Toivo Muilu*, Jarmo Rusanen**

* University of Oulu, Department of Geography,
Agrifood Research Finland, Ruukki Research Station
P.O. Box 3000, FIN-90014, Finland
toivo.muilu@oulu.fi
** University of Oulu, Department of Geography
P.O. Box 3000, FIN-90014, Finland
jarmo.rusanen@oulu.fi

Changes in population and industries in the rural areas of Finland: from analysis of administrative regions to a GIS based approach

***Abstract**: The statistical analysis of rural change is traditionally based on classifications of administrative regions, like municipalities or provinces. These classifications do not allow fine-grained interregional analysis of rural change. Especially in sparsely-populated countries, like Finland, the border between rural and urban areas is often fuzzy, which means that rural elements may be found within administratively urban municipalities. This paper presents a GIS-based approach for analysis of changes in rural population and industries. The data employed is based on 1 x 1 km inhabited grid cells defined by base map coordinates, allowing for a flexible analysis of rural change independent from administrative borders.*

Keywords: Finland, rural change, rural industries, rural definitions, GIS.

Introduction

The Finnish rural areas have undergone a profound change during the last decade or so. The major structural changes have been the breakdown in the numbers of people living in rural areas and in the agricultural employment, which have for a long time been in an interactive relationship. The number of active farms with more than one field hectare has fallen by 25% during Finland's membership in the European Union (1995–2003). Agrifood Research Finland predicts that the number of dairy farms will go down from 17,000 in 2003 to only 10,000 in 2010, in only 6–7 years (Niemi and Ahlstedt 2004). At the same time it was especially the secondary sector that has increased its share in rural employment. These changes are due to many internal and external pressures affecting the profitability of agriculture, but perhaps the major reasons for the development have been the deep recession in the Finnish economy at the beginning of the 1990s and the impact of membership in the European Union on agriculture since 1995.

These changes have not taken place equally in different rural areas, however, since some areas have been more successful. If we want to analyse very detailed internal changes in rural areas we come up against the problem of how to define different rural areas? This paper introduces some examples given by accurate georeferenced data for the analysis of changes within rural areas. The paper is divided into five chapters after this introduction. First we look briefly at the problems in rural area definition and then the Finnish georeferenced data will be introduced. The third and fourth chapters deal with a couple of examples on the GIS-based analyses and finally we make some concluding remarks.

Rural area definitions

The analysis of regional change requires both relevant areal typologies for rural-urban continuum and reliable statistical data. Rural area or „rurality" is not a precise concept as noted by several authors (see e.g. Clout 1977; Gilg 1985; Pacione 1985) but definitions are required for research and administrative purposes, like allocation of regional development funds.

The most commonly used international area classifications are those employed by the OECD and Eurostat. The OECD Project on Rural Indicators was carried out in 1994–1996 as a part of its Rural Development Programme. The project developed a 'degree of rurality' classification, which was based on the population densities of administrative and statistical area units, as these were regarded as providing an indicator that was sufficiently unambiguous and straightforward to calculate. Regions were classified into three types: predominantly rural, significantly rural and predominantly urbanised (OECD 1994; see also Muilu and Rusanen 2004).

The Eurostat classification speaks of 'degrees of urbanisation'. This classification is also a tripartite one, accounting for both population density and the size of the population: densely populated areas, intermediate areas and thinly populated areas. Another classification for rural areas was proposed by the European Commission in its report *The Future of Rural Society* (1988) where the areas are classified among types based on their level of integration into the national economy and their (not exclusively physical) distance from the main centre of their region: remote areas, intermediate areas and economically integrated areas (EC 1997; Eurostat 1997).

The tripartite classifications of rural areas are employed also by Statistics Finland. In Finnish rural policy the rural triple partitioning is well established and it divides the total of 448 municipalities (2002) into sparsely populated rural areas (129 municipalities), rural core areas (179), urban-adjacent rural areas (82) and urban areas (58) (Palttila and Niemi 2003).

These classifications are adequate for most regional and rural policy purposes on the international (like EU) and national level, since they recognize that rural areas are not uniform. Remote areas require quite different rural policy measures

compared to areas located in commuting belts of growth centres, for example. The typologies do not, however, allow fine-grained interregional analysis on rural change on provincial or even municipality levels. Especially in sparsely--populated countries like Finland the border between rural and urban areas is often fuzzy, which means that rural elements may be found within administratively urban municipalities. It is interesting to note, for example, that some of the administrative cities in Finland belong even to the sparsely populated areas in the above typology, even though there are not anymore differences in the administrative status between rural and urban municipalities. This paper presents a GIS based approach for the analysis of change in rural industries, which allows for a very accurate and borderless approach to the rural-urban continuum.

Georeferenced data in Finland

We mean here by the georeferenced data the data sets that are specific to geographical locations by means of base map coordinates and thus are independent of administrative boundaries. In Finland no censuses at regular intervals, e.g. ten years, have been carried out since 1987 when the population census data was compiled through direct access to more that 30 different registers for the first time. These register-based censuses have been done annually after that. Each individual is located geographically with an accuracy of 10–20 metres by means of the base map coordinates of the building designated in the person's address, enabling location and substance data to be combined in whatever manner may be required. People living in the same building like a block of flats get the same building coordinates. The coordinates of the buildings were established in connection with the "conventional" censuses of 1970, 1975, 1980 and 1985, but at that stage the data sets were not of the same quality and coverage as nowadays. This data can without doubt be called georeferenced (Statistics Finland 2003; Muilu and Rusanen 2004).

Finland has a total surface area of 338,145 km^2, of which 304,473 km^2 (90%) is land. Correspondingly, the number of 1 x 1 km base map grid squares that were inhabited in the year 2000 was 102,658, or about a third of the land area. Thus two thirds of the country's base map grids are entirely uninhabited, in addition to which almost a half of the inhabited grid squares, 46%, have no more than five inhabitants, so that all told Finland can be regarded as extremely sparsely inhabited and the importance of the notion of rural areas can be well appreciated (Statistics Finland 2003).

It is not possible to use this data for spatial research on an individual level because of the privacy of the people and so it has to be aggregated into some regional unit. It has been noticed in previous studies that the most suitable unit for analysis of this kind of data on national level are 1 x 1 km grid cells. In most densely populated urban regions also smaller units, like 250 x 250 m, have been used.

To conclude, the GIS based approach means here the use of this unique georeferenced data available only in a few countries besides Finland. The statistical analyses were made with the SAS programme version 8.2. First the numbers and proportions of employees in different industries and by place of residence were calculated in each inhabited 1 x 1 km grid cell with no more than 100 inhabitants, which has been found to be a suitable threshold value for defining rural areas within this data (e.g. Naukkarinen et al. 1993; Muilu and Rusanen 2003). Then line charts (Figures 1–6) were made by ordering the grid cells according to their population density, from the sparsest (1 inhabitant/grid cell) to the densest (100 inh./grid cell). The number of employees in industries and the dominance of different sectors were presented on the y-axis. This simple method gives us a straightforward image of how the employment structure changes in different parts of the rural regional structure.

The numbers of rural population

In the European context the share of rural population in Finland is still high. If we compare the rural population by the means of the classification of municipalities described above the share of sparsely populated rural areas was 10% (approx. 534,000 inhabitants) and the share of rural core areas 17% (approx. 877,000) in 2000. Urban-adjacent rural areas accounted for 16% (approx. 815,000) and the rest of the people (57%, approx. 2,928,000) lived in urban municipalities (Palttila and Niemi 2003).

The numbers of rural people have been decreasing for a long time in Finland. The annually compiled georeferenced data allows us to analyse the short-term changes in rural areas. In our previous study we found that, whereas the total population of Finland has been increasing steadily during the course of history, the rural areas have been losing their population from the 1960s onwards. For example, between the point in time preceding the serious recession period in Finland and the instant of the recovery (1989–1997) the rural areas ($\leq$ 100 inhabitants/km^2) lost 41,473 persons (–3.5%) while the total population of Finland grew by 168,096 persons (3.3%). These changes may not look so big, but it should be noticed that they took place only in just eight years (Muilu and Rusanen 2004).

Changes in industries in rural areas

Agriculture may still be the most important form of land use in core rural areas, but this is no longer the case when its role in employment is concerned. The European Commission (1999), for example, notes that only about a sixth of all jobs are in primary sector in rural areas of Europe and that there are twice as many jobs in the secondary sector as in agriculture. In this chapter we look at some examples of figures that the Finnish georeferenced data and GIS methods enable.

The change in the number of jobs in different industries

First we look at the numbers of jobs in different sectors of industries. As much as almost 80% of jobs in primary industries are located in grid cells with the maximum of 30 inhabitants/km^2. On the other hand the most sparsely populated grid cells (1–4 inhabitants) contain only few jobs altogether, since they are mostly inhabited by old and retired people. Figure 1 also presents the dramatic change that took place between 1980 and 1995. This means that the structural change in rural areas was in full swing already before Finland's membership of the EU in 1995. The more inhabitants in grid cells, i.e. the closer to the cities, the less people were employed in primary industries (Figure 1).

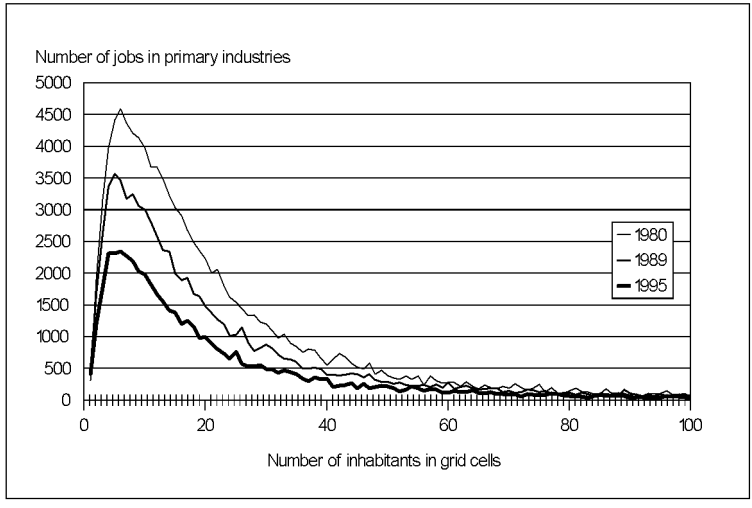

Figure 1. Number of jobs in primary industries by place of residence in inhabited rural areas of Finland (≤ 100 inhabitants per km^2) according to population density in 1980, 1989 and 1995 (Data sources: Statistics Finland, unpublished grid cell data)

Development in secondary and tertiary sectors was notably smoother during the same period. It looks as if in different rural areas in different years there have not been clear trends in the change of numbers jobs outside the primary sector. One explanation for this result is obvious: secondary and tertiary sector jobs are not especially „rural" in character but nevertheless a certain amount of them have always been present in rural areas as a kind of auxiliary activitities for rural people (Figures 2 and 3).

Dominance of different industries in rural areas

Our second example shows how the dominance of different industries has changed in rural areas in Finland. Dominance means here that it was calculated from each grid cell which was the largest sector of employment for the rural population by place of residence in each year.

The dominance of different industries in all rural areas (≤ 100 inhabitants/ km^2) of Finland is presented in Figures 4–6. In 1989 primary industries were still

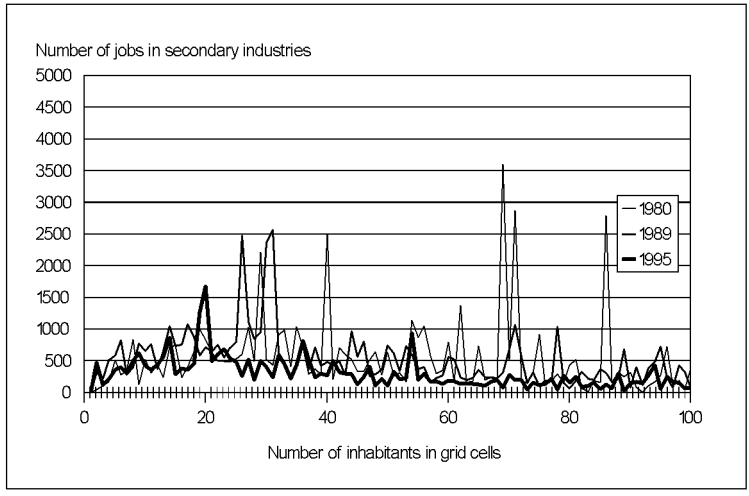

Figure 2. Number of jobs in secondary industries by place of residence in inhabited rural areas of Finland (≤ 100 inhabitants per km^2) according to population density in 1980, 1989 and 1995 (Data sources: Statistics Finland, unpublished grid cell data)

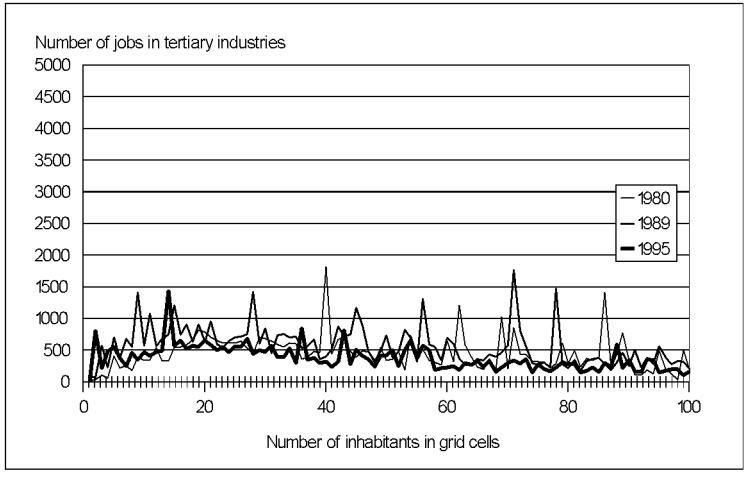

Figure 3. Number of jobs in tertiary industries by place of residence in inhabited rural areas of Finland (≤ 100 inhabitants per km^2) according to population density in 1980, 1989 and 1995 (Data sources: Statistics Finland, unpublished grid cell data)

clearly the most common source of income in rural areas. Data is missing for 1990–1992 but since 1993 a rapid increase of secondary industries changed the situation dramatically. In 1995, the same year that Finland joined the European Union, the shares of primary and secondary sectors in employment were almost even and at the end of last century the tertiary sector was closing on the primary sector (Figure 4).

The change within only ten years (1989–1999) is even more dramatic if we look more closely at different rural areas. Population density classes of 1–20 inhabitants/km^2 include the most sparsely populated and core rural areas, where most of

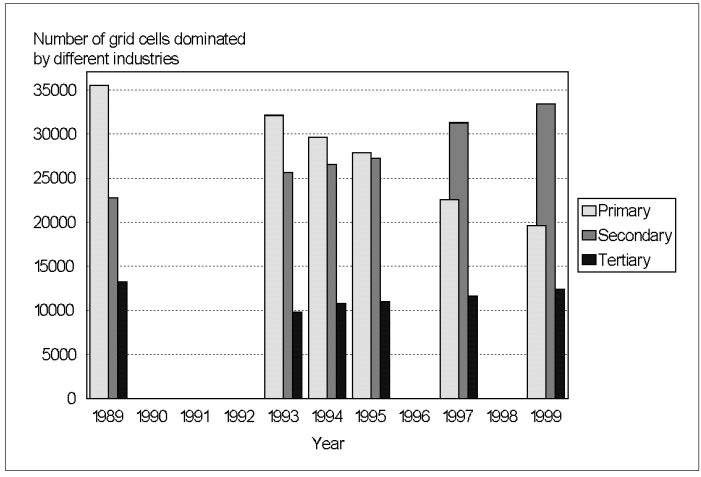

Figure 4. Dominance of different industries by place of residence in inhabited rural areas of Finland (≤ 100 inhabitants per km^2) according to population density in 1989–1999. Data from 1990, 1991, 1992, 1996 and 1998 were not available (Data sources: Statistics Finland, unpublished grid cell data)

the agriculture takes place, and 21–100 inhabitants/km^2 are the rural areas adjacent to commuting centres. In 1989 the dominance of primary industries was very clear in the sparsely populated grid cells. The decrease has been steady after that and, in 1997, the secondary sector was the clearly dominant industry even there. It seems that, compared to the previous figure, the change from primary to tertiary dominance took place two years later (Figure 5). In the commuting belt secondary industries have for a long time been overwhelming and the primary sector has had only a minor role there (Figure 6).

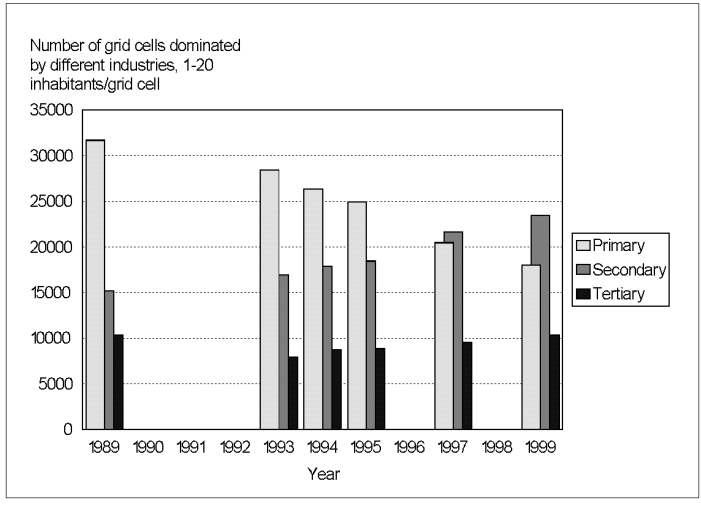

Figure 5. Dominance of different industries by place of residence in sparsely populated rural areas of Finland (≤ 1–20 inhabitants per km^2) according to population density in 1989–1999. Data from 1990, 1991, 1992, 1996 and 1998 were not available (Data sources: Statistics Finland, unpublished grid cell data)

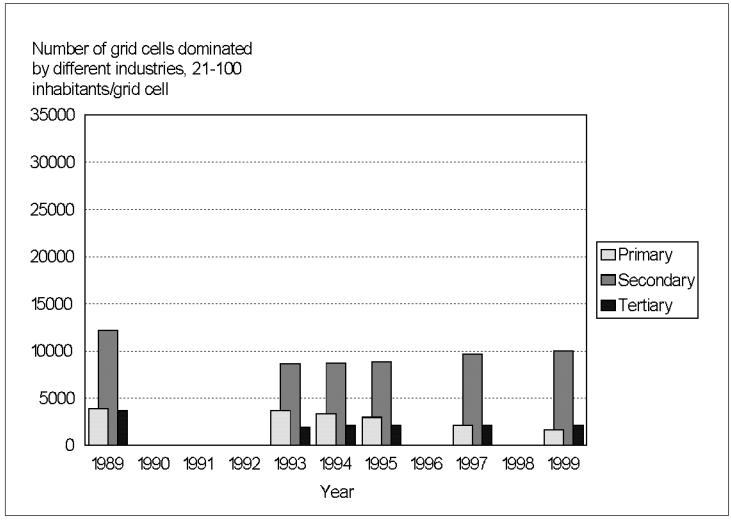

Figure 6. Dominance of different industries by place of residence in rural areas adjacent to commuting centres of Finland (≤ 21–100 inhabitants per km^2) according to population density in 1989–1999. Data from 1990, 1991, 1992, 1996 and 1998 were not available (Data sources: Statistics Finland, unpublished grid cell data)

Conclusions

The loss of population and jobs in primary industries have hit the most sparsely populated and core rural areas most seriously, whilst the situation in rural areas adjacent to commuting centres is substantially more optimistic. The most important finding from this study is that the primary sector no longer holds a dominant role in rural employment in any part of the rural areas of Finland. The change has been very rapid and Finland's membership in the European Union most probably accelerated this process. This is due to the fact that Finland is, in addition to its very sparse population structure, also the most northern country in the world where significant agriculture is practised and so its structure is very sensitive to external changes.

The big question for the future of the remote and sparsely populated rural areas, such as those typical for Finland, is whether local economies and labour markets will manage to find substituting jobs outside the diminishing primary sector. The figures presented in this paper show a considerable increase in the secondary and tertiary sectors in rural areas but, in the future, it is obvious that globalization and enlargement of the EU will increase competition for jobs, not only between urban areas, but also between regions and rural areas. Agrifood Research Finland predicts that the regional development in rural areas of Finland will become even more differentiated in the future, which will result in a polarized regional structure with the winning and loosing regions (Niemi and Ahlstedt 2004). This requires efficient tools for fine-grained interregional and rural analysis if we want to predict and react to this development.

Georeferenced data employed with GIS methods constitute an efficient tool for the analysis of internal structures of regions. At international and national level the tripartite (or sometimes quaternary if urban areas are included) regional classifications or typologies are sufficient for comparative studies, but as mentioned above, in sparsely populated countries and areas like those in Finland more fine-grained data methods are sometimes needed. The Finnish georeferenced data based on 1 x 1 km inhabited grid cells and defined by base map coordinates allow for flexible analysis of rural change, independent of administrative borders.

References

Clout H.D., 1977, *Rural geography*, Pergamon Press, Oxford.

[EC] European Commission, 1988, *The Future of Rural Society,* COM(88)501 final of 28.07.1988, Brussels.

[EC] European Commission Directorate General for Agriculture (DG VI), 1997, *Rural developments*, CAP 2000 Working Document, European Commission, Luxembourg.

[EC] European Commission, 1999, *Sixth Periodic Report on the Social and Economic Situation and Development of Regions in the European Union*, Luxembourg.

Eurostat, 1997, *Regions: Statistical Yearbook 1997*, Luxembourg.

Gilg A., 1985, *An introduction to rural geography*, Edward Arnold, London.

Muilu T., Rusanen J., 2003, *Rural young people in regional development – the case of Finland in 1970–2000*, Journal of Rural Studies, 19, 3, 295–307.

Muilu T., Rusanen J., 2004, *Rural definitions and short-term dynamics in rural areas in Finland in 1989–1997*, Environment and Planning, A, 36, 1499–1516.

Naukkarinen A., Rusanen J., Colpaert A., 1993, *The future of rural settlement structure in Finland*, Geography Research Forum, 13, 61–70.

Niemi, J., Ahlstedt J., (eds.), 2004, *Finnish Agriculture and Rural Industries 2004*, Agrifood Research Finland, Publications 104a, Helsinki.

OECD, 1994, *Creating rural indicators for shaping territorial policy*, Paris.

Pacione M., 1985, *Rural geography*, Harper & Row, Publishers, London.

Palttila Y., Niemi E., 2003, *Maaseutu EU-ohjelmakauden 2000–2006 alussa – maaseutuindikaattorit* (English abstract: *Rural Areas at the Beginning of the 2000–2006 EU Programming Period – Rural Indicators*), Statistics Finland, Katsauksia 2003/2.

Rusanen, J., Muilu T., Colpaert A., Naukkarinen A., 2003, *Georeferenced data as a tool for monitoring the concentration of population in Finland in 1970–1998*, Fennia, 181, 2, 129–144.

Statistics Finland, 2003, *Municipalities and Regional Divisions Based on Municipalities 2003*, Handbook 28.