodological difficulties that are best clarified at the very beginning loom large.

The most straightforward way of expressing the character of the micro-locations of the settlements in a non-descriptive fashion is to analyze their catchment areas. A settlement's catchment – the area accessible from the settlement within a given distance – is a direct function of its micro-location.[510] The extent of the catchment radius depends on the basic economies of the settlements studied. As the present study is focused on urban and non-agrarian settlement categories, two catchment radii are of particular relevance: the 5-km, or one-hour walking distance radius, and the 15-km, or 3-hours walking distance radius. The former catchment can be called the farming radius. It defines the maximum area that can be cultivated directly and on a daily basis by farmers residing in the central place. It should be pointed out that comparative evidence suggests that in densely populated and fertile areas, the normal catchment is often reduced to 30 minutes walk from the central place or less.[511] But because we are not studying purely agrarian settlements, it is wise to assume - at least for the category of autonomous towns – a larger than average farming catchment area. It should not be lost from sight that the 5-km catchment radius is used primarily as an index of the locational preferences of the settlement. It is not meant to imply anything about their rank or economic orientation (see *infra*).

The second catchment radius encloses the maximum area wherein the surplus agricultural produce can be tapped through the market. As in the case of the farming radius, the maximum range of 3-hours walking distance is defined by the law of logistics. It is the maximum distance a peasant is willing to travel to sell his surplus and obtain goods that are unavailable locally.[512] It is the same rule of day-return defining the farming radius. A longer travelling distance would simply overinflate the expenses of the whole undertaking, requiring additional expenses for an overnight stay and safe-keeping of the goods. Obviously, only a minority of the studied settlements could actually function as micro-regional

[510] Vita-Finzi, Higgs 1970, 1-37; Hodder, Orton 1976; Johnson 1977, 479-508; Roper 1979, 119-140.
[511] Bintliff 1999, 505-545; Bintliff 2002b, 153-177.
[512] Bintliff 2002, 209-250.

markets. But as we are primarily interested in the properties of the site of settlement rather than in the particular settlement, we proceeded to estimate the amount of arable land enclosed by the market-radius for all settlements included in this study, regardless of their rank.

As we shall shortly see, the study-region includes both extensive plains and vast zones of hilly to mountainous terrain. It is therefore advisable to use walking rather than linear distances. However, creating a digital terrain model for the entire study-region was not a viable option. The most we could do is test the effect of the relief on the size of the catchment in a small number of cases representative of the different geographies of our study-region[513]. Predictably the ruggedness of the terrain did not have a very dramatic effect on the size of the catchment enclosed by the farming radius, but with the extended market radius, the differences were becoming considerable. When the terrain is fairly rugged, even the area enclosed by the 2-hours walking distance radius may be reduced by 30% and, in mountainous conditions, the catchments are reduced by nearly two-thirds (Map V_1). We have therefore decided to adopt two alternative catchment radii: 10 km for the towns and settlements of the western Balkan provinces and Dacia, 15 km for the settlements of the Danube provinces and Thrace.

Both the farming and the market radius have to be considered if we are to determine the logic behind the siting of the settlements and to examine their sustainability by the local resources. The 5-km catchment radius is more sensitive as a location index than the 10- or 15-km radii, simply because the latter catchments are large enough to include resources that were originally of minor importance for the siting of the settlements and their economy. The obvious downside of using only the 5-km radius is that it is too small for all settlements with population figures higher than 6000-7000, basically including all the major towns in our study-area.[514] This circumstance diminishes its value as an index of locational preferences, as it will lump together the categories of large settlements and those featuring specialized economies. Finally, about one-third of the settlements included in this analysis had access to the agricultural resources of areas much larger than those enclosed by the marketi radii by virtue of their status.

The underlying assumption of this analysis is that the variable settlement locations will at least partly reflect the relative importance of two broad categories of natural resources: agricultural land and other, pastoral or non-agricultural resources, like minerals or access to the main lines of communication. Those settlements that were primarily focused on exploiting the agricultural potential of the surrounding land are more likely to occupy a central position in the cultivable zone and enjoy a higher percentage of arable land within their theoretical hinterlands. Those communities whose primary concerns lay in their control of the flow of goods and people or the extraction of mineral resources often had to relinquish at least a proportion of their agricultural potential. Obviously, this is a Weberian ideal type.[515] Once we turn our attention to the individual sites, we shall quickly discover that in the majority of the cases, the micro-location of the settlements was ambiguous. Even those settlements whose involvement in non-agricultural economies is known from other sources had access to a certain amount of cultivable land. The same applies to the predominantly agricultural

[513] The tests were run by Bart Noordervliet, whom I thank once more for his friendly assistence.
[514] Bintilff 2002b, Figure 1.
[515] In reality, the town-based landowner could own properties beyond the immediate catchment radius of the towns, but this possibility does not diminish the value of the location index. Instead, it exemplifies a mechanism by which the towns extended their outreach.

communities. They rarely occupied the geometric centres of the surrounding tracts of arable land. This is because even the traditional rural communities in most parts of this region practised mixed agricultural economies, making locations along the edges of the ecological zones highly attractive.[516] This economic strategy is optimally suited to the mountainous terrain that characterizes much of the Balkan Peninsula.

Economic strategies were not the only variables that determined settlement locations. The defensive quality of the available micro-locations, access to drinking water, protection from the elements and even ideological considerations all played a role in determining settlement locations. We should also mention the political factor, especially in view of the historical evidence of forced migrations and the displacement of the native communities in the period following the Roman conquest.[517] There is an ever-present risk of confusing the effects of the non-economic and economic factors in analysing the siting of settlements. What might appear to be a settlement focused largely on the non-agricultural sector could, in theory, owe its "non-optimal" location to the absence of drinking water in the plough-zone or to unknown political factors.

Although these considerations certainly weaken the sensitivity of our location index, they do not necessarily disqualify this path of analysis altogether. In fact, minor or even moderate differences in the agricultural potential should not be overemphasized, as they might easily be the outcome of our imprecise estimates. However, when it comes to the exploitation of non-agricultural resources, like mines or natural harbours, the economic orientation will inevitably be reflected in the amount of arable land available within the theoretical hinterlands. To take the most obvious example, the catchments of coastal settlements will always comprise smaller agricultural territories than the catchments of most inland settlements. Moreover, we can take comfort from the fact that the relatively advanced urban culture of the High Empire eliminated at least some of the non-economic locational factors, like the availability of drinking water or natural defences. In this context, we shall try to shed light on the possible differences between the locations of the autonomous towns and those of secondary agglomerations or special-purpose settlements, like spa-towns or road-side settlements. Finally, without the slightest intention of underestimating the significance of the figures for the agricultural potential of our towns, it must be stressed that, for a number of individual towns, we know something about their economies from the archaeological and written sources. Where such evidence is available, it will always be considered in relation to our estimates of the agricultural territories.

It can be argued that this entire approach has an inbuilt defect, because it has been designed primarily for the study of predominantly agrarian settlements.[518] Estimating the amount of arable land within a given catchment radius makes sense as long as it is assumed that the settlements in question were the principal bases for the farming population. The prevalent scholarly opinion is that the Roman town did not conform to this model,[519] although it should not be excluded that in certain parts of the study-

[516] Cvijić 1918.
[517] Strabo 7.3. 10; CIL XIV 3608; Gerov 1997, 8; for the displacement of the Azali after the Pannonian revolt, see Mócsy 1974, 55; see Colombo 2010, 171-202, for a different interpretation.
[518] Higgs, Vita-Finzi 1970, 1-37.
[519] Garnsey 1998, 183-200; de Ligt, Garnsey 2012, 69-94. Agricultural land remained the main source of income for the town-residing elites, but it is unlikely that it was exploited by farmers based in the town.

region some settlements continued to operate as agro-towns[520]. The same applies to the other settlement categories. Notwithstanding the scattered evidence of intensive agricultural exploitation of the hinterlands of some auxiliary *vici*, most scholars agree that the grain-procurement of the army units was organized by the central government and was not reliant entirely on the local or regional resources.[521]

The starting position – rather than its final finding or its underlining assumption - of the present study is that most of the settlements in the region were sustained primarily by agricultural production. At the very least, the ensuing analysis should help us assess the importance of agricultural considerations in the siting of the different categories of settlements and, indirectly shed light on their economic profiles. It has to be stressed that the estimates of the agricultural territories are purely theoretical. We are interested in studying the implications of the settlement sites on the agrarian potential, even if the communities that occupied these sites satisfied their subsistence needs from more distant regions or did not own the land in their surroundings. This exercise is legitimate if viewed from two perspectives. It highlights the agricultural potential of those areas that were not occupied by autonomous towns during the High Empire and it points to the directions in which urbanism expanded or retreated in later periods.

The geographical factor cannot possibly be overlooked in this kind of analysis. As we are dealing with a large area, made up of several major regional units with contrasting physical geographies, this must surely have an effect on our figures. Just by looking at a physical map of the region, one can easily predict that the towns located in the Danube Valley and along the other major rivers will, on average, have offered greater agricultural potential than the towns located in the western, mountainous half of the peninsula, even if there were no major differences in their general economic orientation. This is a valid and relevant observation, but it pertains to the agricultural potential of wider regional units rather than individual settlements. It has to be remembered that there is a considerable degree of local or micro-regional variability in our study-area, both in the provinces in the western half of the peninsula and in the frontier provinces. Overall, the towns and settlements of Pannonia and Moesia Inferior would have probably enjoyed larger agricultural territories than those of Macedonia or Dalmatia, but this fact does not reduce the significance of the variable potentials of the towns that belonged to the same province.

It should be stressed that the immediate goal of this study is to produce rough estimates for the extent of arable land within the 5- and 10/15-km catchment radii of the towns and secondary agglomerations.[522] In view of the quality of the available data, we are not in a position to make a proper assessment of the carrying-capacity of the surroundings of the settlements.[523] With a few exceptions, palaeoenvironmental site-based or regional studies are very thin on the ground.[524] On the other hand, we cannot afford to collect modern environmental data, for example, regional soil-maps, annual yields or rainfall records, for the entire study-area. The most we can do is to try to determine

[520] *Cf*. for example, Lo Cascio 1999, 161-172.
[521] Erdkamp ed. 2002. See, Lo Cascio 2007, 619-647; for different opinions.
[522] The towns and communities known only from historical and epigraphic sources cannot be included in this analysis for obvious reasons, although we have included those cases in which the location has been approximately determined.
[523] Rosen, Finkelstein 1992; De Angelis 2000, 111-148.
[524] For example, Chapman, Shiel, Batović eds. 1996; Santoro 2008; Serlegi 2009, 135-146.

what percentage of the theoretical hinterland of our settlements was potentially cultivable. This means that only a small fraction of the relevant data shall be considered. Much will be obscured, as we know next-to-nothing about the local variations in soil types or their fertility in relation to the agricultural practices and technology in the time-period studied. Nonetheless, we remain convinced that the settlement's location will in itself indicate the possible non-agricultural economic focus of its population.

The agricultural potential of the land in our study-area is chiefly determined by the relief and hydrography. In many regions, between 60 and 80% of the territory is taken up by mountains or hills. This characteristic is especially pronounced in the western part of the peninsula, in the Dinaric Alps, an area in which the geological framework has also pre-conditioned that large portions of the mountainside are karstified.[525] The soaring, massive ranges of the Carpathians, Mount Haemus and Rhodopes do cut across the eastern half of the Peninsula, but they are less rugged and less extensive than the Dinaric Alps. In the north, on the Middle Danube and along the lower courses of its Pannonian tributaries, the rugged terrain is hardly an issue. The problem here is that unknown proportions of the river plains were permanently flooded prior to the canalization of the river in the last couple of centuries. This is mentioned in the ancient sources and it is often depicted on Late Medieval-Early Modern maps of the region.[526] Poor drainage is also a problem in certain regions in the western half of the study-area, like the Albanian coastal plain or the limestone plateaus in Dalmatia.[527] This flood-zone was not suitable to agriculture and, like the mountainsides it was probably left outside the ancient plough-zone. Naturally, both the mountainside and marshland offered a range of valuable resources like pastures, woodlands and fishing, but we assume that these were merely complementary to the local agricultural economies.

In fact, our main sources for estimating the extent of arable land are the physical relief and modern land-use. For the western Balkans, these data are probably sufficient. Here, the limitations posed by the physical relief are both rigid and relatively stable. It can be safely assumed that, in most micro-regions of the western Balkans, the modern plough-zone approximately reflects the agricultural potential of the area in the past.[528] Only a marginal increase as a consequence of the construction of agricultural terraces will have ever been possible. Of course, this does not mean that the modern plough-zone fully coincides with the area cultivated in Antiquity. In the published literature there are hardly any data relevant to this topic. But the extent of the modern plough-zone - clearly visible on aerial images even in cases of recently abandoned fields - does convey a rough idea of the agricultural potential of the areas in question. It is possible that the ancient land-use was less intensive than it was after the technological advances and population growth in the Early Modern period, but for what are now marginal and depopulated areas, the opposite might be true.

This source is less reliable for estimating the arable potential in the Pannonian provinces. Modern topographical maps show sizeable marshy areas along the major Pannonian rivers, in some cases extending for 10 km on both river-banks. Without specialized palaeo-environmental studies, we have no way of drawing even a very rough sketch of the landscapes in these regions in the past. Surely, the

[525] The Naval Intelligence Division 1944.
[526] Marshes in the hinterland of ancient Mursa are mentioned in the description of the Pannonian revolt in AD 6 – 9, Vell. Pat. 2.112, Pinterović 1978; Domić-Kunić 2012, 29-69.
[527] The Naval Intelligence Division 1920b.
[528] However *cf*. the case of Liburnia and the northern Adriatic, Chapman, Shiel, Batović eds. 1996, 23-24.

modern regulation of the river-beds will have had a positive impact on the productivity of this land, but it would be wrong simply to project the situation from the Early Modern-Late Medieval periods retrospectively onto Antiquity. The height of the water-table would have been dependent on a broad range of climatic and anthropogenic variables of which we know too little. Finally, it should be pointed out that, for Roman Pannonia, there is historical evidence of large-scale land reclamation projects.[529] As we have no way of assessing the effect of these factors, it was decided to exclude the areas transected by modern drainage canals or ancient river-beds from the estimates of the agricultural territories. Like the modern plough-zone, these features are easily distinguished on aerial photos.

More constraints on the local agricultural potential were posed by a series of non-environmental factors. In principle, these consist of the administrative and territorial divisions in the study-area. In the case of the provincial and state-frontiers, it was assumed that the land on the other side of the frontier was not exploited even when it fell within the 5-km radius of the nearest settlement. The problem is that, quite often, the boundary-lines cannot be determined precisely – as in the case of the northern Dacian *Limes*, or the forts located to the east of the River Olt. The majority of the provincial frontiers on the other hand, were drawn along the mountain ranges, passing through sparsely urbanized areas. Therefore, they pose only a minor problem in comparison to the unknown extents and locations of the extra-municipal districts, like the mining areas or imperial estates.[530] In the next chapter, we shall demonstrate that a considerable portion of the study-area was controlled by the provincial government. Unfortunately, we have no way of gauging the degree of dispersal of this state-owned land. It can only be hoped that it was grouped into larger districts.[531]

No less complicated are the territorial relations between two neighbouring settlements. The close spacing of neighbouring settlements of a similar rank and status will inevitably have had a limiting effect on their agricultural territories. In view of the average inter-city distances in our study-area, this is hardly a problem even if the market radius is set at 15 km. However, in the zones of pre-Roman urbanism, in which towns were often spaced at distances of less than 20 km, or on the frontier, in which the auxiliary *vici* are separated by even shorter distances, this was obviously an important factor. In the next chapter, we shall try to reconstruct the administrative territories of the autonomous towns, but these reconstructions are too imprecise to be of much assistance in determining the amounts of arable land on either side of the boundary. It is worth repeating that the primary goal of this analysis is to estimate the amount of arable land enclosed by the catchment radius. We therefore proceeded by dividing the intervening arable land equally between the two neighbouring settlements of equal status.

This approach seems to be less problematic when estimating the agricultural potential in the surroundings of the secondary agglomerations. However, this settlement category is beset by problems of a different nature. In the preceding chapter, it was demonstrated that, in terms of size and physical appearance, they differed little from the average rural settlement. Because of their inconspicuousness, only a small segment of this settlement category has been identified and hence the true spacing between the neighbouring settlements of this rank has to be a matter of guesswork. Therefore, the estimates for the agricultural territories of most of our secondary agglomerations are

[529] Hist.Aug. *Vita Probi* 18.8, after Gračanin 2005, 287-298. The story was evidently a piece of imperial propaganda, but it probably contains a kernel of truth.
[530] Dušanić 1977, 52-94.
[531] It is very possible that this was actually true of the iron mines, Ørsted 1985.

almost certainly over-inflated. In most of the cases their agricultural territories were probably smaller than the area enclosed by the 5-km catchment radius.[532]

In cases in which a secondary agglomeration fell within the market radius of an autonomous town, the arable land in its hinterland was added to the total for the autonomous town. Nevertheless, separate counts were kept of the agricultural potential of the subordinate settlement, both within the farming and the market radius. This approach allows a direct comparison between the properties of the sites of both settlement categories.

So far, we have argued that the settlement's micro-location expressed as the amount of cultivable land within the 5- or 10/15-km catchment radii will always reflect, among other factors, the economic interest and strategy of the local community. However, if seen in isolation, these approximations are not particularly informative for the second goal of this study or the evaluating of the settlement's sustainability by the local resources. Small communities can live comfortably off the limited volume of agricultural products from their surroundings, even when large segments of the population are fully engaged in non-agricultural activities, mining or industries. At the other extreme, the largest urban communities in the area exceeded the agricultural productivity of their theoretical hinterlands, even when 100% of the land within the market radius was arable. The study of the agricultural territories becomes meaningful only when it is carried out in relation to the population estimates or, at least, city-size. In fact, determining the amount of arable land is only the first step, as the primary study goal is the ratio of arable land to population size or the amount of arable land per individual. This will allow us to isolate those settlements that, because of their size or location, could not secure their subsistence from the immediate surroundings, implying highly specialized economies, larger administrative territories or other special arrangements.

When projecting the population size of individual settlements, a great number of methodological and technical problems have to be faced. [533] This is hardly surprising in view of the character of the available data. We only have a vague idea of the extent of the built-up area of the settlements and a few scattered clues to the population density in these agglomerations and almost nothing is known about the size of housing units or households. One thing certain – and this lies at the very heart of the problem – is that the population density varied dramatically, not only between settlements of different categories, but also within a single settlement[534]. This is neatly illustrated by the example of the garrison settlements, in which population density ranged from up to 500 individuals per hectare in the auxiliary camps to fewer than 100 inhabitants per hectare in the *vicus*, usually made up of smaller residential units, spaced at greater distances to allow for working space or storage facilities.[535] Similar amplitudes in the population densities can be expected for the civilian settlements. The evidence from the study-area, although fragmentary and non-representative, suggests that the size of the residential units could vary from several hundred square meters in the wealthy quarters of the large towns to only 30-40 square meters in the secondary agglomerations.[536] A simple comparison of

[532] Compare with the figures in Bintliff 2002b, Figure 1.
[533] *Cf*. Hanson 2016.
[534] Duncan-Jones 1963, 85-90; Lo Cascio 1999, 164-166; De Ligt 2012.
[535] Campbell 2009. In the *canabae* of Carnuntum, the early phases are marked by a very sparse settlement structure, with houses separated by large stretches of land used as working areas, gardens or orchards, Kandler 2008, 90-108; see Sommer 1997, 41-52, for the auxiliary *vici* in Germany and Britannia.
[536] A handful of examples are enough to illustrate the situation: a suburban villa in Salona, *ca* 1250 sq. m; Piplović 1980, 89-101; an urban residence in Burnum, *ca* 1,000 sq. m, Boschi 2011; an urban residence in

the areas with housing units will lead us to the conclusion that the military forts – and also perhaps certain quarters of the autonomous towns - had population densities up to 10 times higher than the various categories of subordinate settlements or the town quarters under public buildings.

Serious data shortages prevent us from addressing the problem of population density across different settlement categories. Nor can this issue be addressed adequately in a chapter devoted to a different topic. For the purposes of the present chapter, we shall have to be content with introducing a constant of 150 individuals per hectare, regardless of the settlement type.[537] This figure is obviously better suited to the large urban settlements characterized by densely packed housing units than for the small unplanned agglomerations,[538] but at the same time it grossly underestimates the population density in the most dominant settlement category of our study-area, the garrison sites. This difficulty is an inevitable consequence of using a constant figure for all settlement categories. In the concluding section to this chapter, we shall revisit the possibility that certain settlement categories had population densities lower than 150 inhabitants per ha. As a further safeguard to counter the possibly exaggerated population densities, we propose two alternative population estimates based on the minimum and maximum figures for the size of the built-up areas. As we saw in the preceding chapter, the differences between the alternative size-estimates are often much greater for the secondary agglomerations than for the autonomous towns. The minimum population figure can be seen as a proxy for the probably lower population density in the former settlement category.

Most studies that analyse the productive potential of specific geographical regions or catchment areas estimate that the ancient annual rates of consumption fluctuated between 175 and 193 kg of grain per capita.[539] Translated into agricultural territory, these annual needs add up to 3-4 ha per family or about 1 ha per person. Obviously, this figure is meant to be used only as a yard stick.[540] In this case too, too much depends on too many factors and, because of the inadequate data, it is nearly

Sarmizegetusa, turned into a temple, 400 sq. m, Piso, Ţentea 2010; a sub-urban residence in Oescus, ca. 3200 sq. m, Ivanov 1987, 7-60; houses in Arupium, 35 to 50 sq. m, Bižić-Drechsler 1974, 1-46.

[537] *Cf*. Marzano 2011, 204; Hanson 2016, apply sliding density ranges to different size-categories, that is in principle surely a better alternative to using a constant, but we feel we know too little about this topic. It is symptomatic that the latter study cites mostly theoretical treatises – Bettencourt 2013, 1438-1441; Ortman *et al*. 2014 - in support of the thesis that smaller size entails lower population density. The empirical evidence in support of the idea that population densities were much higher in large towns refers to exceptional cases like Rome, Ostia or Alexandria; Russel 1958, 64-68; Hanson 2016, 66-69; *cf*. De Ligt 2012, 207, fn. 53.

[538] Price 2011, 17-35, has argued in favour of population densities as low as 40-60 inhabitants to the hectare for villages and not more than 100-120 inhabitants to the hectare for the large towns in Classical and Hellenistic Greece. However, their size estimates for the sites discovered in the Sphakia survey do not refer to individual chronological phases but to the total extents of the ceramic scatters, Price 2011, 27. Given that the core of the settlement shifted over time, this will probably result in larger site-areas and lower population densities. The overall impression is that too little is known about this subject, even in regions with a long history of research.

[539] Foxhall, Forbes 1982, 41-90; Garnsey 1998b, 201-213; De Angelis 2000, 111-148.

[540] There are considerable differences in opinions when it comes to the agricultural productivity of the land in Antiquity. Earlier scholars have suggested that the average productivity levels were not higher than 235 kg per hectare for wheat and 330 kg per hectare for barley, figures deduced from an inscription concerning the year 329/328 BC for Attica, that was by all standards a bad year, Garnsey 1998b, 201-213. Garnsey has proposed a net production of 625 and 770 kg per hectare for wheat and barley respectively. This will inevitably decrease the arable area necessary to sustain a single person to about 0.65 ha and 0.8 ha, given that fallowing was practised. However, this estimate is based on the yearly statistics for the period 1911-1950, when new methods and technologies were slowly being introduced. A humbler productivity is suggested by Salares 1991; Erdkamp 2005.

impossible to arrive at realistic estimates of the agricultural productivity of the land. Even if we disregard the obvious fact that the cultivation of cash-crops would require smaller areas to cover the annual household needs than the cultivation of grain,[541] without the help of predictive modelling, it is virtualy impossible to account for the great variability in the agricultural productivity of the land caused by the different soils, temperatures and hydrography.

The final difficulty facing this study is to determine the size of the population who lived outside the central place. In the case of autonomous farming communities or agro-towns, a large proportion of the population that lived off the agricultural products of a certain catchment may be assigned to the central place. However, once we extend the catchment radius beyond the 5-km, the presence of a permanently settled rural population, either residing in independent nucleated settlements or in hammlets of tenant farmers attached to large private properties has to be accounted for. If we want to obtain a clearer look at the agricultural potential and locational preferences of the settlements included in this study, it is crucial to have at least an approximate idea of the size of the rural population. This problem was touched upon while discussing the problematic estimates of the catchments of the road-side or auxiliary *vici*. Yet again, the current state of knowledge about the Balkan countryside is far from satisfactory. Integrated regional projects that include systematic surface prospection are still very rare. In a number of cases, it is possible to approach the problem by collecting and critically analysing the legacy data available, but obviously this can be done for only a very small portion of our study-area. In our discussion of the agricultural territories and locational preferences of the settlements by provinces, we shall refer to some of these case studies. These studies shall not only offer a closer look at the distribution of the population in the urban hinterlands, they will also shed light on the changing exploitation strategies at increasing distances from the central place.

In the absence of adequate data, we shall have to make do with the few parameters at our disposal at present. These are the estimates of the settlements' built-up areas and of the agricultural potential in their immediate hinterlands. Accepting the simplyifing view that the annual consumption requirements of a mature individual can be met by the produce of 1 ha of cultivable land, it is possible to postulate maximum population figures for every territory included in this study by simply equating the number of arable hectares to the number of individuals. Deducting the projected number of the urban population – based on constant population densities of 150 per ha – from the maximum number of individuals who can be sustained from the agricultural hinterlands, we arrive at the maximum rural population for the districts studied. An even more straightforward operation is simply to divide the figure for the urban population by the figure for the maximum district population. The result will be the *minimum urbanization rate* per district.

Obviously this formula aims to chart the limits of the possible. That the ceiling of the local carrying-capacities was reached in all studied hinterlands is as likely as to assume that 100% of the population lived in the central place. In reality, the local urbanization rates must have stood somewhere in-between the two extremes.

As we shall shortly see, it is possible to infer which settlements were oversized for their agricultural territories just by looking at the variable urbanization rates per district. This is preconditioned by the fact that the areas located beyond the 5-km catchment radius cannot have been farmed exclusively

[541] Jongman 2007, 592-618; obviously even if cash-crops were the dominant cultures in the territories of some towns, their produce would have had to be exchanged for grain.

by town-based farmers. Without a certain population minimum permanently residing in the outer reaches of the countryside, there could have been no maximum productivity.[542] It is therefore valid to postulate a maximum urban to rural population ratio above which the sustenance of the urban population from the agricultural produce of their hinterland becomes logistically untenable or impossible. Because of the many variables involved – technology, agrarian relations, environmental conditions and the types of crops grown – it is impossible to arrive at a universally applicable threshold for this ratio, but for the Roman world of the second and third centuries AD, urbanization rate of 33% may be regarded as the approximate limit of self-sustainability.

A more direct approach to assessing the sustainability of the central place will require certain modifications to the equation one hectare of cultivable land equals one person. Depending on the local urbanization rates, it is possible to adjust the amount of arable land necessary to secure the subsistence needs of the urban population. That the food requirements of the population based in the countryside will inevitably raise the lower threshold of agricultural productivity must also be taken into account. For example, assuming a 30% urbanization rate and that the fruits of the land located within the 5-km catchment radius were reserved for the urban population, the agricultural land necessary to cover the needs of a single town-resident increases to 3 ha in the outer belt of the market radius catchment. In this outer belt, representing about 75% of the theoretical hinterland based on the 10-km radius, only one-third of the agricultural territory was directly available to the urban residents, the other two-thirds were consumed by the labour force residing in the countryside.[543] On the basis of these postulations, the overall amount of land necessary for the sustenance of a single urban resident in any given section of the extended hinterland increases to about 2 ha, or more precisely to 1.85 ha. If we lower the urbanization rate to 10-15%, to match the widely accepted overall rate of urbanization for the western provinces of the Empire, the land necessary to sustain one urban resident from any part of the agricultural territory will rise to almost 3 ha. In order to visualize the settlements that grew too large for their agricultural territory more clearly, we shall add trend-lines for the minimum land-to-population ratio in the graphs plotting the population estimates and the amount of arable land. All the settlements situated high above this line outgrew the agricultural capacities of their immediate hinterland, implying a large administrative territory, a strong non-agricultural sector, special governmental subventions or a combination of any of these mechanisms. We shall see that, with a few exceptions, all settlements falling above the trend-lines for the minimum land-to-population ratio also feature a local urbanization rate higher than 30%.

It may be objected that this approach is another repercussion of the erroneous assumption that the Roman towns functioned like agro-towns. Indeed this model has originally been devised for the Bronze Age and Iron Age centres in the eastern Mediterranean and the Near East.[544] We adopted the approach without major modifications, not because we believe that most of the urban residents plowed their own fields, but to account for the fact that a given proportion of the agricultural territory was owned directly by the urban residents. A distinction has to be made between the land property of the urban elite and the land that fell within the market radius of the central place but was owned

[542] On the role of labour in determining agricultural productivity see Erdkamp 2005, 12-54.
[543] Bintliff 2002b, 159. This amounts to projecting twice as many people in the rural districts as in the urban centre, a figure that is too low for most of the western provinces of the Roman Empire, in which the urbanization rate is normally estimated at not more than 10-15% of the total population: Scheidel 2007, 38-86; Wilson 2011, 161-195; De Ligt 2012. See Hanson 2016, fn. 657, for a full bibliography.
[544] Bintliff 2002b, 157-159.

by the rural communities. This is more closely related to the agrarian relations in the urban hinterlands than to the local urbanization rate, although these two paramteres are essentially inseparable. In the core segment of the catchment area a larger proportion of the agricultural produce stood at disposal of the urban dwellers than in the peripheral belt, in which only a small proportion of the harvest was set aside for urban consumption through the market or taxation. We have no means of learning how much of the land within the extended catchment radius belonged to the urban elite. Presumably it was much greater than the area enclosed by the farming radius, but because this land would have been likewise exploited by means of hired labor, tenant farmers of sharecroppers, we've decided to limit our zone of total urbanization to the 5-km catchment radius. This is not an attempt to model the settlement pattern at increasing distances from the central place, but a rough approximation of the variable agrarian relations in the area enclosed by the market radius.

It doesn't take much to add another trend-line in the graphs correlating urban population size and agricultural territories. This trend-line will mark the minimum land-to-population ratio at constant urbanization rates of 10, 20 or 30%, depending on the province. These are the average district rates for the individual provinces. It is difficult to agree with the principle assumption behind this approach, even though it is simpler in comparison to that described in the preceding paragraph. Constant urbanization rates across the entire market catchment would imply that population density increased from the periphery to the centre of the urban hinterlands. As we shall shortly see, this will result in a substantial increase in the number of towns that are too large for their theoretical hinterlands.

In order to keep this chapter within human proportions, only the optimum scenario – minimum population figures and 10/15-km catchment radii – will be discussed in greater details. The maximum size-estimates will be considered only if they are judged to be more reliable than the conservative size-estimates. Doubtless, if higher population figures or smaller catchment radii are advanced, there will be quite a few settlements that will fall just above the trend-line for the minimum land-to-population ratio. But only the settlements that exceed this threshold by a greater margin will remain unsustainable by the resources available in their immediate hinterlands, no matter the values of the parameters considered.

Northern Macedonia and Epirus

In location and geography, this region belongs to the southwestern part of the Balkan Peninsula. It is predominantly mountainous country, composed of the southern half of the Dinaric-Pindus Range (Map V_2).[545] However, in comparison to Dalmatia, the relief is less rugged. The mountain masses are broken up by the numerous plateaus and high fluvial plains, many of which are very fertile and relatively large. There are considerable regional variations. The earlier observation for example, is valid for the eastern half of the province, that is the Vardar Valley, but not for northern Albania or Epirus in which the major rivers flow through narrow gorges, leaving little room for cultivable land on the valley floors.[546] The Albanian coastal plains represent yet another geographical zone.[547] These are fairly extensive sections of flat land, but they are poorly drained and, as in the Danube provinces, considerable areas were marshy. This problem is not limited to the coastal zone. Flooding has

[545] The Naval Intelligence Division 1945.
[546] The Naval Intelligence Division 1920b, 9-36.
[547] The Naval Intelligence Division 1945, 73-83.

hampered the agricultural potential along the major rivers in the interior of the country. Nowadays, these areas have been drained and are intensively cultivated and hence it is very difficult to take a precise account of their extents. Hopefully, they were limited to narrow belts along the major rivers and consumed only minor sections of the presently arable land.

The other natural aspects in this province were favourable. The soils, climate and hydrography guaranteed the agricultural riches of the regions that belonged to Roman Macedonia and Epirus. Apart from the hilly or mountainous terrain and poor drainage, the only other possible hindrance to the full exploitation of the theoretical hinterlands was the very close spacing of the towns, especially pronounced in northern Epirus and in the Middle Vardar Valley. As it is not always possible to decide which settlements were autonomous and which were subordinate central places, we proceeded by making alternative estimates: one assuming that the problematic settlements were autonomous, the other that they belonged to the territory of the nearest town. Obviously, the differences between the alternative estimates are dramatic, but in none of these cases does the lower figure challenge the sustainability of the settlements analyzed.

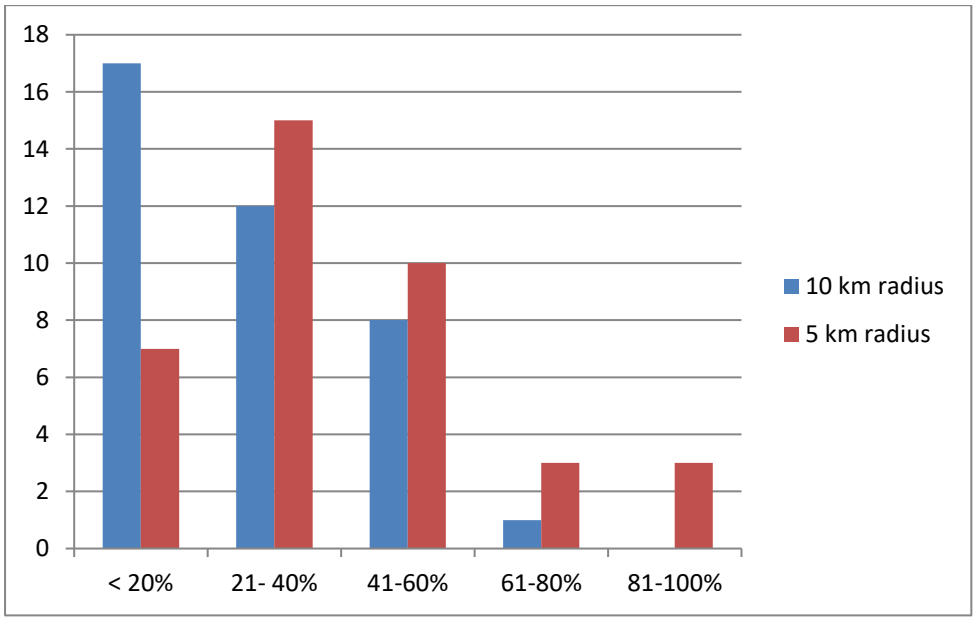

Figure V_1: Distribution of the settlements across percentage ranges for arable land within the 10- and 5-km catchment radii

That the arable surfaces cover less than 50% of the hinterlands in over two-thirds of the cases is hardly surprising in view of the geography of this province.[548] However, we did not anticipate that the agricultural potential, expressed in percentage, would decrease so sharply when the catchment radius is extended to 10 km (Figure V_1). In both scenarios, there is a roughly equal number of settlements in control of hinterlands with average agricultural potential – that is 21-60% of the catchment. Yet, the number of settlements with agricultural potential lower than 20% is visibly decreased in the 5-km catchment radius and there is a slight increase in the number of settlements that belong to the other end of the spectrum. The mountainous geography of the area means that the extension of the catchment radius is more likely to include uncultivable stretches rather than new arable land. Only in

[548] *Cf*. De Angelis 2000, 138-141.

the case of seven settlements did the extended theoretical hinterland increase the percentage of arable land, in three of which the increment was marginal, that is smaller than 5%. Even in absolute terms, the extended catchment radii add relatively small amounts of arable surface. Almost one-half of the settlements gain less than 40-50 square kilometres of arable land in the extended catchment radius. This result suggests that proximity to arable land was a major factor in the geographical distribution of the towns and settlements in Northern Macedonia and Epirus.

There are no apparent correlations between the various settlement categories and the amount of arable land in their hinterlands. This relationship has possibly been scrambled by a number of small, subordinate settlements, like the anonymous hill-top site near Symizë in the Korça Plain, the road-side *vicus* Ad Scampsa or the unnamed agglomeration near modern Krupište in the Bregalnica Valley. These were subordinate settlements whose extent in the period of the High Empire is uncertain.[549] On account of their well-chosen micro-locations, at least 50% of their catchment areas were arable. This could very well be an effect of the limited data-set. We are not sure if these were the only agglomerations within the 10- or even the 5-km catchment radii. In view of their tiny size and the concomitant lack of conspicuous remains, it is likely that they had to share the excellent agricultural potential of their surroundings with other, hitherto unknown, settlements of similar rank and size.

With a few exceptions, most of the autonomous towns were in control of hinterlands that were at least 20% arable. It is difficult to make further distinctions between the *poleis*, although it should be stressed that most of the settlements that were promoted to colonies or *municipia* or included sizeable communities of Roman citizens - Bylis, Heraclea Lyncestis, Stybera, Stobi – enjoyed access to large agricultural territories. However, there are a number of exceptions, like Dimalë or Antipatrea, peregrine communities that in all likelihood declined after the Roman conquest, even though their micro-locations guaranteed large arable surfaces. The settlement in control of the most fertile catchment was the Greek colony of Apollonia that jealously guarded its ancient traditions until the end of Antiquity.

The theoretical local urbanization rates in the parts of Roman Macedonia and Epirus included in this study vary greatly from settlement to settlement (Table V_1 in Appendix 2). Excluding a group of small communities with uncertain size-estimates, either located on the northern Epirote coast or in the mountainous parts of the province, there is an apparent positive correlation between settlement size and the local urbanization rate. In nearly all of the hinterlands of the major towns mentioned in the preceding paragraph, the local urbanization rate was higher than 30%, even with the minimum size-estimates. In the surroundings of the minor *poleis* and secondary agglomerations, the urbanization rates barely exceeded 20%. Only the community of Dyrrhachium, the top-ranking settlement in this province, was much larger than the rural community potentially residing in its hinterland. If the maximum size-estimate is accepted, the urban population of Dyrrhachium was already visibly larger than the agricultural capacity of its hinterland. Taking the optimistic estimate, this town was 75% larger than the maximum carrying-capacity of the land within the 10-km catchment radii. The average district urbanization rate is 33% for the minimum estimate, over 42% for the maximum estimates. Most of Roman Macedonia belonged to an urban tradition that was closer to the Greek *polis* than to the Roman *municipium*.

[549] Symize: Andrea 1984, 71-88; Ad Scampsa: Cerova 1997, 285-304; Krupište: Mikulčić 1999.

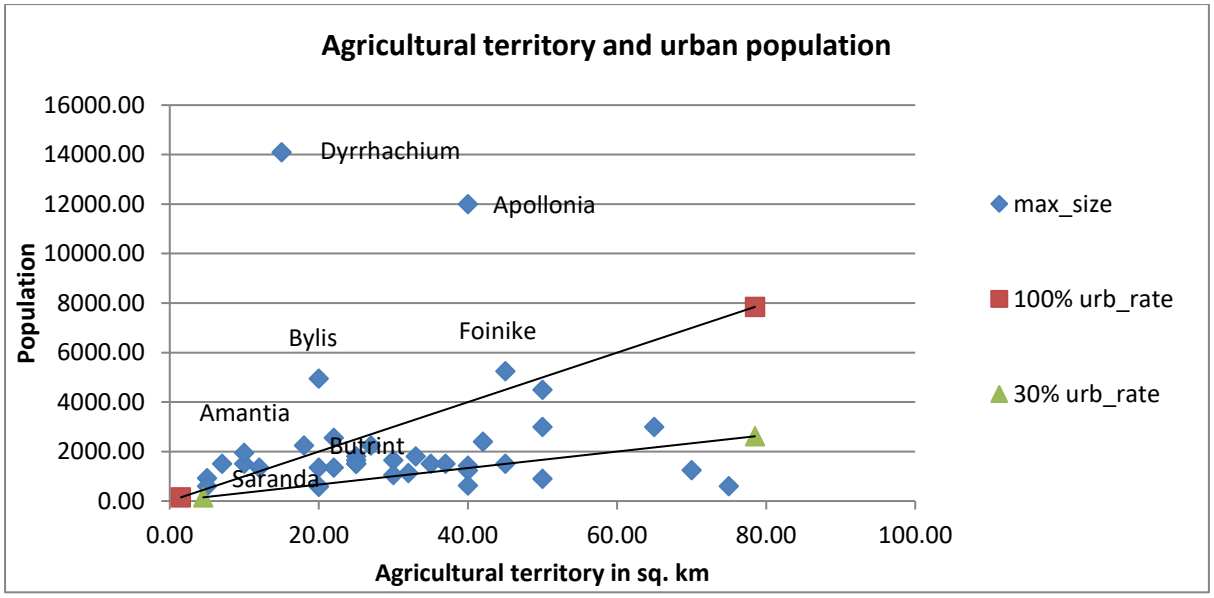

Figure V_2: Population figures and estimates of arable land within the 5-km catchment radius

Figure V_2 is a testimony to the favourable location of most of the towns and settlements of Roman Macedonia. Even with the maximum size estimates, only a handful of towns were too large for the agricultural resources lying within the 5-km catchment radius. A group of smaller *poleis* and port-towns are placed just above the trend-line for the minimum land-to-population ratio, but for many of these, the maximum size-figures are not particularly reliable. Obviously, this observation is valid only if we assume that most of the population in the 5-km catchment radius was concentrated in the central place. If 30% urbanization rate is postulated, the situation would be completely reversed and over-three quarters of the settlements would have become unsustainable. This would imply that despite the tradition of agro-towns in the area, most of the settlements were too big to function as simple agrarian communities.

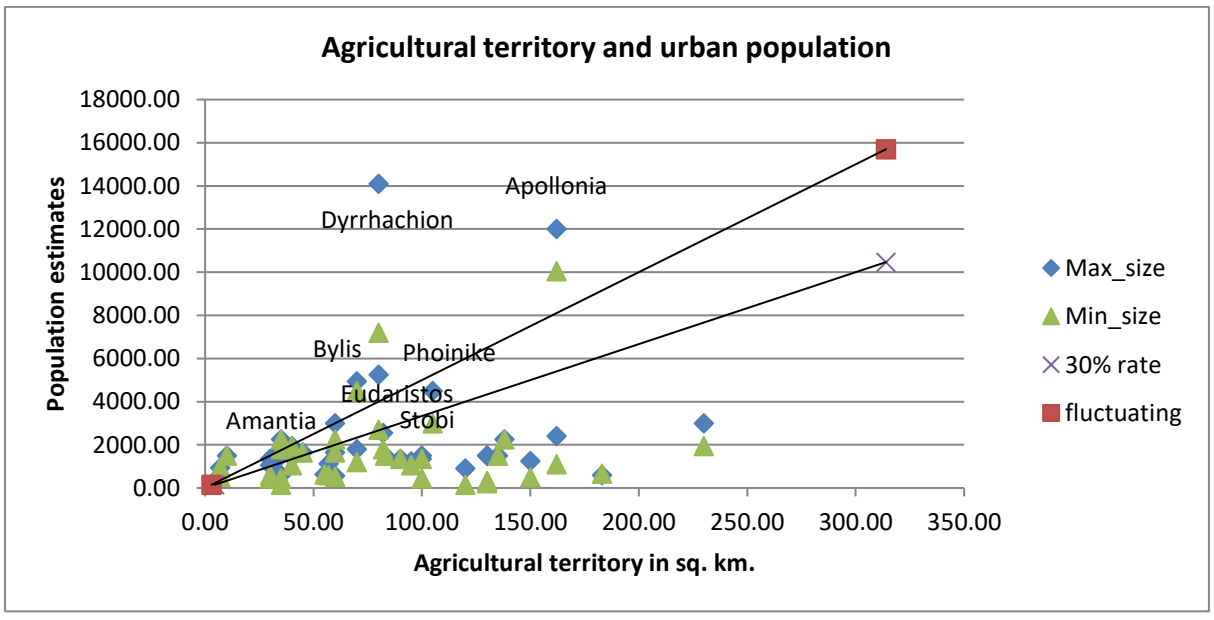

Figure V_3: Population figures and estimates of arable land within the 10-km catchment radius

With population figures based on the minimum size-estimates, extended catchment radii and fluctuating urbanization rates, the great majority of the towns and settlements in Roman Macedonia would have been small enough to live off the resources available locally. As suggested by the projected local urbanization rates, only the top-ranking settlements in the province clearly exceeded the agricultural potential of their extended hinterlands. Dyrrhachium is joined by the second Greek colony Apollonia and a few settlements positioned in the bottom left corner of the graph, but these were tiny agglomerations, located in the agriculturally marginal parts of the province. The group includes small ports of call, like Orikum and Onchesmos, possibly compensating for the grain deficiencies in the their territories by their profits from maritime trade and fishing,[550] and the assumed centres of the *koina* of Upper Macedonia, in which only minor adjustments in the size of the settlement or the arable land could shift the settlement below the trend-line.[551] One of these sites is a possible mining settlement on the Moriovo Plateau.[552] If these were proved, it would confirm our predictions that the settlements with a pronounced non-agricultural component are likely to be oversized in relation to their immediate hinterlands, but the size-estimate for the site in question is anything but certain. Most of the *poleis* that constituted the second tier of the settlement hierarchy are placed below the trend-line for the minimum land-to-population ratio.

Allowing for the possibility that the settlements grew to their maximum extent, a number of *poleis* come close to or are shifted slightly above the trend-line, whereas Dyrrhachium climbs far above the threshold for the minimum land-to-population ratio. Most of the towns that come close to exceeding the limits of the agricultural potential in their hinterland were major *poleis*, like Bylis, Foinike or Stobi. That they are joined by a few obscure towns – Eudaristos or Amantia – can be entirely attributed to the unlikely maximum size-estimates. It has to be acknowledged that all of these settlements were autonomous towns but, as we shall see in the next chapter, their administrative territories were not much larger than the territories enclosed by the market radius. They could therefore rely only on a very limited amount of resources from beyond the 10-km radii.

Note that when the district urbanization rate is fixed at 30% and the maximum size-estimates are used, most of the larger *poleis* in the interior of the province, alongside the small coastal settlements, would have become oversized in relation to the local agricultural resources. Moreover, a number of smaller towns would have come very close to the trend-line for the minimum land-to-population ratio. If the theoretical urbanization rates for the urban hinterlands are lowered, the fact that so many settlements would have struggled to secure their survival by the local resources cannot be readily explained. Insisting on constant local urbanization rate of 30% would either entail population densities lower than 150 inhabitants per hectare or lower size-figures. Indeed, in the minimum size-estimate, the number of settlements that fell above the trend-line for the minimum land-to-population ratio is unchanged.

It is all the more unfortunate that there are very little or no data about the settlement patterns in the hinterlands of these towns. Among the few exceptions is Foinike, in Epirus, at which the Italian mission has carried out a systematic survey of the area to the north and east of the town.[553] Notwithstanding

[550] Orikum: Kumi 1989, 277-278; Onchesmos: Lako 1986, 279-281.
[551] Papazoglou 1988; Nigdelis, Souris 1997, 55-64; Mikulčić 1999. It is also possible that population density was lower than 150 inhabitants per hectare in these settlements. See fn. 535.
[552] Mikulčić 1999, 91-93.
[553] Giorgi 2003, 91-97; Giorgi *et al*. 2005, 195-210.

the ambiguous nature of these data, it is evident that the hinterland of the town underwent an intensive agricultural exploitation, beginning with the Hellenistic period and continuing under the Roman Republic and Early Empire. The great majority of the sites measured less than 0.5 ha and can only be interpreted as farms or *villae*.[554] This interpretation is further supported by the finds of isolated funerary monuments, evidently private mausoleums associated with these estates. Most of the sites whose character is securely determined are located within the 5-km catchment radius from the town, but the significance of this observation is diminished by the unknown scope and intensity of the survey.

At least in the case of Foinike, it seems that the town's primary occupation was agriculture. There is hardly any evidence of the importance of other, non-agricultural activities. Foinike remained a land-locked community and its relations with the nearest port-town, Onchesmos, are unclear. In Late Antiquity, the latter became a bishopric while Foinike apparently declined, although it maintained its independent status.[555] It is possible that the large size of the town in relation to its immediate hinterland reflects the situation in the pre-Roman period, when Foinike was the capital of the *koinon* of the Chaonians.[556] As long as this arrangement was in place, the town could presumably draw on additional resources from the territories of the neighbouring *poleis*.

The research carried out in the hinterland of Apollonia is particularly important, as it covered a substantial portion of the city's immediate hinterland.[557]. Thanks to this shard-based ceramic survey, it was possible to observe a number of important specifics that were obscured in the Foinike surveys. In Apollonia too, a network of farms and *villae* in the immediate hinterland of the town had been established by the Hellenistic period and continued into the Roman period. However, the study of the pottery collected demonstrates a sharp decline in the period following the Roman conquest, both in the overall number of shards and in the number of farms. The findings of this project confirm our suspicions about the maximum size-figures for Roman Apollonia. Here, as in many other towns in Epirus and in the territory of the old Illyrian kingdom, the size-figure refers to the walled area in the Hellenistic period. If Apollonia shrank in size after the Roman conquest, while formally maintaining the old urban limits, the sustaining of the town from its own hinterland would not have presented a problem, and the evidence of less intensive exploitation of the countryside becomes more intelligible.[558]

In the case of Dyrrhachium, neither the increased catchment radius nor the minimum estimate for the built-up area relieve the pressure on the agricultural potential of the urban hinterland. Located close to a promontory and surrounded by the sea on two sides, the agricultural potential of this town was inevitably limited to a fraction of its theoretical hinterland. Moreover, the coastal plain that constitutes the hinterland of Dyrrhachium was covered by extensive marshes until the middle of the

[554] *Cf.* Jameson *et al*. 1994; Mee, Forbes 1997; size of Roman and Late Roman *villae*, Mulvin 2004, 377-411; Potter 1979.
[555] Onchesmos: Lako 1986, 281; Lako, Muçaj, Bushi and Xhyheri 2014, 613-625; Foinike: De Maria 2012, 27-53.
[556] Budina 1986, 111-121.
[557] It should be pointed out that this research was focused on the rugged area to the east and south of the colony, because it was feared that the coastal section of the hinterlands would not have been favourable settlement locations. However, probing transects in the direction of the sea have revealed both an extensive carpet of off-site material and discrete clusters of finds. Davis *et al*. 1998-2002.
[558] Evidence of abandonment of parts of the built-up area of the Classical and Hellenistic town: Lamboley *et al*. 2012.

twentieth century. The limited size of the agricultural territory, but also malaria and other paludal diseases, hindered the growth of Ottoman and Early Modern Durrës. There are indications of a more favourable hydrology in the area prior to Late Antiquity, but without a focused palaeo-environmental research programme there is no way of evaluating the impact of this factor.[559]

Both the historical and archaeological evidence suggest that the agricultural deficiencies of Dyrrhachium's hinterland were at least compensated in part by the important role of this town in the maritime traffic between Italy and the Balkans. The historical sources mention the bustling ports of Dyrrhachium, stressing its outward-looking and international character in contrast to the neighbouring Greek colony of Apollonia.[560] At the time of the Roman conquest and subsequent expansion in the interior of the Balkan Peninsula, Dyrrhachium was the principal military and economic base of the expanding Republic and enjoyed access to the agriculture produce of an area much larger than its immediate hinterland.[561]

However, there were other solutions to the meagre agricultural potential in the hinterland of this town. As we shall demonstrate in the next chapter, scant though epigraphic evidence is, it suggests that Dyrrhachium had a vast administrative territory, extending into the lower and middle course of the Shkumbini (Map V_3).[562] This territory contained sizeable stretches of arable land, and a moderately populated countryside could produce enough surpluses to compensate for the shortcomings of Dyrrhachium's immediate surroundings. In fact, even if the administrative territory is limited to the coastal plain, covering an area of over 240 square kilometers of arable land, the agricultural potential of Dyrrhachium looks much brighter. On any view, it is likely that this important trade-hub had access to resources brought in from a territory much larger than that enclosed by the 10-km market radius.

The survey of the agricultural territories of the towns in Roman Epirus and Macedonia allows us to make a few general observations. The great majority of the settlements in the area were of a size that did not necessitate very extensive hinterlands. Less than 10% of all settlements included in this study required an area larger than that enclosed by the 5-km radius to satisfy their sustenance needs. In this respect, most of the towns and town-like agglomerations of Roman Epirus and Macedonia fall within the same range as the so called *Dorfstadt* – a settlement of at least 500 inhabitants and a territorial radius ranging between 2 and 5 kilometres.[563] If they are to be judged solely by their size and micro-locations, - inevitably other evidence is wanting - the towns of northern Epirus and Macedonia were ideally poised to act as agro-towns.[564] They were by all standards small, but their micro-locations were

[559] That the hydrological conditions in Antiquity were more optimal that in later periods is indicated by the archaeological finds in the area to the northeast of the urban core and the analysis of the pollen record from the excavations in the amphitheatre; Myrto 1989, 89-109; Santoro 2008, 9.
[560] Cabanes, Drini eds. 1995.
[561] Most clearly reflected in the spread of the *tetradrachms* issued in Dyrrhachium during the Late Republic, Mitrea 1983, 23-31.
[562] Anamali, Ceka, Deniaux, eds. 2007; see Chapter VI.
[563] Bintliff 2002b, 158.
[564] As explained in the introductory section, many scholars would argue that the agro-town or *Dorfstadt* has no place in the Roman Empire, see fn. 516. Even for the towns in the Roman East – representing the prototype of the *Dorfstadt* – there is evidence suggesting that they had become more elite-dominated by the Hellenistic period, and this trend continued after the Roman conquest, Alcock 1993; Bintliff 2014, 49-53. This does not necessarily contradict our observations on the siting of these towns. Their micro-locations indicate that these settlements were founded as agro-towns, even if their socio-economic profile changed in later centuries.

well chosen, with a clearly agricultural focus. To some extent, this pattern was dictated by the physical geography. The niches exploited by these towns offered a limited amount of land and the high, inhospitable mountain ranges made the exploitation of the neighbouring niches logistically demanding and economically unviable. Hence, a large territory often brought little benefit in terms of the expansion of the agricultural potential. Under these conditions, the pronouncedly modular pattern of settlements of a similar size is hardly surprising.

There is very little evidence of large-scale non-agricultural economies in the towns of Roman Macedonia and Epirus. With the exception of Dyrrhachium, the economic interest of these communities did not reach beyond the regional horizon. What determined growth or at least a status-distinction was the favourable geographical location in the context of regional politics. A town like Stobi, conveniently located at the crossing of two interregional roads and close to the provincial frontier, obviously benefited from these circumstances and, despite its fairly modest agricultural potential, it outshone its neighbours although it did not outgrow them by a large margin. The same can be said of Dyrrhachium, only slightly larger than Apollonia when we consider the maximum size-estimates. In this respect, it could be argued that the agricultural potential of the region did set the outer limits of urban growth in this part of the study area.

Dalmatia

Roman Dalmatia was a land of mountains.[565] In certain parts of the province, especially its southern half, over 80% of the territory is taken up by the Dinaric Alps. The agricultural potential of this province is further undermined by its geological framework. The arable land is scattered across hundreds of tiny high plains, separated by extensive stretches of barren, waterless karst. Even on the plateaus, agricultural productivity is potentially diminished by the frequent floods, caused either by heavy downpours or the melting of snow in late spring. In comparison to Albania, the Dalmatian coast is much narrower. With a few exceptions, like the Ravni Kotari in modern Croatia, the coastal plains are small or simply non-existent. This grim sketch of the country's agricultural potential is to a certain degree moderated by the fertility of the large valleys running through the northern half of Dalmatia, in present-day Bosnia. However, it is as well to remember that there were very few traces of Early Roman urbanism in this part of the province. These relatively fertile areas were either attached to the mining districts or remained under military control.[566]

It can be argued that this perspective underestimates the food-producing capacity of Dalmatia by ignoring the importance of animal husbandry and maritime resources, not to mention the possible gains in cultivable land by the terracing of the hilly zone.[567] A large proportion of the cultivated land in the coastal district was laid down to olives and vines, although evidence of the export of these products to other provinces has not yet been found. Moreover, in some corners of the province, it is clear that erosion has washed away a significant portion of the arable land available in Antiquity.[568] A

[565] The Naval Intelligence Division 1944, 43-85; Wilkes 1969.
[566] See Chapter Six.
[567] Škegro 2006, 149-173; Begović-Dvoržak, Schrunk-Dvoržak 2004, 65-91.
[568] Chapmann, Shiel, Batović, 1996, 23-24.

stark illustration of this tendency can be found in the hinterland of Iader, in which the traces of centuriation are spread out over a now barren area (Map V_4).

The fact remains that the region had a low grain-producing capacity. According to an agricultural survey of the area carried out immediately after World War I, only about 10% of the territory of Dalmatia was cultivated, a visibly lower percentage compared to the extent of the plough-zone in the rest of the western Balkans.[569] It has to be stressed that the study refers to the Austro-Hungarian province of Dalmatia. Bosnia and Herzegovina and Montenegro are treated separately in the cited study, complicating any direct comparison. Nonetheless, according to the same source, all three regions of Roman Dalmatia were grain-importing regions in the early decades of the twentieth century.

As in Macedonia, large portions of Roman Dalmatia belong to the belt of pre-Roman urbanism, with intercity distances shorter than 20 km. This circumstance shrinks the agricultural potential in the hinterlands of individual towns even more.

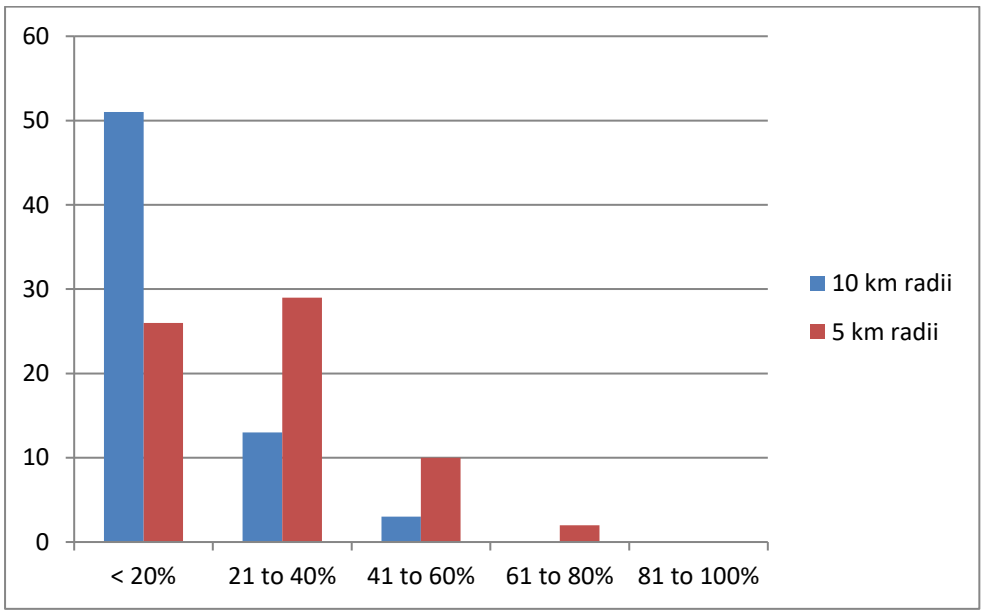

Figure V_4: Distribution of the towns and settlements across percentage ranges for arable land within the 10- and 5-km catchment radii

Because of the relatively small extent and dispersed character of the arable land in Dalmatia, the extension of the catchment radii rarely results in substantial gains of cultivable surface. This is even more sharply pronounced than in Macedonia, in which in some cases at least, the extended hinterland guaranteed the survival of the central place. For Roman Dalmatia, it is evident that the extended catchment radius decreased the percentage of arable land in the hinterland. Over 90% of the settlements have a less than 40% arable surface in their hinterlands when the catchment radius is increased to 10-km. This percentage drops to 80% with the 5-km radius, and at the same time, the number of settlements whose agricultural territory makes up at least half of their theoretical hinterland rises to nearly 20%. With the 10-km radii, only two settlements have agricultural potential higher than 50%. In only two of the Dalmatian settlements is there an increase in the percentage of

[569] Louis 1924; The Naval Intelligence Division 1944b, Figures 15, 16.

arable land when the catchment radius is extended to 10-km and, even in these cases, the gain is truly marginal, hardly exceeding 5%. It is important to mention that one of these settlements is Domavia, the administrative centre of the silver mining district in the east of the province. In absolute numbers, no more than 12 settlements gain over 50 square kilometres of arable land with the extended catchment radius.

It is difficult to discern a clear correlation between the different settlement categories and the size of their agricultural territories. As was shown in the opening chapters, the settlement network of Dalmatia had a mixed genesis. In most cases the period of the foundation of a certain town is less relevant than the geographical zone in which it was founded. Most pre-Roman towns were located in the narrow coastal zone in which arable land was extremely scarce. If we compare the micro-locations of the land-locked communities, the pre-Roman foundations, including a handful of examples that were probably abandoned after the conquest, had agricultural potential comparable to the newly founded settlements in the interior of the province. It is also evident that the few road-stations and, even a few of the mining *vici*, occupied locations that were served by relatively sizeable agricultural hinterlands. We repeat that all estimates for the amount of arable land controlled by particular settlements are only theoretical. It is likely that there were far more settlements of a similar rank and size sharing the same geographical niches than those included in this analysis.

The marked discrepancies between the high and low estimates for the size of the Dalmatian towns and settlements are inevitably reflected in the differences between the projected minimum urbanization rates (Table V_2). According to the high size-estimates, over one-half of all settlements included in the analysis had communities as large as, or larger than, the maximum rural population inhabiting the area of the 10-km catchment radius. Even more striking is the prediction that no less than 15% of all settlements are larger than the agricultural potential of their hinterlands, even if the rural population is excluded. Looking at the conservative size-estimates, the projections become far more convincing. Only in about 12% of the territories, do we find an urban-rural ratio close to 1 or higher, half of which were composed of small settlements located on the coast or in areas of challenging terrain. Of the larger towns, only the provincial capital Salona, the Greek colony of Issa and the mining *municipia* in the interior had urbanization rates higher than 40%. According to the low estimates, in the hinterlands of most of the autonomous towns, the minimum urbanization rate was between 25 and 37%. The average for the entire province falls within the same range. Even after lowering the population density in the central places to 120 per ha and accepting the minimum estimates, the average district rates are still as high as 22% (Table V_2 in Appendix 2). Unless our size-estimates and population projections are entirely off the mark, it would be reasonable to count with average rates of about 30% in the urban territories, in both Dalmatia and northern Macedonia and Epirus. High district urbanization rates would have been a logical response to the low to modest agricultural productivity in both regions. Therefore it shouldn't be excluded that the settlements of coastal Dalmatia included farming population.

These estimates are somewhat compromised by the results of the Neo-thermal Dalmatia Regional Project.[570] The intensive survey of sections of the Liburnian countryside and the research carried out at individual settlements has howed that, despite the process of urban withdrawal,[571] the countryside

[570] Chapmann, Shiel, Batović, eds. 1996.

[571] The evidence from the presumed site of the Liburnian *oppidum* Blandona, suggests that the settlement was reduced to an isolated residence or workshop in the aftermath of the Roman conquest. The small-scale

witnessed an upswing in rural investments and villa construction. Both in numbers of individual sites and overall artefact density, the Roman period is the most predominant phase in the surface archaeological record of Ravni Kotari.[572] The Roman period in Liburnia is not only marked by the highest artefact and site-densities, it is also the most wide-spread phase encountered in all pedological and climatic zones. In some cases, isolated *villae* or clusters of farm-buildings from the Roman period were discovered in the midst of what is now barren karst. This is not easily reconciled with our high projections for the local urbanization rates that imply a moderate population density in the immediate surroundings of the towns. However, caution is advised when interpreting the results of this regional project. Although highly advanced for its time, the Neo-thermal Dalmatia Project did not develop an explicit methodology for site-definition. As a result, it is difficult to decide if the prominence of the Roman period in the surface record is related to the large number of sites or the dense off-site carpet. More to the point, the large number of *villae* do not necessarily imply high population density in the countryside. Mentions of large nucleated villages are missing in the project's publication. If isolated farms and *villae* were the only settlement form in the Liburnian countryside, this can be taken as evidence in support of our high projections for the local urbanization rates.

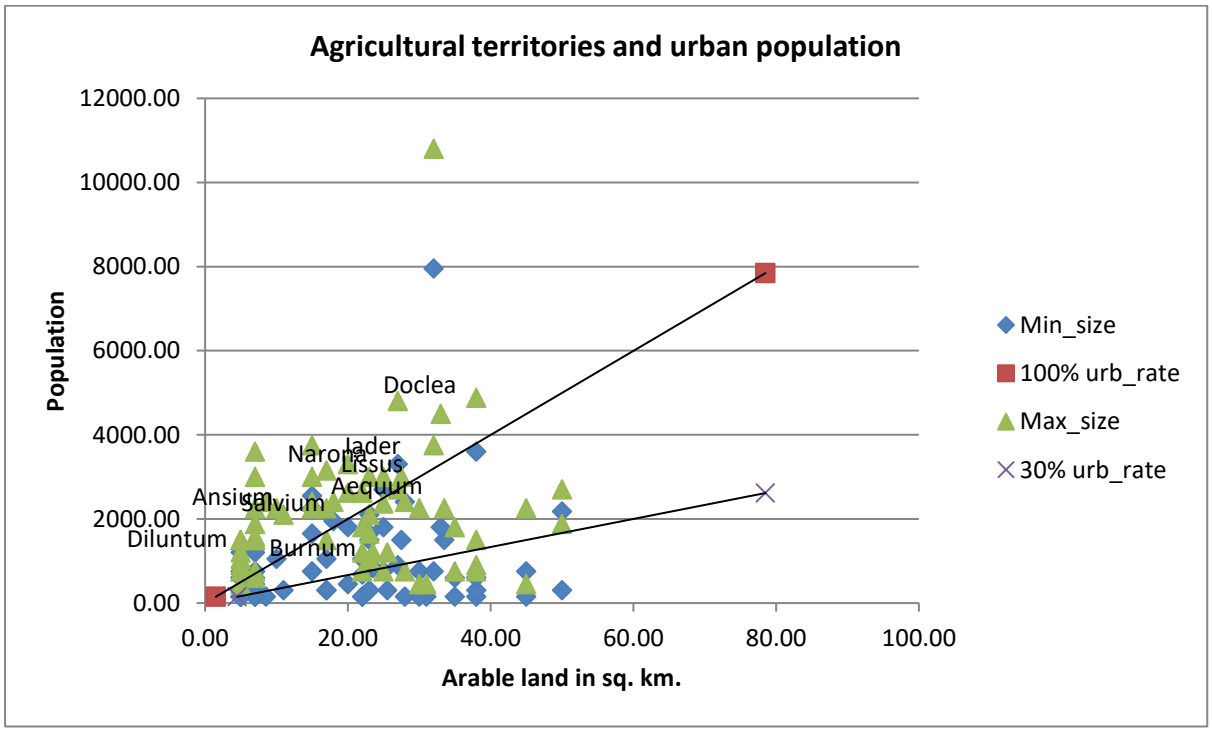

Figure V_5: Minimum and maximum population figures and estimates of arable land within the 5-km catchment radius

If the maximum size-estimates are accepted, over half of the Dalmatian towns and settlements would be too large for their 5-km catchments. In the preceding chapter we explained why these figures were unlikely for the great majority of the pre-Roman hill-top settlements. The same applies to the road-

excavations at Nedinum revealed not a single public building from the Roman period in the area of the acropolis, Chapmann, Shiel, Batović, eds. 1996, 123-131; 231-250, Figure 94. *Cf.* the developments in the hinterland of the Hellenistic *oppidum* near present-day Margeliç, in southern Illyria. Davis, Korkuti *et al*. 1998-2002.

[572] Chapmann, Shiel, Batović, eds. 1996, 84-85.

side *vici*, whose size-estimates are based solely on impressions gathered by unsystematic field walking.[573] Judging by the absence of monumental architecture dating to the Roman period, these settlements were of a much humbler size than indicated by the maximum estimates.[574] This hypothesis is corroborated by the low agricultural productivity of their surroundings, a feature particularly indicative of the likely size of the secondary agglomerations. If the Dalmatian road-side *vici* truly did reach the maximum estimates, they either boasted large territories or they had to rely on regular grain imports. Both scenarios are unlikely. Without an autonomous status, these settlements were not in position to exploit the land located beyond their immediate surroundings, while the logistical efforts necessary to secure a regular supply of grain to these land-locked communities would have hardly been justifiable. A likelier explanation is that, in terms of size, they differed little from the typical village, even if they did stand apart by their specialized economy and social composition. Reverting to the minimum size-estimates, only the largest autonomous towns outsize the arable potential of their immediate surroundings.

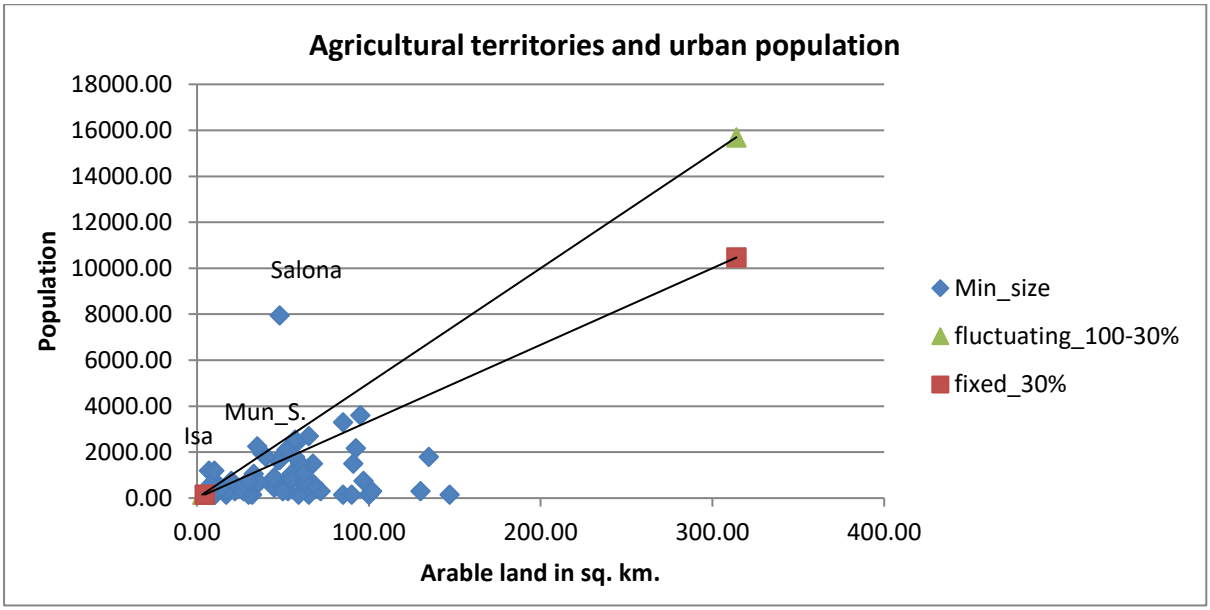

Figure V_6: Minimum population figures and estimates of arable land for the 10-km catchment radius

Dropping the unlikely maximum size-estimates from the analysis and extending the catchment radius to 10-km, only a small group of settlements exceeds the agricultural potential of their hinterlands (Figure V_6). Admittedly, if we adopt the simplifying view that the urbanization rate was constant across the urban territory, the group of settlements placed above the threshold of self-sustainability is enlarged. These are more or less the same settlements whose population equalled or exceeded the number of rural residents (Table V_2 in Appendix 2). However, for nearly all of these settlements the land-shortage is inconsiderable. This was a surprising outcome in view of the poor agricultural resources in the area and the fairly large number of special-purpose settlements, ports of call and mining *vici*.

[573] Bojanovski 1988.

[574] The population estimates have also been inflated by using a relatively high population density of 150 inhabitants per hectare.

In this context, it is interesting to take a closer look at the few archaeologically verified mining settlements in Roman Dalmatia. After all, this is the settlement category for which the premises of this research, elaborated in the introductory part, should prove most relevant. Given that the primary targets of the mining colonies were the exploitation of the ore deposits rather than the farm-land, this is likely to reduce the amount of arable land in their surroundings. The centre of the silver-mining district in the Middle Drina Valley, identified with the remains at Sase, near modern Srebrenica, occupies one of the least favourable locations from an agricultural point of view.[575] Even with the minimum size-estimates, there is less than 1 ha of arable land per person within the 10-km catchment radius of this settlement. However, only about 5 kilometres to the northeast of ancient Domavia, archaeological surveys have discovered a major agglomeration dated to roughly the same period.[576] According to the archaeologist who surveyed the site, this was a fairly large settlement, spread over an area of about 25 ha. The site is located on the left bank of the Drina and has immediate access to a large expanse of arable land on the valley floor and in the hilly area on the right river-bank. The plough-zone consumes nearly 40% of the theoretical hinterland of this site and, despite the unlikely size-estimate, it could have comfortably secured its subsistence from the surrounding area. The monumental remains near Sase have been identified with Domavia, the administrative centre of the mining district, and this makes the neighbouring site in the Drina Valley a possible candidate site for the mining colony.[577] If this interpretation proves correct – it is problematized by the fact that the plan of the excavated remains at Domavia also shows residential buildings[578] – it could point to a possible pattern of settlement and production in the mining districts. The example of Domavia shows a tendency to separate the administrative centres of the districts physically from the mining settlements and smelting-facilities. Unfortunately this model has only one or two possible parallels.[579] The study of the settlement locations in these areas shows that even mining colonies were located in or near agriculturally productive areas. Indeed, most of the Dalmatian settlements associated with mining or related activities, have fairly productive hinterlands and, regardless of the possibly overestimated built-up areas and population densities, were well below the productive ceiling of their theoretical hinterlands.

It has to be emphasized that too little is known about the exact chronology and character of these settlements. Occasional surface evidence of ore-smelting cannot serve as a solid basis for determining the character of the local economies. Equally convincing is the scenario in which the mining colonies remain attached to the administrative centres, acquiring most of their food supply from the agriculturally productive sectors of the districts. A gradual involvement of the local, primarily agricultural, communities in the process of production would not have been surprising in this context. In any event, the chief prerequisite for the sustainability of either of these models is the small to medium size of the miners' communities.

[575] Srejović 1965, 7-48; Wilkes 1969, Figure 19; Bojanovski 1988, 193-203.
[576] Bojanovski 1981, 125-197.
[577] Škegro 1998, 89-117; a similar pattern has been attested elsewhere in Dalmatia and Pannonia Superior. Bojanovski 1981, 189-191, however, sees the remains at Vojlavica as a road-station and the site of the ore-smelting facilities.
[578] Wilkes 1969, 277-283 and Figure 19, could relate to the Late Roman phase of the site though.
[579] *Cf*. the case of the *ferraria* in southern Pannonia, in which a similar separation between the administrative centre of the district in Ljubija and the mining settlement near modern Blagaj, on the Japra, is found. Sergejevski 1963, 85-102; Bojanovski 1988, 273-278.

Finally, it should not be forgotten that these settlements belonged to the governmental sector of the provincial economy. If they were purely mining colonies, it is likely that their food supply was guaranteed by the district procurator. In the next chapter, it will be demonstrated that the mining districts might have extended over large territories, including sizeable stretches of fertile land that belonged to the government.

Contrary to our expectations, only a few of the towns located in the coastal zone or on the islands proved too big for their surroundings, even with the minimum size-estimates. Issa, the only Greek colony in the area that survived the Dalmatian wars and the Roman conquest belonged to this category. It is certain that Issa had a much larger territory prior to the Roman conquest and the founding of Salona.[580] This Syracusan colony, like some of the pre-Roman towns in Epirus and Illyria, declined after the Roman conquest but did retain its formal status and walled perimeter. The Roman period saw the construction of public baths and *villae* on the periphery of the old town, but the city walls constructed in the fourth century BC were not maintained and there is some evidence to suggest deliberate demolition.[581] With the minimum size-estimates, the rest of the small maritime settlements could secure their survival from their immediate hinterlands.

There is only one Dalmatian settlement that is too big for its immediate hinterland, regardless of the size-estimate and the extent of the theoretical hinterland. This is again the largest settlement in the province, the provincial capital Salona. Even if we accept the optimal scenario, assuming a minimum size-estimate and extended catchment radius, Salona has a deficit of nearly 100 square kilometres of arable land. Although in Dyrrhachium, the grain demand could be met from the neighbouring regions, that might have been attributed to the colony, in the case of Salona, the surrounding micro-regions are agriculturally much poorer than the immediate vicinity of the capital. On the high plains to the north and east of Salona and on the islands of Hvar and Brač there is hardly more than 30 square kilometres of arable land in total.

In view of these circumstances, the possibility that a large proportion of Salona's population was involved in the non-agrarian sector has to be acknowledged. Like Dyrrhachium, Salona was an important port and, in conjunction with Narona, it was an important base at the time of the conquest of the Dalmatian interior. The town maintained close trade connections, not only with Italy, but also with the Aegean, the Eastern Mediterranean and the North African coast. It is no accident that, by the late second century AD, Salona boasted a sizeable community of merchants from the Orient.[582] These communities are barely represented in the small towns in the interior of the peninsula. Their presence in Salona is a symptom of the attraction the town exerted on trade and business. One should also take note of the high mobility of Salona's aristocracy, especially their involvement in the mining districts in the east of the province and their role in the establishment of the new *municipia* in the Dalmatian interior.[583] The growth of Salona was almost certainly based on a much broader economic base than the exploitation of the agricultural potential found in its immediate surroundings.

[580] Suić 1996, 269-282; Čargo 2004.
[581] Čargo 2002, 399-469.
[582] Cambi ed. 1991; Wilkes 2002, 87-105.
[583] Sergejevski 1957, 109-125; Zotović 2002, CIL III 8338; Ferjanić 2002, 62-67; gives examples of veterans based in Salona serving as town magistrates in the neighbouring towns.

The two faces of Dalmatia, the Adriatic-Mediterranean and the continental, belong to two essentially different urbanistic traditions. Therefore, it is rather an uphill battle to try to come up with a concise conclusion about the urban developments in this province. In the coastal zone, despite the very limited agricultural resources, urbanism had begun to take root centuries before the arrival of the Roman merchants. Notwithstanding the evidence of a reduction in the number of sites of urban character in the Roman period, settlement density was maintained at a fairly high level, albeit at the cost of the size of these communities. With the exception of the inland Liburnian towns in Ravni Kotari, virtually all settlements in the Dalmatian coastal zone were port-towns. Nonetheless, access to fertile land was deemed equally important. This is confirmed by the fact that nearly all micro-regions that offered even the smallest amount of arable land were occupied, while some excellent harbour locations – like modern Šibenik – never developed into urban communities.

The availability of agricultural resources grows even more important in the interior, on the high plains on the Adriatic side of the Dinaric Alps. The Roman colonies and the newly founded *municipia* regularly occupy the largest of these niches, for example Aequum and Novae or Doclea, in the Podgorica Basin (Map V_5).[584] Because of the limited size of these plains and the absence of other natural resources, their central places never grew to any large extent. Unlike in the coastal zone in which almost every possible niche was occupied by a small urban-like community, the small plateaus in the interior never developed an urban centre.

Both the geographical conditions and settlement patterns change dramatically in the continental parts of the province. Although a large proportion of this land is mountainous and unsuitable for agricultural production, there are large fertile regions along the major Bosnian rivers and their tributaries. Nevertheless, settlement density declines abruptly, while settlement sizes remains within the same range as in the coastal zone. With the exception of Domavia, all settlements in this part of the province, including those that belong to the mining districts, had recourse to good agricultural potential in their immediate surroundings. In other words, despite the environmental potential for demographic growth, none of these settlements came close to reaching the productive limits of its hinterland. This observation lends support to our interpretation of the settlement system in Dalmatia elaborated in the preceding chapter: it was fine-tuned to the extraction of the natural riches in the interior of the province administered from the provincial capital. As mentioned in the opening part of this section, the large fertile stretches along the Bosna or Vrbas – nowadays home to three of the five largest towns in Bosnia and Herzegovina - remain conspicuously devoid of urban settlements. In the next chapter, it will be demonstrated that it were political and economic rather than environmental factors that dictated urban developments in this part of the province.

The northern Adriatic

Despite its small size, this part of the study-area displays a fairly high degree of regional variation. Its principal geographical components are the fertile Istrian Peninsula, a small part of the Julian Alps, the Upper Sava Basin and the Kvarner Bay in the northern Adriatic. There are a wide number of climatic and geo-pedological variations between these micro-regions. The agricultural potential ranges from

[584] The central position of Aequum might signal more optimal hydrological conditions than those in the Early Modern period, when much of the valley floor was affected by seasonal flooding, The Naval Intelligence Division 1944, 60.

excellent on the Istrian Peninsula to mediocre in the valley of the Ljubljančica and negligible on the Kvarner Islands, the northern Liburnian coast and in the mountainous interior. The main factors that have limited the agricultural potential of the area have been the narrow coastline and the extremes in relief and climate in the interior. On the other hand, in the Upper Sava Valley, the agricultural potential was reduced by the poor drainage of the fluvial plains.[585]

Like coastal Dalmatia, these regions are deficient in mineral resources. Agriculture and fishing, in combination with the control of the key communication nodes, often provided the only bases for urban development. Both Slovenia and Dalmatia were grain-deficient regions at the beginning of the tewentieth century,[586] although dmittedly, this observation is based on aggregate data for much larger territorial units than those covered by this section. As elsewhere in the western half of the peninsula, considerable micro-regional variations have to be taken into account. In general, however, with the exception of certain parts of the Istrian Peninsula, the northern Adriatic differs little from the rest of the Dalmatian coast.

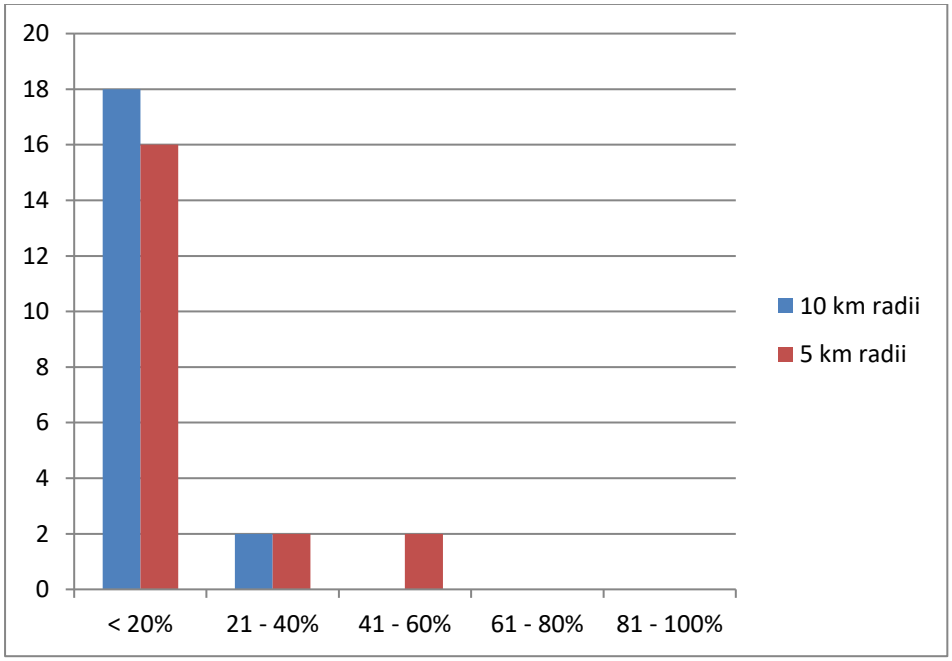

Figure V_7: Distribution of the towns across percentage ranges for arable land within the 10- and 5-km catchment radii

As in other mountainous areas, the extended catchment radius had a limited effect on the agricultural territories, especially in the coastal zone around Kvarner Bay. This applies to nearly all settlements in the coastal zone. Conversely, the settlements located on the Istrian Peninsula and the couple of settlements in the Upper Sava Valley are in a more favourable position. Nonetheless, when the percentage of arable land within the 10- and 5-km catchment radii is compared, it is evident that, relatively speaking, little is gained by the extended catchment radius. Only in the case of one settlement – the central place of a small *civitas* - do we see a marginal increase in the percentage of

[585] The Naval Intelligence Division 1944, Figure 3, 28-30.
[586] Louis 1924, Table 126. For the productivity of this area see The Naval Intelligence Division 1944b, Figures 18, 19. The bleak image is reinforced by the omission of the Istrian Peninsula from the geographical survey and the high grain consumption rates, Louis 1924, Table 11.

productive land. In absolute terms, the gains are pretty negligible, rarely exceeding 50 square kilometres. But given the very small size of the majority of these communities, even a minor increase would have had the potential to make the difference between a self-sustainable and market dependent settlement.

In the preceding chapter, we observed an apparent divide between the western and eastern parts of this area. All settlements in possession of over 50 square kilometres of arable land within the market catchment are located on the western coast of the Istrian Peninsula or in the Upper Sava Valley. These were also the largest settlements in this part of our study-area. There seems to be a further correlation between juridical status and agricultural productivity of the hinterland. All three Roman colonies in this region belong to the agriculturally rich corners of the area, Pola and Parentium on the western Istrian coast, Emona in the Upper Sava Valley. The towns on Kvarner **B**ay, on the other hand, were either *municipia* or the central places of free, tax-exempt *civitates*.[587] In view of their status, it is difficult to qualify them as disadvantaged in comparison to the Roman colonies. Some of these communities were granted Italic rights, while the number of Italian settlers was high in nearly all Liburnian communities.[588] However, the location of the colonies guaranteed larger agricultural territories than those of the central places of the *civitates*. It is no accident that only settlements that belong to the latter category increase the percentage of arable land with the extended catchment radii. As in Macedonia and Epirus, the Romans were consistent in turning their backs on the agriculturally marginal parts of the region.

According to the unlikely maximum size-estimates, the minimum urbanization rate in the territories of these settlements was over 80% (Table V_3 in Appendix 2)! Contributing equally to the high value for this parameter is the low agricultural potential in the hinterlands, over three-quarters of the settlements had hinterlands that were less than 20% arable. According to the maximum size-estimates, over half of the settlements in the northern Adriatic featured over 40% district urbanization rates and were almost certainly disproportionally large in respect of their agricultural territories. Although long, the list is fairly coherent, in that the great majority of the settlements were peregrine communities or Latin *municipia*. In the *agri* of the three Roman colonies, the minimum urbanization rates varied between 20 and 45%, regardless of the size-estimates. This was parallelled in Dalmatia and Macedonia, in which most of the Roman colonies and *poleis* with large communities of Roman citizens had urbanization rates falling in the same range. Only the settlements with the smallest agricultural potential in their hinterlands, largely coinciding with the Liburnian *oppida* on Kvarner Bay reveal urbanization rates higher than 50%, even with the minimum size-estimates. In view of the close spacing of agglomerated settlements in this area, the high projection for the local urbanization rates are not implausible. Even with the minimum size-estimates and population density of 120 to the hectare, the minimum local urbanization rate for the entire region is nearly 30%.

[587] Alföldy 1965; Čače 2001, 7-43.
[588] Kurilić 2006, 7-72.

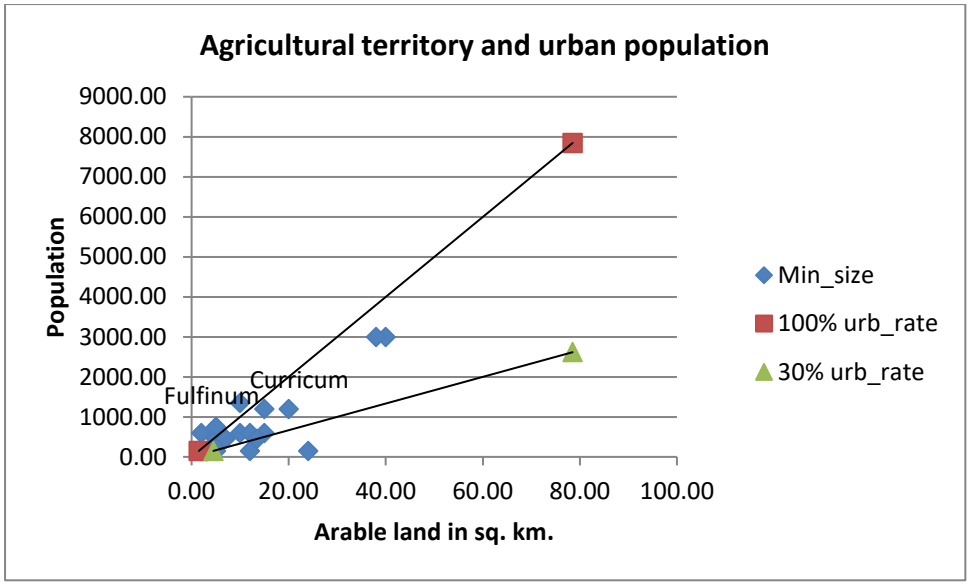

Figure V_8: Minimum population figures and estimates of arable land for the 5-km catchment radius

The maximum size-figures for the majority of the port-towns on Kvarner Bay are problematic. As in Dalmatia, the optimistic size-estimates refer mainly to the size of the topographical unit occupied by the settlement, or alternatively, the space available between the sites of the *necropoleis*. Only future research will tell if this area was built-up. With the minimum size-estimates and the 10-km catchment radii – likewise more appropriate to this part of the study-area, as the majority of the settlements were autonomous towns - almost all of these settlements could have been sustained by the local resources (Figure V_9). In fact, even with the 5-km catchment, only a handful of small *oppida* are slightly oversized in respect to their territories. Because of their small size, most of the towns and settlements in the northern Adriatic were sustainable by the local resources, but only if it is assumed that 100% of the population in the 5-km catchment radius was based in the central place. Decreasing the district rates to 30%, over three-quarters of the settlements would have been too large for their 5-km catchments (Figure V_8).

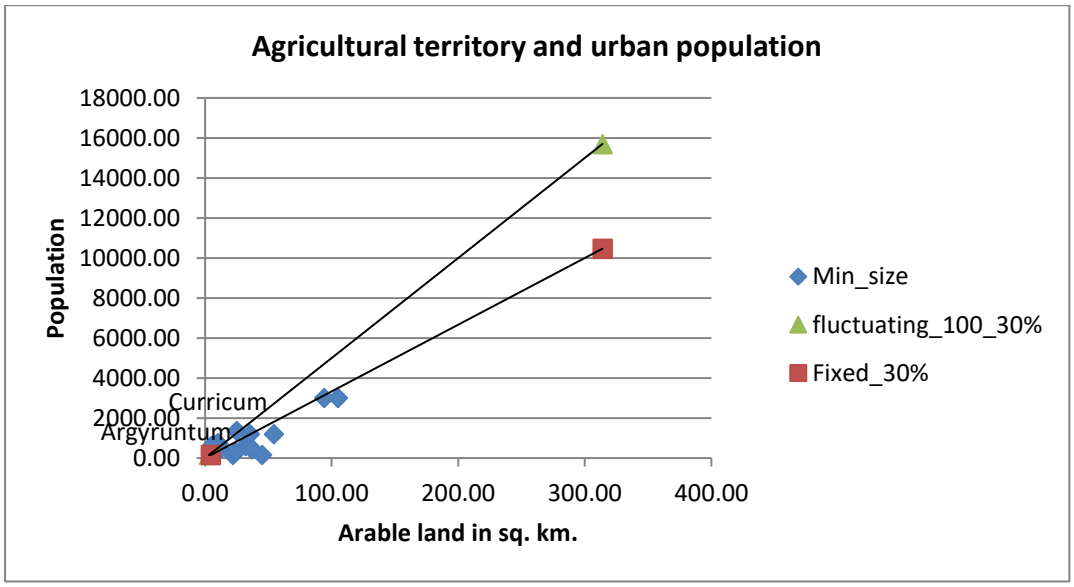

Figure V_9: Minimum population figures and estimates of arable land for the 10-km catchment radius

It is notable that even though the gains in agricultural land introduced with the extended catchment radius are not particularly impressive, they are sufficient to sustain the urban population even at a fixed urbanization rate of 30%. The only two settlements that exceed the agricultural potential of their enlarged hinterlands were Fulfinum and Curricum, *municipia* that occupied a small island in the Kvarner bay. Both towns exceeded their agricultural hinterlands by relatively small margins and minor adjustments in the size of the arable hinterland or the population density could shift them below the trend-line for the minimum land to population ratio. Moreover, these were maritime communities that could compensate for the grain deficiencies of their hinterlands by extracting marine resources or cultivating cash-crops. Here, as along the rest of the Adriatic coast, it would be wrong to evaluate the agricultural potential by the standards used for the settlements in the interior of the Balkan Peninsula.

In the preceding chapter, we came to the conclusion that the areas around the northern Adriatic were a segment of a much larger settlement network, whose centre was located outside the limits of our study-area. None of the Italian settlements included in this study is a true outlier in respect to the agricultural productivity of its hinterland. Almost all of these towns could in theory have secured their subsistence from their own hinterlands. When the size of the town outstripped the agricultural potential of the immediate surroundings, the gap was always fairly small and the deficit could easily be the result of inaccurate estimates of the two parameters.

It is useful to repeat the difference between the Roman colonies in western Istria and in the Upper Sava Valley and the small port towns and *oppida* on Kvarner Bay. The micro-locations of the former not only guaranteed that they could be sustained by the local resources, they also left some room for surplus production. Amphora studies have demonstrated that much of the oil and possibly wine on the Middle Danube *Limes* was produced on the Istrian Peninsula during the first century AD.[589] These towns were envisioned as autonomous entities in control of larger territories from the moment of their foundation. In contrast to this, the port-towns and *oppida* had an extremely limited agrarian base. Although small by any standard, they were forced to push the limits of the agricultural productivity of their hinterlands. This ties in with the archaeological evidence of heavy investments in the countryside, farms and villa constructions, the building of terraces and port facilities.[590] In any event, the productivity of these small settlement niches should not be written off easily. The sheer fact that they gave rise to so many little towns that were able to sustain themselves for at least a couple of centuries is telling in itself. Were life in this zone truly as precarious as our numbers suggest, a lower urban density could justly be expected. Despite their small size, many of these settlements had a proper urban fabric: city walls, temples and aqueducts. This is difficult to reconcile with an overstretched agricultural productivity. It all leads to the conclusion that the maritime zone gave rise to a specific type of urbanism, manifested in the small port-town or *oppidum*. These were truly maritime settlements, owning very little arable land in the interior, and land there was mostly suitable to the cultivation of fruits, olives and vines.[591]

The high density of *villae* in the coastal zone, the limited agricultural potential and the small inter-city distances left very little scope for the emergence of secondary agglomerations in the urban territories.

[589] Kelemen 1987, 3-47; Kelemen 1988, 111-150; Kelemen 1990, 147-193; Tassaux 2011, 431-440.
[590] Matijašić 1982, 53-64; Ilakovac 1997-1998, 69-82; Schrunk, Begović 2000, 252-276.
[591] At the time of the Austro-Hungarian Empire, the grain for this region came from the Pannonian Plain, Louis 1924, 15.

If we exclude the possible residences of the tenant farmers attached to the larger villa complexes – not yet confirmed archaeologically - there are hardly any sites in the Liburnian or the Istrian countryside that can be qualified as nucleated rural settlements. Even the more distant parts of the urban hinterlands were exploited through villa-complexes rather than through dependent rural settlements. This strategy seems to have been well-adapted to the poor agricultural potential in the area, as it would have reduced the number of permanent residents in the countryside and the trouble of taxing these communities. It also implies a fairly high rate of urbanization in the urban hinterlands along the Adriatic coast and a strong agricultural focus of the urban communities.

Pannonia Superior

In the regions drained by the Danube, the geographical realities change dramatically from those witnessed on the other side of the Dinaric Alps. Certain parts of Pannonia Superior still comprise hilly to mountainous land, especially in the southwest. These are, however, relatively low and lush outshoots of the Julian Alps that bear little comparison to the precipitous, barren ridges of the Dinaric or Albanian Alps. The principal hallmarks of the Pannonian landscape are the large rivers, the Sava, Drava, Mura, Raba and Danube. They all flow through low, wide fluvial plains. Their valleys are separated by chains of rolling hills or low mountain ranges that do not represent major obstacles to communication nor do they cover a very extensive area (Map V_6).[592] In order to acknowledge the changed geographical reality in the Pannonian provinces, the market radius was extended to 15 km. This adjustment might have resulted in the overestimates of a handful of catchments, mostly in the southwestern corner of the province.

Far more detrimental to the agricultural potential of Pannonia Superior are the marshy areas that occupy wide belts along the river-banks.[593] As a result of the large reclamation projects of the last century, this problem was all but eliminated and large segments of the flood-zone were either occupied or brought under the plough. Hence, the modern plough-zone is not the most accurate source on which to base the estimate of the amount of arable land in the past. As explained in the Introduction, it will require a tremendous amount of time and energy to compile a rough hydrographical sketch for these areas, and what is finally produced will show situation relevant only to the Early Modern or Late Medieval periods. An additional limiting factor was the close spacing of the garrison towns and *vici* on the frontier, separated by distances shorter than 20 km along certain sections of the *limes*.

According to an early twentieth century agricultural survey of the area, Pannonia Superior is divided into two major parts.[594] The region to the north of the Mura, roughly corresponding to the Hungarian part of the province, is one of the most fertile regions in the entire Middle Danube Basin. Judging by the estimates, this land was able to produce over 1,500 kg of wheat per hectare and it created most of the surplus in the Austro-Hungarian monarchy. Surprisingly enough, the southern half of the province, belonging to modern-day Croatia and northern Bosnia, had a considerable grain deficit in

[592] The Naval Intelligence Division 1944, Figure 3, 32-35.
[593] The Naval Intelligence Division 1944, Figure 20, 34.
[594] Louis 1924, Figure 3, Table 11.

the decade prior to World War I. In comparison to the northern part of the province, a relatively large proportion of the south was covered by hills and low mountains that were probably left out of the plough-zone. In addition, wide strips of land along the Sava and Drava were marshy. Nevertheless, it is difficult to accept that these valleys were grain-importing regions. The tables clearly show that the problem of this country was not the fertility of the land, but the unusually high annual ratio of grain consumption, three times higher than in some of the neighbouring regions.[595]

Finally, while it is true that the heavy Pannonian soils are much more fertile than the thin soils in the western and southern parts of the peninsula, this difference only really manifested itself with the advance of modern agricultural techniques and mechanized agriculture. It is unclear whether the farmers at the time of the High Empire could have made full use of the potential fertility of these soils.[596] Understandably, this does not diminish the prime agricultural character of the Pannonian provinces, attested both by the archaeological and written evidence.

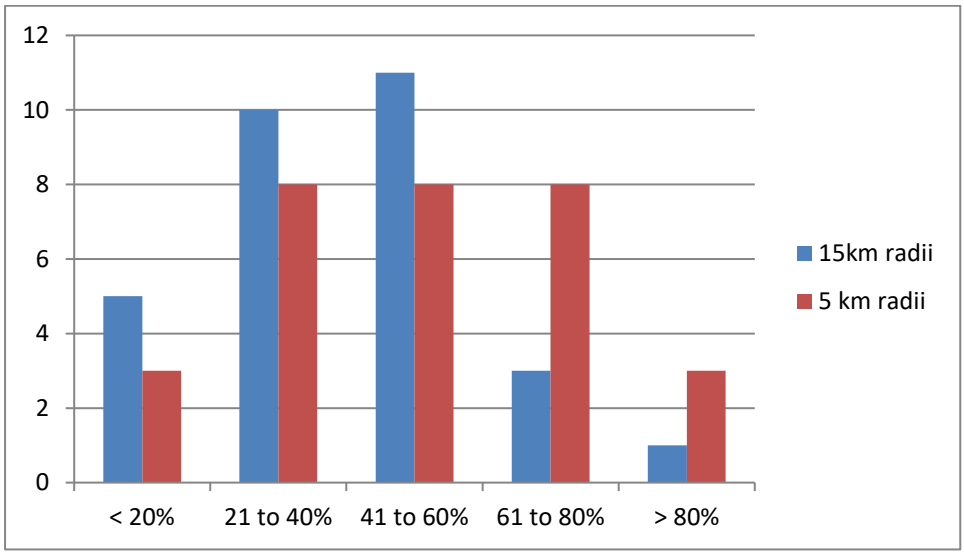

Figure V_10: Distribution of the settlements across percentage ranges for arable land within the 15- and 5-km catchment radii

In the western Balkan provinces, the extended catchment radius often brought only slight enlargement of the agricultural territories and, consequently, the percentage of arable land in the hinterland declined. The case of Pannonia Superior demonstrates that perhaps this was a general trend, unrelated to the character of the regional geography. Only a couple of Pannonian settlements increase the percentage of arable land in their hinterland, one of which was a site associated with ore-processing.[597] One possible reason for the prevalently negative effect of the increased catchment radius is the distribution of the auxiliary *vici*, often spaced at intervals of 17-18 km. However, the market catchments led to diminished agricultural territories even in the case of the autonomous

[595] Louis 1924, Table 11. In general, the variations between the consumption rates in the different regions of the Austro-Hungarian Kingdom are striking *cf*. Table 11 and 126. The data are drawn from official government documents. The agricultural potential of the area looks much better on the maps produced by the British Admiralty a couple of decades later: The Naval Intelligence Division 1944b, Maps 17, 18.
[596] The fertility of the *chernozems* in Pannonia is contrasted with the thin soils in the western part of the peninsula in The Naval Intelligence Division 1944b, 75.
[597] Basler 1977, 121-216.

towns located in the interior of the province. Their example highlights the importance of the agricultural factor in the siting of the Pannonian settlements. Even in the favourable context of Pannonian geography, not every location was equally optimal.

In absolute numbers, the gains of new arable land with the extended catchment radius are hard to downplay. Only three settlements – two of which were auxiliary *vici* on the Danube frontier – gain less than 50 square kilometres of cultivable surface. In contrast, recall that in the western Balkan provinces, only three or four settlements were lucky enough to increase their agricultural territory by an equivalent margin. With the far better soils at their disposal, the great majority of the Pannonian settlements doubled their arable potential and many tripled it.

As in most of the provinces studied so far, there are only vague correlations between the settlement's status and the size of the agricultural territories. The relatively homogenous relief has also minimized the possible differences that might have arisen from the contrasting geographical conditions, although the towns in the mountainous south feature lower percentages of arable land than the settlements located to the north of the Drava. The chief point of difference in the Pannonian settlements was their proximity to the political and administrative frontiers. In the interior, most of the towns have market catchments that are over 60% arable, while on the Danube *Limes* the arable percentage drops to 40%. Because there were only a few garrison settlements in the interior of Pannonia Superior, this difference coincides with the divide between the civilian and garrison settlements. With the exception of those garrison towns that became honorary colonies, all of the *coloniae* had over 40% of arable land in their hinterlands. They were joined by some of the *municipia* and garrison towns in the interior of the province.

The district urbanization rates in Pannonia Superior are visibly lower than in the provinces discussed in the preceding sections (Table V_4 in Appendix 2). Obviously, this is to a large extent dictated by the greater catchment radius ascribed to the Pannonian settlements. Pannonia Superior belonged to the belt of newly founded towns and settlements and its urban tradition tallies closely with the standards in the northwestern provinces of the Empire. Even in the high estimates the average urbanization rate in the urban territories barely reaches an average of 16%. In the less likely minimum size-estimates it drops to less than 10%. This is another indication of the agricultural potential of the urban territories in Pannonia. Even though the Pannonian towns were much larger than their Dalmatian or Macedonian counterparts, the weight of this factor is completely overridden by the large size of the agricultural territories. The latter imply very high total populations for the urban territories, depressing the minimum urbanization rates.

The patterns observed in the other provinces are repeated in Pannonia Superior. Minimum urbanization rates lower than 10% appear consistently among the third-tier settlements, both *vici* and small, autonomous towns. The urbanization rates in the territories of the larger autonomous towns were more variable, but in general they are higher than 30%. The only exception is the colony of Savaria, in which the projected urbanization rates are only slightly higher than 10%, mostly because of the great fertility of the land. Predictably, only in the case of the largest legionary towns and Poetovio is the urban to rural ratio close to or greater than one. The unusually large size of these agglomerations signals that these developments were not rooted entirely in the local conditions.

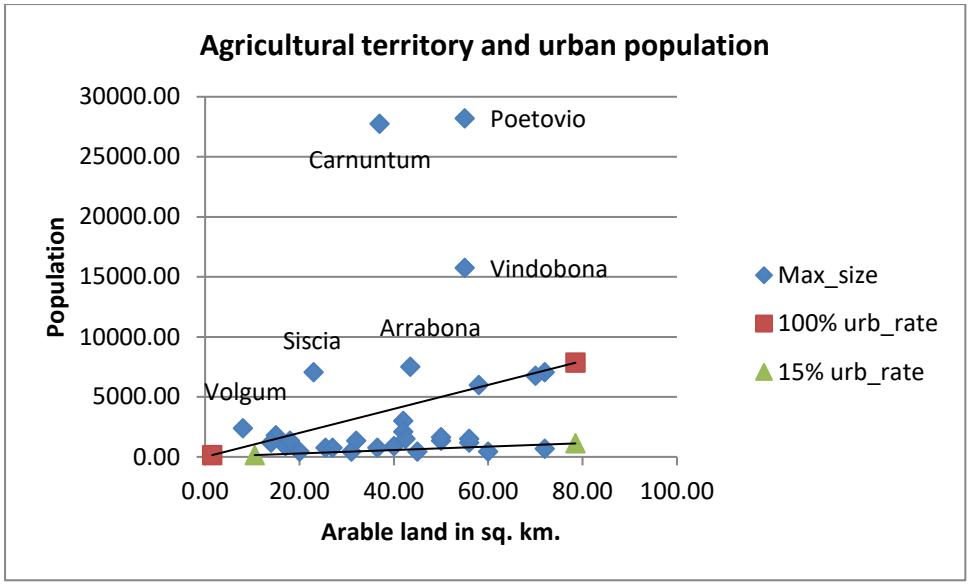

Figure V_11: Maximum population figures and estimates of arable land for the 5-km catchment radius

Certainly, the most obvious testimony to the fertility of this province is the fact that the great majority of the settlements, including over half of the autonomous towns, were sustainable by the agrarian resources available within the 5-km catchment radius. This has no connection to the nature of the urban economies in Pannonia Superior. Although considerably smaller than their Pannonian counterparts, most of the colonies and *municipia* in the western Balkan provinces outgrew the local agrarian potential. In view of the agricultural potential of the urban hinterlands, the latter settlements were the larger. The implication is that factors of a different nature set the limits of growth to the Pannonian towns.

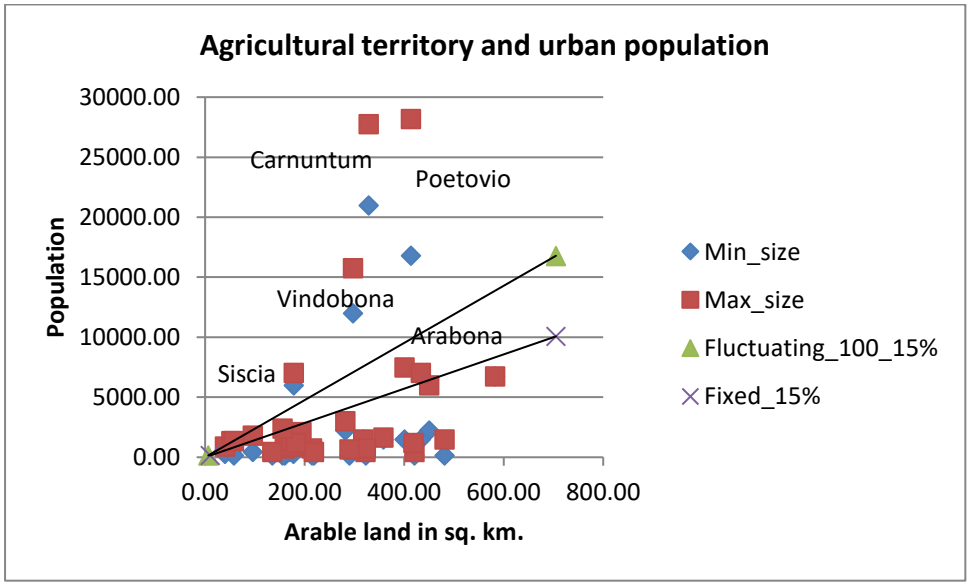

Figure V_12: Maximum and minimum population figures and estimates of arable land for the 15-km catchment radius

Regardless of the values assigned to the parameters correlated in Figure V_12, the three largest agglomerations in the province remain high above the trend-line, with deficits ranging from 207

square kilometres in the case of Vindobona, in the minimum size-estimate, to over 800 square kilometres for Carnuntum at its largest. It is certain that these settlements, all three official towns, were in control of territories much larger than the 705 square kilometres enclosed by the market catchment. Nevertheless, in some cases the deficit is worryingly high and one wonders if the problem was overcome by the large administrative territories. Even so, in all probability the large expanses of fertile land in combination with a moderately dense rural population would have alleviated the land deficit in the territories of these towns.[598]

Other possibilities are also worth considering. Most scholars agree that, during the period of the High Empire the grain supply of the army was in the hands of the central government.[599] We have estimated the agricultural potential in the surroundings of the auxiliary *vici* only to explore the possible locational preferences for these sites. Obviously, the garrisoned units were not entirely reliant on local resources. Accepting this fact, we shall have to lower the population estimates for the garrison towns, by subtracting the number of garrisoned soldiers. Exact data are unavailable, but it is safe to assume that the military personnel in the legionary towns would have been in the region of 6,000, including the auxiliary units that accompanied the legions.[600] The results are mixed. At Vindobona, subtracting the number of soldiers from the total population estimate removes the subsistence problem but, at Carnuntum, the deficit is only reduced to 300 square kilometres in the minimum, and over 580 square kilometres in the maximum population estimate. Understandably, these considerations have absolutely no effect on Poetovio that was a civilian town.

One final possibility that needs to be considered is that the *canabae* had a sparser settlement structure, entailing lower population densities. The long-standing research on the *canabae* in Carnuntum has brought to light a loosely planned agglomeration, with houses separated by spacious cultivated plots or working space.[601] Deducting the size of the legionary contingent from the total population of the legionary camp and *canabae* and assuming a population density of 100 to the hectare in the *canabae* will nearly halve the grain demand of Carnuntum. However, even this adjustment will only reduce, but not eliminate the problem of sustaining the largest town in our study-area. It should also be pointed out that the low density of housing units was characteristic of the earliest phase of the *canabae*. By the Severan period, the settlement area appears to have been packed with buildings.[602]

The non-agricultural sector almost certainly had an important share in the economies of all three towns. Its participation is obvious in the case of the garrison towns. The large communities of professional, full-time soldiers – equal in size to the population of the major civilian towns – represented a big and attractive market. Their presence certainly would have drawn a large number of entrepreneurs, craftsmen and retailers who, taken in conjunction with the families and partners of the serving soldiers, would have constituted the back-bone of the legionary towns.[603] This segment of the legionary town, usually identified with the *canabae* would have certainly purchased its grain at

[598] For the prominence of the villa landscape in the territory of Carnuntum, see Kandler, Humer, Zabehlicky 2004, 11-66; Ployer 2009, 1437-1446.
[599] Garnsey, Gallant, Rathbone 1984, 30-44; Erdkamp ed. 2002; although allowing for the involvement of private entrepreneurs in the transport of goods intended for the army.
[600] Doneus, Gugl, Doneus 2013; Kronberger, Mosser 2002, 573-584.
[601] Kandler, Zabehlicky 1986, 341-349; Kandler 2008, 90-108.
[602] Doneus, Gugl, Doneus 2013, Figure 87.
[603] Vittinghoff 1971, 299-324; Mócsy 1974, 139-147.

the market. The *canabae* were located on military land that was of very limited extent.[604] They measured roughly about 10-15 square kilometres and were strictly reserved for military use. The agricultural base of this community was located elsewhere in the province and, by the second century, in the territory of the *municipia* that developed next to the legionary camp. As the legionary towns were consumers not great producers, it is unlikely that their grain supply would have had to have come from more distant sources.[605]

Consequently, Poetovio was the only Pannonian town that partly had to rely on large-scale production for the regional market to cover a portion of its grain demand.[606] Evidence of manufacturing has been found, but little can be said about the scale of these activities. A few established facts deserve a brief mention. The rescue excavations on the eastern periphery of the ancient town have revealed an extensive potters' quarter, unparallelled in any other Pannonian town.[607] In contrast to the military towns and *vici* on the Danube, in Poetovio the imports from the large pottery workshops in Gaul and Germania were already in decline by the middle of the second century and had been replaced by locally produced ware. Pottery was not the only product of this town. There is evidence for the large-scale production of bronze, glass and carved bone. Poetovio is also known from the historical sources to have been an important textile producer.[608] Furthermore, it is impossible to overlook the importance of the Poetovian marble quarries. Alongside Noricum, Poetovio was one of the main suppliers of Alpine dolomites to the Pannonian towns.[609] More importantly, in the next chapter, we shall see that Poetovio, like most other Roman colonies, had a large administrative territory. It extended over an area of at least 2,000 square kilometres, most of it in the fertile valleys of the Mura and Drava. Even if future research proves that the scale of non-agricultural production in Poetovio was too small to meet the regional demand, the town could have relied on its vast territority to secure its grain supply.

Despite the high fertility of the land, the urban density in Pannonia was much lower than in Dalmatia or Macedonia. As in all provinces in our study-area, the agrarian potential did not necessarily lead to urban growth. Much of the land in the Sava, Drava and Raba Valleys remained under-urbanized throughout the period of the High Empire. Nor should the possibility that we have tended to overestimate the agrarian potential of these regions be ignored but, in the next chapter, we shall weigh up the fact that these gaps were caused by political and demographic rather than by environmental constraints. The possibility that some of the increased grain demand in the frontier communities was met from these areas should also be taken into account.

Agricultural considerations obviously ranked high in the period of town-foundation in this province, although other factors – primarily connectivity – also played a role. The physical geography of the province would have allowed for a great deal of flexibility in the siting of settlements. Even if the town was not placed in an optimal location in relation to its agricultural resources, there would have still

[604] Piso 1991, 131-169.
[605] Carnuntum: Kandler, Humer, Zabehlicky 2004, 11-66; Doneus, Gugl, Doneus 2013, 167-172.
[606] Siscia too stands above the trend-line for the minimum land-to-population ratio and, despite the relatively small deficit and imprecise nature of the estimates of the agrarian potential, it is worth mentioning the fact that Siscia was the principle base for the exploitation of the Pannonian iron mines, Lolić 2003, 131-152. Radman-Livaja 2007, 153-172, has discussed the epigraphic evidence of textile manufacture.
[607] Horvat *et a*l. 2003, 153-189.
[608] Horvat *et al*. 2003, 181.
[609] Djurić, Müller 2009, 1-17.

been plenty of arable land in its immediate surroundings. The majority of the large Pannonian towns were located on river-banks, although these could potentially be marshy areas. Evidently connectivity and, also possibly the natural defensive possibilities of the locations, were deemed equally important and, thanks to the agricultural riches of the broader region, these communities could afford to use a proportion of their hinterland for non-agricultural purposes. These factors effectively thwart all attempts to gauge the economic profile of the settlements simply by looking at the agricultural potential in their immediate surroundings.

Pannonia does not run counter to the pattern observed in the provinces in the western part of the peninsula. Only the largest towns would not have been able to produce the required amount of grain in the theoretical hinterlands defined by the 15-km radius. In Pannonia Superior, this deficiency was compensated for either by a broadening of the local economic base, that went hand in hand with large administrative territories and land purchases in neighbouring territories - the case of Poetovio, parallelled by Salona and Dyrrhachium in Dalmatia and Macedonia - or by the special subsidies from the central government, as in the case of the garrison towns of Carnuntum and Vindobona.

Pannonia Inferior

The ruggedness of the relief was even less of a problem in Pannonia Inferior. Only a marginal segment of the provincial territory is comprised of hilly terrain (Map V_6). However, the geomorphology of the area has determined that sizeable areas to the south of Lake Balaton and along the rivers were waterlogged and ill-suited to agricultural exploitation. As explained in the preceding paragraphs, we are not in a position to arrive at even a rough estimate of the marshy areas in Antiquity. All available sources relate to the Early Modern period, by which time the hydrological situation in the region had probably undergone significant changes.[610] According to the written sources, there were marshes in the area in Antiquity, but there are no means to approximate their extents. We have tried to take this negative factor into account by deducting the areas drained by modern canals from the total arable area enclosed by the theoretical catchment radii.

At the beginning of the twentieth century, Pannonia Inferior belonged to the same high-fertility zone as the neighbouring Pannonian province.[611] Alongside Vojvodina, the territories of the two former Roman provinces formed the agricultural core of the Austro-Hungarian Empire, compensating entirely for the low productivity of the Alpine regions in the western parts of the monarchy. There is some historical evidence that the Pannonian provinces assumed a similar grain-producing role during the fourth century AD, but the issue is still debated.[612] We were again surprised to discover that the southern part of the province, the Danube-Sava Interfluve, produced only a moderate surplus in the early twentieth century, insufficient to cover the grain deficits in the rest of modern Croatia. However, we remain convinced that the very high rate of consumption adopted by the survey cited rather than any deficiency in the agricultural productivity of the area caused this deficit.

[610] For the southern part of the province see The Naval Intelligence Division 1944, Figure 3, 32-35.
[611] Louis 1924, Figure 3, Table 11.
[612] Varady 1969; Lengyel, Radan eds. 1980, 61; Gabler 1991, 51-73.

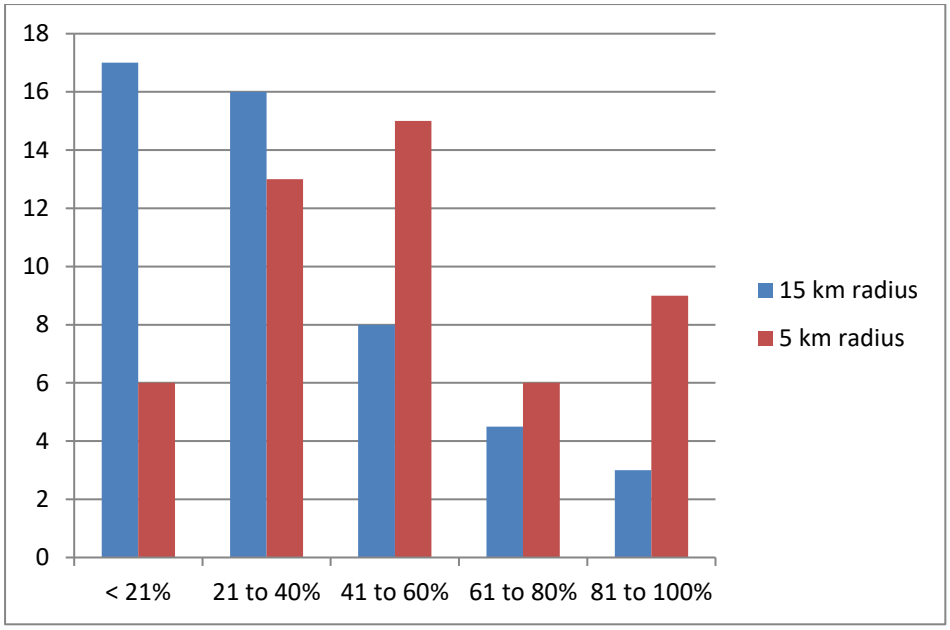

Figure V_13: Distribution of the settlements across percentage ranges for arable land within the 15- and 5-km catchment radii

In Chapter Three we saw that almost 80% of the Pannonian settlements were located on the Danube. The direct consequence of this siting was that a certain proportion of the immediate surroundings was waterlogged but, even more significantly, about half of the theoretical catchments of these settlements were located beyond the state frontiers. In view of the undulating relief in the interior of the province, one would have expected the extended catchment radius to have had a positive effect on the amount of arable land in the urban hinterlands. However, nothing would seem to be farther from the truth when one takes a closer look at the figures expressed in percentages. Quite the oposite, with the market radius, the number of towns whose hinterlands were less than 40% arable increases substantially, representing about two-thirds of all urban hinterlands. Nearly half of the settlements had catchments that were at least 50% arable in the 5-km catchment radius. This percentage drops to 16% when the catchment radius is extended to 15-km.

In Pannonia Inferior, as in the neighbouring Pannonian province, the negative effect of the extended catchment radius was predestined by the short distances between the frontier settlements. Because of the proximity of neighbouring settlements of equal rank, the hinterlands of the garrison settlements have radii smaller than 10 km. Nonetheless, as in Pannonia Superior and in contrast to the western Balkan provinces, in absolute terms the gains are far from insignificant. Over two-thirds of the settlements add more than 100 square kilometres of new arable land with the extended catchment radius. Accounting for the needs of the rural population in these areas, – even if estimated at three-quarters of the total population - this increase could have secured the livelihood of about 2,500 urban residents.

There are not any obvious correlations between the amount of arable land and the rank of the settlements. With a few exceptions, and mostly because of their position on the Danube frontier, the plough-zone in the hinterlands of most garrison settlements was made up of between 20 and 40% or 40 and 60%, depending on the catchment radius. This group includes the two honorary colonies of Aquincum and Brigetio. On the other hand, the autonomous civilian towns were located in the interior

of the province and at least 80% of their hinterlands are arable. As in some other provinces, despite their small size and subordinate status most of the secondary agglomerations also enjoyed a high agricultural potential. We have included this small group of settlements only to demonstrate that large segments of the Pannonian provinces remained under-urbanized, despite the fact that environmental conditions did not dictate this. For similar reasons, we have included a group of Late Roman foundations in this analysis. Notwithstanding the possibility that they might have grown out of smaller settlements and stations founded in the period of the High Empire, both Iovia and Tricciana enjoyed an excellent agricultural potential. They too show that large sections behind the eastern Pannonian *Limes* were not urbanized, despite the solid agricultural potential (Map V_7).

The minimum urbanization rates in the hinterlands of the Pannonian towns and settlements are kept low by the large market catchments and the favourable geographical conditions. Among the auxiliary and road-side *vici*, they are consistently lower than 20% with the maximum, dropping to less than 5% with the minimum size-estimates (Table V_5 in Appendix 2). The only exceptions are the auxiliary *vici* whose territory was limited by the Danube frontier or the close proximity of the neighbouring forts. The urbanization rates in the market catchments of the autonomous towns, most of which were located in the interior of the province, do not differ from those in the catchments of the auxiliary and road-side *vici*. Only in the hinterlands of the legionary agglomerations are the district rates higher than 50%. Because the settlements of Pannonia Inferior enjoyed access to less extensive agricultural territories – a precondition of their location on the Danube *Limes* and by the short spacing between the auxiliary *vici* – the average local urbanization rates are slightly higher than in Pannonia Superior, ranging between 10% for the minimum and 22% for the maximum size-estimates. Obviously, the relatively high average urbanization rates for the urban territories are hardly representative of the distribution of the population in Pannonia Inferior. They have been pushed upwards by the high urbanization rates in the territories of the auxiliary *vici* that occupy the corners of the provincial territory or the thickly defended sections of the *limes*. Lowering the population density in the settlements to 120 persons per hectare – unlikely in view of the high density in the military forts – will sink the local rates by 5%.

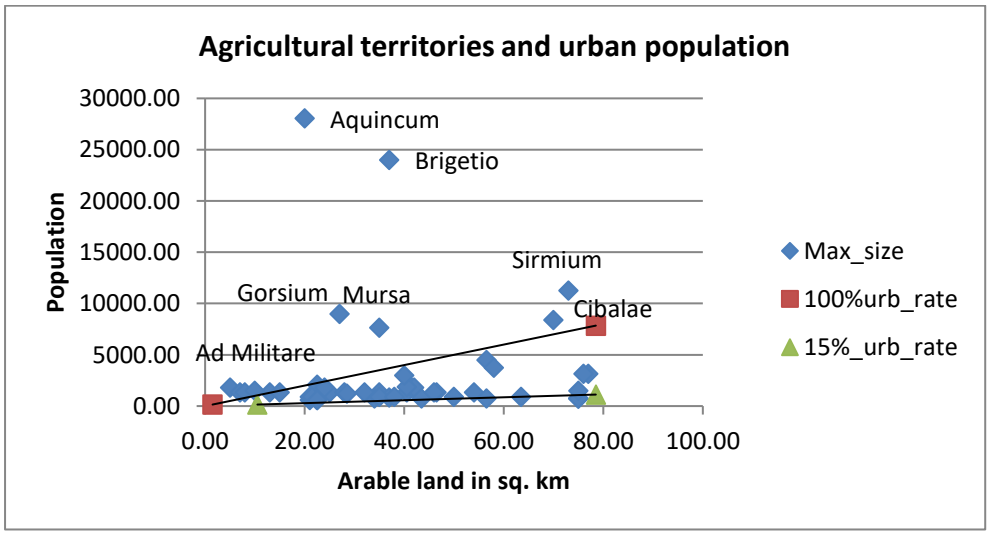

Figure V_14: Maximum population figures and estimates of the agricultural territory for the 5-km catchment radius

Only the largest towns in Pannonia Inferior exceeded the agricultural potential of their farming catchments. Most of these towns were too large for the land in their immediate catchments, even if they were 100% arable. The cluster of settlements in the lower left corner of the graph that are placed on the trend-line for the minimum land-to-population ratio are obscure auxiliary *vici* that occupied marginal locations on the Danube frontier. The remaining Pannonian settlements, even at their largest, are situated below the sustainability threshold. As in the case of Pannonia Superior, this is a corollary of the high fertility of the province. Most of the settlements in question were auxiliary *vici*, whose siting was not determined by agricultural considerations.

Taking a constant urbanization rate of about 15%, the picture is entirely reversed and almost none of the Pannonian settlements are fully self-sustainable. This is in itself a possible indicator that urbanization rates could have been much higher in the immediate surroundings of the central place. In order to have all third-tier settlements placed below the trend-line – a likely assumption bearing in mind that these settlements could rarely rely on resources located beyond their farming catchments -, the district rates must be increased to at least 50%.

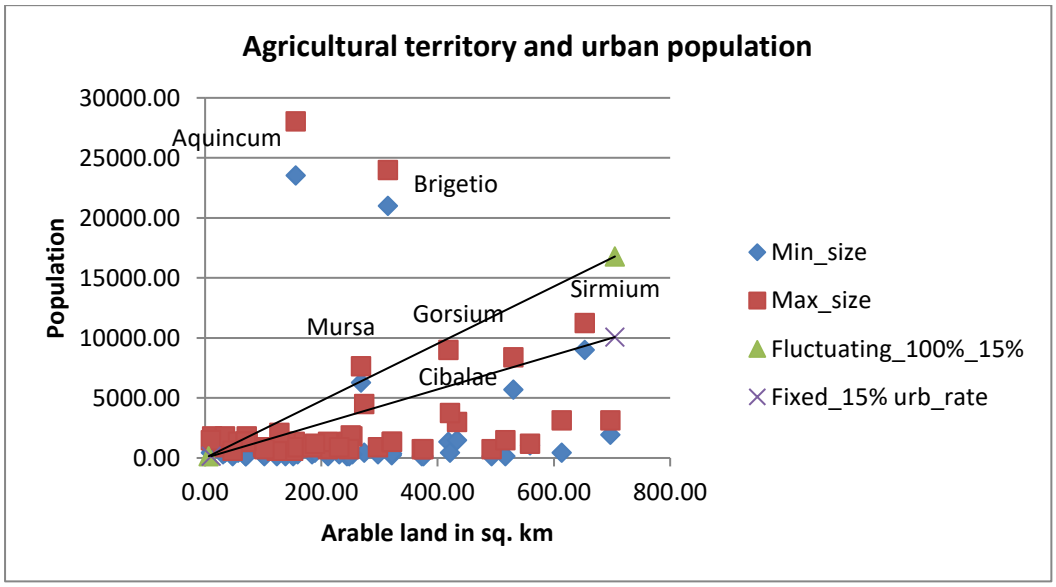

Figure V_15: Maximum and minimum population figures and estimates of arable land for the 15- km catchment radius

Taking the extended catchment radii and minimum population estimates, all but the two largest Pannonian towns become self-sustainable. Even with the maximum population estimates, most of the civilian towns, with a few exceptions, could have satisfied the bulk of their grain consumption from the arable land available within the 15-km radii, regardless of the projected size of the rural population. A few of the second-tier settlements – Cibalae, Sirmium - came close to reaching the ceiling of their agricultural productivity, but the maximum estimates for both towns refer to their extent in the Late Roman period. It is likely that alongside Mursa, Cibalae and Sirmium were involved in non-agricultural economc pursuits on a significant scale, but the evidence is too scant.[613] In the case

[613] Cibalae was obviously involved in pottery production, but the true scale of this manufacture is difficult to assess, Iskra-Janošić 2004, 189; Iskra-Janošić 1996, 141-149; for imperial kilns in Mursa see, Pinterović 1978; the archaeological evidence is meagre, Filipović 2004, 157-168. There is no evidence of other, more profitable industries.

of Sirmium, the epigraphic record attests the involvement of its elite in the silver-mining district along the Drina.[614] Primarily on account of its geostrategic importance, Sirmium became one of the capitals of the Empire under the Tetrarchy. Subsequently, the town underwent considerable changes in its urban fabric to accommodate the exigencies of the Imperial court and the great influx of administrative personnel and its urban area was enlarged.[615] Finally, all three settlements were autonomous towns and their administrative territories were much larger than the area enclosed by the extended catchment radius. The small land deficits for these towns could have easily been compensated for by the arable land available in their administrative territories.

Only the two legionary agglomerations were so much larger than their arable hinterlands that neither the conservative size-estimates nor the increased catchment radius could compensate for the huge gap between these two parameters. The land-shortages climb to 567 and to over 830 square kilometres, with the minimum size-estimates and to as much as 1000 square kilometres for Aquincum at its largest. We can only repeat the explanations that have been offered for the largest towns of Pannonia Superior. A considerable proportion of the population of Brigetio and Aquincum – between one-quarter and one-third – consisted of professional soldiers.[616] This segment of the population was not involved in agricultural production nor was it entirely dependent on the local agricultural produce. Discounting the military component will substantially alleviate the problem of feeding these towns although, as in the case of the legionary towns in Pannonia Superior, large and fertile administrative territories will have to be reckoned with.

If we are to understand the mechanisms by which towns the size of Aquincum coped with the high grain demands, it is crucial to look at the settlement patterns in the countryside. Unfortunately, the published data are far from ideal, the bulk of them are based on orientational surveys and accidental discoveries (Map V_8).[617] The lack of systematic research in the countryside and the fact that much of Aquincum's hinterland has been swallowed up by modern Budapest preclude even the most rudimentary quantitative analysis. However, regardless of all the deficiencies that might arise, Map V_8 shows a slightly higher concentration of *villae* within the 5-km radius of the provincial capital. At least four *villae* have been identified in this central zone of the town's hinterland and another two lie just outside the 5-km catchment radius. Together, they make up almost one-half of the *villae* discovered on the assumed administrative territory of the colony. The rest of the *villae* attributed to Aquincum are located at the edge of or beyond the market catchment. They are clustered along the major roads that led to the northern Pannonian frontier, at distances of about 15 to 20 km from the town. This pattern is vaguely repeated in the territories of Carnuntum and Scarbantia in Pannonia Superior. Clusters of *villae* appear beyond the 5-km radius and, in these cases, again it is difficult to observe an increased frequency of the construction of *villae* within the shorter catchment radius (Map V_9).[618] If these data are at least partly correct, they could imply relatively high urbanization rates on the administrative territories of these towns. As in most of the urban hinterlands, larger nucleated settlements are rare or absent in the catchment areas defined by the market radius.

[614] Bojanovski 1981, 148-149; Škegro 2006, 161-162.
[615] Mirković 1971, 5-90.
[616] Márity 1992, 65-73.
[617] Fitz 1971, 47-57; Németh 1997, 47-55; Zsidi 2003, 209-230.
[618] Gabler 1973, 139-176; Kandler, Humer, Zabehlicky 2004, 24-26.

The predominance of *villae* does not necessarily exclude the presence of nucleated settlements. Indeed, the putative territory of Aquincum features a fairly high number of small rural agglomerations. However, with a few exceptions, most of these *vici* are located outside the core area of the urban catchment.[619]Although the significance of this fact can only be surmised, it is not easily written off. It is difficult to point out any possible research biases that could have caused this distribution. The absence of nucleated settlements is parallelled in a number of urban hinterlands and it would appear to support the hypothesis of a high urbanization rate in the towns' immediate surroundings. However, more evidence is needed before we can embrace this postulation wholeheartedly. The predominance of *villae* primarily reflects the agrarian relations in the urban hinterlands. It is interesting to observe that, unlike the *vici* in some other provinces in this region, the names of the majority of the nucleated settlements in the territory of Aquincum have not survived in the epigraphic record. The fact that they are often associated with large *villae* might perhaps indicate their genesis and role in the agricultural economy of the area. Even in the distant hinterland of the town, much of the rural population would have made their living as tenant farmers on the large estates of the rich urban dwellers.

The towns of Pannonia Inferior occupied micro-locations that offered access to agriculturally rich territories. Although on average larger than the towns of Roman Macedonia or Dalmatia, fewer of the Pannonian towns came close to reaching the limits of the grain-producing capacities of their theoretical hinterlands. It is symptomatic that in nearly all of these cases, the size-estimates refer to Late Antiquity. Notwithstanding the importance of the non-agrarian sector in these towns, it could be argued that agricultural considerations and connectivity ranked high in the siting of all civilian settlements in Pannonia Inferior. However, these conditions were not decisive in the urban developments in the area. Most of the urban growth was limited to the frontier zone, fuelled by the generous financial support of the central government. Only when the Danube *Limes* began to falter in the fourth century AD was this pattern abandoned and new centres emerged in what had previously been "vacant" areas in the Pannonian interior. At this time, the civilian towns in the south of the province reached their apogee, possible straining the resources available in their immediate hinterlands. The large agglomerations on the Danube *Limes* continued to exist as long as the central government was in a position to send grain and silver to the army and invest in construction. Once this supply-line was cut, even the largest towns on the *limes* experienced a considerable reduction in size and, with the advance of the Barbarian tribes, were either completely abandoned or lost their urban character.[620]

Moesia Superior

In contrast to the Pannonian provinces, the geography of Moesia Superior is much more varied.[621] A significant portion – up to 80% - of its territory is composed of hills and mountains (Map V_10). Although the amount of cultivable land in these areas is limited, it is rich in pastures and, more importantly, in precious metals.[622] Despite the extent of the hilly zone, this province cannot be compared to the truly mountainous geography of Dalmatia. The Moesian Mountains are less rugged than the Dinaric or Albanian Alps and they are dissected by large and fertile river valleys. These offer

[619] Fitz 1971, 50; Nagy 1971, 59-81; Zsidi 1997, 225-227.
[620] Mócsy 1974, 308-319.
[621] Mladenović 2012.
[622] The Naval Intelligence Division 1920b, 12-19; The Naval Intelligence Division 1944, 89-107.

large amounts of fertile land, especially the Morava and its tributaries.[623] In the northwest of the province, in the interfluve between the Morava and the Kolubara, the Pannonian landscapes return. In this region, with the exception of Mount Kosmaj, almost 100% of the land is arable. The peripheral parts of the province fall outside the drainage system of the Morava, but these are equally fertile regions: the Metohija Plain, the Skopje Basin and the Timok Valley in its lower half. A small segment of the Danube Valley on the other side of the Iron Gates and Mount Haemus also formed part of Moesia Superior.[624] However, because over half of the settlements included in this analysis were located in the rugged portions of the province – a fact which is telling in itself – the market radius has been set at 10 kilometres.

The agricultural surveys characterize Moesia Superior as a surplus-producing region during the first couple of decades of the last century.[625] This document refers to the agricultural productivity of the kingdom of Serbia, a polity that inherited most of the territory of Moesia Superior, but it also covered considerable mountainous stretches that in antiquity formed parts of Macedonia and Dalmatia. It is therefore likely that agricultural productivity was even higher in the section of the kingdom that was once a part of Moesia Superior. Admittedly, an unknown proportion of the fertile northwestern quarter of the Serbian kingdom had belonged to Dalmatia or Pannonia in the past, but this historical fact does not challenge the overall positive image of the agricultural capacities of the Moesian valleys.

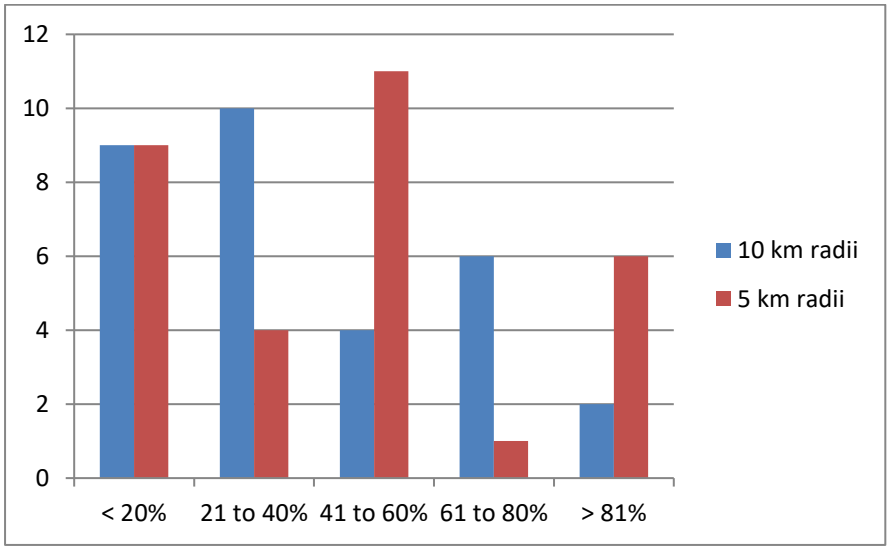

Figure V_16: Distribution of the settlements across percentage ranges for arable land within the 10- and 5-km catchment radii

In comparison to some other provinces, the enlarged theoretical hinterlands have a relatively positive effect on the percentage of arable land in Moesia Superior. Slightly over one-quarter of the settlements see an increase in the percentage of arable land taking the extended catchment radius. The increment is not always triffling. In fact, most of the towns and settlements increase their agricultural potential by over 10% with the market catchment. It should be remembered that in the majority of the provinces studied so far, even a slight increase in the percentage of arable land is an exception. The extended hinterlands also improved the agricultural potential of some of the coastal

[623] The Naval Intelligence Division 1944, 92-93, 99-100.
[624] The Naval Intelligence Division 1944b, Figure 17-18.
[625] Louis 1924.

towns in the western Balkan provinces, hinting at the possibility that other, non-agricultural factors were decisive in the siting of these settlements. In Moesia Superior, the majority are represented by the auxiliary *vici* and legionary towns, a category of settlements whose micro-locations were entirely determined by military and logistical rather than by agricultural considerations. In absolute numbers, the gains are much higher than in the western Balkan provinces. Only five or six settlements add less than 50 square kilometres of arable land when the catchment radius is extended to 10 kilometres.

No obvious patterns emerge when we attempt to correlate the different settlement categories with the agricultural potential in their theoretical hinterlands. Even among the handful of certainly attested autonomous towns, there are considerable differences. The percentage of arable land ranges from between 11 and 19% for the Dardanian *municipium*, to over 70% for Ulpiana or Naissus. In the case of the legionary towns of Singidunum and Viminacium, the agricultural territories drop to less than 35% of the market catchments. Rather unexpectedly, Trajan's colony, Ratiaria, had only about 20% of arable land in the 10-km catchment. Scupi, the first colony of Moesia Superior, had a far more favourable location and over 60% of its 10-km catchment was productive. The Roman colonies usually occupied locations that guaranteed fertile theoretical hinterlands and, in this respect, Ratiaria presents a special case.

Smaller agricultural territories seem to have been a feature of the garrison settlements. The agricultural territories of both the auxiliary *vici* and legionary towns rarely contain over 30% of their catchments. However, this is chiefly predetermined by their location on the Danube frontier rather than by their soci-economic fabric. Some of the most fertile hinterlands in the interior fall within the catchment radii of garrison settlements like Timacus Minus or Naissus. In this context, we can observe that, as in other sparsely urbanized provinces, the supposed locations of road-stations almost always enjoyed a very high percentage of cultivable land in their immediate vicinity. While they probably would have had to have shared this agricultural potential with an unknown number of similarly sized settlements, the fact remains that most of these micro-locations were never urbanized. Instead, urbanism took root in the narrow frontier zone and in some of the mining districts.

Taking the minimum size estimates, in over two-thirds of the Moesian hinterlands included in this study, the urbanization rates are lower than 10%. (Table V_6 in Appendix 2) The district rates could rise to 20% if we accept the maximum size-estimates, but for the majority of the settlements in question, these are not particularly reliable. The low urbanization rates were predetermined chiefly by the small size of most of these settlements. As in the rest of the study-area they were smaller than 15 ha and they were quite often located in the most fertile sections of the province. Most of them were not autonomous towns and the real number of similarly sized settlements in these areas can only be surmised. Whatever their size, we would not be far off if we were to say that, in at least three-quarters of the provincial territory, the population was distributed into small communities that could live comfortably off the agricultural resources found in their immediate surroundings. Excluding the legionary settlements that as elsewhere exceeded the agrarian capacities of their hinterlands, higher urbanization rates can only be observed among some of the autonomous towns and the auxiliary *vici* located in the Iron Gates on the Danube. They range between 20 and 60%. Only in the case of the mining *municipium Dardanorum* was the urban to rural ratio higher than one, even in the minimum size-estimate. With the exception of the legionary agglomerations, the medium to high urbanization rates were primarily a consequence of the low agricultural potential in the settlements' surroundings rather than of their size. It is mostly because of this circumstance that the average district rates were

relatively high. Almost 30% are implied by the maximum, 16% by the minimum size-estimates. We expect urbanization rates on the order of those projected for the Pannonian provinces – between 10 and 20% - were the market catchments extended to 15 km or the urban population density reduced to 120 per hectare.

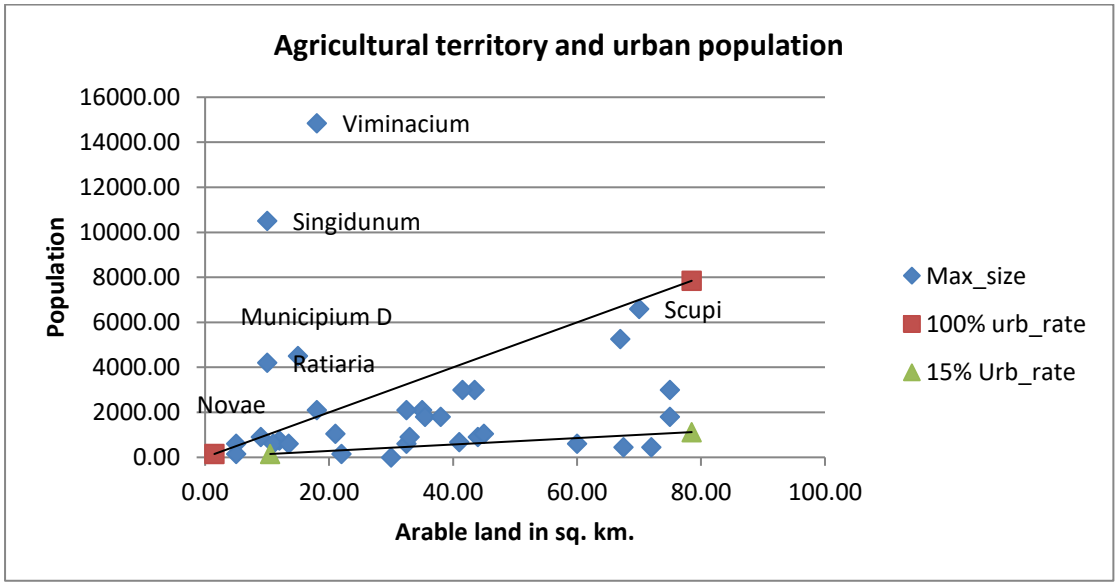

Figure V_17: Maximum population figures and estimates of arable land for the 5-km catchment radius

Despite the fact that their micro-locations were not always optimal in relation to the agricultural resources, the majority of the Moesian settlements were self-sustainable because of their small size. In this respect the situation in Moesia Superior was not different from that encountered in the Pannonian provinces. Only a handful of autonomous towns, including the two legionary agglomerations, were too large to function as simple agrarian communities. However, the principal assumption that underlies this distribution is that the entire produce of the farming catchment was reserved for the urban dwellers. As in the Pannonian provinces, postulating a rural population seven times the size of the urban population – which is the overall urbanization rate usually ascribed to the northwest provinces - only a few of the Moesian settlements would have been self-sustainable. In the case of Moesia Superior, 30 to 40% urbanization rate in the 5-km catchments is the bare minimum required to shift most subordinate settlements below the trend-line.

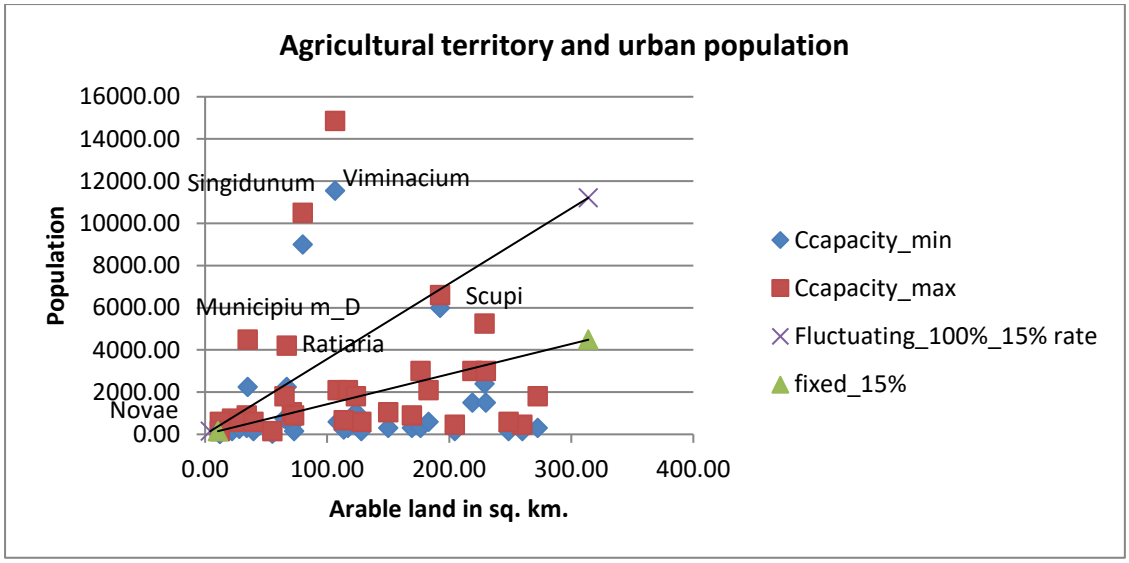

Figure V_18: Maximum and minimum population figures and estimates of arable land for the 10-km catchment radius

It is striking that the prospect of the oversized settlements in Figure V_17 is unchanged when the catchment radius is increased to 10 kilometres. The same group of settlements falls above the trend-line for the minimum land-to-population ratio and the land deficit is not reduced. The additions of new arable land are relatively modest in the case of Ratiaria and the *Municipium Dardanorum*, while the legionary towns are too large even for their market catchments. Nonetheless, the great majority of the settlements are shifted above the trend-line once the catchment radius is extended to 10 kilometres. Taking the low size-estimates and constant urbanization rate of 15%, over three-quarters of the Moesian settlements would have been self-sustainable with the extended hinterland.

Apart from the small group of autonomous towns, a few of the auxiliary *vici* in the Iron Gates are also unsustainable by the resources available within their market catchment. The principal role of the military outposts in the Danube Gorge was control of the river traffic.[626] These garrison settlements were not dependent on the local agricultural resources and, because of their small size and access to the Danube, their sustenance did not present a serious challenge for the provincial government.

The *municipium Dardanorum* was likewise a settlement with a highly specialized economy. In contrast to the Early Roman period, the hinterland of this town - the Upper Ibar Valley - is now occupied by small villages, each exploiting its own small niche (Map V_11). Despite the inadequacy of the data, we have suggested that similar patterns might be expected in the mining districts in Dalmatia and Pannonia. It is unclear what conditions gave rise to the emergence of a fairly large agglomeration in the Dardanian district. Even with the minimum size-estimate, the *Municipium Dardanorum* is slightly oversized for its hinterland.[627]

It is important to bear in mind that almost all the very large settlements in our study-area had direct access to harbours or river-ports. The *Municipium Dardanorum* is a land-locked settlement, located hundreds of kilometres from the nearest harbours. Provisioning this community over a period of at

[626] For conditions in the region of the Iron Gates see The Naval Intelligence Division 1944, 102-107.
[627] Archaeological remains: Čerškov 1970; economic profile and social composition: Dušanić 1971, 241-259; Dušanić 2004, 247-270.

least three centuries would have been prohibitively expensive for the provincial government, regardless of the profitability of the silver mines in its territory. One possibility that does spring to mind is that grain was shipped from the agriculturally rich areas in Kosovo Polje or the Skopje Basin. As we shall see in the next chapter, the epigraphic sources reveal the close involvement of the urban elites of both Scupi and Ulpiana in the *ordo* of the mining colony.[628]

Ratiaria is the other civilian town in Moesia Superior that exceeded the local agricultural resources. The margin is small and the sustenance problem occurs only with the maximum size-estimate that refers to the size of the town in Late Antiquity. The minimum size-estimate is the more accurate one in the case of Ratiaria.[629] It is nonetheless worth mentioning that, like Siscia or Sirmium, the involvement of the elite of this town in the mining district in the region is well attested epigraphically, while its river-port would have opened access to the agricultural produce of a territory much larger than the town's catchment. Like most of the autonomous towns in the Danube provinces, Ratiaria was in control of a very large territory that contained vast fertile areas between Mount Haemus and the Danube.

Only the largest two settlements in the province exceed the agricultural riches of their hinterlands by a greater margin. As in the rest of the frontier provinces, these are the two legionary settlements, both located on the 60-km-long section of the Danube *Limes* in Moesia Superior. These garrison towns are too large even for the amount of arable land found within the 10-km catchment radius. Because of the absence of double towns on this section of the Danube *Limes*, both Viminacium and Singidunum are considerably smaller than their Pannonian counterparts and consequently, the deficit is comparatively small. In the case of Viminacium, it amounts to over 300 square kilometres with the maximum population estimate, but this figure is reduced by one-third when the conservative size-estimates are taken into consideration. Depending on the population estimates, Singidunum fell short by 170 to 215 square kilometres of arable land.

The special conditions that applied to the remaining large frontier towns are also what sustained the extraordinary growth of Singidunum and Viminacium. Deducting the military personnel from the estimated population of these settlements, the grain deficit is greatly reduced in the case of Viminacium and all but disappears in the case of Singidunum. In the next chapter, we shall see that the administrative territories of these towns were relatively small, but fertile. The large stretches of arable land along the Rivers Mlava and Sava ensured the sustainability of both settlements.

In general terms, Moesia Superior is similar to the rest of the frontier provinces in its distribution of towns and settlements in relation to the agricultural resources. The great majority of the agglomerated settlements were of a size that allowed them to survive from the resources available locally, even though their micro-locations were not fully optimal from an agrarian perspective. To some extent, this circumstance masks the important variations in the siting of the different town categories. Nonetheless, economic specialization was reflected in the siting of the garrison settlements in the Danube Gorge and the *Municipium Dardanorum*. These communities were not dependent on local resources, but on governmental subsidies. The land deficits of the legionary towns were much greater, but these were unrelated to the economic orientation of these communities.

[628] Šašel 1992; cf. Dušanić 2004, 257; for parallel roles of Siscia and Sirmium in the Pannonian mining districts.
[629] Luka 2014, 50-64.

Agricultural considerations were not the principal factor that determined the location of settlements in Moesia Superior. This is evident from the spread of urbanism in this province, absent from large tracts of arable land in the Morava Valley and its tributaries. There were no major settlements with an urban character in these parts of the province. As in many other provinces, they were dominated by settlements of minor size and rank and, in some cases, they had been brought under military surveillance.

Moesia Inferior

In one of the preceding chapters, Moesia Inferior was compared to Pannonia Inferior on the grounds that both provinces were originally little more than narrow military zones along the Danube frontier.[630] The main factor that limited the agricultural productivity in both areas was the peripheral location of the majority of the settlements, exacerbated by their close spacing. Nevertheless, from the view point of the specifics of the relief, climate and soils, there are a number of important differences between these two frontier provinces. The geological substrate of the Moesian Tableland – limestone covered with loess deposits of variable depths – has preconditioned a fairly rugged relief.[631] The rivers that issue from Mount Haemus in the south flow through deep, narrow valleys that offer negligible amounts of arable land and present formidable barriers to those wishing to traverse the longitudinal axis of the province. However, there are important regional variations. In the interfluve between the Rivers Kibrica and Isker, water drains away quickly through the porous limestone, resulting in a steppe-like landscape that is thinly populated even in modern times (Map V_12). Whereas most of the river-valleys that cut across the Moesian Tableland are little more than narrow ravines, the Rosica Valley is far more open, probably offering the best agricultural land in the central parts of the province.[632] The southern part of the extended province covers hilly terrain, but because most of the Moesian settlements are located on the Danube, the market radius shall be increased to 15 kilometers.

With the exception of the area of the Danube Delta, the marshy areas are not as widespread as in the Pannonian provinces. The promissing hydrology of the area is attributable to the fact that, in its lower course, the right bank of the Danube is much higher than the opposite bank, in some cases rising to over 100 meters above the surface of the stream.[633]

It has proven impossible to find any hard data about the agricultural productivity of this part of modern Bulgaria in the early twentieth century. However, at the beginning of the last century, the country's prime export product was grain. The official data show that over 50% of the national grain production was cultivated in the northern half of Bulgaria, the region that roughly corresponds to Moesia Inferior.[634] The fertility of the region was also stressed in the *cursus honorum* of the Moesian governor Plautius Silvanius Aelianus.[635] This inscription advertises one of his greatest achievements as a provincial governor in the middle of the first century AD: the settlement of large Trans-Danubian groups in the province, allowing him to levy a tax in grain for the first time since the Roman

[630] Gerov 1980, 147-167; Poulter 1980, 729-744.
[631] The Naval Intelligence Division 1920.
[632] Poulter ed. 1995, 4-7.
[633] The Naval Intelligence Division 1920, 12.
[634] The Naval Intelligence Division 1920, 106.
[635] Tačeva ed. 2004, 124-125.

conquest.[636] The conclusion has to be that it was shortage of labour rather than the low fertility of the soils that hindered the agricultural productivity of this province.

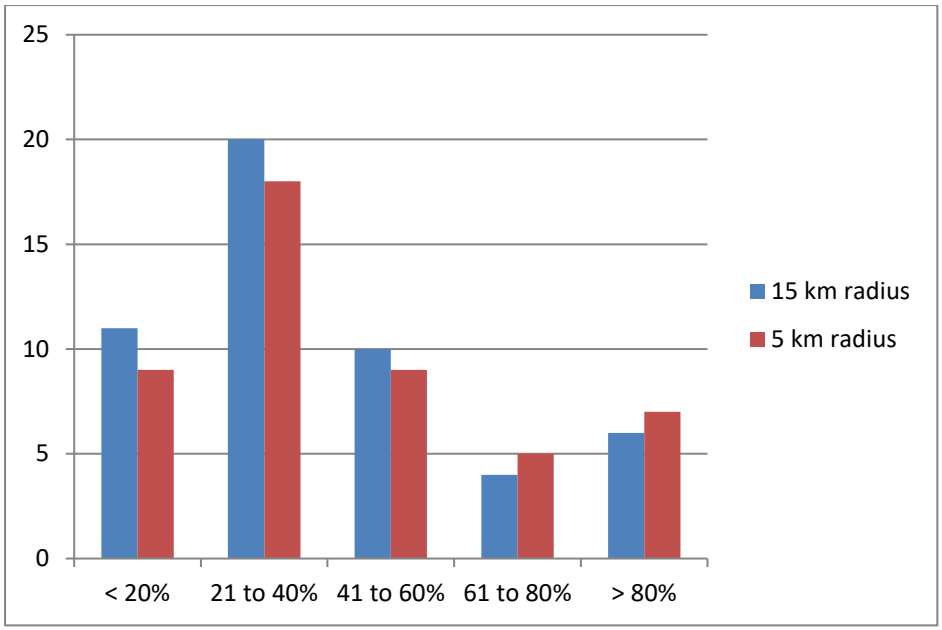

Figure V_19: Distribution of settlements across percentage ranges for arable land within the 15- and 5-km catchment radii

Only a relatively small portion of Moesia Inferior is occupied by high mountains and the extended catchment radii have a generaly positive effect on the agricultural potential. For nearly one-third of the settlements, their extended catchment radius results in an increase in the percentage of arable hinterland. In most of the cases, the growth is 10% or higher. This group mostly consists of the auxiliary *vici* on the Danube and the settlements on the Black Sea coast. The positive effects of the extended catchment radii were also boosted by the distances between the garrison settlements on the Lower Danube. Along those sections on which the auxiliary camps were spaced more closely, the effect on the agricultural potential is either trifling or negative. To a large extent, this outcome confirms the point of departure of our enquiry. The percentage of arable land increases with the extended catchment radius of those settlement categories that were not founded purely with a agrarian purpose in mind.

The extended catchment radius results in only minor increments in the percentage of arable land for the few settlements from the interior of the province included in this group. The reason is that the majority of these settlements were located in the mountainous, southern periphery of the province. With the exception of Montana, the centre of a mining district,[637] the rest of these settlements were *vici*, closely concentrated on the narrow valley floors. The extended catchment radius does add a limited amount of extra land that was probably exploited by the neighbouring *vici* or farms.

In absolute terms, the increments are substantial. Only about 10% of the settlements gain less than 50 square kilometres and most of these were located either along the heavily guarded sections of the

[636] Most scholars agree that the migrants were settled in the territory of the later province of Moesia Inferior; Gerov 1997, 8; Mócsy 1970, 28, located the event in Moesia Superior.
[637] Aleksandrov 1994.

limes or in the outermost corners of the provincial territory. As in most frontier provinces characterized by a flat relief, the increased catchment radius regularly adds large expanses of fertile land to the agricultural territories of the settlements.

These observations also underline the fact that, as in Moesia Inferior, by far the most important locational factor for the group of settlements analysed, regardless of their rank and status, was access to the Danube or the Black Sea. Over 80% of all settlements – including the large civilian towns – were located on the edge of the provincial territory. Access to a convenient harbour location or control of the important strategic points along the Danube was in some cases deemed preferable, even though it restricted the size of the agricultural territories.

With a few exceptions, located at the northern foot of Mount Haemus, the settlements in the interior of the province enjoyed a high agricultural potential. It was a mixed group, made up of major rural settlements and road-side *vici*, garrison settlements and a couple of autonomous civilian towns. The great majority of these settlements were not autonomous towns and they could not have been very large or important in the period of the High Empire. A similar trend has been observed in the other provinces in our study-area. Urbanism thrived along the *limes* and on the coast, leaving extensive stretches of fertile land in the interior remained predominantly rural.

Because of the extended market catchment and the fertility of its territory, Moesia Inferior has one of the lowest district urbanization rates in the study-area. In almost two-thirds of the hinterlands studied, the population of the central place represented less than 10% of the total population that could be sustained by the local resources, even in the maximum size-estimates (Table V_7 in Appendix 2). The settlements that show urbanization rates higher than 10% are a small but a varied group. They are composed of the garrison settlements and civilian towns on the Danube and the pre-Roman foundations on the Black Sea coast. More importantly, the group unites settlements that were 20 ha or larger and much smaller settlements that occupied agriculturally marginal locations, like promontories or on the curve in the Danube's Bend.

There are no readily observable patterns among the settlements that feature higher urbanization rates in their 15-km catchment areas. Both the newly founded autonomous towns and the Greek colonies on the Black Sea coast accounted for between 10 and 60% of the total number of inhabitants who could have been sustained by the agricultural potential in their hinterlands. In fact, on the territories of most of the autonomous towns, the projected urbanization rates range between 10 and 30%. Only the largest agglomerations in the province – as in all frontier provinces represented by the legionary towns –had populations greater than the rural population in their hinterlands, even in the low size-estimates. The largest settlement in Moesia Inferior – the legionary agglomeration of Novae – accounted for between 50 and 60% of the agricultural capacity of its hinterland, a relatively low percentage, compared to the Pannonian double towns. This is surely one of the main factors that depress the overall local urbanization rates in Moesia Inferior. With the minimum size estimates, this is only about 5%, with the maximum estimates, it climbs to 11%. The high estimates for the built-up areas of the Moesian towns are not particularly convincing, but the low estimates limit the size of the auxiliary *vici* to the area of the military camp. We have therefore taken into account the maximum size-estimates in determining the minimum land-to-population ratio.

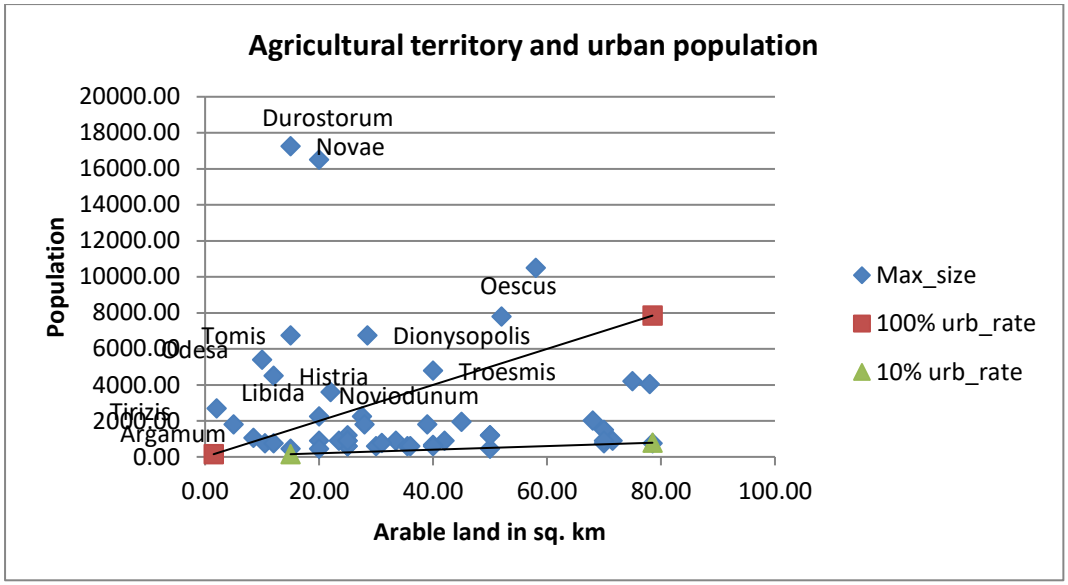

Figure V_20: Maximum population figures and estimates of arable land for the 5-km catchment radius

The settlements that are too big for the arable land enclosed by the 5-km catchment radius constitute a varied group. Most of these settlements are Greek colonies and outposts on the Black Sea coast, unimpressive in size but occupying long promontories and surrounded by the sea on three sides. In the western Balkan provinces, this settlement category was likewise placed above the trend-line for the minimum land-to-population ratio. The Greek colonies were not founded on locations that guaranteed immediate access to agricultural territory. Access to the sea had always been the imperative and the sustainability of these settlements required large administrative territories. In addition to the legionary camps, the group includes a couple of official towns, auxiliary and road-side *vici*. A trait common to all these settlements is their marginal location on the Danube. The few special-purpose settlements do not show land deficits, even in the maximum size-estimates. The hinterland of Montana, the centre of the only known mining district in Moesia Inferior, could sustain a population much greater than the district capital and the surrounding *villae*.[638]

Taking the rural population in the areas enclosed by the 5-km catchment radii into account, all of the autonomous towns and a few of the auxiliary *vici* would have fallen above the trend-line for the minimum land-to-population ratio. It is very unlikely that the urbanization rates in the farming catchments of the Moesian town and settlements were lower than 40%. In that case, most of the Moesian settlements would have been unsustainable by the local resources.

[638] Aleksandrov 1994, 41-47; Binev 2003, 160-182.

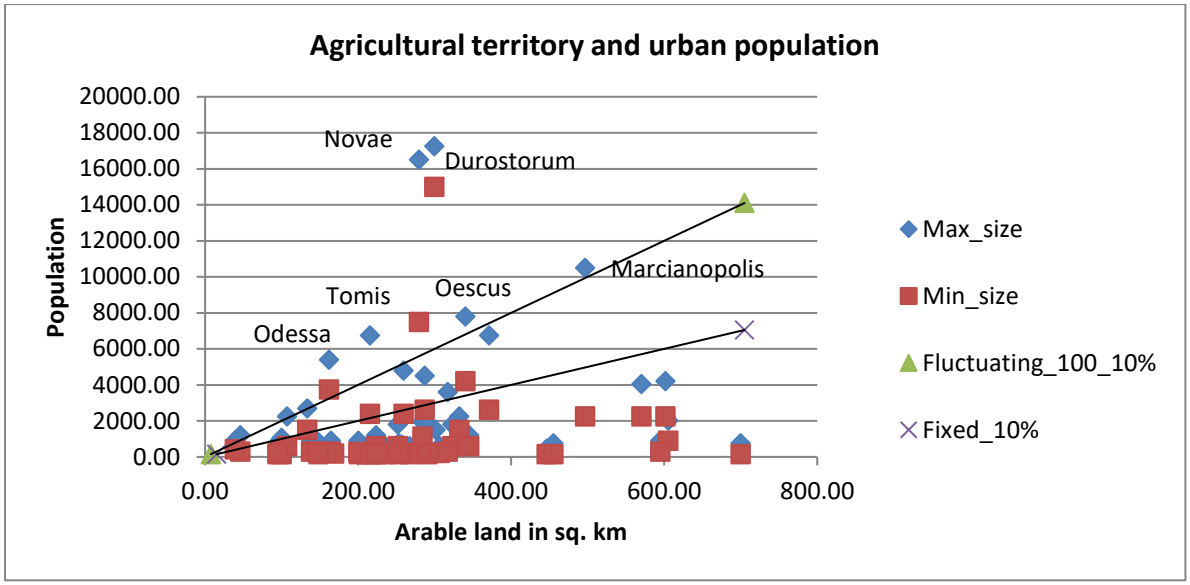

Figure V_21: Maximum and minimum population figures and estimates of arable land for the 15-km catchment radius

Nearly all of the settlements whose size comes close to or exceeds one-half of their agricultural territories were autonomous towns. It is therefore reasonable to assume that the catchment radii of most of the oversized settlements were at least 15-km. Even assuming that on average the rural population was ten times greater than the population of the central place – as predicted by the minimum size-estimates - most of the large towns would have had sufficiently large agricultural territories to secure their subsistence needs. But as shown on Figure V_21, this is only true as long as the population estimates are kept to the minimum. If we allow that the Moesian settlements grew to their maximum extents prior to Late Antiquity, the problem of the limited agricultural capacity returns. The shortages range from 108 square kilometres for Odessa, to 122 square kilometres for Tomis. They are, moreover, joined by a couple of inland settlements, such as Marcianopolis and Oescus on the Danube. In all of these cases, the deficiencies are relatively small and could easily have stemmed from the overinflated size-estimates for some of these towns, the inaccuracies in the estimates of the size of the agricultural territories or a combination of the two.

By now it should come as no surprise that only the two legionary towns in this province exceed the agricultural potential of their hinterlands by a substantial margin. We shall avoid repeating what was said for the rest of the legionary towns on the Danube. Visibly smaller than their Pannonian counterparts, the deficit in arable land is somewhat less pronounced in the case of the Moesian towns. If we deduct the legionary garrison from the minimum size-figure for the total urban population, the sustainability of Durostorum ceases to be a problem. In the case of Novae, the deficit persists. It ranges between 150 and 263 square kilometres, depending on the population estimate. A recently published gazetteer of the rural settlements in the hinterland of this town reveals a densely populated countryside.[639] The chronology of most of these sites is unclear, but it is tempting to relate them to the granting of the municipal status to Novae that came with a sizeable stretch of territory between

[639] Tomas 2007, 31-47.

the Belene Plain and the River Yantra.[640] Finally, both towns could also rely on additional supplies from the interior of the province and from the wider Pontic region via the Danube.

The tendency to urbanize the peripheral but well-connected zones of the region observed in most of the provinces in our study-area continues unabated in the east of the peninsula. Because of their locations on the Black Sea coast and the Danube frontier, the Moesian settlements had moderately sized agricultural territories that in the majority of the cases expanded when the catchment radius was extended. Nonetheless, the great majority of the settlements were of a modest size that allowed them to live off the arable land available within the 5- or 15-km catchment radii. Apart from the largest garrison towns, the few exceptions included the largest colonies on the western Black Sea coast. The towns that outstripped the grain-producing capacities of their immediate hinterland either enjoyed special privileges or were trade-oriented maritime settlements. Both categories had access to the agricultural produce of areas much larger than their immediate hinterlands by virtue of their autonomous status.[641]

The interior of the province remained predominantly rural, despite the great agricultural potential of certain areas, like the Iskar Valley or parts of the Dobroudja. In this respect too, Moesia Inferior joins the rest of the Balkan and Danube provinces. As in Pannonia Inferior, the land behind the *limes* began to show definite signs of urbanization only in Late Antiquity. It is not by chance that many of our size-figures refer to areas that were walled only in Late Antiquity. The paucity of data pertaining to the earlier settlement phases hints at a substantial urban growth in this region in the late third and throughout the fourth century.

Thrace

In comparison to its northern neighbour, the physical geography of Roman Thrace is far more diverse, even when the Aegean coast and the eastern Thracian plain are excluded. Mountains make up large segments of the province, especially in the south and west (Map V_13). These areas offer only a very limited amount of arable land in the narrow valleys and high plains. The prime resources were timber and pastures. Compared to the mountains in the western Balkan provinces, the Thracian mountains do not abound in mineral resources.[642] As a result, to this day large areas of the mountainous regions in the west and south of Bulgaria do not have any major urban settlements. There was neither a sufficiently broad agricultural base to support a spontaneous urban growth nor other natural resources to compensate for the scarcity of arable land. Nevertheless, because the core of Thrace's urban network was centred on the Great Thracian plain, the outer market radius is set at 15 km.

The main agricultural riches of the province lie in the Great Thracian plain and along the major Thracian rivers, the Toundja and Stryama, the Maritza and in the Struma Valley in the west. With its fertile soils, mild climate and good hydrology, these regions have attracted permanent farming settlements ever since the earliest Neolithic.[643] Thrace was not a frontier province and, as mineral resources are relatively scarce, there were no zones of special interest to the central government.

[640] Kolendo, Božilova eds. 1997; see the next chapter.
[641] See the next chapter.
[642] The Naval Intelligence Division 1920.
[643] Valeva, Nankov, Graninger eds. 2015.

Furthermore, the considerable distances between the major Thracian settlements offered full access to the territories within the 15-km catchment radius. Administrative and political frontiers had no effect on the extents of the agricultural territories. The only possible limiting factor to the grain-producing capacity was the proximity to the mountains and the sea.

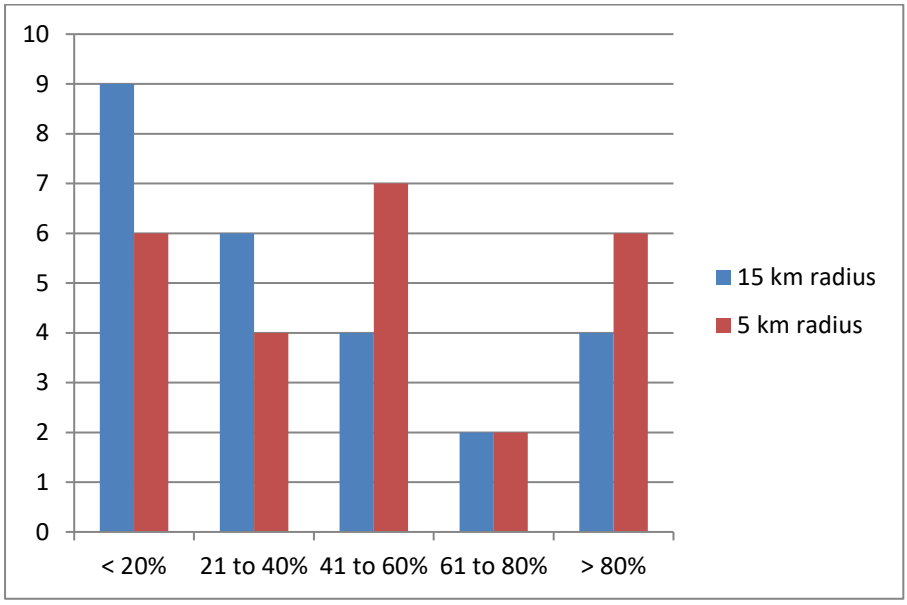

Figure V_22: Distribution of the settlements across percentage ranges for arable land within the 15- and 5-km catchment radii

In Thrace, the effects of the extended catchment radii are prevalently negative. About one-quarter of the Thracian settlements experienced a rise in the percentage of arable land with the extended catchment radius. This is a high percentage by regional standards, a fact which is chiefly preconditioned by the large intercity distances and the relatively flat relief. Nonetheless, for the majority of the settlements, the extended hinterland reduces the percentage of arable land.

The coastal settlements profited the most from the enlarged hinterland. Access to a good harbor was the prime factor in the siting of these towns. In contrast, in most of the continental settlements the increased catchment radius decreases the percentage of arable land in the theoretical hinterlands. This circumstance reflects both the mountainous geography in certain parts of the province and the strong agricultural focus of these communities. Thrace joins the Danube provinces by the amount of new arable land introduced with the extended catchment radius. About three-quarters of the settlements add over 50 square kilometres of arable land in the 15-km market catchments.

There is no clear correlation between the different settlement categories and agricultural productivity. In the urban hinterlands, the percentage of arable land in the 15-km zone varied from below 15% for the Greek colonies on the Black Sea coast, to between 15 and 50% for the towns of western Thrace, to over 35% for the towns and settlements in the Great Thracian Plain. Similar fluctuations characterize the size of the agricultural territories of the non-urban settlements. The principal factors that determined agricultural productivity were the local geographical conditions not the socio-economic profile of the settlement.

Nonetheless, the most important feature of the urban map of Thrace cannot be inferred from the estimates of the agricultural territories. In the preceding chapters we have pointed out the sparseness of the urban network in Early Roman Thrace. In view of the favourable geographical and historical conditions, the number of urban settlements is surprisingly low. Large sections along the Maritza and most of the Toundja Valley, densely populated in earlier periods, were left virtually empty during the High Empire.[644] Most of the sites in these areas can be described as minor agglomerations, hypothetically associated with *emporia* or road-stations. At the same time, there were urban developments in regions with less plentiful agricultural resources and with a dubious pre-Roman urban tradition. Instead of making maximum use of the agricultural riches of the Maritza and Toundja, the urbanization of the province was spread evenly across the different geographical zones, including the high fluvial plains in western Thrace and, obviously, the coastal zone. Only the mountains in the south and north of the province were devoid of any urban or urban-like centres.

Because of the relatively modest settlements size and the large agricultural territories, it is likely that the minimum urbanization rates were low in the territories of the Thracian towns and settlements. In fact, Thrace does not stand out from the other provinces by the number of settlements with population figures lower than 15% of the agricultural capacity of their immediate hinterlands (Table V_8 in Appendix 2). With the maximum size-estimates, they constitute slightly over one-half of all Thracian settlements included in this analysis, chiefly coinciding with the group of subordinate central places. Thrace differs from the rest of the provinces in the study-area in that the hinterlands of the largest Thracian towns were large enough to sustain rural populations twice the size of the populations of the urban centres. No Thracian town boasts a population figure higher than 30% of the total population who could live off their hinterlands, even with the maximum size-estimates. The only exception is a mining settlement in the Strandja massif, but its true nature and size is far from certain. In comparison to the rest of the Balkan provinces, Thrace had no settlements that were too large for their immediate surroundings. Consequently, the average local urbanization rates range from about 5% in the minimum to less than 15% in the maximum size-estimates.

These rough projections cannot be checked against the archaeological evidence from the Thracian countryside. In view of what is known about the constitution of these urban communities, the division of the countryside into separate sectors attributed to different *phylai*, as well as the large number of epigraphically attested *komai* in Thrace,[645] it is unlikely that the rural sector was thinly populated or was it predominantly villa-based. A few important epigraphic documents clearly attest that at least the peripheral sections of the urban hinterlands were exploited by tax-paying *komai*.[646] Although this evidence is insufficient to argue that Thrace was substantially different from the other Balkan provinces, at least it does not contradict our projections for the local urbanization rates.

[644] *Cf.* with Figure 2 in Hawthorne, Varbanov and Dragoev 2011, showing the distribution of Thracian pit-sanctuaries. Nearly two-thirds of all registered sites that belong to this category are located between the Rivers Maritza and Toundja, the heart of historical Thrace. The Roman province was evidently a different territorial entity.

[645] Martemianov 2012, 40-51; Gerov 1980, 273-283.

[646] This is plainly evidenced in the case of Pautalia, Gerov 1998, 72-184.

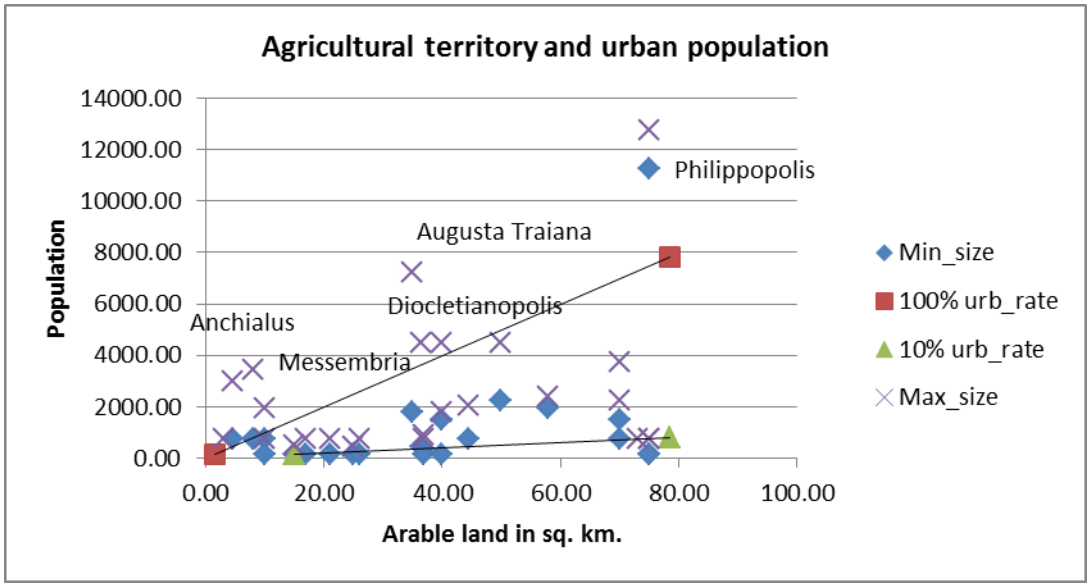

Figure V_23: Maximum and minimum population figures and estimates of arable land for the 5-km catchment radius

With the exception of the largest town in continental Thrace, no other settlement is oversized for the agricultural resources within the 5-km catchment radius, when the minimum size figures are considered. As anticipated during the survey of the settlements by percentage ranges for the arable territories, the Thracian towns can be envisioned as tiny islands in a sea of agriculturally productive land. Most of these settlements are self-sustainable as long as the urbanization rates within the 5-km zone are higher than 30%. The situation changes when the maximum size-figures are taken. In that case, almost one-third of the settlements would have been too large for the immediate surroundings. Some of these figures are not very reliable, but it is worth noting that familiar settlement categories pop up above the trend-line for the minimum land-to-population ratio: the Greek colonies and the largest settlements in the interior of the province. Both settlement categories had access to administrative territories much larger than the immediate farming catchments.

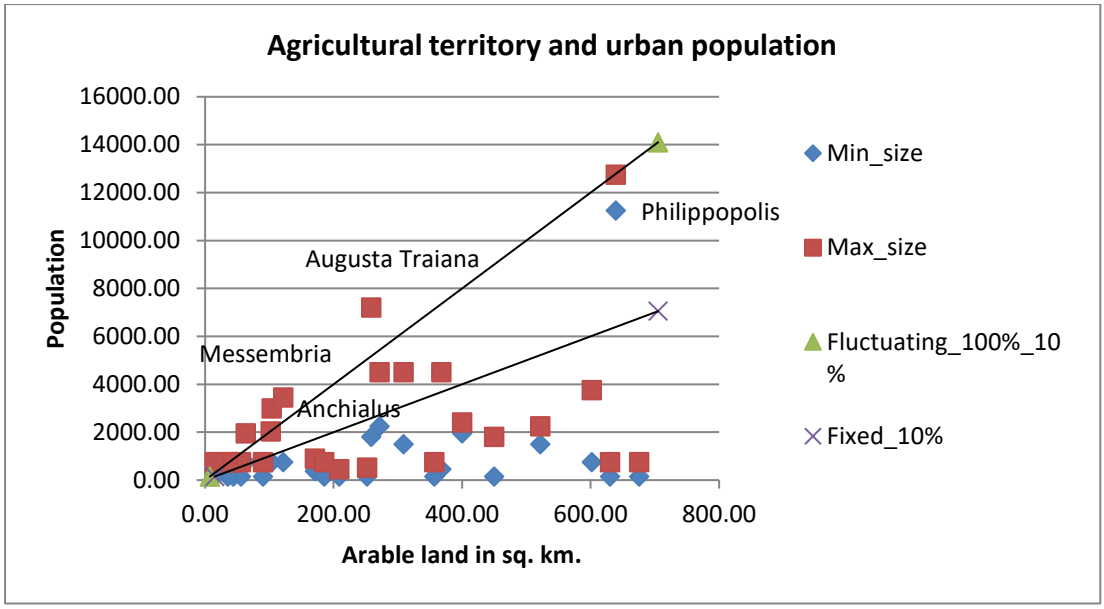

Figure V_24: Maximum and minimum population figures and estimates of arable land for the 15-km catchment radius

The relatively low local urbanization rates are reflected in the graph correlating the population figures and the amount of arable land in the urban hinterlands. With the extended catchment radius and the high size-estimates, only a few settlements would have felt any pressure on the grain-producing potential. Both the two largest towns in the province, Philippopolis and Augusta Trajana, and the Greek colonies of Apollonia and Mesembria are located on or above the trend-line for the minimum land-to-population ratio. Mostly because of its location at the foot of Mount Haemus, Augusta Traiana had the greatest land deficit of about 100 square kilometres. If we postulated fixed urbanization rates of 10% across the entire urban hinterland, these towns would have been joined by another small group of autonomous towns, but only in the maximum size-estimates.

It is difficult to see what factors might have sustained the excessive size of these communities. Philippopolis, the seat of the provincial assembly, was the only major regional centre in the province during the High Empire.[647] The epigraphic monuments bear witness to the presence of a vigorous community of professional associations that certainly did not belong to the agricultural sector of the local economy.[648] Philippopolis was not the provincial capital, but it does share many common features with the capitals in the demilitarized provinces. This town was the main centre in the Thracian interior and, like the rest of the supra-regional centres, it was able to draw on resources located beyond the regional horizon.

Little can be said about the remaining Thracian towns whose maximum size exceeds the agricultural riches of their immediate hinterlands. Their epigraphic heritage is not as copious as that of Philippopolis and only tiny fragments are known from the archaeology of these towns. One thing that all of these communities had in common was their autonomous status. They were the centres of regions much larger than the hinterlands enclosed by the 15-km catchment radius and it is likely that

[647] Gerasimov 1958, 289-304; Velkov ed. 1979, 328-340; Lozanov 2015, 75-89.
[648] Botušarova 1957, 308-311; Velkov ed. 1979, 328-340; Djambov, Mateev 1980, 106-121.

the potential grain deficits in the immediate hinterlands were compensated for by the taxes and rents coming from the peripheral parts of the urban territories.

When we consider the minimum population estimates in conjunction with the 15-km catchment radii, none of the Thracian towns appears to have been too big for the grain-producing capacities of their hinterlands. Even Philippopolis is placed well below the trend-line marking the minimum land-to-population ratio. It is possible that many of these towns were either smaller than suggested by the maximum estimates or had lower population densities and never really strained the limits of the agricultural resources available within their hinterlands. This could very well be the case for Mesembria, Apollonia and Augusta Trajana, towns for which we have the estimates only for the walled areas.

With the exception of the colonies on the Black Sea coast, most of the Roman towns in Thrace occupied micro-locations that ensured access to agriculturally rich hinterlands. It is true that the largest towns in the interior of the province did possibly outstrip the grain-producing capacity of their immediate surroundings, but the margin was negligible. However, the exploitation of the agricultural riches of the province was not the principal goal behind the urbanization of Roman Thrace. The urban core of Thrace did not coincide fully with the agricultural heartland of the country in the central Thracian plain, large portions of which lay outside the urban umbrella. Administrative and strategic considerations must have played an equally important role in the urban genesis of the area. Towns like Pautalia and Serdica were in control of key nodes in the road-network that covered the interior of the province, inheriting the territories of communities that had been autonomous at the time of the Roman conquest.[649] Although carefully placed in relation to the local resources, the main function of these towns was to govern the mountainous but strategically important regions of western Thrace. Even the agriculturally marginal Upper Mesta Valley hosted an autonomous town. Outside this framework of administrative centres, there was little urban growth prior to Late Antiquity, even in areas with optimal agricultural conditions.

Dacia

In view of its physical geography, climate and fertility of the soils, Roman Dacia is one of the most diverse provinces in our study-area. Its territory encompassed large alluvial plains, steppe-like tablelands, plateaus and mountain ranges. In a broader perspective, the key line of division is the Carpathian Mountains, separating the Transylvanian Plateau from the great Wallachian Plain (Map V_14).[650] To the south of the Carpathian Range, nearly all land is agriculturally productive. Besides the favourable climate and sufficient amounts of rainfall, the black soils or *chernozems,* extremely rich in nutrients, have guaranteed the high fertility of the sub-Carpathian region.[651] On the other hand, Transylvania, that corresponds to the combined territories of Dacia Apulensis and Porolissensis in Antiquity, is a plateau surrounded on all sides but the north by mountains. Its openness to Central Europe means a cooler climate and higher amounts of rainfall compared to Wallachia. The chief factor

[649] Gerov 1998, 72-184.
[650] In the Roman period, the provincial border between Maluenses and Apulensis roughly coincided with the Carpathian Range; Oltean 2007.
[651] The Wallachian Plain, the western part of which was included in the Roman Empire, has been the bread-basket of the modern Romanian state: Keefey *et al*. 1972, 35, 254-274; Bachman *et al*. 1990.

limiting the agricultural productivity in Transylvania is not the relief, as most of the hills have gentle slopes and even in the mountainsides there are numerous small valleys that are agriculturally productive. The fly in the ointment is that the lighter brown soils, much poorer in nutrients than the *chernozems*, decrease the fertility of the land. Crop rotation has been crucial in preventing the over-depletion of the soils in this area.

Although conditions were far from optimal, Transylvania was an agriculturally productive region in the first couple of decades of the twentieth century.[652] This was not a great surplus producing region like Vojvodina, but it could sustain itself and, it has to be stressed that the agricultural productivity in the Wallachian Plain was maximized only in the modern era, after the deforestation of much of the tableland between the Danube and the Transylvanian Alps.[653] It is likely that, in the past, only a portion of this land was cultivated. Just as wide stretches along the Danube's left bank were converted into arable land only after the large drainage projects of the last century. Hence, a caution must be observed not to overstress the differences in agricultural productivity between the two principal regions of Roman Dacia.

At this point, it should be noted that the most fertile portions of modern Romania, Banat and the Great Wallachian Plain, were left outside the borders of the Empire, even though they were brought under military control albeit briefly.[654] Only the smaller, western portion of Wallachia was permanently occupied. Again, it was primarily geo-strategic and other, non-agricultural considerations that directed the expansion of the Roman Empire. Despite the fact they were more fertile than the Transylvanian Plateau, the Wallachian Plain and Banat were far more open to the *Barbaricum* and hence more difficult to defend from the incursions of nomadic people. Besides, Transylvania had other, equally attractive assets. Even after centuries of exploitation, the Transylvanian Mountains still boast one of the largest deposits of gold and silver in Europe.[655] Not less valuable were the iron-mines in the southwest and the salt-pans in the east of Transylvania.

As in other frontier provinces, the administrative and political divisions posed additional constraints on the agricultural territories. Along certain sections of the Dacian frontier, the auxiliary castles are spaced at distances shorter than 10-km, reducing the catchment radius to less than 5-km. The proximity of the *limes* was less of a problem than in the other frontier provinces. The Dacian *Limes* was not a linear frontier and the garrison settlements were located a few kilometres behind the frontier-line.[656]

Although Roman Dacia covered large expanses of flat land, the majority of the settlements included in the analysis are pinned on the Dacian *Limes*, in mountainous areas. In order to account for this fact, the market radius has been reduced to 10 km.

[652] Louis 1924, Figure 3.
[653] Keefey *et al*. 1972, 35.
[654] Gudea 1979, 63-87; Macrea 1967, 121-141.
[655] Modern mining in the area dates back to the second half of the last century, Bachman *et al*. 1990, 155.
[656] Ferenczi 1967, 143-162; Gudea 1997.

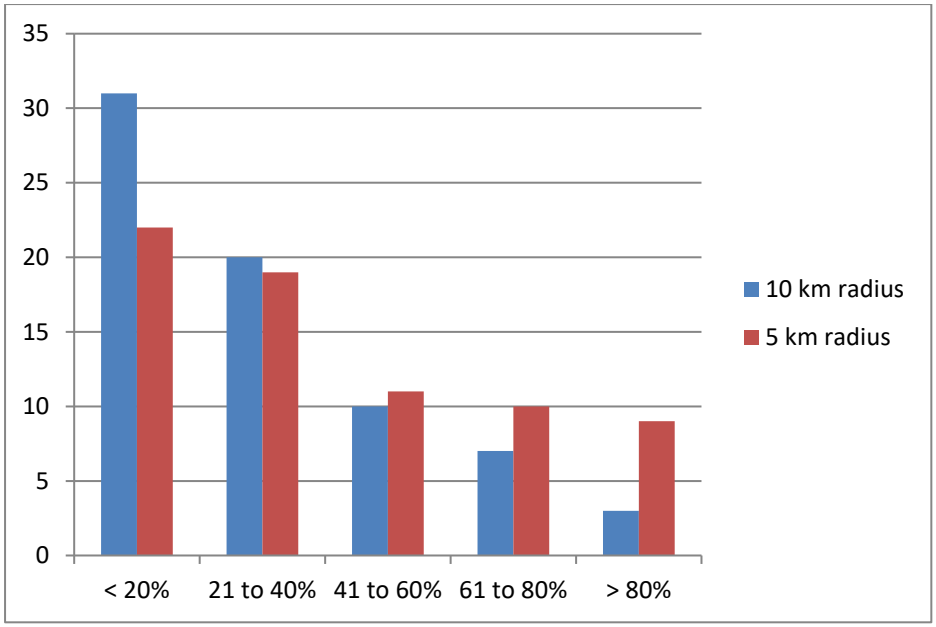

Figure V_25: Distribution of settlements across percentage ranges for arable land within the 10- and 5-km catchment radii

In contrast to Thrace or Moesia Inferior, the increased catchment radius has a strongly negative effect on the percentage of arable land in Dacia. The greatest discrepancy between the two scenarios lies in the number of settlements that belong to the highest percentage range. Only three settlements are in control of hinterlands in which over 80% of the land was arable with the 10-km catchment radius. With the shorter catchment radius, the number of settlements that belong to this percentage-range is tripled. The extended catchment radius would decrease the number of settlements belonging to the upper percentage-ranges to less than a third of the total number of settlements, the peak in the distribution falling at the lowest percentage-range.

For over half of the settlements, the increased catchment radius results in a reduction in the percentage of agricultural territory of more than 5%. This contrasts sharply to only 10 settlements, or about 15%, whose agricultural territories increase, usually by a tiny margin. Most of these settlements were located along the Dacian *Limes*, in areas of low settlement density, but the group also includes the mining settlements in the region of Alburnus Maior; in other words, those settlement categories whose primary concern were non-agricultural resources. Only a couple of these settlements were autonomous towns, both developing from garrison settlements.

In absolute numbers the gains of arable land with the extended catchment radius are sizeable. Almost 50% of all settlements add at least 50 square kilometres to their agricultural territories. The majority of these are located in the flat sections of the Dacian interior.

As in the majority of the provinces in our study-area, there is no positive correlation between the settlement's size or status and the extent of the agricultural territories. For example, in the case of the autonomous towns, the plough-zone might include anywhere between 5 and 85% of the theoretical hinterlands. Similar fluctuations characterize the hinterlands of the garrison settlements that did not have an autonomous status. The fact that the towns and settlements of Roman Dacia occupied a wide range of niches, with a tendency to cluster in the medium size-ranges, signals that

agriculture was not the most decisive factor in drawing the new settlement map of the province. Despite the much greater agricultural potential of the sub-Carpathian region, the core of Roman Dacia was in Transylvania and, even here, the accent was on the control of communications rather than on maximizing the amount of plough-land.

Into the matter of the local urbanization rates, Roman Dacia does not represent an exceptional case. Over two-thirds of the settlements have population figures that do not exceed 30% of the total population sustainable by the agricultural resources in their 10-km hinterlands (Table V_9 in Appendix 2). In fact, the population figures for the majority of these settlements are lower than 15% of the maximum population figures of their districts, even with the maximum estimates. With a few exceptions, these coincide with the third tier in the settlement hierarchy – settlements measuring less than 15 ha - strongly represented in Roman Dacia because of the large number of garrison settlements stationed there. The exceptions are the auxiliary *vici* located in the Transylvanian Iron Gates or in the Olt Defile, areas that are unlikely to have been densely populated. Higher district urbanization rates were also encountered among a small group of auxiliary forts on the northern Dacian *limes*, an area of mountainous relief and short inter-site distances.

As elsewhere, the autonomous towns and the largest among the garrison settlements belong to a different class. Our estimates project minimum urbanization rates in the 10-km zone of no less than 30% for most representatives in this settlement category. It is useful to make a further distinction between the group of settlements containing up to 50% of the total population sustainable by the local agricultural resources and those exceeding the agricultural capacities of their surroundings. Most of the auxiliary *vici* that have exceptionaly high local urbanization rates belong to the former group. These were the exceptions discussed in the preceding paragraph: the small garrison settlements located in Transylvanian Iron Gates or the Olt Defile. They are joined by a small group of autonomous towns. The remaining autonomous towns are too large for their immediate surroundings, even if we discount the needs of the rural population. However, the considerable differences between the alternative size-estimates cannot be ignored. With the low size-figures, the populations of all but one autonomous town are smaller than the agrarian capacities of their hinterlands. Obviously, this has a visible effect on the average district rates. They range from about 12% with the minimum size-estimates to over 30% with the maximum size-figures. It is not easy to decide in favor of one of these scenarios. It is patent that the maximum size-figures overestime the size of some of the autonomous towns as they refer to the walled areas in Late Antiquity, but the low figures almost certainly underestimate the true size of the garrison settlements. In order to balance between these two extremes, we shall evaluate the sustainability of the settlements the urbanization rates have been set at 20%.

We are almost entirely ignorant about the population density in the Dacian countryside and, as the archaeological data potentially relevant to this topic have not been produced by systematic surveys, there is no way of knowing if they reflect real variations in the density of rural settlement. It is nevertheless striking that the available studies of traditional rural settlements record only a handful of agglomerations within the 10-km radii of both civilian and garrison settlements and almost none within the 5-km radius.[657] The *villae*, on the other hand, are almost entirely limited to the municipalized portions of Dacia, mostly along the Rivers Mureş and Someş and in the Haţeg Basin

[657] Protase 1980b, Figure 23.

(Map V_15). Indeed, the wider surroundings of a number of Dacian towns in these valleys feature increased densities of *villae*, most of which probably were the property of the urban residents. These are particularly prominent in the hinterlands of Apulum and Sarmizegetusa, although an equally high density of *villae* have been discovered in the neighbourhood of Napoca, a town that could have secured its subsistence even when its hinterland is limited to the 5-km radius.[658] This pattern can be read as evidence of high urbanization rates in the territories of the major towns, but the fragmentary nature of the data warrants a great deal of caution. As in Pannonia, the *villae* in the hinterland of Apulum were often accompanied by small hamlets, probably inhabited by tenant farmers.[659] Obviously, if this was the norm, the so-called villa-landscape is hardly a guarantee of a low population density in the countryside. It could merely disguise the fact that most of the land in the immediate surroundings of the towns had been appropriated by the urban elite.

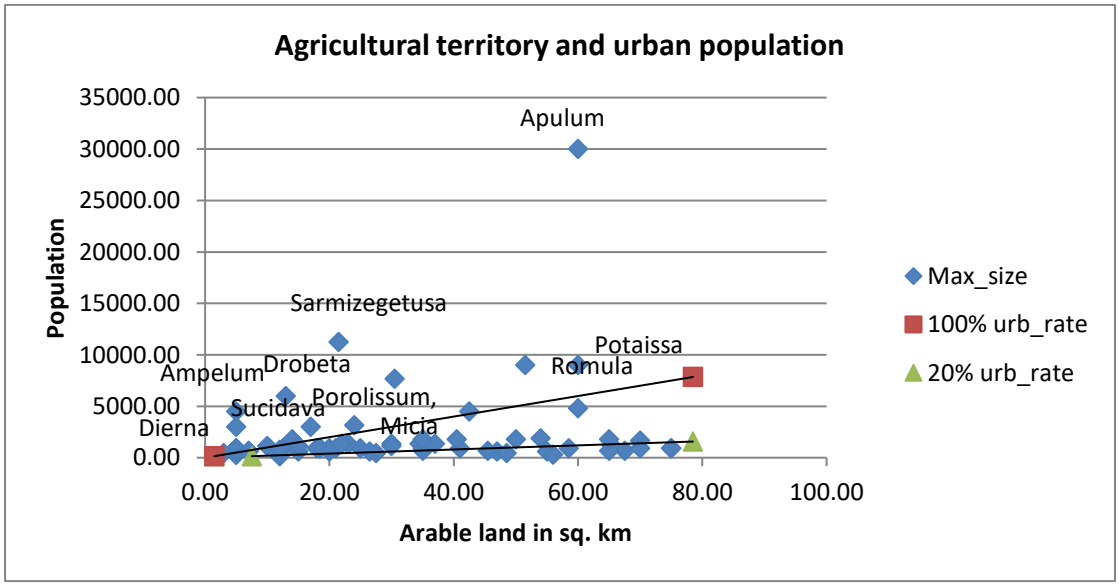

Figure V_26: Maximum population figures and estimates of arable land for the 5-km catchment radius

Most of the autonomous towns and major auxiliary *vici* were too large for the grain producing capacities of their 5 km-catchments. This is true for about one-half of these settlements, even with the minimum size-estimates and discounting the needs of the rural population. With the exception of Apulum, none of these towns was of an exceptional size, but their catchments often included mountainous land or territory lying on the other side of the frontiers, depressing the local farming potential. Obviously, these settlements had never been conceived of as agro-towns. The fact that the remaining settlements were self-sustainable is entirely due to their small size. Most of them were garrison settlements and the agricultural aspect had no role in their siting. Theoretically they could have functioned as purely agrarian settlements, but this is in no way telling of their actual economies. It is merely a symptom of the hampered settlement growth outside the category of autonomous towns.

[658] Oltean 2007, Gudea 2009, 187-319; Fodorean 2013.
[659] Oltean 2007, 143-144.

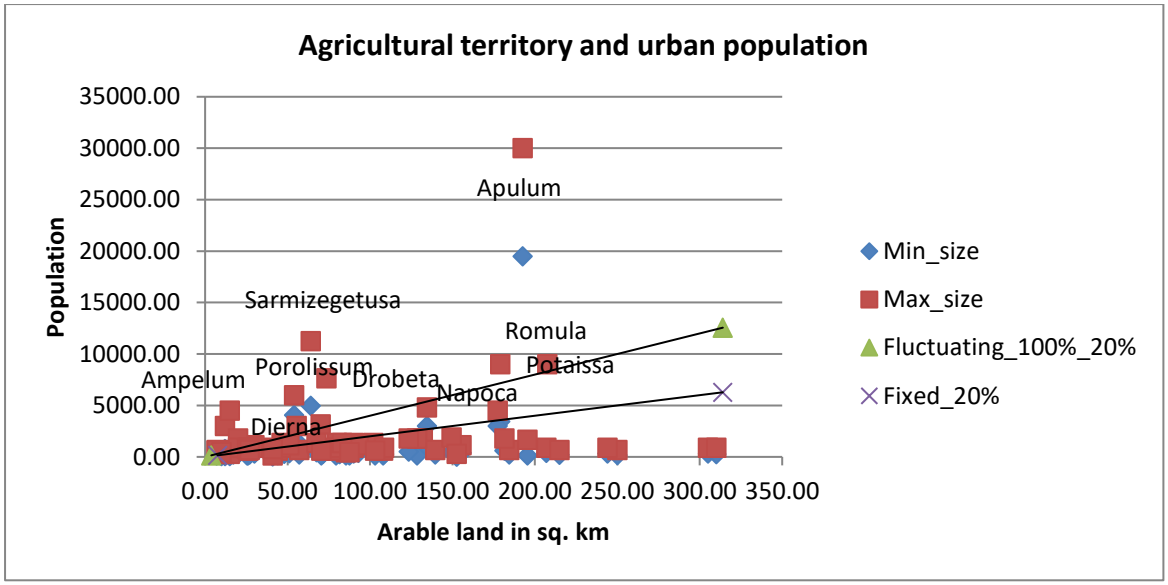

Figure V_27: Maximum and minimum population figures and estimates of arable land for the 10-km catchment radius

The settlements that featured local urbanization rates higher than 50% are oversized for the agricultural territories in their 10-km hinterlands. As in other provinces, there is a big difference between the largest settlement and seat of the provincial governor, Apulum, and the remaining settlements that outgrew their immediate surroundings. Whereas for the latter, the deficit in arable land is not greater than 50-60 square kilometres with the minimum size-estimates, for Apulum, it is almost 300 square kilometres and it rises to over 550 square kilometres with the high size-figure. Similarly pronounced discrepancies have been observed in Pannonia, in which the top-ranking settlements were, like Apulum, double towns. The group is expanded when the maximum size-estimates and a constant urbanization rate of 20% are accepted, including the autonomous towns on the periphery of the provincial territory – Romula, Drobeta and Dierna – and the mining *municipium* Ampelum. With the exception of the latter, the land-shortages are insignificant and, in view of the low reliability of the high size-estimates, these cases do not merit any thorough deliberation. Ampelum was the centre of the Dacian *auraria* and, if the maximum size-estimate is correct, much of its grain supply must have come from outside the mining district.[660] Although there are some indications that Ampelum was an autonomous town, it is likely that the grain procurement for the mining district was in the hands of the district procurator.[661]

It should not be overlooked that all of these towns, except Sarmizegetusa, were garrison settlements. Therefore, they were not entirely dependent on the size and fertility of their territories for the livelihood of their inhabitants. In the case of Porolissum, all that has to be done is to subtract the approximate number of permanently stationed troops from the total population estimate to shift this settlement below the sustainability threshold. However, this modification fails to solve the problem of Apulum's supplies. It merely reduces the land-shortage to about 400 square kilometres with the maximum, 145 with the minimum size-estimate. In the next chapter we shall see that both Sarmizegetusa and Apulum had extensive administrative territories, covering some of the most fertile

[660] Russu ed. 1975; Mrozek 1977, 95-109.
[661] For the status of Ampelum see the next chapter.

sections of the Transylvanian Plateau. Apulum's territory was particularly large, extending over the Mureş Valley and the lower Târnava. The land shortages in the immediate surroundings of these towns could have been readily compensated by the large extent of fertile land available in their administrative territories. In addition to their large territories, the economic base of the elites of Sarmizegetusa and Apulum covered much of Transylvanian Dacia. The magistrates and professional associations of these towns left copious epigraphic evidence for their involvement in the mining districts and salt-pans of the province.

In Dacia, as in many other provinces of our study region, the highly urbanized belt only partly coincided with the agricultural heartland of the country. The extensive fertile stretches of territory south of the Carpathian Range were very sparsely urbanized and, even on a micro-regional level, the locations of the individual towns were not always optimal. The example of Sarmizegetusa is particularly illustrative. Located a short distance from the mountain pass that leads into the Transylvanian Iron Gates, only about 50% of its 5-km hinterland was arable. Had this town been founded several kilometres to the northeast, in the central parts of the Haţeg Depression, at least 80% of the hinterland would have been arable. Apparently, proximity to one of the gateways leading into Roman Dacia had higher priority than the proximity to arable land in the eyes of the city-founders. This circumstance might hint at the possibility that Sarmizegetusa did, after all, grow on the site of a temporary fort.[662]

Sarmizegetusa was not an exceptional case. Connectivity was an equally important locational factor for most of the Dacian towns along the imperial road in the west of the province and even more so for towns like Drobeta or Dierna, in the area of the Danube's Iron Gates. One important lesson from the survey of the Dacian urban hinterlands is that riverine transport was a profitable economic activity that attracted urban growth and offered a steady channel of supply from distant regions. However, for most of the settlements, their sub-optimal positioning in relation to the agricultural resources was not particularly troublesome, although ultimately, it did present a serious barrier to further growth. The majority of the Dacian settlements were small enough to secure their subsistence needs even from a limited catchment radius.[663]

Conclusions

An important conclusion that emerges from this chapter is that the land to population ratio was not always sensitive to the economic profile of the settlements. The rolling countryside, the good pedologic and climatological conditions allowed a great deal of flexibility in the settlements' siting. On the other hand, economic specialization rarely coincided with high population figures; a telling sign that not everyone could rely on market supplies. Slightly more indicative of the possible implications of non-agricultural factors in the settlements' locations is the effect of the extended catchment radius on the size of the agricultural territory. This effect was regularly positive for the settlements located on the coast or along the *limes*, while the predominantly agricultural settlements in the interior gained much smaller tracts of new arable land. However, this is not an overriding rule. In certain geographical zones, the settlements located in the interior also gained sizeable amounts of additional arable land

[662] Diaconescu 2004, 87-142; Petolescu 2011, 83-109.
[663] Ironically the possible exceptions, Dierna and Ampelum, are the only two towns in Roman Dacia for which we can hardly hope to acquire additional size-data. Learining from the situation in the mining districts in the west of the peninsula, we think it unlikely that these were particularly large agglomerations.

with the extended radius, although their orientation was in all probability entirely agricultural. Likewise, this index is blind to the locational peculiarities of the majority of the mining settlements. Unlike the coastal or frontier settlements, the extended catchment radius rarely introduced new patches of arable land in the hinterlands of the mining towns. Too often, the factors that determined these variations were purely geographical and are more relevant to the nature of the local geography than to the economic strategies of the individual towns. Most of the variations between and within individual provinces can be ascribed to the local geographical specifics. Hence, the consistent differences between the size of the arable hinterlands in Dalmatia and Thrace or between the southern and northern half of Pannonia Superior.

Because the overall tendency was to spread the settlements in the same category across a broad spectrum of settlement niches, there is no correspondence between the agricultural potential and the size or rank of the settlement. Here, we recall the example of Thrace, in which the urban network was primarily geared towards securing a full administrative coverage of the province. The autonomous towns were evenly spread across the provincial territory, regardless of the agricultural potential of the constituent micro-regions. Most of the garrison towns are found on the *limes*, but they are also present in the agriculturally rich regions in the Balkan interior. Likewise, the majority of the *coloniae* and *municipia* were concentrated in the grain-producing sectors of the provinces, but a sizeable minority – including the most important urban centres in the region – emerged in the coastal zone or on the *limes*. The consistently smaller agricultural territories of the frontier settlements were preconditioned by their peripheral position rather than their socio-economic profile.

However, a more balanced view is needed if we are to do justice to the topic treated in this chapter. It makes little sense to deny the limitations posed by the physical environment on the spread of urbanism or the growth of individual towns. However, the weight of the ecological factors can easily be overestimated. The mountainous areas rarely formed parts of the urban territories and, consequently, their effect on the variable extent of the agricultural territories was limited. At the same time, the presence of large and fertile valleys by no means guaranteed the emergence of a dense urban network or large towns. If anything, the study of the agricultural territories has demonstrated that settlement growth was not proportional to the grain-producing capacity of the hinterland. Instead, it can be argued that the micro-locations of the majority of the newly founded settlements were not determined by purely agricultural considerations.

As observed a number of times in this chapter, the urban map of the Balkan provinces almost never coincided with the agricultural heartlands of the provincial territories. In certain regions, there were neither autonomous towns nor large subordinate settlements, despite the relative fertility of these areas. These corners of our study-area will be discussed in a greater detail in the next chapter. For the moment, it is enough to point out the possibility that a proportion of the agricultural produce from these areas was shipped to the zones that were known to be deficient in arable land. This would have been the most viable solution to the problem of supplying the large garrison settlements on the frontier or the few mining towns, especially in view of their low productivity or lowly status. Depending on the juridical status of the grain-producing areas, the grain was shipped directly to the *limes* or was levied as a tax and redistributed by the central government.

The fact that the importance of the agricultural sector is not necessarily reflected in the micro-location of a settlement should not come as a surprise when the genesis of the great majority of newly founded

town is considered. Over one-third of the settlements in our study-area emerged near permanent garrison sites and a large number of big and important settlements were built at sites that had once been occupied by the military. Agricultural considerations could not have played a significant role in the siting of these settlements. Access to ports or control of land-traffic was a far greater concern tp the town-founders, if we are to go by their choice of location. However, this circumstance does not diminish the significance of the agricultural sector in the economy of the Roman towns. That their micro-locations were often sub-optimal in relation to the agricultural resources merely indicates the patterns of land-ownership and exploitation. It is not an accident that the secondary agglomerations were on average better located than the majority of the autonomous towns. It cannot be expected that the Roman city would have behaved like the typical agro-town. The large and well-connected territories, in combination with the regime of land-lease, would have obviated the need for an immediate access to the productive territories.

Comparing the settlement size figures and the extents of their agricultural territories has indicated the minimum theoretical urbanization rates in the immediate hinterlands of the central place. This is both an index of the sustainability of the central place by the local agricultural resources and a means to project the maximum size of the rural population. The foregoing analysis also underlines the differences between the zones of pre-Roman urbanism and newly founded towns and settlements. In Roman Macedonia, coastal Dalmatia and the northern Adriatic, the minimum local urbanization rates within the 10 km zones never dropped below 30%, even with the minimum size-estimates. In the Danube provinces and Thrace, they range between 10 and 20% in the low size estimate, but as the minimum size figures are unlikely for the auxiliary *vici*, – the most dominant settlement category in these provinces – one suspects that the average local urbanization rates were closer to 20 than to 10%. It is worth stressing that these projections are based on constant urban densities of 150 inhabitants to the hectare that might prove too high, especially for the low-ranking settlements.[664] Moreover, the towns and settlements in the frontier provinces and Thrace have been assigned greater catchment areas than their counterparts in the western Balkan provinces. However, in no way do these remarks question the observed difference between the two principal zones in our study-area. There are a couple of exogenous factors that would have contributed to this divide. The rugged geography in the belt of pre-Roman urbanism, coupled with the high urban density would have given rise to local urbanization rates higher than in the frontier provinces, although the central places in the western Balkan provinces were much smaller than the towns in the latter regions.

It is far more difficult to grasp the implications of these differences for the economic profile of the settlements or for the agrarian relations in their territories. A possible consequence of the fact that at least one-third of the maximum population lived in the central place is that the average towns of Roman Macedonia or Dalmatia were more agriculturally oriented than their counterparts in Pannonia or Moesia. An unknown segment of these communities was possibly involved in farming, continuing the centuries-old tradition of agro-towns in these areas. Bearing in mind the reduced agricultural potential in the territories of these towns, the strong degree of centralization could have functioned as an efficient strategy of coping with land-shortages. On the other hand, most of the newly founded towns and settlements in the frontier provinces not only housed a smaller proportion of the maximum population of their hinterlands, but were also poorly positioned so that they could not take optimal

[664] See the discussion in the introductory section.

advantage of the surrounding agricultural resources. On the surface at least, this circumstance seems to have favoured the indirect exploitation of their agricultural territories.

The differences between individual towns and settlements or between the different settlement categories within each of the two zones are likewise highly important. In all provinces the minimum local urbanization rate does grow with the increasing settlement size. In the great majority of the third-tier settlements – measuring less than 15 ha - it barely reaches 10%, rising to 20-30% in the hinterlands of the autonomous towns but reaches more than 50% among the provincial capitals and the largest agglomerations in the provinces. The latter figure obviously does not pretend to reflect the demographic reality in the territories of these towns. The urbanization rates were probably similar to those on the territories of the autonomous towns, implying that the total population figures for these districts were greater than their grain-producing capacity. Therefore, large and fertile administrative territories would have been the crucial prerequisite for the normal functioning of these towns. Only a minority of the towns and settlements upset the positive correlation between settlement size and the local urbanization rates. These are the settlements located in the narrow coastal zone, defiles or the mountainous parts of our study-region. Even though small in size, the urbanization rates in the territories of these communities were much higher than the urbanization rates normally projected for the settlements that belonged to the same size-categories. We are fairly confident that these figures are a good approximation of the small number of people who could live outside the central place in these areas of challenging terrain.

It is impossible to check the accuracy of these projections by confronting them with an independent set of evidence. Good survey data are available only for a handful of settlements – most of them included in this chapter – and even in these cases, the interpretation is not as straightforward as might be hoped. The key problem is that, in reality, the settlement patterns in the countryside primarily reflect the agrarian relations in the survey-area. They are only indirectly indicative of the size of the rural population. Nevertheless, despite all the difficulties arising from the intensity and scope of the surveys, the fact remains that not a single town in our study-area featured a large nucleated settlement within its 10 or 15 km catchment radius. This does not contradict the relatively high local urbanization rates predicted on the basis of our estimates of the settlement size and their agricultural territories. Moreover, it fits a historically well-attested and much theorized model, albeit more relevant to the Early Modern period than to Classical Antiquity.[665] In this scenario, the high degree of centralization in the urban hinterlands was maintained by continuous rural-urban migration that tallies with the differences between the theoretical district rates projected for the autonomous towns and secondary central places. The power of attraction of the latter was hardly comparable to that of the autonomous towns. More relevant to the central topic of this chapter, the constant influx of the rural population into the major towns in our provinces increased the labour productivity in the countryside and, at the same time, reduced the grain consumption of the rural population.[666]

It is questionable if this mechanism can be readily applied to the time-period studied. Large scale manufacture has been poorly evidenced in the Balkan towns and they had little to offer to the unskilled peasant in terms of employment. In this part of the Roman Empire, the crucial factor that hampered the growth of the rural population in the urban hinterlands was the concentration of

[665] Abrams, Wrigley eds. 1978; Scheidel 2007, 38-86.
[666] Erdkamp 2005, 12-13.

economic and political power in the official towns. The predominant pattern of land ownership and the monopoly on administrative, religious and market services prevented the emergence of large agglomerations in the urban hinterlands. The bulk of the peasant population would have been dispersed into small communities, attached to the estates of the urban elite. In these conditions, there would have been hardly any room for settlement growth in those parts of the countryside that belonged to the catchment areas of the autonomous towns.

Lower urbanization rates in the urban territories are possible, but not unless the projections for the size of the urban population are downsized or higher yields per hectare are supposed. With lower urbanization rates and high size-estimates or population densities of 150 inhabitants to the hectare, the number of settlements that were unsustainable by the local resources would nearly double in certain provinces in our study-area. This scenario is not very convincing. For the majority of the towns in the study-region, it is impossible to think of a realistic mechanism by which the grain deficit would have been overcome. The only viable alternative to the projected high district rates is to decrease the population density in the central place to at least 120 inhabitants per hectare, possibly less for certain categories of subordinate settlements.

Taking the maximum size-estimates and fluctuating urbanization rates, at least 90% of the settlements included in this study could have easily met their grain-demands of the land available in their immediate surroundings. We were surprised by the fairly large number of settlements – including large, autonomous towns – that could have secured their survival, even from the 5-km catchments. The local socio-economic conditions – low population density, the modest wealth of the local elites – limited the growth of the majority of the Balkan towns long before they reached the ceiling of the agricultural capacities of their immediate surroundings.

The most prevalent strategy for coping with the agricultural shortages in many corners in our study-area was to limit the settlement size. This is clearly exemplified by the tiny port-towns on the Adriatic coast. The great majority of these settlements relied on a very narrow agricultural base. Fairly often, they came close to reaching their grain-producing limits, but they never really outgrew their theoretical hinterlands. For many of these settlements, the size-estimates are highly problematic and it is possible that, in many cases, we have simply over-emphasized the strain on the agricultural productivity. Of course, it should not be forgotten that the subsistence base of most port-towns was not limited to the small patches of arable land in the interior. All these settlements made full use of the maritime resources and cogently that they specialized in cultivating olives and vines. Consequently, the land-to-population ratio derived from the estimates of the annual grain production and consumption rates is probably not the ideal yard-stick for this settlement category. The very large number of small port-towns, especially on the Dalmatian and Epirote coasts, proves that theirs was a viable economic strategy. Despite the limited amount of arable land, the coast remained a highly urbanized zone throughout Antiquity, whereas in the much larger grain-producing regions in the interior urban tendencies either struggled to take hold or failed to materialize.

Other communities known for their non-agricultural orientation – the few mining colonies and towns; the settlements that specialized in transport – can rarely be recognized by the size of their agricultural territories. With a few exceptions, the arable surfaces in the mining districts were visibly larger than in the coastal zone. In fact, some of the settlement niches in the mining districts could easily accommodate an agglomeration of 20 ha. Nonetheless, the key to the sustainable exploitation of

these difficultly accessible and isolated corners of the area were the small, rural-like settlements. The pattern of small settlements was reinforced by the juridical status of these districts that was not very favourably inclined towards the emergence of large agglomerations. However, towns like *Municipium Dardanorum* or Ampelum, are examples that differential development was possible even in this sector, notwithstanding the problematic size-estimates for the two mining towns. We can only speculate about the areas from which these *municipia* procured their grain, but the most convenient source would have been the surplus-producing micro-regions within the same province; possibly the same areas that failed to develop an urban or urban-like centre. It is almost certain that the grain supply of these districts was at least in part controlled by the district or provincial procurator.

This brings us to the point that the garrison settlements were the only settlement category whose siting was completely unrelated to the local variations in agricultural potential. The grain-procurement for large segments of their population was in the hands of the provincial government, a situation that freed them from the limitations inherent in their physical setting. The great majority of the garrison settlements were located on the frontiers and often had access to less than 50% of their catchment radii. Even so, most of these agglomerations were of a size that allowed them to live off the resources available locally. It is no accident that, in nearly all the cases in which the garrison settlements outgrew the local agricultural resources, they were granted an autonomous status as well as a generous stretch of territory. This act provided the material base necessary for the sustenance of the civilian community attached to the forts.

Most of the autonomous towns in our study-area were also of a size proportional to the agricultural potential of their immediate surroundings. Only a very small percentage of the second-tier settlements –those measuring between 15 and 60 ha - outgrew the agricultural capacity of their theoretical hinterlands and usually only by a narrow margin. The discrepancies are small and could have easily arisen from the imprecisions in the estimates of the settlement's size or territory. The possibility that population density was lower than 150 per hectare, even in many of the autonomous towns, also requires a serious consideration. However, even if these deficits are roughly accurate, there were mechanisms by which they were overcome. In the next chapter, we shall demonstrate that most of these towns were in control of fairly large territories. Admittedly, these did not always contain prime agricultural land, but nonetheless they did increase the tax-paying and rental income base and extended the outreach of the urban market. The scattered epigraphic and archaeological evidence suggests that some of the major autonomous towns – and particularly those that appear slightly too big for their hinterlands - were involved in manufacture and transport, and this would have certainly opened access to the resources of the neighbouring and more distant regions. As is shown in the next chapter, the elites of these towns were regularly involved in the exploitation of the mining districts and also possibly played a role in provisioning the army. But, for the majority of the autonomous towns that outsripped their immediate hinterlands, it was control of large administrative territories that sustained their relatively large populations.

Unexpectedly, although in hindsight it might seem obvious, the method of investigation adopted proved quite consistent in picking out the wealthiest and largest towns in the study-area. Only the largest and most important towns were far too big for the 10- or 15-km catchment areas. Regardless of the geographical conditions, the large size of these communities regularly exceeded the agricultural potential found within the market radius. When occupying locations marginal to the plough-zone – as was quite often the case –, the deficit in arable land was especially pronounced. It is very difficult to

account for the size and longevity of these settlements unless it is assumed that they were in control of territories that extended well-beyond their market catchments, deployed a much wider and far-reaching scope of economic activities than the average provincial town and/or a privileged position in the political and economic system of the High Empire. Consequently, almost contrary to our initial expectations, the examination of the arable land to population ratio did not highlight the group of settlements that featured highly-specialized economies, – with the exception of a few of the mining towns - but it never failed to isolate the top-ranking settlements in the regional hierarchies; a category whose economic base almost certainly included a strong agrarian component. In the frontier provinces, these were the legionary towns. It is true that, like the rest of the garrison settlements, they did not rely solely on the agricultural potential of their hinterlands, but for many of these settlements – especially the double towns – the corn shortage persists, even after the military segment is subtracted from the total urban population. In some of the provinces, like Pannonia Superior and possibly Dacia, – accepting the maximum population estimate for Sarmizegetusa – the legionary towns were joined by the seat of the financial procurator. In the demilitarized provinces, this role was assumed by the provincial capital in Dalmatia or the seat of the provincial assembly in Thrace. An attribute common to almost all of these towns was the high connectivity of their sites. In the preceding chapter, we pointed out that the majority of the largest towns in our study-area were located along the geometric periphery of the region. This pattern has secured a special role for the largest towns in the wider urban network in this part of the Empire. Towns like Salona or Dyrrhachium were the vital nodes through which Italy was connected to the Balkan Peninsula, whereas the double towns on the Middle Danube were potential bases for further expansion and, by analogy, must have mediated the relations between the Empire and the *Barbaricum*. Most importantly they were crucial to the maintenance of peace on the frontiers and the political stability in Italy and the provinces. This highly sensitive political and military role secured their survival in spite of their large size and marginal locations. The specific reasons behind the growth of the military towns and the large Adriatic ports were obviously different, but their highly connected locations in conjunction with their accumulated wealth and privileges provided them with a sustenance base much greater than their theoretical hinterlands or administrative territories. After the collapse of the *limes* in the middle of the third century and the radical reorganization of the frontier defenses under the Tetrarchy, the military towns declined, while urbanism retreated to the agriculturally more optimal locations behind the frontier zone. On the other hand, the largest civilian towns in the interior maintained their importance and rank throughout Late Antiquity.