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Analysis of Farmland Abandonment and the Extent and Location of Agricultural Areas that are Actually Abandoned or are in Risk to be Abandoned

P. Pointereau, F. Coulon, P.Girard, M.Lambotte, T. Stuczynski, V.Sánchez Ortega, A. Del Rio

Editors : E.Anguiano, C.Bamps, J-M.Terres

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ACRONYM LIST

BSPS: Beef Special Premium Scheme

CAP: Common Agricultural Policy

CLC: Corine Land Cover

EEA: European Environment Agency

EPS: Extensification Payment Scheme

FADN: Farm Accountancy Data Network

FLA: Farmland Abandonment

FSS: Farm Structure Survey

GIS: Geographic Information System

HNV: High Nature Value

IACS: Integrated Administration and Control System

IFN: National Forest Survey

INSEE: *Institut National de la Statistique et des Etudes Economiques (France)*

JRC: Joint Research Centre

LAU: Local Administrative Unit (LAU 1 = NUTS 4, LAU 2 = NUTS 5)

LFA: Less Favoured Areas

LU: Livestock Unit

LUCAS: Land use/ Cover Area Frame Statistical Survey

MS: Member State

M: Malopolskie

NUTS: Nomenclature of Territorial Units for Statistics

RGA: *Recensement Géneral de l'Agriculture*

SCPS: Suckler Cow Premium Scheme

SCAFR: *Société de Conseil pour l'Aménagement Foncier Rural*

SIGEC: *Système Intégré de Gestion et de Contrôle*

TERUTI: The French survey on the use of the territory (*Enquête utilisation du territoire*)

UAA: Utilised Agricultural Area

WM: Warminsko-Mazurskie

1. Introduction

In most EU Member States, a significant decline of the Utilised Agricultural Area (UAA) has been shown in the last three decades. The loss of UAA is mainly due to Farmland abandonment but other land-use changes should be taken into account as afforestation and soil sealing.

Farmland abandonment (FLA) can be defined as the cessation of agricultural activities on a given surface of land. This process has been observed in many regions of Europe and at different periods, particularly on marginal land. FLA has significant environmental consequences and is often associated with social and economic problems in rural areas. For parcels that were previously intensively managed, abandonment has brought environmental benefits, particularly a reduction in agricultural chemicals pollution. For areas that used to be grasslands, and that were valued for their botanical interest or as habitats for breeding and migratory birds (High Nature Value farmland), FLA entails significant loss of biodiversity. Specific species are dependent on low fertiliser input, and on grazing or mowing. When these activities come to an end, the botanical composition in HNV farmland can be rapidly altered, and its conservation value will decline within relatively few years. Important bird areas may also lose their character. In the early years of abandonment, this process may be relatively easy to reverse with appropriate management. Once more severe abandonment sets in; a much greater effort is required.

For those reasons, FLA growingly attracts policy-makers´ attention, both at national and EU level. Since 1992, the Common Agricultural Policy (CAP) has increasingly been adapted to better serve sustainability, by means of a fundamental reform process designed to move away from a policy supporting price and production, to a policy of direct income aid and rural development measures. An important step in the reform process was the Agenda 2000, which established that the CAP should not only improve the competitiveness of EU agriculture, guarantee food safety and quality, and stabilise farm incomes, but also provide environmental benefits, enhance the rural landscape and sustain the competitiveness of rural areas across the EU. Consequently, since the CAP reform of 2003, farmers who apply for single farm payments have to comply (cross-compliance) with GAEC (Good Agricultural and Environmental Conditions) and with the Statutory Management Requirements that define standards for the environment, food safety, animal and plant health, and animal welfare.

The 2003 CAP reform took another step toward integrating environmental concerns into the CAP. It reinforced a number of measures that encourage land use and practices compatible with the protection of environmental resources, both in the first pillar (market and income policy) and in the second pillar (rural development policy). Agri-environmental indicators are developed to monitor the integration of environmental concerns into the CAP. They can serve a variety of policy purposes:

- To provide information on the current state of the farmed environment and the ongoing changes;
- To track the impact of agriculture on the environment;
- To assess the impact of agricultural and environmental policies on the environmental management of farms;
- To inform agricultural and environmental policy decisions;
- To inform the broader public on agri-environmental relationships.

One of the agri-environmental indicators to be developed is called ‘identification of the risk of farmland abandonment’ (Nr 14) (COM2006 (508final)). This study aims to prepare the guidelines for this indicator by assessing the state and risk of FLA. Agricultural areas (extent

and location) that are currently abandoned or at risk of land abandonment have been identified, using statistical information and spatial analysis at different NUTS levels.

Moreover, the Council Regulation (Reg. 1698/2005, art. 50, 3) states that the Less Favoured Areas (intermediate category) "*must be affected by significant natural handicaps, notably a low soil productivity or poor climate conditions, and where maintaining an extensive farming activity is important for the management of the land.*" It clearly aims at avoiding the abandonment of the land. In addition, DG Agriculture and Rural Development is currently working on a new definition for classing the EU Other/Intermediate Less Favoured Areas (art.19) to be implemented after 2010. This study aims also to contribute to this task by assessing the driving forces of FLA in the EU-27. Abandonment of agricultural land has been identified using a methodological approach that reveals the essential combination of environmental, economic, social and political aspects. Factors and intensity of land-abandonment have been compared.

The first step of the study addressed a literature overview on the causes of FLA and risk criteria before developing the basement of the methodology. Different definitions of land uses and farmland-abandonment were presented and data sources and the main results at EU-27 level analysed.

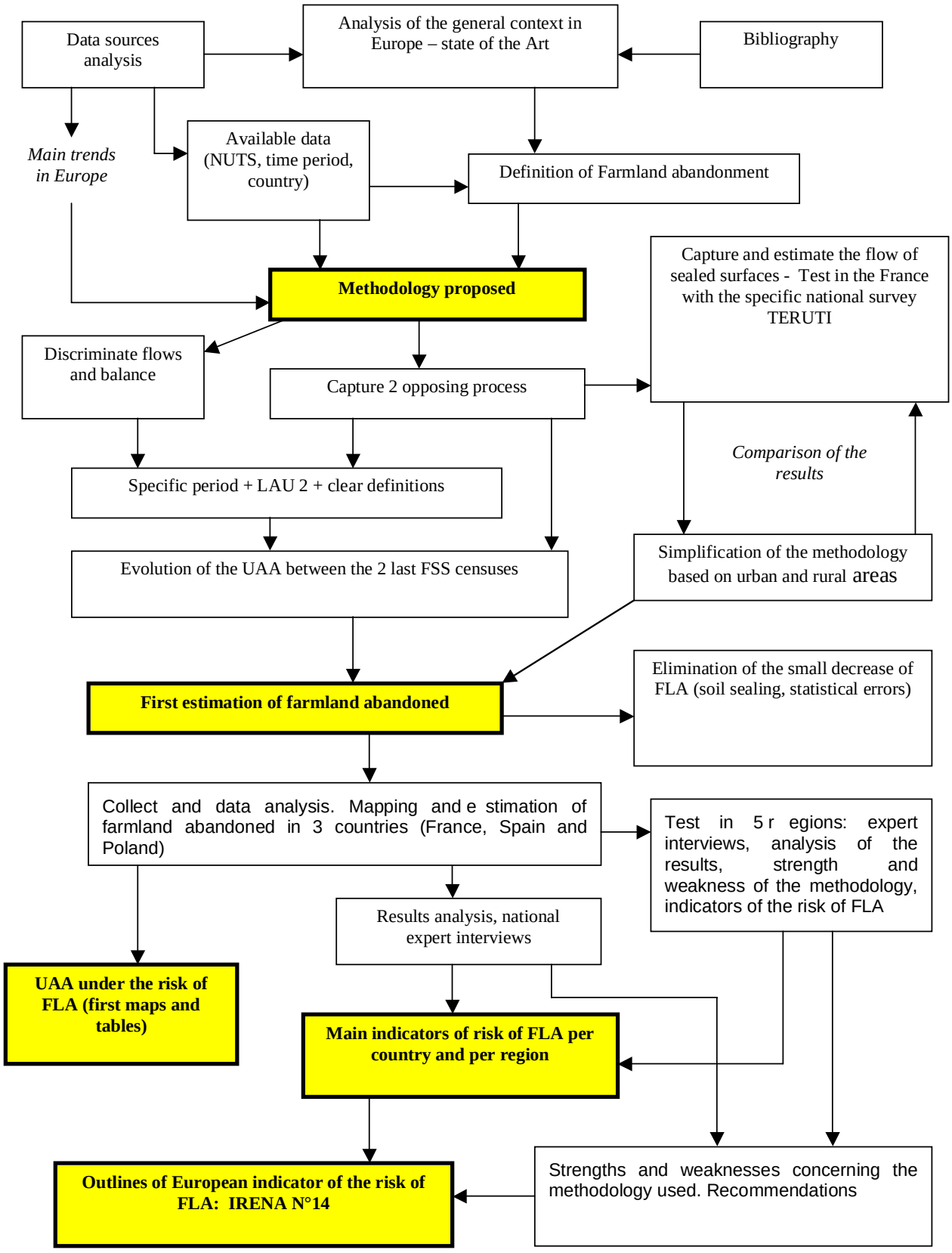
Once defined, the methodology was tested in three of the main agricultural countries in the EU-27 in terms of surface: France, Spain and Poland. These three countries represent 35% of the EU-27 total UAA and have a large range of agricultural situations. The French agricultural sector includes intensive and extensive farming systems, low lands and mountains. The Spanish agriculture encompasses typical Mediterranean crops, as olive groves, and large surfaces of non-cultivated lands. Poland is a new member-state undergoing a transition period.

Prior to the test, a specific analysis has been carried out in France to locate the flow of farmland converted into artificial surfaces, based on the land use survey TERUTI, the Population Census and the French definitions of urban and rural areas (INSEE definitions). Results have been compared to the final methodology proposed, with a view to test the validity of the hypotheses.

After analysing the national results, five test-regions (Aquitaine in France, Galicia and Catalonia in Spain, Malopolskie and Warminsko-Mazurskie in Poland) were chosen to cover different regional contexts where a high level of FLA had been observed – as reported by different experts. In these 5 test-regions, interviews of experts and stakeholders have been carried out in order to ask their opinion on the implemented methodology and on the results obtained, and to analyse in a comprehensive and pragmatic way the causes of farmland abandonment.

Based on the results obtained in the 3 countries and 5 regions and on the main causes of FLA observed, indicators of risk of FLA have been proposed. Finally, recommendations were formulated to improve the methodology and datasets. In addition, suggestions for new surveys were set out.

Figure 1: Global methodology of the study



2. Literature overview on the causes of farmland abandonment and risk criteria

Farmland abandonment is a reality, which began slowly in the first years of the 20th century and became more important as from the 1950s, with the integration of rural societies into a broader economic and social organisation. A disaster scenario that predicted the abandonment of a great part of UAA did not occur. The areas where farmland abandonment happened are mainly the mountain areas of Western Europe, the extensive grasslands (Laurent, 1992), and areas in Eastern Europe with poor soil, which are difficult to exploit economically (Keenleyside, 2004, Grinfelde, 2007). Some social and environmental impacts of farmland abandonment are also summarized in Appendix 2.

Only case studies linked to research programs provided some local results. There are various causes of farmland abandonment in Europe, and they depend on the area and the period under consideration. The causes of farmland abandonment are not the same in every European region (Moravec, 2007). Each region presents a specific agricultural situation that is a consequence of diverse factors (historic, geographic, demographic, economic…). The causes are often a combination of these factors, with one predominating over the others; most of the factors are linked together.

Field conditions (type of soil, slope, exposure…) are important factors to explain farmland abandonment, but their relevance varies according to the type of agricultural system that characterises the production (Gellrich, 2006). Farmland abandonment also occurs when the system is stressed by external forces or by its own evolution towards extensification or intensification, usually driven by economic conditions and the social environment (Baudry, 1991) such as milk-quotas or set-aside.

Scientific regional studies have reported different causes of farmland abandonment, but there is no global accurate study on the causes of farmland abandonment.

The first cause of farmland abandonment was the integration of rural societies into a global system (see Appendix 1). Farmers living in rural areas were confronted to the development of communications, to a new organisation of markets, etc… These changes had an impact on population movements and on the decrease of the number of workers in rural areas. Despite the increase of the farm size, part of the land previously cultivated is no longer used (generally land with low fertility or difficult access).

2.1 Factors of farmland abandonment

2.1.1 Geographic, ecological and agronomic factors

Depending on the geographic and environmental situation, some causes of farmland abandonment can be detected.

A study carried out for the Swiss mountains analysed the ecological and geographic factors of farmland abandonment (Gellrich, 2006). First, the study shows that forest re-growth can be observed between approximately 1 400 m and 2 100 m and on slopes of between 20° and 40°. However, farming has been maintained over a large range of heights.

The study shows that farmland abandonment occurs in areas where average degree-days (heat sums) are low (lower than 1 000 degree days). In fact, up to a certain limit, the higher the heat totals, and the larger the increase of the yield potential of agricultural areas.

Also, the steeper the slope (above 20-25°) the higher the amount of abandoned, because steepness affects the accessibility of land, either by foot or for agricultural machines. With the development of mechanisation, accessibility is becoming a condition for exploiting land (Mottet, 2005). Small size fields are also correlated with farmland abandonment because of the difficulty to cultivate (Mottet, 2005).

Farmland abandonment increases also with the distance to the road (Gellrich, 2006; Mottet, 2005). The Swiss study estimates that farmland abandonment concerns 5% of farmland when roads are at a distance of 800 m from the fields. This factor results from land planning that favoured some areas over others.

Agronomic conditions are also a factor of farmland abandonment. In fact, in Eastern Europe, farmland abandonment occurs generally on poor soils with a low yield potential (EU, 2004). In the Swiss mountains, it was shown that shallow soils are more concerned by farmland abandonment. In fact, below a soil depth of 40 cm, farmland abandonment occurs more frequently (Gellrich, 2005). Deep soil is generally related to higher nutrient and water-holding capacities, and thus a higher yield potential.

Land use and the evolution of the farming system also have consequences on farmland abandonment. For example, in Eastern European countries, there was a decrease in livestock numbers and as a result, a lower demand for fodder and crops, thus involving farmland abandonment (EU, 2004). Alpine pastures are also concerned as it was demonstrated in the Swiss mountains: a land with 60% of alpine pasture is more affected by farmland abandonment (Gellrich, 2006). Economic factors explain this situation. Subsidies there are only based on livestock, whereas in other areas subsidies are based on agricultural surfaces and livestock.

2.1.2 Demographic and socio-economic factors

Rural emigration and immigration have been linked to farmland abandonment in the European mountains (Gellrich, 2006). With the decrease in the number of farm workers, small size farms were no longer sustainable. The size of the farms has increased, but in this process, some poor lands were abandoned. In mountain areas in France, the decrease of the number of workers caused farmland abandonment (Baudry, 1991). A Swiss study (Gellrich, 2006) confirms this fact, showing that in areas where there is a small population working in agriculture (that is to say where the proportion of employees in sectors II and III is high, or around 85 %) and where population migration is high, farmland abandonment occurs more frequently. In areas where there is a low density of population, there is a loss of infrastructure (schools, shops, processing facilities) and a loss of agricultural services (veterinary, slaughterhouse). These areas are no longer attractive for people, especially for farmers.

It is commonly accepted that farmland abandonment occurs in areas where farming is no longer viable (Gellrich, 2006). This factor is linked to geographic, environmental and agronomic factors. Farmland abandonment does mainly occur in areas with poor soils. But the CAP policy tends to limit this phenomenon by helping farmers in Less Favoured Areas (LFA) through subsidies in order to maintain a certain rural society (Baudry, 1991).

In France, it was shown that farmland abandonment correlates with the price of land. In fact, more the lower the price of land, the more there is farmland abandonment. Nevertheless, the decrease in the price of land does not result only from excess in the offer of farmland. The process is far more complex (Laurent, 1992).

Farmland abandonment can also be due to inheritance or succession difficulties. Either there is nobody to inherit the farmer, and the farm is abandoned, (Mottet, 2005) or there is dissension within the family, which prevents the sale of the farm (Laurent, 1992). These problems often happen when inheritance is a problem.

Moreover, the retirement of an older generation who accepted generally low living standards but was part of a strong rural culture, contributed to the increase of farmland abandonment (EU, 2004). In France, this thesis is conflictive, because it was shown that many couples keep a farming activity after their retirement (Laurent, 1992).

2.1.3 Policy effect on farmland abandonment

European and national policies have an impact on land management and farmland abandonment. In 1992, the new CAP established the set-aside scheme in order to limit production. Some predicted an increase of farmland abandonment but it was shown that CAP subsidies were useful to maintain farming in less favoured areas.

The new CAP policy introduced in 2003 furthered the decoupling of aid and production. Since 2005, direct payments are given to farmers in the form of rights, whose value and number are determined by the total aid received by farmers and their UAA area in 2000-2002. Such payments are not linked to current production and should therefore stop the trend toward land utilisation for crop production. Decoupling payments will increase regional specialisation and consequently farmland abandonment, but this effect can be regulated with the GAEC and with payments from the 2nd pillar (Butlault, 2004).

For all MS, **cross-compliance requirements** will "*ensure that all agricultural land, especially agricultural land which is no longer used for production purposes, is maintained in good agricultural and environmental conditions" (GAEC).*

GAECs concern:

- Minimum land management and retention terraces to avoid soil erosion
- Minimum livestock stocking rates
- Protection of permanent pasture
- Maintenance of permanent features
- Avoiding the encroachment of unwanted vegetation on agricultural land

GAECs concern only the agricultural surfaces which received payments. These surfaces, even if there are not cultivated, are not abandoned.

Some scenarios conclude that arable crop production should decrease in the EU-15, mainly through a reduction of land used for this activity, whereas fodder and pasture areas would increase (Latruffe, 2006). In France, decoupling is partial for cereals and oilseed crops. This suggests a risk of abandonment of cereal production in some regions with a low potential. This situation, based on 2005 cereal prices, has completely changed with the high cereal prices since 2006.

New Members States are just starting to implement the CAP Pillar One direct aid payments, and by 2010-13 the payment rates will be fully aligned with those of EU-15 Member States. Most of the new MS (with the exception of Slovenia and Malta) will start making these payments under the 'Single Area payment Scheme' (SAPS), but between 2005 and 2008 they will switch to the 'Single Payment Scheme' (SPS). SAPS payments may encourage farmers to reintroduce long-term management on temporarily abandoned land.

For these Central and Eastern European countries, the new CAP policy (in force after 2004) opened markets to external competition in what used to be a national system. This opening gave rise to competition, and small farms could not compete any more with large farms. However, the creation of large farms will not necessarily use all the farmland available, and some will be abandoned. Despite CAP subsidies farmers, even for some large farms, the competition was too strong.

2.1.4 Historical factors in the New Member States

Concerning the recent period, Central and Eastern European countries have to confront a sudden and radical change. The transition period after 1989 was accompanied by major changes in the agricultural structure, which generally involved the break-up of large collective or state farms, and land privatisation (Keenleyside, 2004). Many farms ceased to operate for some time, or went through a fragmentation process during which management took a seemingly long time to adjust or was temporarily disrupted. The resulting smaller units typically faced considerable challenges, including lack of equipment, limited access to capital, a scarcity of advice and technical support, difficulties with markets, dismantlement of agro-food systems, and low levels of government support. Labour force left agriculture on a large scale. Large numbers of farm animals were slaughtered. The decrease in livestock numbers has consequently led to a lower demand for fodder from grassland and crops.

Furthermore, many of the new landowners used to be urban dwellers, with no experience or particular interest in farming. The connection between ownership and management weakened in many places. Some farmers have to rent land from a large number of different owners in order to create viable holdings.

The consequence was large farmland abandonment. In 2002, in Estonia, 10.1% of agricultural land was categorised as abandoned (in fact classified as fallow land) 21.1% in Latvia, 10.3% in Lithuania, 26.7% in Hungary and 17.6% in Poland (Keenleyside, 2004).

Finally, causes of farmland abandonment are various and generally complementary, which increases farmland abandonment (see Table 2).

2.2 Overview on indicators to assess the risk of FLA

Risk indicators are closely linked to factors of farmland abandonment and several of them have been already pointed out in the bibliography.

From an agronomical point of view, it was noted that farmland abandonment occurs in areas with low livestock density. This risk indicator was used in Eastern European countries (EU, 2004) and in Mountain areas in France (Mottet, 2005). The proportion of alpine pasture is also an indicator in the Swiss mountains (Gellrich, 2006).

The reduction of full time farms and the decrease of professional farms are indicators of farmland abandonment in the Swiss mountains (Laurent, 1992, Gellrich, 2006).

Population age and, more specifically, the proportion of old farmers about to retire is a demographic indicator because it has been seen that the lack of heirs for the farm causes farmland abandonment. The proportion of young farmers in the area can also be measured.

It is also interesting to analyse the type of jobs. Generally, farmland abandonment happens in areas where there is a great proportion of employees in Sectors II & III (Gellrich, 2006). European agri-environmental indicators (IRENA) provide interesting information to evaluate the probability of farmland abandonment in EU:

- Intensification/extensification (IRENA 15),
- Specialisation/diversification (IRENA 16),
- Land use change (IRENA 12),
- Land cover change (IRENA 24).

The indicator IRENA 17 on marginalisation has tried to locate the regions on risk of land abandonment. This indicator provided at NUTS 2 linked economic and demographic factors: low profitability of farms and farmers close to retirement age. Low profitability is assumed to occur where 40% of holdings have a Farm Net Value Added per Annual Work Unit (FNVA/AWU) below 50% of the region's average FNVA/AWU. Regions where farmers aged 55 years and over manage more than 40% of holding are counted as regions with a high share of farmers close to retirement age. But this indicator did not succeed.

Regarding the type of land threatened by FLA and its geographical localisation, permanent grasslands, and especially rough grasslands, appear to be at risk in several regions in Europe, particularly in mountain areas and in islands (see Table 1).

Table 1: Type of land threatened by farmland abandonment and geographic localisation in some European countries

Country	Type of land	Geographic location
England	Natural and semi grasslands	North England Welsh border South west
	Remote mountain and island areas	Northern Ireland Scottish Highlands and Islands, Welsh mountains
France	Grasslands and traditional orchards	Southern Massif Central Dry Alps

Country	Type of land	Geographic location
Germany	Grasslands, mountain areas	Mittelgebirge (Central Mountain) Alps (middle and southern mountains) Bradenburg, Mecklenburg, Vorpommern (north-east of Germany)
Denmark	Permanent grasslands and arable land	Spread all over the country
Greece	Arable land and rough grazing land	Mountainous areas
Italy	Grasslands	Mountain areas of the Alps and the Pennines Hilly areas in Southern Italy
Lithuania	Grasslands	No data
Czech Republic	Grasslands and traditional orchards	Hilly or mountainous areas

Source: Moravec, 2007.

2.3 Synthesis of factors and risk indicators of FLA

Table 2: Synthesis of factors and risk indicators in the literature overview that explain farmland abandonment

Type of factor	Causes of farmland abandonment	Risk indicators favouring farmland abandonment
Geographic	• Steep slope • Distance from the farm to the field • Low accessibility • Low size of the field	• Low degree day • Slope
Demographic	• Decrease of the number of workers • Decrease of professional farms (Laurent, 1992) • Population changes (immigration, emigration)	• Old farm working population (share of farmers close to retirement age) • High proportion of employees in Sectors II & III • Low and high proportion of commuters • Very low population density • Low access to services (a long distance to town) • Low percentage of farmland in the territory • Low density of agricultural services (veterinary, slaughter-house)
Agro-ecological	• Poor soils • Land used as alpine pastures • Small parcels	• Low soil depth • % of low soil quality • Small parcel size • Low livestock density • High proportion of alpine pasture
Socio-economic	• High cultivation costs and low yield potential • Decrease in livestock numbers • Low land price • Farmers close to retire without follow-up • Difficult inheritance because of dissension within the farm between children and parents • Very small farms	• Low proportion of professional farms (full time farm) • Small size farm • Low farming incomes (especially margin per hectare) and low profitability of farms • Low land prices
National and EU policies	• At times, problem in MAE contracts renewal after 5 years duration. • New sanitary requirements from the CAP in eastern European countries since 2004	• Low CAP payments (first and second pillars) per ha • Low agricultural prices
Historical	• For the Eastern European countries, transition to free market economies with a breakdown of the agricultural economy during the 1990-2004 period (Keenleyside, 2004)	

3. Base of the methodology to identify FLA

The principal difficulty of this study is to reveal two opposing processes: (1) the conversion of farmland and (2) the farmland abandonment that is behind the loss of farmland areas. **The conversion of farmland to artificial surfaces** is a continuous process in Europe and in the world. It is linked to several parameters:

- population increase;
- population migration from rural to urban areas, and from city centres to their periphery;
- changes in lifestyle, due to more mobility, more equipment, more residential surfaces and more space for leisure;
- number of people per household.

The flow of sealed soil can be considered as irreversible. One of the conclusions of the literature is that this flow is important and increasing, and cannot be neglected.

Forests are generally well protected in urban areas as a result of the urban population's demand for forest recreation areas. This means that urbanization occurs mainly on agricultural land or on non-utilised agricultural lands, rather than on forests.

Existing methodologies to identify the process of farmland conversion were analysed, and an overview of the potential data sources was given.

The second difficulty of this study concerns **the forest flow**. Forest surfaces are increasing at the national level in most of the European countries (see Chapter 3.5). This is a main trend in Europe, since the latest period of the 19th and the beginning of 20th centuries. During this period, long-established deforestation trends were halted and reversed. However, there still exists a small flow of deforestation, which is difficult to identify. It corresponds to the conversion of forests into transport infrastructures (train, motorways) or into agricultural land. For example, in Germany, during 1977-1998, forest clearing represented in average 50% of the afforestation (Weber, 2000). It is also necessary to distinguish artificial plantations from natural afforestation. The first one occurs on farmland, and is not considered as farmland abandonment.

Afforestation on agricultural lands is an economic project which benefits from public funds provided by programs such as the European program initiated with the 2080/92 Regulation during 1993-1999. This conversion of agricultural land is not considered as farmland abandonment, even if the plantation generally occurs on marginal lands often located in remote or mountainous areas. But this artificial process differs from the natural conversion into forests of non-utilised agricultural lands, which is generally the last step of the farmland abandonment process. Colonisation by tree species happened gradually and over decades. These two different processes can occur at the same time and cannot be located easily. The relationship between forest expansion and agricultural retrenchment is complex, simply because afforestation also happens on "other lands" which were not farmed for many years. And there is no direct national relationship or significant statistical correlation between forest expansion and agricultural contraction for a specific period. The relationship can be considered only over a long period of time.

There is no specific European survey on forest and the best accurate data are provided by FAO at national level. Concerning afforestation, programs initiated under the 2080/92 regulation, results are provided only at NUTS 1.

The third difficulty is that the **processes of farmland abandonment and conversion of non-utilised farmland into agricultural surfaces can occur in the same areas** (NUTS 2, NUTS 3). That is why the UAA net result (even if the flow of soil sealing was identified) at these scales does not give a good view or the best estimate of farmland flows. The net result always hides and under-estimates (compensation by an increase of farmland) the flow of FLA.

The last difficulty is that all these **processes concerning land use flows do not occur at the same time and with the same intensity in the same region or country**. They depend on the social, economical and political context.

In conclusion, to identify farmland abandonment and to understand the driving forces behind, it is necessary:

- to come up with a clear definition of farmland abandonment;
- to work on a specific period and a short time scale;
- to separately identify the flow of sealed and afforested farmland;
- to measure the flows and not only the net result;
- to work at a large scale (LAU 1 and LAU 2);
- to use European databases.

The following two parts of the study analyzed all those criteria before proposing the most suitable methodology to calculate and locate the flow of farmland abandonment.

4. Definitions and Framework

4.1 Categories of land uses concerned by the study

Definitions provided by the Farm Structure Survey (FSS) (Commission decision of 24th November 1999) will be preferred whenever they are available.

4.1.1 Utilised agricultural area

The FSS definition is *"the total area taken up by arable land, permanent grassland, permanent crops and kitchen gardens."* The Utilised Agricultural Area (UAA) refers to the total area used for crop production, which is exhaustively described as: arable land including temporary grazing and fallow and green manure, permanent grassland, land under permanent crops (e.g. fruits and grapes), crops under greenhouses and other utilised agricultural areas. **The UAA includes set-aside, fallow land and rough grazing but does not include common land** consisting of pasture, horticultural or other land, if the land is not operated as an agricultural holding. This includes common land allotted (land over which the holder enjoys rights by virtue of his occupancy of a particular post or allotted by the parish or other organisation) and common land which has been rented out.

4.1.2 Fallow land and set-aside

Fallow land is not to be confused with non-utilised agricultural area. **Fallow land is part of the UAA**. The essential characteristic of fallow land is that **it is left to recover**, normally for the whole crop year.

Fallow land may be: *bare land bearing no crops at all, land with spontaneous natural growth (the normal weeds that grow on any land), which may be used as feed or ploughed in, or land sown exclusively for the production of green manure (green fallow)* (FSS). The FADN Survey specifies that *UAA under rotation and not harvested, may provide poor quality pastures*.

From the agronomic point of view, fallow land is land temporarily let to rest in order to improve soil fertility.

Set-aside was introduced by the 1992 CAP reform, making it compulsory for farmers to set aside a part of their fields in order to limit overproduction. In exchange, the area let to rest is subsidized. The 2003 CAP reform specified that set-aside land can be cultivated for non-food production. Set-aside land is part of the fallow land only when it is not cultivated for non-food

products (energetic crops or industrial crops). The duration of set aside land is at least one year and can reach 5 years in some countries.

Some confusion exists due to the translation and the interpretation of the term 'fallow land' by the different stakeholders in each country, to the recent evolution forcing farmers to limit their production by freezing part of their land, and to the particular situation of the new MS undergoing a transition period.

3 types of land can be distinguished behind the generic term of fallow:

- The agronomic fallow as green manure, important in terms of surface in the past, but limited today by input use (fertilisers) and land management (drainage, irrigation).
- The set-aside, not cultivated with energetic crops or industrial crops.
- The set-aside, cultivated with energetic or industrial crops.

In the new Member States, the situation is particular. Set-aside has not been implemented, and a high proportion of the observed fallow land comes from the abandonment of arable lands and pastures during the transition period (1990-2004). Fallow land, in these MS, is considered by some authors as agricultural abandoned land because set-aside is not implemented (Keenleyside, 2004).

4.1.3 Non-utilised agricultural area and other land

'Other land' not included in the UAA is considered as non-utilised agricultural land (fallow land is excluded) and land occupied by farmyard buildings, tracks, ponds, quarries, infertile land, rocks, etc…

Non-utilised (or unutilized) agricultural land is defined as "*agricultural land which is no longer farmed, for economic, social or other reasons, and which is not used in the crop rotation system which means that no agricultural use is intended. This land could be brought back into cultivation using the resources normally available on an agricultural holding*" (source: FSS).

Considering the definition of farmland abandoned (see Chapter 4) and the methodology used to catch the farmland abandoned (see Chapter 3.2), this FSS class 'non-utilised agricultural land' is not included in farmland abandoned because not included in the UAA.

4.1.4 Forest area and wooded area

Wooded areas are not included in the UAA. Wooded area is "*covered with trees or forest shrubs, including poplar plantations inside and outside woods and forest-tree nurseries grown in woodland for the holding's own requirements, as well as forest facilities. Windbreaks, shelter-belts, hedgerows, etc, should be included insofar as it is appropriate to regard them as woodland*" (source: FSS).

FAO and most of National Forestry Surveys make differences between forest area and other wooded area such as isolated trees, small groups or lines of trees. France, for example, includes hedges and isolated trees in this category because these surfaces can be identified by the land use survey TERUTI. But generally, in agricultural surveys as FSS or FADN, hedges and isolated trees are part of UAA (FSS definition), because they are clearly included in the cadastral surface. This can be a source of confusion.

Other confusions arise when open woodlands are grazed.

FAO definitions

Forest area:

Forestland comprises the actual forest areas dominated by trees or shrubs capable of producing wood or other forest products. Minimum surface area is 0.5 ha. Areas should be covered by forest trees for at least 10%, measured as the vertical projection from the trees for a mature stand. Unstocked forestland includes areas which are not themselves productive but necessary for production.

Other wooded areas

These are the wooded formations of any kind less than 0.5 ha in size, as well as open woodlands having a crown density of less than 10%, areas of brushwood, shrub land, stunted trees, etc…

Not included are orchards, gardens, parks and other areas having ornamental plants

Forest areas and other wooded areas are estimated with a great precision by the National Forestry Surveys (as *Inventaire Forestier National* in France or the *Inventario Forestal Nacional* in Spain). The main results are presented in the FAO database 'FAOSTAT'.

4.1.5 Definition of artificial areas

Agricultural surveys (FSS, FADN) do not provide any information on artificial areas other than the surfaces occupied by farm buildings and included in the category 'Other land'. They are not concerned with the estimate of artificial areas. This is not their objective.

European datasets that can estimate artificial surfaces are: Corine Land Cover and Land use/ Cover Area Frame Statistical Survey (Lucas).

Artificial surfaces are integrated in the CLC category 1, including 4 sub-classes: urban fabric (1.1), Industrial, commercial and transport units (1.2), mines, dumps and construction sites (1.3) and artificial non-agricultural vegetated areas (1.4) which include lawns.

LUCAS proposes two categories for artificial lands: with buildings and without buildings.

4.1.6 Different definition for a same category

The main differences between the FSS survey and a land use/cover survey such as LUCAS (or a national land use survey such as TERUTI in France) or CLC (only land cover), is that FSS is based on the farmer's declaration while the CLC is based on photo- interpretation (aerial-survey technique or satellite images (remote-sensing technique)) and LUCAS gathers info through field survey. Table 3 presents the main differences between FSS and CLC.

The definitions of utilised agricultural land and non-utilised agricultural land are not exactly the same, due to the fact that these two categories of survey are based on two different approaches: land use and land cover. This is one of the reasons why these surveys may have different UAA.

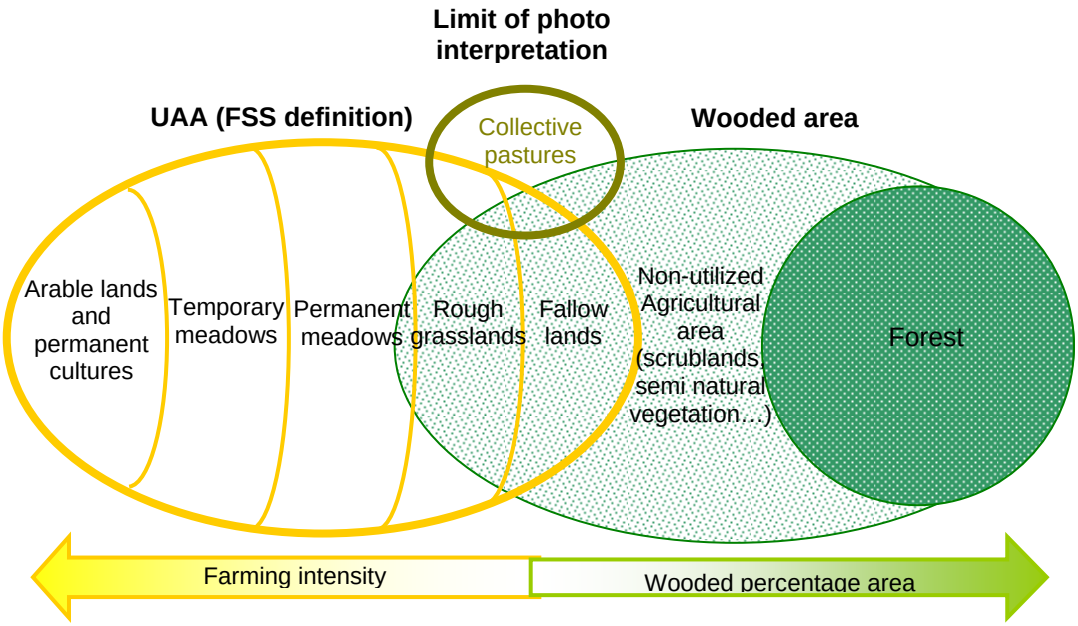
CLC should be used with care for area estimation. The direct use by simple polygon measurement can give strongly biased results, for several reasons, mainly because of a scale that is not suitable for area statistics. In principle the direct use of CLC for estimation is only acceptable when no other data are available.

Area-estimation of the UAA/agricultural areas by using the CLC can give strongly biased results. The CLC-farmland area estimations (all agricultural classes and natural grassland) give different results than the UAA/agricultural areas as available in the Farm Structure Survey due to the different ways of data-collection, methodology and definitions.

Table 3: Comparison of UAA and other land covers according to the FSS survey, CLC and French TERUTI survey

	FSS	CLC	TERUTI
For all categories		Small surface categories are captured by the dominant categories (limit of 25 ha) with a risk of underestimation of the agricultural surface in dominant urban areas or forest areas, and an overestimation in dominantly agricultural areas.	Sample survey based on 550 000 points observed. 1 point weights for 100 ha.
UAA	Declared by the farmer. Includes fallows and scrublands that are grazed in an extensive way.	Includes some land owned by non-farmers and managed as farmland. For example: properties of less than 1 ha (generally grasslands grazed by horses or sheep). Can exclude some rough grasslands and some 'old' fallow lands.	Includes all crops, grasslands, summer pastures, permanent crops, fallow land and family gardens owned or not owned by farmers. But excludes isolated trees and hedges.
Fallow land	Included in the UAA. FSS distinguishes fallow land with no economic use and set-aside area used for the production of non-food products	There is no specific category for fallow land. If the set-aside is cultivated with non-food products, it will be classified as arable land. Fallow land can be included either in agricultural areas or in semi-natural areas. If the surface of fallow land is small, it will be generally included in agricultural areas.	
Grassland	Included in the UAA in several categories: temporary grasslands, productive permanent grasslands and rough grasslands.	Classified either under pastures (agricultural areas) or as natural grassland (forest and semi-natural areas)	Divided in 6 classes: artificial grassland (based on legumes), temporary grasslands, productive permanent grasslands, rough grasslands, summer pastures and pastures with traditional orchards.
Common lands	Excluded. It is only known if the farmer uses common lands	No possibility to differentiate common lands from pastures or natural grasslands.	Specific class but only located in mountains.
Non-utilised agricultural land	Only the surfaces included in the holding and not considered in the UAA	The non-utilised agricultural land is classified in different typologies such as 'agriculture and significant natural vegetation mosaics' or 'moors and heathland'.	Two classes are considered '*friches*' and '*landes' which are semi-natural areas not farmed and with less than 10% wooded area.*
Forest and other wooded areas	All wooded land on the holding.	All forests classified in different types	Includes poplar plantation, small wood (less than 0.5 ha) and isolated trees.
Artificial areas	Not included.	Specific categories	Specific categories

Figure 2: The frontier between utilised agricultural land, non-utilised agricultural land and forest.



4.1.7 Difficulties in land categorisation

The estimate of abandoned farmland or land in the process of abandonment is difficult because the limits of the different land uses are not clear and precise, as for example between rough grassland which is only grazed several weeks per year and a non-utilised land which was abandoned six years ago. In both cases, shrubs and tall herbs will be found. The presence of grazing animals is the only difference. The same can be said of the difference between an old fallow and a non-utilised farmland. It is simply a question of declaration by the farmer. IACS provides annually an UAA and can offer an estimation of farmland loss. However, the access to the data is limited in some countries and not all the farmland is included in IACS.

Even if common lands are not identified by FSS, this is not a major problem, as long as the variation between the two periods is considered.

In some regions, sylvopastoralism (as '*dehesas*' in Spain and Portugal or '*pré-bois*' in the Alps) can also be a source of errors. *Dehesas* are usually classified as pastures, and the surface occupied by trees, calculated on the basis of an average diameter per tree, is discounted from the total surface.

4.2 Definition of farmland abandonment

Abandoned land definitions are complex and results will be different according to the chosen definition.

Some authors have also given their point of view on the farmland abandonment definition:

- "*A shift from a given pattern of land use (often extensive/traditional farmland) to a less intensive one caused by the reduction of human activity, leading to a recovery of scrublands and eventually forest (but alternative pattern possible).”* (Danilo, 2003)
- "*Land abandonment is not reduced to stopping farming exploitation but it can also correspond to a change in the farm use of the soil, from a traditional use to a less intensive use*." (Baudry, 1991)
- "*The land is considered as abandoned land when it's no longer used as an economic resource*." (Coppola, 2004)
- "*Abandonned land is an unused resource, both economically and environmentally.”* (Keenleyside, 2004)
- "*A land which has not been used for agricultural production without alternative exploitation (forestry, urbanisation) covered all the year by a vegetal laye*r." (Bühnemann, 1979)

The different definition provided by literature proves the complexity of farmland abandonment. These definitions depend on the type of their approach (administrative, social…see Table 4) and are adaptable to the context of the country. Thus, some countries use a qualitative definition of abandoned land (such as a description of the condition of the land) whereas others have a quantitative definition (number of years without cultivation or grazing). **In all cases, it is acknowledged that farmland is considered to be abandoned when there are no more farming functions.** Soil sealing and tree plantation are never considered as a process of farmland abandonment.

In England, to benefit from GAEC subsidies, shrubs and rank vegetation must be cut or grazed at least once every five years. This implies that land is considered to be abandoned if left unmanaged for more than five years.

In Germany, there is no official definition. Only in 1956 a social definition appears and specified that abandoned land refers to farmland that is no longer cultivated due to social and structural change.

In Greece and Lithuania, abandoned land is defined as land that has not been used for more than five years.

The different definitions of farmland abandonment can be classified by types of approach and compared (see Table 4).

Table 4: Strengths and weaknesses of the different definitions of farmland abandonment

Definitions	Definition	Strengths	Weaknesses
Administrative	Farmland is abandoned if left unmanaged for more than 5 years.	Easiness to quantify with investigation or declaration. Clear definition.	Only agricultural land declared by farmers. Does not take into account common lands when they are managed by several farm
	Land which has not been used for agricultural production for 2 years.	Idem	Idem
Economic	The land is considered as abandoned land when it is no longer used as an economic resource.	Can be captured by the price of the abandoned land compared to the average market price of agricultural land. The farmer's price should be lower.	A land does not just have an economic function. Farming is only seen as a sector that must maximise its profits.
Social	Land abandoned following social and structural changes. Perception by other social categories. Generally people do not make a difference between fallow land and non-utilised farmland.	It takes into account the causes of farmland abandonment: farmers' age, farm size.	Can be too restrictive for certain cases.
Ecological Landscape	Based on the description of the vegetal cover: percentage of scrubs, bushes and trees.	Easiness to quantify with satellite images or surveyors.	It is too restrictive. The same vegetation state can result in various uses (e.g.: grazing, nature conservation)
Agronomic	Land where farming has ceased and land which has been under-exploited.	There is an active process with a central point, which is farming.	There are many states of under-exploited land that are not easy to differentiate.

Generally, farmland and forests are easily characterised because they are economically exploited. But between these two categories, there are other land uses with different definitions. Farmland abandonment is a result of ceasing farmland exploitation, but certain authors also consider it as a change in cultural practices. The process of extensification is considered as the starting point for land abandonment. In fact, **land abandonment corresponds to a decline of farming.**

There are two different ways to consider land abandonment. The first one considers that land is abandoned when it is no longer cultivated or used by farmers. This refers to farmland abandonment. The second approach considers that farmland abandonment is a continuous process linked to the extensification of practices, which leads to a lower utilisation of land and finally to its abandonment. Some authors talk about *semi abandonment* or *hidden abandonment* (Keenleyside, 2004).

Statistical surveys (FSS, FADN) use the first approach because they need simple and clear definitions to obtain clear and comparable answers. The **UAA is a key point** of all the statistical surveys because it is used in different and important ratios such as farm size, yields, stocking density or average payments per ha. Most of the agricultural payments are also linked to an agricultural surface.

4.3 Time scale and period considered

To estimate abandoned farmland and the risk of farmland abandonment, it is necessary to **consider a specific period and a specific territory**. The period is important because some factors of farmland abandonment are directly linked to the agricultural context, such as

agricultural product prices or payment amounts. Farmland abandonment is also linked to social, historical and economic aspects, which differ from one country to another, and to the time period (see the 3 studied countries). The case of the new member states is a good example of how the situation differs from the old MS (farm size, land privatisation, market organisation).

It is also necessary to **work on the latest data available** to take into account the evolution of the agricultural context.

It is clear that the context of the most recent period (2001-2007) is different from that of the last decade (1990-2000). In the old MS, the 1990-2000 decade corresponds to the implementation of the 1992 CAP reform, and in the new MS, to a transition period. The recent 2001-2007 period is that of the implementation of the new CAP reform (decoupled payments, cross compliance). In the case of Poland, there was the CAP implementation and a high increase of subsidies to Polish farmers.

Contrary to the annual rotation change and crop-sharing in the farmland, farmland abandonment is a process which has to be considered over several years. There is no real need to build an annual indicator. **Five years is the minimum time period to study and identify the process.**

4.4 Data sources

4.4.1 European level

At the European level, 4 main data sources were used:

- **FAOSTAT**

This FAO database provides:

- Relevant statistics concerning the forest area per country, especially for the years 1990, 2000 and 2005, years of the Forest Resource Assessments.
- Long term series on UAA (1961-2003).

- **European Commission**

Eurostat provides:

- long term series of UAA evolution (from1973/1991 to 2003/2006 depending of the country) at NUTS 1 (Agriculture/land use)
- the administrative limits of municipalities (Gisco)

DG Agriculture and Rural Development: FADN provides data on the business operation of farms. The spatial level varies from national to regional level. This source was not used in this study.

- **Corine Land Cover**

CLC is the only data source which provides the flows between the different land uses, but only for the 1990-2000 period. It estimates the withdrawal of farming and the conversion of farmland to artificial surfaces.

4.4.2 National level

- **Population and Housing Census**

In France, the National Institute of Statistics and Economic studies (INSEE), provided the population data at LAU 2 for the two last censuses (see Table 8). The National Institute of Statistics (INE) provided data for Spain and the Ministry of Agriculture (GUS) for Poland.

➢ **FSS**

Finally, the Farm Structure Survey (FSS) is the main data source used in this study, together with the population censuses. The main variable used was UAA. The two latest FSS, 1988-2000 for France, 1989-1999 for Spain and 1996-2002 for Poland, were provided at LAU 2 by the national statistical divisions of the Ministry of Agriculture.

➢ **Other surveys**

For France, three other data sources were used:

- The land use survey TERUTI, for the 1992-2003 period.
- The national forestry survey (*Inventaire Forestier National*) which provides data on the evolution of the forest area for a period of 12 years, at the *département* level, and at a specific scale called '*Petite Région Forestière*'.
- The SCAFR database concerning the purchasing and selling of agricultural land.

4.4.3 Conclusions concerning the data sources

The European databases (FAOSTAT, Eurostat/Agriculture/land use, CLC) were used to produce an analysis of the main land uses and the main trends in Europe over the recent periods.

FSS is a European Survey (described in the Regulation N° 571/88 of 29 February 1988) but currently not publicly available at LAU 2 for EU-27. The datasets were finally provided by National Agricultural Ministry of each country.

In conclusion, the final results of this study (Tables and Maps) are based on the latest (national) FSS and population census, which provided data at LAU 2.

The time spent to obtain all these data was particularly long and explains the delay incurred by this study.

4.5 Data results for the EU-27 at national level

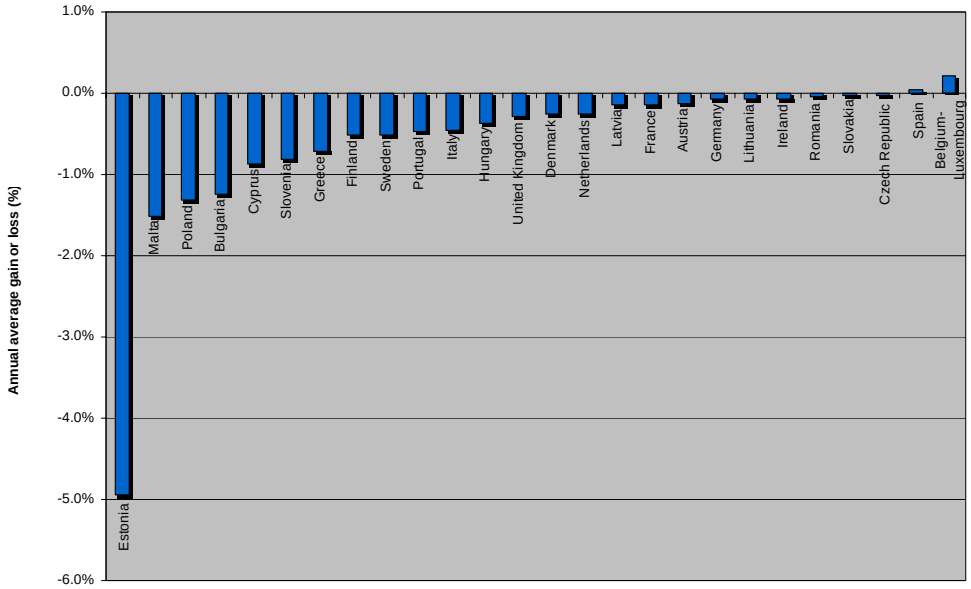
4.5.1 The agricultural area

The agricultural area of the EU-27 covered 212 million ha in 1961, 207 million ha in 1993, 201 million ha in 2000 and 195 million ha in 2003 (source FRA 2005-FAO). This long term FAO database series estimates the loss of UAA over 42 years at 30 million ha, or an average of 707 000 ha per year.

Concerning the recent period (1993/2003), the UAA is decreasing in almost all the countries except Spain and Belgium+Luxembourg **(see Figure 3)**. Most of the countries lost between 0.1% and 1.5% of their UAA per year. The greatest loss in terms of percentage occurred in Estonia (-5%).

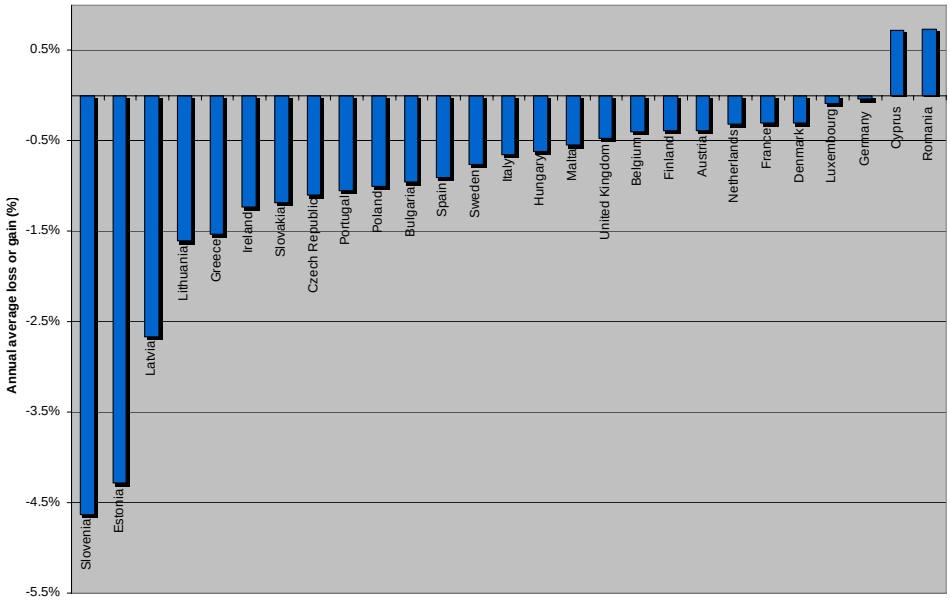
Data from Eurostat (Agriculture/Land use) **(see Figure 4)** shows some differences with an increase of the UAA only in Cyprus and Romania. Most of the countries have lost between 0.1% and 1.5% of their UAA per year. The greatest loss in terms of percentage occurred in Slovenia (-4.6%) and in the Baltic countries (Estonia -4.3%, Latvia -2.7% and Lithuania -1.6%).

Figure 3: UAA annual average evolution in EU between 1993 and 2003 (%)



Source: FAOSTAT

Figure 4: UAA annual average evolution (%) of the EU-27



Source: Eurostat - (Agriculture/Land use) ; ** BE , DK, SP, FR, GR, IE, IT, LU, NL, UK, (1973-2005), SE (1983-2004) PT (1984-2005), AT, BG, CZ, EE, HU, LT, LV, PL, RO, FI, CY(1987-2005), SK (1988/2005), DE, SL, MT (1991-2005)*

The UAA increase observed after 1990 (compared to the period 1970/1990) must be due to the **CAP reform** decided in 1992 and implemented in 1993. Gradually, aid has been linked to surface and not to crop yields or to the number of animals:

- 1993: coupled payments for the surface of arable crops and set-aside.
- 1993: a density factor (administrative Livestock Unit/fodder surface) is created, to receive the Suckler Cow Premium and the Special Premium (created in 1980 and 1987 with no eligibility criteria regarding livestock density) which was fixed at 3.5 in 1993. It

was reduced to 3.0 in 1994, to 2.5 in 1995, to 2 in 1996, 1.9 in 2002 and 1.8 in 2003 (with some changes in the method of counting the fodder surfaces and the LU).

- 1993: establishment of a new premium: the Extensification Premium (representing 25% of total animal payments) with a stocking density limit going from 1 to 1.8 depending of the year, the country. Since 2003 a new compliance is added with a minimum 50% of grassland in the UAA
- 2000: the LFA payments are granted to surfaces (they were previously linked to the number of animals). Eligibility criteria (such as maximum LU) can be decided by the MS.
- 1993: implementation of the new agro-environmental scheme (2078) allocated with an increased budget. Some measures concern directly the management of extensive grasslands.

Other factors, such as **taxes**, could also have influenced the agricultural surface used as low productive grassland. For example, in France, in the 1990s, a part of the taxes was proportional to the UAA surface of the farm. This situation changed gradually, and now state taxes and social taxes are proportional to the farm income. Land taxes have also been reduced.

The consequences are that before the nineties, farmers underestimated their surface declaration. After the nineties, it was more profitable for them to declare all their surfaces and obtain an official rent for land used without an official certification. This was particularly true for grazing regions. This context can explain the surface increase between 1990 and 2000 in some countries and in some regions such as the South-East of France or Spain. Therefore, it is necessary to look also at extensification criteria such as the LU/forage area, or the percentage of permanent grasslands/UAA.

The new situation is:

- The implementation since 2005 of the single payment scheme and the decoupling of payments.
- The CAP implementation since 2004 in the new MS.
- The high increase of cereal prices since 2006 benefits specialised crop systems and not breeding systems, which must buy feedstuff.

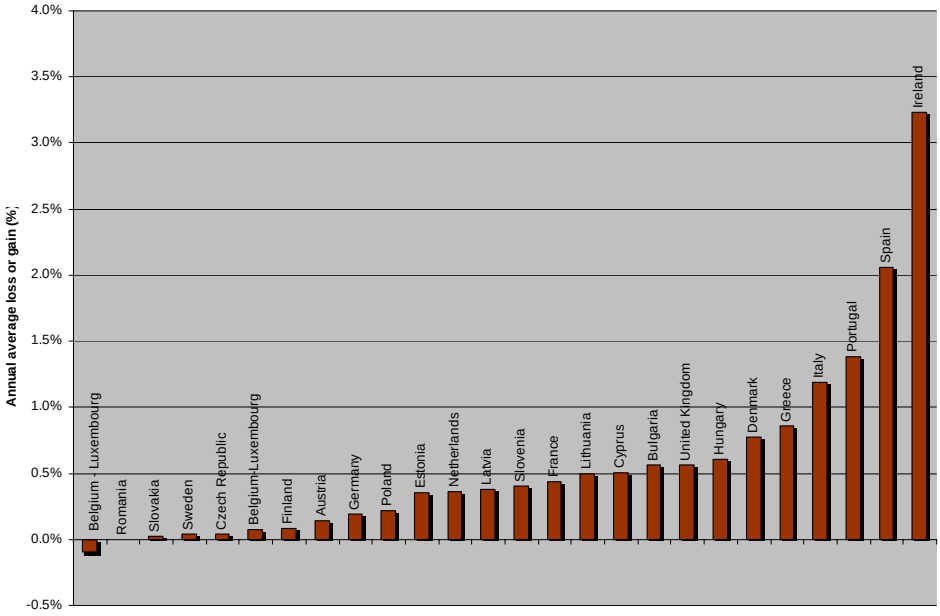
This new context clearly shows that the process of farmland abandonment must be considered in the frame of a specific period.

The evolution of land use and land management will also depend on the implementation of the GAEC. To receive payments, land must be maintained in good environmental conditions and integrate the IACS system. The non-integration into the IACS system could be in the future a new reason for farmland abandonment.

4.5.2 The forest area

The forest area of the EU-27 was 145 million ha in 1990, 152 million in 2000 and 156 million in 2005 (Source: FRA 2005-FAO) representing 36% of the EU territory.

Figure 5: Forest annual average evolution in EU between 1990 and 2005 (%)



Source: FAOSTAT (for Spain the methodology has changed: the forest area started with trees covering more than 20% of area in 1990, and only 10% of area in 2005).

A gain in forest surfaces is observed and estimated at 10 939 000 ha in 15 years (+7.6%) corresponding to an average of **729 000 ha per year (at an average annual rate of 0.48%)**. The highest increase rates during this recent period are in:

- Ireland +52% (Forest area: 10% of the country)
- Spain +33%
- Portugal +22%
- Italy +19%
- Greece +14%
- Denmark +12% (Forest area: 12% of the country)
- Hungary +10%
- UK +9% (Forest area: 12% of the country)
- Bulgaria +9%

Most of these countries are located either in the Mediterranean area (Spain, Portugal, Italy, Greece and Bulgaria) or in the Atlantic area. The former have a high-afforested rate and generally poor soil conditions. The latter have a very low afforested rate (Ireland, Denmark, UK). The Netherlands is not on the list, but no land is available there for afforestation.

During this period, the surfaces of scrublands and other woodlands in EU-27 decreased by 2 889 000 ha (24 M to 21 M), or 193 000 ha per year. The main hypothesis is that these areas became forests (artificial plantations and natural afforestation).

Other woodlands are mainly located in Mediterranean countries Spain (11 Mha), Greece (2.9 Mha), France (1.8 Mha), Italy (1 Mha), but also in Sweden (3.2 Mha) and Finland (0.8 Mha). Their surfaces are decreasing in all countries except Italy (+ 167 000 ha).

The forest area decreased in only 3 countries between 1990 and 2005:

- Belgium and Luxembourg: -10 000 ha
- Romania: -1 000 ha

Concerning **farmland** afforestation under regulation n°2080/92, only partial data were collected. DG Agri only provides national results. The flow of afforestation for EU-15 was estimated at 899 857 ha at the end of April 1999 (Weber, 2000). The main countries concerned are Spain (406 000 ha), Portugal (124 000 ha), UK (101 000 ha) Ireland (98 000 ha) Italy (60 000 ha) and France (45 000) Spain dominated, with 47% of the total afforested land. In most Member States, the decrease, between 1994 and 1999, of utilised agricultural area (UAA) resulting from afforestation, was marginal. The highest decreases were located in Ireland (1.35%), Portugal (1.25%) and Spain (0.95%). 61% of afforested land was taken from permanent grassland and pasture, 36% from arable land and 3% from land under permanent crops (Weber, 2000).

The part of the afforestation flow in forest expansion depends of the country and it is close to 100% in Ireland and only 17% in France.

The lack of accurate data (LAU 2) on farmland afforestation has an impact on the methodology used to estimate the flow of abandoned farmland. As farmland afforestation[1] is not considered as part of the process of farmland abandonment, this surface should be considered separately in the flow of UAA loss. But this can only be done at the end, once the UAA loss (excluding urban areas) is estimated.

The CLC database provides an estimate of the withdrawal of farming LCF6 ("*farmland abandonment and other conversions from agriculture activity in favour of forests or natural land*").

The results for 24 countries (EU 27 minus Sweden, Finland, Cyprus and Malta, + Croatia) ver the 1990-2000 period are:

- 239 300 ha corresponding to a loss of arable land and permanent crops (2% of the stock);
- 286 000 ha corresponding to a loss of pastures and mosaics land and permanent crops (3.5% of the stock);
- **corresponding to a total withdrawal of 52 530 ha per year.**

4.5.3 Sealed soil

The net increase of artificial areas in EU-24 has been estimated to 870 000 ha between 1990 and 2000 (Source: CLC). But this flow is largely under-estimated. Only for France, this flow was estimated at 727 000 ha between 1992 and 2003 (Source: TERUTI).

Limitations of the Corine database concern:

- Relatively coarse scale: the size of the minimum mapping unit, which was set at 25 ha. The land cover classes that tend to appear in small patches are often included in other dominant classes around, and are consequently underestimated. This happens for example for artificial areas:
- A minimum width of the mapping unit of 100 meters.
- To detect change, the minimum mapping unit was set at 5 ha.
- The temporal resolution for Corine data, depending on the countries, goes from 5 to 14 years. But the rates of change can be expressed on an annual basis.

The estimate of artificial areas is 17 057 200 million ha in 2000, representing an average ratio of 364 m^2 of artificial areas per inhabitant. TERUTI estimates this ratio to be of 720 m^2 for France.

[1] Afforestation in this context is actual plantation of forest. Therefore there is a use for having an income and farmers are even subsidized to do so. The land is not abandoned.

In Switzerland the Federal Office for Spatial Development estimates the ratio at 411 m^2 and in Germany, the National Land Use Accounts at 534 m^2.

Considering the results for France, we can conclude that the CLC gives a better estimate of the stock than of the flow.

For different reasons, it is difficult to simply link the evolution of the population and the flow to artificial areas:

- The data on total national population hide the flows between regions (as in Poland, where the global population is decreasing, but it is increasing in 2 regions, see Chapter 5) and inside the regions (migrations from rural to urban areas).
- The average artificial area per inhabitant is increasing. This hypothesis is confirmed for France (see Appendix 4) and explained by the demand of sports and infrastructure, and the development of houses rather than apartments.

In general, the highest percentage of agricultural land converted to artificial surfaces between 1990 and 2000 has occurred in urban regions (IRENA 12 – land use change) such as Madrid (6%), South Netherlands (5%) North Netherlands (5%) and in coastal regions such as Alicante (3.6%). These percentages must be compared to the European average of 0.6%.

For countries where the population is decreasing, the annual artificial gain is estimated at an average of 0.9 m^2 per inhabitant and 2 m^2 per inhabitant for countries where the population is increasing (CLC and population surveys). For France, the TERUTI survey estimated this ratio at 7 m^2.

At the national level, we can consider that half of the flow to artificial surfaces corresponds to an increase of needs per inhabitant (due to changes in lifestyles) and the other half to the population increase per municipality (natural growth + migration).

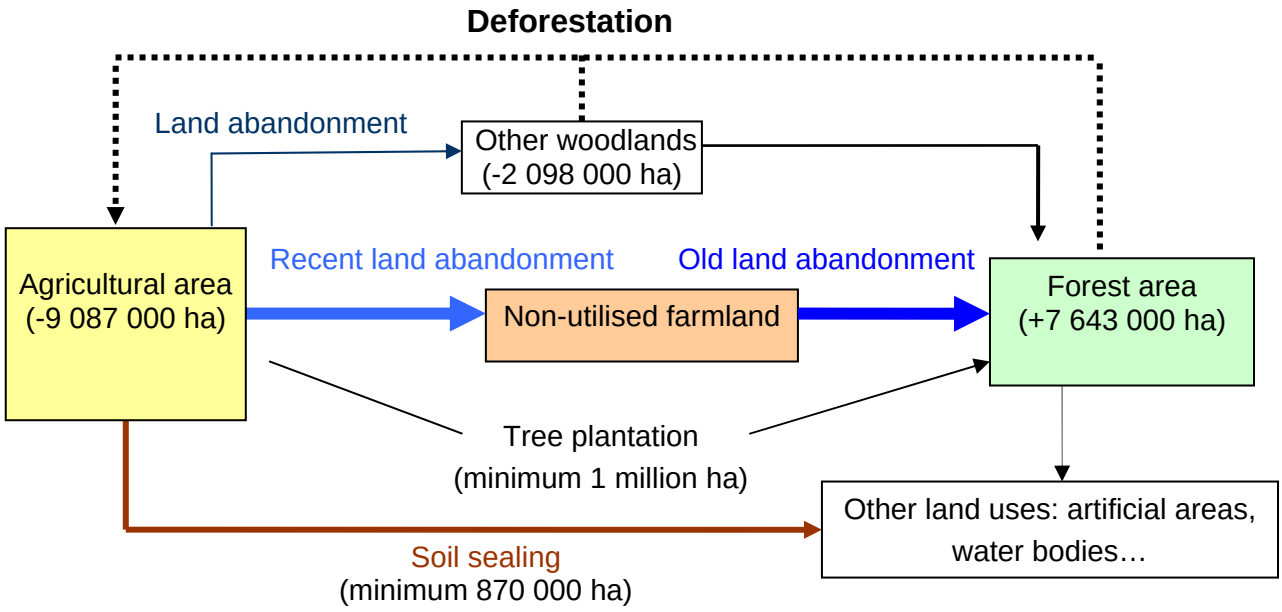
The CLC results concerning the loss of farmland (87 380 ha) including farmland abandonment and sealed farmland are largely underestimated compared to the 1.1 millions ha of farmland loss per year provided by the FAO database during the period 1993-2003 (period where the data are available for all the countries of EU27). This is why CLC is not used in this study to calculate the flow of farmland abandonment. Nonetheless, CLC offers interesting results and elements for comparison.

4.5.4 Flows between agricultural area, forest area and artificial area

The main hypothesis is that the loss of agricultural surface could be estimated considering the flows of forest surface (“natural afforestation”), tree plantations and artificial area gain. But the equation is more complex due to the importance of the non-utilised farmland which is not classified as farmland, neither as forest area nor as other woodlands

Moreover, this equation cannot be calculated with global data: FAO data (the net UAA balance and the net forest and other woodland balance), the flow of farmland afforestation (DGAgri) and sealed farmland (CLC) (see figure 6).

Figure 6: Main flows (balance) among agricultural land, forest and sealed soils, for the 1990-2000 period and for 20 countries (except the Baltic countries, Slovakia, Czech Republic, Slovenia and Malta)



Source: FAOSTAT, CLC and DG Agri

4.6 General conclusions concerning land use in Europe

4.6.1 Limits of the European databases

The two Figures below show the evolution at the national scale of woodland surfaces and UAA for a period of 31 years (1974-2005) for France and Spain. The results are particularly heterogeneous. This is mainly due to the difference between the results of census surveys (FSS in France and Spain, or forestry survey in Spain), sample survey (FSS structure) or synthetic data.

The conclusion is that it is very important to work on a defined period that corresponds to a same statistical methodology and survey. This is one of the reasons for the choice of the FSS census (see 4.1).

Figures 7 and 8 present the evolution of UAA and forests (Eurostat/Agriculture/land use) for France and Spain.

Figure 7: Woodland and UAA evolution in France between 1974 and 2005 (ha)

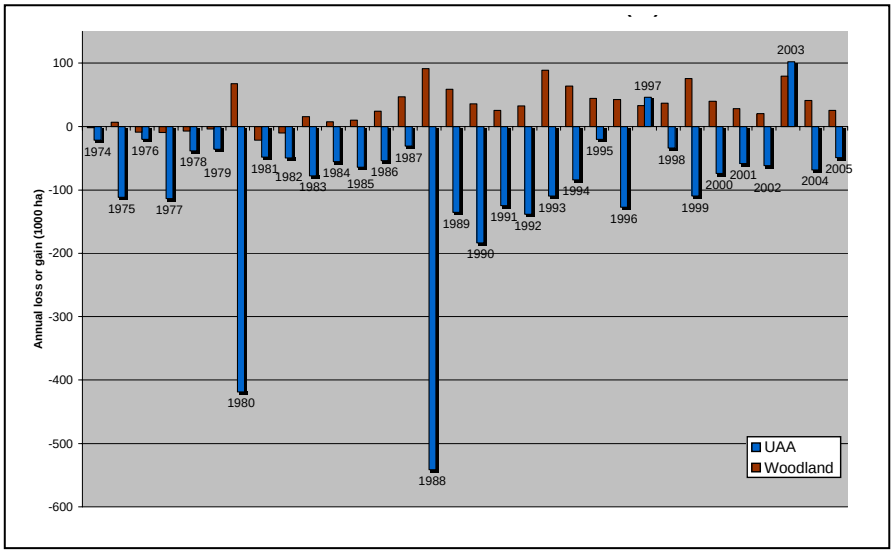
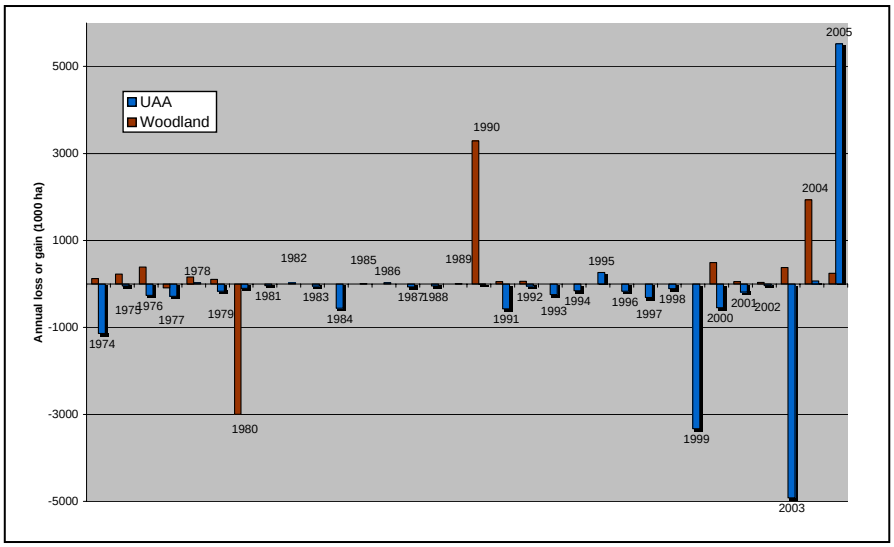


Figure 8: Woodland and UAA evolution in Spain between 1974 and 2005 (ha)



Figures 7 and 8 show that FSS censuses in 1980 and 1990 are inconsistent with intermediate years/surveys.

Table 5 also shows all the difficulties there are to compare the different databases. The databases are not implemented in the same way, and often data are missing for some countries. Any comparison of the results, such as the evolution of the UAA, is difficult.

Table 5: UAA evolution according to different databases (1990-2000 period)

Database	Countries	UAA evolution (1990-2000)
Eurostat (Agriculture/land use)	EU-20 (minus Germany, the United Kingdom, Greece, Malta, Czech Republic, Slovenia)	-12 126 000 ha
CLC	EU-24 (minus Sweden, Finland, Cyprus, Malta, Croatia)	-873 800 ha
FAOSTAT	EU-22 (minus Estonia, Latvia, Lithuania, Slovakia, Czech Republic)	- 8 573 000 ha

4.6.2 The main trends are not enough

Since 1970, there is an actual trend of farmland abandonment in Europe, corresponding to a decrease of farmland and to an increase of forest surfaces. If we look at the statistical data, farmland decrease is important in the new member States (Baltic countries, Poland, Bulgaria, but also Italy, Portugal, Greece and France). The situation is different in Spain which saw an increase of the UAA in the more recent period. The reason is that the “other surfaces” or “other categories of land” cover in Spain a significant area and constitute a land stock for agricultural or forest purposes.

However, to have a good overview of the situation, it is necessary to estimate the flows to artificial areas and analyse the results at a level that yields more accuracy (LAU 2). The withdrawal of farmland through the process of soil sealing is important when compared to the farmland abandonment process, and it cannot be neglected. CLC is not accurate enough to estimate this flow. The conditions of the surveys (definitions of the different categories, periods) must also be analysed in detail.

For example, in Denmark and the Netherlands, the loss of UAA cannot be considered as farmland abandonment.

4.6.3 Net results and flows

The main problem concerning the general data provided by FAO and Eurostat at NUTS 1 and NUTS 2 is that these are net results. They hide the flows at the local scale. CLC provides these flows clearly, but with a large underestimation.

The solution for the period considered is to work at a scale that allows for more accuracy (LAU 2) to detect the real flow of FLA.

4.6.4 Considering the mains flows

Only the main flows have been considered in this study (see Table 6). The decision to consider urban and rural areas separately gives a solution to the lack of data.

Table 6: The different flows and their consideration in this study

Flows	In rural areas	In urban areas*	Considered in the study
Farmland to sealed soils	Limited	Very important (main flow)	It was considered that the majority of this flow is located in urban areas and in rural areas with small UAA decrease.
Artificial plantations	Important in some countries. Located mainly on farmland.	Limited by land access and land prices. Only local government and municipalities can manage such project in urban area, but it's very limited.	Considering the fact that data on farmland afforestation are not available at LAU 2, this flow was included in the flow of farmland abandonment and explains part of this flow.
Deforestation	This flow is limited mainly to infrastructures (train, highways). Farmers can deforest only small parcels to increase arable surface.	Very limited: urban forests are generally state owned and very well protected.	Not considered
Farmland to water bodies and wetlands	Limited, related to dam implementation.	Very limited	Not considered
Farmland to open spaces	Very limited	Very limited	Not considered
Artificial surfaces to agricultural surfaces	Very limited	Limited	Not considered

**: urban area corresponds to definition used here "municipalities with a population density over 150 inhab in the last population census or a population increase of over 10% between the 2 last population census."*

4.6.5 Conclusions on reliable and available data on the flow of farmland abandonment

Currently, the only data source at the European scale on the flow of farmland abandonment is provided by CLC, for the 1990 – 2000 period and for 24 countries.

Data on the flow concerning the gain of forest surfaces or the loss of agricultural surfaces are provided by different sources (Eurostat, FAO) but cannot be counted as flow of farmland abandonment for 3 main different raisons:

- These results are at the national level, and hide flows between municipalities or regions
- Gain of forest surfaces can originate from other land uses, such as semi-natural vegetation
- A large part of farmland area losses are converted to artificial uses

The gain of forest area can be a proxy for the flow of farmland abandonment if a long period is considered (from several years to centuries) though not for a short period or for a recent period (1990-2000). This is why the evolution of forest area cannot be used to estimate and locate the flow of farmland abandonment over a short period of time. However, this information can be used to validate the results and estimate the risks of farmland abandonment. Indeed, gain of forest can be considered as a good indicator of risk of FLA.

The lost of UAA is neither the flow of farmland abandonment because part of the loss comes from farmland converted into sealed surfaces.

For all the different reasons presented above, it was decided to limit the analysis to a short and recent period, using the same data sources (FSS) at a relevant scale which allows the observation of the different flows.

5. Methodology to calculate and locate the flow of farmland abandonment at the European level

5.1 FSS census data

The FSS census is the only data provided at LAU 2. UAA outputs and UAA inputs do not generally happen in the same municipalities. The consequence is that, at a large scale (as NUTS 1, 2, 3), the flows are always underestimated.

Table 7: Strengths and weakness of the main European databases.

Databases	Strengths	Weaknesses	Proposals
Eurostat (Agriculture/land use)	Long term series	Data provided at NUTS 1 and 2. Mixes different data sources (FSS Census, Structure and other sources)	At LAU 1 and LAU 2, only use the FSS census
FADN	Long term series	Data provided at NUTS 1 and 2 only. Data only refer to professional farms	Not used
FAO database	Long term series. Main trends	Provides data only at NUTS 1	Use to give context to describe FLA
CLC	Flows between 1990 and 2000 for most of the EU (24 countries). Land Cover Flow 6 “flow of abandoned land”. Good information on stocks. Data on sealed soil. Comparison of the relative values	Flows (farmland abandonment, sealed soil, afforestation) are underestimated	Comparison of the results and of the flows in relative values
Afforested farmland	Accurate data at the national level	Only provides data at the European level (DG Agri) at NUTS 1	Try to obtain accurate data from the National Agency in charge of farmland afforestation program. Use national results to explain and correct the UAA loss estimates

The strength of the FSS census is that it provides data at LAU 2, and over a recent and interesting period (1990-2000), not only for the evolution of UAA, but also for other components of the farm. A flow, and not just a net result, can be measured at LAU 2 as well. The definitions of the different categories, and particularly that of UAA, did not change between the 2 censuses.

For all these different reasons, the latest FSS censuses have been chosen. They refer, corresponding to a time scale that goes from 6 years (Poland) to 12 years (France), over a period in the 1990s (see Table 8). For France and Spain, the period considered corresponds to the implementation of the new CAP, entailing direct payments. For Poland the period covers the transition up to its entry in the EU (2004) and the implementation of the CAP (2005) (see Chapter 5).

Table 8: Time period studied, according to country

	FSS census time scale	Time period in years	Population and housing census	Time period in years
France	1988- 2000	12	1990-1999	9
Spain	1989-1999	10	1991-2001	10
Poland	1996-2002	6	1996-2002	6

SOURCES: national ministry of Agriculture and national statistic institutes.

LAU 1 was used for France because of the important number of municipalities (see 4.3.1), and LAU 2 for Spain and Poland. The average size of the administrative unit goes from 3 250 ha in Spain to 7 550 ha in France (see table 9).

Table 9: Comparison of administrative units per country

Country	France	Spain	Poland
Administrative unit concerned	LAU 1	LAU 2	LAU 2
Number of administrative units	3 689	8 106	2 335
Average surface of the administrative units (in Ha)	14 833	6 242	13 362
Average UAA of the administrative units (in Ha)	7 551	3 255	7 164
Average population of the administrative units (in inh.)	15 863	4 802	16 374

5.2 Methodology to estimate and locate the flow of abandoned farmland

The first objective is to estimate (in hectares) and locate the farmland abandoned during the considered period.

The following definition of abandoned farmland is proposed:

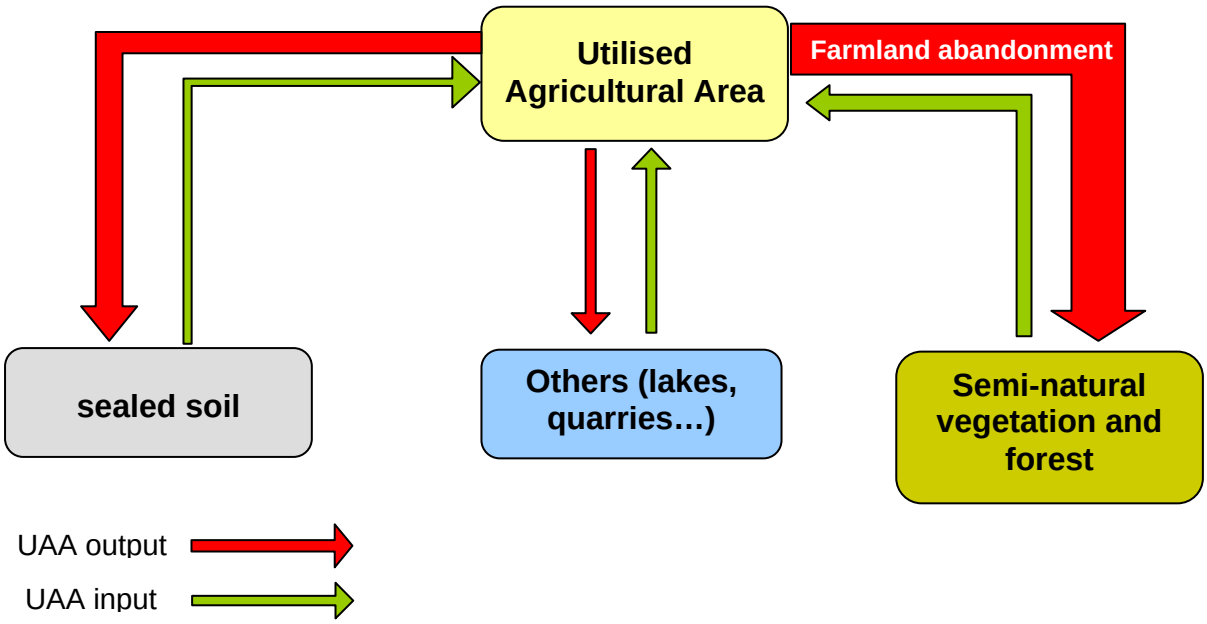
Abandoned farmland is the UAA loss observed between two FSS censuses, that has not been converted into artificial areas. This non-utilised agricultural land is no longer farmed for economic, social or other reasons, and is not included in the crop rotation system. Depending on the climate and ecological context, this abandoned farmland will gradually be covered by scrubs and trees. Tree plantation is not considered as a part of farmland abandonment, but for lack of relevant data this flow will be part of the abandoned farmland.

Abandoned farmland is the flow from farmland to non-utilised agricultural land, semi-natural areas and forests, during the period under consideration (see figure 9).

The core of the methodology is to compare the UAA evolution on the basis of two FSS censuses at LAU 2. This means inside a municipality (LAU 2), only the UAA net result is taken into account. The flow of farmland abandonment can be estimated in ha over the period, or per year (to compare the different countries) and as a percentage of the UAA in the first census.

When the UAA increase, it is considered that there is no farmland abandonment. The loss of UAA expresses the maximum surface that was abandoned during the period.

Figure 9: The main flows linked to the UAA



The main difficulty of this approach is to estimate where the flow from farmland to artificial areas occurs, as well as its quantity (see figure 9). It is considered that the flow from farmland to other land uses (water bodies, wetlands and open spaces with little or no vegetation) is insignificant.

The artificial areas are mainly located in urban areas (see appendix 4). The increase of artificial areas is mainly driven by the population density and the increase of the population. The hypothesis of the methodology is that the flow from farmland to artificial area is mainly located in urban areas where the population density is high or increases very fast. So even if it is not possible to estimate the flow we can capture a large part of it in the urban areas.

The definition to define urban areas is based on the OECD definition (population density over 150 inhabitants /km^2) coupled with another indicator: a population increase with more than 10%. Fortunately, the Population and Housing censuses occurred more or less in the same period as the FSS censuses (see Table 8). This indicator was considered to be strongly correlated to the extension of sealed soils (industrial and commercial units, construction sites, a part of the infrastructures, green urban areas). The 10% threshold corresponds to approximately double the national average (+5% in 10 years for Spain and 3.5% in 9 years for France. In Poland the population decreased).

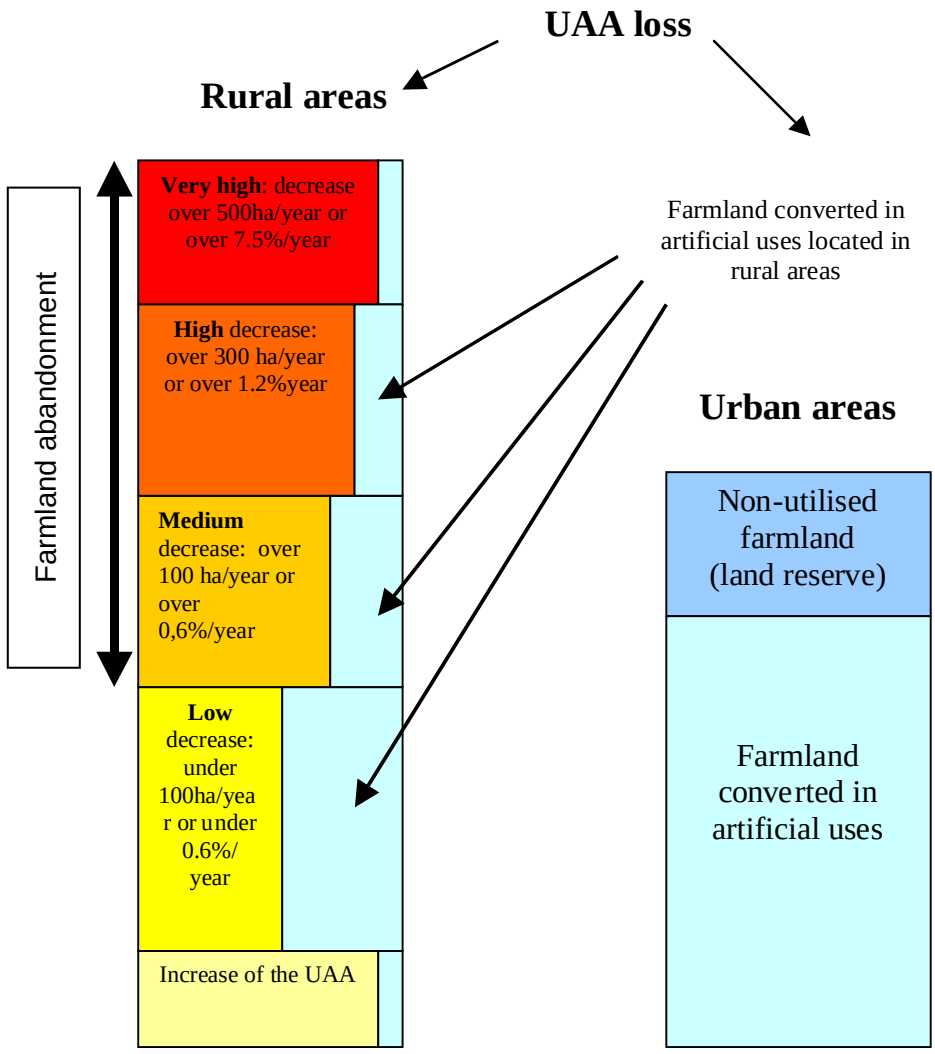
Finally, for this study, the following definition of urban area was chosen:

Urban areas = municipalities with a population density > 150 inhabitants per km^2 or an increase of the population of more than 10% between the two population censuses

Rural areas = municipalities not classified as urban areas

But not all the flow of soil sealing goes to urban areas. Therefore, the category “low decrease of UAA” (loss under 100 ha/year and under 0.6%/year) is excluded of the flow of farmland abandonment, knowing that a large part of the UAA loss goes to soil sealing.

Figure 10: Farmland abandonment and flows of sealed soils



For more precision on the location of the flow of soil sealing, for the French case study, this flow was located on the basis of the 'TERUTI' national survey and of INSEE definitions of urban, peri-urban and rural areas (see Chapter 5.1). It also permitted to validate the final equation (see below).

Each country was finally divided **into 6 categories**: urban areas (with an extended definition to better identify the flow of soil sealing) and rural areas (non urban areas), divided in 5 categories that reflect the amount of UAA loss, in ha and in percentage (very high UAA decrease, high decrease, medium decrease, low decrease, increase). The flow from farmland to artificial area is considered as negligible in the three first categories of rural areas.

Tree plantation on farmland cannot be separated and is included as a part of farmland abandonment.

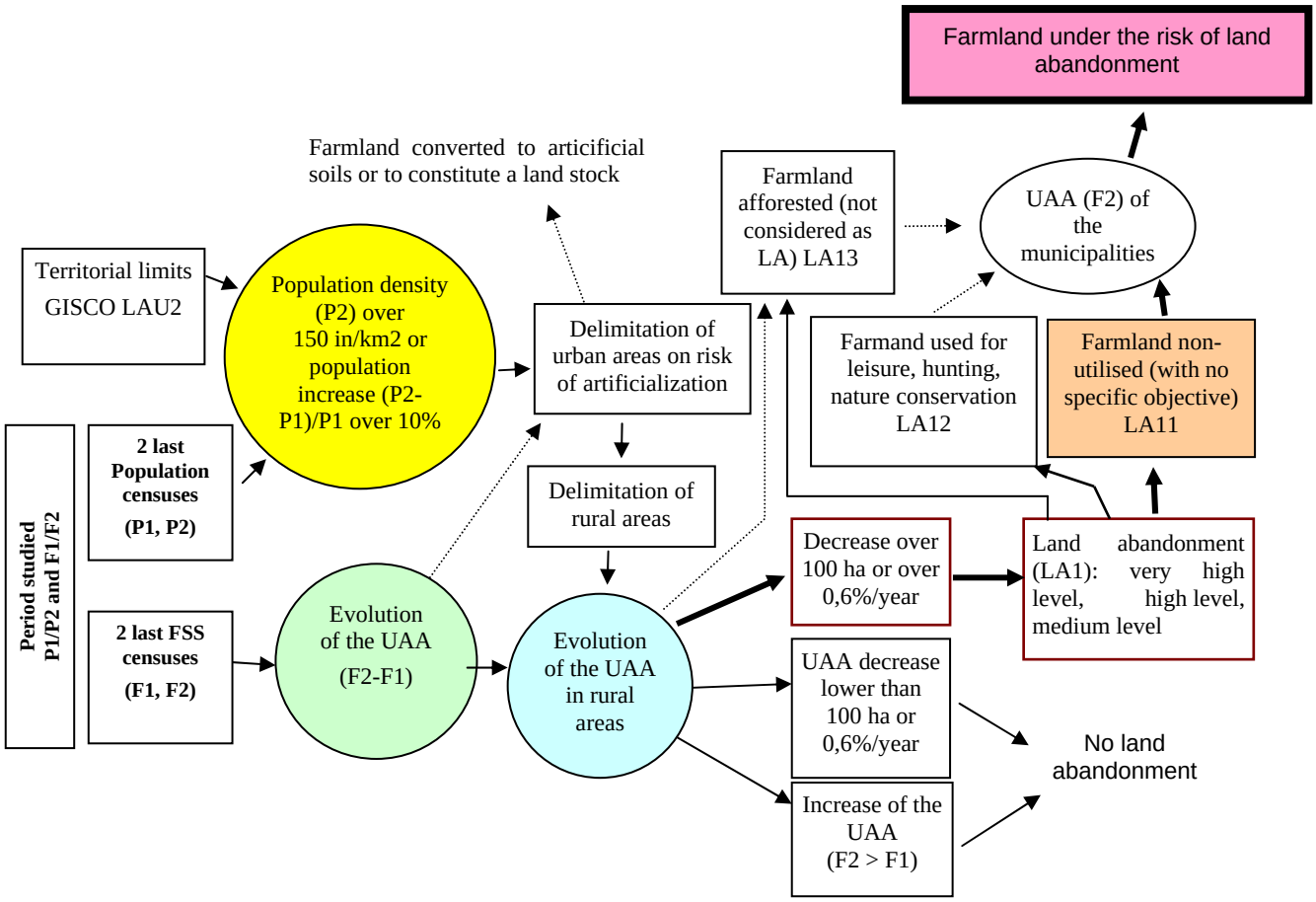
The final equation is:

The flow of farmland abandonment = UAA loss in rural areas with very high, high and medium level of UAA decrease (over 100ha/year or over 0,6%/year).

The farmland at risk of abandonment is considered as the total UAA observed in the last census of municipalities where farmland abandonment occurred during the period under study. It is a proxy. Indeed, this supposes that:

- the trends will be the same during the next period (and it will be seen that it is not the case);
- all the UAA is threatened by abandonment, and not just a part (for example, only the poor soil or parcels located on slopes).

Figure 11: Methodology to calculate the abandoned farmland and the farmland at risk of farmland abandonment



6. The French case study

6.1 Context

6.1.1 Comparison of FSS and TERUTI results

In France, two relevant surveys are available to measure the flows of farmland and, more generally, land uses: FSS censuses and the TERUTI survey (the French survey on the use of the territory – 'Enquête Utilisation du Territoire')

These surveys cover more or less the same period. FSS were done in France in 1988 and 2000, and TERUTI (homogeneous series) in 1992-2003.

FSS data at LAU 1 (formerly known as NUTS 4) and not LAU 2 in France were chosen for 2 reasons:

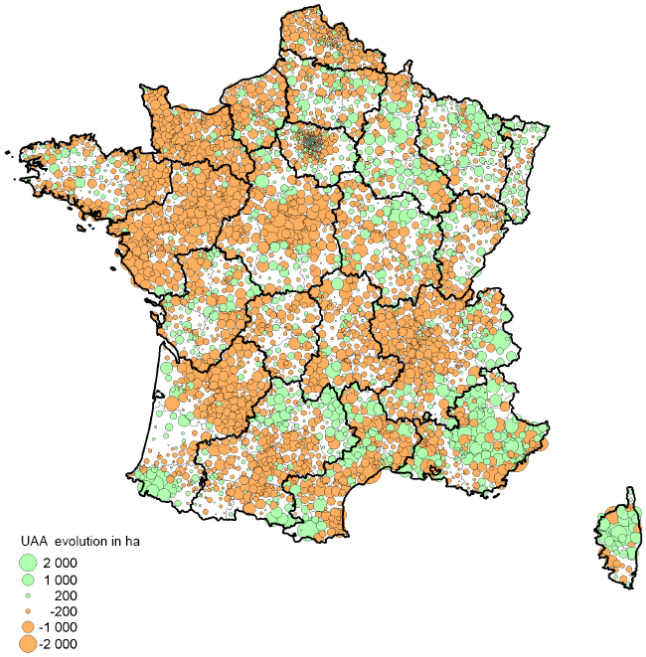
- The high number of municipalities in France (36 000).
- To prevent errors due to the problems arising from the registration of the farm and the farmland[2].

These two surveys give an estimate of loss of farmland. TERUTI also provides the main flows per region, such as the flow from farmland to sealed soil, and the flow of farmland abandonment.

6.1.1.1 Results from FSS censuses

Map 1 presents the evolution of the UAA in France between 1988 and 2000. UAA decreased from 28 595 799 ha in 1988 to 27 856 313 ha in 2000. This corresponds to **an annual loss of 61 624 ha**. But this result is the end result from considering the UAA net result from losses and increases.

Map 1: Evolution of the French UAA between the two last FSS censuses



[2] UAA area is counted with reference to the farm-registered office. In this way, in 2000, 71% of UAA areas was located in the same commune as the owner. This means that about 30% of communal UAA area is not on the same administrative communal area. The evolution of UAA at LAU 2 is linked to the change of farmer/owner and not to changes in land use. For example, when a farmer who lives in commune 1 stops farming and sells his land to other farmers, these buyers do not necessarily live in the same commune. Therefore, the UAA area increases in the buyers' communes and decreases in commune 1 where, the seller lives, and farmland is not abandoned in commune 1. Consequently, the use of data at LAU 2 can be a source of mistakes. Working at LAU 1 minimises the error.

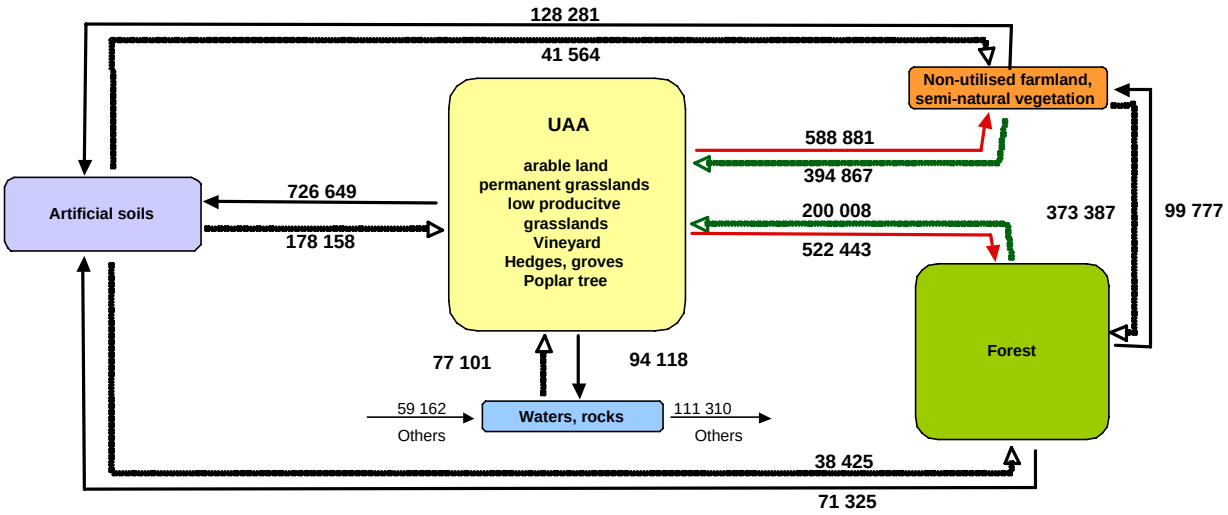
6.1.1.2 Results of the TERUTI survey

TERUTI methodology is presented in Appendix 4.

TERUTI shows important flows from non-utilised farmland, semi-natural vegetation and forest toward agricultural areas (54 000 ha per year). **TERUTI also provides a first estimate of the flow of farmland abandonment (101 000 ha per year),** including farmland afforestation.

A yearly 66 000 ha of farmland, 12 000 ha of non-utilised farmland and 6 000 ha of forest were sealed (see figure 12).

Figure 12: The main land use flows in France during 1992-2003



Source: TERUTI

6.1.1.3 Comparison of the results

UAA loss is more important using TERUTI than FSS data (see Table 10). TERUTI agricultural categories include a larger diversity of surfaces (+3.2 million ha) such as common lands and grasslands non-managed by farmers (1.5 million ha) and also small woods and poplars (839 000 ha) not included in the FSS UAA (see table 3). This difference can be expressed more precisely by comparing the results at a regional level. The main differences occur in the South-West of France, where FSS observed an extensification of farming practices (more grasslands and less livestock density) while TERUTI observed farmland abandonment.

In the West of France (*Normandy, Pays de Loire*) and the South-West (*Dordogne, Lot et Garonne*) the differences come from land of small properties still 'farmed', owned by -non-farmer owners and not rented officially to farmers. TERUTI observes a farmland while FSS considers that the land is not managed as an agricultural holding.

Table 10: Comparison of results provided by FSS and TERUTI

Survey	Period	Area (ha)	Area differences	Annual loss	Annual loss differences
FSS	1988-2000	28 595 799 to 27 856 313	Property of less than 1 ha and with no productive objective is not included	- 61 624 ha	Very extensive grasslands are included
TERUTI	1992-2003	32 145 730 to 31 063 773	Poplars, groves, common lands are included	- 98 360 ha	Farmland not declared by the farmer or the owner is included

Sources FSS 1988-2000, TERUTI 1992-2003.

6.1.2 Locate the flow of soil sealing in France

6.1.2.1 The methodology used

The methodology is presented in detail in Appendix 6. The objective is to find national ratios regarding soil sealing and population and area (urban / rural), using data provided by population censuses (source : INSEE - *Institut National de la Statistique et des Études Économiques*-), to estimate the increase of sealed soils at LAU 1 by disaggregating the increase of artificial surfaces calculated by TERUTI at NUTS 1. Next, the farmland converted into artificial areas is subtracted from the UAA loss.

Three ratios were calculated, for the following:

- The increase of inhabitants considering the area and the population density. Four thresholds were established on the sealed soil need, and the ratio varies from 100 m^2 per inhabitant, in highly populated urban areas, to 1 800 m^2/inhabitant in rural areas (see Table 11).
- The increase of the need of sealed soils, which was estimated at 5 m^2 per inhabitant and per year.
- The estimate of the percentage of sealed soils coming from the UAA. This ratio was estimated at NUTS 2, and it goes from 48% to 97% according to data gathered at "*département*" scale.

Table 11: Need of sealed soils per inhabitant according to area and population density

Area and population density	Area of sealed soils in 1999 (m^2 /inhabitant)
Urban (population at LAU 1 > 50 000 inh)	100
Urban (population at LAU 1 < 50 000 inh)	500
Peri-urban '*monopolar*'	850
Rural and peri-urban '*multipolar*'	1800

Source: INSEE Population survey and calculation by SOLAGRO - see Appendix 4.

With this methodology, **the flow of sealed farmland as been estimated to 679 208 ha, 56 600 ha/year, (see table 12)** and located at LAU1 (see Map 6 French Atlas). This flow corresponds to 86% of the TERUTI estimation: 726 649 ha for the period 1992-2003 (66 059 ha/year). The remaining 14% corresponds to an over-estimation in populated cities.

6.1.2.2 Results

a) The flow of farmland abandonment

The farmland abandonment was estimated at a flow of 936 555 ha in 12 years, or 78 046 ha per year.

Table 12: Estimated surfaces of abandoned land in France, according to the evolution of the UAA and the flow of sealed farmland for the period 1988-2000

	"cantons" (LAU1) with an UAA increase	"cantons" (LAU1) with an UAA decrease lower than the flow of sealed farmland	"cantons" (LAU1) with an UAA decrease higher than the flow of sealed farmland	TOTAL
Evolution of the UAA in ha	535 303	-81 707	-1 193 081	-739 486
flow of sealed farmland	193 142	229 540	256 526	679 208
Farmland abandonment in ha	0	0	936 555	936 555

Source: TERUTI/SCESS, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

58% of this flow is located in rural areas, and 42% in urban areas (see Table 13). The high and medium level of farmland abandonment in rural areas covers 45 491 ha per year.

Considering the results, different thresholds have been defined based on the surface of abandoned farmland and the percentage of the UAA. They have been combined to define four classes (see table 5.3b):

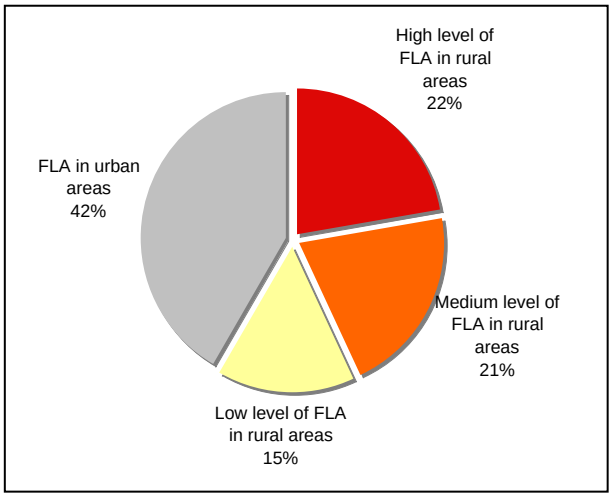
- class 1 : no farmland abandonment
- class 2 : low level of farmland abandonment
- class 3 : medium level of farmland abandonment
- class 4 : high level of farmland abandonment

Table 13: Estimated surfaces of abandoned land in France, according to areas and intensity of abandonment for the period 1988-2000

Level of FLA	Thresholds	Rural areas	Urban areas	Total
High	Over 500 ha and over 7% of the UAA	332 900 Ha	270 549 Ha	603 449 Ha
Medium	Between 100 and 500 ha or between 4 to 7% of the UAA	212 990 Ha	118 671 Ha	331 661 Ha
Low	Less than 100 ha or less than 4% of the UAA	893 Ha	553 Ha	1 446 Ha
Total in ha		**546 782 Ha**	**389 773 Ha**	**936 556** Ha
Total in %		**58%**	**42%**	**100%**

Source: TERUTI/SCESS, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Figure 13: The amount of farmland abandonment in rural and urban areas in France (source TERUTI)



To summarize, **only 13.4% of the UAA area is affected by a high or medium level farmland abandonment** (more than 4% of the abandoned UAA, or more than 100 ha per canton in 9 years) and 4% is affected by a high level of farmland abandonment. The category "*low level of farmland abandonment*" is too small to be taken into account, considering the exactness of the data.

Table 14: Estimate of the French UAA concerned by the process of farmland abandonment

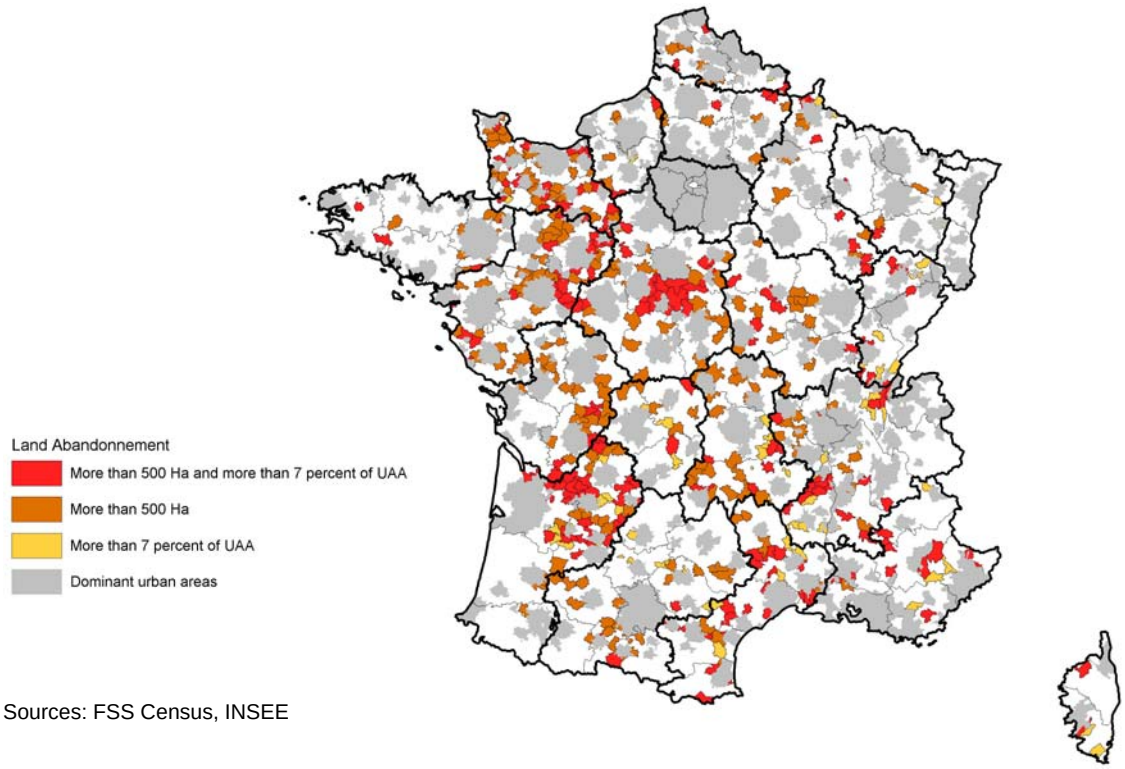
Level of FLA	UAA of the counties (LAU 1) concerned by FLA in 2000	% of the total UAA
High	1 229 414 Ha	4%
Medium	2 498 089 Ha	9%
Low	6 248 792 Ha	22%
Total	9 976 296 Ha	35%

Source: TERUTI/SCESS, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

b) Where does farmland abandonment occur?

All the maps are in the French Atlas – Appendix A produced with this report.

Map 2: Evaluation of farmland abandonment outside dominant urban areas in France (1988-2000) – First version with sealed farmland excluded



If we exclude the farmland abandonment occurring in urban areas, we observe a large spatial distribution, with some hot spots such as:

- The department of *Dordogne* and *Lot-et-Garonne, both* in the South-West
- The *Sologne* region
- The west of France (*Normandy* and *Pays de Loire*)
- The *Massif Central,* albeit not all of it
- Some areas in the Mediterranean region

With this INSEE method, we globally not observe farmland abandonment in the mountains, apart from the *Massif Central*, nor in Brittany and all the fertile plains of the North and east of France, nor in the Garonne Valley.

c) Which type of land is concerned?

The land use of the municipalities in the rural areas concerned by farmland abandonment can be characterised with the data provided by the FSS (see Table 15). These municipalities are mainly located in areas with a low percentage of farmland (less than 40%), and a high percentage of forest surfaces.

However, there is a problem with the category without farmland abandonment (see table 15). This category includes all the extensive grazing systems where the UAA have increased, which are in turn mixed with the regions where crop systems are dominant. That explains why there is a high level of rough grasslands and a low livestock density.

Therefore, at this stage, only the results for the different levels of farmland abandonment can be compared.

Table 15: Farmland use in the French municipalities where farmland abandonment occurs

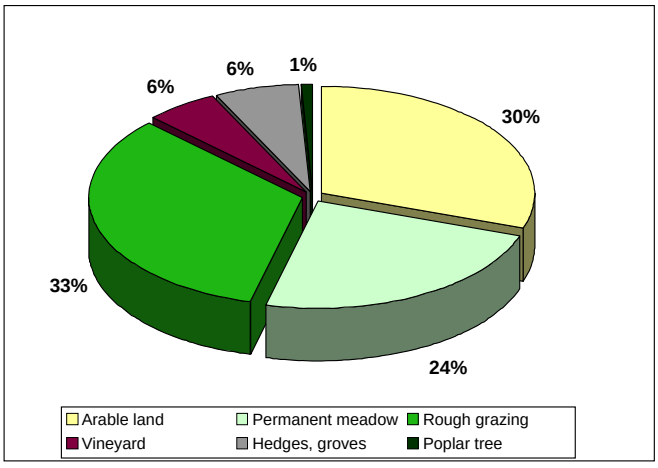
Level of FLA	% UAA in the territory	Rough grasslands	% of rough grasslands	Permanent grasslands	% of permanent grasslands	% of SFP/ UAA	Livestock density	% of UAA classified in HNV
High	39.5%	92 410	7.5%	413 817	33.7%	59%	0.982	49.8%
Medium	50%	104 555	4.2%	906 737	36.3%	60%	1.045	45%
Low	61.1%	177 395	2.8%	1 688 143	27%	50%	1.140	29%
None	48.5%	689 811	8.6%	1 907 565	23.7%	48%	0.985	36.5%
Total	51.6%	1 064 170	5.9%	4 916 262	27.3%	48%	1.047	36%

Source: TERUTI/SCESS, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Table 15 shows that the high level of farmland abandonment occurs in the regions where there is a combination of high percentage of rough grasslands (7.5%), a low livestock density (under 1 LU/ha fodder area) and a low share of the UAA in the territory. The high level of rough grasslands (8.6%) in municipalities with no FLA is due to LFA payments impacts in mountains areas as the Alps or the Pyrenees where no FLA occurs.

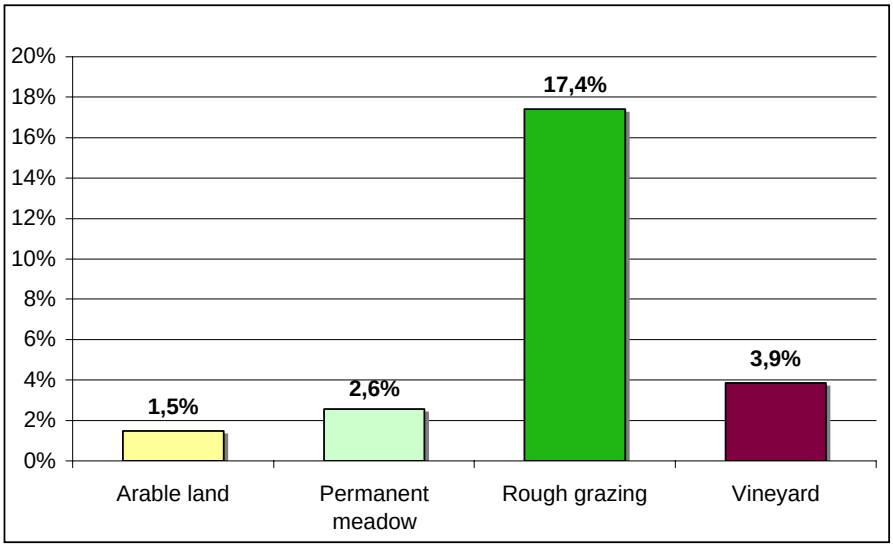
These hypotheses are confirmed by the TERUTI survey. 17% of rough grasslands and 4% of vineyards were abandoned, compared to 1% of arable land (see figures 14 and 15).

Figure 14: Origin of abandoned farmland in France (1992-2003)



Source: TERUTI, 1992-2003

Figure 15: Percentage of land abandoned in France in each kind of UAA (1992 -2003)



Source: TERUTI/SCEES

A percentage of this flow of farmland abandonment corresponds to afforestation. 45 000 ha of farmland have been afforested in France between 1994 and 1999 (Päivinen, 2000).

d) Location of farmland abandonment

In *Sologne*, most of the farmland properties are bought to develop private hunting grounds, and that there is a low interest in farming. In *Dordogne,* a very attractive region for tourism, and in the West, not far from Paris, the impact of the purchase of farm properties (houses + some land) by non-farmer needs to be measured. In France, 561 000 hectares have changed owners in 2005 in what amounted to 240 000 sales operations (Levesque, 2007). The concerned surface is 20 600 ha of land for residential use albeit without a house, and 31 200 ha with a house.

In intensive agriculture areas such as the *Pays de Loire*, farm specialization and the increase in farm size can have an impact on the abandonment of some small parcels. In the *Massif Central* region, extensive grasslands are abandoned. In the *Languedoc Roussillon* region the wine crisis partially explains farmland abandonment.

50% of the areas with a high level of farmland abandonment are classified as HNV farmland areas (as defined in the study by Pointereau, 2007).

6.1.2.3 Conclusions concerning this first approach to farmland abandonment

- UAA loss is not sufficient to estimate farmland abandonment (over estimation).
- The flow from farming area to artificial surfaces is important, particularly so in urban areas.
- Soil sealing drives some farmland abandonment in urban areas (land reserve).
- The evolution between the two FSS censuses should be analysed taking into account the evolution of the agricultural context between 1988 and 2000.
- The agricultural surface observed with FSS (farmer's statement) could be different from what is observed in the fields (farmland (expert?) observation).
- Extensification of grazing systems to catch more payments explain some UAA extension. But this does not necessarily mean that grasslands are well managed
- The percentage of low productive (rough) grasslands is a driving force of farmland abandonment.
- The wine crisis and the loss of vineyards (mainly in *Languedoc-Roussillon*) explain partly the farmland abandonment in this region.

- Farmland abandonment is observed not only in the mountains but also in the west of France. This could be the consequence of the intensification, concentration and specialisation of the farming systems. Some grasslands or small parcels are abandoned because they are too far from the farm, or because they cannot be ploughed or grazed because there are no more animals on the farm.
- Land owners can set apart some surface of farmland for their leisure (hunting, horses…) but not for agricultural production. Part of this land is not identified by the FSS.

6.1.3 Simplification of the methodology to map farmland abandonment

The estimate of sealed soil is difficult due to the lack of relevant data at the European level. Therefore, a simplified methodology, to identify the flow of soil sealing, has been proposed (see Chapter 4.2).

Before applying the simplified methodology to France, a comparison of the 2 methodologies is proposed:

- Comparison of the classifications (see table 16)
- Estimation of the sealed farmland according to the new classification (see table 17)

Table 16 shows that 77% of the classification is common to the 2 methodologies. 174 "*cantons*" classified as rural by INSEE criteria has been considered as urban with the new methodology. At the same time, more "*cantons*" (18%) considered as urban by INSEE has been classified as rural by the new methodology.

Table 16: Comparison of the 2 methodologies ('INSEE' and 'FLA methodology') to locate urban and rural areas in France (see also map11 of the French atlas - Appendix A)

Cross-checking the 2 classifications	Number of administrative units (LAU 1)	UAA 2000	% of administrative units
Rural areas according to INSEE criteria and the FLA methodology	1 556	17 002 926	42%
Rural areas according to INSEE criteria and Urban areas applying the FLA methodology	174	1 005 764	5%
Urban areas according to INSEE criteria and Rural areas applying the FLA methodology	663	6 138 512	18%
Urban areas according to INSEE criteria and Urban areas applying the FLA methodology	1 296	3 709 111	35%

**INSEE criteria: The administrative unit (LAU 1) is classified as an urban area if more than 40% of the population live in urban or 'monopolaire' (monopolar) municipalities (LAU 2). Else, the administrative unit is rural areas.*

Source: TERUTI/SCESS, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Table 17 shows that only 10% of sealed land coming from the UAA is located in municipalities where farmland abandonment occurs (medium to very high threshold) and 26% in municipalities with low or none FLA. Meanwhile 64% is located in urban areas. **These results confirm the accuracy of the methodology (see 4.2)**

Table 17: Location of sealed soil in France according to the different categories in the new FLA methodology

Level of UAA decrease (1988-2000)	UAA loss thresholds	Sealed land in rural areas	Sealed land in urban areas	TOTAL (in ha)
Very high	over 500 ha/year or over 7.5%/year	0	17 369	**17 369**
High	over 300 ha/year or over 1.2%/year	24 577	153 429	**178 006**
Medium	over 100 ha/year or over 0.6%/year	43 553	66 346	**109 899**
Low	under 100 ha/year and under 0.6%/year	103 337	77 455	**180 792**
None		75 371	117 770	**193 142**
TOTAL in ha		**246 839**	**432 370**	**679 208**
TOTAL in %		**36.3%**	**63.7%**	**100%**

Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

6.2 Results of the methodology to estimate farmland abandonment

Tables and maps in Appendix A

6.2.1.1 Urban areas

In 2000, only 16.9% of the UAA was located in urban areas (17.3% in 1988).

The UAA loss in urban areas is estimated at 375 071 ha (31 000 ha per year), or 29% of the total loss. 63% is located in municipalities with a population density over 150 inh/km^2.

At the same time, a UAA increase of 143 931 ha is also observed, but most of it (69%) is located in municipalities with a population density below 150 inh/km^2: The net result is – 231 139 ha **(-4.7%).**

TERUTI estimates that 66 000 ha of farmland per year was converted into artificial surfaces (see 4.3.1.2). That means that the UAA loss in urban areas supposed to be mainly for artificial uses, is not sufficient to cover all the demands and that part of the soil sealing still remains in rural areas mainly in the category 'low level' FLA.

6.2.1.2 Rural areas

- Gains

The gain of UAA in rural areas is very low: 391 372 ha (Table 4 - French atlas - Appendix A), and it corresponds to 1.4% of the UAA in 1988. 72% of the increase is located in municipalities with a population density lower than 50.

- Losses

The loss of UAA in rural areas at LAU 2 represents 899 718 ha (see Table 3 - French atlas - Appendix A) in 1988. This corresponds to 71% of the total loss.

- Net result

The net result in 1988 **is a decrease of the UAA in rural areas of 508 346 ha** (Table 5 - in Appendix A).

6.2.1.3 Estimate of abandoned land

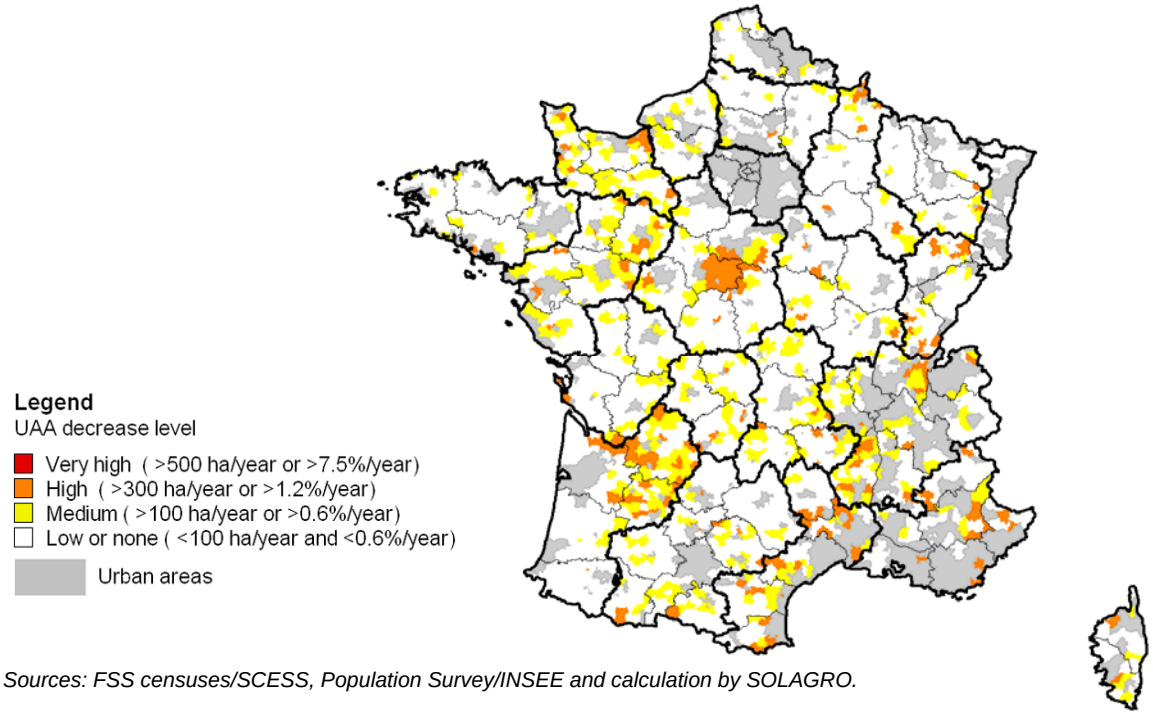
558 093 ha were abandoned (Table 18). They represent **2% of the total UAA in 1988**.

Table 18: Farmland abandonment in France

Farmland abandonment per level	Abandoned Farmland, in ha	In %
Very high level (UAA loss over 500 ha/year per municipality, or over 7.5%/year of the UAA observed in 1988)	0	0%
High level (UAA loss over 300 ha/year or over 1.2%/year)	199 333	36%
Medium level (UAA loss over 100 ha/year or over 0.6%/year)	358 760	64%
Estimate of total farmland abandonment	558 093 ha	100%

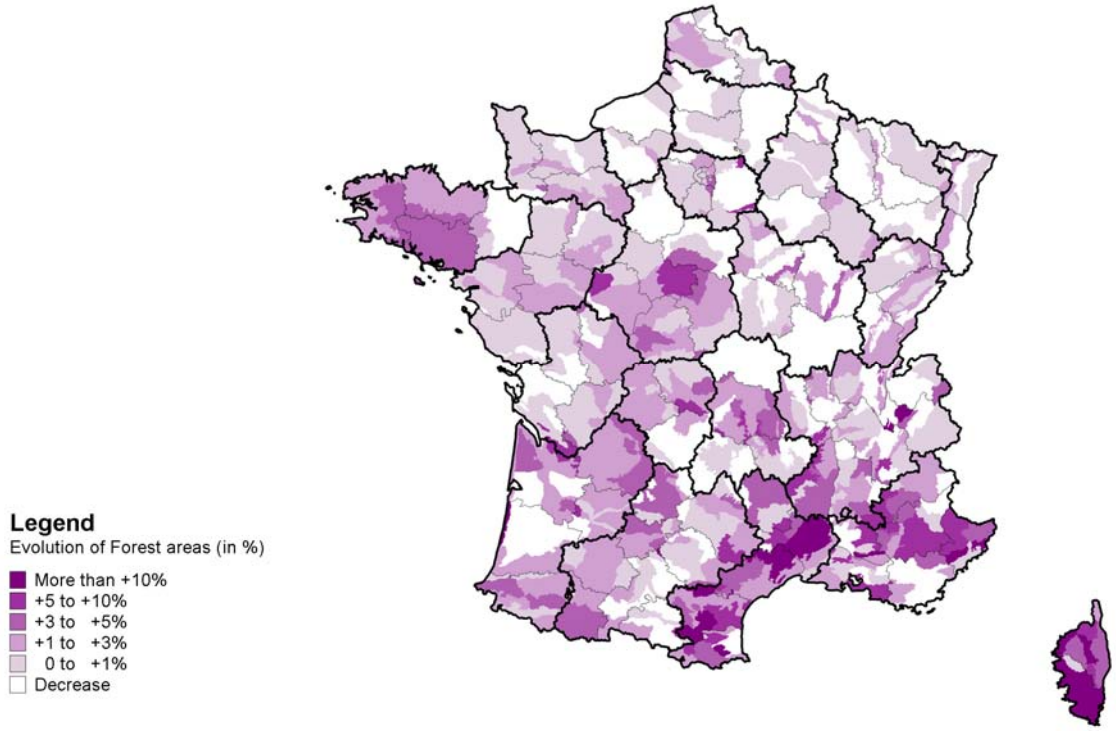
Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Map 3: Farmland abandonment in France



Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Map 4 Evolution of the forest surface in France in a time period of 12 years (1988-2000)



Source: Inventaire Forestier National (1991-2003).

6.2.1.4 Causes of farmland abandonment

The different causes are presented in 4.2.

The UAA evolution of the counties, where farmland abandonment has been observed, has been analysed using data provided by FSS. Table 19 shows that permanent grasslands and

particularly rough grasslands are more characterised by abandonment than arable lands (UAA-fodder crops). For example in the areas with high and medium level of farmland abandonment permanent grasslands have decreased with 23-27%, meanwhile arable lands have increased with 4 to 8%.

Table 19: Evolution of the crops in the areas with FLA

FLA Level	Evolution of productive permanent grassland	Evolution of rough grassland	Evolution of total permanent grassland	UAA evolution	Evolution UAA – Fodder crops
Very high	-	-	-	-	-
High	-29.5%	-38.9%	-32.2%	-20.9%	-10.7%
Medium	-24.4%	-41.5%	-26.7%	-9.4%	4.2%
Low	-21%	-36.7%	-22.6%	-3.1%	7.9%
None	-10.6%	11.7%	-6.1%	5.1%	11.7%
Total	**-19.2%**	**-18.5%**	**-19.1%**	**-2.1%**	**8.2%**

Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Table 20 shows that 40% of the counties (LAU 1) with farmland abandonment are not located in Less Favoured Areas.

Table 20: Farmland abandonment and Less Favoured Areas in France

	Number of LAU 1 concerned	In %	UAA loss in ha	UAA loss in %
LAU 1 mainly located in LFA *	350	63%	-333 216	60%
LAU 1 not located in LFA	207	37%	-224 877	40%

* LAU 1 is considered in LFA if more than 50% of the UAA is classified in LFA

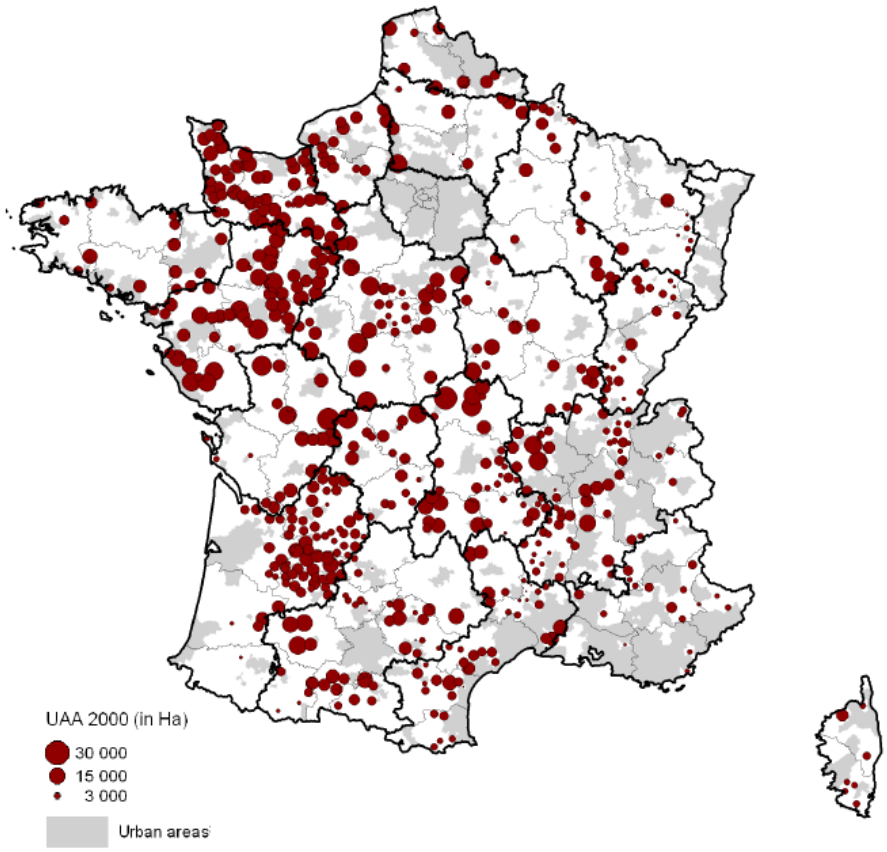
Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Map 3 and Map 4 (page 46) show the relation between farmland abandonment and the increase of forest surfaces as in *Sologne* or the South of *Ardèche*.

6.2.1.5 UAA at risk of farmland abandonment

The UAA at risk of farmland abandonment represents almost 4.2 million ha, or 15% of the UAA in 2000 (see Table 9 – French atlas - Appendix A).

Map 5: French UAA 2000 under the risk of farmland abandonment



Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

6.3 Results of the expertise in Aquitaine

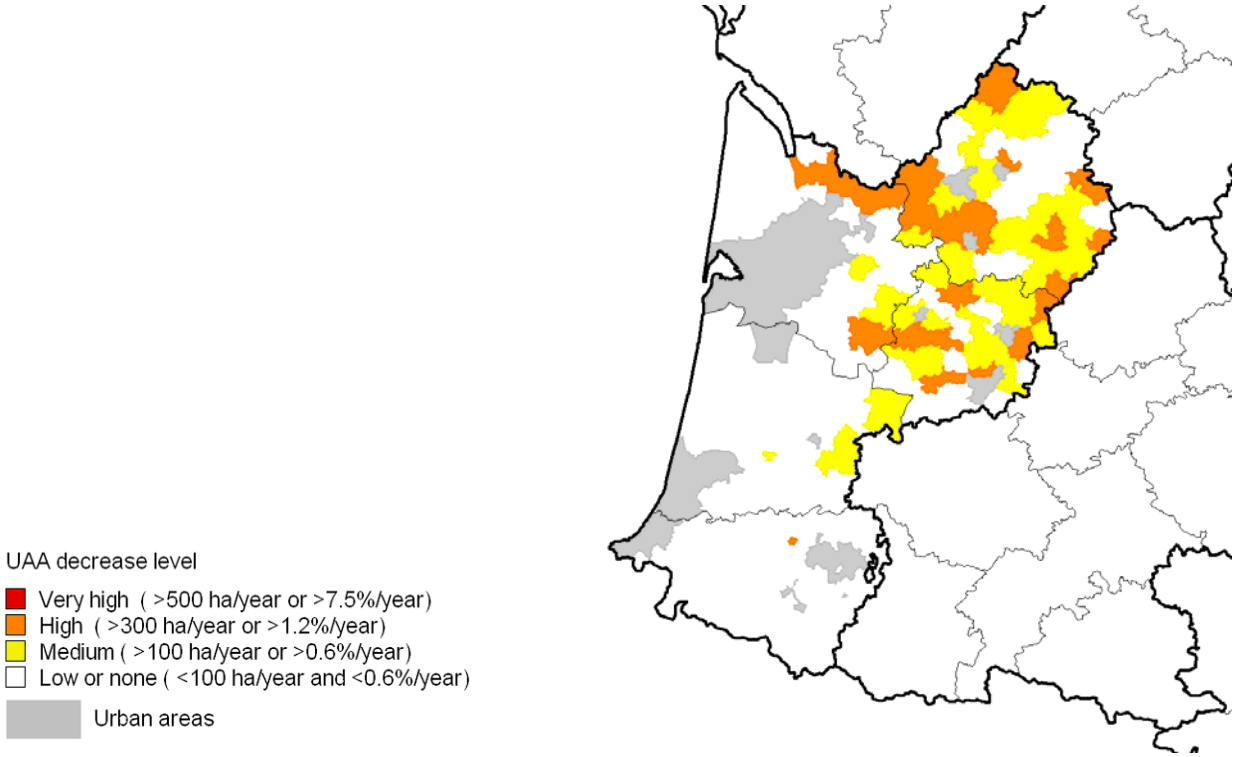
Tables and maps in Appendix A

6.3.1 Evolution of land uses and production

In 12 years (1988-2000), the rural areas of the region of Aquitaine lost **87 000 ha of UAA:** a negative end result of 59 000 ha (-4.2%). **This flow represents 10% of the national flow**. But the UAA loss is mainly concentrated in two departments: the *Lot et Garonne* and the *Dordogne*. No farmland abandonment is observed in very dynamic agricultural regions such as the *Pyrénées atlantiques* (dairy cheese production and maize), the *Landes* (irrigated maize and intensively cultivated vegetables) and the *Gironde* (high quality vineyard)

UAA decrease in urban areas represents 16 000 ha, or 15% of the total decrease.

Map 6: Farmland abandonment in Aquitaine



Sources: FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

6.3.2 Causes of farmland abandonment

Permanent grassland is the main contributor to the UAA loss, due to the decrease in mixed traditional farms. The situation is particular in the *Dordogne* and the *Lot et Garonne* where, since the 1990s, there is land pressure driven by residential functions (principal and secondary residences). More and more land is sold to non-farmers (in the Lot et Garonne, 25% of the annual market in 1995 and 50% in 2006). Generally, when a buyer can afford 300 000 € for a house, he tries to buy 10 ha of land to go with the house, for 30 000 €. Meanwhile the land is not abandoned and is managed by the new owner (with horses for leisure, for example). Table 21 shows that the farmland sold to non-farmers could explain 23% of the UAA loss.

The farmland abandonment is more important in the areas with low soil quality and with no land consolidation.

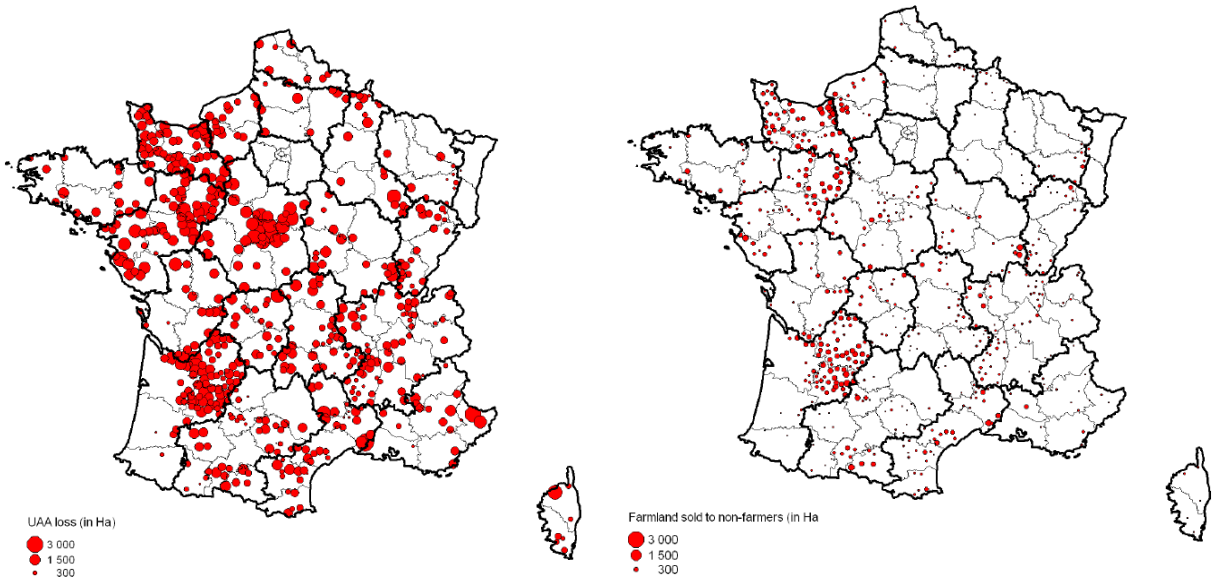
Table 21: Farmland sold to non-farmers in France

UAA decrease level (1988-2000)	Threshold	Farmland sold to non-farmers	UAA decrease 1988-2000	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	0	-
High	UAA loss over 300 ha/year or over 1.2%/year	25 823	199 333	13,0%
Medium	UAA loss over 100 ha/year or over 0.6%/year	64 620	358 760	18,0%
Low	UAA loss under 100 ha/year and under 0.6%/year	116 019	341 625	34,0%
TOTAL in ha		**206 462**	**899 718**	22,9%

Sources: SCAFR, Levesque, 2007, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

The land market price is high and there is also a competition for farmland among farmers. It concerns a yearly 1.5% of the UAA. Even if some parcels are abandoned, stakeholders do not consider that there is farmland abandonment in their region because the pressure on the land is still high and the agriculture productive.

Maps 7 and 8: Farmland abandoned in ha and farmland sold to non-farmers in french rural areas



Sources: SCAFR, 2006, FSS censuses/SCESS, Population Survey/INSEE and calculation by SOLAGRO.

Table 22: Causes of UAA decrease in France

	Causes /context	Consequences on farmland abandonment
Demographic	Farmers close to retirement age. Problems with transmission of farm ownership. The 'traditional system' of mixed farms of 30 ha is no longer sustainable and economically profitable. The farm size increases, with a higher degree of specialisation (crops, fruit, viticulture). The size of professional beef farms is now 150-200 ha. There are less and less farms.	During the transmission some grassland, remote or small parcels, do not find a bidder.
Farming system	Traditional mixed systems are no longer profitable	idem
Geographic and bio-physical	The best land, on the *Garonne* and the *Lot* valleys are always used. But in the hillsides farmland is not so fertile. Specialised farms (fruits, vegetables, irrigated crops) are mainly located in the valleys	Abandonment of the less fertile soils occurs on slopes and hillsides, but also on wet grassland
Social and economic	*The Dordogne* and the north of the *Lot et Garonne* are very attractive for tourists and for residential functions, with attractive landscapes and a warm climate. Houses in small farms are sold at a high price when farmers retire, not only for secondary houses but also for principal residences. English and Dutch inhabitants are very present in these two departments.	New owners buy a house surrounded by some land (between 1 and 10 ha).

6.3.3 Remarks on the methodology

Table 23: Remarks on the methodology developed

	Context	Remarks	Proposals
Definition of urban and rural areas		No remark	
FSS Accuracy	The increase of UAA in some municipalities can be partly explained by the fact that the land is registered in the municipality where the farmer lives. When the size of the farm increases, the UAA can increase in municipalities where there are dynamic and profitable farms. But work at LAU 1 limits this statistical phenomenon. Horses for leisure are not included in FSS	FSS does not capture some grasslands managed by non-farmers for their leisure.	Observe competition in the land market and the average price of land. For France LAU 1 appears to be the best scale considering the general increase of farm size and the small size of the municipalities.

6.3.4 Risk indicators of farmland abandonment proposed for Aquitaine

Table 24: Risk indicators of farmland abandonment proposed for Aquitaine

Type of indicators	Risk indicators that favour farmland abandonment
Bio physical	- Percentage of low soil quality
Demographic	- **Old age of worker population**
Geographic	- **Steep slopes**
Farm characteristics	- Percentage of permanent grassland and sheep - farm size - type of farming systems
Economic	- **High land prices** - competition in the land market - Percentage of secondary residences

7. The Polish case study

7.1 Context

7.1.1 Agricultural surfaces

Between 1996 and 2002, a high decrease of UAA (**1.6 million hectares -9%),** was observed, corresponding to arable lands (-12%), grasslands (-8%) and pastures (-24%) with an increase of set-aside and fallow land (+28%) and orchards (+26%).

The lost UAA corresponds to a flow of 249 000 ha per year (-1.3%).

Table 25: Comparison of the results of FSS 1996 and FSS 2002[3] in Poland

In ha	1996	2002	Evolution	In %
UAA	18 474 568	16 899 297	-1 575 271	-9%
Total arable land	14 087 662	13 066 504	-1 021 158	-7%
Total sown arable land	12 288 511	10 764 289	-1 524 222	-12%
Set-aside and fallow land	1 799 151	2 302 215	503 064	28%
Orchards	215 541	270 955	55 414	26%
Grasslands	2 760 139	2 531 284	-228 855	-8%
Pastures	1 364 752	1 030 554	-334 199	-24%

Source: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Censuses 1996-2002.

The Eurostat database also shows a larger decrease of the UAA for the period 1987-2005: on average -159 000 ha per year (-1%) corresponding to a total UAA reduction of 18%. Between 2001 and 2003, around **2.2 million ha disappeared.**

The reduction of the UAA is due to the reduction of arable land surfaces (on average 133 100 ha per year), and permanent pastures and rough grazing surfaces (on average 137 100 ha per year) (see table 26).

Table 26: Evolution of farmland uses in Poland between 1987 and 2005

	Annual average evolution (ha)	Annual average evolution (%)
UAA	-159 000	-0.8%
Arable land	-133 100	-0.9%
Permanent pastures	-35 300	-2.4%
Rough grasslands	-101 800	-6.7%

Source: Eurostat/Agriculture/Land use, 1987-2005

Considerable farmland abandonment occurred during the period 1996-2002 and mainly concerned the grasslands. FLA appears to be located mainly in the east of Poland, where there are small and diversified holdings, as opposed to the west, where during the Communist period, many large holdings were state-owned farms.

The Polish agriculture is characterised by highly fragmented farms. Soils of average or poor agricultural quality are dominant and climate conditions might additionally hinder agricultural production.

[3] Please, note that those data have gathered at national level and national results coming from data collected at a larger scale could be slightly different.

The main feature of Polish agriculture is the large number of very small farms (see Table 27). The average size of farms in 2004 was still 7.5 ha of UAA with a significant regional differentiation. Even if the enlargement of existing farms is a constant process, the number of smallest farms (under 5 ha) has been rising. The change in the area structure of the farms is very slow because of the economical situation in rural areas: high unemployment (18% in 2004) and to the existence of other sources of income (in 50% of the farms, most of the income did not come from the sale of agricultural products).

Table 27: Structure of individual farms in Poland according to UAA size in 1995 and 2004

	1-2 ha	2-5 ha	5-10	10-15	More than 15	
Number of farms in 1995	21%	34%	27%	11%	8%	2 047 600 farms
Distribution of the UAA in 1995	5%	17%	31%	19%	28%	13 819 900 ha
Number of farms in 2004	26%	32%	22%	10%	11%	1 851 800 farms
Distribution of the UAA in 2004	5%	14%	21%	15%	45%	13 930 400 ha

Source: Agriculture 2004, Central Statistical Office (GUS-Poland), 2005

For many years, the stock of cattle, sheep and horses had been decreasing, mainly during 1990-2000. The number of cows decreased by 1.3 million between 1990 and 1995, and by 0.7 million between 1995 and 2003. Pastures and grasslands occupied only 21% of the UAA in 2002, and their surface decreased between 1996-2002, corresponding to 38% of the total UAA loss. There is a direct link between farmland abandonment and the fall of ruminant animal stocks.

7.1.2 Population evolution and soil sealing

Poland has a specific demographic evolution, with a population decrease (377 200 inhabitants between 1996 and 2002 -Eurostat-) similar to that of most of the New Member States. The population increased only in 2 regions (Malopolskie and Wielkopolskie). In other regions, the population decreased by more than 4% during the observed period (Lodzkie, Slaskie, Opolskie). Some big cities, such as Poznan and Katowice, are losing population to the peri-urban area.

Even if the total population is decreasing in Poland, there is a large population migration from rural to urban areas.

The global loss of population hides different flows occurring at the same time:

- Migration from Poland to the Western countries.
- Migration from some rural areas to urban areas.
- Migration from city centres to peri-urban areas.
- Expansion of housing (catching-up with the new life standards).

Pushed by the development of the economy, these population flows create housing and infrastructure needs. The need for land is therefore becoming important in these urban areas.

7.1.3 Forests

The Eurostat estimate of the forest area is 9.173 million ha in 2005, with **an annual evolution of 24 600 ha** between 1987 and 2005 (+ 0.3%/year).

Data on Forest surfaces provided by the annual Polish statistical data show similar results. Forest surface is increasing constantly (100 000 ha in 7 years). The category “other lands which are not used” covers 3.9 million ha. Forest surface covered 9.16 million ha in 2005, with an increase of 30 000 ha per year (+0.3%).

7.1.4 Evolution since 2002

The most up-to-date available data are from FSS 2002.

The trend between 2003 and 2007 appears to be one of an increase of agricultural land use. A decrease of fallow land was observed since the implementation in 2005 of direct payments to farms requiring GAEC and LFA payments.

The total area of arable land left fallow was 2.3 million ha in 2002 (source: FSS), which was 17.6% of the total arable land. In 2004, the area of fallow land decreased to 1.3 million ha. This is, to a large extent, related to the implementation of the Common Agricultural Policy in Poland (Ministry of Agriculture and Rural Development, 2005).

According to the Geodetic Register of the end of 2004, the UAA in Poland was 19 148 000 ha. However, in 2004, only an area of 16 327 000 ha was utilised agriculturally. Until 2003, the UAA acreage decreased systematically, mainly due to its allocation to housing purposes and to the infrastructure accompanying housing estates. But, in 2004, with the implementation of direct payments, the UAA grew by 158 000 ha.

Consequently, it is difficult to know exactly what happened since 2002, and to measure the land use consequences following Poland's entry in the CAP. Data on set-aside surfaces are now available at the commune level. Some information is also available at the Agency for the Restructuring and Modernisation of Agriculture (ARIMR). The IUNG is currently carrying out a study in *Wojewodztwo Dolnoslaskie* (South-West) based on the interpretation of satellite data (comparison 2002 - 2005).

Since its entry in the European Union, on 1st May 2004, there has been a strong economic growth (between 5 and 6% of GDP). The price of the land increased very fast (30% per year during these last years)

Financial aids from structural funds and direct payments have been implemented since October 2004, and increase every year (25% of the EU standard in 2004, 40% in 2007 and 100% expected in 2013). Yields of major crops are increasing. In consequence, the farm income increased by 74% in 2004 (2% in 2005 and 11% in 2006).

7.2 Results of the methodology to estimate farm land abandonment

Tables and maps in Appendix B

7.2.1 Urban areas

7.2.1.1 Definition

Map 7 of the Polish atlas shows that urban areas are mainly municipalities with more than 150 inhabitants/km^2. Only in few municipalities – where the population density is still lower than 150 inhabitants/km^2 - has the population increased more than 10%. These municipalities are all located close to large cities (Warsaw, Gdansk, Bydgoszcz, Poznan, Gorzow, Wroclaw).

Urban areas covered 14% of the UAA in 2002 and included 29.7% of the Polish population.

Table 28: Typology and characterisation of urban areas in Poland in 2002

	Population density over 150 inhabitants/km^2 and population increase over 10%	Population density over 150 inhabitants/km^2	Population increase over 10%	Total urban areas
Percentage of total inhabitants	1.1%	58.2%	2.4%	59.4%
Percentage of the total surfaces	0.4%	12.7%	2.7%	15.0%
Percentage of the UAA	0.3%	12.2%	2.3%	14.2%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS censuses 1996 & 2002.

7.2.1.2 Loss of UAA in the urban areas and estimate of the UAA converted into artificial uses

UAA decrease in urban areas was estimated at 764 032 ha, corresponding to 36% of the total decrease (-30% if we consider the net result). In municipalities with a density of over 200 inh/km^2, 35% of the UAA (633 193 ha) was lost during the period.

At the same time, an increase of the UAA was also observed.

UAA increase in urban areas was estimated at 241 717 ha, corresponding to 31% of the total increase but this increase was mainly located in a municipality with a population density under 150 inh/km^2: 141 415 ha (59%).

It is not possible to estimate exactly the UAA which was converted into artificial uses.

7.2.2 Rural areas

7.2.2.1 Gains

The gain of UAA is 528417 ha (Table 4, Appendix B). 74% of the increase is located in municipalities with a population density lower than 100 inh/km^2 (Table 4 of the Polish atlas - Appendix B).

7.2.2.2 Loss

In rural areas, the loss of UAA is **1 364 598 ha** or 64% of the flow (see Table 3, appendix B). 950 475 ha (70%) were located in municipalities where the population is decreasing and the population density is under 100 inh/km^2. The highest ratio **(-11%)** is located in the very low-populated municipalities (under 20 inh/km^2).

The majority of the UAA loss in rural areas corresponds to a high or very high level of decrease (over 3 000 ha or over 10% of the UAA per municipality).

7.2.2.3 Net result

The net result is a decrease of the UAA of 1 358 496 ha (8%) (see Table 5 Appendix B) in the period 1996-2002 of which 836 181 ha in rural areas and 522 315 ha in urban areas.

7.2.3 Estimate of farmland abandonment areas

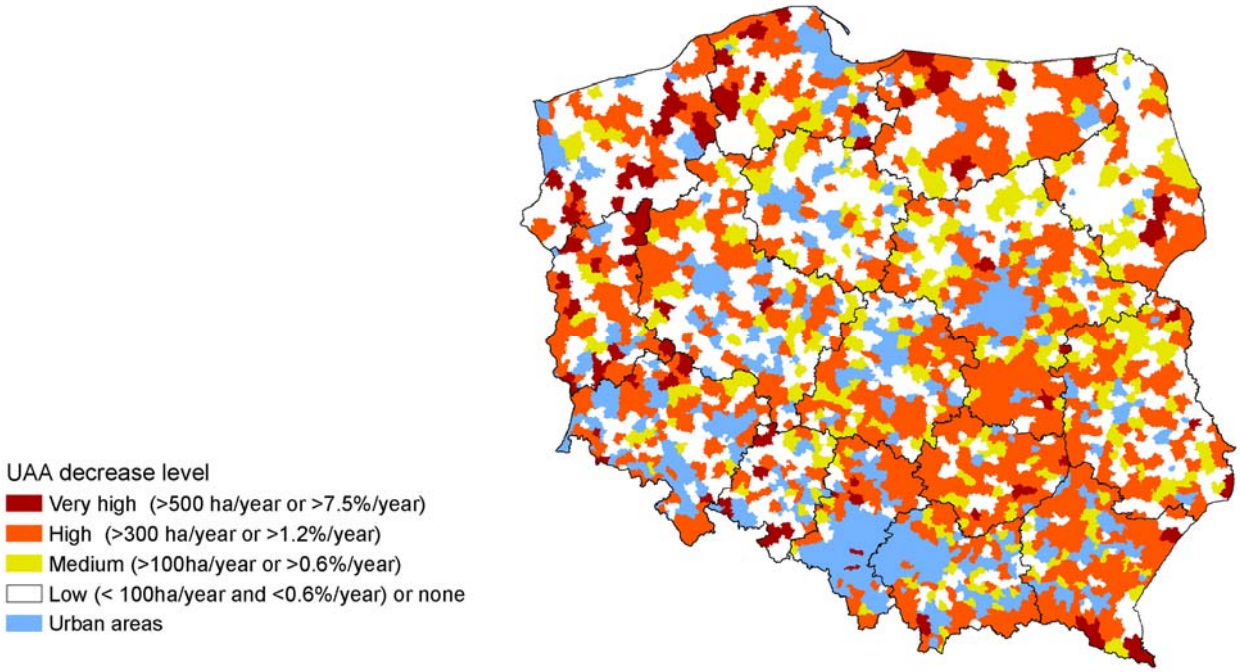
760 000 ha, corresponding to 4.2% of the UAA observed in 1996, were affected by farmland abandonment during the period (see Table 29).

Table 29: Farmland abandonment per level in Poland

Farmland abandonment per level of UAA loss	Abandoned farmland, in ha	As a %	% UAA 1996
Very high level (UAA loss over 500 ha/year per municipality, or over 7.5%/year of the UAA observed in 1996)	521 708	68%	2.9%
High level (UAA loss over 300 ha/year or over 1.2%/year)	227 458	30%	1.3%
Medium level (UAA loss over 100 ha/year or over 0.6%/year)	10 736	2%	0.1%
Estimate of total farmland abandonment	**759 902**	**100%**	**4.2%**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Census 1996-2002, and calculation by SOLAGRO.

Map 9: Farmland abandonment in Poland



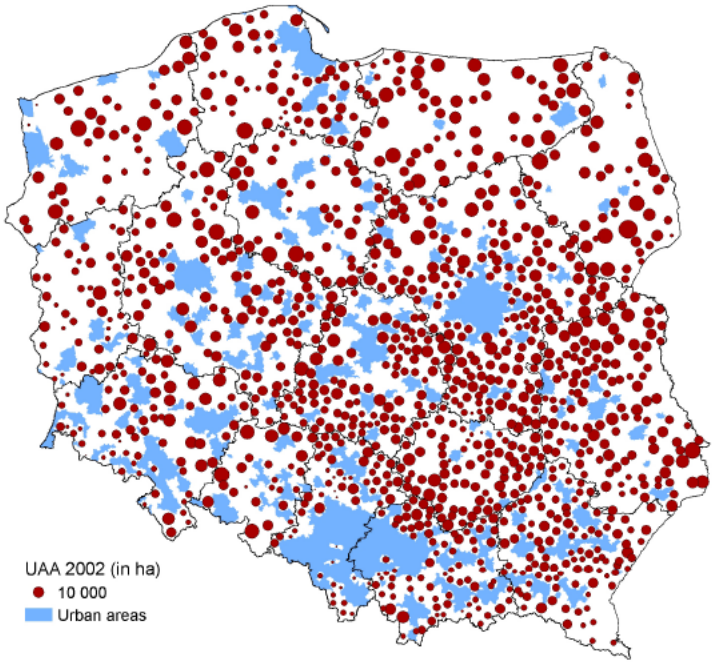
Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Census 1996-2002 and calculation by SOLAGRO.

In 2002, rural municipalities concerned by UAA loss during the 1996-2002 period, represented 65.1% of the Polish territory (203 621 km^2), and 46.9% of the Polish UAA.

The UAA in rural municipalities with a high or a very high FLA represented 5911566 ha, or 35.6% of the Polish UAA in 2002.

7.2.4 UAA at risk of farmland abandonment

Map 10: Polish UAA (2002) under the risk of farmland abandonment



Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Census 1996-2002 and calculation by SOLAGRO.

There is a higher FLA in the municipality with a low population density (less than 20 inh/km^2) and with a high population decrease - see Table 3 - Polish atlas - Appendix B.

7.3 Results of the expertise in Malopolskie and Warminsko-Mazurskie

Tables and maps in Appendix B

7.3.1 Background information

The test regions represent different socio-economic patterns and environmental conditions, observed in farm size and structure, climate, soil type and quality.

The region of Malopolskie is located in southern Poland. This region is partly mountainous (Carpathian Mts.) and holds a significant percentage of small-scale and/or subsistence farms. Being a mountainous region, there are many areas with adverse natural conditions - e.g. steep slopes or short vegetative period because of altitude so more difficulties for crop production. In the past, transhumance (vertical seasonal livestock movement) was very popular. The region is very attractive from a tourist point of view and so there is a potential urbanization impact. The region is marked by an increase of afforested areas at the expense of agricultural land.

Warminsko-Mazurskie is situated in northern Poland. This region is characterised by lowland areas and hosted in the past a big share of large, state-owned, 'co-operative' farms. The land of these large co-operative farms belonged before to the state – afterwards there were changes of ownership, property rights etc. with a huge impact on land use and cessation of agricultural practices. Potentially interesting is to find the impact of 'remoteness' of agricultural holdings with regard to farmland abandonment and impacts of urbanization, as parts of the region are extremely touristically attractive.

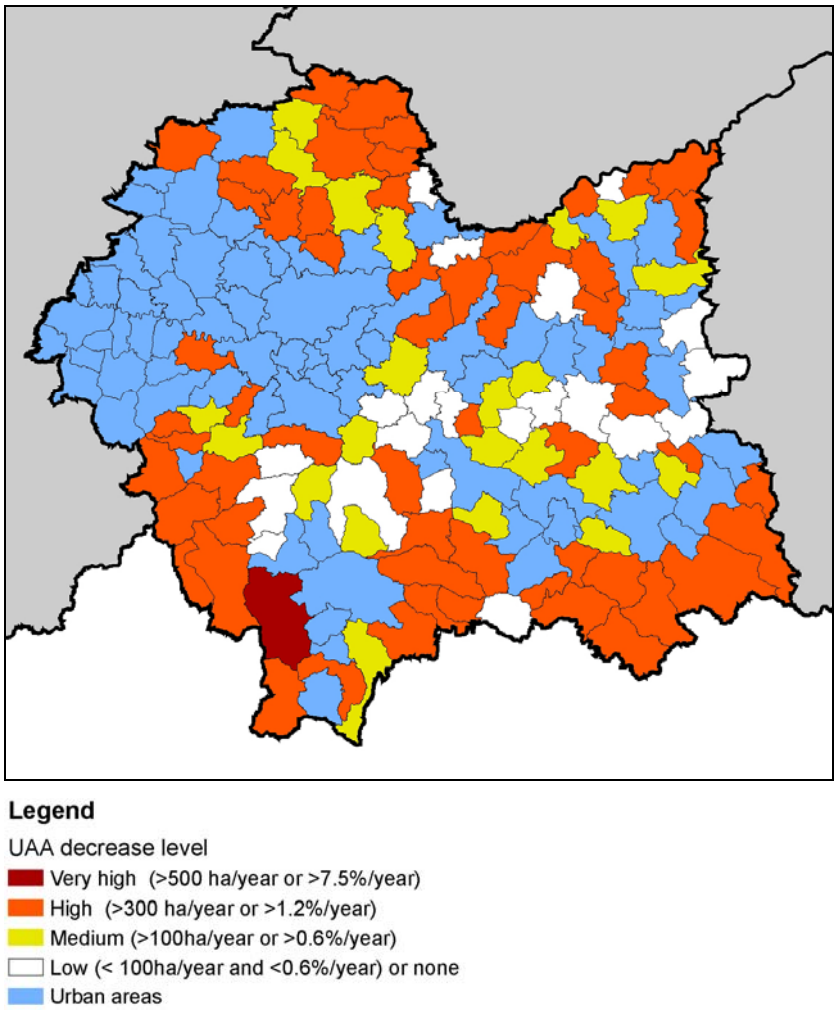
7.3.2 Malopolskie (M)

7.3.2.1 Evolution of land uses and production between 1996/2002

The stock of cattle significantly decreased in the M region, whereas the number of sheep increased (Ministry of Agriculture and Rural Development of Poland, 2005). In general, a decline in ruminant animals caused a massive abandonment of grasslands, particularly in small farms. The decline of dairy cows followed the changes in the dairy products industry, whose production relied on the major milk suppliers, thus eliminating small farms unable to ensure proper quality and hygiene standards. Only in the close vicinity of the *Tatra* mountains, where the landscape attracts tourism and tourist services have developed, is the stocking density of sheep high enough to maintain grasslands, although the production of traditional sheep cheese is sold locally, and not through the industrial chain.

The current structure of farms and the mosaic pattern of fields seem to be quite stable, although the link between the farms and the market is very weak. In this light, the non-commodity outputs of farms gain importance. The agricultural land market and the trading of farmland are relatively weak, except for areas in the close vicinity of Krakow. Changes in farm size are mainly a consequence of land ownership transmission within the family through inheritance. Some land consolidation took place in the northern part of the region; however, even here, this process is very slow. In the middle and southern parts there is a further decline of land property size– land here is not considered as an agricultural production means, although the property has a value which can be liquidated in the future, when other landscape functions such as tourism become more important.

Map 11: Farmland abandonment in Malopolskie



Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Census 1996-2002 and calculation by SOLAGRO.

7.3.2.2 Causes of farmland abandonment

The main cause driving farmland abandonment is the small farm size, because it cannot provide a sufficient income. A characteristic of Malopolskie is that it has the smallest mean farm size in the country (3.6 ha). There is no legal requirement for cultivating land in Poland, and the property tax on land is minimal. This causes many owners to consider land as an investment, and to ignore its production function. This restricts interest in farming, since it is impossible to buy land which is also considered as family heirloom. In parts of the mountainous Tatras landscape, where tourism generates a high demand for regional products, small farms manage most of the land under grasslands where the traditional sheep cheese is produced.

The impact of urbanisation on the periphery of major cities bears strongly on farmland abandonment. This is due to alternative income opportunities, which are more attractive, compared to farming. As the distance from the city increases, the intensity of farmland abandonment declines. The urban impact changes the production function of the land, which becomes urban land reserve to be liquidated in the future. Very limited land consolidation was observed, as there is no interest in selling land due to strong expectations for future high value gains. Cultural reasons and the strong attachment to the land as a family heirloom also explain the underdevelopment of the land market.

Subsistence farming for self-consumption can also be an important factor in slowing down farmland abandonment on small farms in the mountains, operated by farmers with a lower level of education and professional skills, a condition that makes it difficult for them to find employment outside agriculture. At the current stage, this group of farmers, often aged over 50, manage the land combining income from temporary and seasonal jobs outside agriculture. However, this is not a sustainable situation, since the younger and better-educated part of the population migrates to other regions. There are examples of massive migrations to foreign countries (such as from *Czarny Dunajec* to the US), which caused a farmland abandonment of over 90% of UUA relatively well suited for agricultural production. In this light, it can be expected that in the next 10-15 years, massive farmland abandonment will occur in mountainous areas, affecting the esthetical value of the landscape, a critical feature for maintaining tourism functions, which generate a major part of the income.

Table 30: Causes of UAA decrease in Malopolskie

	Causes /context
Demographic	The ageing of small farm holders is a considerable process. An important part of the income of these farms comes from pensions. When these sources cease to exist and land is transferred to the next generation, it is often abandoned. Subsistence farming is disappearing as the younger generation takes over the land.
Farming system	A low share of abandoned land is observed in sub-regions with relatively good quality soils and specializing in the production of vegetables for the local market Small farm size and a scattered pattern of small parcels within a farm. Small farms cannot afford to maintain quality standards to meet future cross-compliance requirements. Small farm size is a main factor explaining the economic inefficiency of farming and the inability to generate an adequate income to support the land owners' livelihood The decline of the stocking density of cows, and the inefficiency of small farms in the M region, lead to grasslands abandonment. Low parcel size is an important factor driving farmland abandonment – in extreme cases such as at Czarny Dunajec, the number of parcels within a farm can be as high as 100, and their width does not exceed 10m. In these conditions mechanisation is not possible, and therefore the use of horsepower for tillage is still common. Demand for local traditional products such as cheese from sheep milk, generated by tourism, counteracts land abandonment in areas servicing tourism, regardless of the poor land quality, climate and slope constraints.
Geographic and bio-physical	Counties such as Tatrzanski in the south of the region face landscape degradation due to farmland abandonment, driven by high altitudes and a harsh mountainous climate. Farmland abandonment is strongly linked to soil quality, although it is of secondary importance. The largest share of abandoned farmland is observed in areas with a slope above 20˚, although a small portion is mowed to benefit from SAPs and LFA payments. In more remote locations cultivation has ceased.
Environment	
Social and economic	Pressure on land in Maloposkie is driven by both urban development due to high population density, but also by foreign investment in the region. The largest share of abandoned land is observed around urban areas, due to the spread of residential property and the development of infrastructures. Farmers do not want to sell or rent their land in these urban areas. Owners consider land as property having a certain value for developing non-agricultural functions. In addition to urbanised areas, a large share of abandoned land is noticed in the Chrzanowski county, which is affected by metal ore mining activities Expansion of tourism-infrastructure, particularly in the south where the tourist industry annually grows between 20-30%. The investment flow and the increase in land prices in Malopolskie are among the highest in the country. Due to the small size of farms, farming cannot provide an adequate livelihood to land owners. The interest in renting land to other farmers is limited in many areas, and can be partially explained by cultural reasons and mentality.

7.3.3 Warminsko-Mazurskie (WM)

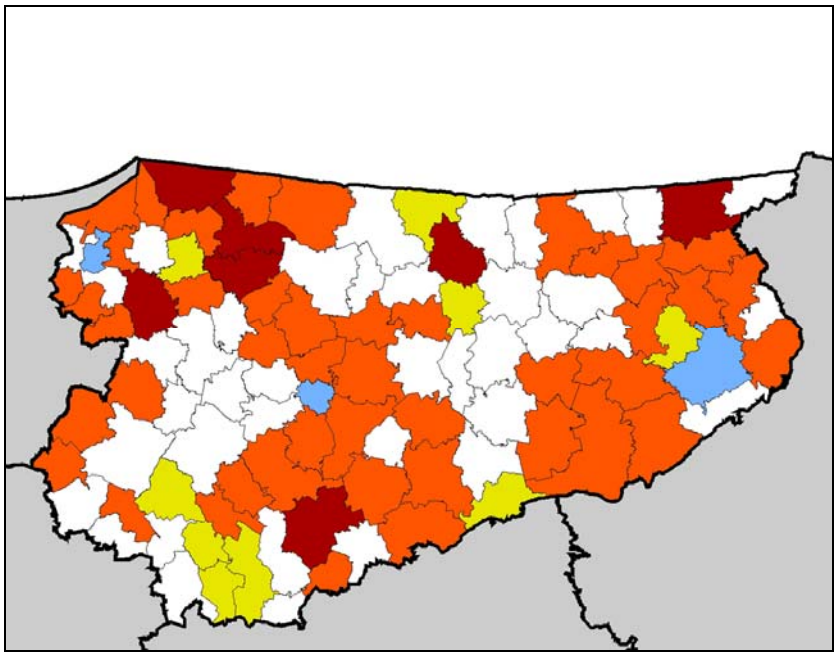
7.3.3.1 Evolution of land uses and production

Farms in the WM region have the second largest average size among all the Polish regions (21 ha). About 20% of the farms are represented by entities. At the beginning of the 1990s, state farms predominantly managed agricultural land (PGR). However, private farms, mainly operated by settlers from former eastern Poland (who moved there after 1945) are larger than 1 000 ha. Before 1990, over 40% of the land was operated by state-owned farms.

As a result of the economic transition, state-operated land was transferred to the Agency of Agricultural Land Property. The main role of this agency was to manage the land and find new owners. At first, land was rented out on the basis of a competitive bid process. At later stages, entities that rented land were able to buy it at preferential conditions. In the 90s, it was common to see a significant amount of this land temporarily abandoned, as there were no skilled managers. Limitations related to land degradation were frequent – lack of ownership led to the exploitation of soil resources, soil acidity and nutrient deficiency. Significant numbers of farms which took bank loans in the beginning of the 90s did not survive the economic reforms (known as Balcerowicz reforms). This was a consequence of the extremely high inflation rate (250% in 1989 and 500% in 1990) and of rapid changes in loan interests, which in turn led to cash flow problems linked to the seasonal character of agricultural goods trading.

Compared to the 90s, in WM a significant increase of the number of cattle stock was observed. Dairy cattle made the largest contribution to this increase, although beef cattle production also increased. This development was a reaction to the demand from the dairy industry, which preferred larger size suppliers, made possible by the existence of large farms (in contrast to the M region) as well as to a significant contribution of the natural grasslands to the land cover.

Map 12: Farmland abandonment in Warminsko-Mazurskie



Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Census 1996-2002 and calculation by SOLAGRO.

7.3.3.2 Causes of farmland abandonment

Warminsko-Mazurskie is relatively less attractive for investors than Malopolskie because of its remote location, lack of infrastructure and its smaller human potential. It seems that more efficient farming on large-size farms in the Warminsko-Mazurskie region was a factor explaining a smaller increase of farmland abandonment in the 1996-2002 period, compared to the Malopolskie region where small farms are predominant.

In the Warminsko-Mazurskie region, farmland abandonment was mainly driven by natural constraints related to soil conditions, remoteness and limited access to fields. As the farm size and the land quality ensure the profitability of farming, agricultural land was in high demand, and a substantial decline of farmland abandonment was observed in recent years. According to stakeholders, the extent of farmland abandonment is almost negligible (currently) and concerns marginal areas or areas left by farms which went through bankruptcy. They cannot be put on the land market because of legal constraints and procedures.

Table 31: Causes of UAA decrease

	Causes / context
Demographic	Ageing is a problem in many counties – in many cases retired farmers transfer their land to their children but continue farming, because the younger generation is employed outside agriculture. The land market is mature enough (since 2004) therefore there is a limited risk of farmland abandonment when farming ceases due to ageing. In some areas such as Olecki county there is a decline of the farmers' age, observed by extension services organizing training programs for farmers.
Farming system	Parcel size is not an issue. Lack of proper rotation, driven by prices, will end up with the expansion of plant diseases, potentially increasing farmland abandonment. This is not a constraint for larger farms, as the standards set by the dairy industry were already implemented; otherwise, milk production would not be possible. For medium-size farms, this can be a problem, because keeping up with standards requires large investments in mechanisation, manure storage facilities, etc.
Geographic and bio-physical	Land quality is a major driver explaining farmland abandonment, since farm size is not a factor. In areas with the most fertile soils, it is almost negligible. The level of steepness is not a limiting factor. There is some impact on farmland abandonment mainly from areas with poor drainage that accumulate water running off the surrounding slopes.
Environment	Similarly to Malopolskie –national parks, numerous nature reserves and areas of protected landscape (one of the largest numbers in PL there)
Social and economic	Due to its remote location, in WM urban growth is not as intense as in M. However, tourist infrastructure is rapidly developing around the Mazurian lakes. The urbanisation of the WM region is area wise only a fraction of that observed in M. Similarly to what occurs in Malopolskie, there is a population trend from the city to peri-urban zones, leading to new developments of residential areas of individual houses. The land market is well developed and administrative procedures are not limiting factors. However, the unclear legal situation of many former state farms led to farmland abandonment in the past since renting managers were reluctant to invest in land without a guarantee; in the future renting managers have an option to become landowners.

7.3.4 Remarks on the methodology

The delimitation of rural areas proposed in this study differs largely from the Polish definition of rural areas (which has 3 classes: rural *gminas*, urban-rural *gminas* and urban *gminas*). Authorities classify 93.2% of the Polish territory as rural area, compared to 85% in the present methodology. This is a real problem for stakeholders concerned by land planning and agricultural policy. Indeed, all the rural development funds are linked to the definition of rural areas.

Table 32: Proposals concerning the proposed methodology

	Context	Remarks	Proposals
Definition of urban and rural areas	Allows detection of urbanisation processes as well as to officially distinguish rural areas that possess urban features.	Sensitive issues from stakeholders' perspective, and inconsistent with existing definition.	Leave the Polish definition of rural areas, as changing it leads to some sensitivity.
FSS accuracy	Important for a constructive dialogue and exchange of information between national agencies and EU counterparts.	Consistent with the country's assessment. Uncertainties involved in the semi-quantitative methodology used by the census. Lack of a spatial dimension and aggregation of data at LAU 2 level. Poor temporal resolution – changes related to the implementation of CAP instruments are not depicted at all. UAA-FSS data (Eurostat) at LAU 2 are currently not publicly available.	Using the classification of satellite images would be the most robust approach
Scale (LAU 2)	From the EU perspective this resolution is more than enough.	The resolution is not adequate for regional assessment.	Collect data at NUTS 3 level for the EU and at LAU 2 for regional analysis, using satellite imagery as data source
Thresholds	The percentage of FLA relative to UAA is a good measure to standardise the assessment. Combining % with the area size of FLA allows for the detection of areas where the problem is significant. The percentage alone could be misleading, as the total size of the administrative units concerned may be very different. Considering FLA as spaces outside urban areas is indicative of how extensive the problem is from the farming and landscape perspective	To take urban areas out of the FLA definition is to ignore landscape degradation in many areas which still maintain a rural character that coexists with urban functions. From the perspective of landscape as heritage, this can be questionable	FLA should be comprehensively assessed both in urban and rural areas as long as these areas contain a farmland.

7.3.5 Risk indicators of farmland abandonment proposed for Malopolskie (M) and Warminsko-Mazurskie (WM)

The Polish FSS provides data on farmland abandonment. But the definition is different from the one used in this study. The question in the Polish FSS concerning abandoned land includes fallows. Nevertheless, this information was used to identify important drivers of farmland abandonment in the two pilot regions – Malopolskie and Warminsko-Mazurskie. FSS data on farmland abandonment flows and stocks are significantly correlated to the number of different variables which can be considered as farmland abandonment causes. It is evident that farmland abandonment cannot be explained by a single factor, and that it is controlled by complex interactions between socio-economic and environmental drivers. For the same variables, correlations are different in the two pilot regions (see figures 16 and 17, table 34).

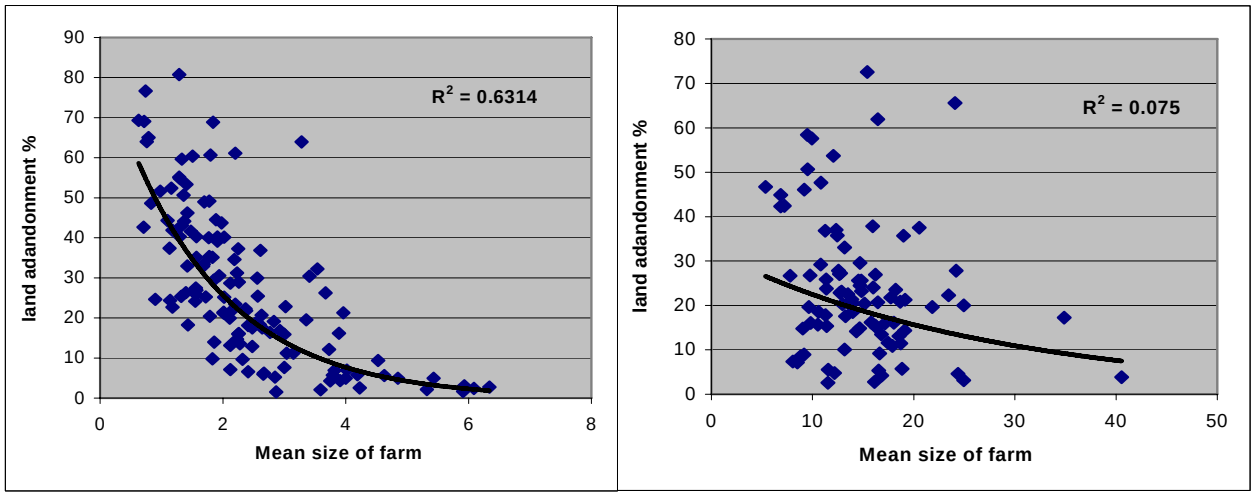
The pilot regions represent fundamentally different socio-economic patterns and environmental conditions, observed in farm size and structure, climate, soil type and quality. These differences explain the different extent of farmland abandonment in the pilot regions. However, the mechanisms at work in the process appear to be very similar. In both regions there is a strong relationship between farmland abandonment and farm size in Malopolska (see Figures 17 and 18), and land quality in both regions (see Table 34). Farmland abandonment due to relief and climatic conditions (length of the vegetation period) are much weaker, although visible after aggregating data for the respective parameters into range groups (percentiles). Aggregation of animal stocking density into ranges also allows demonstrating their impact on land management. Socio-economic variables, such as population density, level of agricultural education, amount of farm investment and age of farmers also contribute to farmland abandonment.

Table 33: Risk indicators of farmland abandonment proposed in Malopolskie (M) and Warminsko-Mazurskie (WM)

Type of indicators	Risk indicators favouring farmland abandonment
Bio physical	- % of low soil quality
Demographic	- **Ageing farm worker population** - Low population density - Great distance from towns (peripherality) - Access to services,
Geographic	- **Slope**
Farm characteristics	-Small farm size and a scattered pattern of small parcels within a farm. - Low livestock density - **Low proportion of professional farms** (full time farms)
Economic	**- Low farming incomes (especially margin per hectare)** **- High land prices** - Low CAP payments - Low LFA and AEM payments

M (see figure 16 left) is characterized by the smallest mean farm size in the country (3.6 ha). Small farm size is a main factor explaining economic inefficiency of farming. Small farm size and inability to generate adequate income suporting livelihood is driving force of massive land abandonment. There is no trend for any remarkable increase of farm size. The average farm size in WM ((see figure 16 right) is 25 ha which is the second largest among NUTS-2 regions in Poland. There is a significant contribution of large farms with a size well over 100 ha which were formed as a result of state farms privatization. However the size of so called ‘individual farms’ which were private, even before the transition, is significantly bigger comparing to Poland average. This ensures profitability and reduces the risk for land abandonment.

Figure 16: Correlation between FSS-based farmland abandonment stock and farm size, for the Malopolska (left) and Warminsko-Mazurskie (right) regions.



Source: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Census 1996-2002

Table 34 shows a correlation between FLA and land quality index only in Malopolskie.

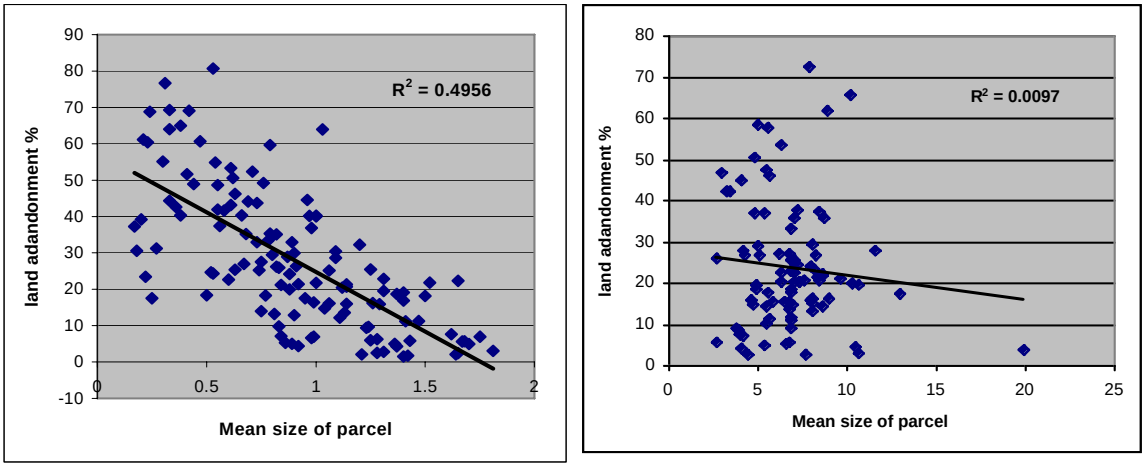
Table 34: Average contribution of FSS farmland abandonment evaluation within different ranges of the land quality index in Malopolskie and Warminsko-Mazurskie regions

Percentile of UAA		Land quality index	Percentage of abandoned land in Malopolskie	Percentage of abandoned land in Warminsko-Mazurskie
1	0-0.25	Low (43.1-67.6)	36.2	25.9
2	0.25-0.5	Medium (67.6-75.3)	24.9	21.3
3	0.5-0.75	High (75.3-84.65)	29.0	22.9
4	0.75-1	Very high (84.65-102)	12.1	17.4

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Censuses 1996-2002.

In M, low parcel size is an important factor driving land abandonment – in extreme casus, such as at Czarny Dunajec (NUTS-5 unit), the number of parcels within a farm can be as high as 100 and their width does not exceed 10 m. In such conditions mechanization is not possible and therefore using horse power for tillage is still common. However in more remote location cultivation is ceased. Subsistence farming of that type is disappearing as the younger generation takes over the land. In WM, parcel size is not an issue. Smaller parcels appear occasionally, mainly due to natural conditions

Figure 17: Correlation between FSS-based farmland abandonment and mean parcel size in Malopolskie (left) and Warminsko-Mazurskie (right) regions



Sources: Central Statistical Office (GUS-Poland) 1996 & 2002, FSS Censuses 1996-2002.

8. The Spanish case study

Tables and maps in Appendix C

8.1 Context

8.1.1 Main trends of land use

Eurostat data show a large decrease of the UAA between 1973 and 2005: -234 000 ha per year (-0.9%), corresponding to a UAA reduction of 29 %. (see Table 35)

Table 35: Evolution of the Spanish UAA between 1973 and 2005

	Surface in 1973 (1,000ha)	Surface in 2005 (1,000ha)	UAA evolution (%)	UAA annual average evolution (%)	UAA annual average evolution (1,000 ha)
Arable land	16 054	12 680	-26.6%	-0.7%	-105
Permanent pastures	10 696	6 388	-67.4%	-1.3%	-135
Total UAA	33 307	25 834	-28.9%	-0.9%	-234

Source: Eurostat/Agriculture/Land use

The UAA decrease is due mainly to the decrease of arable land surfaces: -105 100 ha per year (-0.7%); of permanent pastures: -135 100 ha per year (-1.3%).

Aside from this main trend, the situation during 1989-1999 (dates of the two last FSS censuses) shows different results, with a 6% increase of UAA.

UAA gain can be explained by the increase of the surface of olive trees and the increase of permanent pastures (see table 36) linked with the increase of animals (sheep and cows).

Table 36: Main evolution of the Spanish Agriculture between the two last FSS censuses[3].

	FSS 1989	FSS 1999	Evolution in ha or in units
UAA	24 741 000	26 317 000	+ 1 576 000
Arable crops	16 247 747	16 920 360	+ 672 613
Olive trees	1 790 000	2 274 000	+ 484 000
Permanent pastures	8 493 000	9 396 000	+ 904 000
Cattle units	4 800 000	6 361 000	+ 1 561 000
Sheep	17 577 000	20 989 000	+ 3 412 000

Source: Ministerio de Agricultura, Pesca y Alimentación de España (FSS censuses 1989 & 1999).

8.2 Results of the methodology to estimate farmland abandonment

8.2.1 Urban areas

8.2.1.1 Location

Urban areas (see Map 7 – Spanish Atlas- Appendix C) are mainly located along the coast and around Madrid and other large cities such as *Barcelona, Valencia, Zaragoza, Sevilla* or *Bilbao* where the population is increasing very fast. A migration of the population from the core of large cities as Madrid to the peri-urban areas is also observed. These are the reasons why the urban areas are increasing in Spain. Municipalities with a population increase of over 10% and a population density below 150 inhabitants/km^2 also cover large areas.

In 1999, the Spanish urban areas (as defined in the methodology) covered 19.9% of the territory (17.6% in 1989) and were home to 79.4% of the Spanish population.

Table 37: Typology and characterisation of urban areas in Spain in 1999.

	Population density over 150 inhabitants/km^2 and population increase over 10%	Population density over 150 inhabitants/km^2	Population increase over 10%	Total urban areas
% of total inhabitants	20.5%	73.0%	26.9%	79.4%
% of total surface	3.2%	8.1%	15.1%	19.9%
% of UAA	2.2%	6.2%	12.4%	16.4%

Sources: Instituto Nacional de Estadística, (Population census 1999), FSS MAPA Census 1999.

8.2.1.2 UAA loss in urban areas and estimate of the UAA converted to artificial uses

Only 16% of the UAA was located in urban areas in 1999 (18% in 1989).

The UAA loss in urban areas is estimated at - 625 337 ha, corresponding to 24% of the total loss. 35% is located in municipalities with a population density over 150 inh/km^2.

At the same time, an increase of the UAA is observed.

The UAA gain in urban areas is estimated at + 559 846 ha, corresponding to 13% of the total increase and is mainly located in municipalities with a population density below 50 inh/km^2. The **net result** in urban areas is **UAA loss** of - 65 491 ha **(- 1.5%).**

It is not possible to exactly estimate the UAA which was converted to artificial uses. The growth of artificial areas can be explained by the high population increase, rural to urban migrations, the growth of tourism and the high number of secondary residences.

8.2.2 Rural areas

8.2.2.1 Gains

The **UAA gain in rural areas is very high**: 3 606 821 ha, corresponding to 15% of the UAA in 1989 (see Table 4 in Appendix C). 80% of the increase is located in municipalities with a population density lower than 50 inh/km^2.

8.2.2.2 Losses

In rural areas, the UAA loss at LAU 2 is of 2 020 077 ha (see Table 3 - Spanish Atlas-Appendix C). It **corresponds to 76% of the total loss**. 91% of the lost UAA are located in municipalities where the population is density is below 50 inh/km^2.

When trying to link with the population density or the population evolution, the results are difficult to analyse because, within the same time period, a gain and a loss were observed. Most UAA loss in rural areas corresponds to a high or very high decrease level (over 3 000 ha or over 10% of the UAA per municipality).

8.2.2.3 Result

The net result **in rural areas is an increase of 1 586 744 ha of UAA** (see Table 5 in Appendix C).

8.2.3 Estimates of abandoned farmland

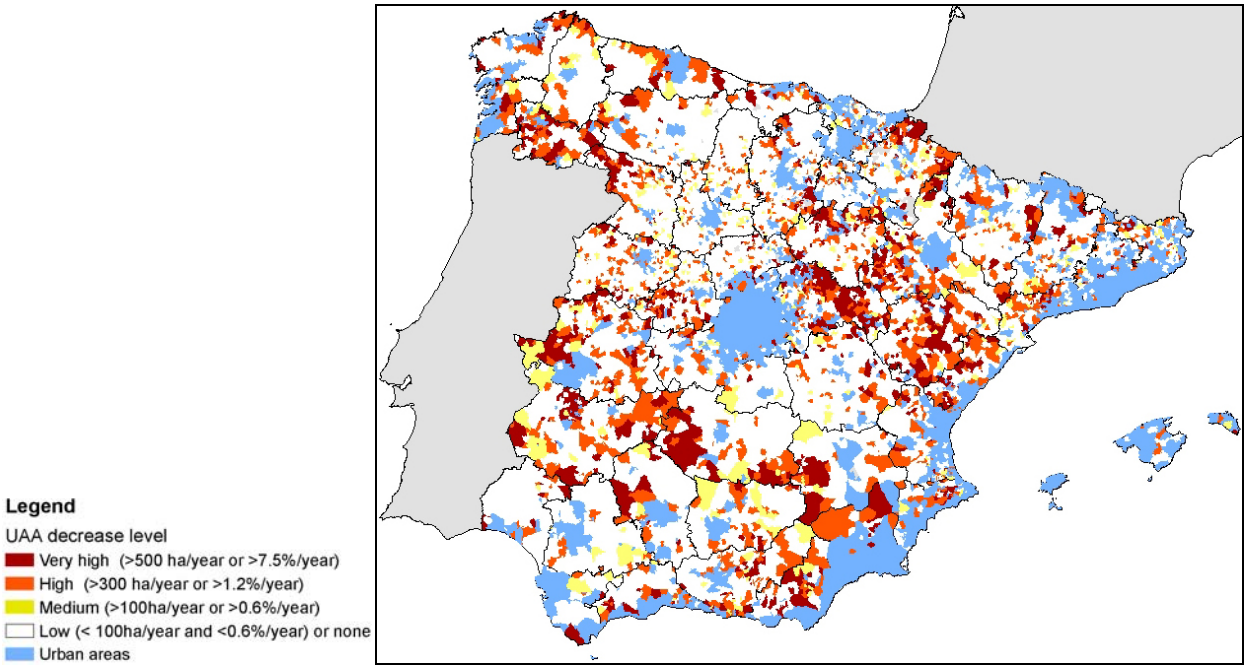
In 1989, 1 986 335 ha were abandoned (Table 38), **corresponding to 8% of the total UAA**. Part of the farmland abandonment corresponds to afforestation. 406 000 ha of farmland have been afforested between 1994 and 1999. Afforestation is responsible for a minimum of 20% of UAA loss in rural areas.

Table 38: Farmland abandonment in Spain

Farmland abandonment per level 1989-1999	Farmland abandoned in ha	In %
Very high level (UAA loss over 500 ha/year per municipality, or over 7.5%/year of the UAA observed in 1989)	1 197 711	60%
High level (UAA loss over 300 ha/year or over 1.2%/year)	706 377	36%
Medium level (UAA loss over 100 ha/year or over 0.6%/year)	88 247	4%
Estimate of total farmland abandonment	1 986 335 ha	100%

Sources: Instituto Nacional de Estadística (Population censuses 1991 & 1999), MAPA (FSS censuses 1989 & 1999) and calculation by SOLAGRO.

Map 13: Farmland abandonment in Spain



Sources: Instituto Nacional de Estadística (Population censuses 1991 & 1999), MAPA (FSS censuses 1989 & 1999) and calculation by SOLAGRO.

The rural municipalities concerned by UAA loss during 1989-1999 represent 32.5% of the Spanish territory (164 000 km^2), and 28.3% of the Spanish UAA in 1999.

8.2.4 UAA under the Risk of Farmland abandonment

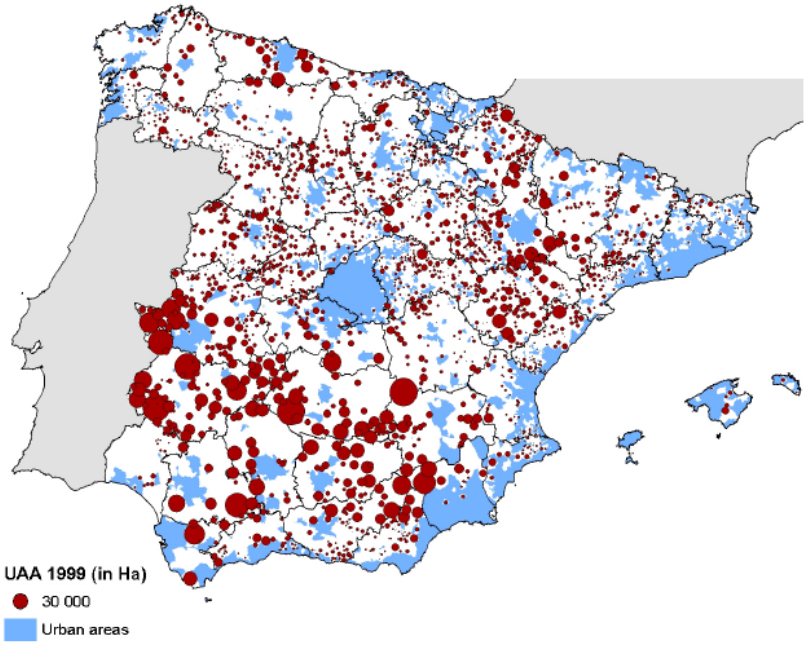
In 1999, the UAA at risk of farmland abandonment represents almost 6 million ha, corresponding to 23% of the UAA.

Table 39: UAA at risk of farmland abandonment in Spain, Catalonia and Galicia

Location and evolution of the UAA	Galicia	Catalonia	Spain
UAA net result in urban areas in ha	- 13 909	-15 125	- 65 491
UAA net result in urban areas in %	-20.2%	-3.6%	-1.5%
UAA net result in rural areas in ha	35 525	60 598	1 586 744
UAA net result in rural areas in %	+5.9%	+8,8%	+7.8%
Total gain in rural areas	103 823	119 681	3 606 821
Total loss in rural areas	68 298	59 083	2 020 077
Farmland abandonment	67 125	57 559	1 986 335
UAA at risk of farmland abandonment in ha	161 142	199 596	5 977 626
UAA at risk of farmland abandonment as a % of the UAA, 1999	23.1%	17.4%	22.8%

Sources: Instituto Nacional de Estadística, (Population census 1999), MAPA (FSS censuses 1989 & 1999) and calculation by SOLAGRO.

Map 14: Spanish UAA (1989) under the risk of farmland abandonment



Sources: Instituto Nacional de Estadística, (Population census 1999), MAPA (FSS censuses 1989 & 1999) and calculation by SOLAGRO.

8.3 Results of the expertise in Galicia and Catalonia

8.3.1 Background information

The region of Galicia is still an Objective 1-region for the Rural Development Funds.

In 2000, it was ranked by the Ministry of Agriculture as 3rd region in Spain to have applied for the afforestation of agricultural land (16.370 hectares).

Cataluña is one of the richest regions of Spain. It faces a lot of problems because of farmland abandonment as the region gained a lot of new scrubland and forest (not afforestation) that has increased the incidences of fire.

8.3.2 Catalonia

8.3.2.1 Evolution of land uses and productions

The UAA in Catalonia increased between 1989 and 1999. Although the region of Catalonia lost 59 000 ha of UAA in rural areas in 10 years, there was a large positive net result of 61 000 ha (+8.8%).

UAA decrease in urban areas represents -59.000 ha, corresponding to 50% of the total decrease. Catalonia is under strong demographic pressure. 6,5% of its territory is urbanised.

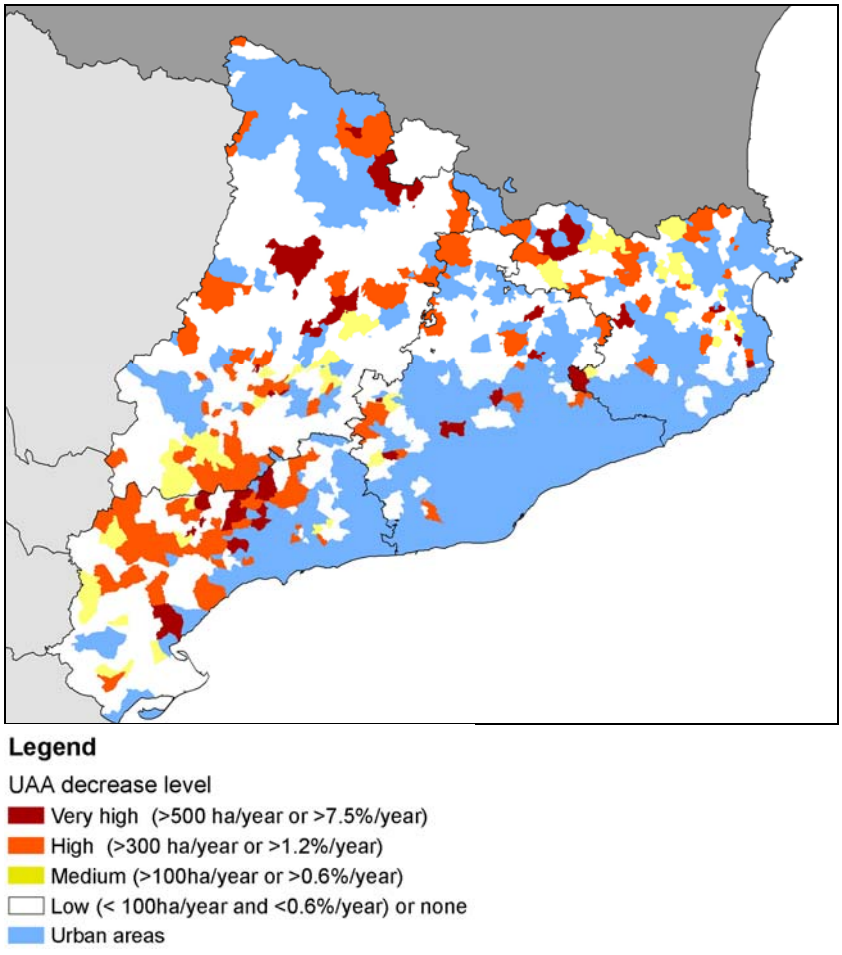
National Forestry Inventory shows that the forest surface in Catalonia increases annually by 1,6%; the natural forest surface increases more than 6%.

Some changes in farm types and productions were observed: tubers decreased by 68%, pulses (-49%), vegetables (-40%), vineyards (-33%), cereals (-11%) and nuts (-3%). On the contrary, industrial crops increased by 63%. Fresh and citrus fruit (11%), flowers (45%) and olives (1%) are grown. Permanent grasslands are also increasing.

Irrigated lands in Catalonia represent 8.6% of the total surface of the community, and they are on the rise. The objective is to reach 12.6% of the surface. Irrigated lands are concentrated in several regions in the *Pla de Lleida (Segrià, Pla d'Urgell, Noguera, etc).*

In Lerida the agrarian sector is dominated by pig production (2.7 million of pigs – 50% of the animals in Catalonia). Pigs are not linked to the land, but the treatment of their waste is a real problem. Farmland on which to spread the slurry is needed, in order to comply with environmental regulations.

Map 15: Farmland abandonment in Catalonia



Sources: Instituto Nacional de Estadística, (Population census 1999), MAPA (FSS censuses 1989 & 1999) and calculation by SOLAGRO.

8.3.2.2 Causes of farmland abandonment

First, urban expansion and tourism development impact the farmland with a high demand on soil and an increase of land price. Catalonia is a very populated region. The population has had a sharp increase in the last years (1993-2006): between 50 to 400% for most municipalities located up to 100 km away from Barcelona. The number of secondary residences is also very high. As a consequence, the pressure on agricultural land is very high, too.

What can be observed in Catalonia are changes in farm production and in farm location. In some municipalities, the UAA increase can be explained by the development of irrigation, by the need to develop farmland on which to spread pig manure, by EU payments and by fires (see Table 40). Farmland abandonment occurs in some part of the *Pyrénées* but mainly in the south of the region.

Table 40: Causes of UAA decrease in Catalonia

	Causes /context	Consequences on farmland abandonment
Demographic	Pressure on farmland in peri-urban areas. Farmers expect some change in the classification of their farmland, to sell it at a higher price. Population growth has been very important in regions near Barcelona: Baix Penedès or La Selva which grew in only 8 years by 69% and 39% respectively.	High pressure on farmland in the peri-urban areas, depending on land planning. Farmers don't want to sell or rent their land. This growth has contributed to the lack of access to farmland for new farmers
Farming system	In mountain areas, the gross yield per ha of UAA is 48-62% lower than in other areas. Decrease of livestock seasonal migrations, and establishment of cattle semi-raise indoor with intensive forage crops. Development of cattle ranches. Readjustment of the livestock: elimination of goats, development of dairy cattle, end of traditional cheese manufacturing, Farm specialisation and concentration in agrarian activities. Market Evolution of different productions (decrease of fruit production, increase of olives, increase of pastures). Development of irrigation in specific areas. Two contrasting processes: land use intensification in areas most favourable to agriculture, and FLA in areas where agriculture is considered uneconomical	Abandonment in mountains areas. UAA decrease in vineyard area. UAA increase where irrigation is related to specific crops (industrial crops, fresh fruit and citrus fruit, flowers and olives). UAA increase in the pig region (Lerida), to spread slurry.
Geographic & biophysical	Poor soils and strong slopes in mountain areas. Marginalisation, mountain limitations.	
Environment	The declaration of protected natural spaces influences the change of uses and the abandonment of activities, when the declaration implies the abandonment of economic activities or imposes higher requirements with regards to the environmental impact of agrarian activities. Important forest fires lead to changes in land use because after the fire the land is ploughed and considered as UAA.	
Social and economic	Development of ski tourist resorts in Pyrénées. Scarce transport infrastructure and few study or work possibilities. Lack of services. Impact of subsidies, the declaration of lands depends on the CAP, especially due to the 1992 reform of the CAP.	Demands for farmland put pressure on the land prices, since high benefits are generated. More farmlands are declared to better compete for EU payments

Table 41: Impact of policy measures on farmland abandonment

Positive impacts to prevent FLA	Negative impacts increasing the risk of FLA	No direct impact observed
Beef payments Direct payments for cereals	No observation	Milk quota LFA payments Agro-environmental measures No specific regional program

8.3.2.3 Remarks on the methodology

The delimitation of urban areas in Spain is difficult because part of the urban population registers in rural areas in order to pay less taxes. The consequence is an increase of the urban area delimitation when this situation contributes to an increase of the population over 10%.

Table 42: Proposals concerning the proposed methodology

	Context	Remarks	Proposals
Definition of urban and rural areas	In Catalonia, rural municipalities are defined as those with a population of 10 000 inh. or less. According to this criteria, 90.3% of the autonomous community is rural space, and groups 19.86% of the population.	The threshold "increase more than 10%" should be modified because in small municipalities, or even in middle-sized ones, the increase of population does not mean FLA or a smaller importance of the agrarian sector. In many towns located near big cities the secondary residences can distort the results. In Catalonia many people are registered in small municipalities (secondary residence, family residence) because specific taxes (such as traffic taxes, etc) are cheaper than in bigger cities.	Increase of population should be linked with a minimum population density. But this definition and methodology provide a good indicator of farmland abandonment in urban areas, where farmers count on a change of land use to sell their land.
FSS accuracy	Gardening is included in the data as an activity within the agrarian sector (and it is an important activity).	No specific proposal	No specific proposal

8.3.3 Galicia

8.3.3.1 Evolution of land uses and productions

Between 1989 and 1999, the UAA of Galicia increased by 21 616 ha. The region lost 84 047 ha and gained 105 663 ha.

UAA loss in urban areas represents –16 000 ha, or 19% of the total decrease and 20% of the UAA.

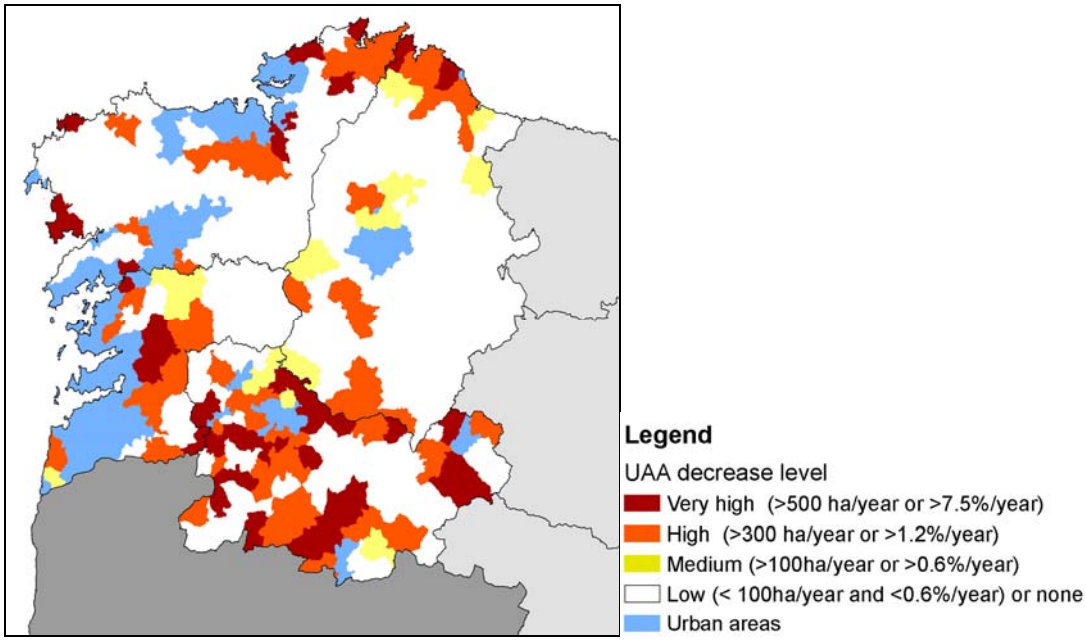
The evolution of UAA in relation to population density and population growth in Galicia shows that:

- 96% of the UAA increase, and 81% of the UAA decrease, happens in municipalities where the population has decreased.
- The biggest percentage of UAA increase and loss, 98% and 79% respectively, happens in municipalities with a low population density (lower than 100 inhabitants per km^2).

Until now, a constant increase of the forested area had been observed. Farmland afforestation has concerned 38 320 ha (1994-1999). The UAA increase in A Coruña can be explained by the increase of permanent pastures, 22 609 Ha (17%) between 1989 and 1999, and by the increase of cattle units: 57 479 units (18%). In the Ourense province, the most mountainous one, there has been the biggest agrarian land abandonment of Galicia has occurred, (-27%), and it

corresponds to a decrease in cattle. The UAA decrease was of – 44 797 ha, with a negative UAA net result (-14 677 ha). No afforestation is observed. The biggest UAA decrease in the whole of Galicia (-20 105 ha, or 89%) between 1989 and 1999 took place in *A Veiga*, one of the largest municipalities in *Ourense* (290 km^2). It is located in a mountainous area, where, in 1999, permanent pastures covered between 85 – 100% of the UAA.

Map 16: Farmland abandonment in Galicia



Sources: Instituto Nacional de Estadística, (Population census 1999), FSS MAPA Censuses 1989/1999 and calculation by SOLAGRO

8.3.3.2 Causes of farmland abandonment

One of the main problems concerning farmland abandonment in Galicia is the small size of the holding, and a small land market. Farmers prefer to keep their lands rather than sell or rent them out. The adaptation of these farms to the new agricultural conditions is difficult. This familial agriculture is economically not profitable.

Table 43: Causes of UAA decrease in Galicia

	Causes /Context
Demographic	Ageing of the population and, in the last years, an important depopulation Emigration (rural exodus) Shortage of young farmers, especially in certain inland areas and in the mountains. In some cases, the most populated zones are the most dynamic as concerns agrarian productivity
Farming system	Small parcels. Low Used Agricultural Area (UAA) per km^2 Small holding (in average 5.4 ha) Difficulties regarding mechanisation Lack of land consolidation Evolution of beef systems Decrease of pastures in areas not suitable for livestock (*Ourense)*
Geographic and bio-physical	Mountainous areas. Poor soils Slopes (between 20° and 40°) because steepness affects the accessibility of land for agricultural machines and by foot. With the development of mechanisation, accessibility is becoming a necessary condition for exploiting land (This is an important factor in *Ourense* and Lugo provinces).
Environment	Pig production and slurry spreading
Social and economic	Farm income: 40% of the average farm income in Spain The UAA/Worked unit is very small too The rental of farmlands in Galicia is practically inexistent The market price of the land is very high due to a low mobility of rural land Difficulties to improve the productivity and to be more competitive Difficulties to finance the purchase of new lands, owed principally to the low productivity of the farmlands Many owners prefer to keep the property of the land and give them over to forestal uses, rather than sell them. This is just to keep the property, not because it is profitable. Inheritance: In Galicia, usually the farmlands are divided among the sons of the farmers. If they do not reach an agreement, farmland abandonment can be favoured.

Table 44: Impact of policy measures on farmland abandonment in Galicia

Positive impacts to prevent FLA	Negative impacts increasing FLA?	No direct impact observed
Direct payments have promoted the increase of the UAA, even more than the declaration of permanent pastures. PRODER and Leader structural Programs have been positive for the structure of rural areas,	Afforestation payments Beef aids have caused farmland abandonment, because the farmers had many difficulties to adapt to the market regulations. There has been an important agrarian structural adjustment, at a spectacular pace. The milk quotas caused the end of many farmlands. In 1982 there were 110 000 dairy farms. Today there are 20 000. There is an intensification of dairy farms with less grazing.	There have been limited AEM (conservation in common lands, advantages for terraced vineyards). Direct payments for cereals LFA payments

8.3.3.3 Remarks on the methodology

The main remarks concern the 'population increase' threshold which is not always adapted. This indicator should be controlled for the municipalities' size and population.

The other remark concerns the common pastures and rough grasslands, which were registered differently in 1989 when compared with 1999.

Table 45: Proposals concerning the proposed methodology

	Context	Remarks	Proposals
Definition of urban and rural areas	In Galicia the Land Planning is very different from the rest of Spain. It is difficult to differentiate between urban and rural areas. In Galicia, there are 30 000 small villages, 3 773 parishes and 315 municipalities.	The threshold of 10% population increase is not always adapted if the municipality is big, and particularly if the population density is low. The increase is then not significant. In general, the results obtained with the studied methodology for urban delimitation seem appropriate; in some cases some areas with rural characteristics but under the influence of urban areas are included as urban areas.	It would be more accurate to discriminate only those municipalities, where the density of population is over 20 or 50 inh./km^2. Use a third indicator on the employment structure, by sectors.
FSS accuracy	In Galicia, 20% of the total surface belongs to local communities. The so-called 'neighbouring mountains' ('*montes vecinales de mano común*') is the property of all the inhabitants of the village. Half of this percentage isn't forested, so there are 350 000 ha of which the definition as permanent pastures or scrublands (other lands) is very diffuse. This fact increases the risk of mistakes in the declaration of UAA and very regular statistics oscillations.	Some farmers lease their land to others on the basis of non-written agreements. In 1999, land that in 1989 was under the denomination of scrubland were declared permanent pastures. This can introduce mistakes in the results. The difference between scrubland ('*monte bajo*') and permanent pastures is very diffuse. Some farmers can declare these scrublands ('*monte bajo*'), that were previously considered under other denomination, as permanent pasture land. And in fact, these scrublands are used for pastures. After the 1989 fires the scrublands were declared permanent pastures. In 1999 they were declared "other lands."	No particular proposal

8.3.4 Risk indicators of farmland abandonment proposed for Galicia and Catalonia

Table 46: Risk indicators of farmland abandonment proposed for Galicia and Catalonia based on interviews

Type of indicators	Risk indicators that favour farmland abandonment
Bio physical	- % of low soil quality
Demographic	- Old farm and working population - Low population density - Location: far from towns (peripherality) - Access to services
Geographic	- Slope
Farm characteristics	- Low livestock density - Low proportion of professional farms (full time farm)
Economic	- Low farming incomes (gross margin per hectare) - High land prices - Low CAP payments - Low LFA and AEM payments

9. Comparison of the 3 case studies

9.1 Assessment of the farmland abandonment

9.1.1 UAA loss in urban areas

UAA included in urban areas represent 14% to 17% of the total UAA of the 3 countries. Under the pressure of sealed surfaces, UAA decreased by 1.5% in Spain and by **18% in Poland**. However, the situation is more contrasted at the regional level, where 3 regions under hard urban pressure can be identified: Malopolskie (-12%), Galicia (-20%) and Warminsko-Mazurskie (-8%). The annual evolution varies from -0.4% in Catalonia to -2.5% in Galicia and -3.7% in Poland.

Table 47: Comparison of the results in urban areas per country

Country	France	Spain	Poland
UAA (last census) in urban areas	4 714 875	4 295 166	2 371 202
UAA (last census) in urban areas as a percentage of the total UAA	17%	16%	14%
UAA net result in urban areas in %	- 5%	- 1.5%	- 18%
Yearly UAA evolution in urban areas	- 0.4%	- 0.2%	- 3.7%
Percentage of the UAA loss in urban areas / total UAA loss	29%	24%	36%

Sources: Populations censuses, FSS censuses and calculation by SOLAGRO.

In Malopolskie, the urban area covers 49% of the regional agricultural surface. The contribution of the urban areas to the total loss of UAA is very high with regards to their surfaces: **24 to 36%** for the 3 counties, with 66% in Malopolskie and 50% in Catalonia. Moreover, not all the flow to artificial surfaces is located in urban areas.

Table 48: Comparison of the results in urban areas per region

Region	Aquitaine	Catalonia	Galicia	Malopolskie	Warminsko-Mazurskie
UAA (last census) in urban areas	141 091	399 613	54 889	195 729	274 895
UAA (last census) in urban areas as a percentage of the total UAA	10%	35%	8%	49%	24%
UAA net result in urban areas, in percentage	- 7%	- 4%	- 20%	- 17%	- 8%
Yearly UAA evolution in urban areas	- 0.6%	- 0.4%	- 2.5%	- 2.2%	- 1.4%
Percentage of UAA loss in urban areas / total UAA loss	15%	50%	19%	66%	37%

Sources: Populations censuses, FSS censuses and calculation by SOLAGRO.

These results confirm soil sealing is responsible for a part of the UAA decrease.

Not all of the UAA loss in urban areas is sealed although it is not possible to exactly estimate the UAA which was converted to artificial uses.

Most of the non-utilised farmland constitutes a land reserve for the future urban-land market. Most of the owners expect large future profits from the sale of their farmland. This flow could be accurately predicted, considering the increase of the population threshold, the population density threshold and the size of the municipality.

9.1.2 Farmland abandonment

Farmland abandonment for the periods under the study represented 2% of the total UAA for France (period 1988-2000), 4% for Poland (1996-2002) and 8% for Spain (1989-1999), where it reached 10% in Galicia. This loss represents a yearly 0.16% to 0.8% of the UAA at the country level, with up to 1.13% in Warminsko-Mazurskie.

But the situation is more complex. **Indeed, farmland abandonment and an increase of the UAA were observed to happen simultaneously.** This situation shows that in Spain there is a delocalisation and a change in the production. In France and in Poland the UAA gain is limited, and part of the flow is the result of statistical problems and of how extensive grasslands were declared in the two FSS.

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Table 49: Comparison of the final results for the 3 countries

Country	France	Spain	Poland
Considered period	**1988-2000**	**1989-1999**	**1996-2002**
UAA (first census)	28 595 799	24 707 192	18 085 356
UAA (last census)	27 856 313	26 229 231	16 726 860
UAA (last census) in rural areas	23 141 438	21 934 065	14 355 658
Loss of UAA	1 274 789	2 645 414	2 128 630
Gain of UAA	535 303	4 166 667	770 134
UAA net result for the period	-739 486	1 521 253	-1 358 496
Yearly loss or gain of UAA	-61 624	152 125	-226 416
Farmland abandonment, in ha	558 093	1 986 335	759 902
Farmland abandonment as a percentage of UAA (first census)	**2%**	**8%**	**4%**
Yearly farmland abandonment as a percentage of UAA (first census)	0.16%	0.80%	0.70%

Sources: Populations censuses, FSS censuses and calculation by SOLAGRO.

Table 50: Comparison of the final results for the 5 regions

Region	Aquitaine	Catalonia	Galicia	Malopolskie	Warminsko-Mazurskie
Considered period	1988-2000	1989-1999	1989-1999	1996-2002	1996-2002
UAA (first census)	1 542 006	1 104 609	675 045	445 950	1 224 688
UAA (last census)	1 473 396	1 150 082	696 661	401 467	1 149 832
UAA (last census) in rural areas	1 332 305	750 469	641 772	205 738	874 937
Loss of UAA	102 692	117 894	84 047	58 411	132 776
Gain of UAA	34 082	163 367	105 663	13 928	57 920
Loss or gain of UAA for the period	-68 610	45 473	21 616	-44 483	-74 856
Yearly UAA net result	-5 718	4 547	2 162	-4 448	-7 486
Farmland abandonment in ha	71 347	57 559	67 125	18 922	82 919
Farmland abandonment as a percentage of the UAA (first census)	**5%**	**5%**	**10%**	**4%**	**7%**
Yearly farmland abandonment per year as a percentage of UAA (first census)	0.39%	0.52%	0.99%	0.71%	1.13%

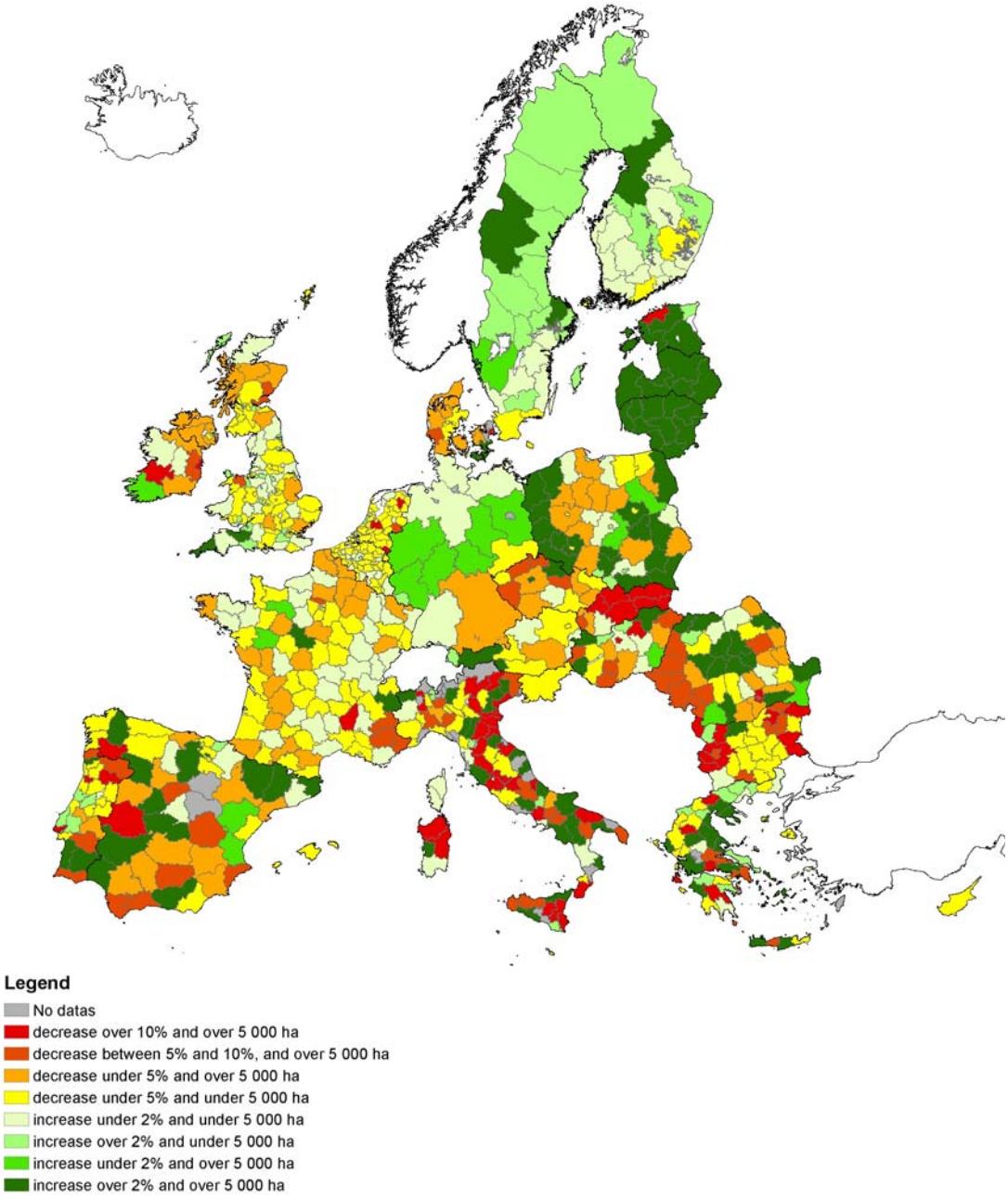
Sources: Populations censuses, FSS censuses and calculation by SOLAGRO.

9.1.3 Farmland abandonment and UAA evolution

The evolution of the UAA net result is not a good indicator to identify farmland abandonment. FLA is observed even with the UAA increasing, like in Spain.

Map 17 presents the UAA evolution for EU-27 at NUTS 3 between 2003 and 2005. Europe appears as a patchwork which is difficult to explain in a simply way.

Map 17: UAA evolution by NUTS 3 in EU-27 between 2003 and 2005



Source: Eurostat and calculation by SOLAGRO.

9.1.4 Farmland at risk of farmland abandonment

"*The total UAA of the municipalities where farmland abandonment was observed during the considered period*" covers 15% of the French UAA (2000), 23% of the Spanish UAA (1999), and up to 50% of the Polish UAA (2002).

Table 51: Farmland at risk of farmland abandonment per country

Country	France	Spain	Poland
Period	2000	1999	2002
Land at risk of abandonment, in ha	4 215 859	5 977 626	8 307 284
Land at risk of abandonment as a percentage of the UAA (last census)	15%	23%	50%

Sources: Populations censuses, FSS censuses and calculation by SOLAGRO.

The maps concerning the "Farmland at risk of FLA" show a spread distribution over the 3 countries, especially for Poland.

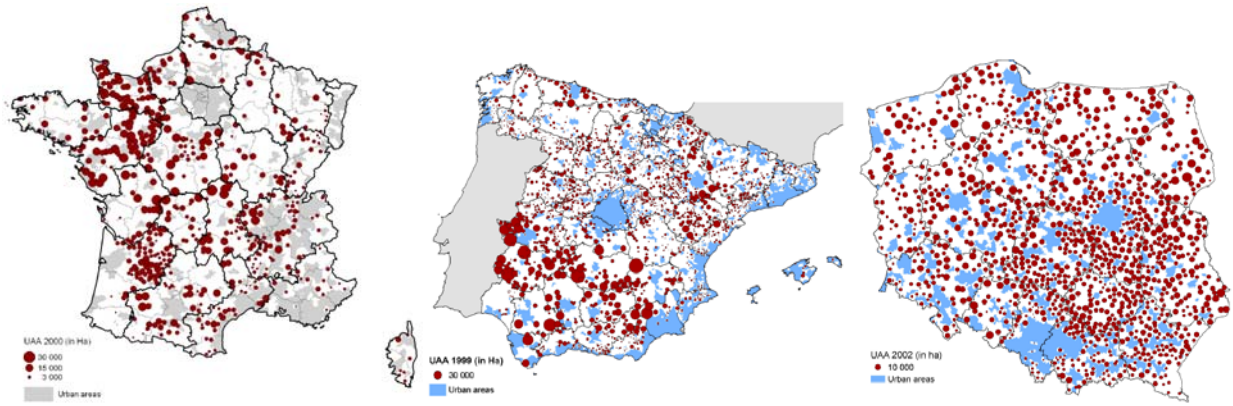


Table 52: Farmland at risk of farmland abandonment per region

Region	Aquitaine	Catalonia	Galicia	Malopolskie	Warminsko-Mazurskie
Reference year	2000	1999	1999	2002	2002
Land at risk of abandonment, in ha	468 312	199 596	161 142	152 666	497 541
Land at risk of abandonment as a percentage of UAA (last census)	32%	17%	23%	38%	43%

Sources: Populations censuses, FSS censuses and calculation by SOLAGRO.

9.2 Comparison of the factors of risk of farmland abandonment in the 5 regions

9.2.1 Causes registered in the 5 test-regions

9.2.1.1 The expansion of urban areas

Conversion of farmland into sealed soils is not farmland abandonment (because the land is used by another activity outside agriculture, therefore not abandoned), though it is an important cause of farmland loss. It seems that maintaining agriculture in urban areas in the regions of the case studies is very difficult.

The expansion of urban areas and tourism activities exerts a high pressure on farmland. Firstly, in these areas there is a high degree of conversion of farmland into sealed soils. Secondly, there is the pressure of the price of land. Non-utilised farmland constitutes a land reserve. Landowners always expect to sell their land at a high price. This phenomenon is observed to happen, in the 5 studied regions and in all 3 countries, around the cities, along the coast and in tourist areas.

9.2.1.2 Farmland affforestation

Farmland afforestation is not farmland abandonment but has been included in the flow of FLA because of the lack of data. For France farmland afforestation represents less than 10% of the flow meanwhile in Spain more than 20%.

9.2.1.3 Leisure in rural areas

In some attractive regions in rural areas (as in the *Dordogne* in France or the *Tatras* and *Mazurian* lakes in Poland) new settlements patterns were observed. New settlers buy houses with 1 to 10 ha of land around their houses. This also affects the average price of farmland. In the specific region of *Sologne,* in France, most of the properties were bought for hunting, and there was a decrease of farming activities. But this conversion of farmland is not real farmland abandonment. The price of the land is high, and the land is not really abandoned.

9.2.1.4 Ageing

Ageing of the farmer population is a problem in most of the studied regions, but especially in Poland. This problem is directly linked to small property size (Poland, Galicia) and to the weak land-market activity due to the farmers' strong attachment to land, considered as a family heirloom.

Generally young farmers look for farmland to increase the size of their farm. Only in some remote areas (South-East of Galicia), a lack of young farmers is observed.

Concerning FLA, when there are no young farmers looking for land, the high percentage of old farmers is a factor of risk.

9.2.1.5 The farming systems

Small farm size and small parcel size are one of the main causes driving farmland abandonment in Poland (Malopolskie) and in Galicia. These farms, based on self-consumption and multi-activities, do not provide their owners with sufficient income. Neither are they adapted to the new sanitary requirements. Mechanisation is difficult. Keeping up with standards requires large investments, as for example, for manure storage facilities. These farms face difficulties to improve their productivity and become more competitive.

Very limited land consolidation (3 000 to 4 000 ha per year) is observed In Poland. Farmers are very attached to their land and do not want to sell it.

However, processing quality products such as traditional sheep cheese in the mountains ('*Oscypek' in the Tatras* and *'Osso-Iraty' in the Pyrénées Atlantiques*), as well as touristic activities, are economic alternatives for small farms.

The specialisation and the intensification of farming systems are pushed by new technologies (irrigation, indoor breeding, large machines) and food processing industries (concentration of the production, quality standards). Traditional systems such as mixed farms are not always adapted to this new context. When the farmer retires and rents or sells his land, some permanent grasslands are abandoned because, when possible, young farmers prefer to develop cereal crops rather than breeding. Small parcels and parcels far from the farm are also abandoned. This occurs in the regions where crop productions are possible. Temporary grasslands and annual fodder can be converted into cereal production.

The evolution of food consumption and the world market also have an impact on farming systems. In France, the wine crisis reduced the vineyard surface, while in Spain the high demand for olive oil plus the direct payment increased the olive grove plantations.

Grazing systems were abandoned in some regions (*Orense* in Galicia). But globally, during the 1990s in the old MS, these systems were well supported by CAP payments (LFA, Suckler Cow premium, Beef Special premium, Extensification Payments) as occurred in the French

mountainous areas or in Spain (+1.5 million of cattle units, +3.4 million sheep and +0.9 million ha of grassland). In Poland, grasslands were abandoned when animal herds collapsed (the number of cows decreased by 2 million between 1990 and 2003). The situation in Poland is opposite to the Spanish one.

9.2.1.6 Geographic and bio-physical

There is a strong relationship between farmland abandonment and soil quality, for example, poor drained soils in WM. Farmland abandonment and topography linkages are much weaker. Slope (between 20° and 40°) can affect the accessibility of the land by agricultural machines. With the development of mechanisation (as in Galicia) accessibility is becoming a condition for exploiting land.

In remote areas, transport infrastructures and lack of services are causes of farmland abandonment.

9.2.1.7 Environment and nature protection.

Actually, nature protection is not a cause of farmland abandonment. This was only noticed in Catalonia (implementation of Natura 2000).

In intensive pig-raising regions (Catalonia, Brittany) farmland is purchased to spread pig manure and reach the Nitrogen Directive requirement.

9.2.1.8 Social and economic

In WM (Poland) the privatisation of state farms led to farmland abandonment, because there were no skilled managers. Significant numbers of farms which took bank loans in the beginning of the 90s did not survive economic reforms.

Farm income is a good indicator of the risk of farmland abandonment (in Poland or in Galicia).

Transmission of property by inheritance can be a cause of FLA, as is the case in Galicia, where the farmland is usually divided among the sons of the farmer. If there is no agreement among them, farmland abandonment can be favoured. This phenomenon has been also observed in Normandy (Laurent, 1992).

Table 53 summarises the different causes of FLA (17 main causes registered during the enquiries) and their importance according to the context of each region and country. Three of them do not correspond to land abandonment because the land has another productive use. There is no single factor and no indicator adapted to all regions. This is why the risk of FLA should be considered at a regional scale, and not at the European level.

Table 53: Weighting the main causes of farmland abandonment, per region

Regions	Aquitaine	Catalonia	Galicia	Malopolskie	Warminsko-Mazurskie
Not 'real' farmland abandonment					
Urban pressure	*	***	**	***	*
Afforestation			*		
Tourism and secondary residences, hunting. New population living in the countryside	***	***	*	***	*
'Real' farmland abandonment					
Small farms	*		**	***	**
Small parcels				***	*
Non-adaptation of traditional farming systems (mixed farming, self consumption)	*	*	***	***	*
Specialisation and intensification. Sanitary requirements. Concentration in agrarian activity.	*	*	***	***	
Extensive grazing system	*	**	**	**	*
Poor soils	*	*	**	*	***
Strong slope in mountain areas		*	*	*	
Transmission of property by Inheritance			*		
Low transport infrastructures and few possibilities of pursuing studies or working. Lack of services in remote areas.		*	*		*
Increase of protected areas		*			
Education level of the farmers				*	*
Low farm income	*	*	**	***	***
State farm privatisation					***
Ageing: old farmers	*		*	**	

9.2.2 The impact of CAP measures

Central and Eastern European countries were not in the EU at the time of the studied period (available data: 1996-2002 (Poland)). In the following period, new MS found difficulties to compete with the intensive farms of the old MS, although they had access to CAP payments and structural funds. But globally, in all countries, familial farming, and extensive farming in less favourable areas, such as in the mountainous areas or the dry Mediterranean areas, had to compete with more intensive farming systems in the more favourable areas of the lowlands.

First and Second Pillar CAP measures play an important role in helping this extensive agriculture.

CAP measures, especially LFA payments but also the Suckler Cow Premium, the Beef Special Premium and the Sheep Premium (with a complement in the LFA area) and the Extensification Payment, contributed to preventing farmland abandonment because they directly affected grazing systems. Moreover, the farming system must comply with the low stocking density and minimum grassland thresholds. In some regions, these payments are completed with agro-environmental measures.

Milk quota policy can have a positive impact on preventing farmland abandonment in LFA depending on the national rules. For example, in France and Italy, quota market is not liberalised like in Denmark or in the Netherlands, and the milk production is maintained in the mountainous areas. Meanwhile there is a general trend in Europe of intensification, increase

size and specialization of dairy farms. Small dairy farms disappeared and the total number of dairy cows is continuously decreasing as the milk production per cow is increasing. One of the consequence is a decrease of grassland surfaces as, generally, beef cattle do not compensate totally the decrease of dairy cattle livestock units.

Afforestation payments can have a negative effect when they limit accessibility to farmland.

The efficiency of these payments depends on the main farm types of the region, their amounts and how they are implemented.

9.2.3 Type of crop concerned by FLA

Arable land is in general not characterised by farmland abandonment. Arable land benefits from high direct payments. However, arable land with a high proportion of fertile soils is directly threatened by the soil sealing process.

Farmland abandonment mainly concerns permanent grassland, and particularly rough grassland. Generally, permanent grassland cannot be ploughed and converted into arable land. The grassland surface decreases constantly, following the European general trend of cattle herd decrease.

Vineyards are directly affected by farmland abandonment due to the European wine crisis. In France, the vineyard surfaces decrease by 3% per year.

Table 54: Type of crop at risk of abandonment per country

	France	Spain	Poland
Cereals (arable land)	No risk	Only in very dry and poor soils	Limited and related to farm structure
Fallow	No risk.	No risk	Limited and related to farm structure
Industrial crops (arable land)	No risk	No risk	Limited and related to farm structure
Fodder crops (arable land)	No risk	No risk	Limited and related to farm structure
Productive permanent grassland	Limited risk	Limited risk	Limited risk
Rough grassland	Important risk	Important risk	Important risk
Vineyard	Medium risk	Limited risk	Not applicable
Olive groves	No risk.	No risk	Not applicable
Other fruits and vegetables	No risk	No risk	No risk

Sources: SOLAGRO (from data collected in each country and experts interviews)

10. Indicators to assess the Risk of Farmland Abandonment

Indicators of risk of farmland abandonment cannot be developed easily in each region and each country. For example, farm size is not sufficient since there are some small specialized farms oriented on vegetables, flower production, orchards and vineyards which are not at risk of farmland abandonment.

High level of rough grassland in the UAA, or fodder surface are good proxies, but not sufficient indicators. Their impact also depends of the amount and the implementation of the CAP payments. For example, in the very extensive areas of the South-East of France, no farmland abandonment is observed.

Mountain areas and slopes are good but not sufficient indicators of risk of FLA. In many mountainous areas in the Alps or the Pyrenees, the different policy supports, combined with high quality products and tourism, prevent FLA.

Table 55 proposes different risk-indicators. Some of these indicators can easily be provided by European databases (FSS, FADN, CLC, Population censuses, IACS, Soil Data Base) but their accuracy is not always sufficient. FADN is provided only at NUTS 2. IACS data still have limited access. No data concerning farmland prices and their evolution are available at the European level.

Table 55: Proposed indicators of risk of FLA

Target issues	Indicators	Data sources
Urban pressure	Surface of urban areas, evolution of sealed soils	Population censuses, CLC
Tourism and secondary residences, hunting. New population living in the countryside	Farmland price and evolution	Country databases
Small farms	Size of the farm (% of farms under 5 ha), other gainful activities (major occupation or subsidiary occupation)	FSS LAU 2, FADN
Small parcels	Average size of the parcels	IACS
Non-adaptation of traditional farming systems (mixed farming, self consumption)	Farm types, % of non-professional farms (difference of UAA between FSS and FADN)	FSS LAU 2, FADN
Specialisation and intensification. sanitary requirements. Concentration in the agrarian activity.	Farm types, input costs/ha	FADN
Extensive grazing system	% of rough grassland in the UAA or in fodder surface, stocking density, payments per ha and per farm	FSS LAU 2, FADN
Poor soils	Soil quality categories	EU-soil database (ESDB)
Steep slope in mountain areas	Percentage of the territory with a slope over 20%	Digital Elevation Model (SRTM)
Transmission of property by Inheritance	Percentage of ageing farmers	FSS LAU 2, FADN
Low transport infrastructures and few possibilities of studies or working. Lack of services in remote areas.	Population density	Population census
Increase of protected areas	Percentage of N2000 in the UAA	N2000 database
Education level of the farmers	Ratio of holding users with agricultural education	FSS LAU 2
Low farm income	Family Farm Income/FWU	FADN
State farm privatisation		
Ageing: old farmers	Percentage of farmers in the class 55-64 and more than 65	FSS LAU 2, FADN
Wine crisis	Evolution of vineyard surfaces	FSS LAU 2, FADN
Employment structure	Ratio of persons employed in economic sectors	Socio-economic data from Eurostat

11. Conclusion and Recommendations

After analysing the literature and the European data (type, availability, scale and period), Farmland abandonment has been defined as the UAA loss observed, between two FSS censuses, that has not been converted into artificial areas. For the considered period, this abandoned land was no longer farmed for economic, social or other reasons, and was not included in the crop rotation system. Due to a lack of relevant data, tree plantation has been integrated into abandoned farmland. Regarding sealed soils, a wider definition of urban areas, based on increase and density of population, has been set up to capture the main part of this flow and reach the best results on estimation and location of FLA.

Farmland abandonment – in terms of UAA-loss and for the considered periods (1988-2000 for France, 1989-1999 for Spain and 1996-2002 for Poland) - represented a total surface of 3.3 million ha for the 3 countries; 2% of the total French UAA, 4% of Poland's, 8% of Spain's. Farmland abandonment and an increase of the UAA have been observed to happen simultaneously (Spain), pointing to a re-localisation of production, which confirmed that the evolution of the UAA net result was not sufficient to identify FLA.

A first estimate of the farmland at risk of abandonment has been produced, based on a continuation of the last period trend (where farmland abandonment occurred between the last

two Farm Structure Survey censuses). This represented 15% of the French UAA, 23% of the Spanish UAA and up to 50% of the Polish UAA. The Polish case has shown a first limit of the indicator, simply because the situation in Poland between 1996 and 2002 went through important restructuration processes with the privatisation of state farms. Then, if a municipality was affected by, at least, a medium level of Farmland abandonment during the last census, all its UAA was considered as at risk of abandonment. This criterion should be reviewed.

The analysis has stressed a strong relationship between farmland abandonment and farming systems. Thereby, most of the arable land isn't at risk of being abandoned contrary to extensive and traditional grazing systems with rough grasslands, as observed in France or in Galicia. Farm income can also be considered as a good indicator of the risk of farmland abandonment (in Poland or in Galicia). However, low farm income is linked to different variables such as small farm size, small parcel size, lack of investment and poor soils.

FLA is controlled by complex interactions between socio-economic and environmental driving forces, which are both region-specific and time-period specific. There is no single driving force and no single risk indicator adapted to all regions. This is why the process of farmland abandonment should only be studied at a regional level with detailed agricultural data available at municipality level. The definition of the indicator on the risk of farmland abandonment (Nr 14, COM2006 (508final)) requires a wider and a more thorough study based on the methodology and the results presented in this report. Regarding the FSS, some weaknesses were pointed out. For instance, a better description of the areas with FLA could be realized if the other data of the FSS were available (farm types, age of the farmer, farm size, crops). Remarks on methodology and improvements are proposed hereinafter.

11.1 Improvements of the methodology

11.1.1 Definition of urban and rural areas

There is a political problem behind the definition of rural areas (same problem as LFA) as some payments (some measures of structural funds) are allocated only to people and holding living or located in the defined zone. Generally the administration and local governments prefer conserve their own official definition of "rural areas".

There is no particular remark concerning the threshold of 150 inhabitants/km^2. The main proposal concerns a minimum threshold of population density.

Some other indicators are proposed, such as the sectors in the employment structure.

Table 56: Proposals concerning the methodology

	Strengths	Weaknesses	Proposals
The population density indicator	OECD indicator.	In most countries the definition of urban and rural areas is not based only on the population density. Stakeholders are reluctant to use a new definition	Cross-check the results in the national rural areas definitions
The population density threshold of 150 inh/km^2	OECD threshold. Corresponds to densely populated areas with a high pressure on the land. Captures well the urban pressure	No remarks on the threshold	
The indicator of the increase of population between the 2 last censuses	This indicator allows identifying the new settlements (peri-urban areas) where there is a high development but a population density below 150 inha/km^2.	The period depends on the country (10 years for Spain, 9 years for France and 6 years for Poland). So the comparison is not exactly the same.	

	Strengths	Weaknesses	Proposals
The threshold of 10% increase	The threshold corresponds to a very high increase of the population (more than double the national average). This indicator detects also tourist areas such as ski stations in mountains where the permanent population is very low but where secondary residences can be important. Buildings exert a pressure on the best agricultural lands around villages and in the valley, and also a pressure on land prices.	The reference period is not the same. The threshold is not really the same in each country. In low populated municipalities (under 20 inhabitants/km^2), even a 10% increase does not represent a lot of people	Propose an annual European threshold based on the European demography. Limit the urban area to municipalities over 50 inha/km^2.
Up-scaling	Yes if the 2 last FSS data available at LAU 2.		
Up-dating		Not before 2010/2011	

11.1.2 Does FSS measure the evolution of the UAA accurately?

11.1.2.1 Extensive grasslands

The main question with the UAA calculated with FSS concerns the extensive grasslands. In some regions and municipalities, extensive grasslands cover large areas but, in relation to their low productivity (less than 0.2 stocking density per ha) their contribution to the meat production is low. However, from a statistical point of view, these surfaces are not weighted and count in term of land use as productive grasslands.

The surface of grazed extensive grasslands depends mainly on the meteorological and terrain conditions, but fires can also open new areas for grazing. In addition, the grazed surfaces and those declared to the FSS are not necessarily the same. No fully satisfactory solution exists.

In any event, the observed grassland evolution must be controlled with 2 other indicators: stocking density and number of cattle units.

The implementation of IACS can provide better information if it is made publicly available.

11.1.2.2 Common lands

The UAA should contain common lands. But that is not the case in most countries. For example in France, common land is included in the UAA only if it is managed by only one farmer.

In some countries, they cover large territories. And because the grazing surfaces are not taken into account in the denominator, they increase the value of the stocking density indicator. There is no specific survey to measure their abandonment.

11.1.2.3 Fallows

Fallow land surfaces should be analyzed with precaution in the new MS where set-aside is not implemented and not compared with the fallow land surfaces of the old Member States. In addition, there is confusion between non-cultivated farmland and fallow. It is often not possible to distinguish the two categories from the fields. In these countries, the surface of fallow land can be considered as a good indicator of FLA before CAP implementation.

11.1.2.4 The intensity of management

One of the weaknesses of the FSS is that the agricultural surface is based on farmer declarations and not on farm practices. An extension of the grassland surface does not always mean better land management.

11.1.3 The risk of farmland abandonment

One possibility to improve the indicator of risk is to focus only on the very high level of FLA.

11.1.4 Data needs

11.1.4.1 The long term series

To observe the main trends, the production of long-term series at NUTS 1 is important. This concerns the evolution of the UAA and the evolution of forest area.

It is particularly difficult to compare the different datasets produced at the European level (FAOSTAT, Eurostat/Agriculture/Land use and CLC) – see Chapter 3.6.

The long-term series must be improved by filling in the missing data and up-dating the database more frequently.

11.1.4.2 The accuracy of datasets

It is clear now that the data at NUTS 3 are not detailed enough to study the environmental effects of policies on farming systems and practices. Only LAU 1 and LAU 2 levels provide relevant information.

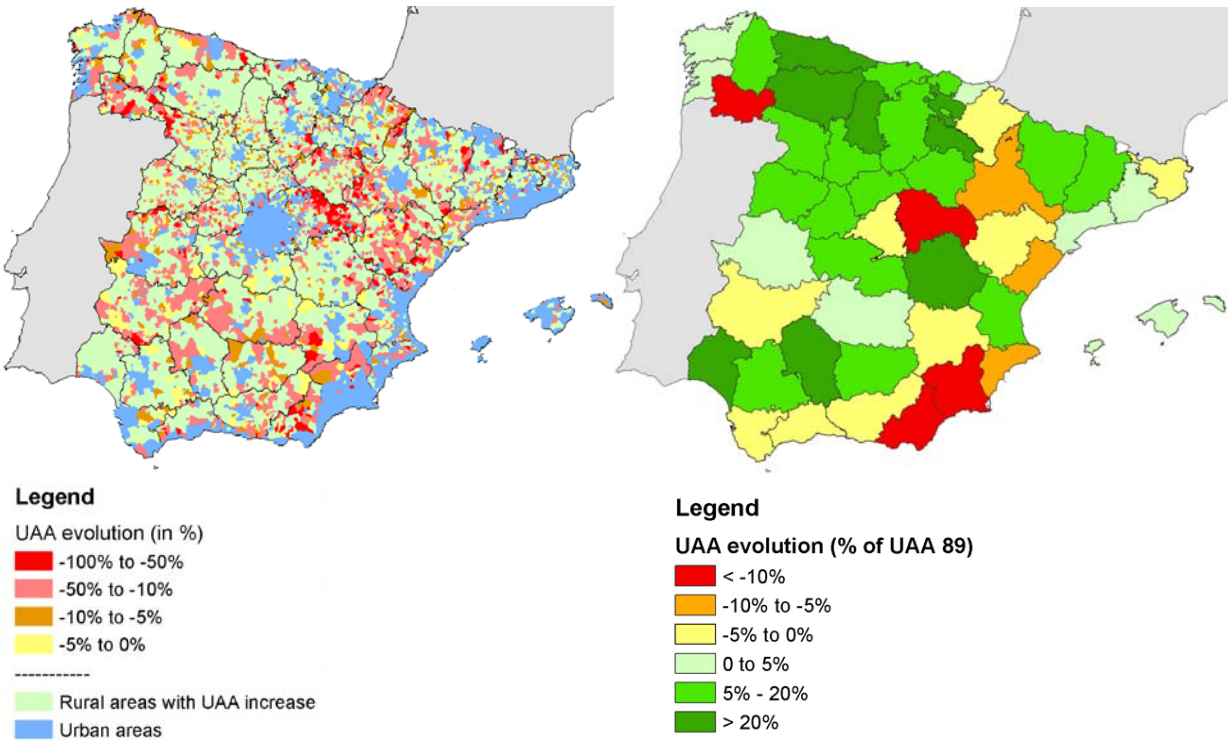
Indeed, compensations and opposite flows are often observed in a region as:

- Intensive arable fields in the plain and extensive grassland in the mountains
- Irrigated land and non-irrigated land
- Intensive production and extensive production
- Flow of sealed soils and flow of farmland abandonment

FSS is the only survey which provides data at this scale.

The comparison of the 2 maps presenting the evolution of UAA at different scales shows the quality of the produced information.

Maps 4 and 11 of the Spanish Atlas- Appendix C: Comparison of 2 representations of the UAA evolution at LAU 2 and at NUTS 2



11.1.5 The need for indicators *(see table 55)*

The need for new indicators of the risk of FLA concerns:

- the parcel size (could be provided by IACS ?);
- the price of farmland and its evolution;
- the percentage of farmers without inheritors.

11.1.6 Remote-sensing data and GIS data

The other direction is to improve the resolution of remote-sensing data such as provided by CLC. This study shows that for the 3 case studies, the data on the flow of farmland abandonment provided by CLC are under-estimated.

11.1.7 Other recommendations

- to add a question on farmland abandonment on Farmland abandonment in FSS (like in Poland)
- to have reliable data on afforestation at LAU 2 and on sealed surfaces at LAU 2
- to have LUCAS data representative for NUTS 2/3 for Farmland abandonment

11.2 Up-scaling and up-dating

11.2.1 Up-scaling the methodology

The proposed methodology can be developed in the other EU countries, if the two latest FSS are publicly available at LAU 2.

11.2.2 Up-dating the methodology

This methodology could be up-dated when the next FSS census will be available, in 2010/2011. The time-delay of 10 years to up-date this methodology is one of the main weaknesses.

11.2.3 Proposals for testing the hypotheses for other regions

Table 57 proposes some hypotheses to be tested in specific European regions. One hypothesis is that no farmland abandonment occurs in intensive and productive agricultural regions dominated by cereal crops and/or in areas with high urban pressure. Also, the importance of farmland afforestation in the flow of UAA loss could be analysed in Ireland and in Denmark. Another hypothesis is to study the impact of a strong rural policy as in Austria. Do these rural measures (LFA, AEM) prevent farmland abandonment?

In regions with low farm income, small holding size, high percentage of old farmers, a high level of farmland abandonment should be observed as in south of Italy, Greece or Portugal.

Table 57: Proposals for testing the hypotheses for other regions

	Hypotheses	Regions and countries
High percentage of arable land in the UAA (over 80%)	No farmland abandonment	Denmark, Finland, Bretagne, Picardie, Centre, Ile-de-France, England-East, Sachsen-Anhalt, Thessalia, Makedonia-Traki, Slattbygdslan
Large farms	No farmland abandonment	Picardie, Ile de France, Mecklenburg-Vorpommem, Brandenburg, England-East, England-North, Scotland, Czech Republic
High farm income, high urban pressure and high population density	No farmland abandonment	The Netherlands, Vlaanderen
Tree plantation covers the abandoned farmland	Low level of farmland abandonment	Ireland, Denmark
Small farms, low farm income, high percentage of permanent grassland, aged farmer	High level of farmland abandonment	Entre Douro et Minho/beira Litoral, Tras-os-Montes/beira interior, Ipiros-Peloponissos-Nissi Ioniou, Sterea Ellas Nissi Egaeou –Kriti, Italy-South, Slovakia
Small farms but high level of payments from the second pillar and touristic activity	No or low level of farmland abandonment	Austria
Poor soil conditions, low income	High level of farmland abandonment	Estonia, Lithuania, Latvia

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APPENDIX

APPENDIX 1: HISTORY AND LOCALISATION OF FARMLAND ABANDONMENT IN EUROPE

Farmland abandonment is a phenomenon that exists for a long time. It began slowly in the first years of the 20th and it became more consequent from the 1950s with the integration of rural societies in a bigger economic and social organisation.

A disaster scenario expecting a great part of UAA transformed in scrubland was telling in France during the 1980s but it did not take place (Baudry, 1991). Historically, in French mountain areas, land abandonment is due to the evolving interactions between the physical environment, a changing society, and new techniques (Baudry, 1991). In these regions, until World War I, agricultural land was partly private and partly common; the common area was stronger than private. The autarkic system collapses with the war because of the fall in number of workers, the increase in farm size and the increase in the connections between local, regional and national economy. In this way, the local rural society is integrated to the global social organisation modifying farmer's view about management of local resources. That explains first phenomenon of farmland abandonment in mountain area. Also, the development of mechanisation has had a role in farmland abandonment because fields that are difficult accessing with tractor are often given up.

During the 1980s in France, there was an alarming idea telling that in 2000, a great part of UAA area will be abandoned. Finally, it is not the case. A study made at the beginning of the 1990s in 'Pays d'Auge - Normandy' in France demonstrated that this thesis was false. In fact, investigating in 8 villages of the area, the study has shown that only 1.5% of UAA area was abandoned (Laurent, 1991). Lands concerned were low size fields on very sloping or wet grounds. These abandoned lands result from mechanisms that occur for a long time and so those do not represent a sign of large farmland abandonment.

Finally, a study managed by the French Ministry of Environment has shown that only 0.04% of agricultural land has been converted into forest between 1990 and 2000, while the opposite conversion (forest to agricultural land) accounts for 0.4% of the woodland (Latruffe, 2006). So, farmland abandonment is still marginal in France. Concerning vineyard area, 107 500 ha have become unused between 1988 and 2004 (i.e., 11% of the whole French vineyard area).

In UK, at the beginning of the 1990s, farmland abandonment was a very insignificant phenomenon. During this period, the main trend within British agriculture was still one of increasing the intensity of production (Bunce, 1991). Few lands that are abandoned concerned high mountain areas (Cairnsmore of fleet in southern Scotland especially). About set-aside areas, at the beginning of the 1990s, scientists weren't too sure of consequences on farmland abandonment. Now, GAEC standards require that set-aside must be maintained in a condition from which it can be returned to agricultural production by the next growing season and so cannot be classified as abandoned.

An Italian study has shown that farmland abandonment began in Apennine mountains with the diminution of people working in agriculture and has concerned 33% to 89% of the UAA in some villages between 1951 and 1981 (Farina, 1991). This emigration began from the first years of the 20th century. Globally, farmland abandonment is expected to increase from 2 to 10% of UAA (Moravec, 2007).

In Germany, there is no clear data about farmland abandonment. The statistical office measures it, comparing cadastral information (land register) and with agricultural area given by farmers. 250 000 ha of farmland has been considered as abandoned. Abandoned lands are located especially in the northeast of Germany, a region with a poor soil.

In Greece, official statistics estimates that 236 000 ha are uncultivated corresponding to 7% of the arable land (Moravec, 2007). In South-Eastern Europe (Greece for example), farmland abandonment is concentrated in dry plains, mountainous or semi-mountainous areas where there are no irrigation systems. In these regions, farmland abandonment is also present in mountain areas where pasturing has collapsed.

In Poland and the Baltic countries, farmland abandonment is concentrated in regions where the soil fertility is low as a result of peaty soils with high water levels, or poor moraine soils (EU, 2004). Rural Development Programmes give detailed information about theses countries. In Poland, in 2002, 17.6% of farmland was abandoned. In the Baltic countries, abandoned land concern 10.1% of the farm land in Estonia, 21.1% in Latvia, 13.3% in Lithuania. But these high percentages include the set-aside. In these new European countries, a temporarily farmland abandonment has especially concerned arable land in response to market changes and the loss of state support (Keenleyside, 2004).

Part of abandoned area is going to be used for summer housing or other leisure purposes that represent a recent phenomenon in these new European countries.

In Central Europe, farmland abandonment is concentrated in area with poor soils in hilly regions and wet soils in river valleys (EU, 2004). In the Czech Republic, farmland abandonment was estimated around 82 500 ha in 2002 according to the official statistics, then 180 000 ha in 2003 and 45 000 ha in 2005. We have to be cautious with these values because they vary so much; maybe different ways for calculations have been used.

Areas where farmland abandonment happened are mainly mountain areas in Western Europe, extensive grasslands, areas with a poor soil difficult exploiting economically in Eastern Europe. But the causes of farmland abandonment are various. Today, in Europe, the reformed CAP policy is possibly more careful to the role a farmers in conservation of landscapes and so some subsidies are going in less favoured areas (LFA) in order to maintain farming in these areas.

APPENDIX 2: IMPACTS OF FARMLAND ABANDONMENT

Ecological and agronomic impacts

It's generally acknowledged that farmland abandonment has generally negative effects on ecosystems and landscapes but it's not always the case.

Impacts on vegetation

In Europe, farmers have always developed grazing and haymaking in semi-natural grassland, which permit an increase in diversity species. Abandonment of these semi natural grasslands has a negative impact on biodiversity. It has been shown that the decrease in species richness is relative to an increase in light competition and a reduction in the possibilities for germination or seed establishment (EU, 2004). When a land is abandoned, standing crop biomass increases so species richness decreases. Vegetation succession leads to species-poor and more homogeneous vegetation types. The final stage will be forest generally except in high mountain areas and steppe zone. Vegetation succession also results in a structural change from open to a closed landscape. The increase in biomass permits a higher level of carbon sequestration in these lands (Gellrich, 2006) that would have a positive effect on global warming.

In Britain, Thomas (1963) showed a decline in species number following cessation of grazing. For example, chalk grasslands abandoned will revert first to scrub and then eventually to some form of woodland. In British lowlands, Marrs (1988) has shown that vegetation in abandoned land terminate in woodland even if meanwhile there are cycles within the vegetation. In uplands, the development of wooded land is less important because of the paucity in of woodland species. It has been also shown that in lowlands the seedbank would provide propagules whereas in the uplands the surrounding vegetation is more likely to be important.

For example, in Britain, lands can be divided in 4 groups (Bunce, 1991):

- Lowland cereal lands (East Anglia, southern England, Midlands and Scottish lowlands): farmland abandonment would occur only on set-aside area. There are a high profitability and high quality of the soil in these areas that increase propaguling. Farmland abandonment would have positive effects in this areas reducing the risk of soil erosion and diffusing agricultural pollution.
- Lowlands dominated by intensive grasslands (Southwest England, Wales, and northern England): impact of abandonment would be positive because of high productivity of grasslands and so the limited resource of species. In fact, within these areas, there is overgrazing due to high stocking rates linked to headage payments, so abandonment could allow managing less intensively these areas. Hedgerows and small woodlands are common and therefore provide a source of propagules.
- Marginal upland: it is the area the most concerned by consequences of farmland abandonment because it contains elements of the limited cropland lowland grassland as well as upland vegetation. There is a speculation in this area.
- Uplands: altitude and latitude are the principal factors that explain development of vegetation in abandoned land.

Livestock could also have role in seed transference from grasslands to abandoned arable land (Gonzales, Bernaldez, 1991) and so on the biodiversity in abandoned land.

Impacts on the fauna

This shift has also an impact on the fauna. Certain bird species can lose their breeding habitats (Partridge, Black-tailed Godwit…). Nevertheless, for certain others birds species, farmland abandonment of semi grasslands may have positive impacts because of increasies of rodents (Montagu's Harrier, Lesser-Spotted Eagle for example).

In Italian Mountain (Apennines especially), an abundance of the wild boar (Sus scrofa) and the roe deer (Capreolus capreolus) have been noticed whereas these two species had been extinct in this area from many centuries but were reintroduced twenty years ago (Farina, 1991). This phenomenon is probably related to the abundance of food resources in abandoned fields. The proliferation of these wild animal species near other farmlands could provoke serious destruction of crops. Farmland abandonment can also be cause for the return of large predator (Danilo, 2003). For example, wolf expansion is increasing in Italy following farmland abandonment. In France, it would be the same way if in the Pyrenean Mountain, farmland were no longer managed.

In Mediterranean area in France, it has been shown (Sirami, 2004) that with farmland abandonment there is an increase in occurrence of forest avifauna species and a decline in open habitat species. Open habitat specie, with a narrow habitat breadth, migratory, and with a southern distribution range is more likely to be negatively affected by farmland abandonment. Whereas, forest species with a broad habitat breadth, sedentary, and with more northerly range is likely to benefit from farmland abandonment.

Concerning arable land, farmland abandonment can provoke a loss of feeding places for wintering birds. Nevertheless, abandonment of intensively managed arable land can have a positive impact on biodiversity, landscapes and water pollution.

Impacts on soils

Farmland abandonment would have impact on the soil. In fact, on sloped soil, erosion would increase and avalanche hazards too (Catherine, 1992) but on others soils, it can participate in the stabilisation of soils (Gellrich, 2006). A study managed in the south-eastern Spain has shown that erosion was linked to vegetation on abandoned land (Cerda, 1997). Vegetation cover is minimal immediately following cultivation, and subsequently the spatial variability increased after abandonment and so erosion increases. In the area studied, the revegetation stages culminated with the establishment of Pinus halepensis, exhibiting low spatial variability in vegetation cover and runoff and erosion rates (Cerda, 1997). So, erosion seems to be a phenomenon that occurs during first years after farmland abandonment but it’s not a long-term process on abandoned land.

Farmland abandonment has impacts also the microbial soil structure and biomass (Zeller, 2000). A study managed on three sites in European Alps measures evolution of different classical variables such as sand, silt and clay percentage, pH, C and N rates. They also measured Soil Microbial Biomass C (SMBC), Soil Microbial Biomass N (SMBN), ergosterol and Phospholipid fatty acid analysis (PLFA). Measures have been made in two kinds of land: abandoned grassland and adjacent agriculturally managed areas.

From this study, it results that in abandoned meadow the pH is lower than in managed area namely soils are more acidic. Also, the ratio C/N increases in abandoned area due to a decrease in N because of the low N rate in shrubs.

Concerning other variables, SMBC is not significantly affected by land management whereas SMBN is significantly lower in grassland with abandoned management (141 μg/g soil) as compare to managed grassland (158 μg/g soil)(Zeller, 2000). The E_C/E_{NIN} ratio has been calculated by dividing differences of organic C extracted from fumigated and non-fumigated soils (E_C) by the differences of ninhydrin-reactive N extracted from fumigated and non-fumigated soils (E_{NIN}). Its value is not significantly between managed and abandoned land. Ergosterol is a molecule component of the membrane of fungi which has the same role as cholesterol for animals. Measuring its quantity in soil sample permit to measure the fungi biomass in soil. Searchers remark that ergosterol increases in abandoned area from 4.5 μg/g soil to 8.6 μg/g

soil (Zeller, 2000). That is related to reductions in the quality plant litter inputs and, hence, soil organic matter quality, and to increases in soil acidity in abandoned meadows. Decrease in pH value is known to be favourable to fungal growth. The reduction in litter quality is due to an increase in the dominance of dwarf-shrubs, which produce litter of low N. Phospholipid fatty acid analysis (PLFA) is an indicator for measuring the active microbial biomass. The PLFA measured is around 32 nmol/g soil in managed areas and 23 nmol/g soil in abandoned grassland namely there is low bacteria activity in abandoned land (Zeller, 2000). Finally, we see that there is an increase in the proportion of fungi realtive to bacteria in abandoned land (Zeller, 2000).

Managing abandoned area and maintain open landscape also permit to avoid forest fires especially in Mediterranean area.

Finally, ecological impacts of farmland abandonment are referring to the idea that authors have about the role of the nature in the society. This is shown concerning evolution of landscapes provoked by farmland abandonment and its impacts on biodiversity, fauna, soils…In fact, for certain authors there are more positive effects and for others authors it's the contrary. Ecological impacts also raise the difficulty of the conflict between conservational aspects and other human interests (for example tourism industry). Also, the expansion of wolves into formerly wolf-free regions raises the issue that it would be accepted by inhabitants in the name of biodiversity or would inhabitants prefer hunting and killing them?

At European scale, the landscapes are so different and farmland abandonment has different ecological impact according to the landscape and it also depends on the way the land was managed previously. To simplify, if the land was managed intensively, farmland abandonment has more positive effect reducing soil erosion, pesticides and fertiliser utilization. If the land was managed extensively, farmland abandonment has more negative impact on biodiversity mainly. That's why, there is a diversity of ecological impact so much there is kind of landscape in Europe and each area need to be observed separately and so impact of farmland abandonment could have negative or positive impacts.

Social and Economic impacts

Social and economic impacts of farmland abandonment are less studied than ecological impacts. It is understandable because when land has been abandoned, it has no longer economic use generally. But this non-use of land can have social consequences on rural societies.

As we have seen, farmland abandonment is often provoked by a particular economic and social situation. So, when lands are abandoned, it emphasising on this situation, it's like a vicious circle. Less farms means also less social infrastructures and less economic activity. Although, in France, it has been shown that lands considered as marginal lands have always some uses (grazing, mushroom or woods picking), it doesn't change the framework. Reduced farming activity can also mean loss of potential income from tourist accommodation and the spontaneous development of forest may reduce the attractiveness of the landscape for tourism (EU, 2004). The relation between the landscape and the farmer, the alarming slogan "No landscapes without farmers" that has been used for a long time in order to raise public awareness of farmland abandonment is not sufficient. Farmland abandonment gives rise to the function and the role of farming and farmers in rural societies (Cemagref). Today, the trend would be more to pay landscape managers that is to say that the first function of the farmer that is production is questioned.

Point of view about impacts of farmland abandonment in European countries

European countries have a different point of view about farmland abandonment. According to the country farmland abandonment may be perceived as an environmental, economic or social problem. Generally, farmland abandonment is considered as a limited economic and social problem. Environmental impacts of farmland abandonment with biodiversity loss, fire hazards

seem to be more important for European countries (Moravec, 2007). We will see the situation in several European countries.

United Kingdom

As it has been said first, farmland abandonment is not a significant phenomenon in the United Kingdom and so it is considered as a small and limited problem (Moravec, 2007). It would occur in marginal areas such as uplands and LFAs with a decrease in number of beef and sheep that would be a cause of undergrazing.

France

In France, farmland abandonment is most considered as a social and political problem than an environmental problem. In fact, a 'useless' land is not socially accepted in the French context. French citizens are more sensitive to open landscapes than closed landscapes. It's also a political issue because farmland abandonment represents a certain menace for farmer organisations and agricultural institutions. Concerning the environmental part, farmland abandonment is not viewed as a threat for biodiversity. Indeed, the main threat concerning biodiversity in France is the intensification (agrochemicals…). On the contrary, abandonment would have positive effects in the intensively managed areas. Also, with intensification, HNV areas have decreased in France increasing abandoned areas. The major environmental problem would concern the risk of fires that increases with the growth of shrubs in dry areas (Mediterranean areas). Finally, In France, farmland abandonment is probably a minor threat to French agriculture compared with to urbanisation and to afforestation.

Germany

Generally, farmland abandonment is considered as a small problem in Germany. The environmental side is a more important issue than social and economic sides. It is because the vegetation succession process on abandoned land is not enhancing the diversity of German landscapes in areas that are already rich in forest cover (Moravec, 2007). Nevertheless, farmland abandonment would have positive environmental impacts on wet land (biodiversity is so poor in these area because of farming) and on arable land (reducing soil erosion). The economic issue concerns local tourist economy ('traditional' agriculture being attractive for tourists). The shrinking of the rural population in the north-eastern Germany represents a social issue of farmland abandonment.

Denmark

In Denmark, there is no measure of abandoned land but the area is expected to be relatively small (Moravec, 2007). The environmental issue is the most important in Denmark. Farmland abandonment is considered as serious problem in relation with the loss of biodiversity in permanent grasslands and landscapes values. In this country, 90% of the agricultural land is arable, farmland abandonment is more seen as an opportunity for nature development in these lands.

Netherlands

Netherlands is a densely populated country, so it is difficult to talk about farmland abandonment as a problem. The threat concerning agriculture is urbanisation. Policy measures encourage the conversion of farmland into nature protection areas.

Italy

Farmland abandonment is considered more as an economic and environmental problem than social in Italy. It could have a negative impact on economic performance of tourism especially in areas where characteristic landscape features constitute an important part of tourist attraction.

About the environmental issue of farmland abandonment, the hydro-geological issue is considered more important than the biodiversity conservation.

Greece

In Greece, social and environmental issue are the most important concerning farmland abandonment. Indeed, farmland abandonment is viewed as a social problem in relation with the depopulation in less favoured areas. The uncontrolled growth of shrubs in mountainous or semi mountainous areas increases fire risk that is an important problem in a country like Greece with hot and dry summers.

Lithuania

Farmland abandonment is not considered as a major problem in Lithuania. On the one hand, environmental impacts of farmland abandonment are seen as negative decreasing biodiversity and on the other hand, it viewed as positive with the cessation of pesticides and fertiliser. For this country, social and economic issue are not the main problem of farmland abandonment.

Czech Republic

In Czech Republic, the environmental issue with the disappearance of high nature value areas (HNV) on grasslands is the most important problem of farmland abandonment. Nevertheless, it would have positive effects on previously managed intensively areas trough the reduction of water pollution with nitrates and pesticides. We note that in Czech Republic, it is more extensively managed land that is concerned by abandonment.

Finally, we remark that impacts of farmland abandonment are considered differently according to the country. Farmland abandonment isn’t a major problem in all EU countries. EU policy will have to take into account different point of view.

APPENDIX 3: THE FRENCH LAND COVER SURVEY TERUTI

TERUTI is an annual survey overseen by the French Agricultural Statistical Office.

The principle of this survey is to observe yearly 550 000 sample points in the French territory, and to classify the point observed in a physical and a functional category. The last series cover from 1992 – 2003.

All samples are chosen on the territory following an accurate method. A first division is made with mesh coverage (12 km x 12 km → 4 700 meshes) of all the French territory. Then, in each mesh, 8 segments are taken, and in each segment, 36 points are spread over, at a distance of around 300 m. Each point represents an area of about 10 m^2 (3m x 3m).

Two codes are attributed to each point:

- a physical code, which is based on ground observation;
- a functional code, which gives information on the socioeconomic use of the land.

Examples: The point is located in a maize field

- Physical code: maize – code 30
- Functional cod: Farming production – code 02

The point is located on a lawn on the edge of a road

- Physical code: lawn – code 68
- Functional code: permanent network of roads – code 08

Some calculations are made in order to establish the random error evaluation, the variance, and the standard deviation.

The level of exactness is acceptable at NUTS 1. The relative error is under 10% for half of all the categories that cover 98% of the territory. At NUTS 2, this error is higher and depends of the size of the category. For example, the error for the vineyard category is around 6% and 10% in Languedoc-Roussillon; it reaches 24% in Bourgogne.

TERUTI is a survey that gives us quite a good vision of the French territory, especially at NUTS 1 and NUTS 2.

The land use survey (TERUTI) provides some of the best information concerning farmland abandonment in France. We can consider that farmland abandonment is simply the flow from farming area to semi-natural vegetation (fallow land, moor and forest).

The TERUTI survey gives indications on land use (and classifies the different soil uses in 81 classes). In order to simplify calculations for evaluating farmland abandonment, certain categories have been grouped (see Table A3.1). Hedges, groves and poplar trees were included in the UAA to simplify the different headings. Farmland abandonment is considered to be the flow from ‘UAA’ to ‘scrubland’ and ‘forest’.

The TERUTI Survey estimates farmland abandonment at about 101 000 ha per year (see Table A5.1).

Table A3.1: Grouping of TERUTI classes to evaluate farmland abandonment

Final class name	TERUTI class name	TERUTI class n°
UAA	- Arable land (wheat, maize…) - Artificial, permanent and natural productive meadows - Collective pasture - Set-aside land and fallow - Orchards - Vine - Hedges, groves, farmland trees - Poplar trees	27-45, 73 46-48 49-50 52 53-62 63 22, 23, 72 24-26
Scrubland (Unutilised farmland)	- Scrubland ('*friche*' in French) - Moor ('*lande*' in French)	69 70
Forest	- Broad-leaved trees, conifers, mixed forest	18-21
Artificial surfaces	- construction sites, roads - green urban areas, …	68, 74 to 91, 99
Water bodies and open spaces	- water bodies and wetlands - bare soils	11 to 15 16 -17

Table A3.2: Farmland abandonment per year (ha) in France, at NUTS 2, between 1992 and 2003 (Source TERUTI/SCEES)

NUTS 2 (« Region »)	Farmland abandonment per year (ha)	% of UAA 1992	% of the total flow of farmland abandonment
Provence Alpes Côte d'Azur	14 566	1.5%	14,4%
Corse	11 256	3.4%	11.1%
Midi Pyrénées	10 103	0.4%	10%
Aquitaine	8 656	0.5%	8.6%
Rhône Alpes	8 140	0.4%	8.1%
Languedoc Roussillon	7 858	0.7%	7.8%
Centre	6 503	0.2%	6.4%
Bretagne	6 394	0.3%	6.3%
Pays de la Loire	5 000	0.2%	4.9%
Poitou Charente	3 397	0.2%	3.4%
Auvergne	3 143	0.2%	3.1%
Limousin	2 826	0.3%	2.8%
Bourgogne	2 454	0.1%	2.4%
Franche Comte	1 982	0.3%	2.0%
Champagne Ardennes	1 721	0.1%	1.7%
Basse Normandie	1 480	0.1%	1.5%
Picardie	1 151	0.1%	1.1%
Lorraine	964	0.1%	1%
Ile de France	949	0.1%	0.9%
Haute Normandie	924	0.1%	0.9%
Nord pas de Calais	863	0.1%	0.9%
Alsace	689	0.2%	0.7%
Total France	**101 020**	**0.3%**	

We notice that the area most affected by farmland abandonment in terms of surface is Provence Alpes Côte d'Azur (14 556 ha per year), and that the less affected is Alsace (689 ha per year). In terms of percentage of UAA (1992), Provence-Alpes-Côte d'Azur is still the first (1.5%). Farmland abandonment is concentrated in some regions. 10 regions account for 81% of farmland abandonment.

TERUTI also gives information on the origin of farmland abandonment, in the sense that it is possible to know which kind of land is concerned by farmland abandonment.

APPENDIX 4: ESTIMATE OF THE FLOW TOWARDS ARTIFICIAL AREAS

- **Definition of a time scale**

All the surveys used (FSS, TERUTI and the Population Survey) describe the evolution over more or less a decade but they were not carried out exactly on the same year. In order to compare information from these three surveys, it is necessary to work on the same time scale. The minimal time scale of all these surveys is 9 years (population census 1990-1999), so we will make calculations on this. Global farmland abandonment will be estimated on this scale. Thereafter, it will be possible to work out the results per year.

- **Calculation of sealed soils from UAA area**

The main objective is to estimate sealed soil area at LAU 1 ("cantons").

The sealed soil surface given by TERUTI will be disaggregated from the national level to LAU 1. The results given by TERUTI at NUTS 2 and NUTS 3 will only be used to validate the results.

The sealed soil area is correlated with demography. In our calculations, the hypothesis is that sealed soil areas at LAU 1 are linked to:

- Increase, over the period, of sealed soil needs per inhabitant.
- Increase of number of inhabitants during the period.
- Increase of the number of secondary residences.

The flow to the artificial area = ratio 1 x number of inhabitants at T2 + ratio 2 x gain of population + ratio 3 x gain of secondary residences.

Ratio 1 is the increase in sealed soil needs per inhabitant, in m^2

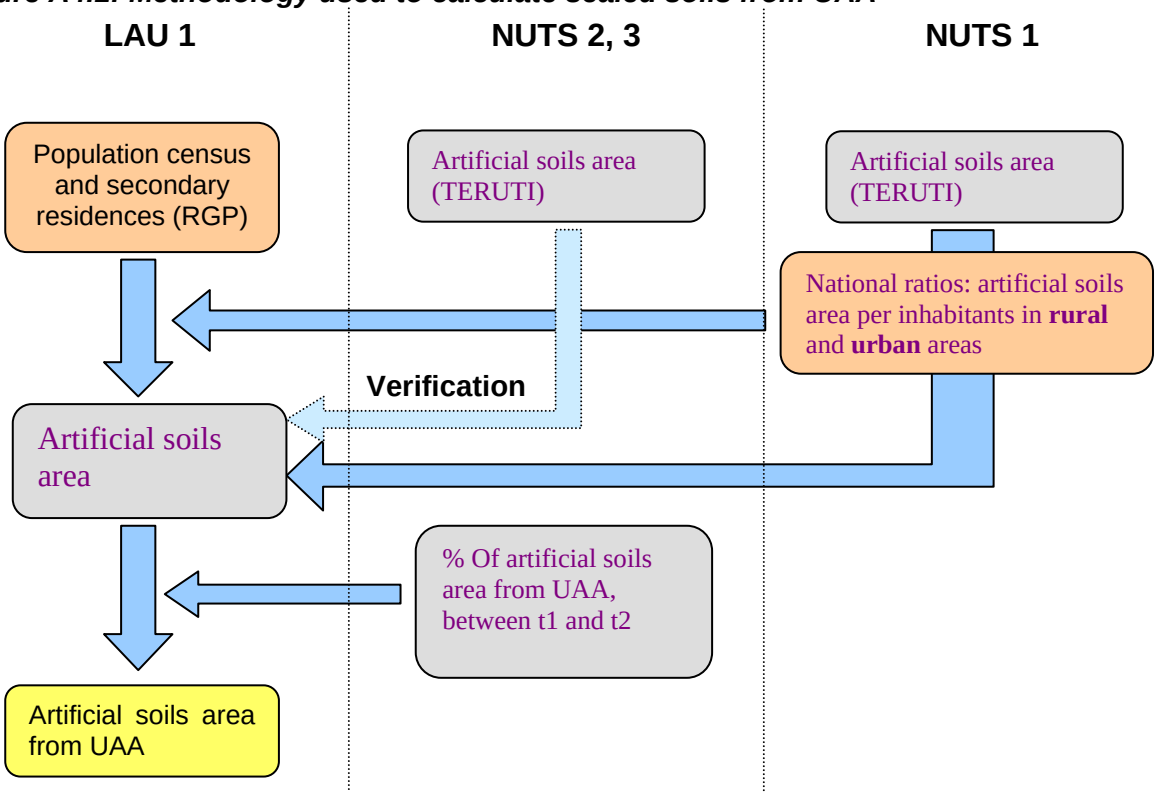
Ratio 2 is the average surface of sealed soils per inhabitant

Ratio 3 is the average surface of sealed soils per new secondary residences

But part of the sealed soil gains during the period not only comes from loss of UAA but from other land uses as well (such as forests or scrublands). In France, TERUTI estimated this ratio in average for France to 18% (going from 52% to 3% according to data gathered at *"département" scale).* It means that in average 82% of the flow to sealed soils comes from the UAA.

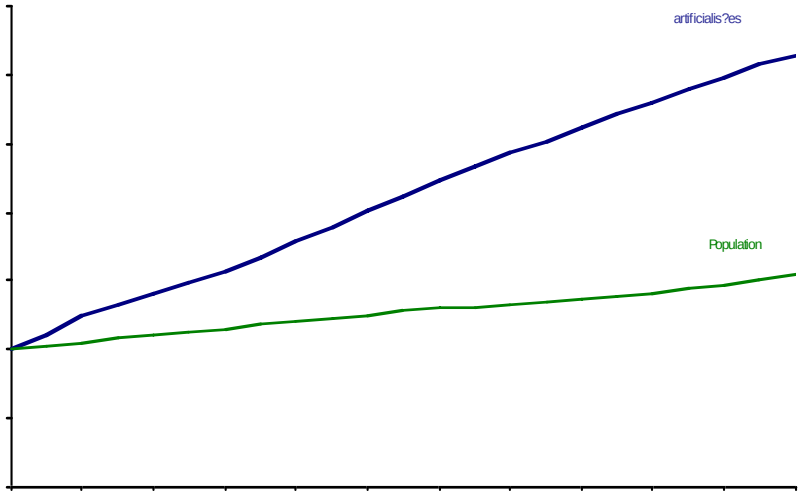
Figure A4.1 presents the different steps of the disaggregation to LAU 1 of the gain of sealed soils.

Figure A4.1: Methodology used to calculate sealed soils from UAA



- **Estimate of the increase in artificial area needs per inhabitant (ratio 1)**

Figure A4.2: Evolution of the need for sealed soil area per inhabitant in France



Source: SCEES-INSEE.

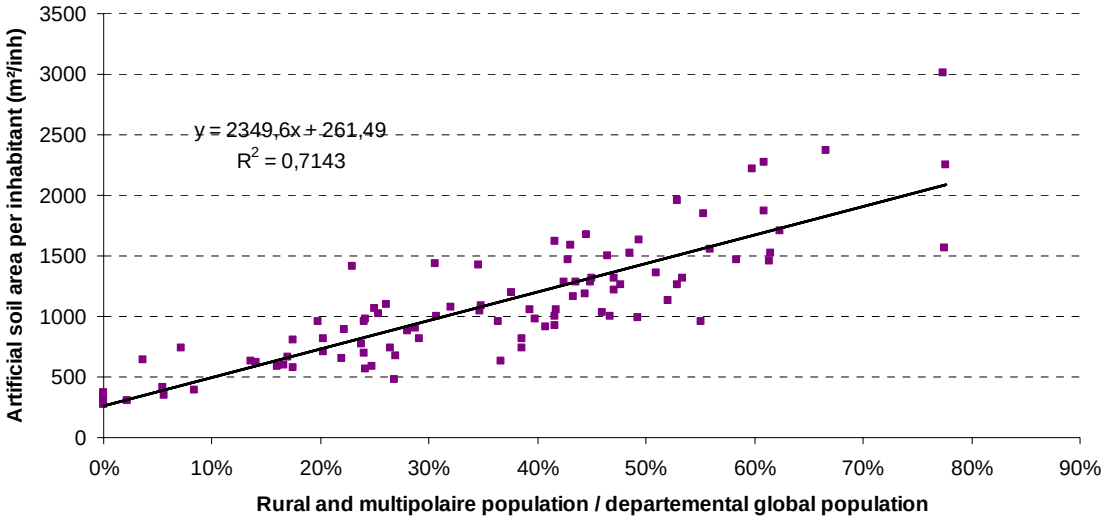
Figure A4.2 shows that the increase in sealed soil area is larger than that of the population. The need of sealed soil area per inhabitant increased regularly between 1982 and 2004. TERUTI estimates this increase at around 7 m^2 per year per inhabitant. But this ratio must be corrected. Even if the national population remains constant, there are migrations inside the country: from rural areas to urban areas, from the city to peri-urban areas, from the North to the South, from the inland to the coast. This population migration of within the country increases the need for sealed soil. The Population Census estimates the increase of population due to migration inside the country at LAU 1 to be one third of the total gain of population. The sum of the gains in population at LAU 1 is + 2 517 849 inh and the sum of the losses is -614 609 inhabitants, corresponding to a net result of 1 903 240 inhabitants (net gain of population). If we consider the gain of population at LAU1 which impacts the demand of sealed soils, the ration should be decrease in proportion (1903240*7/2517849 = 5,3m2). In final **a ratio of 5 m^2/new inhabitants at LAU1 was used**.

- **Estimate of artificial area per inhabitant in rural and urban areas (ratio 2)**

To calculate this ratio the urban and the rural population were differentiated. Indeed, the structure of housing is different in urban areas. The sealed soils area per inhabitant in a city where people live mainly in buildings is lower than in peri-urban areas and rural areas, where most people live in individual houses.

In fact, the sealed soils area is correlated with the types of communes (see Figure A4.3).

Figure A4.3: Sealed soils area per inhabitant and types of communes



Sources : TERUTI, INSEE.

This graph was drawn with data from TERUTI and population census 1999. Each point represents a French department in which the percentage of population in rural and multipolar municipalities in relation to global departmental population was calculated. As can be seen, the sealed soils area per inhabitant has a correlation coefficient of 0.72. In other words, the sealed soils area per inhabitant increases when the rural population increases.

Some results are provided by CLC (see Table A4.5).

Table A4.5: Data on sealed soils per inhabitant in France

	Urban areas	**Rural areas**
Population (1999)	44 196 510	14 321 885
Area (ha)	9 918 000	45 182 000
Artificial built areas (ha) (Corine Land Cover)	1 418 274	632 548
(1) Artificial built area per inhabitant (m^2/inh)	321	442
(2) Housing area per inhabitant (m^2/inh)	100	1100
(3) Total artificial area per inhabitant (m^2/inh)	572	1442

Sources: IFEN 44-341 p. – SCEES (housing survey, 1999) – TERUTI.

The ratio (1) only takes into account the built area and underestimates the artificial vegetated areas such as green urban areas, gardens, lawns… The Housing Survey provides some interesting results concerning the size of private housing (2):

- 100 m^2 per inhabitant for urban areas in 2003;
- 1 100 m^2 per inhabitant for rural areas in 2003.

If housing area is estimated at around 100 m^2 in rural areas (Housing Survey, 1999), 1 000 m^2 of unbuilt sealed soils remain. Consequently, in rural areas, artificial areas are of about 1 442 m^2/inhabitant (442 + 1 000) (3).

For urban areas, the unbuilt artificial area per inhabitant must be estimated, using TERUTI data. In fact, TERUTI gives the global value for sealed soils in 2003 (4 593 045 ha). The built sealed

soil (rural and urban, data from Corine Land Cover) and the unbuilt rural artificial areas (1 000 m^2 x rural population) must be subtracted from this value. The result is 572 m^2 per inhabitant (3).

- **Taking account the different types of municipalities**

These first calculations are not very accurate for urban areas, but they give a first idea. In fact, in very dense urban area, the ratio is lower than 572 inh/m^2.

The population census provides the number of inhabitants per canton according to the type of municipality.

4 types of municipalities are considered:

- Urban municipalities: municipalities with at least 2000 people where none of dwellings is separated from the nearest by more than 200 meters

- « *monopolaires* » (monopolar) communes: communes where 40% of the resident population have a job in an urban commune.

- « *multipolaires* » (multipolar) communes: communes where 40% of the resident population have a job in several urban cities.

- Rural communes: the remaining communes

With a base on the TERUTI results on sealed soils areas in densely populated areas by department, the ratios for population were adapted (see Table A4.6). TERUTI provides the global sealed soils area in France. The determined ratios are those of this area at the national scale.

Table A4.6: Ratios used to calculate soil sealing at LAU 1

Types of population	Sealed soils area (m^2/inh) 1999	Population 1999
Urban (population at LAU 1 > 50 000 inh)	100	13 901 093
Urban (population at LAU 1 < 50 000 inh)	500	21 807 091
« Monopolaire » (monopolar)	850	9 344 741
Rural and « mutlipolaire » (multipolar)	1 800	13 465 490
Total		58 518 395

Sources: Population censuses/INSEE, TERUTI/SCEES and calculation by SOLAGRO.

- **Estimate of artificial area per secondary residences (ratio 3)**

Concerning the variation of the number of secondary residences we have affected a ratio of 2.4 inhabitant (corresponding to the national average of primary residences) per house with a ratio of 1,800 m2/inh. It means 4320m2 of sealed soils for each new secondary residence.

- **Results concerning the origin of soil sealing**

Table A4.7 shows that 50% of the demand for sealed soils comes from the increase of the needs per inhabitant. The population increases accounts for 30% and the secondary residences for 20% (gross flow of 314 107 secondary residences between 1990 and 1999).

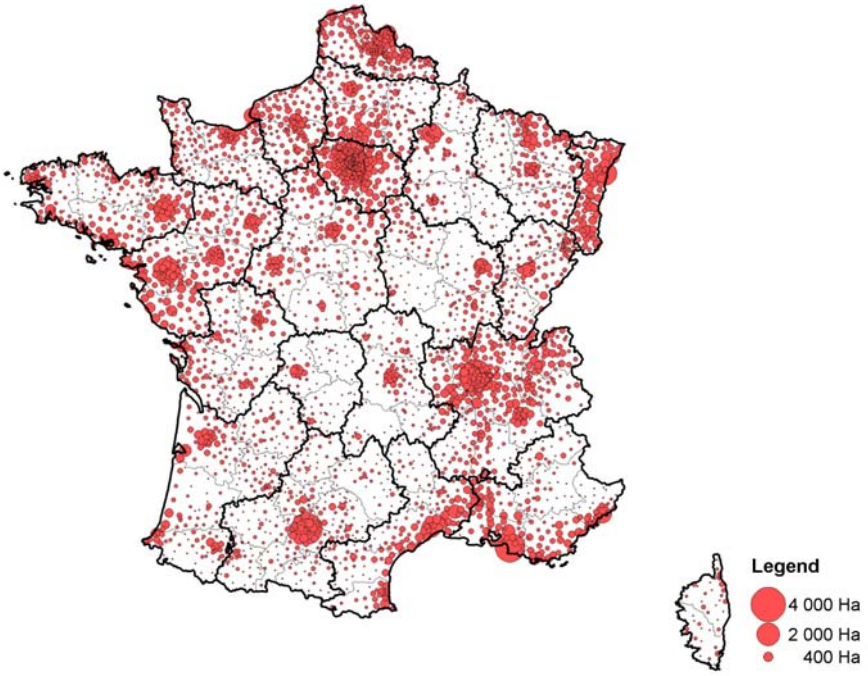
Table A4.7: Soil sealing regarding the different demand for the period 1988-2000

Types of population	In ha	In %
Soil sealing linked to the population increase	203 823	30
Need of sealed soil area per inhabitant	339 691	50
Soil sealing linked to secondary residences	135 694	20
Total demand for soil sealing	**679 208**	100

Sources: Population censuses/INSEE, TERUTI/SCEES and calculation by SOLAGRO.

- **Localisation**

Map A.1 6: Sealed farmland



Sources: Population censuses/INSEE, TERUTI/SCEES and calculation by SOLAGRO.

- **Simplification of the calculation**

Sealed soil is considered as a land which was transformed for urbanisation (housing, substructures, and facilities…) by destroying the original soil, often beyond recovery.

In the calculations, some hypotheses were made concerning the level when farmland abandonment is considered at LAU 1:

- If UAA area increases between t1 and t2, it is considered that there is no farmland abandonment. Only forests and other semi-natural vegetation can be sealed.
- If the UAA is very low and highly populated at LAU 1, no farmland abandonment is considered, even if there is a loss of UAA.
- If the loss of UAA does not cover the expansion of sealed soils during the period (LA (t1, t2) < 0), no farmland abandonment is considered.

Table A4.8: UAA area at LAU 1 and level of population at LAU 2 for which we consider there is no farmland abandonment

UAA area at t2 (ha) LAU 1	Population at t2 (inhabitants) LAU 1
< 50	> 2 000
< 100	> 25 000
< 200	> 50 000
< 800	> 100 000

Sources: Population censuses/INSEE, TERUTI/SCEES and calculation by SOLAGRO.

The flow between UAA and other lands such as lakes and quarries is negligible when compared to the value of other flows towards semi-natural vegetation, forest and sealed soil.

APPENDIX 5: EXPERTS AND STAKEHOLDERS CONSULTED

➢ **Europe**

- Jacques WEBER, European Environmental Agency

➢ **France**

- Michel ADNOT, Michel MOREL and Veronique RABAUT, Division of Economical Statistical Studies (SCEES), Ministry of Agriculture
- Michel COURET and Pascal LOMBEZZI - Regional Direction for Agriculture and forest of Normandie - Stastical division
- Robert LEVESQUE, Director - SCAFR
- Jean-Claude BOTRON, Director - SEGESA
- Jean-François BASCHER, Study and assessment, Ministry of Agriculture
- Gerard BALLENT, Scientist INRA Toulouse
- Jean-Francois RUAS, Scientist - INRA Rennes
- Bruno GUIARD, GIS - Conservatoire du littoral
- Jean-Luc DUPOUEY, Scientist - INRA Nancy

➢ **Aquitaine**

- Bertrand ROUCHER, Regional Direction for Agriculture and Forest of Aquitaine – Stastical division
- Céline DELRIEUX, Engineer - DDAF Dordogne, responsable des études statistiques
- Christian MOURRA, Engineer - DDAF Lot et Garonne, responsable des études statistiques
- Michel ROCHER, Chargé d'étude – SAFER Garonne pour le Lot-et-Garonne
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- Oscar ROBLES MIGUEL, Technical study - Generalitat de Catalunya department of Agriculture, feeding and Rural Development
- Fermi GARRIGA, GIS, Direction of Agrarian Planification and Relations - Forest Technology Centre of Catalonia

➢ **Galicia**

- Edelmiro LÓPEZ IGLESIAS, Director Xeral de Desenvolvimiento Rural - Consellaría do Medio Rural.

- Carlos ÁLVAREZ LÓPEZ, Ingeniería Agroforestal - Organization: Universidad de Santiago de Compostela. Departamento Ingeniería Agroforestal.
- José MARCIAL DÍAZ MANSO, Responsible for geographic applications – SITGA, Xunta de Galicia

➢ **Poland**

- Tomasz STUCZYNSKI – Institute of Soil Science and Plant Cultivation

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- Bronislaw KAMILSKI - Extension Centre – Olecko Branch
- Henryk WELC - Warminsko-Mazurskie Agricultural Chamber in Olsztyn
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INITIATIVES POUR L'ÉNERGIE, L'AGRICULTURE ET L'ENVIRONNEMENT
Association Loi 1901 - SIRET 324 510 908 00050

Analysis of Farmland Abandonment and the Extent and Location of Agricultural Areas that are Actually Abandoned or are in Risk to be Abandoned

APPENDIX A: Maps and tables for France

Framework contract n° 380641 F3ED
on the provision of expertise in the Field of Agri-Environment for the JRC

2008

EUROPEAN COMMISSION JRC ies Institute for Environment and Sustainability

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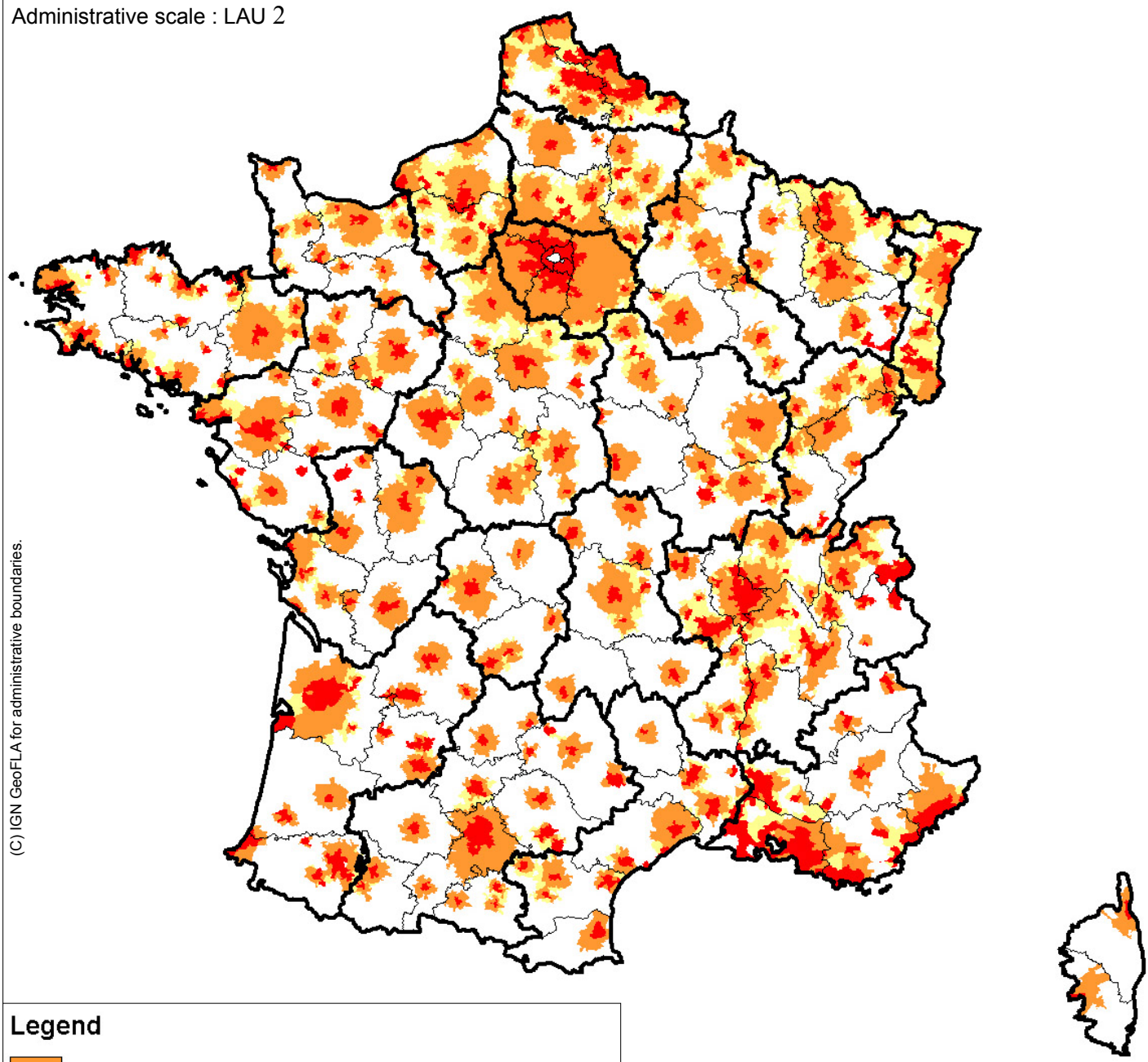
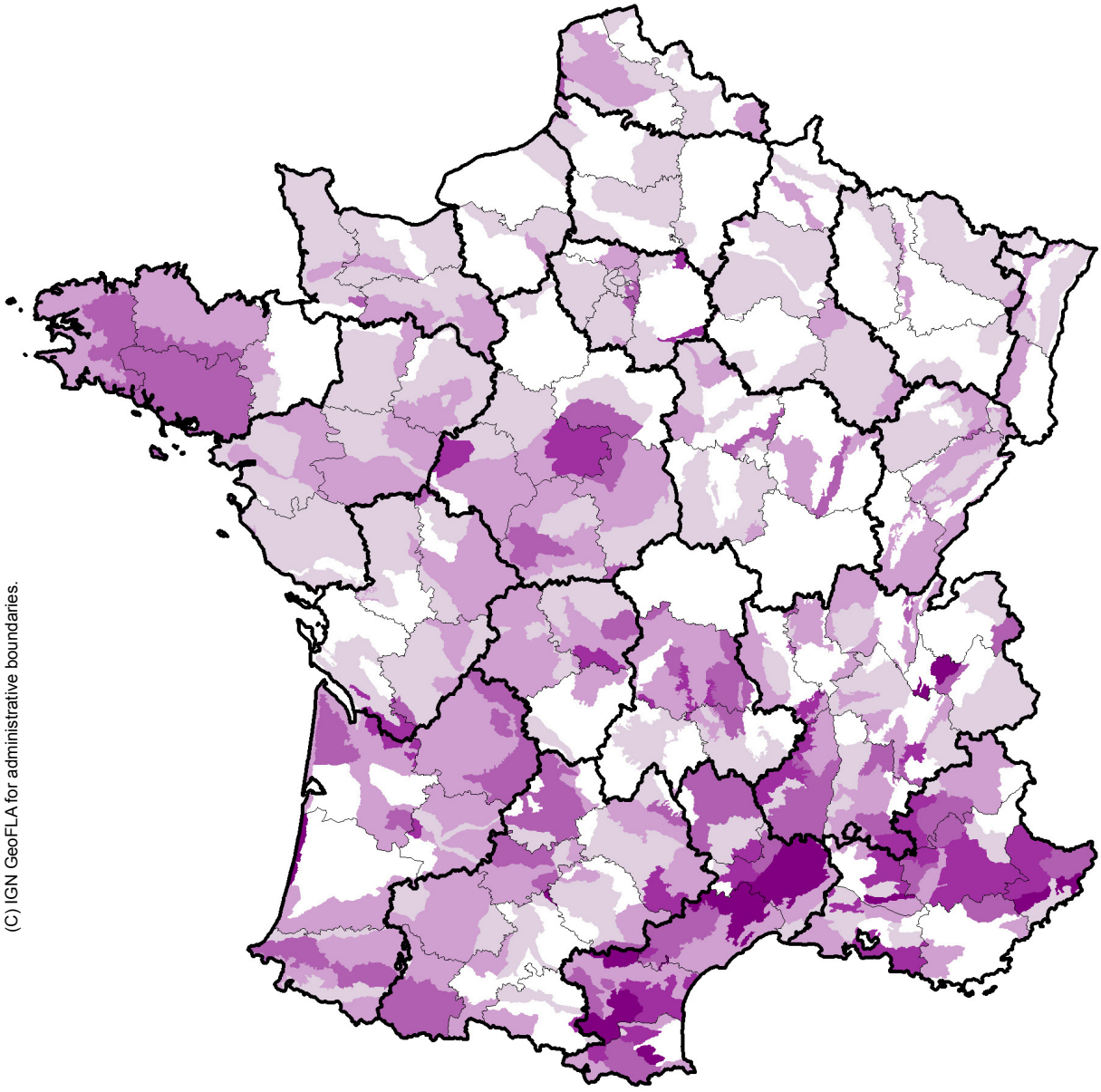
Map 1 : INSEE classification of municipalities in France (1999)



Map produced by SOLAGRO, May 2007.

Map 2 : Evolution of forest surface by "Small Forest region" in France in a time periode of 12 years (1991-2003)



(C) IGN GeoFLA for administrative boundaries.

Legend

Evolution of Forest areas (in %)

- More than +10%
- +5 to +10%
- +3 to +5%
- +1 to +3%
- 0 to +1%
- Decrease

"Small Forest Region': Homogeneous forest areas, specifically designed for the French forest survey.

Source: National Forestry Inventory (1991-2003)

Map produced by SOLAGRO, May 2007.

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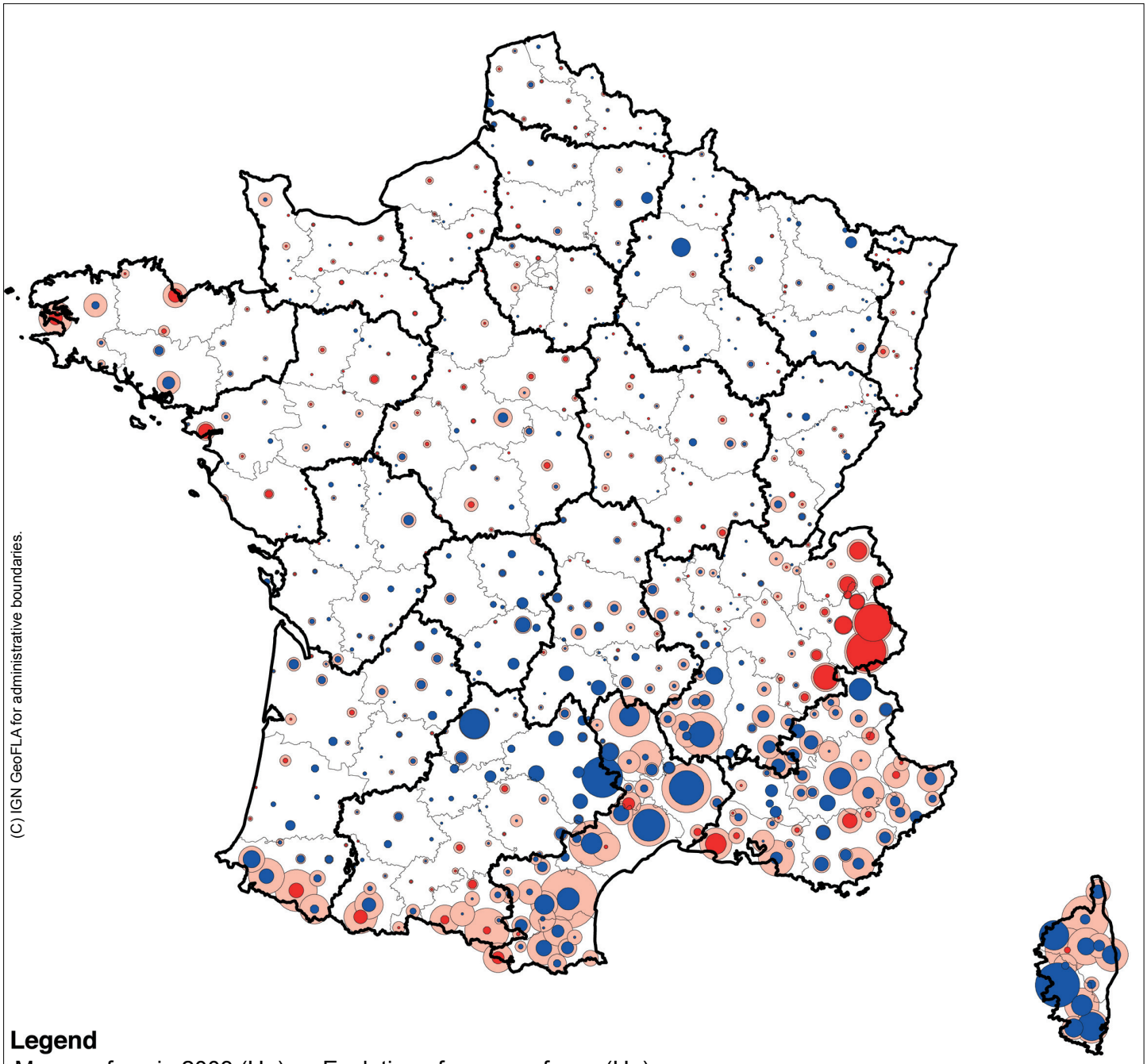
Map 3 : Evolution of moor surfaces by "Small Forest region" in France (1991-2003)

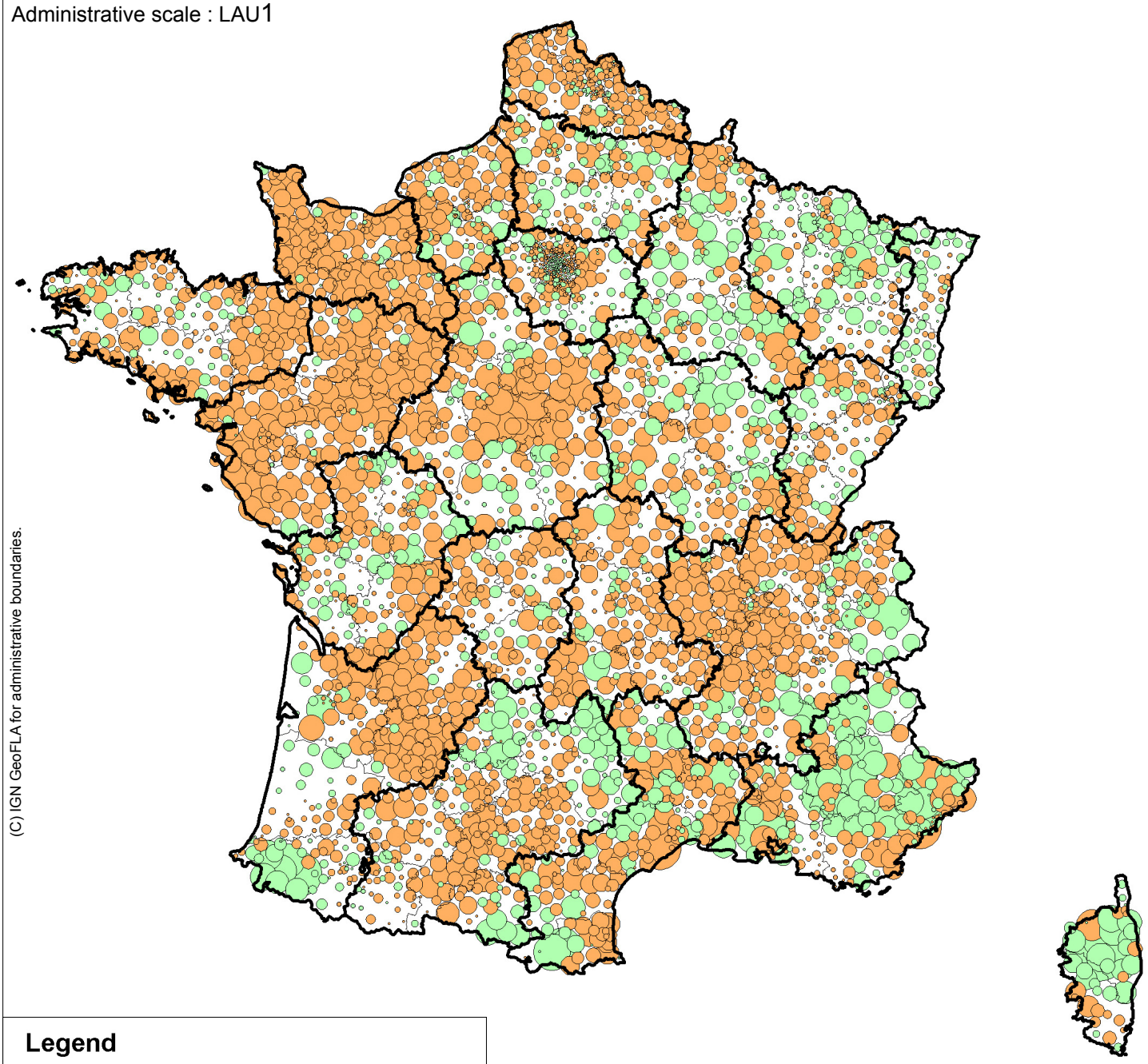


Source: National Forestry Inventory (1991-2003)

Map produced by SOLAGRO, May 2007.

Map 4 : UAA evolution by LAU1 in France (1988-2000)

Administrative scale : LAU1



(C) IGN GeoFLA for administrative boundaries.

Legend

UAA evolution in ha

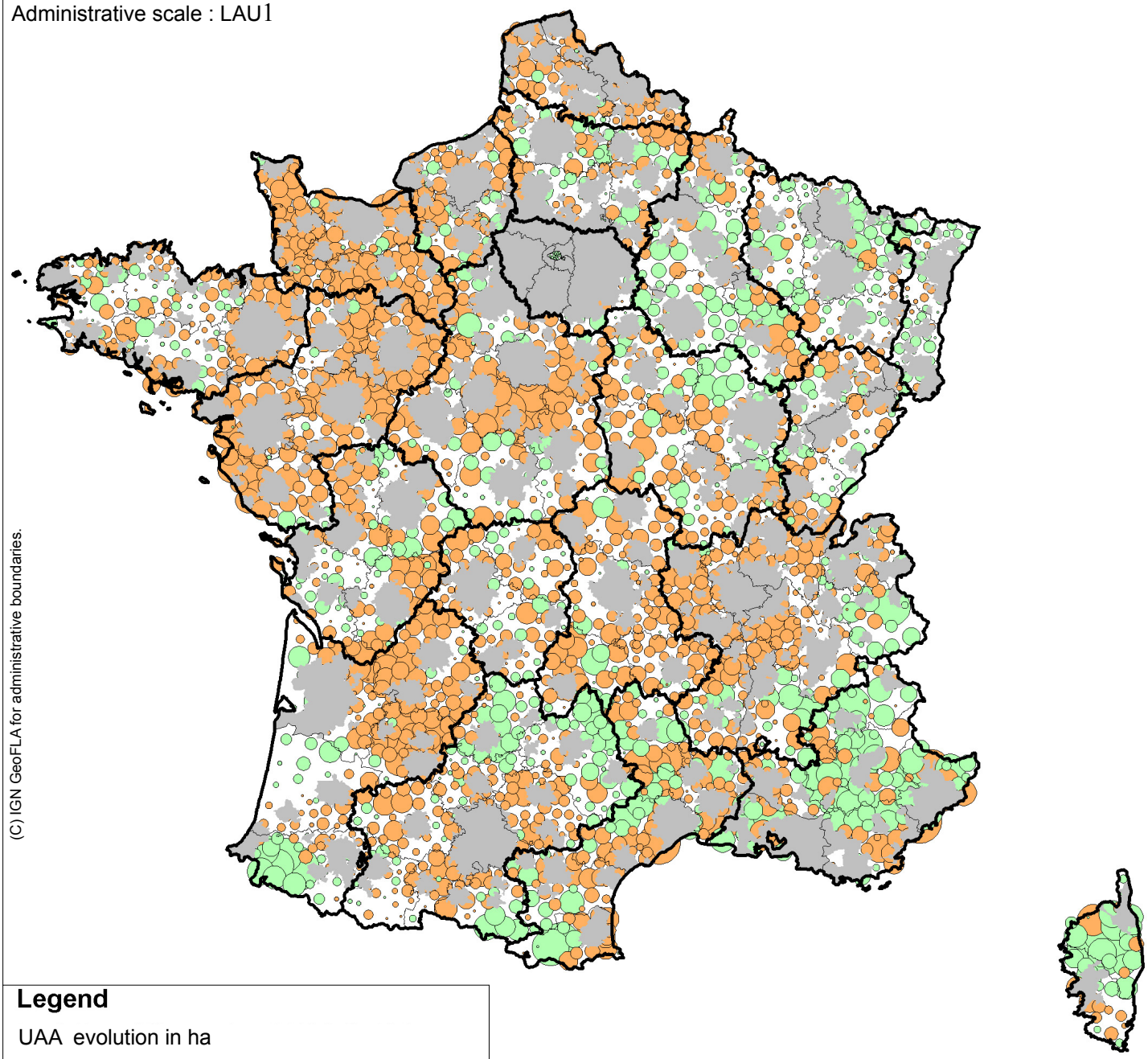
- 2 000
- 1 000
- 200
- -200
- -1 000
- -2 000

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, May 2007.

Map 5 : UAA evolution by LAU1 in dominant rural areas* in France (1988-2000)

Administrative scale : LAU1



(C) IGN GeoFLA for administrative boundaries.

Legend

UAA evolution in ha

- 2 000
- 1 000
- 200
- -200
- -1 000
- -2 000

Dominant urban areas *

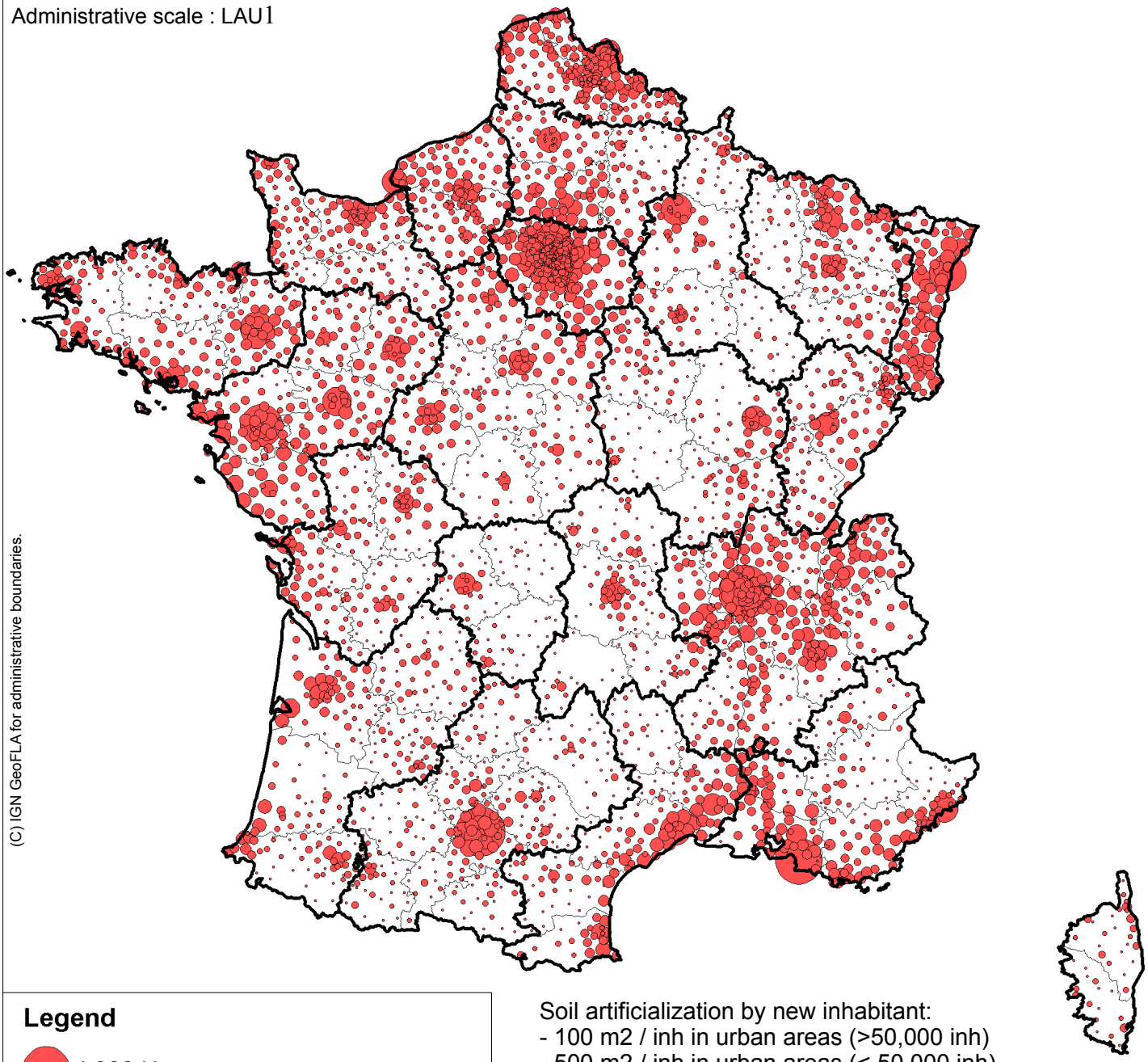
(*) INSEE définitions by LAU2 : urban municipalities and "communes monopolaires".

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, May 2007.

Map 6: Estimation of the flow of farmland to artificial soil by LAU1 in France in a period of 12 years (1988-2000)

Administrative scale : LAU1



(C) IGN GeoFLA for administrative boundaries.

Legend

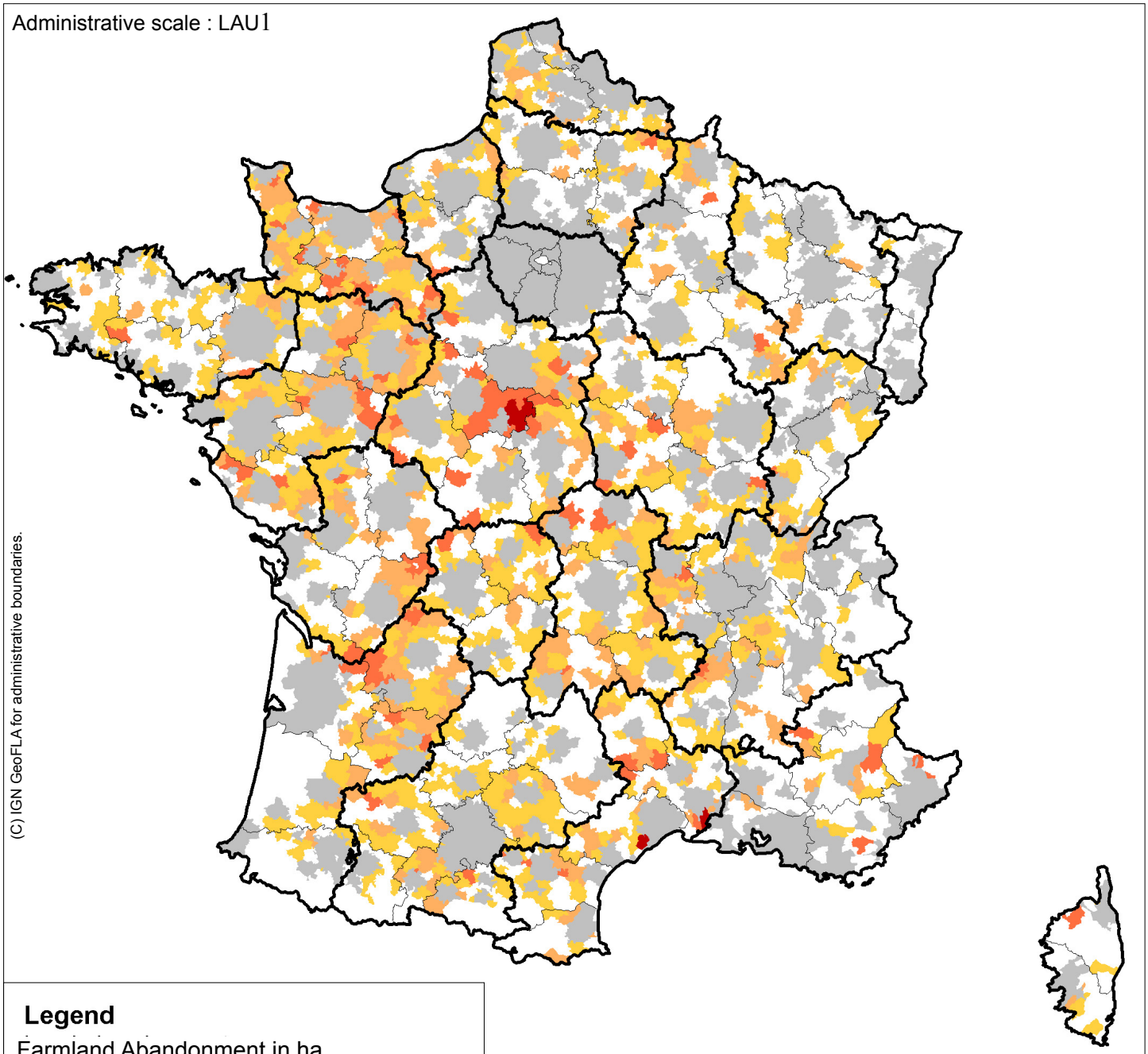
4 000 Ha
2 000 Ha
400 Ha

Soil artificialization by new inhabitant:
- 100 m2 / inh in urban areas (>50,000 inh)
- 500 m2 / inh in urban areas (< 50,000 inh)
- 850 m2 / inh in periurban areas
- 1 800 m2 / inh in rural areas
- 1 800 m2 per non permanent home in rural areas

Sources: FSS censuses 1988 & 2000,
INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 7: Estimation of farmland abandonment* by LAU1 in dominant rural areas in France (period: 1988-2000)

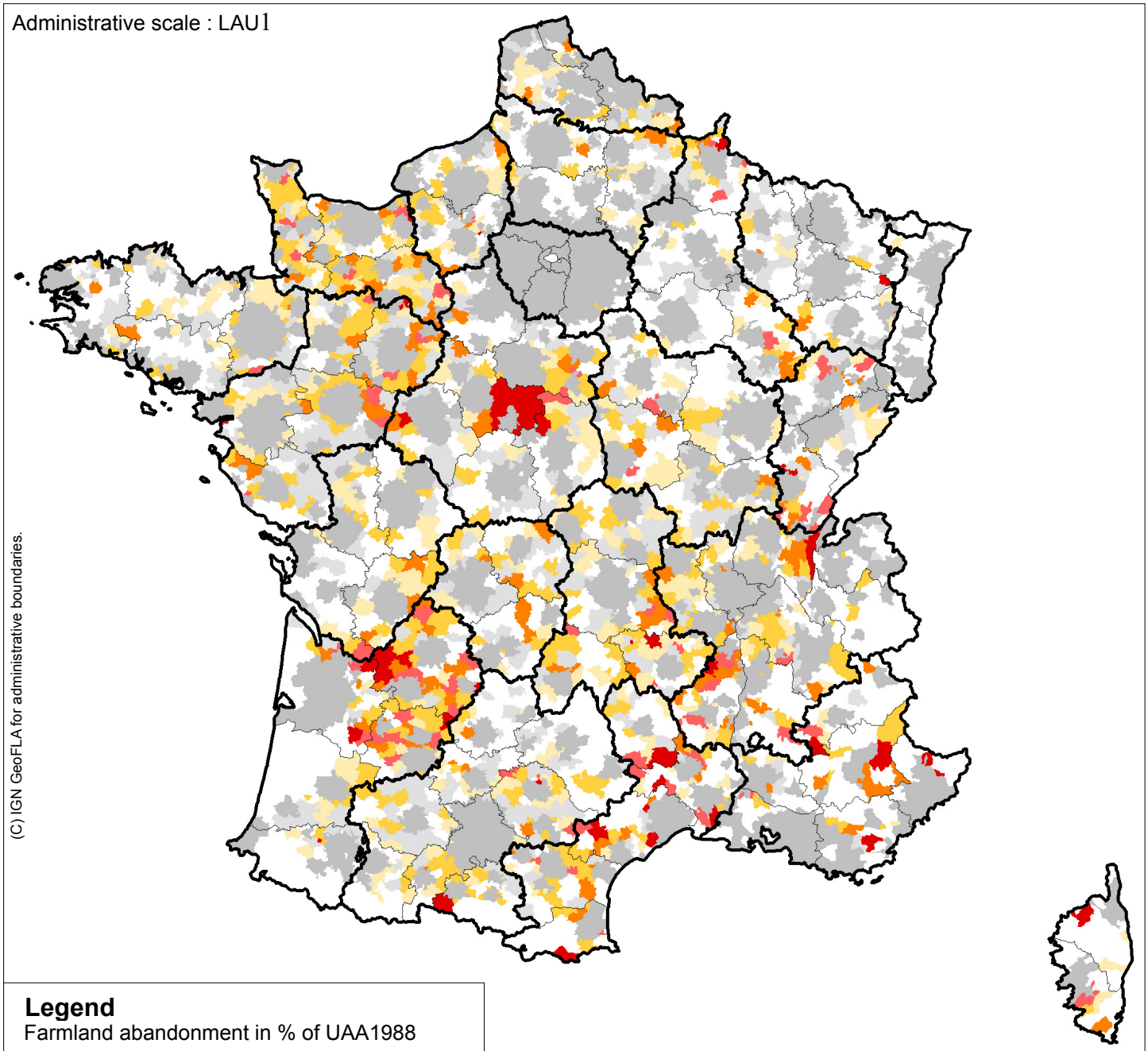


(*) UAA decrease minus farmland artificialized.

Sources: FSS censuses 1988 & 2000,
INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 8: Estimation of farmland abandonment* by LAU1 in dominant rural areas in France (period 1988-2000)

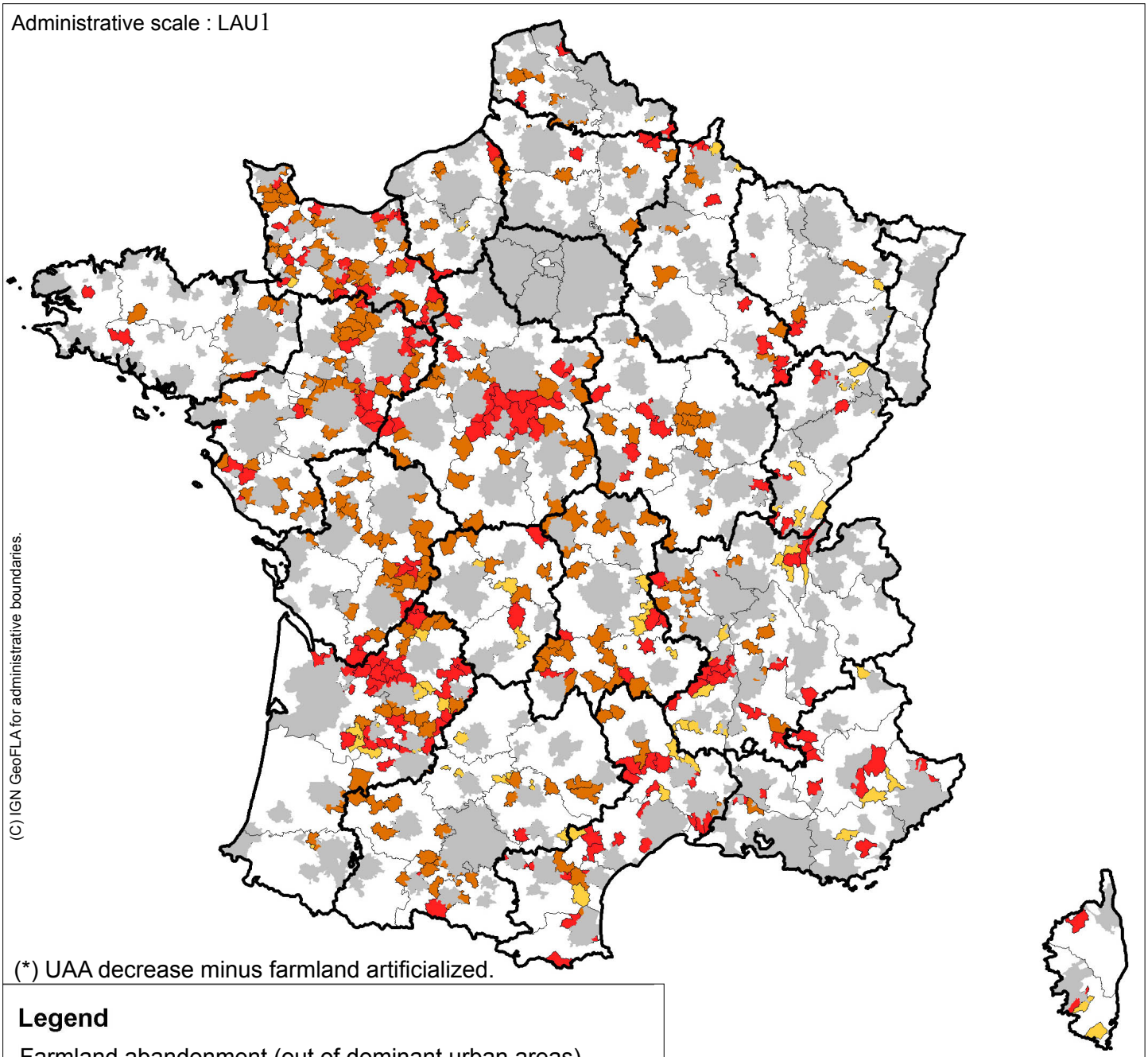


(*) UAA decrease minus farmland artificialized.

Sources: FSS censuses 1988 & 2000,
INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 9: Main areas of farmland abandonment* by LAU1 in dominant rural areas in France (period 1988-2000)

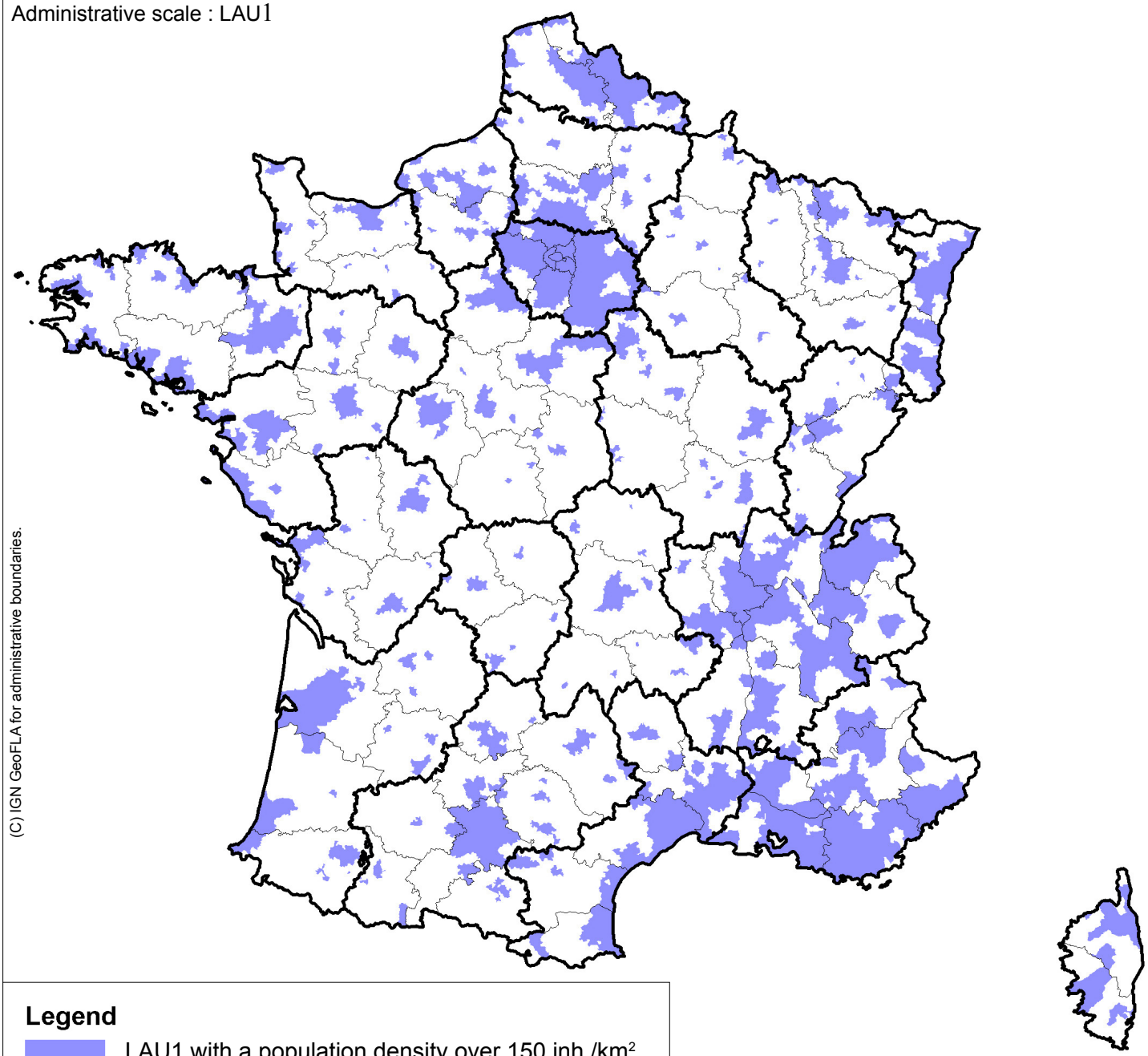


Sources: FSS censuses 1988 & 2000, INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 10: High population density or dynamic population areas by LAU1 in France (1990-1999)

Administrative scale : LAU1



(C) IGN GeoFLA for administrative boundaries.

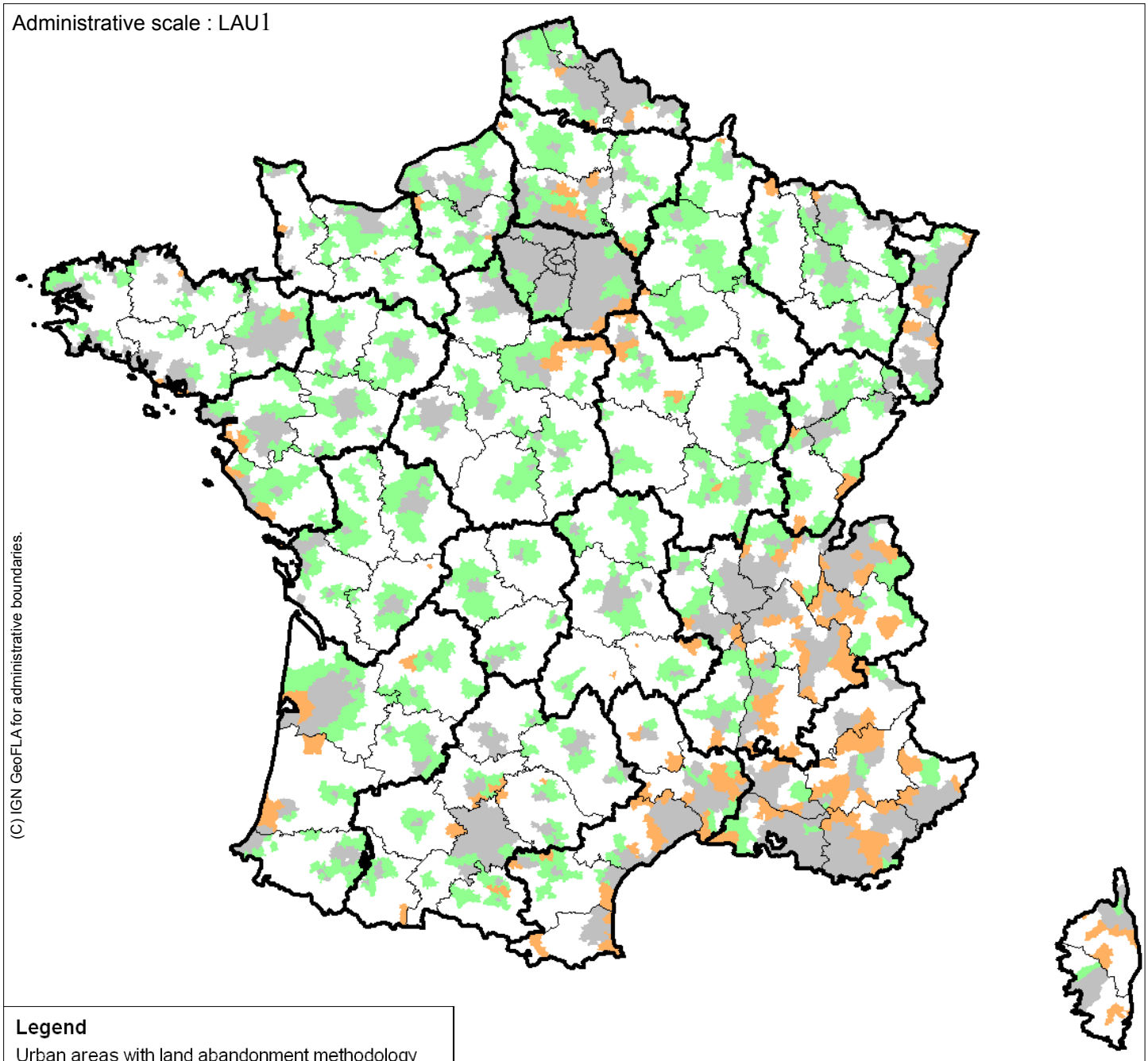
Legend

LAU1 with a population density over 150 inh./km² or a population increase over 10% between 1990 and 1999 (source : Population censuses 1990 & 1999).

Sources: INSEE (population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 11: comparison of the 2 methodologies tested in France to locate urban and rural areas

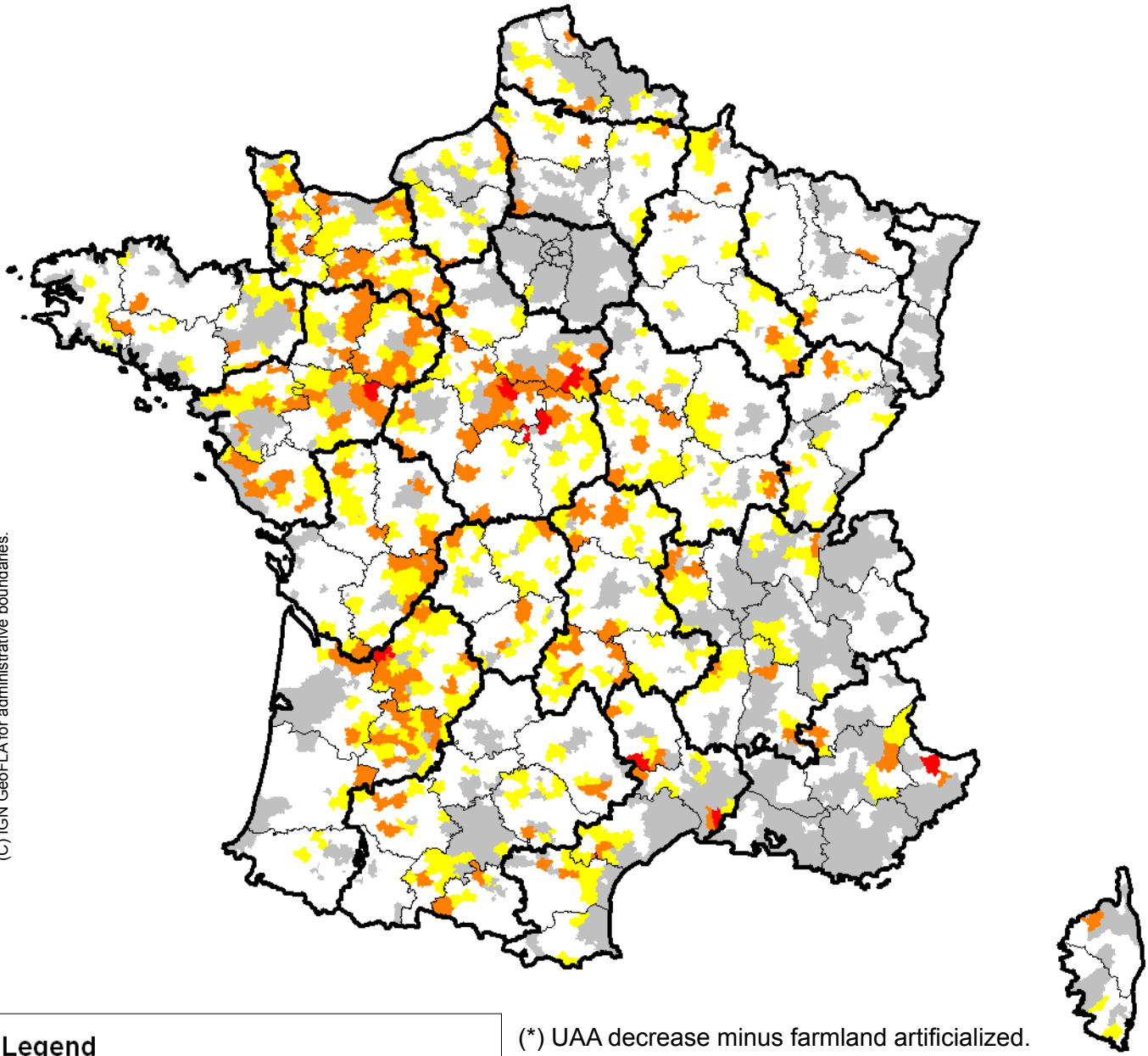


Sources: INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 12: Estimation of the farmland abandonment* by LAU1 in rural areas in France (1988-2000)

Administrative scale : LAU1



(C) IGN GeoFLA for administrative boundaries.

Legend

Estimation of land abandonment

- More than 2 500 ha
- More than 1 000 ha
- More than 500 ha
- Urban areas

(*) UAA decrease minus farmland artificialized.

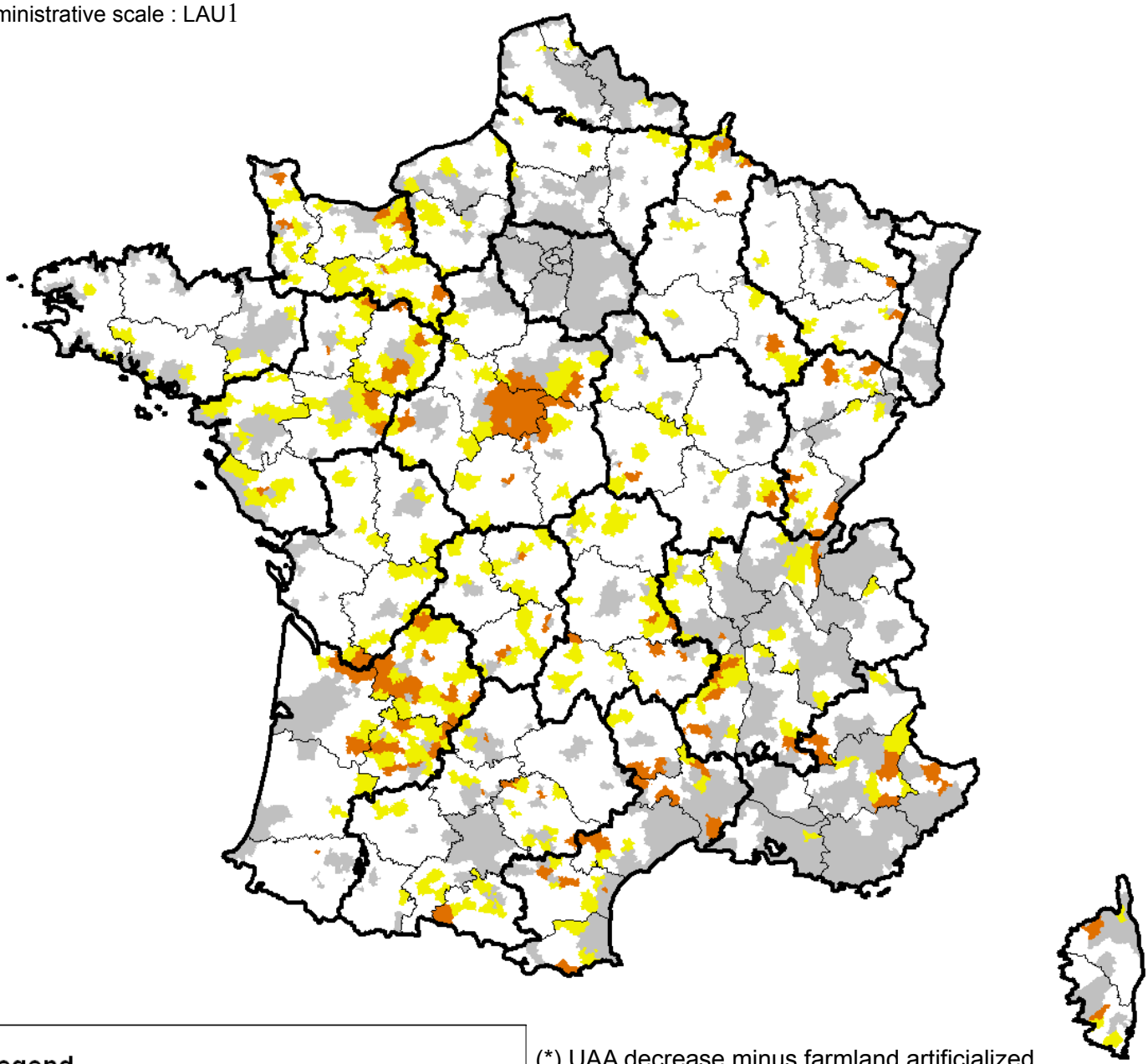
Urban areas : administrative units with a population density over 150 inh./km2 or a population increase over 10% between 1990 and 1999 (sources: Population censuses 1990 & 1999).

Sources: FSS censuses 1988 & 2000, INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

Map 13: Farmland abandonment level* by LAU1 in rural areas in France (1988-2000)

Administrative scale : LAU1



(C) IGN GeoFLA for administrative boundaries.

Legend

Farmland abandonment level

- Very high (>500 ha/year or >7.5%/year)
- High (>300 ha/year or >1.2%/year)
- Medium (>100 ha/year or >0.6%/year)
- Low or none (<100 ha/year and <0.6%/year)
- Urban areas

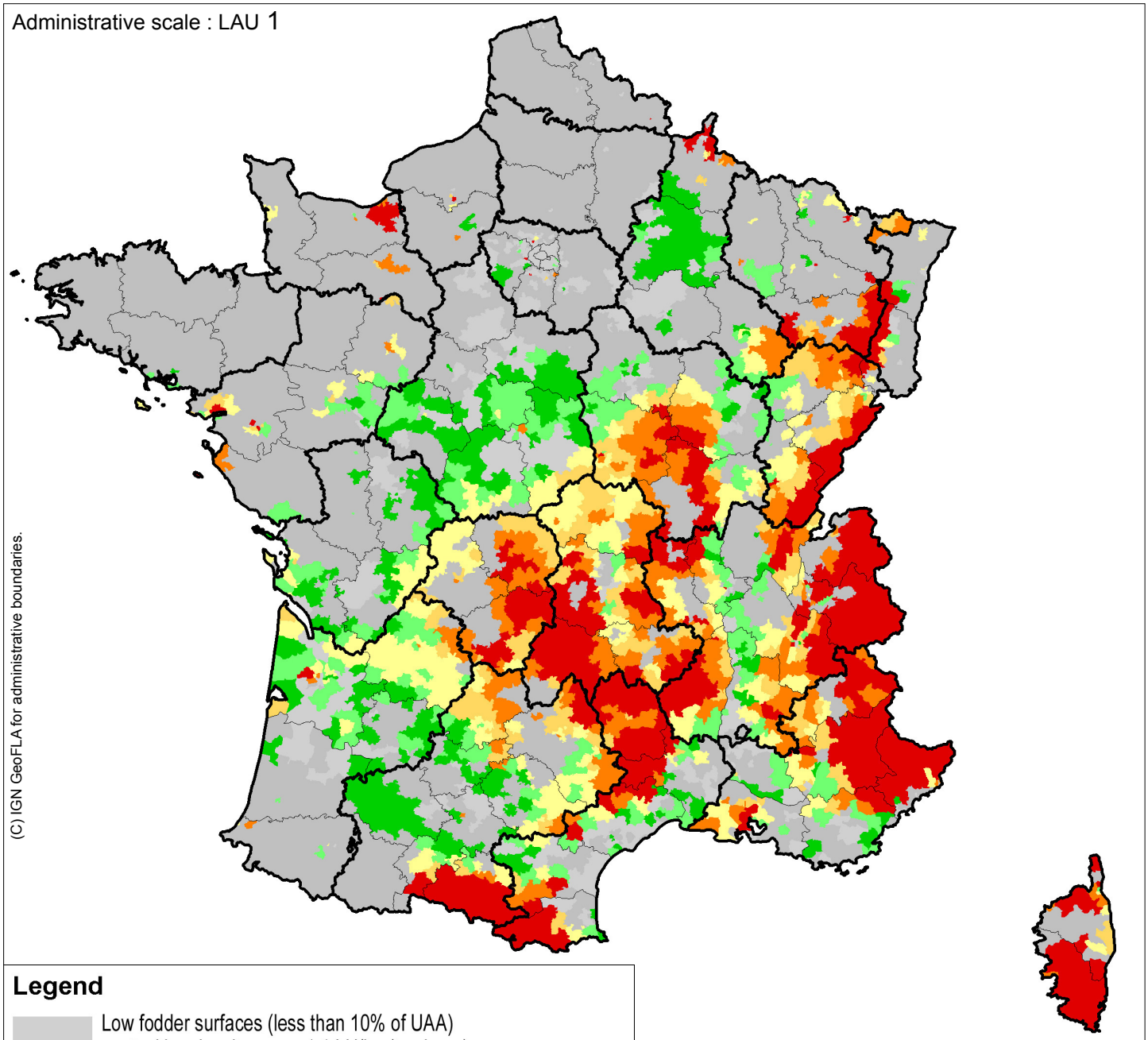
(*) UAA decrease minus farmland artificialized.

Urban areas : administrative units with a population density over 150 inh./km2 or a population increase over 10% between 1990 and 1999 (sources: Population censuses 1990 & 1999).

Sources: FSS censuses 1988 & 2000, INSEE (Population censuses 1990 & 1999).

Map produced by SOLAGRO, May 2007.

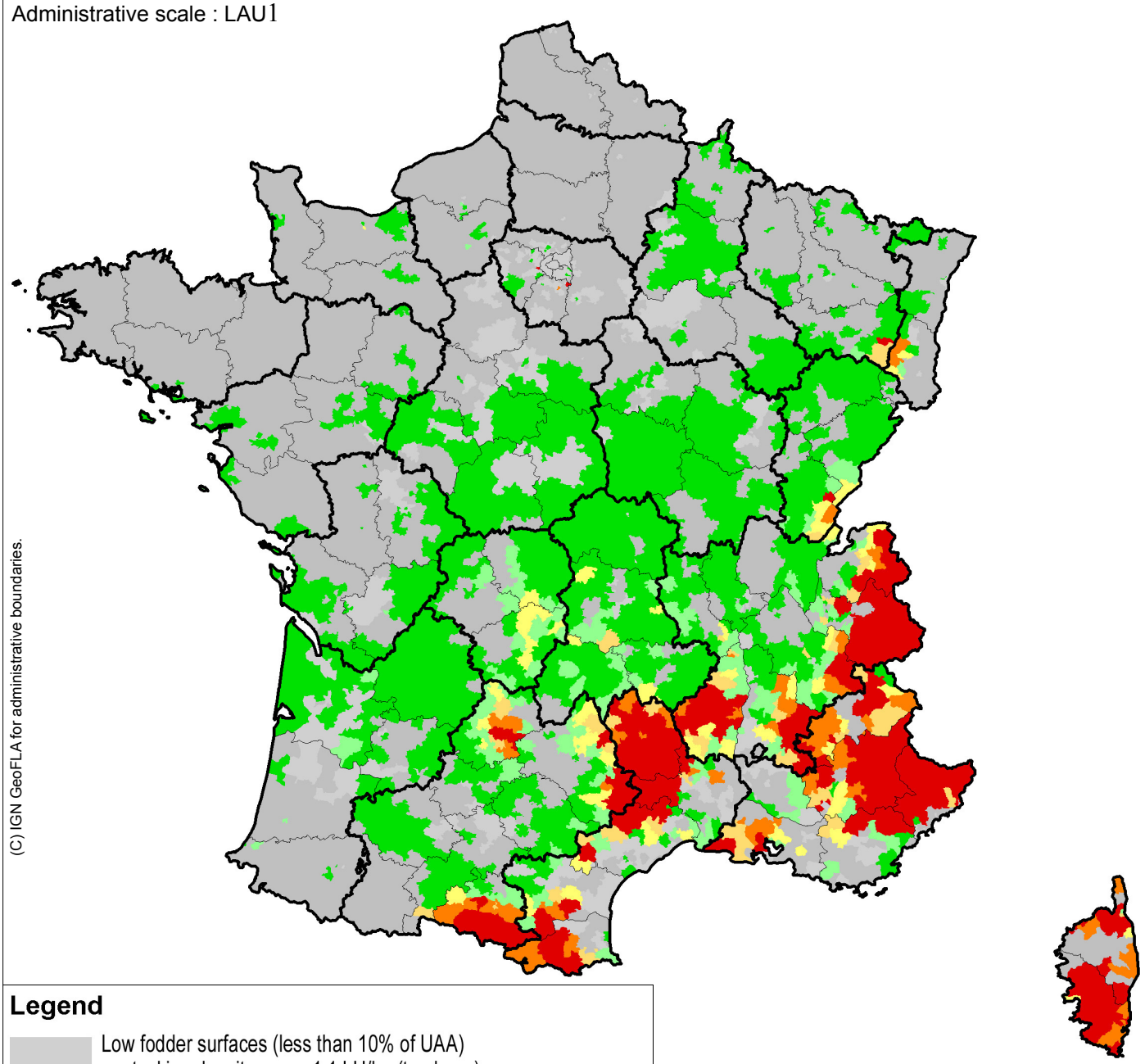
Map 14: Part of permanent grasslands in the UAA in France in 2000



Source: FSS census 2000.

Map produced by SOLAGRO, May 2007.

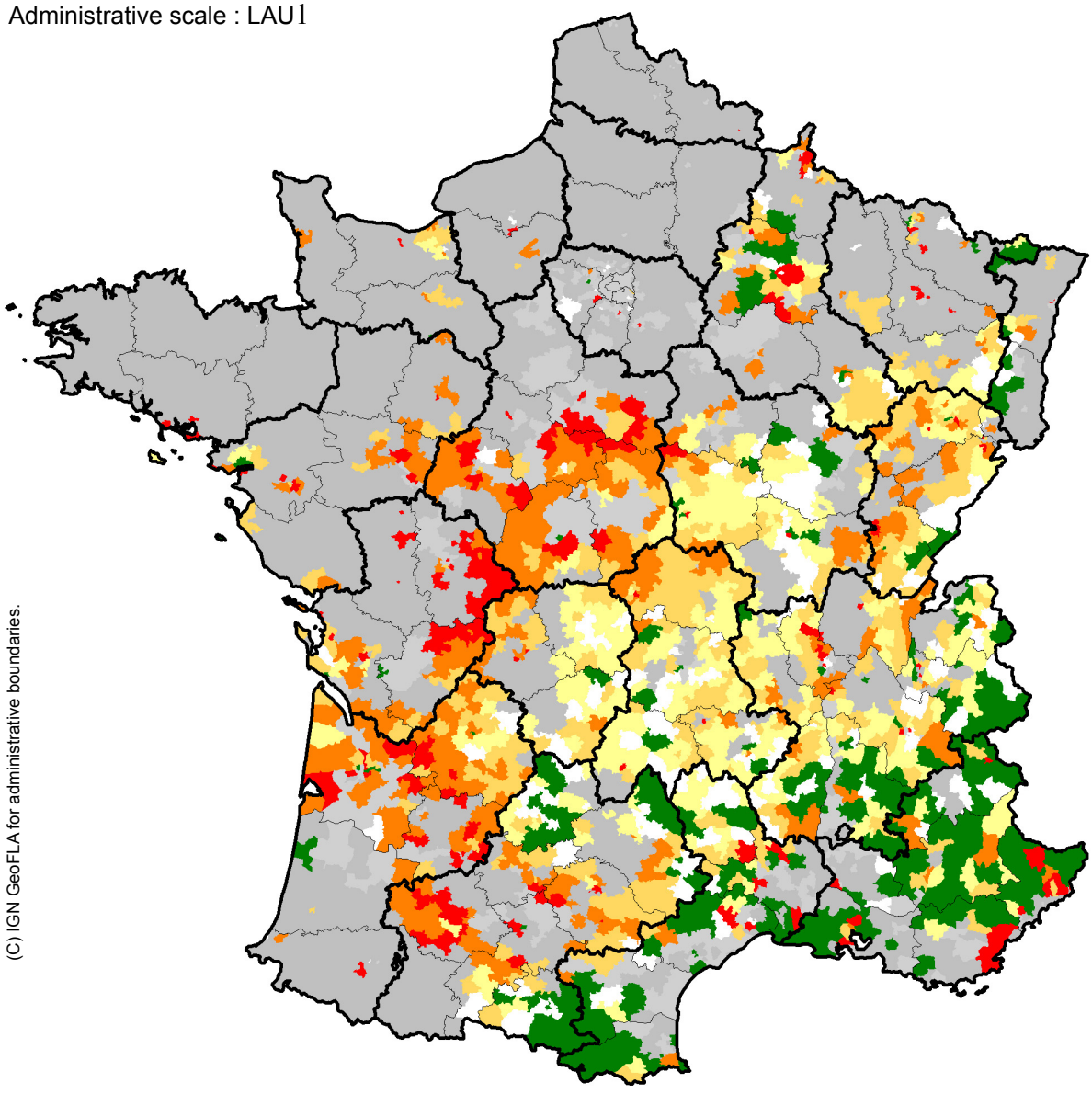
Map 15: Part of low productive permanent grasslands in the UAA in France in 2000



Source: FSS census 2000.

Map produced by SOLAGRO, May 2007.

Map 16: Evolution of permanent grasslands in France between 1988 and 2000



Legend

Low fodder surfaces (less than 10% of UAA) or stocking density upper 1.1 LU/ha (top layer)

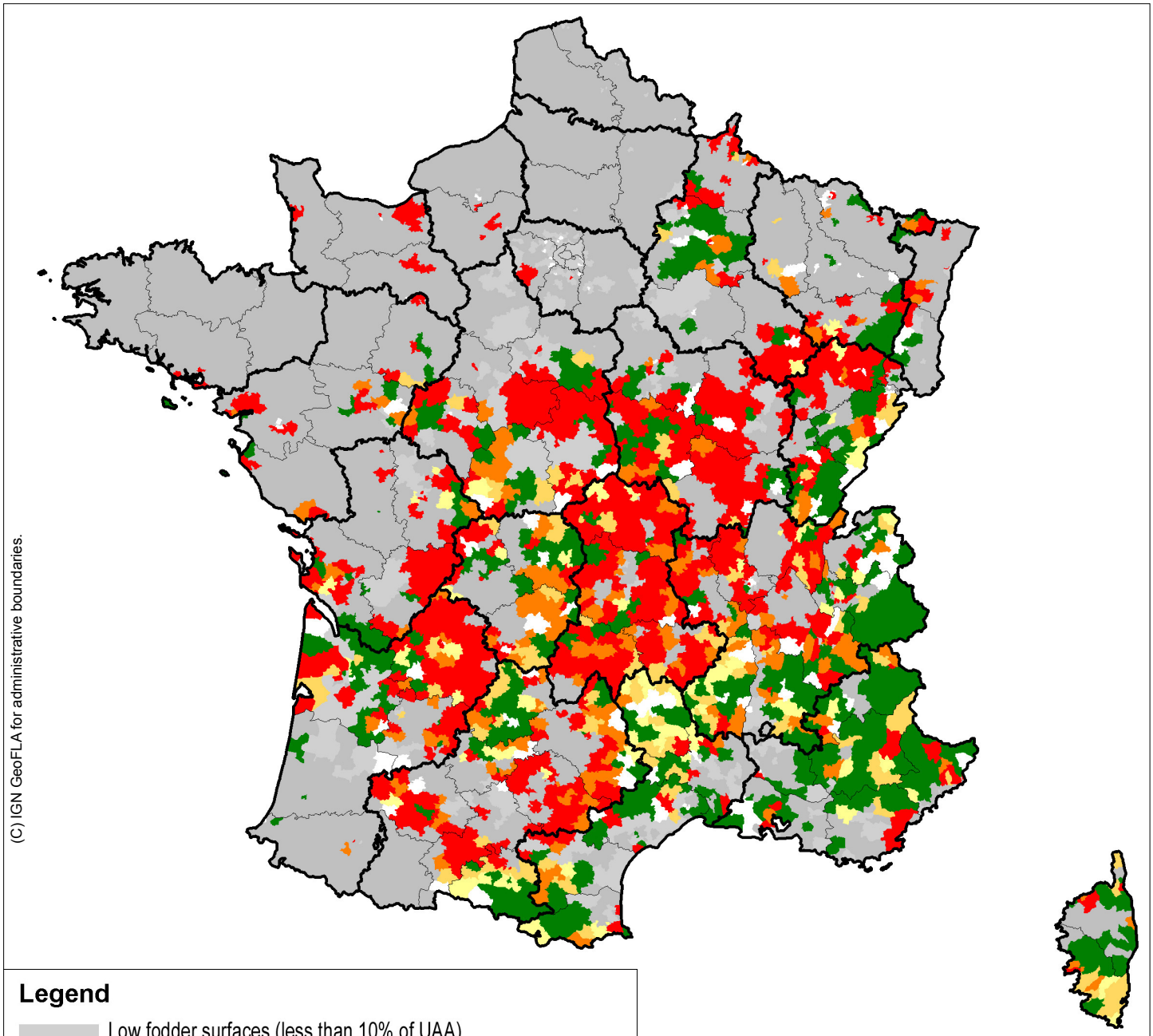
Evolution of permanent grasslands (in %)

- > + 5%
- - 5% to + 5%
- - 15% to - 5%
- - 30% to - 15%
- - 50% to - 30%
- < - 50%

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, May 2007.

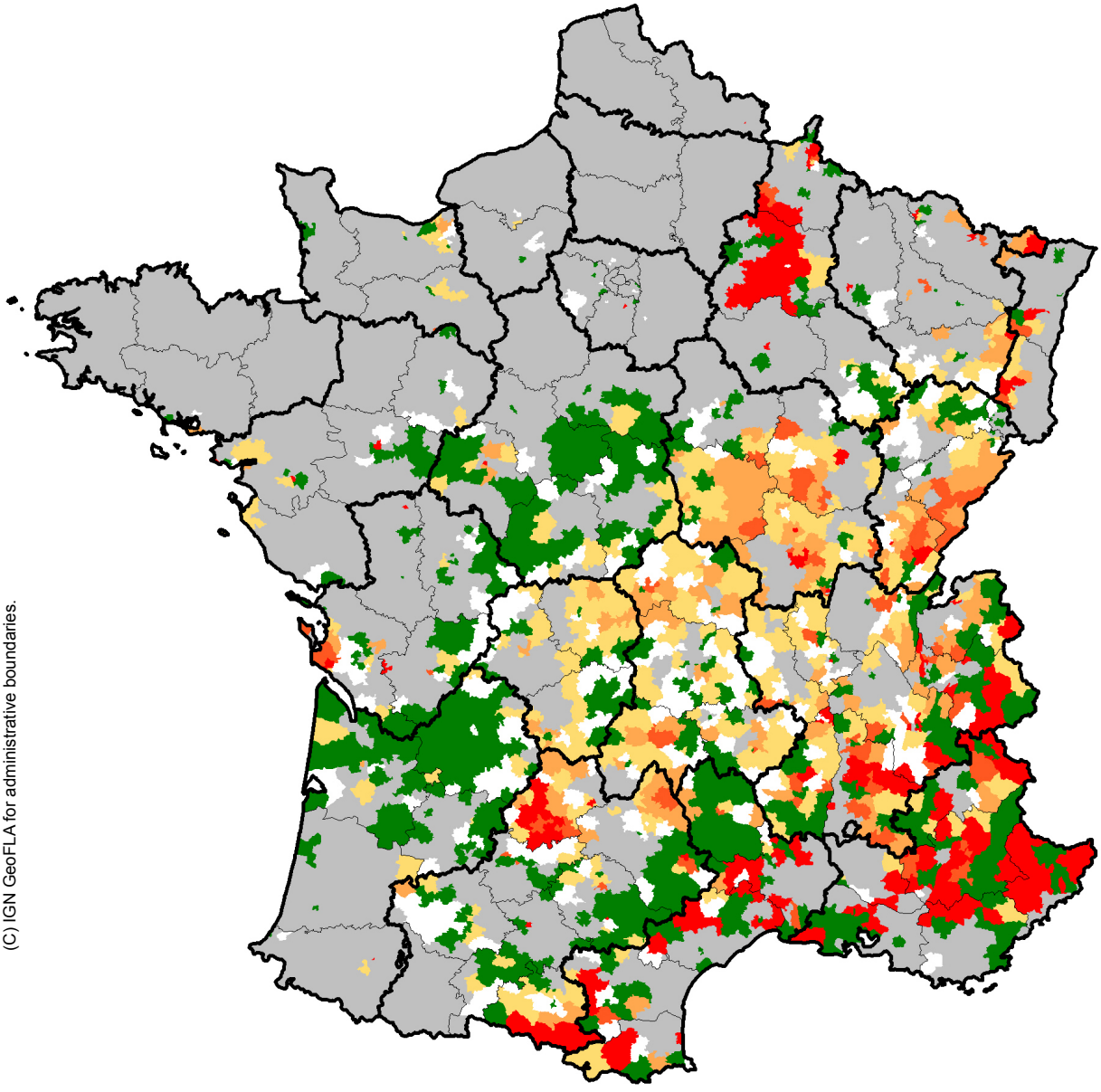
Map 17: Evolution of low productive permanent grasslands in France (1988-2000)



Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, May 2007.

Map 18: Evolution of livestock density by LAU1 in France (1988-2000)



(C) IGN GeoFLA for administrative boundaries.

Legend

Low fodder surfaces (less than 10% of UAA) or stocking density upper 1.1 LU/ha (top layer)

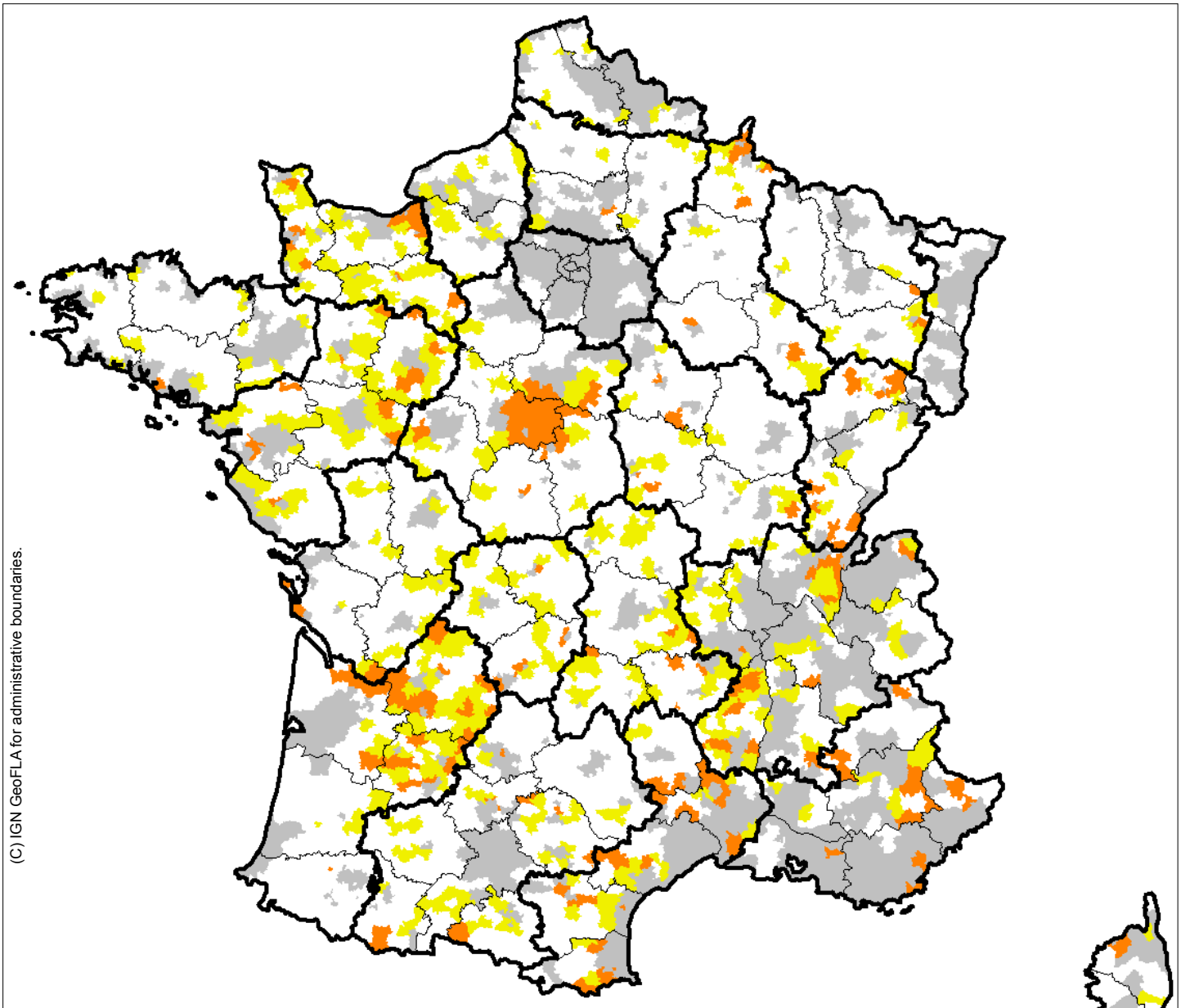
Evolution of the Livestock density (in %)

- > +3%
- -3% to +3%
- -10% to -3%
- -15% to -10%
- -20% to -15%
- < -20%

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, May 2007.

Map 19: UAA decrease level* by LAU1 in rural areas in France (1988-2000)



Urban areas : administrative units with a population density over 150 inh./km2 or a population increase over 10% between 1990 and 1999 (sources : Population censuses 1990 & 1999).

Legend

UAA decrease level

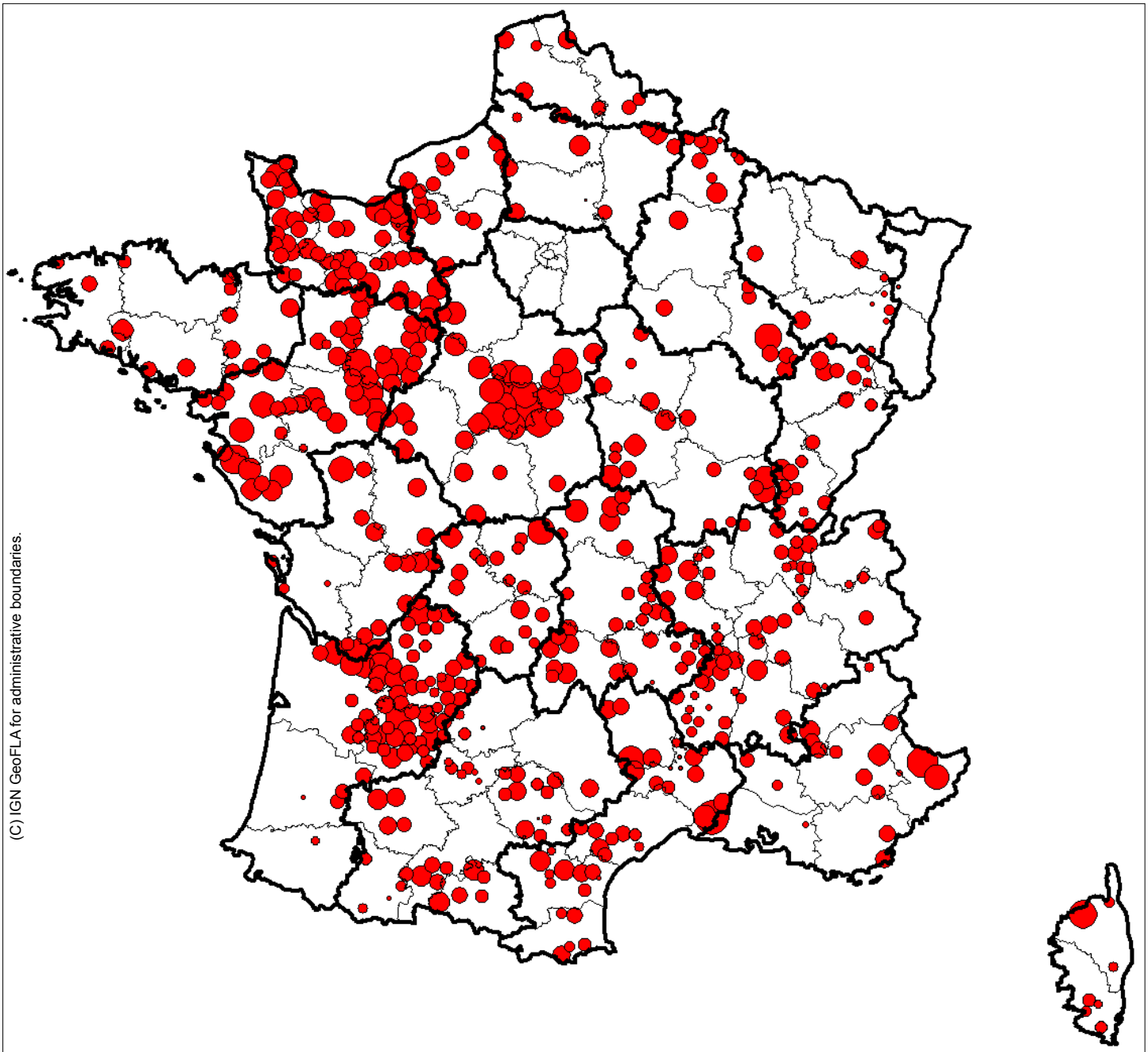
- Very high (>500 ha/year or >7.5%/year)
- High (>300 ha/year or >1.2%/year)
- Medium (>100 ha/year or >0.6%/year)
- Low or none (<100 ha/year and <0.6%/year)
- Urban areas

(*) UAA decrease only.

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, September 2007.

Map 20: UAA loss in rural areas with farmland abandonment(1) by LAU1 in France (1988-2000)



(C) IGN GeoFLA for administrative boundaries.

Legend
UAA loss (in Ha)

- 3 000
- 1 500
- 300

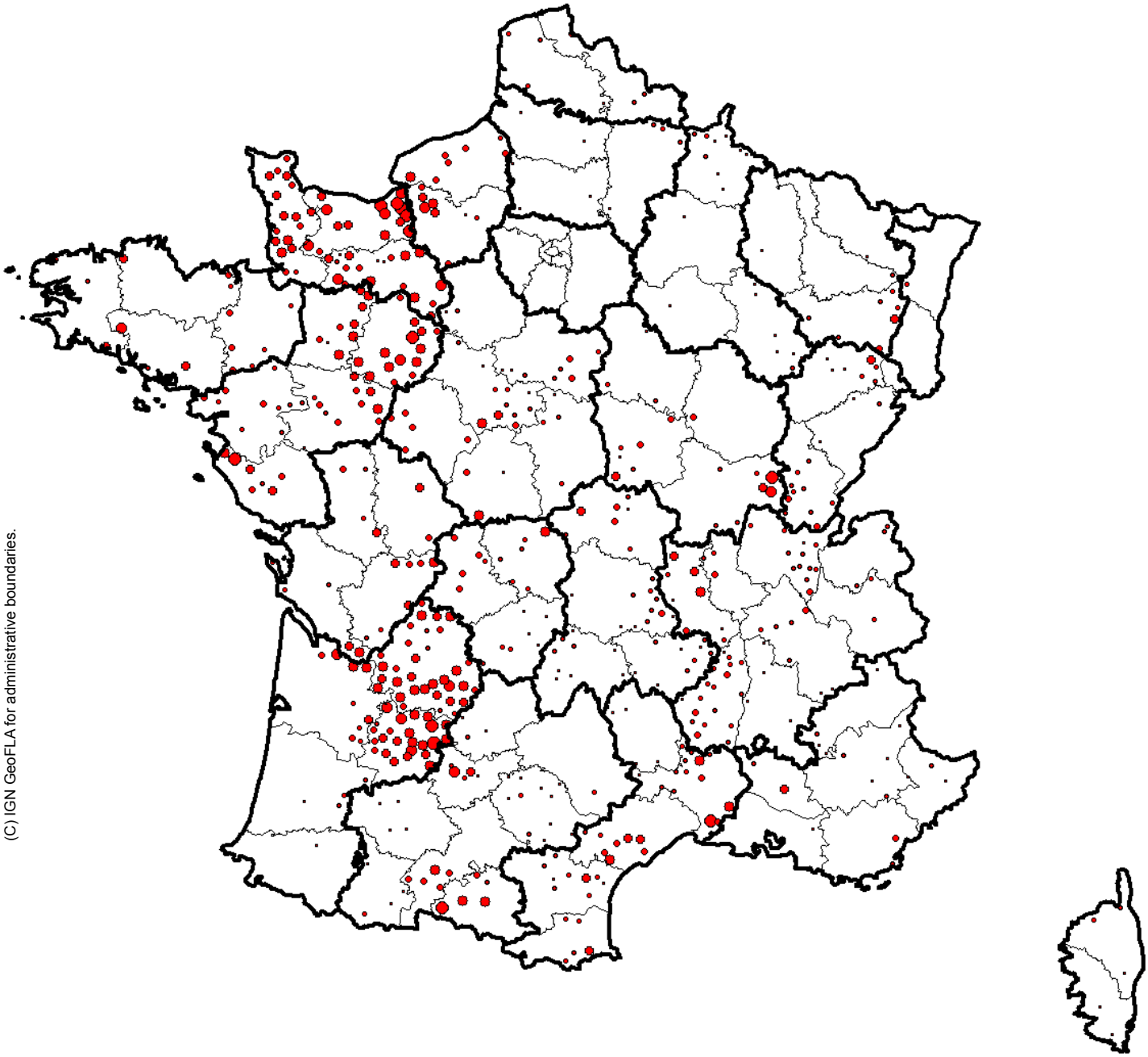
(1) LAU1 with an UAA decrease over 100 ha/year or 0.6%/year.

(2) Urban areas : administrative units with a population density over 150 inh./km2 or a population increase over 10% between 1990 and 1999 (sources : Population censuses 1990 &1999).

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, September 2007.

Map 21: Farmlands sold to non-farmers in rural areas with farmland abandonment(1) by LAU1 in France (1988-2000)



(C) IGN GeoFLA for administrative boundaries.

Legend

Farmland sold to non-farmers (in Ha)

- 3 000
- 1 500
- 300

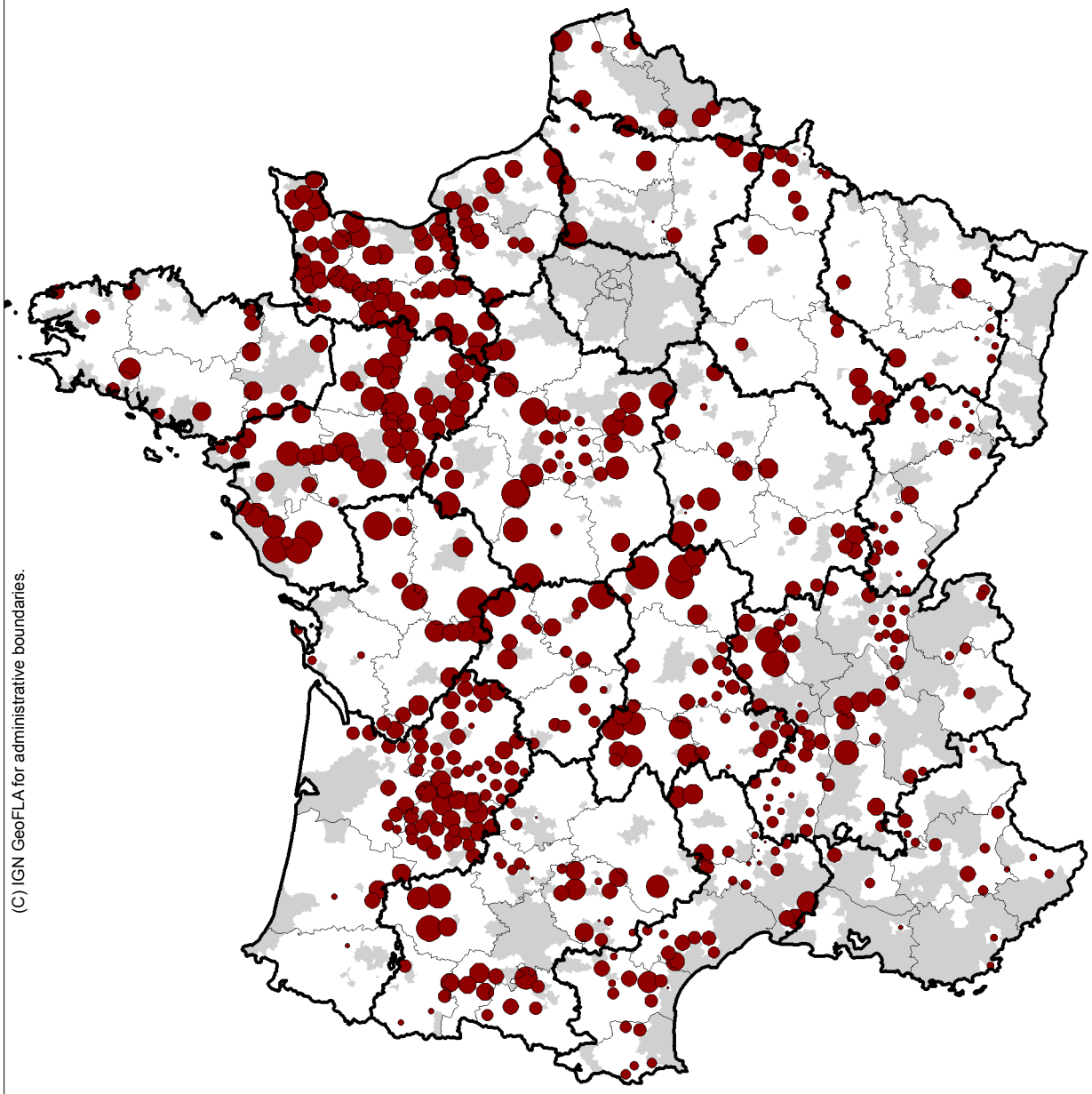
(1) LAU1 with a UAA decrease over 100 ha/year or 0.6%/year.

Urban areas : administrative units with a population density over 150 inh./km2 or a population increase over 10% between 1990 and 1999 (sources : Population censuses 1990 & 1999).

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, September 2007.

Map 22: UAA 2000 in rural areas with farmland abandonment(1) by LAU1 in France



(C) IGN GeoFLA for administrative boundaries.

Legend

UAA 2000 (in Ha)

30 000

15 000

3 000

Urban areas²

(1) LAU1 with a UAA decrease over 100 ha/year or 0.6%/year.

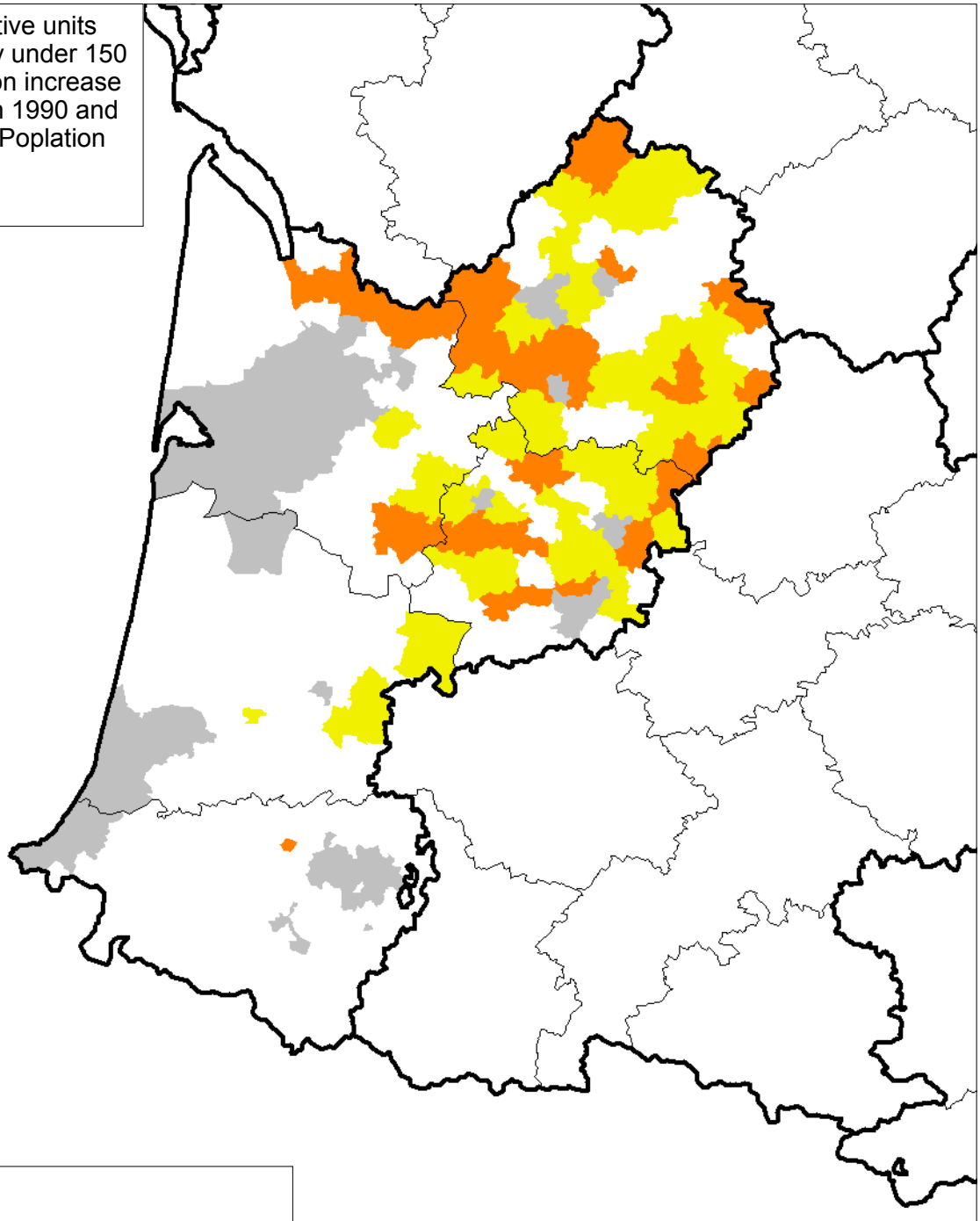
(2) Urban areas : administrative units with a population density over 150 inh./km2 or a population increase over 10% between 1990 and 1999 (sources : Population censuses 1990 & 1999).

Source: FSS census 2000.

Map produced by SOLAGRO, September 2007.

Map 23: UAA decrease level by LAU1 in rural area in Aquitaine (1988-2000)

Rural areas : administrative units with a population density under 150 inh./km2 and a population increase lower than 10% between 1990 and 1999 (sources : INSEE, Poplation censuses 1990 & 1999).



(C) IGN GeoFLA for administrative boundaries.

Legend

UAA decrease level

- Very high (>500 ha/year or >7.5%/year)
- High (>300 ha/year or >1.2%/year)
- Medium (>100 ha/year or >0.6%/year)
- Low or none (<100 ha/year and <0.6%/year)
- Urban areas

Sources: FSS censuses 1988 & 2000.

Map produced by SOLAGRO, September 2007.

Table 1: UAA 1988 related to population density and population evolution by LAU1 in France

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	78 897	154 044	295 151	239 752	132 236	238 212	**1 138 292**	4%
12.5% to 15%	50 192	165 520	306 975	120 463	63 832	90 462	**797 444**	3%
10% to 12.5 %	110 050	416 861	495 206	178 234	66 939	126 333	**1 393 623**	5%
7.5% to 10%	86 617	677 631	876 145	237 945	123 498	179 433	**2 181 269**	8%
5.0% to 7.5%	229 770	1 207 227	912 422	277 363	77 882	132 650	**2 837 314**	10%
2.5% to 5.0%	398 816	1 604 529	1 219 975	335 466	92 590	180 707	**3 832 083**	13%
0% to 2.5%	610 911	2 186 233	1 178 614	233 874	112 985	223 997	**4 546 615**	16%
-2.5 to 0%	786 977	2 287 517	1 124 773	181 272	90 709	207 898	**4 679 146**	16%
-5.0% to 2.5%	1 192 097	2 018 920	505 844	85 468	36 109	102 662	**3 941 101**	14%
-7.5% to -5.0%	799 559	769 822	132 714	19 963	6 435	23 575	**1 752 068**	6%
-10% to -7.5%	609 909	327 510	20 656	7 421	3 188	18 556	**987 239**	3%
-12.5% to -10%	275 615	58 480	41 568	2 225	0	3 144	**381 032**	1%
-15% to -12.5%	59 132	21 290	0	628	0	621	**81 671**	0%
Less than -15%	39 653	7 233	0	0	0	15	**46 901**	0%
UAA with population increase	1 565 254	6 412 046	5 284 488	1 623 097	669 962	1 171 794	**16 726 641**	58%
UAA with population loss	3 762 942	5 490 772	1 825 554	296 976	136 442	356 471	**11 869 158**	42%
TOTAL UAA 1988	5 328 196	11 902 818	7 110 042	1 920 074	806 404	1 528 265	**28 595 799**	
TOTAL in %	19%	42%	25%	7%	3%	5%	100%	
UAA 1988 in "Rural areas"	**23 649 784**							
UAA 1988 in "Urban areas"	**4 946 014**							

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS census 1988.
Made by Solagro, September 2007.

Table 2: UAA 2000 related to population density and population evolution by LAU1 in France

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	100 703	160 161	280 306	221 618	118 825	209 574	**1 091 188**	4%
12.5% to 15%	58 075	159 032	294 826	116 455	59 694	81 608	**769 690**	3%
10% to 12.5 %	116 507	417 640	475 619	173 318	68 162	114 064	**1 365 311**	5%
7.5% to 10%	93 384	663 390	838 555	226 945	114 799	157 463	**2 094 536**	7%
5.0% to 7.5%	240 809	1 174 262	882 273	266 501	71 364	124 342	**2 759 551**	10%
2.5% to 5.0%	400 113	1 550 032	1 169 475	321 424	90 083	162 937	**3 694 063**	13%
0% to 2.5%	606 770	2 130 009	1 138 573	228 198	107 812	205 601	**4 416 964**	15%
-2.5 to 0%	785 320	2 241 978	1 103 286	174 097	90 179	188 928	**4 583 788**	16%
-5.0% to 2.5%	1 197 295	1 966 583	495 705	85 431	33 943	92 575	**3 871 531**	14%
-7.5% to -5.0%	785 392	761 508	128 660	19 158	6 093	20 602	**1 721 411**	6%
-10% to -7.5%	605 575	326 374	18 844	7 179	2 715	16 309	**976 996**	3%
-12.5% to -10%	277 908	57 571	42 145	2 147	0	2 486	**382 258**	1%
-15% to -12.5%	59 409	22 253	0	533	0	456	**82 651**	0%
Less than -15%	40 314	6 060	0	0	0	0	**46 374**	0%
UAA with population increase	1 616 361	6 254 525	5 079 627	1 554 460	630 740	1 055 590	**16 191 303**	57%
UAA with population loss	3 751 214	5 382 326	1 788 640	288 545	132 930	321 355	**11 665 010**	41%
TOTAL UAA 2000	5 367 574	11 636 851	6 868 267	1 843 005	763 670	1 376 945	**27 856 313**	
TOTAL in %	19%	41%	24%	6%	3%	5%	97%	
UAA 2000 in "Rural areas"	**23 141 438**							
UAA 2000 in "Urban areas"	**4 714 875**							

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS census 2000.
Made by Solagro, September 2007.

Table 3: UAA loss related to population density and population evolution by LAU1 in France (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total loss	% loss	Evolution 1988-2000
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	-3 040	-7 136	-21 353	-23 360	-14 665	-32 946	**-102 499**	8%	**-9%**
12.5% to 15%	-505	-9 098	-15 895	-5 842	-4 387	-10 690	**-46 418**	4%	**-6%**
10% to 12.5 %	-6 216	-12 479	-24 652	-7 698	-4 332	-13 089	**-68 465**	5%	**-5%**
7.5% to 10%	-2 993	-26 007	-45 316	-13 301	-9 062	-23 505	**-120 184**	9%	**-6%**
5.0% to 7.5%	-11 661	-48 875	-41 396	-15 538	-6 844	-13 821	**-138 134**	11%	**-5%**
2.5% to 5.0%	-19 786	-72 297	-59 219	-16 784	-3 095	-21 089	**-192 269**	15%	**-5%**
0% to 2.5%	-21 637	-82 331	-50 005	-9 483	-6 588	-23 786	**-193 830**	15%	**-4%**
-2.5 to 0%	-24 448	-74 289	-38 852	-9 971	-2 832	-23 938	**-174 330**	14%	**-4%**
-5.0% to 2.5%	-28 633	-72 460	-14 361	-1 767	-2 516	-12 502	**-132 238**	10%	**-3%**
-7.5% to -5.0%	-29 752	-22 419	-6 790	-806	-343	-3 766	**-63 876**	5%	**-4%**
-10% to -7.5%	-19 117	-7 363	-2 214	-296	-510	-2 653	**-32 155**	3%	**-3%**
-12.5% to -10%	-4 819	-1 591	-238	-78	0	-658	**-7 384**	1%	**-2%**
-15% to -12.5%	-1 200	0	0	-95	0	-164	**-1 459**	0%	**-2%**
Less than -15%	-358	-1 173	0	0	0	-15	**-1 546**	0%	**-3%**
UAA loss with population increase	-65 838	-258 223	-257 835	-92 006	-48 973	-138 927	**-861 801**	68%	**-5%**
UAA loss with population loss	-108 328	-179 294	-62 455	-13 013	-6 201	-43 697	**-412 988**	32%	**-3%**
TOTAL UAA loss	-174 166	-437 517	-320 290	-105 018	-55 174	-182 624	**-1 274 789**		
TOTAL in %	14%	34%	25%	8%	4%	14%	100%		
% of UAA loss	**-3%**	**-4%**	**-5%**	**-5%**	**-7%**	**-12%**	**-4%**		
UAA loss in "Rural areas"	**-899 718**							71%	
UAA loss in "Urban areas"	**-375 071**							29%	

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 4: UAA increase related to population density and population evolution by LAU1 in France (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total increase	% increase	Evolution 1988-2000
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	24 846	13 252	6 508	5 226	1 254	4 309	**55 395**	10%	**5%**
12.5% to 15%	8 388	2 610	3 746	1 834	250	1 836	**18 664**	3%	**2%**
10% to 12.5 %	12 673	13 258	5 065	2 782	5 555	820	**40 153**	8%	**3%**
7.5% to 10%	9 760	11 766	7 725	2 301	363	1 535	**33 451**	6%	**2%**
5.0% to 7.5%	22 700	15 909	11 246	4 676	326	5 513	**60 371**	11%	**2%**
2.5% to 5.0%	21 082	17 800	8 719	2 742	588	3 319	**54 250**	10%	**1%**
0% to 2.5%	17 496	26 106	9 965	3 807	1 416	5 390	**64 180**	12%	**1%**
-2.5 to 0%	22 791	28 749	17 365	2 797	2 302	4 968	**78 972**	15%	**2%**
-5.0% to 2.5%	33 831	20 123	4 222	1 730	349	2 414	**62 669**	12%	**2%**
-7.5% to -5.0%	15 585	14 106	2 736	0	0	793	**33 219**	6%	**2%**
-10% to -7.5%	14 784	6 228	403	55	37	406	**21 912**	4%	**2%**
-12.5% to -10%	7 113	681	816	0	0	0	**8 610**	2%	**2%**
-15% to -12.5%	1 477	962	0	0	0	0	**2 439**	0%	**3%**
Less than -15%	1 019	0	0	0	0	0	**1 019**	0%	**2%**
UAA win with population increase	116 945	100 702	52 974	23 368	9 751	22 723	**326 463**	61%	**2%**
UAA win with population loss	96 599	70 849	25 541	4 582	2 688	8 581	**208 840**	39%	**2%**
TOTAL UAA win	213 545	171 551	78 515	27 950	12 440	31 303	**535 303**		
TOTAL in %	40%	32%	15%	5%	2%	6%	100%		
% of UAA win	**4%**	**1%**	**1%**	**1%**	**2%**	**2%**	**2%**		
UAA increase in "Rural areas"	**391 372**							73%	
UAA increase in "Urban areas"	**143 931**							27%	

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 5: UAA balance related to population density and population evolution by LAU1 in France (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total balance (in ha)	% balance	Evolution 1988-2000
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	21 806	6 116	-14 845	-18 133	-13 411	-28 637	**-47 104**	6%	**-4%**
12.5% to 15%	7 883	-6 488	-12 149	-4 008	-4 138	-8 854	**-27 754**	4%	**-3%**
10% to 12.5 %	6 457	779	-19 587	-4 916	1 223	-12 269	**-28 312**	4%	**-2%**
7.5% to 10%	6 767	-14 241	-37 591	-11 000	-8 699	-21 970	**-86 733**	12%	**-4%**
5.0% to 7.5%	11 039	-32 965	-30 150	-10 862	-6 518	-8 307	**-77 764**	11%	**-3%**
2.5% to 5.0%	1 296	-54 497	-50 500	-14 042	-2 507	-17 770	**-138 020**	19%	**-4%**
0% to 2.5%	-4 141	-56 224	-40 040	-5 676	-5 173	-18 396	**-129 650**	18%	**-3%**
-2.5 to 0%	-1 657	-45 540	-21 487	-7 175	-530	-18 971	**-95 359**	13%	**-2%**
-5.0% to 2.5%	5 197	-52 337	-10 139	-37	-2 166	-10 088	**-69 569**	9%	**-2%**
-7.5% to -5.0%	-14 167	-8 314	-4 054	-806	-343	-2 973	**-30 657**	4%	**-2%**
-10% to -7.5%	-4 334	-1 135	-1 812	-242	-473	-2 247	**-10 242**	1%	**-1%**
-12.5% to -10%	2 294	-910	578	-78	0	-658	**1 226**	0%	**0%**
-15% to -12.5%	277	962	0	-95	0	-164	**980**	0%	**1%**
Less than -15%	661	-1 173	0	0	0	-15	**-527**	0%	**-1%**
UAA balance with population increase	51 107	-157 521	-204 861	-68 637	-39 222	-116 204	**-535 338**	72%	**-3%**
UAA balance with population decrease	-11 728	-108 446	-36 914	-8 431	-3 512	-35 116	**-204 148**	28%	**-2%**
TOTAL UAA balance	39 379	-265 966	-241 775	-77 068	-42 734	-151 320	**-739 486**		
TOTAL in %	-5%	36%	33%	10%	6%	20%	100%		
Evolution during the period	**1%**	**-2%**	**-3%**	**-4%**	**-5%**	**-10%**	**-3%**		
UAA balance in "Rural areas"	**-508 346**								
UAA balance in "Urban areas"	**-231 139**								

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 6: UAA balance related to population density and population evolution by LAU1 in France (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%	28%	4%	-5%	-8%	-10%	-12%	**-4%**
12.5% to 15%	16%	-4%	-4%	-3%	-6%	-10%	**-3%**
10% to 12.5 %	6%	0%	-4%	-3%	2%	-10%	**-2%**
7.5% to 10%	8%	-2%	-4%	-5%	-7%	-12%	**-4%**
5.0% to 7.5%	5%	-3%	-3%	-4%	-8%	-6%	**-3%**
2.5% to 5.0%	0%	-3%	-4%	-4%	-3%	-10%	**-4%**
0% to 2.5%	-1%	-3%	-3%	-2%	-5%	-8%	**-3%**
-2.5 to 0%	0%	-2%	-2%	-4%	-1%	-9%	**-2%**
-5.0% to 2.5%	0%	-3%	-2%	0%	-6%	-10%	**-2%**
-7.5% to -5.0%	-2%	-1%	-3%	-4%	-5%	-13%	**-2%**
-10% to -7.5%	-1%	0%	-9%	-3%	-15%	-12%	**-1%**
-12.5% to -10%	1%	-2%	1%	-3%	-	-21%	**0%**
-15% to -12.5%	0%	5%	-	-15%	-	-26%	**1%**
Less than -15%	2%	-16%	-	-	-	-98%	**-1%**
UAA balance with population increase	3%	-2%	-4%	-4%	-6%	-10%	**-3%**
UAA balance with population decrease	0%	-2%	-2%	-3%	-3%	-10%	**-2%**
TOTAL UAA balance in % of UAA 1988	1%	-2%	-3%	-4%	-5%	-10%	**-3%**
UAA balance in "Rural areas"	**-2,1%**						
UAA balance in "Urban areas"	**-4,7%**						

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 7: UAA decrease by LAU1 related to urban or rural areas in France (1988-2000)

UAA loss level (1988-2000)	Threshold	**Rural areas**	**Urban areas**	**Total (in ha)**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	-9 609	**-9 609**	0,8%
High	UAA loss over 300 ha/year or over 1.2%/year	-199 333	-192 165	**-391 498**	30,7%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-358 760	-112 088	**-470 848**	36,9%
Low	UAA loss under 100 ha/year and under 0.6%/year	-341 625	-61 208	**-402 834**	31,6%
TOTAL in ha		**-899 718**	**-375 071**	**-1 274 789**	100%
TOTAL in %		70,6%	29,4%	100,0%	

Urban areas: LAU1 over 150 inhabitants per km^2 or population increase over 10% between 1990 and 1999

Rural areas: LAU1 under 150 inhabitants per km^2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 8: UAA 2000 by LAU1 related to urban or rural areas in France

UAA loss level (1988-2000)	Threshold	**UAA2000 in Rural areas**	**UAA2000 in Urban areas**	**Total in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	282	**282**	0,0%
High	UAA loss over 300 ha/year or over 1.2%/year	754 395	548 767	**1 303 161**	7,2%
Medium	UAA loss over 100 ha/year or over 0.6%/year	3 461 465	996 516	**4 457 981**	24,5%
Low	UAA loss under 100 ha/year and under 0.6%/year	10 845 929	1 570 442	**12 416 372**	68,3%
TOTAL in ha		**15 061 789**	**3 116 007**	**18 177 795**	**100%**
TOTAL in %		87,4%	12,6%		100%
TOTAL of UAA 2000		54,1%	11,2%		65,3%

Urban areas: LAU1 over 150 inhabitants per km^2 or population increase over 10% between 1990 and 1999

Rural areas: LAU1 under 150 inhabitants per km^2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 9: Farmland abandonment by LAU1 in France (1988-2000)

UAA loss level (1988-2000)	Threshold	Farmland abandonment	% of UAA1988	UAA 2000	% of UAA 2000
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	0,0%	0	0,0%
High	UAA loss over 300 ha/year or over 1.2%/year	199 333	0,7%	754 395	2,7%
Medium	UAA loss over 100 ha/year or over 0.6%/year	358 760	1,3%	3 461 465	12,4%
TOTAL in ha		**558 093**	**2,0%**	**4 215 859**	**15,1%**

Urban areas: LAU1 over 150 inhabitants per km^2 or population increase over 10% between 1990 and 1999

Rural areas: LAU1 under 150 inhabitants per km^2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 10: Sealed UAA by LAU1 related to urban or rural areas in France (1988-2000)

UAA decrease level (1988-2000)	Threshold	Sealed UAA (in 12 years)			
		in rural areas	in urban areas	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	17 369	**17 369**	2,6%
High	UAA loss over 300 ha/year or over 1.2%/year	24 577	153 429	**178 006**	26,2%
Medium	UAA loss over 100 ha/year or over 0.6%/year	43 553	66 346	**109 899**	16,2%
Low	UAA loss under 100 ha/year and under 0.6%/year	103 337	77 455	**180 792**	26,6%
None		75 371	117 770	**193 142**	28,4%
TOTAL in ha		**246 839**	**432 370**	**679 208**	100%
TOTAL in %		36,3%	63,7%	100,0%	

Urban areas: LAU1 over 150 inhabitants per km^2 or population increase over 10% between 1990 and 1999
Rural areas: LAU1 under 150 inhabitants per km^2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute 1990 & 1999, FSS Census 1988-2000
Made by Solagro, September 2007.

Table 11: UAA 1988 related to population density and population evolution at LAU1 in Aquitaine

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	8 830	12 640	11 971	994	**34 436**	2%
12.5% to 15%	0	5 335	25 745	3 849	2 314	0	**37 244**	2%
10% to 12.5 %	5 443	4 506	10 157	0	0	9 327	**29 432**	2%
7.5% to 10%	5 402	38 902	16 119	5 012	3 943	4 125	**73 503**	5%
5.0% to 7.5%	23 957	32 630	35 380	8 954	8 502	1 568	**110 991**	7%
2.5% to 5.0%	5 920	143 409	76 469	13 899	0	3 166	**242 862**	16%
0% to 2.5%	15 434	198 451	76 445	24 737	0	12 229	**327 297**	21%
-2.5 to 0%	49 912	176 197	61 393	22 754	2 145	9 324	**321 725**	21%
-5.0% to 2.5%	46 099	159 001	16 903	0	1 645	3 431	**227 077**	15%
-7.5% to -5.0%	25 268	81 244	8 707	0	0	0	**115 219**	7%
-10% to -7.5%	17 599	0	4 622	0	0	0	**22 221**	1%
-12.5% to -10%	0	0	0	0	0	0	**0**	0%
-15% to -12.5%	0	0	0	0	0	0	**0**	0%
Less than -15%	0	0	0	0	0	0	**0**	0%
UAA with population increase	56 156	423 233	249 146	69 091	26 730	31 408	**855 764**	55%
UAA with population loss	138 877	416 442	91 625	22 754	3 789	12 755	**686 242**	45%
TOTAL UAA 1988	195 033	839 675	340 771	91 845	30 519	44 163	**1 542 006**	
TOTAL in %	13%	54%	22%	6%	2%	3%	100%	
UAA 1988 in "Rural areas"	**1 390 818**							
UAA 1988 in "Urban areas"	**151 188**							

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS census 1988.
Made by Solagro, September 2007.

Table 12: UAA 2000 related to population density and population evolution at LAU1 in Aquitaine

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	8 517	13 044	11 505	761	**33 827**	2%
12.5% to 15%	0	3 602	25 642	3 819	1 742	0	**34 807**	2%
10% to 12.5 %	5 907	3 381	9 627	0	0	8 678	**27 592**	2%
7.5% to 10%	6 314	40 147	15 626	4 826	3 254	3 458	**73 624**	5%
5.0% to 7.5%	24 144	28 356	31 519	7 662	7 203	1 420	**100 303**	7%
2.5% to 5.0%	7 166	134 424	71 673	11 621	0	3 578	**228 461**	15%
0% to 2.5%	15 345	188 765	72 093	24 082	0	12 464	**312 749**	20%
-2.5 to 0%	53 610	168 670	58 026	20 020	2 446	7 158	**309 931**	20%
-5.0% to 2.5%	47 183	144 941	16 070	0	1 227	2 657	**212 078**	14%
-7.5% to -5.0%	26 836	82 620	8 675	0	0	0	**118 132**	8%
-10% to -7.5%	18 300	0	3 592	0	0	0	**21 892**	1%
-12.5% to -10%	0	0	0	0	0	0	**0**	0%
-15% to -12.5%	0	0	0	0	0	0	**0**	0%
Less than -15%	0	0	0	0	0	0	**0**	0%
UAA with population increase	58 877	398 674	234 698	65 054	23 704	30 358	**811 364**	53%
UAA with population loss	145 929	396 232	86 363	20 020	3 673	9 816	**662 032**	43%
TOTAL UAA 2000	204 806	794 906	321 060	85 074	27 377	40 173	**1 473 396**	
TOTAL in %	13%	52%	21%	6%	2%	3%	96%	
UAA 2000 in "Rural areas"	**1 332 305**							
UAA 2000 in "Urban areas"	**141 091**							

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS census 2000.
Made by Solagro, September 2007.

Table 13: UAA loss related to population density and population evolution at LAU1 in Aquitaine (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total loss	% loss	Evolution 1988-2000
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	0	-383	-281	-483	-233	**-1 380**	1%	**-4%**
12.5% to 15%	0	-1 733	-698	-30	-571	0	**-3 032**	3%	**-8%**
10% to 12.5 %	0	-1 125	-814	0	0	-649	**-2 588**	3%	**-9%**
7.5% to 10%	0	-585	-819	-186	-689	-745	**-3 024**	3%	**-4%**
5.0% to 7.5%	-116	-4 274	-3 861	-1 292	-1 299	-259	**-11 101**	11%	**-10%**
2.5% to 5.0%	0	-10 074	-4 796	-2 278	0	-333	**-17 480**	17%	**-7%**
0% to 2.5%	-600	-12 771	-4 352	-656	0	-1 934	**-20 314**	20%	**-6%**
-2.5 to 0%	-381	-10 478	-3 471	-2 734	0	-2 255	**-19 319**	19%	**-6%**
-5.0% to 2.5%	-1 281	-14 624	-833	0	-418	-776	**-17 932**	17%	**-8%**
-7.5% to -5.0%	-1 047	-3 615	-31	0	0	0	**-4 693**	5%	**-4%**
-10% to -7.5%	-797	0	-1 030	0	0	0	**-1 828**	2%	**-8%**
-12.5% to -10%	0	0	0	0	0	0	**0**	-	**-**
-15% to -12.5%	0	0	0	0	0	0	**0**	-	**-**
Less than -15%	0	0	0	0	0	0	**0**	-	**-**
UAA loss with population increase	-716	-30 562	-15 723	-4 722	-3 042	-4 154	**-58 920**	57%	**-7%**
UAA loss with population loss	-3 507	-28 717	-5 366	-2 734	-418	-3 031	**-43 772**	43%	**-6%**
TOTAL UAA loss	-4 223	-59 279	-21 089	-7 456	-3 460	-7 186	**-102 692**		
TOTAL in %	4%	58%	21%	7%	3%	7%	100%		
% of UAA loss during the period	**-2%**	**-7%**	**-6%**	**-8%**	**-11%**	**-16%**	**-7%**		
UAA loss in "Rural areas"	**-86 983**							85%	
UAA loss in "Urban areas"	**-15 709**							15%	

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 14: UAA increase related to population density and population evolution at LAU1 in Aquitaine (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total increase	% win	Evolution 1988-2000
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	0	70	685	16	0	**771**	2%	**2%**
12.5% to 15%	0	0	596	0	0	0	**596**	2%	**2%**
10% to 12.5 %	464	0	284	0	0	0	**748**	2%	**3%**
7.5% to 10%	913	1 829	325	0	0	79	**3 145**	9%	**4%**
5.0% to 7.5%	303	0	0	0	0	111	**413**	1%	**0%**
2.5% to 5.0%	1 246	1 088	0	0	0	745	**3 080**	9%	**1%**
0% to 2.5%	511	3 085	0	0	0	2 170	**5 766**	17%	**2%**
-2.5 to 0%	4 079	2 952	104	0	301	89	**7 525**	22%	**2%**
-5.0% to 2.5%	2 365	565	0	0	0	2	**2 932**	9%	**1%**
-7.5% to -5.0%	2 616	4 991	0	0	0	0	**7 607**	22%	**7%**
-10% to -7.5%	1 499	0	0	0	0	0	**1 499**	4%	**7%**
-12.5% to -10%	0	0	0	0	0	0	**0**	-	**-**
-15% to -12.5%	0	0	0	0	0	0	**0**	-	**-**
Less than -15%	0	0	0	0	0	0	**0**	-	**-**
UAA increase with population increase	3 437	6 002	1 275	685	16	3 104	**14 520**	43%	**2%**
UAA increase with population loss	10 559	8 507	104	0	301	92	**19 563**	57%	**3%**
TOTAL UAA win	13 996	14 509	1 379	685	317	3 196	**34 082**		
TOTAL in %	41%	43%	4%	2%	1%	9%	100%		
% of UAA increase during the period	**7%**	**2%**	**0%**	**1%**	**1%**	**7%**	**2%**		
UAA increase in "Rural areas"	**28 470**							84%	
UAA increase in "Urban areas"	**5 612**							16%	

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 15: UAA balance related to population density and population evolution at LAU1 in Aquitaine (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total balance (in ha)	% balance	Evolution 1988-2000
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	0	-313	404	-467	-233	**-609**	1%	-2%
12.5% to 15%	0	-1 733	-103	-30	-571	0	**-2 437**	4%	-7%
10% to 12.5 %	464	-1 125	-530	0	0	-649	**-1 840**	3%	-6%
7.5% to 10%	913	1 244	-494	-186	-689	-667	**122**	0%	0%
5.0% to 7.5%	187	-4 274	-3 861	-1 292	-1 299	-148	**-10 688**	16%	-10%
2.5% to 5.0%	1 246	-8 985	-4 796	-2 278	0	412	**-14 401**	21%	-6%
0% to 2.5%	-89	-9 686	-4 352	-656	0	236	**-14 548**	21%	-4%
-2.5 to 0%	3 698	-7 526	-3 367	-2 734	301	-2 166	**-11 794**	17%	-4%
-5.0% to 2.5%	1 084	-14 060	-833	0	-418	-773	**-15 000**	22%	-7%
-7.5% to -5.0%	1 569	1 376	-31	0	0	0	**2 913**	-4%	3%
-10% to -7.5%	701	0	-1 030	0	0	0	**-329**	0%	-1%
-12.5% to -10%	0	0	0	0	0	0	**0**	0%	-
-15% to -12.5%	0	0	0	0	0	0	**0**	0%	-
Less than -15%	0	0	0	0	0	0	**0**	0%	-
UAA balance with population increase	2 721	-24 560	-14 448	-4 037	-3 026	-1 050	**-44 400**	65%	-5%
UAA balance with population decrease	7 052	-20 210	-5 262	-2 734	-116	-2 939	**-24 210**	35%	-4%
TOTAL UAA balance	9 773	-44 770	-19 710	-6 771	-3 142	-3 990	**-68 610**		
TOTAL in %	-14%	65%	29%	10%	5%	6%	100%		
Evolution during the period	**5%**	**-5%**	**-6%**	**-7%**	**-10%**	**-9%**	**-4%**		
UAA balance in "Rural areas"	**-58 513**								
UAA balance in "Urban areas"	**-10 097**								

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 16: UAA balance related to population density and population evolution at LAU1 in Aquitaine (1988-2000)

Population evolution (1988-2000)	Population density in 2000 (inh. per km2)						Total balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%	-	-	-4%	3%	-4%	-23%	**-2%**
12.5% to 15%	-	-32%	0%	-1%	-25%	-	**-7%**
10% to 12.5 %	9%	-25%	-5%	-	-	-7%	**-6%**
7.5% to 10%	17%	3%	-3%	-4%	-17%	-16%	**0%**
5.0% to 7.5%	1%	-13%	-11%	-14%	-15%	-9%	**-10%**
2.5% to 5.0%	21%	-6%	-6%	-16%	-	13%	**-6%**
0% to 2.5%	-1%	-5%	-6%	-3%	-	2%	**-4%**
-2.5 to 0%	7%	-4%	-5%	-12%	14%	-23%	**-4%**
-5.0% to 2.5%	2%	-9%	-5%	-	-25%	-23%	**-7%**
-7.5% to -5.0%	6%	2%	0%	-	-	-	**3%**
-10% to -7.5%	4%	-	-22%	-	-	-	**-1%**
-12.5% to -10%	-	-	-	-	-	-	**-**
-15% to -12.5%	-	-	-	-	-	-	**-**
Less than -15%	-	-	-	-	-	-	**-**
UAA balance with population increase	5%	-6%	-6%	-6%	-11%	-3%	**-5%**
UAA balance with population decrease	5%	-5%	-6%	-12%	-3%	-23%	**-4%**
TOTAL UAA balance in % of UAA 1988	5%	-5%	-6%	-7%	-10%	-9%	**-4%**
UAA balance in "Rural areas"	**-4,2%**						
UAA balance in "Urban areas"	**-6,7%**						

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 17: UAA decrease by LAU1 related to urban or rural areas in Aquitaine (1988-2000)

UAA decrease level (1988-2000)	Thresholds	Rural areas	Urban areas	TOTAL in ha	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	0	**0**	0,0%
High	UAA loss over 300 ha/year or over 1.2%/year	0	0	**0**	0,0%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-33 225	-2 350	**-35 575**	67,8%
Low	UAA loss under 100 ha/year and under 0.6%/year	-15 636	-1 228	**-16 864**	32,2%
TOTAL in ha		**-48 862**	**-3 578**	**-52 439**	**100%**
TOTAL in %		93,2%	6,8%	100,0%	

Urban areas: LAU1 over 150 inhabitants per km2 or population increase over 10% between 1990 and 1999
Rural areas: LAU1 under 150 inhabitants per km2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 18: UAA 2000 by LAU1 related to urban or rural areas in Aquitaine

UAA decrease level (1988-2000)	Thresholds	Rural areas	Urban areas	TOTAL in ha	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	0	**0**	0,0%
High	UAA loss over 300 ha/year or over 1.2%/year	0	0	**0**	0,0%
Medium	UAA loss over 100 ha/year or over 0.6%/year	311 500	20 237	**331 737**	37,5%
Low	UAA loss under 100 ha/year and under 0.6%/year	521 943	31 986	**553 929**	62,5%
TOTAL in ha		**833 443**	**52 223**	**885 666**	**100%**
TOTAL in %		94,1%	5,9%		100%
TOTAL of UAA 2000		56,6%	3,5%		60,1%

Urban areas: LAU1 over 150 inhabitants per km2 or population increase over 10% between 1990 and 1999
Rural areas: LAU1 under 150 inhabitants per km2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 19: Sealed UAA by LAU1 related to urban or rural areas in Aquitaine (1988-2000)

UAA decrease level (1988-2000)	Thresholds	Sealed UAA (in 12 years)			
		Rural areas	Urban areas	TOTAL in ha	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	1 299	**1 299**	3,9%
High	UAA loss over 300 ha/year or over 1.2%/year	2 524	4 864	**7 388**	22,0%
Medium	UAA loss over 100 ha/year or over 0.6%/year	2 813	846	**3 659**	10,9%
Low	UAA loss under 100 ha/year and under 0,6%/year	4 643	3 803	**8 446**	25,1%
None		5 250	7 563	**12 813**	**38,1%**
TOTAL in ha		**15 230**	**18 375**	**33 605**	**100%**
TOTAL in %		45,3%	54,7%	100,0%	

Urban areas: LAU1 over 150 inhabitants per km2 or population increase over 10% between 1990 and 1999
Rural areas: LAU1 under 150 inhabitants per km2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

Table 20: Farmland abandonment by LAU1 in Aquitaine (1988-2000)

UAA loss level (1988-2000)	Threshold	Farmland abandonment	% of UAA1988	UAA 2000	% of UAA 2000
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	0,0%	0	0,0%
High	UAA loss over 300 ha/year or over 1.2%/year	0	0,0%	0	0,0%
Medium	UAA loss over 100 ha/year or over 0.6%/year	33 225	2,2%	311 500	20,2%
TOTAL in ha		**33 225**	**2,2%**	**311 500**	**20,2%**

Urban areas: LAU1 over 150 inhabitants per km^2 or population increase over 10% between 1990 and 1999
Rural areas: LAU1 under 150 inhabitants per km^2 and population increase under 10% between 1990 and 1999

Sources: French Statistic Institute (Population censuses 1990 & 1999), FSS censuses 1988 & 2000.
Made by Solagro, September 2007.

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Analysis of Farmland Abandonment and the Extent and Location of Agricultural Areas that are Actually Abandoned or are in Risk to be Abandoned

APPENDIX B: Maps and tables for Poland

Framework contract n° 380641 F3ED
on the provision of expertise in the Field of Agri-Environment for the JRC

2008

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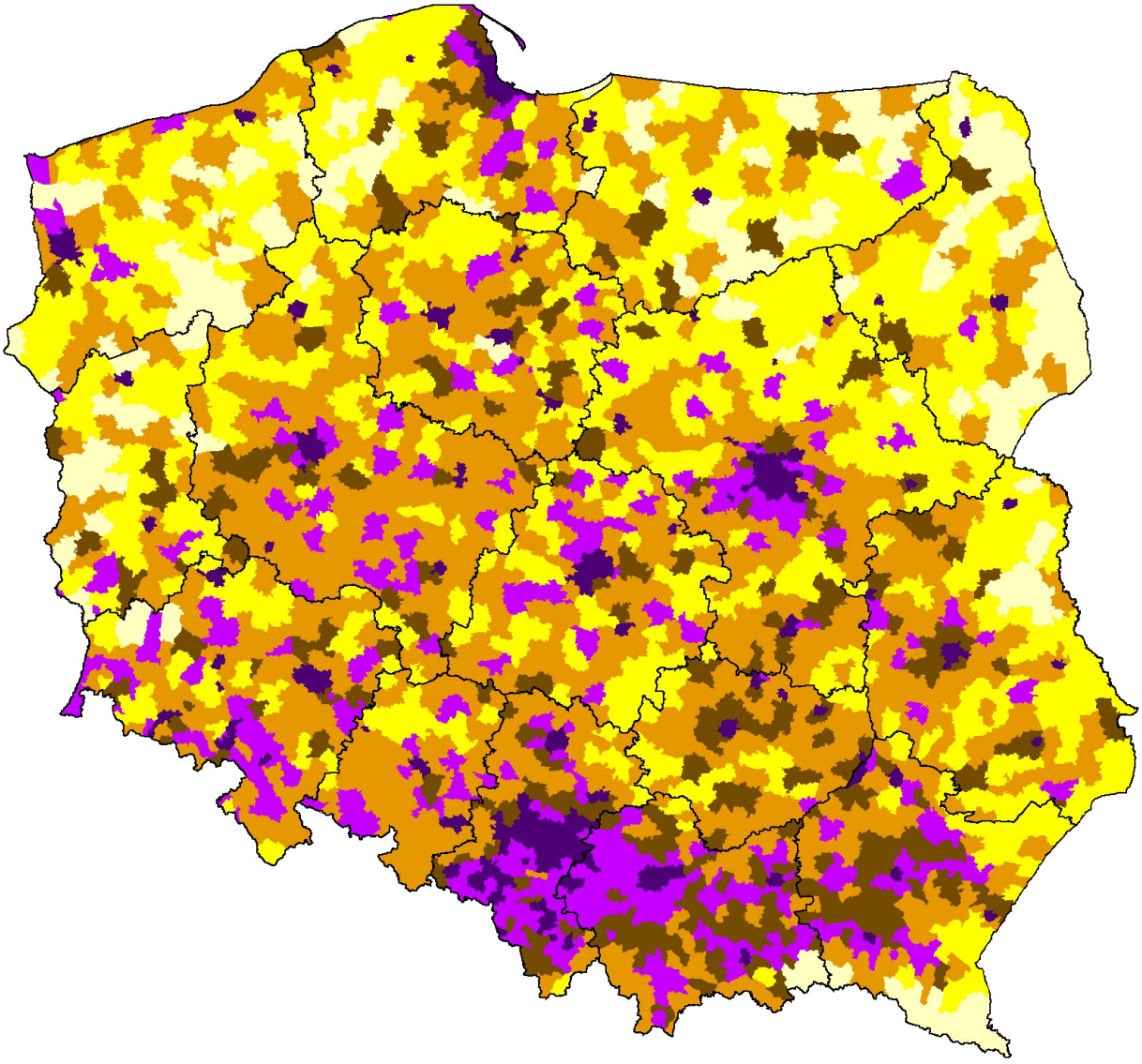
Map 1: Population density by LAU2 in Poland in 2002

Administrative scale : LAU 1



Legend

Population density (inh./km²)

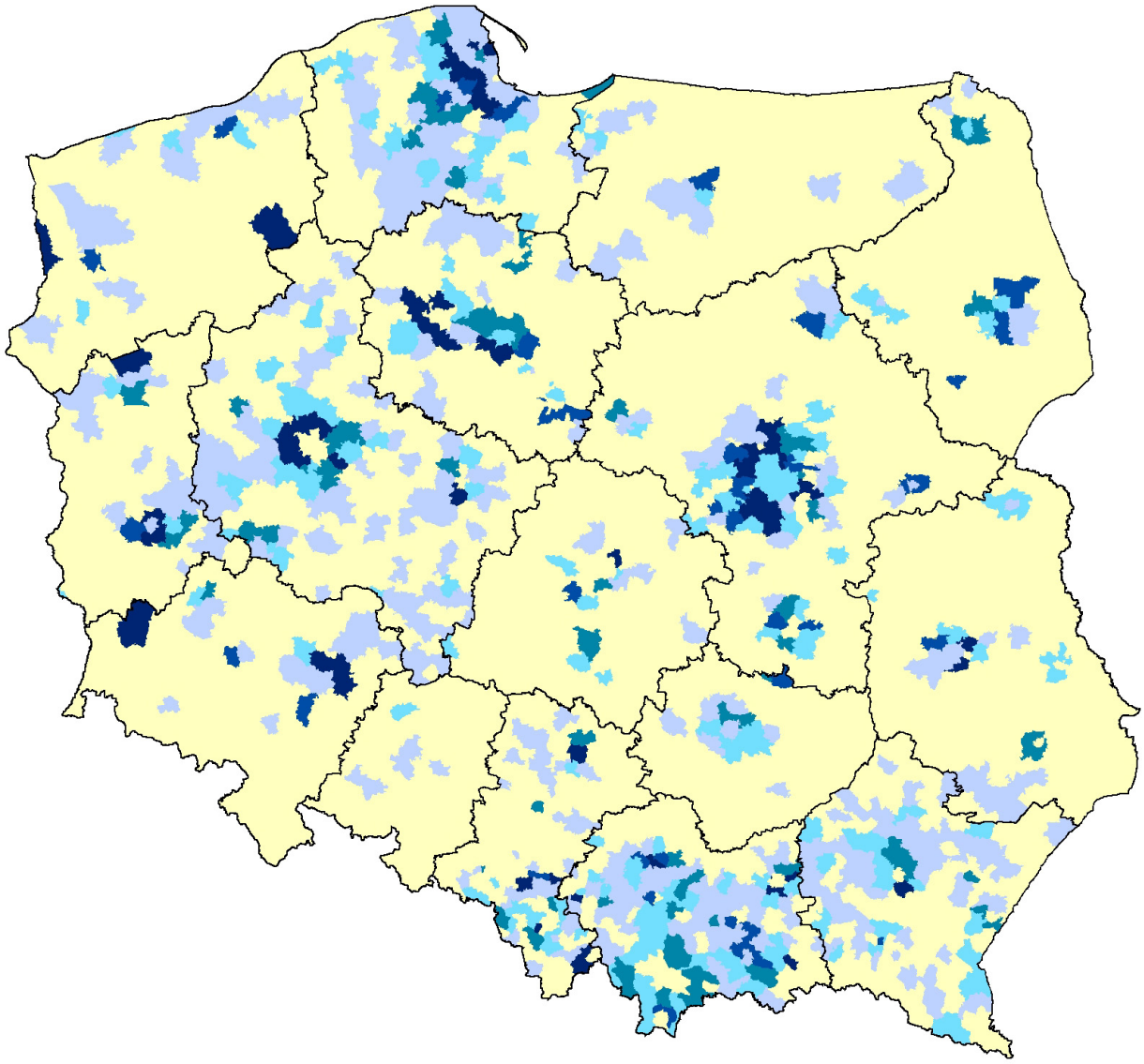
- < 25
- < 50
- < 100
- < 150
- < 500
- > 500

Source: Central Statistical Office (GUS-Poland), Population census 2002.

Map produced by SOLAGRO, June 2007.

Map 2: Population evolution by LAU2 in Poland (1996-2002)

Administrative scale : LAU2



Legend

Population evolution (in %)

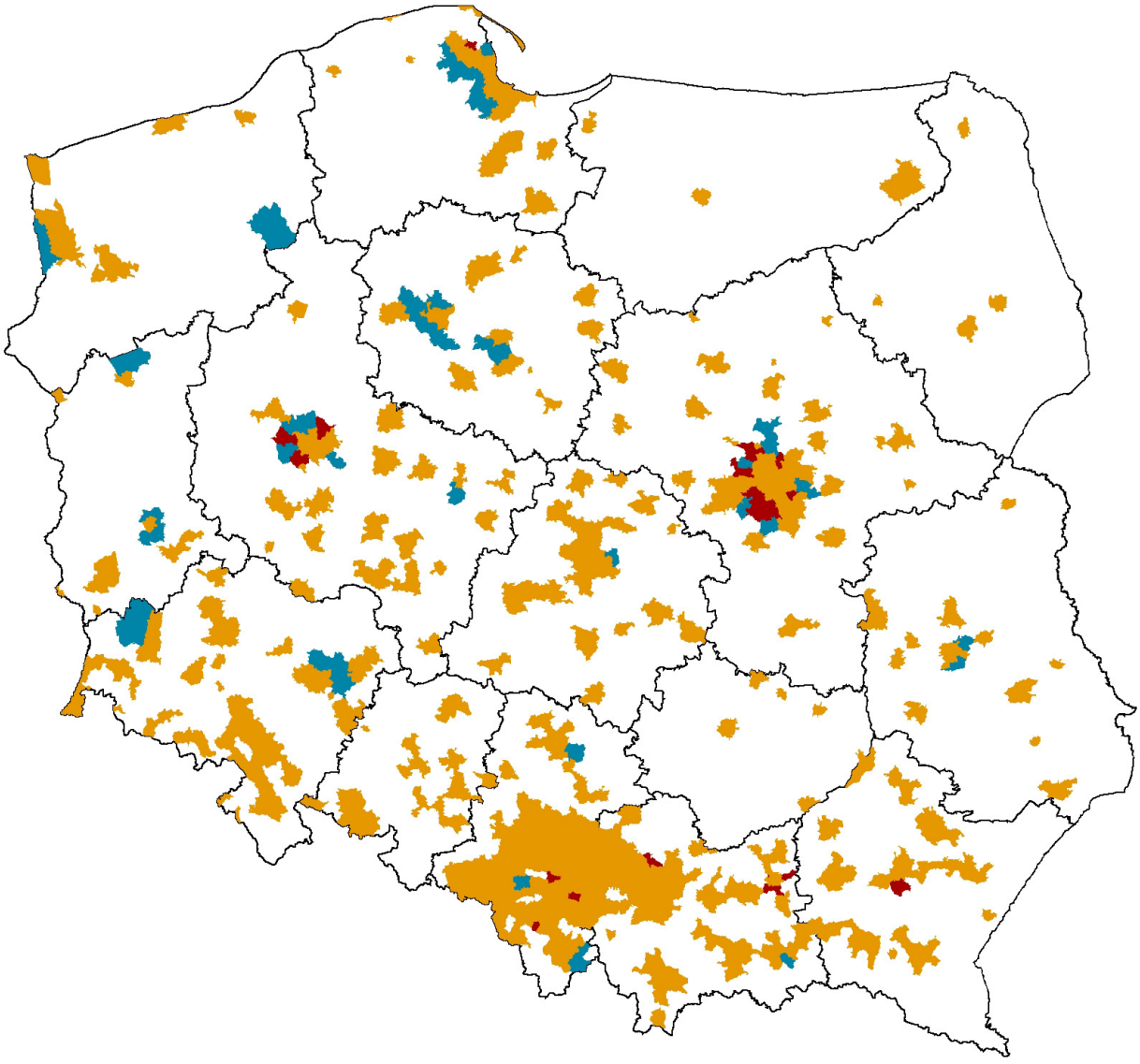
- Decrease
- Gain under 5.0%
- Gain over 2.5%
- Gain over 5.0%
- Gain over 7.5%
- Gain over 10%

Source: Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 3: Urban and rural areas by LAU2 in Poland (1996-2002)

Administrative scale : LAU2



Legend

Urban areas

- Density over 150 inh/km² in 2001
- Population increase over 10% (1996-2002)
- Population increase over 10% and density over 150 inh/km² in 2001

Rural areas

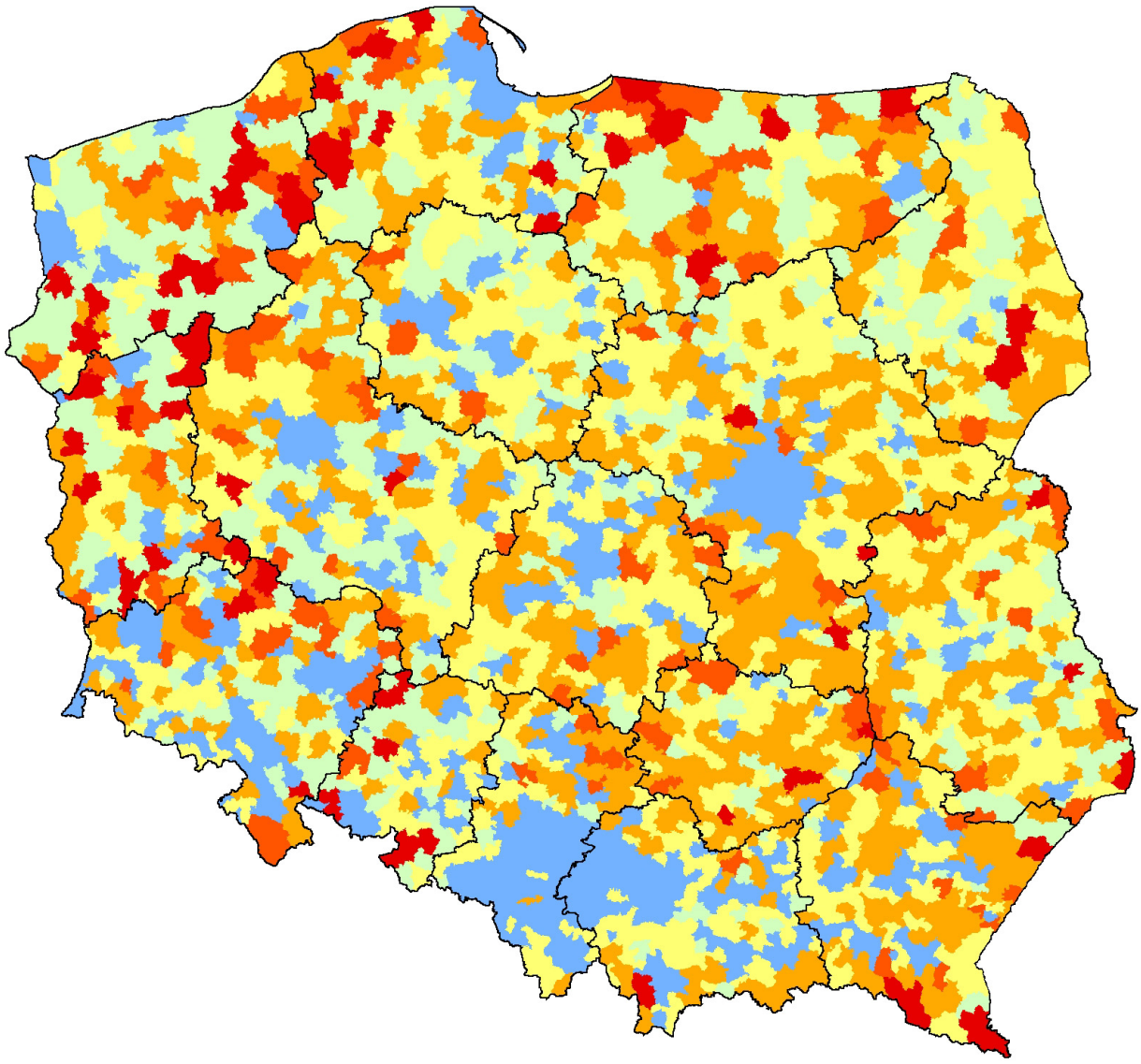
- Population density under 150 inh/km^2 and population increase < 10%

Source: Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 4: UAA evolution by LAU2 in rural areas in Poland (1996-2002)

Administrative scale : LAU2



Legend

UAA decrease in rural areas

- Over 500 ha/year
- 300 to 500 ha/year
- 100 to 300 ha/year
- Under 100 ha/year

- Rural areas with UAA increase
- Urban areas

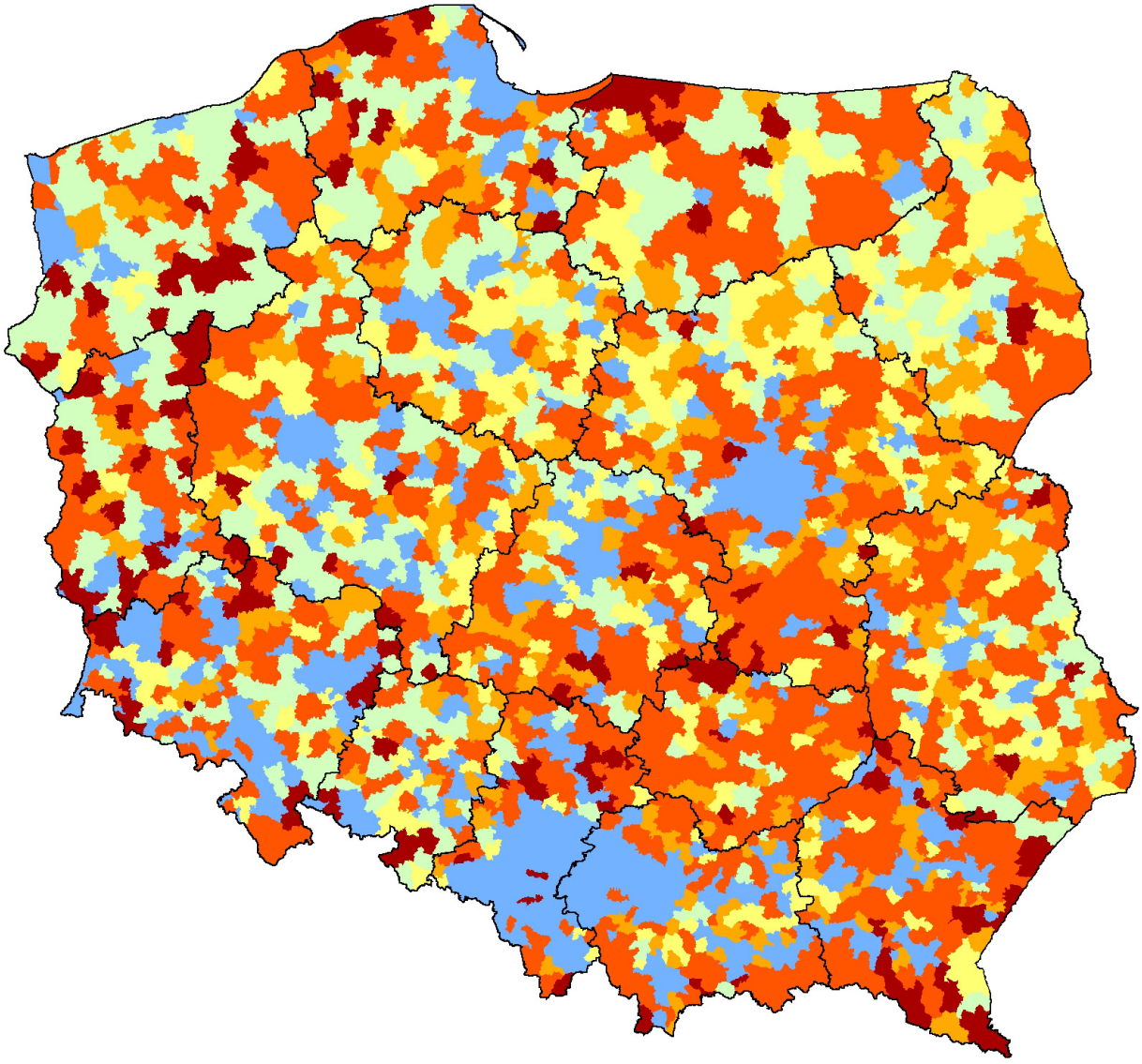
Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1996 and 2002.

Sources: FSS censuses 1996 & 2002. Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 5: UAA evolution by LAU2 in rural areas in Poland (1996-2002)

Administrative scale : LAU2



Legend

UAA decrease in rural areas (in %)

- Over 7.5%/year
- 1.2 to 7.5%/year
- 0.6 to 1.2%/year
- Less than 0.6%/year

- Rural areas with UAA increase
- Urban areas

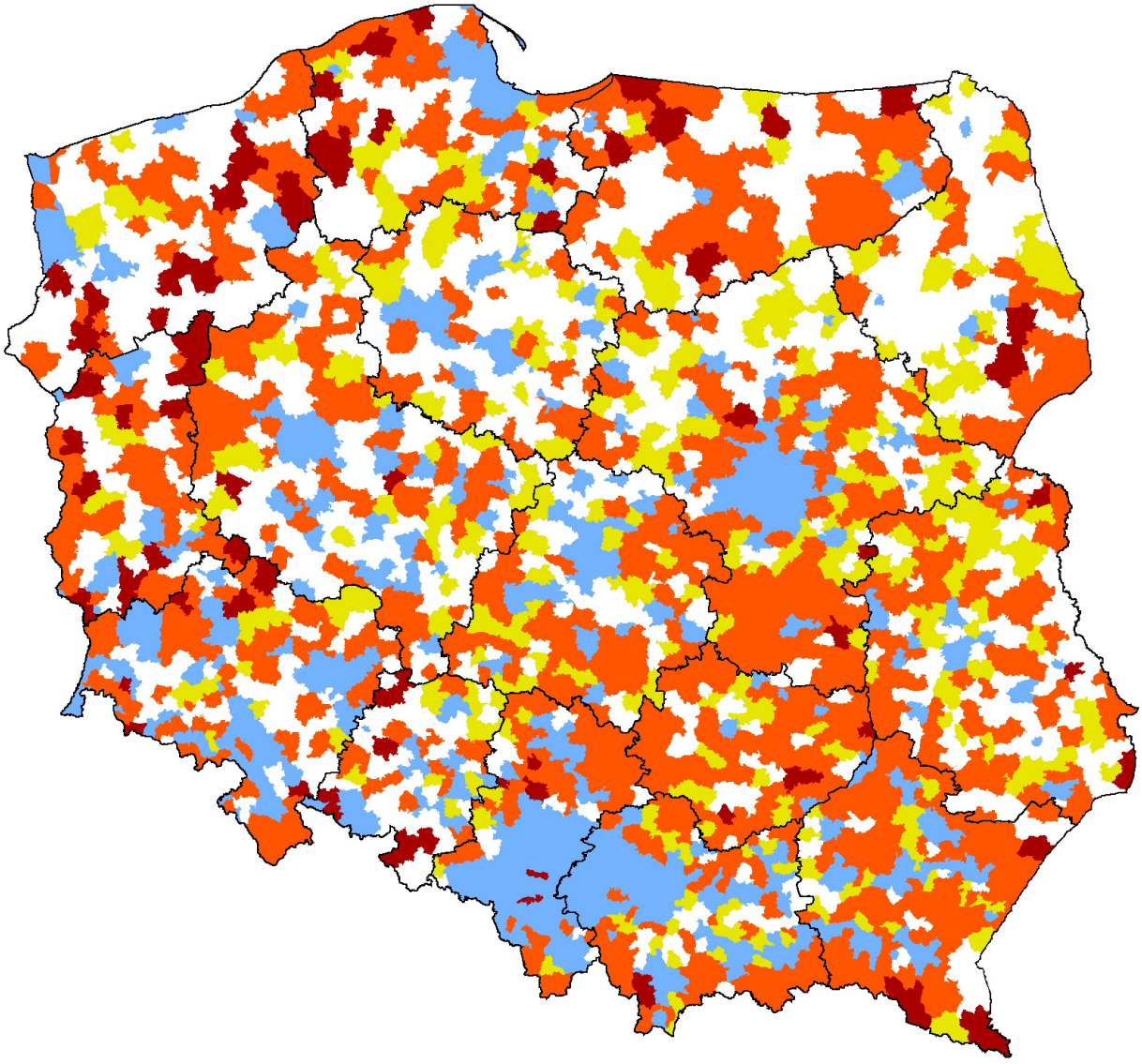
Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1996 and 2002.

Sources: FSS censuses 1996 & 2002. Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 6: UAA decrease* level by LAU2 in rural areas in Poland (1996-2002)

Administrative scale : LAU2



Legend

UAA decrease level

- Very high (>500 ha/year or >7.5%/year)
- High (>300 ha/year or >1.2%/year)
- Medium (>100ha/year or >0.6%/year)
- Low (< 100ha/year and <0.6%/year) or none
- Urban areas

Urban areas : administrative units with a population density over 150 inh./km^2 or a population increase over 10% between 1996 and 2002.

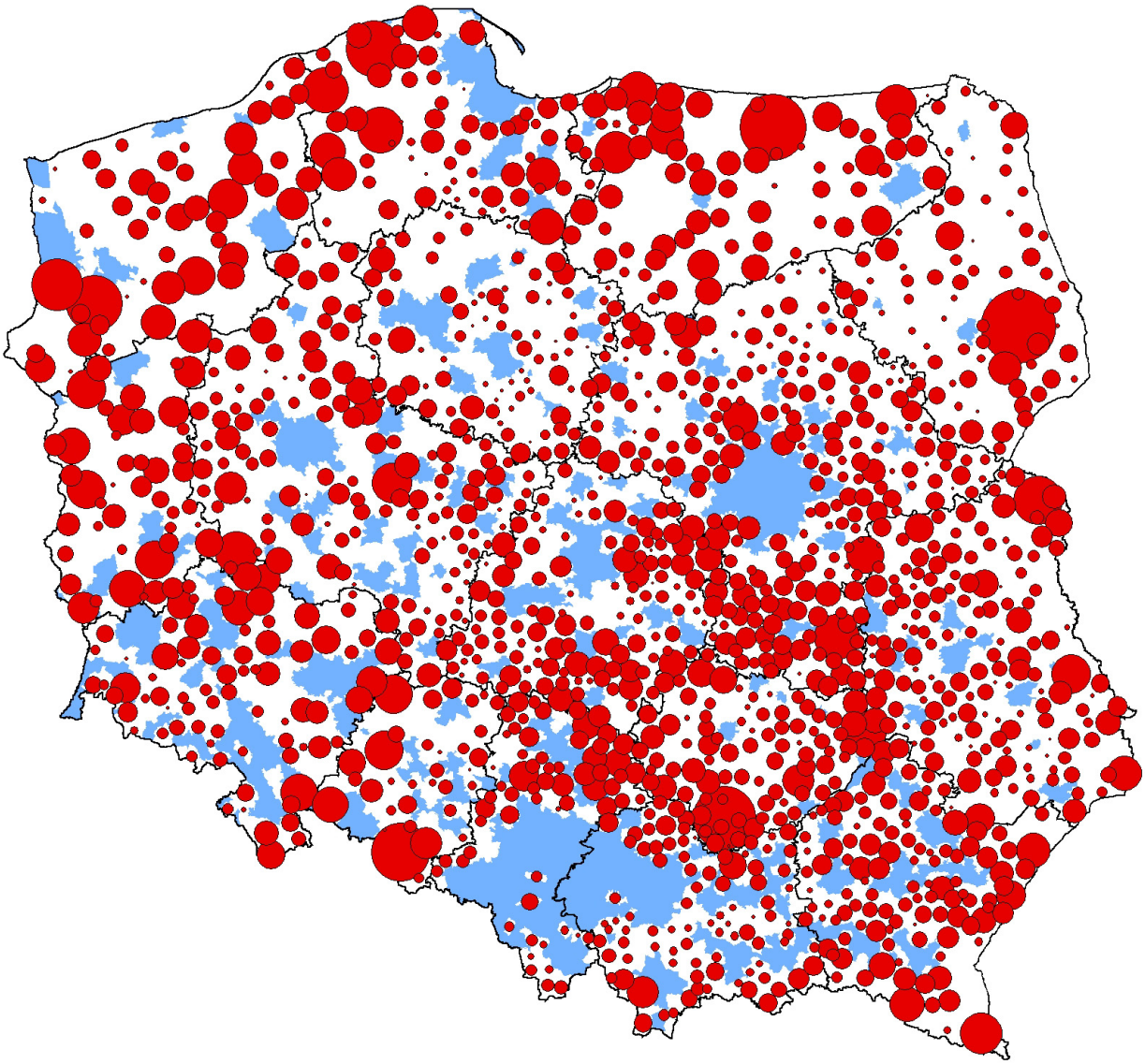
(*) UAA decrease between 1996 and 2002.

Sources: FSS censuses 1996 & 2002. Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 7: UAA decrease in rural areas with farmland abandonment* by LAU2 in Poland (1996-2002)

Administrative scale : LAU2



Legend

UAA decrease 1996-2002 (in ha)

9 000

Urban areas

Urban areas : administrative units with a population density over 150 inh./km^2 or a population increase over 10% between 1996 and 2002.

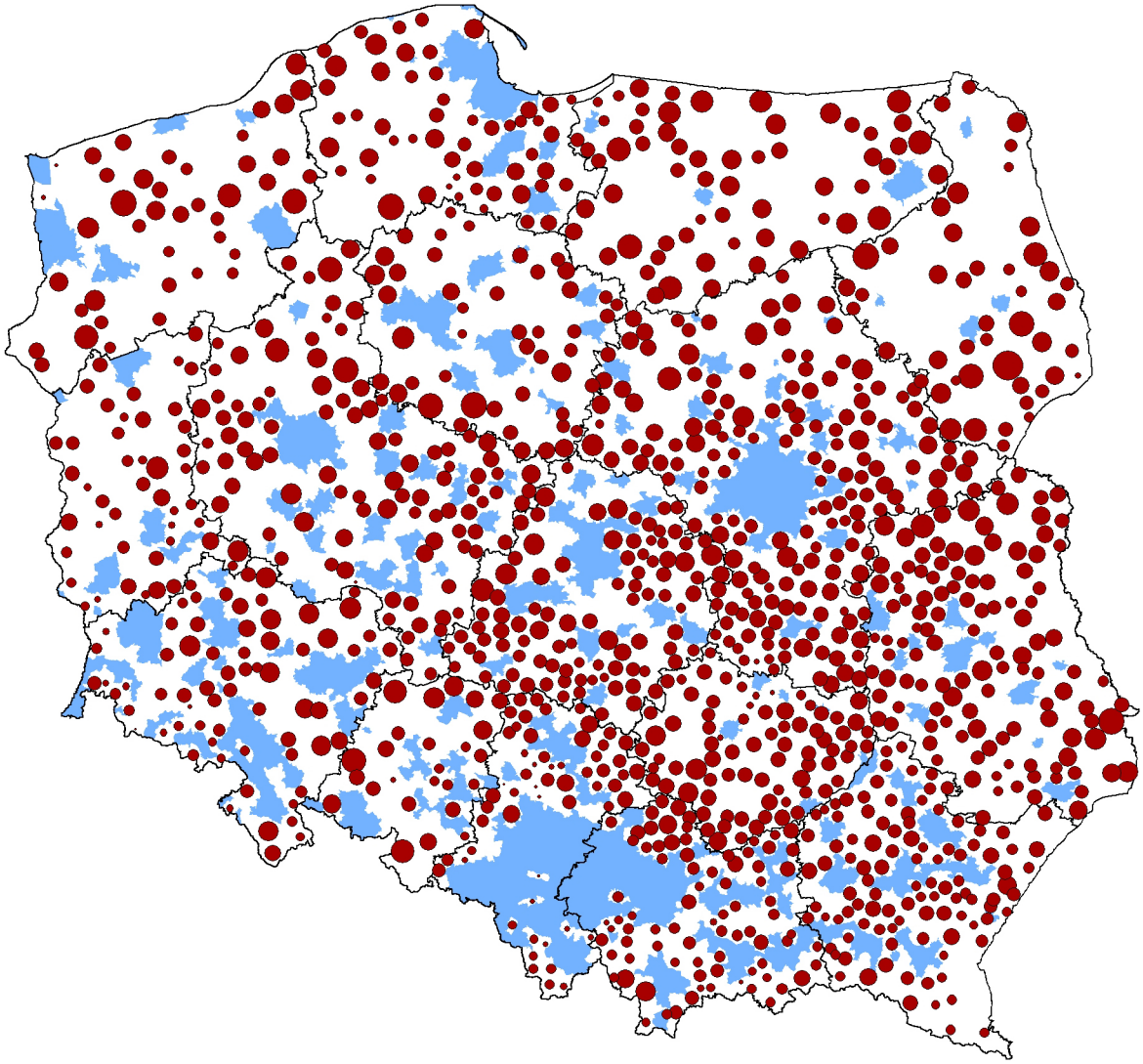
(*) LAU1 with an UAA decrease over 100 ha/year or 0.6%/year.

Sources: FSS censuses 1996 & 2002. Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 8: UAA 2002 in rural areas with farmland abandonment* by LAU2 in Poland

Administrative scale : LAU2



Legend

UAA 2002 (in ha)

- 10 000
- Urban areas

Urban areas : administrative units with a population density over 150 inh./km^2 or a population increase over 10% between 1996 and 2002.

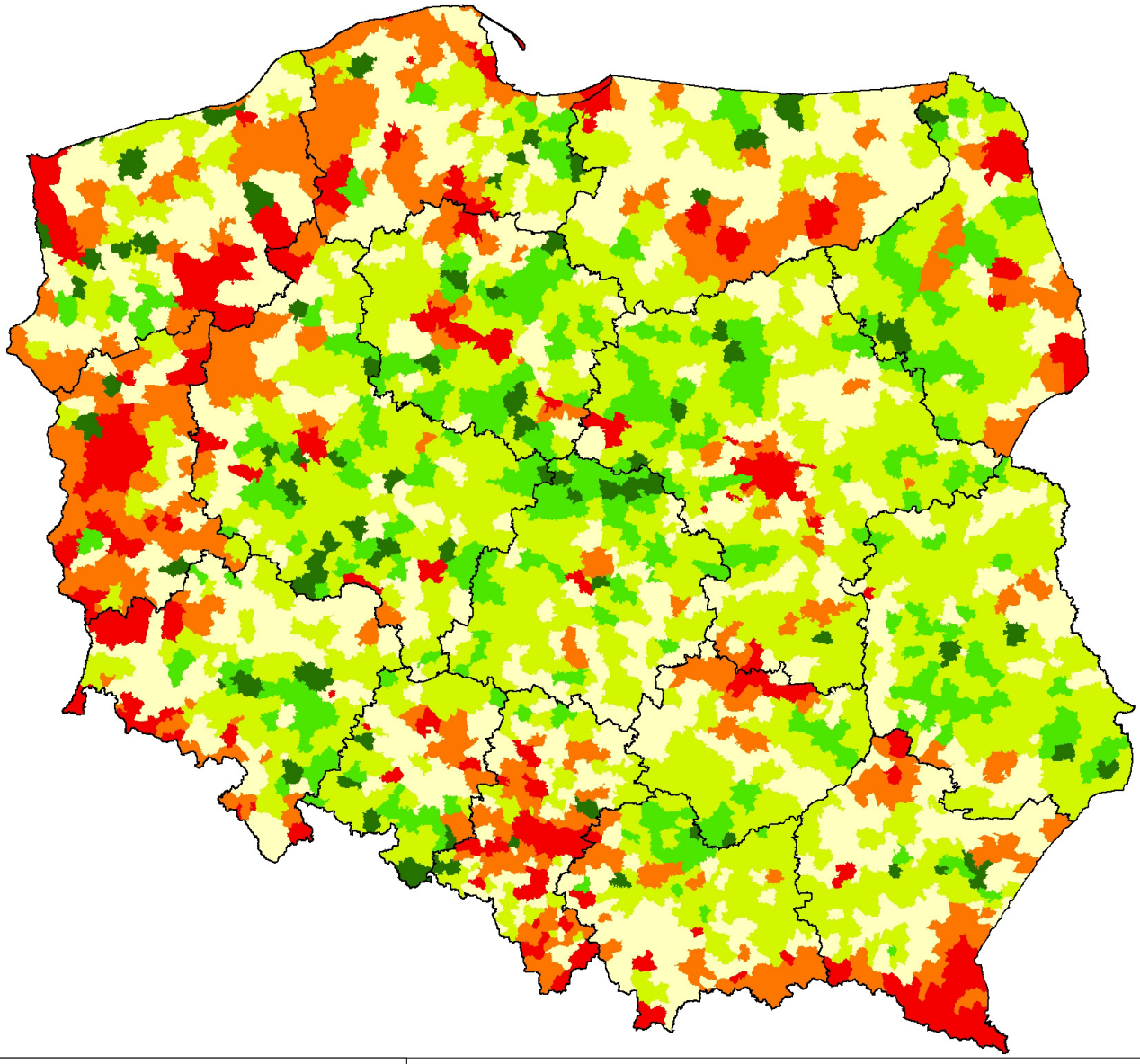
(*) LAU1 with an UAA decrease over 100 ha/year or 0.6%/year.

Source: FSS census 2002.

Map produced by SOLAGRO, June 2007.

Map 9: UAA percentage in the total areas in Poland in 2002

Administrative scale : LAU2



Legend

UAA percentage

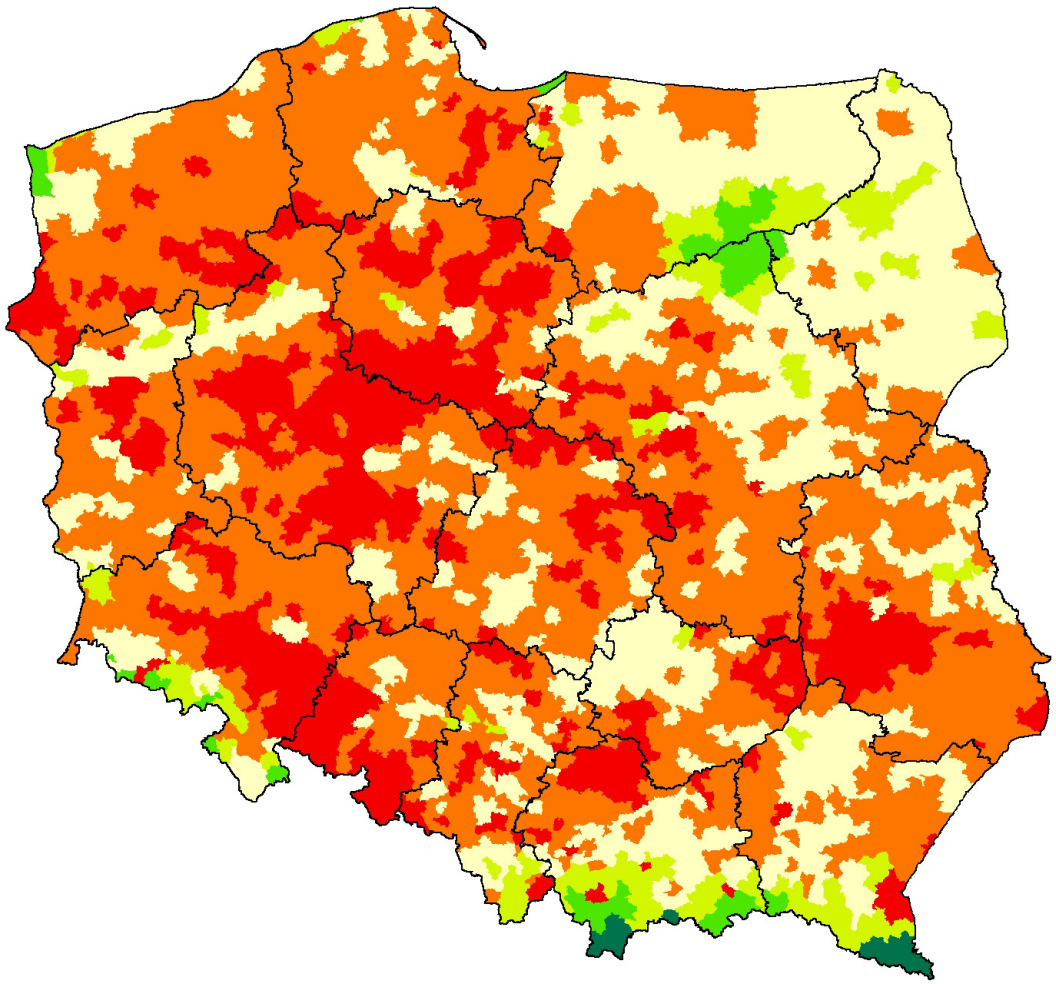
- 0% - 20%
- 25% - 35%
- 35% - 55%
- 55% - 75%
- 75% - 90%
- 90% - 100%

Source: FSS census 2002.

Map produced by SOLAGRO, June 2007.

Map 10: Permanent pastures percentage in the UAA in Poland in 2002

Administrative scale : LAU2



Legend

Permanent pastures

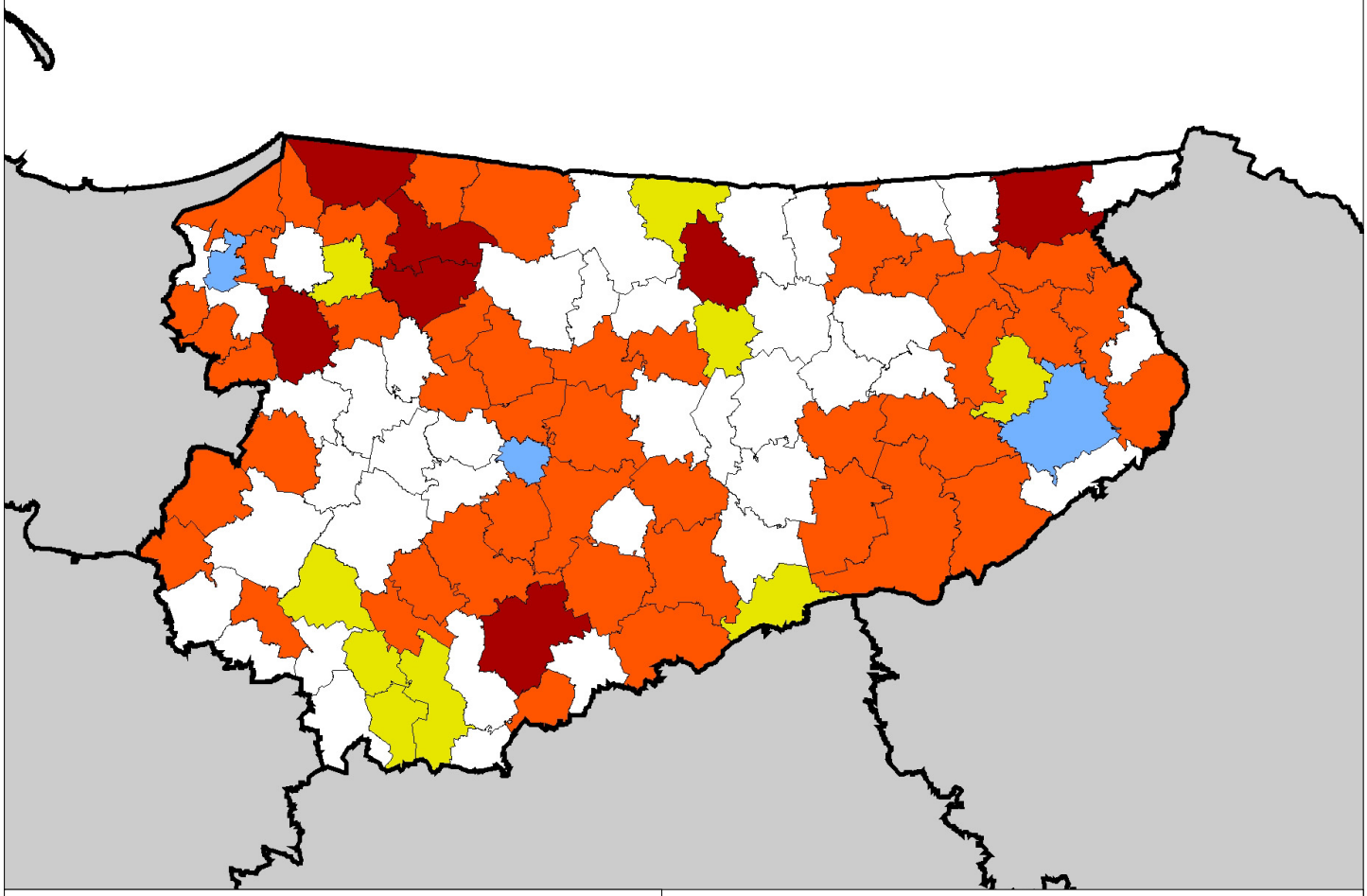
- 0% - 10%
- 10% - 25%
- 25% - 45%
- 45% - 65%
- 65% - 85%
- 85% - 97,8%

Source: FSS census 2002.

Map produced by SOLAGRO, June 2007.

Map 11: UAA decrease* level by LAU2 in rural areas in Warminsko-Mazurskie (1996-2002)

Administrative scale : LAU2



Legend

UAA decrease level

- Very high (>500 ha/year or >7.5%/year)
- High (>300 ha/year or >1.2%/year)
- Medium (>100ha/year or >0.6%/year)
- Low (< 100ha/year and <0.6%/year) or none
- Urban areas

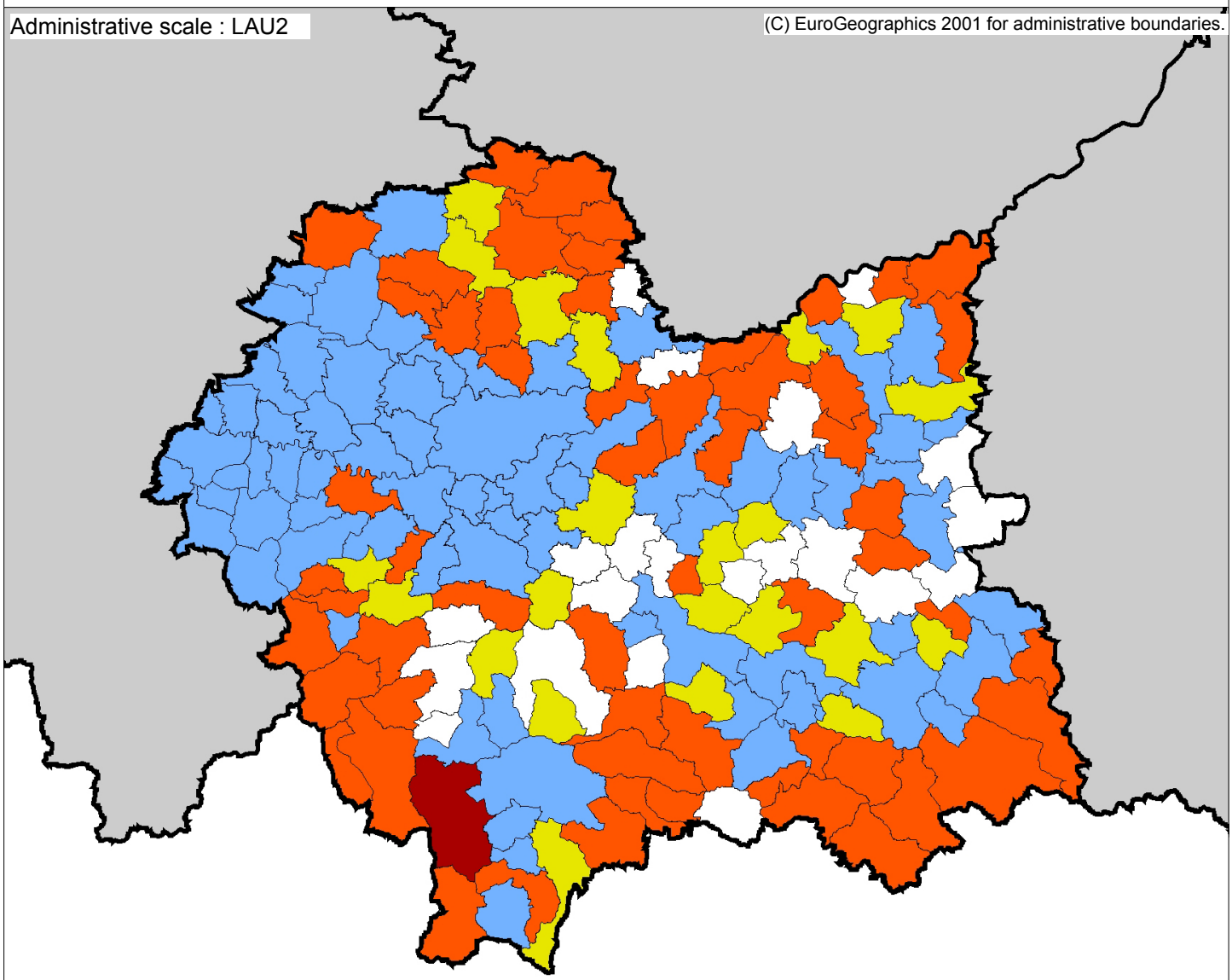
Urban areas : administrative units with a population density over 150 inh./km^2 or a population increase over 10% between 1996 and 2002.

(*) UAA decrease between 1996 and 2002.

Sources: FSS censuses 1996 & 2002. Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Map 12: UAA decrease* level by LAU2 in rural areas in Malopolskie (1996-2002)



Legend

UAA decrease level

- Very high (>500 ha/year or >7.5%/year)
- High (>300 ha/year or >1.2%/year)
- Medium (>100ha/year or >0.6%/year)
- Low (< 100ha/year and <0.6%/year) or none
- Urban areas

Urban areas : administrative units with a population density over 150 inh./km^2 or a population increase over 10% between 1996 and 2002.

(*) UAA decrease between 1996 and 2002.

Sources: FSS censuses 1996 & 2002. Central Statistical Office (GUS-Poland), Population censuses 1996 & 2002.

Map produced by SOLAGRO, June 2007.

Table 1: UAA 1996 related to population density and population evolution by LAU2 in Poland

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	10 727	0	59 571	45 845	22 761	17 223	**156 127**	1%
12.5% to 15%	1 586	11 412	27 439	3 997	0	573	**45 007**	0%
10% to 12.5 %	0	9 222	35 608	4 658	7 407	13 184	**70 079**	0%
7.5% to 10%	0	41 684	82 955	45 716	12 241	34 984	**217 580**	1%
5.0% to 7.5%	106	46 430	184 204	86 258	24 525	52 930	**394 453**	2%
2.5% to 5.0%	7 191	167 324	422 381	173 461	53 775	231 913	**1 056 045**	6%
0% to 2.5%	32 270	651 196	832 099	451 768	172 738	330 884	**2 470 955**	14%
-2.5 to 0%	66 793	1 321 937	2 239 208	571 144	320 269	591 265	**5 110 616**	28%
-5.0% to 2.5%	94 759	1 760 593	2 092 666	346 002	220 883	387 497	**4 902 400**	27%
-7.5% to -5.0%	86 374	1 428 445	868 338	151 450	40 046	115 126	**2 689 779**	15%
-10% to -7.5%	64 178	545 198	164 429	17 482	6 606	19 394	**817 287**	5%
-12.5% to -10%	11 345	59 903	17 205	0	0	7 228	**95 681**	1%
-15% to -12.5%	40 739	16 437	0	0	0	0	**57 176**	0%
Less than -15%	0	0	658	1 513	0	0	**2 171**	0%
UAA 1996 with population increase	51 880	927 268	1 644 257	811 703	293 447	681 691	**4 410 246**	24%
UAA 1996 with population loss	364 188	5 132 513	5 382 504	1 087 591	587 804	1 120 510	**13 675 110**	76%
TOTAL UAA 1996	416 068	6 059 781	7 026 761	1 899 294	881 251	1 802 201	**18 085 356**	
TOTAL in %	2%	34%	39%	11%	5%	10%	**100%**	
UAA 1996 in "Rural areas"	**15 191 839**							
UAA 1996 in "Urban areas"	**2 893 517**							

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 2: UAA 2002 related to population density and population evolution by LAU2 in Poland

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	11 211	53 465	96 660	69 516	22 542	13 973	**267 367**	2%
12.5% to 15%	1 582	12 264	27 607	3 735	0	385	**45 573**	0%
10% to 12.5 %	0	7 763	35 852	4 419	7 177	9 448	**64 659**	0%
7.5% to 10%	0	53 923	86 372	43 797	10 087	33 129	**227 308**	1%
5.0% to 7.5%	85	58 395	180 064	79 601	22 591	49 311	**390 047**	2%
2.5% to 5.0%	6 887	160 240	397 667	160 004	46 084	131 192	**902 074**	5%
0% to 2.5%	39 868	673 047	821 981	424 065	166 034	292 767	**2 417 762**	14%
-2.5 to 0%	54 211	1 308 290	2 099 652	501 437	278 417	388 129	**4 630 136**	28%
-5.0% to 2.5%	74 570	1 648 279	1 928 664	361 393	197 256	250 745	**4 460 907**	27%
-7.5% to -5.0%	78 084	1 316 554	791 381	128 143	36 377	67 210	**2 417 749**	14%
-10% to -7.5%	56 344	519 507	155 531	14 128	5 931	14 359	**765 800**	5%
-12.5% to -10%	10 475	51 548	16 452	0	0	3 984	**82 459**	0%
-15% to -12.5%	38 427	14 899	0	0	0	0	**53 326**	0%
Less than -15%	0	0	583	1 110	0	0	**1 693**	0%
UAA 2002 with population increase	59 633	1 019 097	1 646 203	785 137	274 515	530 205	**4 314 790**	26%
UAA 2002 with population loss	312 111	4 859 077	4 992 263	1 006 211	517 981	724 427	**12 412 070**	74%
TOTAL UAA 2002	371 744	5 878 174	6 638 466	1 791 348	792 496	1 254 632	**16 726 860**	
TOTAL in %	2%	35%	40%	11%	5%	8%	**100%**	
UAA 2002 in "Rural areas"	**14 355 658**							
UAA 2002 in "Urban areas"	**2 371 202**							

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 3: UAA loss related to population density and population evolution by LAU2 in Poland (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA loss	% loss	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	-139	0	-16 354	-4 934	-4 282	-6 793	**-32 502**	2%	**-21%**
12.5% to 15%	-4	0	-1 750	-262	0	-188	**-2 204**	0%	**-5%**
10 to 12.5 %	0	-1 459	-2 265	-239	-253	-3 736	**-7 952**	0%	**-11%**
7.5 to 10%	0	-3 863	-6 869	-4 473	-2 154	-7 407	**-24 766**	1%	**-11%**
5.0 to 7.5%	-21	-5 058	-14 870	-7 348	-2 030	-8 164	**-37 491**	2%	**-10%**
2.5% to 5.0%	-304	-16 997	-39 921	-18 271	-7 923	-94 862	**-178 278**	8%	**-17%**
0 to 2.5%	-3 022	-61 923	-65 378	-42 867	-16 359	-93 904	**-283 453**	13%	**-11%**
-2,5 - 0%	-16 220	-114 346	-184 407	-69 913	-40 486	-250 049	**-675 421**	32%	**-13%**
-5,0 - -2,5%	-20 521	-144 099	-185 914	-36 474	-25 602	-112 254	**-524 864**	25%	**-11%**
-7,5 - -5%	-10 322	-115 220	-80 987	-12 794	-3 669	-47 222	**-270 214**	13%	**-10%**
-10% - -7,5%	-8 027	-34 968	-20 534	-3 354	-675	-5 370	**-72 928**	3%	**-9%**
-12,5% - -10%	-870	-8 355	-1 760	0	0	-3 244	**-14 229**	1%	**-15%**
-15% - -12,5%	-2 312	-1 538	0	0	0	0	**-3 850**	0%	**-7%**
< -15%	0	0	-75	-403	0	0	**-478**	0%	**-22%**
UAA loss with population increase	-3 490	-89 300	-147 407	-78 394	-33 001	-215 054	**-566 646**	27%	**-13%**
UAA loss with population loss	-58 272	-418 526	-473 677	-122 938	-70 432	-418 139	**-1 561 984**	73%	**-11%**
TOTAL UAA loss	-61 762	-507 826	-621 084	-201 332	-103 433	-633 193	**-2 128 630**		
TOTAL of UAA loss in %	3%	24%	29%	9%	5%	30%	100%		
% of UAA loss during the period	**-15%**	**-8%**	**-9%**	**-11%**	**-12%**	**-35%**	**-12%**		
UAA loss in "Rural areas"	**-1 364 598**							64%	-9%
UAA loss in "Urban areas"	**-764 032**							36%	-26%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 4: UAA win related to population density and population evolution by LAU2 in Poland (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA win	% increase	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	623	53 465	53 443	28 605	4 063	3 543	**143 742**	19%	**92%**
12.5% to 15%	0	852	1 918	0	0	0	**2 770**	0%	**6%**
10 to 12.5 %	0	0	2 509	0	23	0	**2 532**	0%	**4%**
7.5 to 10%	0	12 474	4 140	0	0	0	**16 614**	2%	**8%**
5.0 to 7.5%	0	2 041	2 491	373	96	2 020	**7 021**	1%	**2%**
2.5% to 5.0%	0	8 743	12 382	3 120	232	47	**24 524**	3%	**2%**
0 to 2.5%	10 620	88 102	28 412	10 927	4 883	43 182	**186 126**	24%	**8%**
-2,5 - 0%	3 638	87 501	51 440	9 009	3 406	21 666	**176 660**	23%	**3%**
-5,0 - -2,5%	332	46 570	42 274	37 337	1 975	14 831	**143 319**	19%	**3%**
-7,5 - -5%	2 032	13 321	21 137	4 015	0	0	**40 505**	5%	**2%**
-10% - -7,5%	193	13 150	11 636	0	0	335	**25 314**	3%	**3%**
-12,5% - -10%	0	0	1 007	0	0	0	**1 007**	0%	**1%**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**0%**
< -15%	0	0	0	0	0	0	**0**	0%	**0%**
UAA win with population increase	11 243	165 677	105 295	43 025	9 297	48 792	**383 329**	50%	**9%**
UAA win with population loss	6 195	160 542	127 494	50 361	5 381	36 832	**386 805**	50%	**3%**
TOTAL UAA win	17 438	326 219	232 789	93 386	14 678	85 624	**770 134**		
TOTAL of UAA win in %	2%	42%	30%	12%	2%	11%	100%		
% of UAA loss during the period	4%	5%	3%	5%	2%	5%	4%		
UAA win in "Rural areas"	**528 417**							69%	3%
UAA win in "Urban areas"	**241 717**							31%	8%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 5: UAA balance related to population density and population evolution by LAU2 in Poland (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						TOTAL UAA balance	% balance	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
> +15%	484	53 465	37 089	23 671	-219	-3 250	**111 240**	-8%	**71%**
12.5% to 15%	-4	852	168	-262	0	-188	**566**	0%	**1%**
10 to 12.5 %	0	-1 459	244	-239	-230	-3 736	**-5 420**	0%	**-8%**
7.5 to 10%	0	8 611	-2 729	-4 473	-2 154	-7 407	**-8 152**	1%	**-4%**
5.0 to 7.5%	-21	-3 017	-12 379	-6 975	-1 934	-6 144	**-30 470**	2%	**-8%**
2.5% to 5.0%	-304	-8 254	-27 539	-15 151	-7 691	-94 815	**-153 754**	11%	**-15%**
0 to 2.5%	7 598	26 179	-36 966	-31 940	-11 476	-50 722	**-97 327**	7%	**-4%**
-2,5 - 0%	-12 582	-26 845	-132 967	-60 904	-37 080	-228 383	**-498 761**	37%	**-10%**
-5,0 - -2,5%	-20 189	-97 529	-143 640	863	-23 627	-97 423	**-381 545**	28%	**-8%**
-7,5 - -5%	-8 290	-101 899	-59 850	-8 779	-3 669	-47 222	**-229 709**	17%	**-9%**
-10% - -7,5%	-7 834	-21 818	-8 898	-3 354	-675	-5 035	**-47 614**	4%	**-6%**
-12,5% - -10%	-870	-8 355	-753	0	0	-3 244	**-13 222**	1%	**-14%**
-15% - -12,5%	-2 312	-1 538	0	0	0	0	**-3 850**	0%	**-7%**
< -15%	0	0	-75	-403	0	0	**-478**	0%	**-22%**
UAA balance with population win	7 753	76 377	-42 112	-35 369	-23 704	-166 262	**-183 317**	13%	**-4%**
UAA balance with population loss	-52 077	-257 984	-346 183	-72 577	-65 051	-381 307	**-1 175 179**	87%	**-9%**
TOTAL UAA balance	-44 324	-181 607	-388 295	-107 946	-88 755	-547 569	**-1 358 496**		
TOTAL in %	3%	13%	29%	8%	7%	40%	100%		
Evolution during the period	**-11%**	**-3%**	**-6%**	**-6%**	**-10%**	**-30%**	**-8%**		
UAA balance in "Rural areas"	**-836 181**								
UAA balance in "Urban areas"	**-522 315**								

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 6: UAA balance related to population density and population evolution by LAU2 in Poland (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%	5%	-	62%	52%	-1%	-19%	**71%**
12.5% to 15%	0%	7%	1%	-7%	-	-33%	**1%**
10% to 12.5 %	-	-16%	1%	-5%	-3%	-28%	**-8%**
7.5% to 10%	-	21%	-3%	-10%	-18%	-21%	**-4%**
5.0% to 7.5%	-20%	-6%	-7%	-8%	-8%	-12%	**-8%**
2.5% to 5.0%	-4%	-5%	-7%	-9%	-14%	-41%	**-15%**
0% to 2.5%	24%	4%	-4%	-7%	-7%	-15%	**-4%**
-2.5 to 0%	-19%	-2%	-6%	-11%	-12%	-39%	**-10%**
-5.0% to 2.5%	-21%	-6%	-7%	0%	-11%	-25%	**-8%**
-7.5% to -5.0%	-10%	-7%	-7%	-6%	-9%	-41%	**-9%**
-10% to -7.5%	-12%	-4%	-5%	-19%	-10%	-26%	**-6%**
-12.5% to -10%	-8%	-14%	-4%	-	-	-45%	**-14%**
-15% to -12.5%	-6%	-9%	-	-	-	-	**-7%**
Less than -15%	-	-	-11%	-27%	-	-	**-22%**
UAA balance with population win	15%	8%	-3%	-4%	-8%	-24%	**-4%**
UAA balance with population loss	-14%	-5%	-6%	-7%	-11%	-34%	**-9%**
Evolution during the period	-11%	-3%	-6%	-6%	-10%	-30%	**-8%**
UAA balance in "Rural areas"	**-5,5%**						
UAA balance in "Urban areas"	**-18,1%**						

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 7: UAA loss related to population density and population evolution by LAU2 in Poland (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	**Rural areas**	**Urban areas**	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	-521 708	-319 575	**-841 283**	39,5%
High	UAA loss over 300 ha/year or over 1.2%/year	-227 458	-871 218	**-1 098 676**	51,6%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-10 736	-133 881	**-144 617**	6,8%
Low	UAA loss under 100 ha/year and under 0.6%/year	-4 130	-39 924	**-44 054**	2,1%
TOTAL in ha		**-764 032**	**-1 364 598**	**-2 128 630**	100%
TOTAL in %		35,9%	64,1%	100%	

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 8: UAA 2002 related to population density and population evolution by LAU2 in Poland

UAA loss level (1996-2002)	Thresholds (by LAU2)	UAA 2002 in rural areas	UAA 2002 in urban areas	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	632 191	376 972	**1 009 163**	-47,4%
High	UAA loss over 300 ha/year or over 1.2%/year	5 279 375	1 056 869	**6 336 244**	-297,7%
Medium	UAA loss over 100 ha/year or over 0.6%/year	2 395 718	187 753	**2 583 471**	-121,4%
Low	UAA loss under 100 ha/year and under 0.6%/year	2 155 336	207 306	**2 362 642**	-111,0%
TOTAL in ha		**10 462 620**	**1 828 900**	**12 291 520**	**194%**
TOTAL in %		91,2%	8,8%		100%
TOTAL of UAA 2002		62,5%	10,9%		73,5%

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 9: Farmland abandonment by LAU2 in Poland (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	Land abandoned	% of UAA 1996	UAA 2002 in LAU2 with LA	% of UAA 2002
Very high	UAA loss over 500 ha/year or over 7.5%/year	521 708	2,9%	632 191	3,8%
High	UAA loss over 300 ha/year or over 1.2%/year	227 458	1,3%	5 279 375	31,6%
Medium	UAA loss over 100 ha/year or over 0.6%/year	10 736	0,1%	2 395 718	14,3%
TOTAL in ha		**759 902**	**4,2%**	**8 307 284**	**49,7%**

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 10: UAA 1996 related to population density and population evolution by LAU2 in Malopolskie

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	0	0	0	3 417	**3 417**	1%
12.5% to 15%	0	0	0	0	0	0	**0**	0%
10% to 12.5 %	0	0	0	0	0	6 499	**6 499**	1%
7.5% to 10%	0	0	0	11 119	3 588	3 080	**17 787**	4%
5.0% to 7.5%	0	0	2 876	9 974	12 384	10 270	**35 504**	8%
2.5% to 5.0%	0	0	12 979	27 926	9 438	18 572	**68 915**	15%
0% to 2.5%	0	0	20 373	48 053	44 975	70 737	**184 138**	41%
-2.5 to 0%	0	5 501	26 286	28 726	7 751	14 798	**83 062**	19%
-5.0% to 2.5%	0	0	16 538	0	0	14 393	**30 931**	7%
-7.5% to -5.0%	0	9 351	4 120	0	0	2 226	**15 697**	4%
-10% to -7.5%	0	0	0	0	0	0	**0**	0%
-12.5% to -10%	0	0	0	0	0	0	**0**	0%
-15% to -12.5%	0	0	0	0	0	0	**0**	0%
Less than -15%	0	0	0	0	0	0	**0**	0%
UAA 1996 with population increase	0	0	36 228	97 072	70 385	112 575	**316 260**	71%
UAA 1996 with population loss	0	14 852	46 944	28 726	7 751	31 417	**129 690**	29%
TOTAL UAA 1996	0	14 852	83 172	125 798	78 136	143 992	**445 950**	
TOTAL in %	0%	3%	19%	28%	18%	32%	**100%**	

UAA 1996 in "Rural areas"	**223 822**
UAA 1996 in "Urban areas"	**222 128**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 11: UAA 2002 related to population density and population evolution by LAU2 in Malopolskie

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	0	6 735	0	4 740	**11 475**	3%
12.5% to 15%	0	0	0	0	0	0	**0**	0%
10% to 12.5 %	0	0	0	0	0	4 963	**4 963**	1%
7.5% to 10%	0	0	0	10 073	3 101	2 525	**15 699**	4%
5.0% to 7.5%	0	0	2 695	9 727	11 730	9 151	**33 303**	8%
2.5% to 5.0%	0	0	11 326	25 073	8 184	15 467	**60 050**	15%
0% to 2.5%	0	0	19 589	45 650	46 191	55 092	**166 522**	41%
-2.5 to 0%	0	4 314	24 599	26 144	6 669	7 948	**69 674**	17%
-5.0% to 2.5%	0	0	15 164	0	0	11 827	**26 991**	7%
-7.5% to -5.0%	0	7 894	3 490	0	0	1 406	**12 790**	3%
-10% to -7.5%	0	0	0	0	0	0	**0**	0%
-12.5% to -10%	0	0	0	0	0	0	**0**	0%
-15% to -12.5%	0	0	0	0	0	0	**0**	0%
Less than -15%	0	0	0	0	0	0	**0**	0%
UAA 2002 with population increase	0	0	33 610	97 258	69 206	91 938	**292 012**	73%
UAA 2002 with population loss	0	12 208	43 253	26 144	6 669	21 181	**109 455**	27%
TOTAL UAA 2002	0	12 208	76 863	123 402	75 875	113 119	**401 467**	
TOTAL in %	0%	3%	19%	31%	19%	28%	**100%**	

UAA 2002 in "Rural areas"	**205 738**
UAA 2002 in "Urban areas"	**195 729**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 12: UAA loss related to population density and population evolution by LAU2 in Malopolskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA loss	% loss	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	0	0	0	0	0	**0**	0%	**0%**
12.5% to 15%	0	0	0	0	0	0	**0**	0%	**-**
10 to 12.5 %	0	0	0	0	0	-1 536	**-1 536**	3%	**-24%**
7.5 to 10%	0	0	0	-1 046	-487	-555	**-2 088**	4%	**-12%**
5.0 to 7.5%	0	0	-181	-247	-750	-1 119	**-2 297**	4%	**-6%**
2.5% to 5.0%	0	0	-1 653	-2 853	-1 254	-3 105	**-8 865**	15%	**-13%**
0 to 2.5%	0	0	-784	-3 182	-2 896	-15 645	**-22 507**	39%	**-12%**
-2,5 - 0%	0	-1 187	-1 730	-2 582	-1 082	-6 850	**-13 431**	23%	**-16%**
-5,0 - -2,5%	0	0	-2 214	0	0	-2 566	**-4 780**	8%	**-15%**
-7,5 - -5%	0	-1 457	-630	0	0	-820	**-2 907**	5%	**-19%**
-10% - -7,5%	0	0	0	0	0	0	**0**	0%	**-**
-12,5% - -10%	0	0	0	0	0	0	**0**	0%	**-**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**-**
< -15%	0	0	0	0	0	0	**0**	0%	**-**
UAA loss with population increase	0	0	-2 618	-7 328	-5 387	-21 960	**-37 293**	64%	**-12%**
UAA loss with population loss	0	-2 644	-4 574	-2 582	-1 082	-10 236	**-21 118**	36%	**-16%**
TOTAL UAA loss	0	-2 644	-7 192	-9 910	-6 469	-32 196	**-58 411**		
TOTAL of UAA loss in %	0%	5%	12%	17%	11%	55%	100%		
% of UAA loss during the period	**-**	**-18%**	**-9%**	**-8%**	**-8%**	**-22%**	**-13%**		
UAA loss in "Rural areas"	**-19 746**							34%	-9%
UAA loss in "Urban areas"	**-38 665**							66%	-17%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 13: UAA win related to population density and population evolution by LAU2 in Malopolskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA win	% increase	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	0	0	6 735	0	1 323	**8 058**	58%	**236%**
12.5% to 15%	0	0	0	0	0	0	**0**	0%	**-**
10 to 12.5 %	0	0	0	0	0	0	**0**	0%	**0%**
7.5 to 10%	0	0	0	0	0	0	**0**	0%	**0%**
5.0 to 7.5%	0	0	0	0	96	0	**96**	1%	**0%**
2.5% to 5.0%	0	0	0	0	0	0	**0**	0%	**0%**
0 to 2.5%	0	0	0	779	4 112	0	**4 891**	35%	**3%**
-2,5 - 0%	0	0	43	0	0	0	**43**	0%	**0%**
-5,0 - -2,5%	0	0	840	0	0	0	**840**	6%	**3%**
-7,5 - -5%	0	0	0	0	0	0	**0**	0%	**0%**
-10% - -7,5%	0	0	0	0	0	0	**0**	0%	**-**
-12,5% - -10%	0	0	0	0	0	0	**0**	0%	**-**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**-**
< -15%	0	0	0	0	0	0	**0**	0%	**-**
UAA win with population increase	0	0	0	7 514	4 208	1 323	**13 045**	94%	**4%**
UAA win with population loss	0	0	883	0	0	0	**883**	6%	**1%**
TOTAL UAA win	0	0	883	7 514	4 208	1 323	**13 928**		
TOTAL of UAA win in %	0%	0%	6%	54%	30%	9%	100%		
% of UAA loss during the period	0%	0%	0%	0%	0%	0%	0%		
UAA win in "Rural areas"	**1 662**							12%	0%
UAA win in "Urban areas"	**12 266**							88%	0%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 14: UAA balance related to population density and population evolution by LAU2 in Malopolskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						TOTAL UAA balance	% balance	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
> +15%	0	0	0	6 735	0	1 323	**8 058**	-18%	**236%**
12.5% to 15%	0	0	0	0	0	0	**0**	0%	**-**
10 to 12.5 %	0	0	0	0	0	-1 536	**-1 536**	3%	**-24%**
7.5 to 10%	0	0	0	-1 046	-487	-555	**-2 088**	5%	**-12%**
5.0 to 7.5%	0	0	-181	-247	-654	-1 119	**-2 201**	5%	**-6%**
2.5% to 5.0%	0	0	-1 653	-2 853	-1 254	-3 105	**-8 865**	20%	**-13%**
0 to 2.5%	0	0	-784	-2 403	1 216	-15 645	**-17 616**	40%	**-10%**
-2,5 - 0%	0	-1 187	-1 687	-2 582	-1 082	-6 850	**-13 388**	30%	**-16%**
-5,0 - -2,5%	0	0	-1 374	0	0	-2 566	**-3 940**	9%	**-13%**
-7,5 - -5%	0	-1 457	-630	0	0	-820	**-2 907**	7%	**-19%**
-10% - -7,5%	0	0	0	0	0	0	**0**	0%	**-**
-12,5% - -10%	0	0	0	0	0	0	**0**	0%	**-**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**-**
< -15%	0	0	0	0	0	0	**0**	0%	**-**
UAA balance with population win	0	0	-2 618	186	-1 179	-20 637	**-24 248**	55%	**-8%**
UAA balance with population loss	0	-2 644	-3 691	-2 582	-1 082	-10 236	**-20 235**	45%	**-16%**

TOTAL UAA balance	0	-2 644	-6 309	-2 396	-2 261	-30 873	**-44 483**
TOTAL in %	0%	6%	14%	5%	5%	69%	100%
Evolution during the period	**-**	**-18%**	**-8%**	**-2%**	**-3%**	**-21%**	**-10%**

UAA balance in "Rural areas"	**-18 084**
UAA balance in "Urban areas"	**-26 399**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 15: UAA balance related to population density and population evolution by LAU2 in Malopolskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%				-		39%	**236%**
12.5% to 15%							
10% to 12.5 %						-24%	**-24%**
7.5% to 10%				-9%	-14%	-18%	**-12%**
5.0% to 7.5%			-6%	-2%	-5%	-11%	**-6%**
2.5% to 5.0%			-13%	-10%	-13%	-17%	**-13%**
0% to 2.5%			-4%	-5%	3%	-22%	**-10%**
-2.5 to 0%		-22%	-6%	-9%	-14%	-46%	**-16%**
-5.0% to 2.5%			-8%			-18%	**-13%**
-7.5% to -5.0%		-16%	-15%			-37%	**-19%**
-10% to -7.5%							
-12.5% to -10%							
-15% to -12.5%							
Less than -15%							
UAA balance with population win	-	-	-7%	0%	-2%	-18%	**-8%**
UAA balance with population loss	-	-18%	-8%	-9%	-14%	-33%	**-16%**

Evolution during the period	-	-18%	-8%	-2%	-3%	-21%	**-10%**

UAA balance in "Rural areas"	**-8,1%**
UAA balance in "Urban areas"	**-11,9%**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 16: UAA loss related to population density and population evolution by LAU2 in Malopolskie (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	**Rural areas**	**Urban areas**	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	-15 316	**-15 316**	26,2%
High	UAA loss over 300 ha/year or over 1.2%/year	-16 124	-22 033	**-38 157**	65,3%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-2 798	-1 038	**-3 836**	6,6%
Low	UAA loss under 100 ha/year and under 0.6%/year	-824	-278	**-1 102**	1,9%
TOTAL in ha		**-19 746**	**-38 665**	**-58 411**	100%
TOTAL in %		33,8%	66,2%	100%	

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 17: UAA 2002 related to population density and population evolution by LAU2 in Malopolskie (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	UAA 2002 in rural areas	UAA 2002 in urban areas	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	12 746	**12 746**	3,5%
High	UAA loss over 300 ha/year or over 1.2%/year	103 188	119 211	**222 399**	61,9%
Medium	UAA loss over 100 ha/year or over 0.6%/year	49 478	16 057	**65 535**	18,2%
Low	UAA loss under 100 ha/year and under 0.6%/year	35 318	23 550	**58 868**	16,4%
TOTAL in ha		**187 984**	**171 564**	**359 548**	**100%**
TOTAL in %		60,0%	40,0%		100%
TOTAL of UAA 2002		46,8%	42,7%		89,6%

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 18: Farmland abandonment by LAU2 in Malopolskie (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	Land abandoned	% of UAA 1996	UAA 2002 in LAU2 with LA	% of UAA 2002
Very high	UAA loss over 500 ha/year or over 7.5%/year	0	0,0%	0	0,0%
High	UAA loss over 300 ha/year or over 1.2%/year	16 124	3,6%	103 188	25,7%
Medium	UAA loss over 100 ha/year or over 0.6%/year	2 798	0,6%	49 478	12,3%
TOTAL in ha		**18 922**	**4,2%**	**152 666**	**38,0%**

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 19: UAA 1996 by LAU2 in Warminsko-Mazurskie

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	0	0	0	0	**0**	0%
12.5% to 15%	0	0	0	0	0	0	**0**	0%
10% to 12.5 %	0	0	0	0	0	0	**0**	0%
7.5% to 10%	0	10 638	0	0	0	0	**10 638**	1%
5.0% to 7.5%	0	0	0	0	0	0	**0**	0%
2.5% to 5.0%	0	0	8 048	0	0	42 757	**50 805**	4%
0% to 2.5%	0	40 546	47 082	9 319	19 053	12 605	**128 605**	11%
-2.5 to 0%	0	86 000	108 266	64 686	0	47 002	**305 954**	25%
-5.0% to 2.5%	0	83 076	156 633	29 173	51 860	27 828	**348 570**	28%
-7.5% to -5.0%	18 215	51 632	139 025	16 838	40 127	34 654	**300 491**	25%
-10% to -7.5%	0	4 830	44 820	0	0	21 918	**71 568**	6%
-12.5% to -10%	0	8 057	0	0	0	0	**8 057**	1%
-15% to -12.5%	0	0	0	0	0	0	**0**	0%
Less than -15%	0	0	0	0	0	0	**0**	0%
UAA 1996 with population increase	0	51 184	55 130	9 319	19 053	55 362	**190 048**	16%
UAA 1996 with population loss	18 215	233 595	448 744	110 697	91 987	131 402	**1 034 640**	84%
TOTAL UAA 1996	18 215	284 779	503 874	120 016	111 040	186 764	**1 224 688**	
TOTAL in %	1%	23%	41%	10%	9%	15%	**100%**	

UAA 1996 in "Rural areas"	**926 884**
UAA 1996 in "Urban areas"	**297 804**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 20: UAA 2002 by LAU2 in Warminsko-Mazurskie

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	5 326	4 434	6 134	0	0	**15 894**	1%
12.5% to 15%	0	0	0	0	0	0	**0**	0%
10% to 12.5 %	0	0	0	0	0	0	**0**	0%
7.5% to 10%	0	8 251	0	0	0	0	**8 251**	1%
5.0% to 7.5%	0	0	0	0	0	0	**0**	0%
2.5% to 5.0%	0	0	10 799	0	0	28 841	**39 640**	3%
0% to 2.5%	0	38 625	44 985	9 222	16 864	10 273	**119 969**	10%
-2.5 to 0%	0	89 881	94 779	65 336	0	41 110	**291 106**	25%
-5.0% to 2.5%	0	78 347	147 196	23 357	45 863	25 380	**320 143**	28%
-7.5% to -5.0%	15 887	51 405	127 925	13 982	25 884	37 061	**272 144**	24%
-10% to -7.5%	0	2 729	46 152	0	0	27 725	**76 606**	7%
-12.5% to -10%	0	6 079	0	0	0	0	**6 079**	1%
-15% to -12.5%	0	0	0	0	0	0	**0**	0%
Less than -15%	0	0	0	0	0	0	**0**	0%
UAA 2002 with population increase	0	52 202	60 218	15 356	16 864	39 114	**183 754**	16%
UAA 2002 with population loss	15 887	228 441	416 052	102 675	71 747	131 276	**966 078**	84%
TOTAL UAA 2002	15 887	280 643	476 270	118 031	88 611	170 390	**1 149 832**	
TOTAL in %	1%	24%	41%	10%	8%	15%	**100%**	

UAA 2002 in "Rural areas"	**874 937**
UAA 2002 in "Urban areas"	**274 895**

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 21: UAA loss related to population density and population evolution by LAU2 in Warminsko-Mazurskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA loss	% loss	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	0	0	0	0	0	**0**	0%	**-**
12.5% to 15%	0	0	0	0	0	0	**0**	0%	**-**
10 to 12.5 %	0	0	0	0	0	0	**0**	0%	**-**
7.5 to 10%	0	-2 387	0	0	0	0	**-2 387**	2%	**-22%**
5.0 to 7.5%	0	0	0	0	0	0	**0**	0%	**-**
2.5% to 5.0%	0	0	0	0	0	-13 916	**-13 916**	10%	**-27%**
0 to 2.5%	0	-2 442	-2 170	-97	-3 066	-2 332	**-10 107**	8%	**-8%**
-2,5 - 0%	0	-3 765	-13 765	-3 239	0	-6 498	**-27 267**	21%	**-9%**
-5,0 - -2,5%	0	-7 713	-13 004	-5 816	-5 997	-3 233	**-35 763**	27%	**-10%**
-7,5 - -5%	-2 328	-2 371	-14 761	-2 856	-14 324	-143	**-36 783**	28%	**-12%**
-10% - -7,5%	0	-2 101	-2 474	0	0	0	**-4 575**	3%	**-6%**
-12,5% - -10%	0	-1 978	0	0	0	0	**-1 978**	1%	**-25%**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**-**
< -15%	0	0	0	0	0	0	**0**	0%	**-**
UAA loss with population increase	0	-4 829	-2 170	-97	-3 066	-16 248	**-26 410**	20%	**-14%**
UAA loss with population loss	-2 328	-17 928	-44 004	-11 911	-20 321	-9 874	**-106 366**	80%	**-10%**
TOTAL UAA loss	-2 328	-22 757	-46 174	-12 008	-23 387	-26 122	**-132 776**		
TOTAL of UAA loss in %	2%	17%	35%	9%	18%	20%	100%		
% of UAA loss during the period	**-**	**-153%**	**-56%**	**-10%**	**-30%**	**-18%**	**-30%**		
UAA loss in "Rural areas"	**-83 267**							63%	-9%
UAA loss in "Urban areas"	**-49 509**							37%	-17%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 22: UAA win related to population density and population evolution by LAU2 in Warminsko-Mazurskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total UAA win	% increase	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
More than +15%	0	5 326	4 434	6 134	0	0	**15 894**	27%	**-**
12.5% to 15%	0	0	0	0	0	0	**0**	0%	**-**
10 to 12.5 %	0	0	0	0	0	0	**0**	0%	**-**
7.5 to 10%	0	0	0	0	0	0	**0**	0%	**0%**
5.0 to 7.5%	0	0	0	0	0	0	**0**	0%	**-**
2.5% to 5.0%	0	0	2 751	0	0	0	**2 751**	5%	**5%**
0 to 2.5%	0	521	73	0	877	0	**1 471**	3%	**1%**
-2,5 - 0%	0	7 646	278	3 889	0	606	**12 419**	21%	**4%**
-5,0 - -2,5%	0	2 984	3 567	0	0	785	**7 336**	13%	**2%**
-7,5 - -5%	0	2 144	3 661	0	81	2 550	**8 436**	15%	**3%**
-10% - -7,5%	0	0	3 806	0	0	5 807	**9 613**	17%	**13%**
-12,5% - -10%	0	0	0	0	0	0	**0**	0%	**0%**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**-**
< -15%	0	0	0	0	0	0	**0**	0%	**-**
UAA win with population increase	0	5 847	7 258	6 134	877	0	**20 116**	35%	**11%**
UAA win with population loss	0	12 774	11 312	3 889	81	9 748	**37 804**	65%	**4%**
TOTAL UAA win	0	18 621	18 570	10 023	958	9 748	**57 920**		
TOTAL of UAA win in %	0%	32%	32%	17%	2%	17%	100%		
% of UAA loss during the period	0%	0%	0%	1%	0%	1%	0%		
UAA win in "Rural areas"	**31 320**							54%	3%
UAA win in "Urban areas"	**26 600**							46%	9%

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 23: UAA balance related to population density and population evolution by LAU2 in Warminsko-Mazursky (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						TOTAL UAA	% balance	Evolution 1996-2002
	0-20	20-50	50-100	100-150	150-200	200 et +			
Over +15%	0	5 326	4 434	6 134	0	0	**15 894**	-21%	**-**
12.5% to 15%	0	0	0	0	0	0	**0**	0%	**-**
10 to 12.5 %	0	0	0	0	0	0	**0**	0%	**-**
7.5 to 10%	0	-2 387	0	0	0	0	**-2 387**	3%	**-22%**
5.0 to 7.5%	0	0	0	0	0	0	**0**	0%	**-**
2.5% to 5.0%	0	0	2 751	0	0	-13 916	**-11 165**	15%	**-22%**
0 to 2.5%	0	-1 921	-2 097	-97	-2 189	-2 332	**-8 636**	12%	**-7%**
-2,5 - 0%	0	3 881	-13 487	650	0	-5 892	**-14 848**	20%	**-5%**
-5,0 - -2,5%	0	-4 729	-9 437	-5 816	-5 997	-2 448	**-28 427**	38%	**-8%**
-7,5 - -5%	-2 328	-227	-11 100	-2 856	-14 243	2 407	**-28 347**	38%	**-9%**
-10% - -7,5%	0	-2 101	1 332	0	0	5 807	**5 038**	-7%	**7%**
-12,5% - -10%	0	-1 978	0	0	0	0	**-1 978**	3%	**-25%**
-15% - -12,5%	0	0	0	0	0	0	**0**	0%	**-**
< -15%	0	0	0	0	0	0	**0**	0%	**-**
UAA balance with population win	0	1 018	5 088	6 037	-2 189	-16 248	**-6 294**	8%	**-3%**
UAA balance with population loss	-2 328	-5 154	-32 692	-8 022	-20 240	-126	**-68 562**	92%	**-7%**
TOTAL UAA balance	-2 328	-4 136	-27 604	-1 985	-22 429	-16 374	**-74 856**		
TOTAL in %	3%	6%	37%	3%	30%	22%	100%		
Evolution during the period	**-1%**	**0%**	**0%**	**0%**	**-3%**	**-1%**	**0%**		
UAA balance in "Rural areas"	**-51 947**								
UAA balance in "Urban areas"	**-22 909**								

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 24: UAA balance related to population density and population evolution by LAU2 in Warminsko-Mazurskie (1996-2002)

Population evolution (1996-2002)	Population density in 2002 (inh. per km2)						Total balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
Over +15%							
12.5% to 15%							
10% to 12.5 %							
7.5% to 10%		-22%					**-22%**
5.0% to 7.5%							
2.5% to 5.0%						-33%	**-22%**
0% to 2.5%		-5%	-4%	-1%	-11%	-19%	**-7%**
-2.5 to 0%		5%	-12%	1%		-13%	**-5%**
-5.0% to 2.5%		-6%	-6%	-20%	-12%	-9%	**-8%**
-7.5% to -5.0%	-13%	0%	-8%	-17%	-35%	7%	**-9%**
-10% to -7.5%		-43%	3%				**7%**
-12.5% to -10%		-25%					**-25%**
-15% to -12.5%							
Less than -15%							
UAA balance with population win	-	2%	9%	65%	-11%	-29%	**-3%**
UAA balance with population loss	-13%	-2%	-7%	-7%	-22%	0%	**-7%**
Evolution during the period	-13%	-1%	-5%	-2%	-20%	-9%	**-6%**
UAA balance in "Rural areas"	**-5,6%**						
UAA balance in "Urban areas"	**-7,7%**						

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 25: UAA loss related to population density and population evolution in Warminsko-Mazurskie (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	**Rural areas**	**Urban areas**	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	-17 816	-36 444	**-54 260**	40,5%
High	UAA loss over 300 ha/year or over 1.2%/year	-59 618	-12 227	**-71 845**	53,6%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-5 485	0	**-5 485**	4,1%
Low	UAA loss under 100 ha/year and under 0.6%/year	-1 695	-838	**-2 533**	1,9%
TOTAL in ha		**-84 614**	**-49 509**	**-134 123**	100%
TOTAL in %		63,1%	36,9%	100%	

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 26: UAA 2002 related to population density and population evolution in Warminsko-Mazurskie (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	UAA 2002 in rural areas	UAA 2002 in urban areas	**TOTAL in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	59 295	68 752	**128 047**	16,8%
High	UAA loss over 300 ha/year or over 1.2%/year	329 829	71 163	**400 992**	52,8%
Medium	UAA loss over 100 ha/year or over 0.6%/year	108 417	0	**108 417**	14,3%
Low	UAA loss under 100 ha/year and under 0.6%/year	86 206	36 324	**122 530**	16,1%
TOTAL in ha		**583 747**	**176 239**	**759 986**	**100%**
TOTAL in %		70,4%	29,6%		100%
TOTAL of UAA 2002		50,8%	15,3%		66,1%

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

Table 27: Farmland abandonment by LAU2 in Warminsko-Mazursky (1996-2002)

UAA loss level (1996-2002)	Thresholds (by LAU2)	Land abandoned	% of UAA 1996	UAA 2002	% of UAA 2002
Very high	UAA loss over 500 ha/year or over 7.5%/year	17 816	1,5%	59 295	5,2%
High	UAA loss over 300 ha/year or over 1.2%/year	59 618	4,9%	329 829	28,7%
Medium	UAA loss over 100 ha/year or over 0.6%/year	5 485	0,4%	108 417	9,4%
TOTAL in ha		**82 919**	**6,8%**	**497 541**	**43,3%**

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1996 and 2002
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1996 and 2002

Sources: Central Statistical Office (GUS-Poland) 1996 & 2002. FSS Census 1996-2002
Made by Solagro, September 2007.

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Analysis of Farmland Abandonment and the Extent and Location of Agricultural Areas that are Actually Abandoned or are in Risk to be Abandoned

APPENDIX C: Maps and tables for Spain

Framework contract n° 380641 F3ED
on the provision of expertise in the Field of Agri-Environment for the JRC

2008

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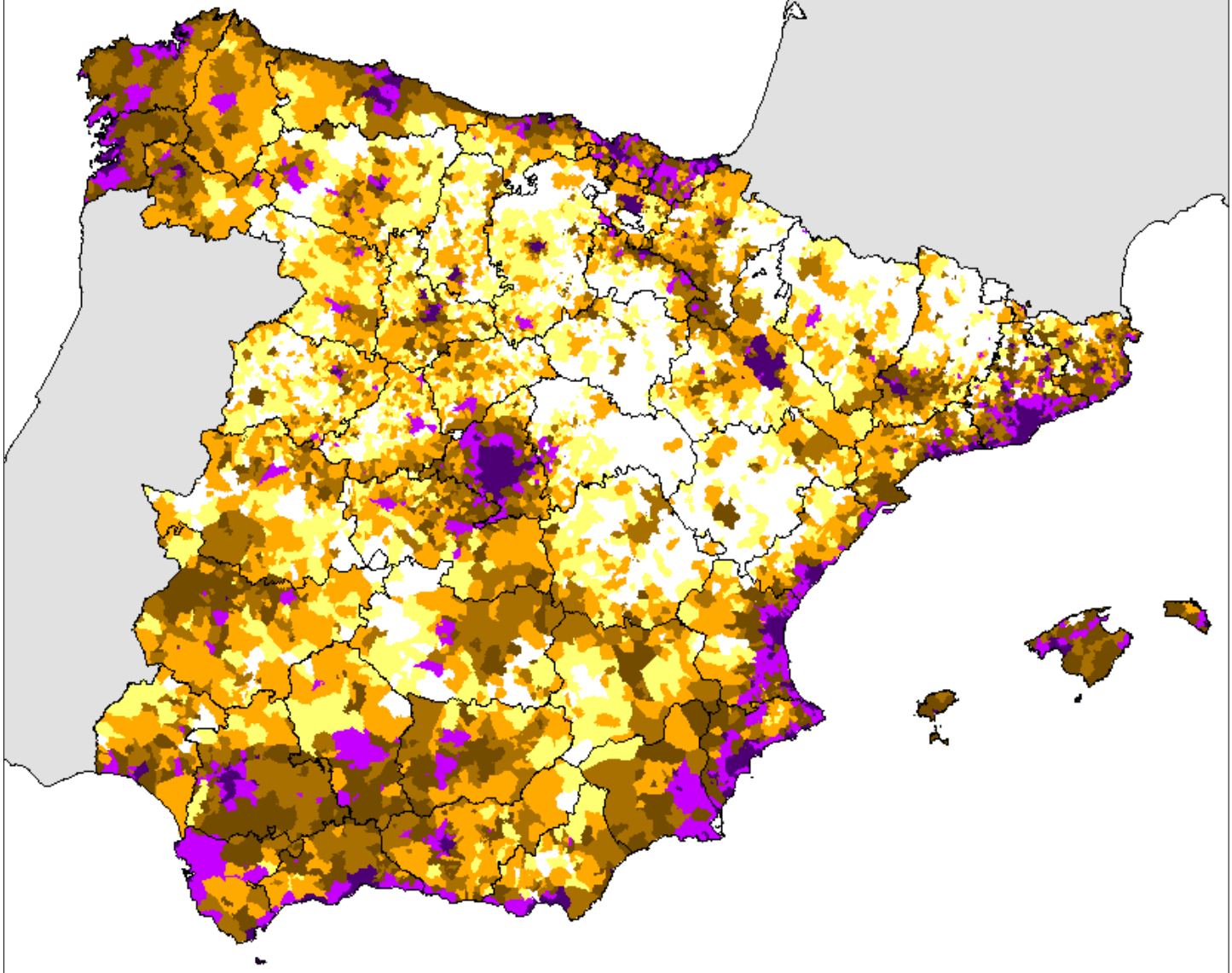
Map 1: Population density by LAU2 in Spain in 2001

Administrative scale : LAU 2



Legend (inh./km²)

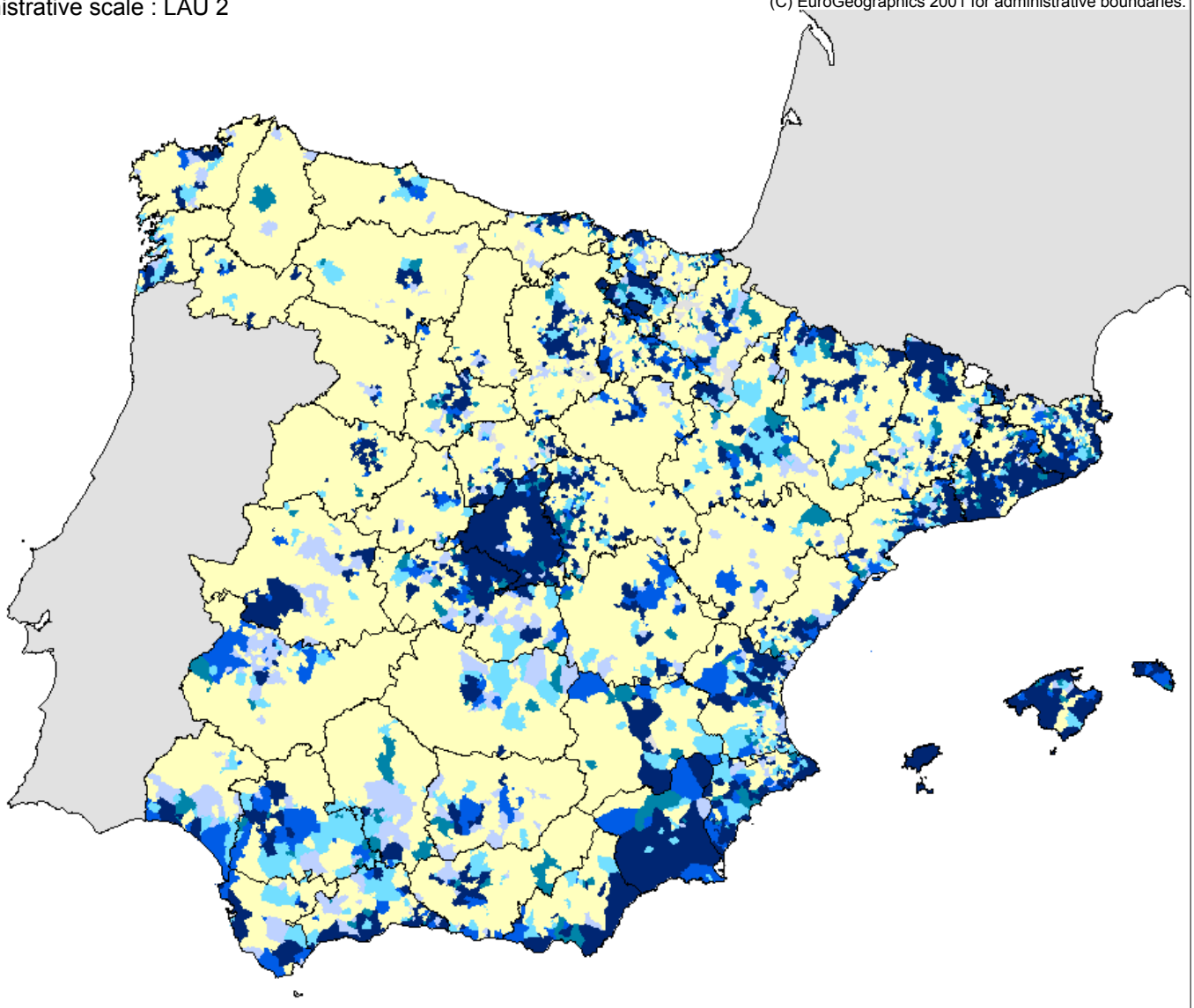
- < 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 150
- 150 - 500
- 500 and more

Source: Instituto Nacional de Estadística (Population census 2001).

Map produced by SOLAGRO, May 2007.

Map 2: Population evolution by LAU2 in Spain (1991-2001)

Administrative scale : LAU 2



Legend

Population evolution (1991-2001)

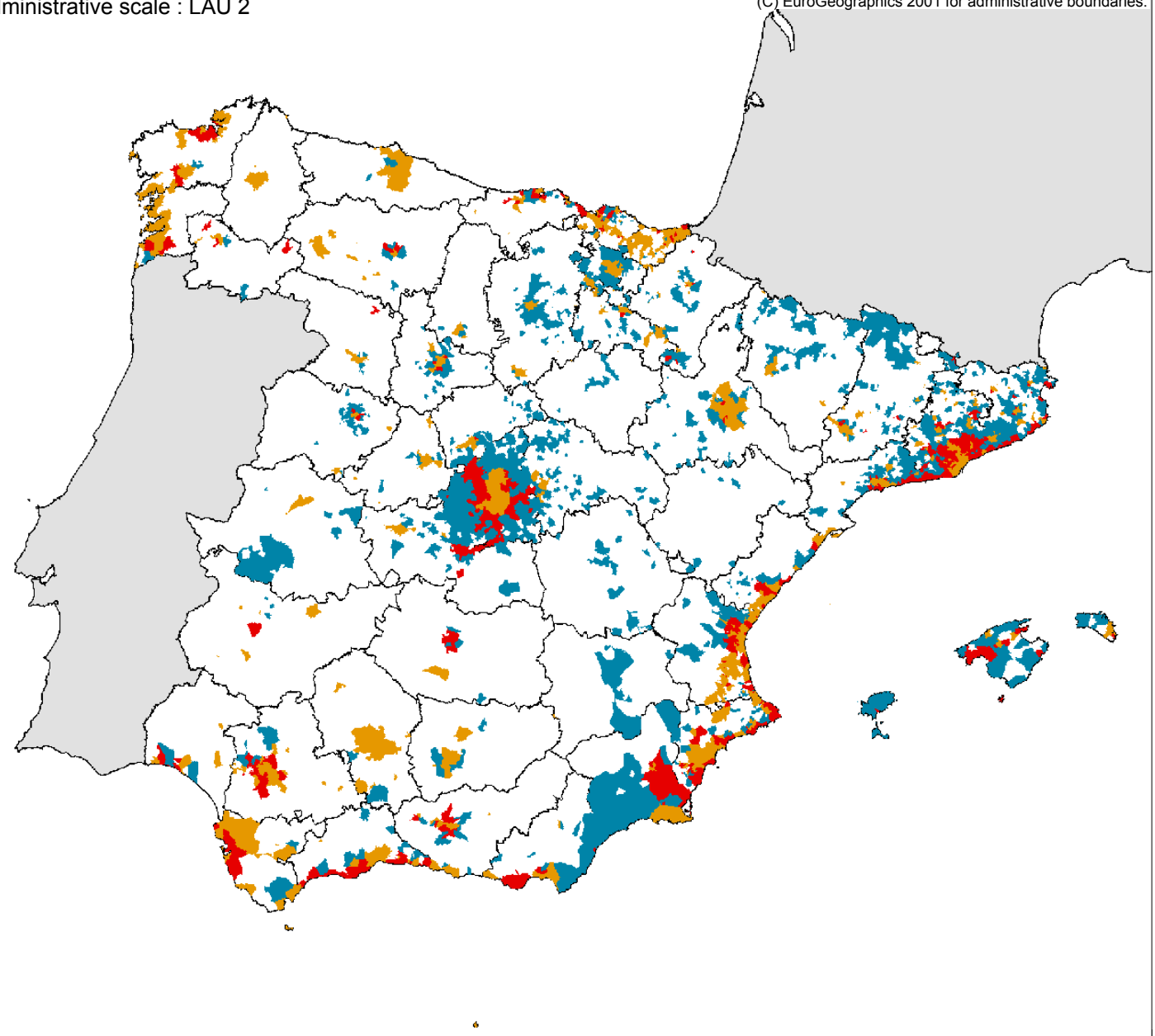
- Population decrease
- Increase under 2,5%
- 2,5% to 5%
- 5% to 7,5%
- 7,5% to 10%
- >10%

Source: Instituto Nacional de Estadística (Population census 2001)

Map produced by SOLAGRO, May 2007.

Map 3: Urban and rural areas by LAU2 in Spain in 2001

Administrative scale : LAU 2



Sources: Instituto Nacional de Estadística (Population censuses 1991&-2001)

Legend

Urban areas

- Population density over 150 inh/km² in 2001
- Population increase over 10% (1991- 2001)
- Population increase >10% and population over 150 inh/km² in 2001

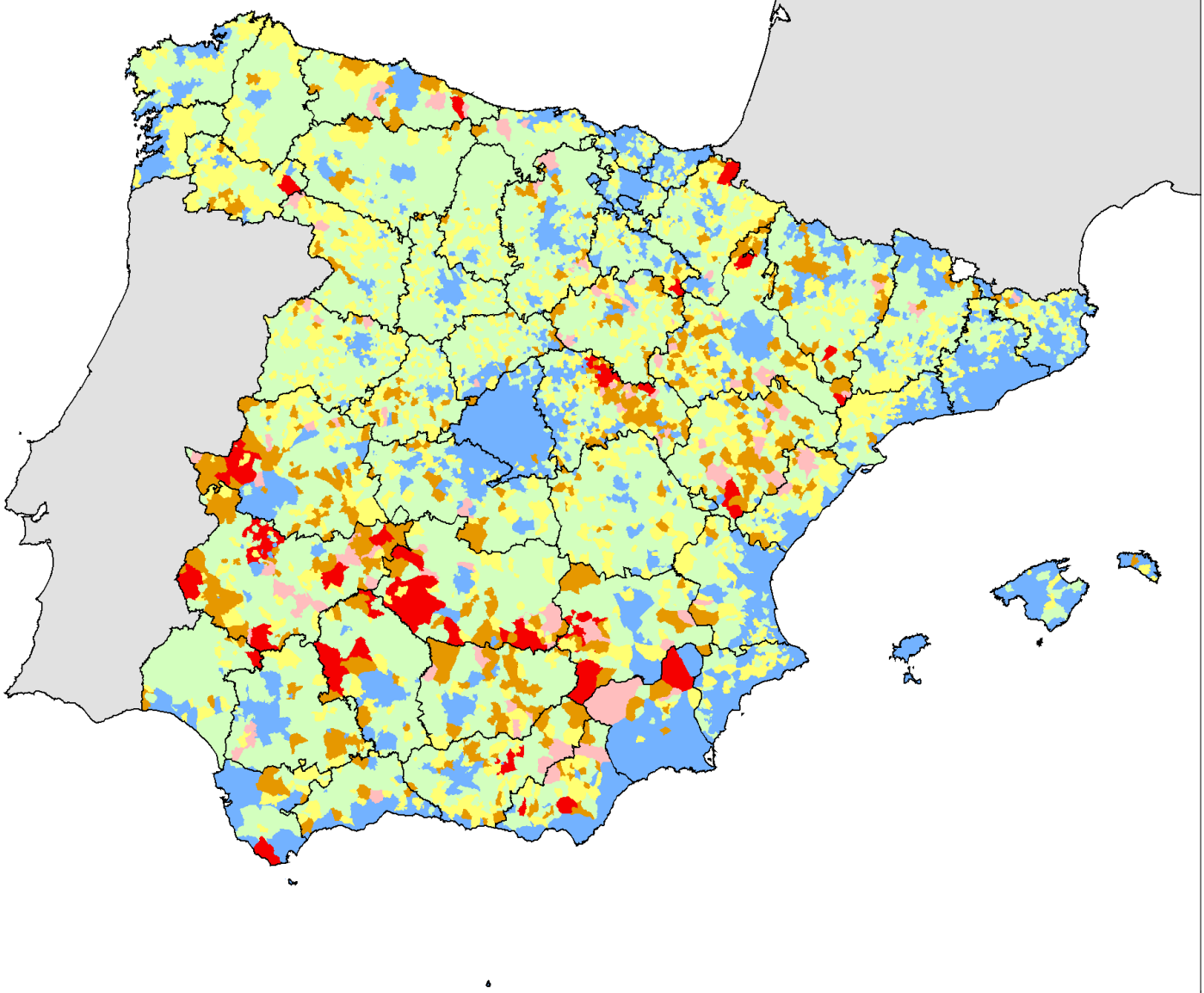
Rural areas

- Population density under 150inh./km² and pop. increase <10%

Map produced by SOLAGRO, May 2007.

Map 4: UAA evolution by LAU2 in rural areas in Spain (1989-1999)

Administrative scale : LAU 2



Legend

UAA loss in rural areas
- More than 5 000 Ha
- 5 000 to 3 000 Ha
- 3 000 to 1 000 Ha
- Less tha 1 000 Ha

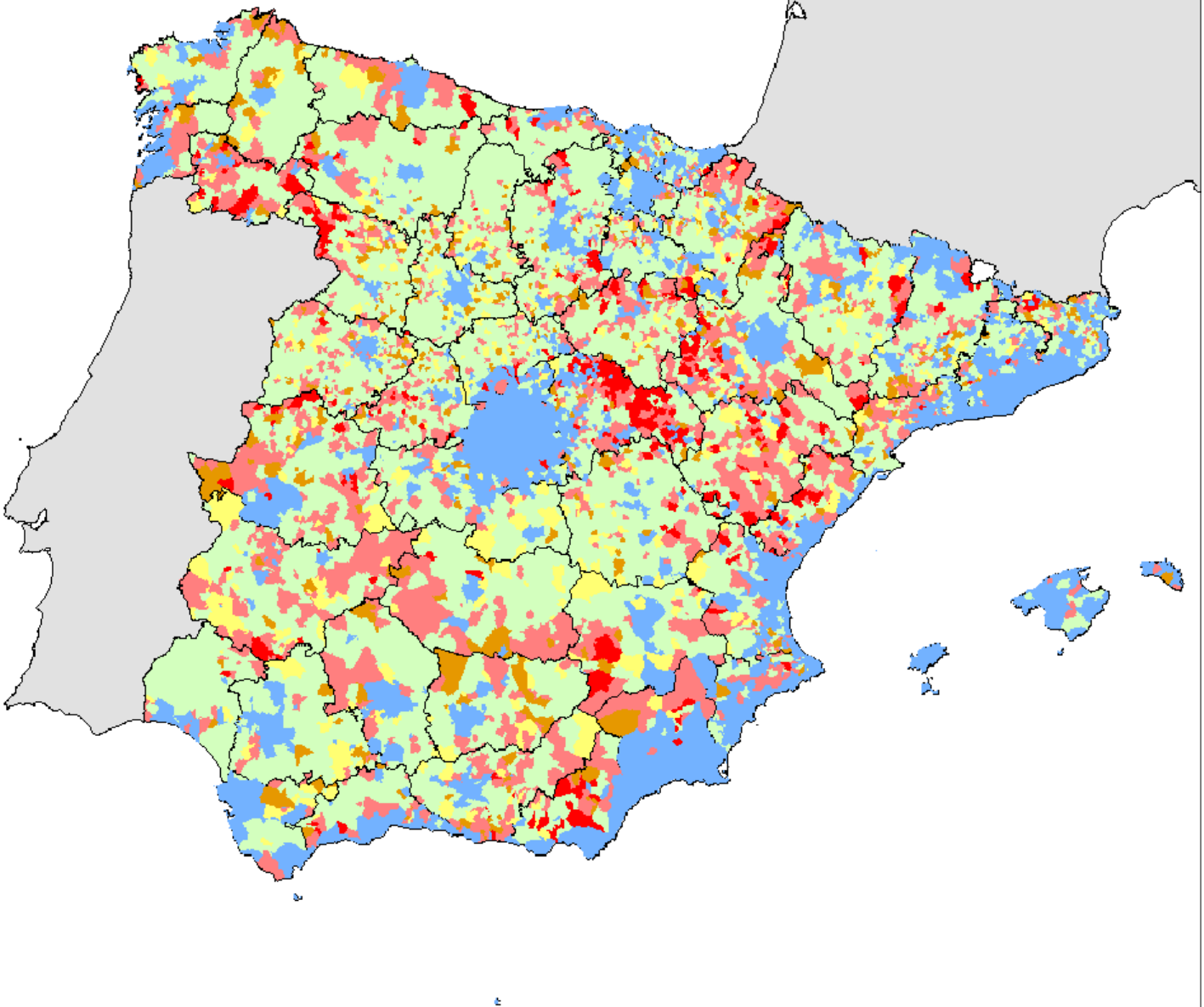
- Rural areas with UAA increase
- Urban areas

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001).

Map produced by SOLAGRO, May 2007.

Map 5: UAA evolution by LAU2 in rural areas in Spain (1989-1999)

Administrative scale : LAU 2



Legend

UAA evolution (in %)

- -100% to -50%
- -50% to -10%
- -10% to -5%
- -5% to 0%

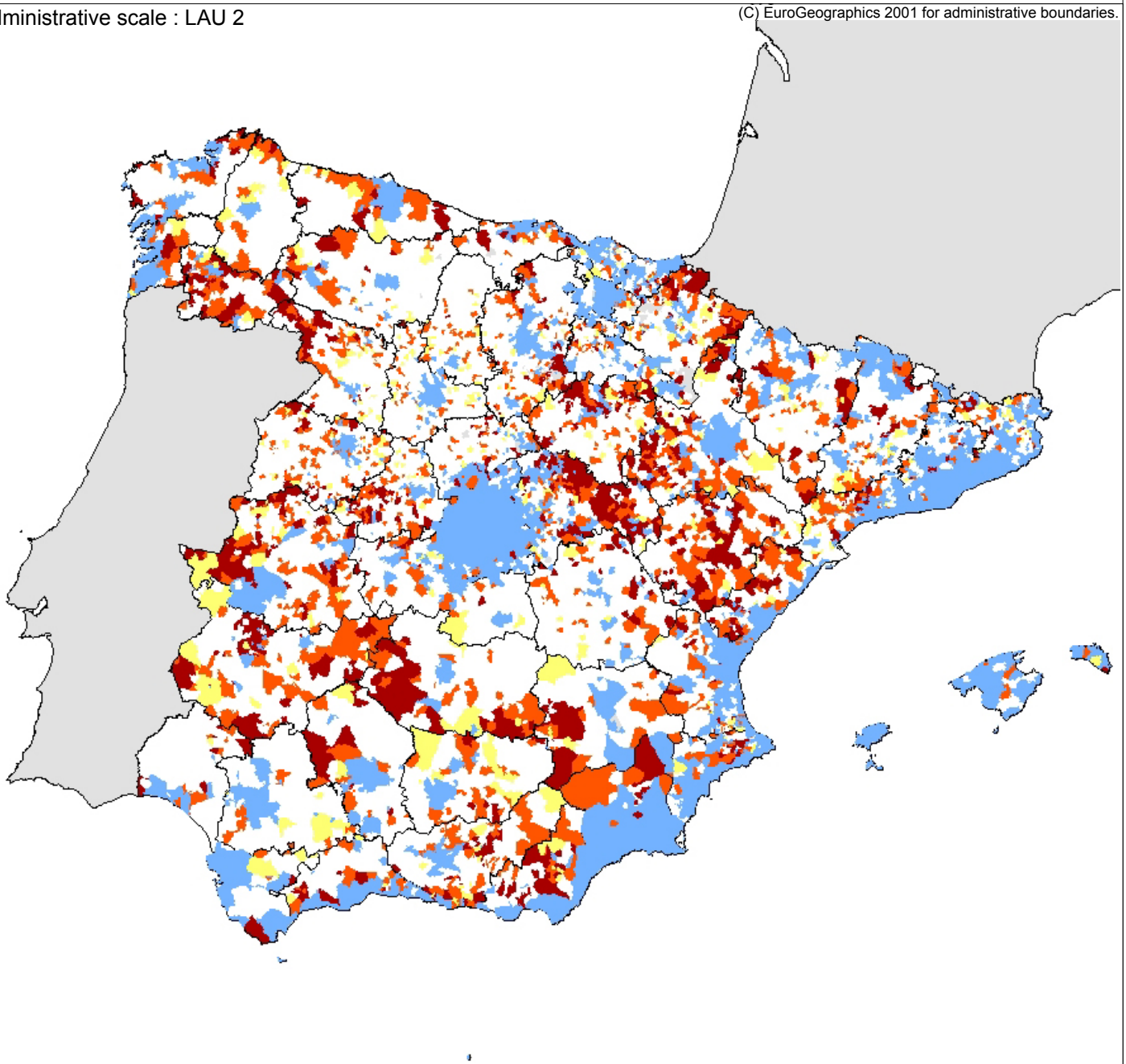
- Rural areas with UAA increase
- Urban areas

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001).

Map produced by SOLAGRO, May 2007.

Map 6: UAA decrease* level by LAU2 in rural areas in Spain (1989-1999)

Administrative scale : LAU 2



Legend

UAA loss level

- Very high (>500ha/year or >7.5%/year)
- High (>300 Ha/year or >1.2%/year)
- Medium (>100 Ha/year or >0.6%/year)
- Low UAA loss level or UAA increase
- Urban areas

(*) UAA decrease between 1989 and 1999.

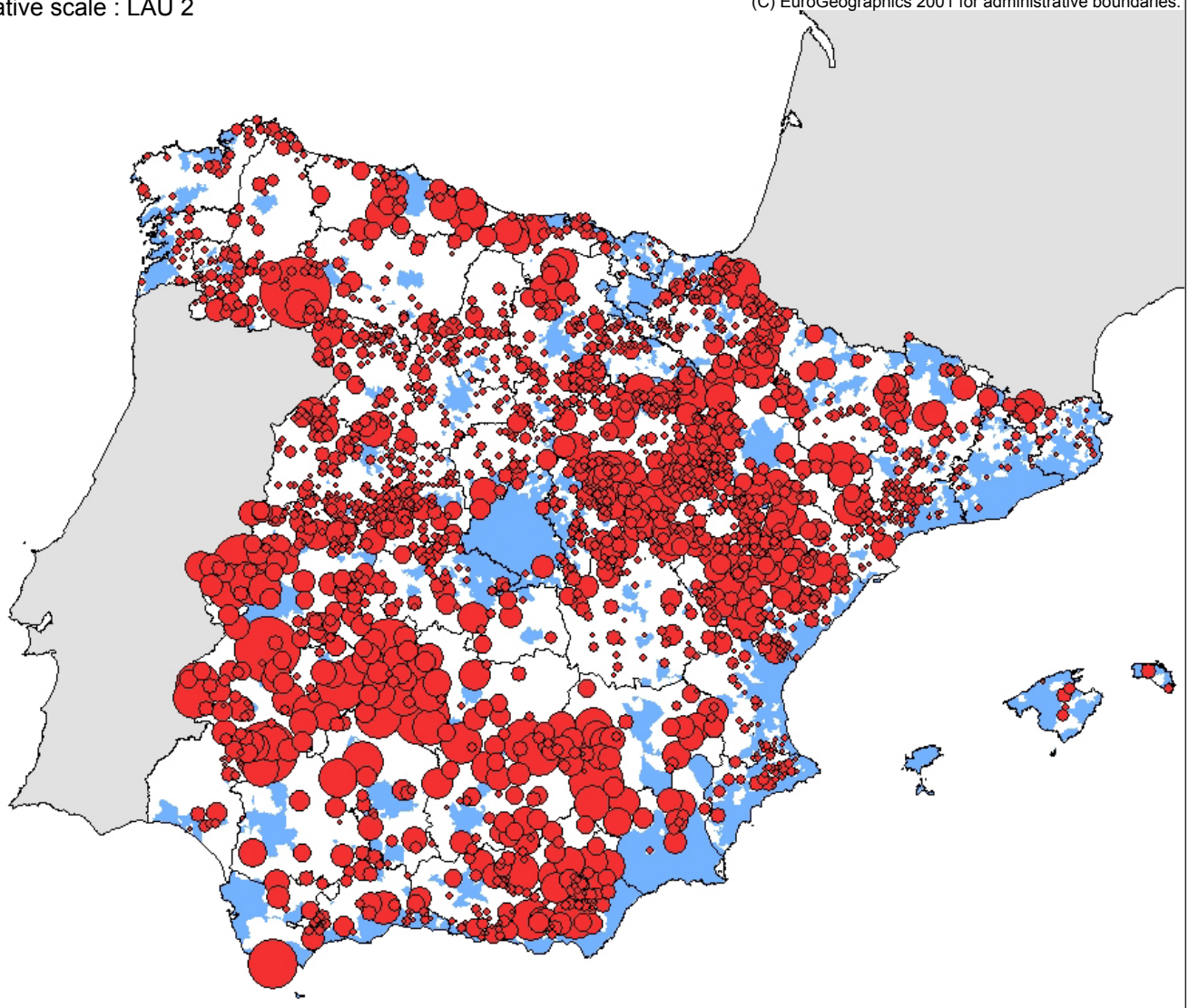
Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1991 and 2001.

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001).

Map produced by SOLAGRO, May 2007.

Map 7: UAA decrease in rural areas with farmland abandonment* by LAU2 in Spain

Administrative scale : LAU 2



Legend

UAA decrease (in Ha)

10 000

Urban areas

(*) LAU1 with an UAA decrease over 100 ha/year or 0.6%/year.

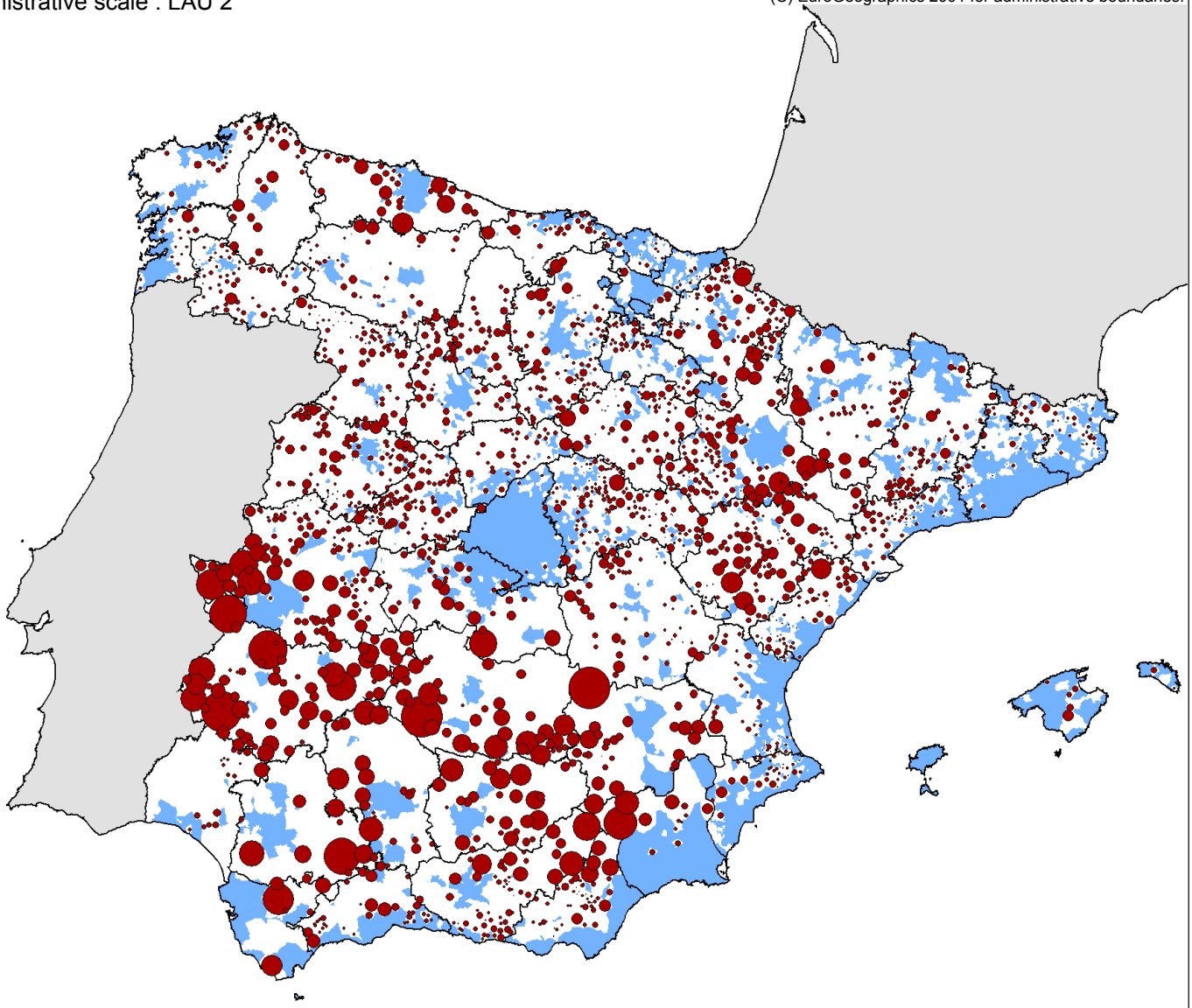
Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1991 and 2001.

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001).

Map produced by SOLAGRO, May 2007.

Map 8: UAA1999 in rural areas with farmland abandonment* by LAU2 in Spain

Administrative scale : LAU 2



(*) LAU1 with an UAA decrease over 100 ha/year or 0.6%/year.

Legend

UAA 1999 (in Ha)

- 30 000
- Urban areas

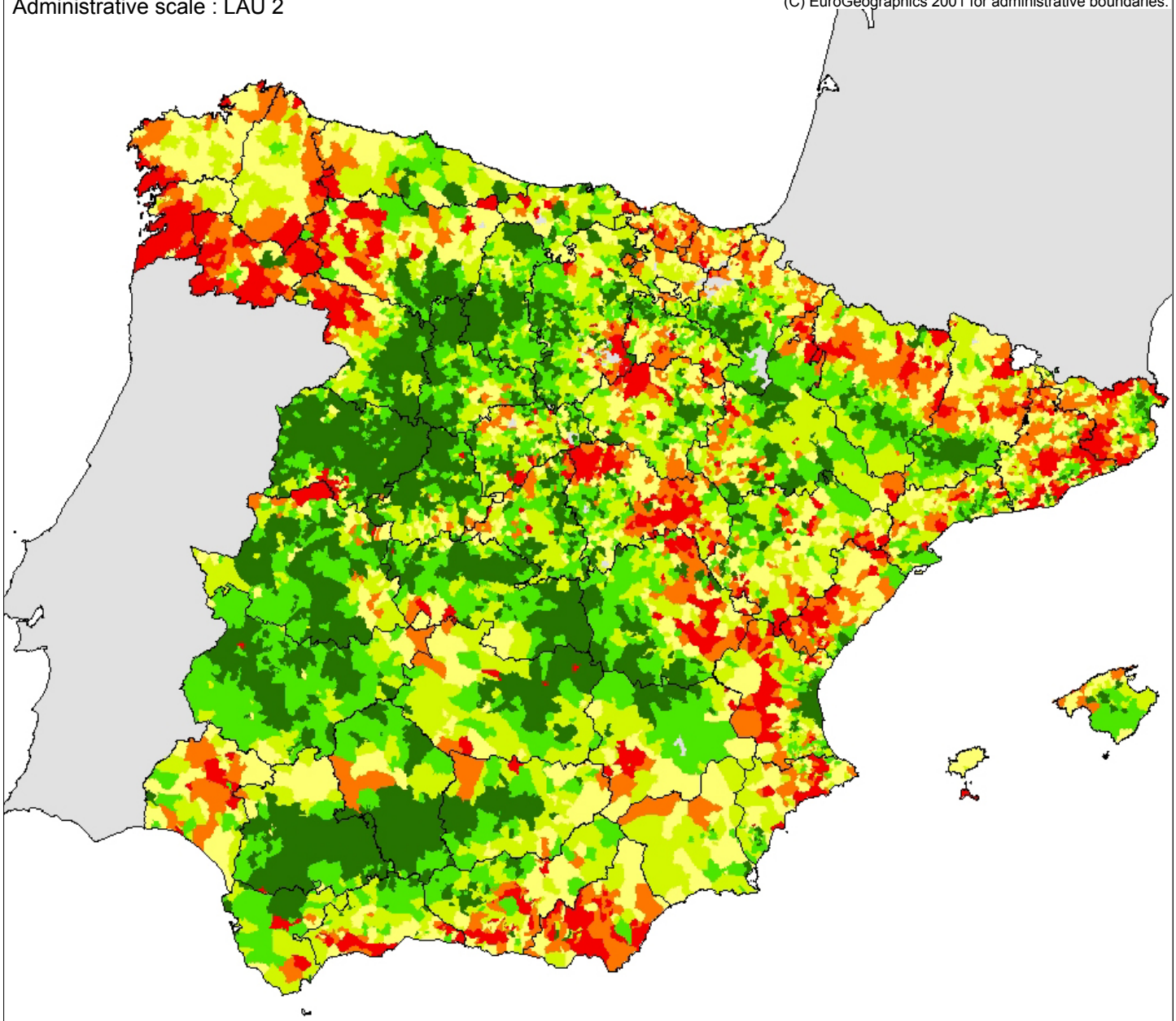
Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1991 and 2001.

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001)

Map produced by SOLAGRO, May 2007.

Map 9: UAA percentage in total areas by LAU2 in Spain in 1999

Administrative scale : LAU 2



Legend

UAA in %

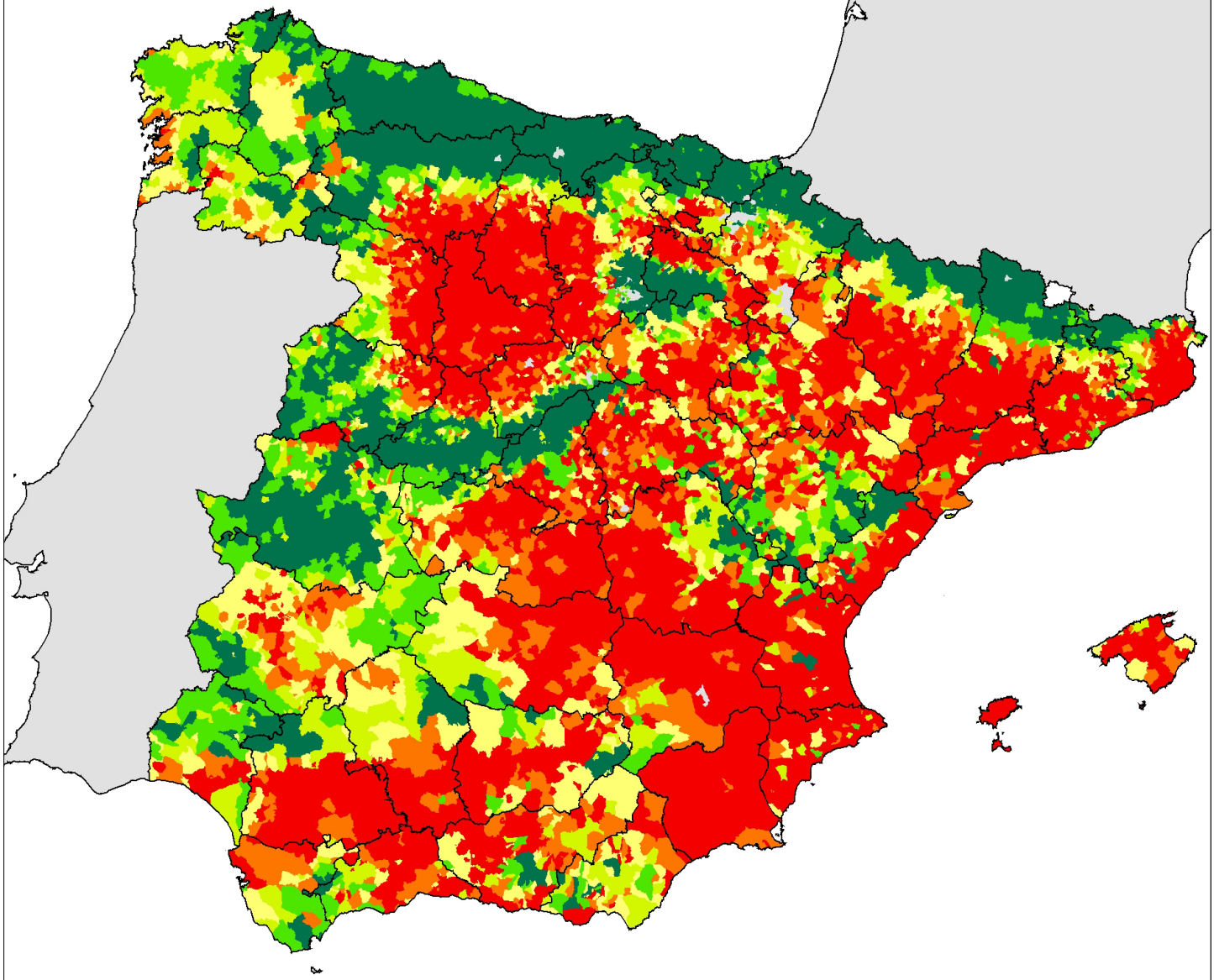
- Under 20%
- 20% to 35%
- 35% to 55%
- 55% to 75%
- 75% to 90%
- Over 90%

Sources: FSS censuses, 1989 & 1999.

Map produced by SOLAGRO, May 2007.

Map 10: Permanent pastures percentage in the UAA by LAU2 in Spain in 1999

Administrative scale : LAU 2



Legend

Permanent pastures

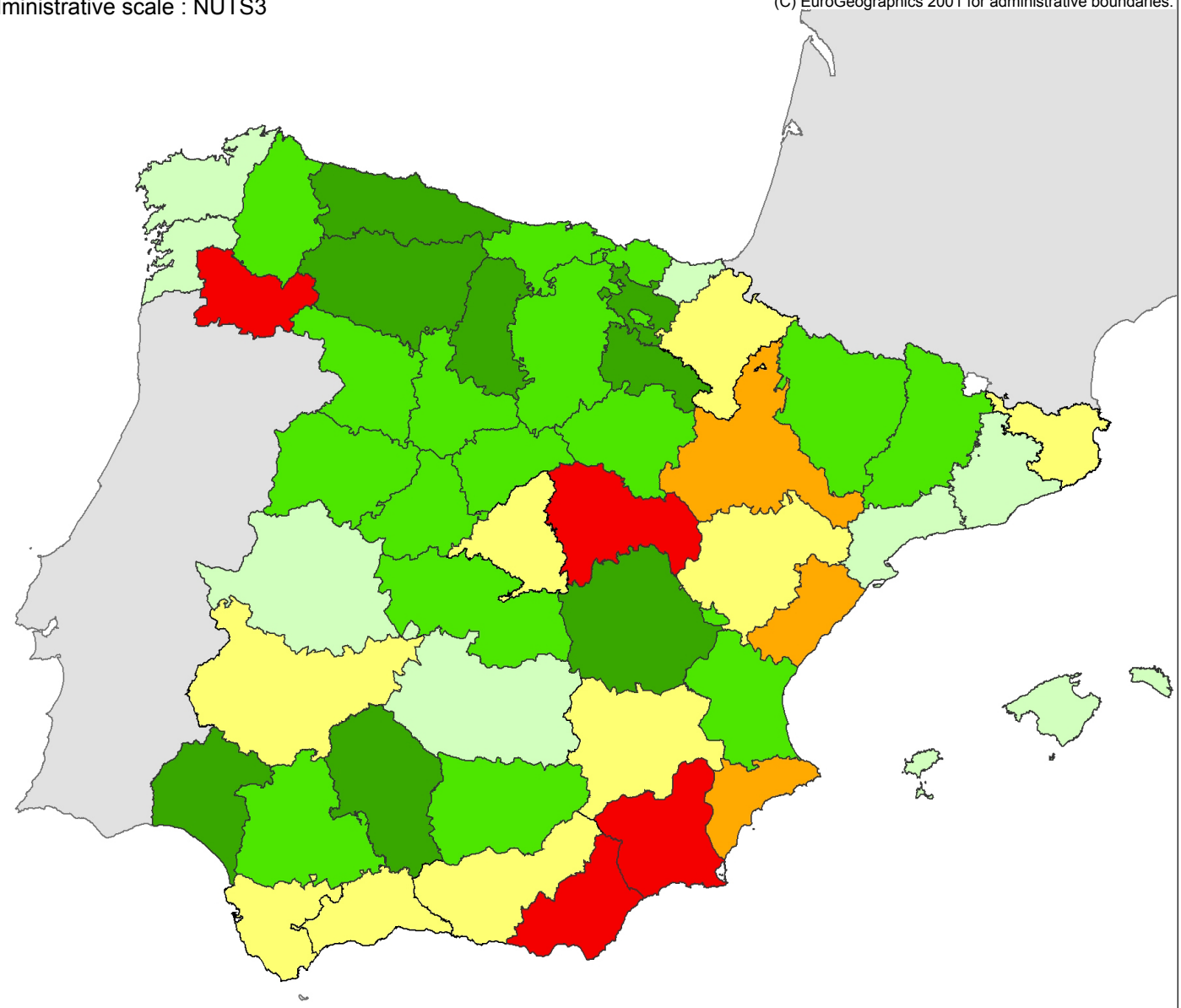
- 0% - 10%
- 10% - 25%
- 25% - 45%
- 45% - 65%
- 65% - 85%
- 85% - 100%

Source: FSS census 1999.

Map produced by SOLAGRO, May 2007.

Map 11: UAA evolution by NUTS3 in Spain (1989-1999)

Administrative scale : NUTS3



Legend

UAA evolution (% of UAA 89)

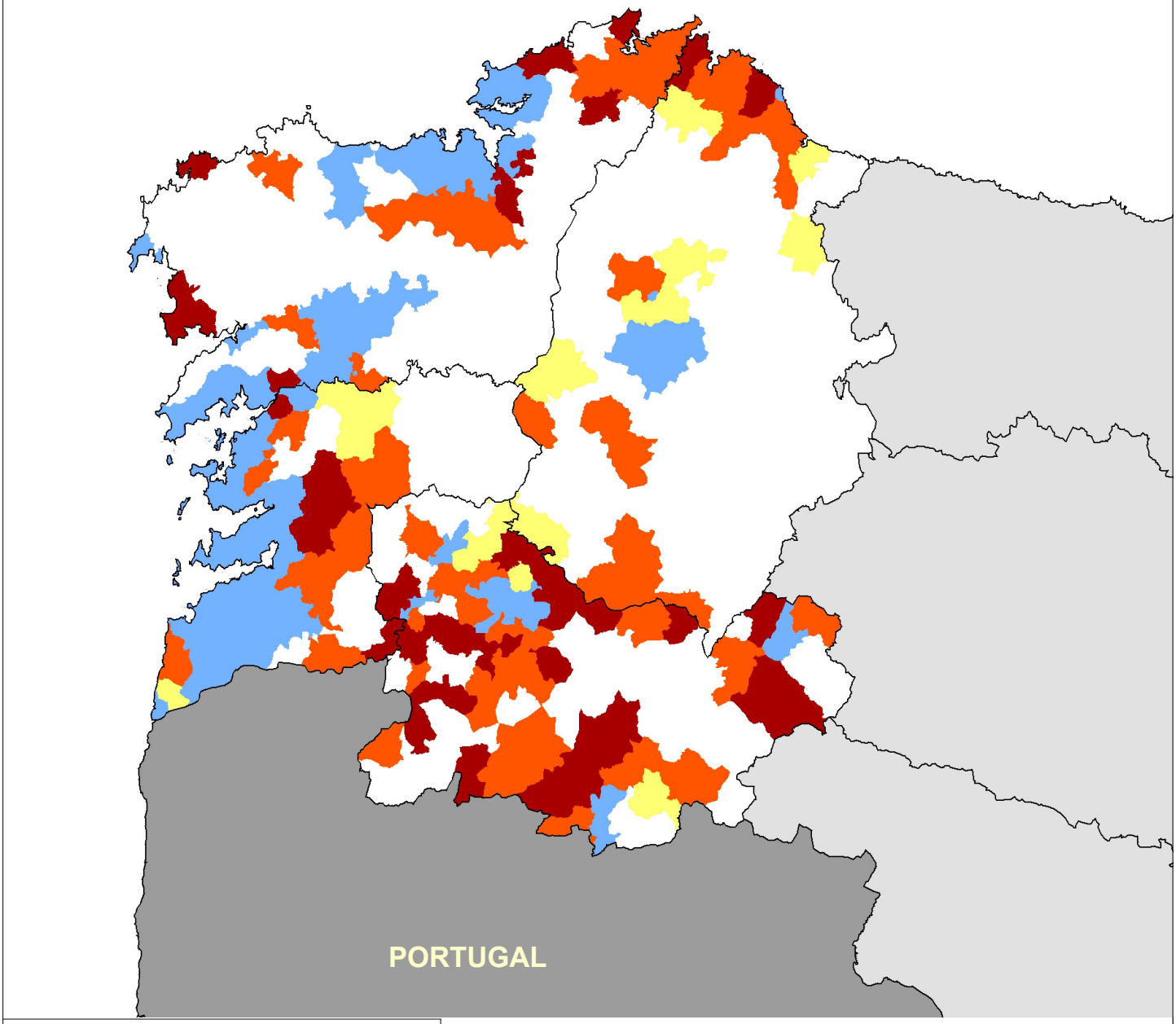
- < -10%
- -10% to -5%
- -5% to 0%
- 0 to 5%
- 5% - 20%
- > 20%

Sources: FSS censuses 1989 & 1999.

Map produced by SOLAGRO, May 2007.

Map 12: UAA decrease* level by LAU2 in rural areas in Galicia (1989-1999)

Administrative scale : LAU 2



Legend

UAA loss level

- Very high (>500ha/year or >7.5%/year)
- High (>300 Ha/year or >1.2%/year)
- Medium (>100 Ha/year or >0.6%/year)
- Low UAA loss level or UAA increase
- Urban areas

(*) UAA decrease between 1989 and 1999.

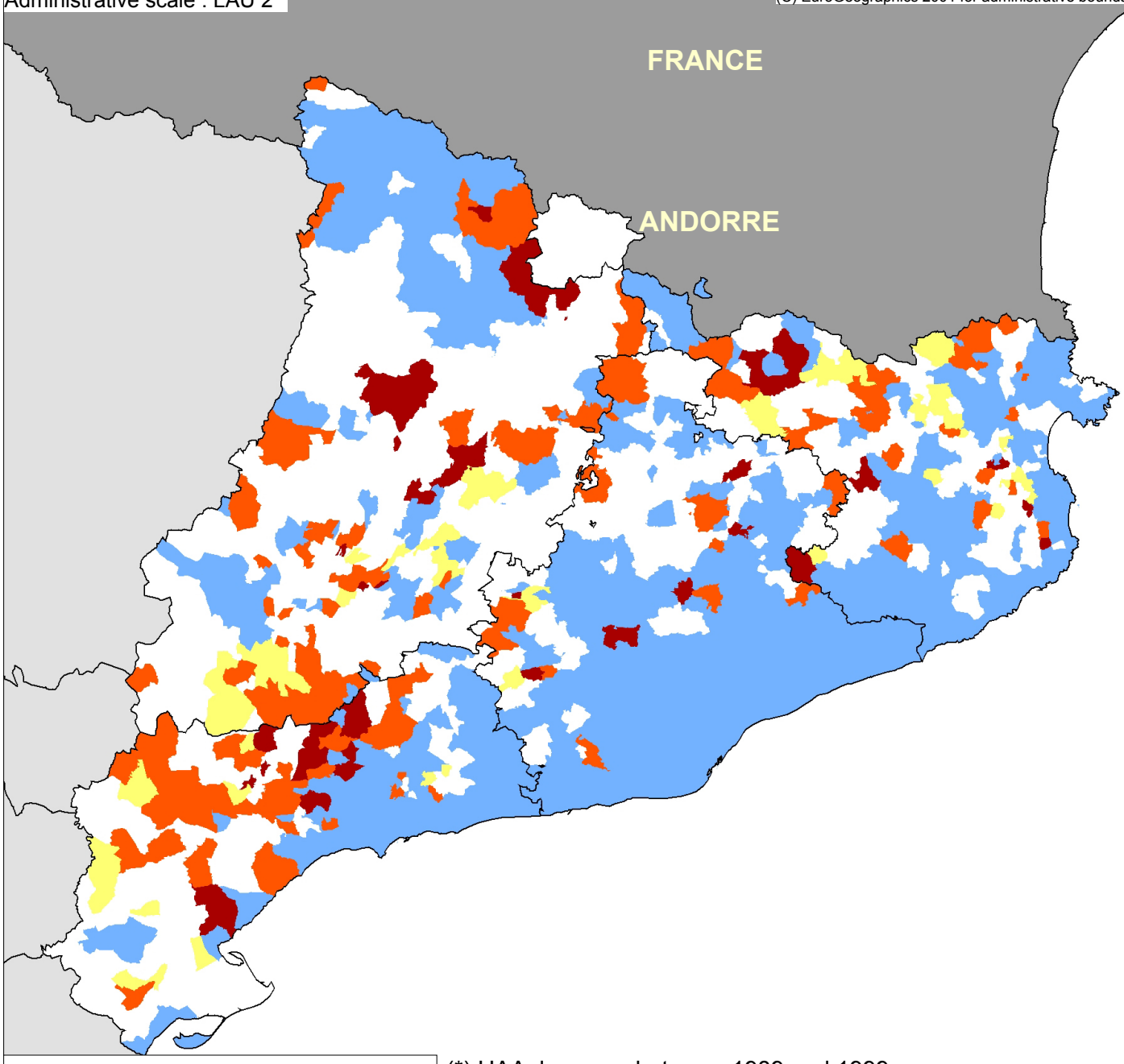
Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1991 and 2001.

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001).

Map produced by SOLAGRO, May 2007.

Map 13: UAA decrease* level by LAU2 in rural areas in Catalonia (1989-1999)

Administrative scale : LAU 2



Legend

UAA loss level

- Very high (>500ha/year or >7.5%/year)
- High (>300 Ha/year or >1.2%/year)
- Medium (>100 Ha/year or >0.6%/year)
- Low UAA loss level or UAA increase
- Urban areas

(*) UAA decrease between 1989 and 1999.

Urban areas : administrative units with a population density over 150 inh./ km^2 or a population increase over 10% between 1991 and 2001.

Sources: FSS censuses (1989 & 1999), Instituto Nacional de Estadística (Population censuses,1991 & 2001).

Map produced by SOLAGRO, May 2007.

Table 1: UAA 1989 related to population density and population evolution by LAU2 in Spain

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	577 894	465 385	384 614	201 867	91 097	305 728	**2 026 585**	8%
12.5% to 15%	68 348	130 092	101 231	182 327	23 128	92 462	**597 588**	2%
10% to 12.5 %	122 680	332 788	52 000	43 352	19 989	110 124	**680 933**	3%
7.5% to 10%	135 994	369 836	248 238	65 133	27 703	179 441	**1 026 345**	4%
5.0% to 7.5%	221 569	314 914	162 176	80 372	32 437	97 246	**908 714**	4%
2.5% to 5.0%	264 384	653 255	346 751	52 849	18 799	150 331	**1 486 369**	6%
0% to 2.5%	**557 437**	594 801	420 068	99 247	39 426	190 807	**1 901 786**	8%
-2.5 to 0%	**797 697**	449 902	254 939	24 926	105 791	64 236	**1 697 491**	7%
-5.0% to 2.5%	**954 739**	499 755	146 817	23 258	6 641	55 984	**1 687 194**	7%
-7.5% to -5.0%	**1 174 670**	469 649	144 750	11 553	3 712	29 694	**1 834 028**	7%
-10% to -7.5%	**1 385 736**	294 762	91 886	9 606	986	8 047	**1 791 023**	7%
-12.5% to -10%	**1 345 896**	303 300	24 740	4 498	21 593	14 511	**1 714 538**	7%
-15% to -12.5%	**1 202 687**	265 707	19 347	2 210	0	2 745	**1 492 696**	6%
Less than -15%	**5 259 906**	526 947	69 804	301	146	4 798	**5 861 902**	24%
UAA 1989 with population increase	1 948 306	2 861 071	1 715 078	725 147	252 579	1 126 139	8 628 320	35%
UAA 1989 with population loss	12 121 331	2 810 022	752 283	76 352	138 869	180 015	16 078 872	65%
TOTAL UAA 1989	14 069 637	5 671 093	2 467 361	801 499	391 448	1 306 154	**24 707 192**	
TOTAL in %	57%	23%	10%	3%	2%	5%	100%	
UAA 1989 in "Rural areas"	**20 347 012**							
UAA 1989 in "Urban areas"	**4 360 180**							

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA census 1989.
Made by Solagro, September 2007.

Table 2: UAA 1999 related to population density and population evolution by LAU2 in Spain

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	605 538	418 901	380 436	188 443	80 519	267 422	**1 941 259**	7%
12.5% to 15%	78 113	132 220	106 222	172 167	22 728	80 216	**591 666**	2%
10% to 12.5 %	150 016	350 570	53 231	40 416	19 491	104 051	**717 775**	3%
7.5% to 10%	172 299	398 775	289 605	65 064	22 183	180 875	**1 128 801**	4%
5.0% to 7.5%	249 598	367 495	162 047	76 859	34 956	92 753	**983 708**	4%
2.5% to 5.0%	292 580	700 237	362 772	52 335	17 787	155 069	**1 580 780**	6%
0% to 2.5%	638 962	648 184	464 175	103 017	40 988	198 179	**2 093 505**	8%
-2.5 to 0%	883 300	489 521	267 651	26 961	101 932	61 886	**1 831 251**	7%
-5.0% to 2.5%	1 042 565	518 655	145 747	26 310	7 478	47 251	**1 788 006**	7%
-7.5% to -5.0%	1 246 328	494 169	156 610	9 691	2 912	26 391	**1 936 101**	7%
-10% to -7.5%	1 518 100	314 048	81 010	10 242	743	8 289	**1 932 432**	7%
-12.5% to -10%	1 421 954	297 236	27 696	7 052	20 907	17 114	**1 791 959**	7%
-15% to -12.5%	1 309 167	307 228	21 093	5 667	483	2 569	**1 646 207**	6%
Less than -15%	5 627 659	567 982	66 126	293	446	3 275	**6 265 781**	24%
UAA 1999 with population increase	2 187 106	3 016 382	1 818 488	698 301	238 652	1 078 565	**9 037 494**	34%
UAA 1999 with population loss	13 049 073	2 988 839	765 933	86 216	134 901	166 775	**17 191 737**	66%
TOTAL UAA 1999	15 236 179	6 005 221	2 584 421	784 517	373 553	1 245 340	**26 229 231**	
TOTAL in %	58%	23%	10%	3%	1%	5%	100%	
UAA 1999 in "Rural areas"	**21 934 065**							
UAA 1999 in "Urban areas"	**4 295 166**							

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA census 1999.
Made by Solagro, September 2007.

Table 3: UAA loss related to population density and population evolution by LAU2 in Spain (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA loss	% loss
	0-20	20-50	50-100	100-150	150-200	200 et +		
> +15%	-168 261	-87 439	-41 915	-26 179	-19 426	-66 661	**-409 881**	15%
12.5% to 15%	-7 151	-10 097	-7 462	-10 599	-1 548	-14 215	**-51 072**	2%
10 to 12.5 %	-19 849	-15 302	-5 458	-5 238	-1 314	-13 406	**-60 567**	2%
7.5 to 10%	-13 536	-22 000	-9 611	-7 221	-5 659	-11 674	**-69 701**	3%
5.0 to 7.5%	-19 501	-12 018	-11 611	-9 127	-2 310	-10 919	**-65 486**	2%
2.5% to 5.0%	-45 998	-28 963	-17 911	-3 391	-1 515	-15 898	**-113 676**	4%
0 to 2.5%	**-46 675**	-34 809	-26 840	-5 452	-2 535	-17 303	**-133 614**	5%
-2,5 - 0%	**-75 449**	-20 259	-21 324	-958	-4 727	-7 427	**-130 144**	5%
-5,0 - -2,5%	**-84 279**	-33 365	-14 851	-1 748	-44	-11 573	**-145 860**	6%
-7,5 - -5%	**-125 875**	-46 342	-10 108	-2 613	-1 000	-4 990	**-190 928**	7%
-10% - -7,5%	**-140 268**	-25 567	-16 884	-447	-243	-675	**-184 084**	7%
-12,5% - -10%	**-138 470**	-38 548	-1 689	-620	-1 580	-804	**-181 711**	7%
-15% - -12,5%	**-124 075**	-22 491	-1 452	-313	0	-511	**-148 842**	6%
< -15%	**-710 329**	-40 236	-6 845	-8	-7	-2 423	**-759 848**	29%
UAA loss with population increase	-320 971	-210 628	-120 808	-67 207	-34 307	-150 076	-903 997	34%
UAA loss with population loss	-1 398 745	-226 808	-73 153	-6 707	-7 601	-28 403	-1 741 417	66%
TOTAL UAA loss	-1 719 716	-437 436	-193 961	-73 914	-41 908	-178 479	**-2 645 414**	
TOTAL of UAA loss in %	65%	17%	7%	3%	2%	7%	100%	
UAA loss in "Rural areas"	**-2 020 077**							76%
UAA loss in "Urban areas"	**-625 337**							24%

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 4: UAA win related to population density and population evolution by LAU2 in Spain (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA win	% increase
	0-20	20-50	50-100	100-150	150-200	200 et +		
> +15%	**170 562**	**44 024**	**49 437**	19 038	8 904	**32 916**	**324 881**	8%
12.5% to 15%	16 916	12 040	12 453	439	1 092	1 969	**44 909**	1%
10 to 12.5 %	**46 807**	**32 900**	6 689	2 302	816	7 333	**96 847**	2%
7.5 to 10%	**48 791**	**51 308**	**50 978**	7 152	139	13 108	**171 476**	4%
5.0 to 7.5%	**48 669**	**64 599**	11 482	5 614	4 829	6 426	**141 619**	3%
2.5% to 5.0%	**74 419**	**75 945**	**33 932**	2 877	503	**20 636**	**208 312**	5%
0 to 2.5%	**126 861**	**87 282**	**71 619**	9 222	4 097	**24 675**	**323 756**	8%
-2,5 - 0%	**162 509**	**60 788**	**33 364**	2 993	868	5 077	**265 599**	6%
-5,0 - -2,5%	**172 077**	**52 265**	**14 464**	4 800	881	2 840	**247 327**	6%
-7,5 - -5%	**196 321**	**70 862**	**21 285**	751	200	1 687	**291 106**	7%
-10% - -7,5%	**274 237**	**44 853**	5 893	1 083	0	917	**326 983**	8%
-12,5% - -10%	**213 060**	**32 484**	4 760	3 174	894	3 407	**257 779**	6%
-15% - -12,5%	**230 548**	**64 012**	3 198	3 770	483	335	**302 346**	7%
< -15%	**1 078 082**	**81 271**	3 167	0	307	900	**1 163 727**	28%
UAA win with population increase	533 025	368 098	236 590	46 644	20 380	107 063	1 311 800	31%
UAA win with population loss	2 326 834	406 535	86 131	16 571	3 633	15 163	2 854 867	69%
TOTAL UAA win	2 859 859	774 633	322 721	63 215	24 013	122 226	**4 166 667**	
TOTAL of UAA win in %	69%	19%	8%	2%	1%	3%	100%	
UAA win in "Rural areas"	**3 606 821**							87%
UAA win in "Urban areas"	**559 846**							13%

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 5: UAA balance related to population density and population evolution by LAU2 in Spain (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA balance	% balance	Evolution 89-99
	0-20	20-50	50-100	100-150	150-200	200 et +			
> +15%	2 301	-43 415	7 522	-7 141	-10 522	-33 745	**-85 000**	-6%	-4%
12.5% to 15%	9 765	1 943	4 991	-10 160	-456	-12 246	**-6 163**	0%	-1%
10 to 12.5 %	26 958	17 598	1 231	-2 936	-498	-6 073	**36 280**	2%	5%
7.5 to 10%	35 255	29 308	41 367	-69	-5 520	1 434	**101 775**	7%	10%
5.0 to 7.5%	29 168	52 581	-129	-3 513	2 519	-4 493	**76 133**	5%	8%
2.5% to 5.0%	28 421	46 982	16 021	-514	-1 012	4 738	**94 636**	6%	6%
0 to 2.5%	80 186	52 473	44 779	3 770	1 562	7 372	**190 142**	12%	10%
-2,5 - 0%	87 060	40 529	12 040	2 035	-3 859	-2 350	**135 455**	9%	8%
-5,0 - -2,5%	87 798	18 900	-387	3 052	837	-8 733	**101 467**	7%	6%
-7,5 - -5%	70 446	24 520	11 177	-1 862	-800	-3 303	**100 178**	7%	5%
-10% - -7,5%	133 969	19 286	-10 991	636	-243	242	**142 899**	9%	8%
-12,5% - -10%	74 590	-6 064	3 071	2 554	-686	2 603	**76 068**	5%	4%
-15% - -12,5%	106 473	41 521	1 746	3 457	483	-176	**153 504**	10%	10%
< -15%	367 753	41 035	-3 678	-8	300	-1 523	**403 879**	27%	7%
UAA balance with population increase	212 054	157 470	115 782	-20 563	-13 927	-43 013	**407 803**	27%	5%
UAA balance with population decrease	928 089	179 727	12 978	9 864	-3 968	-13 240	**1 113 450**	73%	7%
TOTAL UAA balance	1 140 143	337 197	128 760	-10 699	-17 895	-56 253	**1 521 253**		
TOTAL in %	75%	22%	8%	-1%	-1%	-4%	100%		
Evolution during the period	8%	6%	5%	-1%	-5%	-4%	**6%**		
UAA balance in "Rural areas"	**1 586 744**								
UAA balance in "Urban areas"	**-65 491**								

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 6: UAA balance related to population density and population evolution by LAU2 in Spain (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%	0%	-9%	2%	-4%	-12%	-11%	**-4%**
12.5% to 15%	14%	1%	5%	-6%	-2%	-13%	**-1%**
10% to 12.5 %	22%	5%	2%	-7%	-2%	-6%	**5%**
7.5% to 10%	26%	8%	17%	0%	-20%	1%	**10%**
5.0% to 7.5%	13%	17%	0%	-4%	8%	-5%	**8%**
2.5% to 5.0%	11%	7%	5%	-1%	-5%	3%	**6%**
0% to 2.5%	14%	9%	11%	4%	4%	4%	**10%**
-2.5 to 0%	11%	9%	5%	8%	-4%	-4%	**8%**
-5.0% to 2.5%	9%	4%	0%	13%	13%	-16%	**6%**
-7.5% to -5.0%	6%	5%	8%	-16%	-22%	-11%	**5%**
-10% to -7.5%	10%	7%	-12%	7%	-25%	3%	**8%**
-12.5% to -10%	6%	-2%	12%	57%	-3%	18%	**4%**
-15% to -12.5%	9%	16%	9%	156%	-	-6%	**10%**
Less than -15%	7%	8%	-5%	-3%	205%	-32%	**7%**
UAA balance with population increase	11%	6%	7%	-3%	-6%	-4%	**5%**
UAA balance with population decrease	8%	6%	2%	13%	-3%	-7%	**7%**
TOTAL UAA balance in % of UAA 1989	8%	6%	5%	-1%	-5%	-4%	**6%**
UAA balance in "Rural areas"	**7,8%**						
UAA balance in "Urban areas"	**-1,5%**						

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 7: UAA loss related to population density and population evolution by LAU2 in Spain (1989-1999)

UAA loss level (1989-1999)	Thresholds	UAA loss in Rural areas	UAA loss in Urban areas	**Total UAA loss in ha**	Total in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	-1 191 711	-404 106	**-1 595 817**	60,3%
High	UAA loss over 300 ha/year or over 1.2%/year	-706 377	-188 297	**-894 674**	33,8%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-88 247	-25 493	**-113 740**	4,3%
Low	UAA loss under 100 ha/year and under 0.6%/year	-33 742	-7 441	**-41 183**	1,6%
TOTAL in ha		**-2 020 077**	**-625 337**	**-2 645 414**	100%
TOTAL in %		76,4%	23,6%		100%

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 8: UAA 1999 related to population density and population evolution by LAU2 in Spain

UAA loss level (1989-1999)	Thresholds	UAA 1999 in rural areas	UAA 1999 in urban areas	**Total UAA 1999 in ha**	Total in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	1 464 852	469 711	**1 934 563**	20,1%
High	UAA loss over 300 ha/year or over 1.2%/year	3 088 928	897 918	**3 986 846**	41,5%
Medium	UAA loss over 100 ha/year or over 0.6%/year	1 423 846	429 847	**1 853 693**	19,3%
Low	UAA loss under 100 ha/year and under 0.6%/year	1 444 112	384 459	**1 828 571**	19,0%
TOTAL in ha		**7 421 738**	**2 181 935**	**9 603 673**	**100%**
TOTAL in %		79,0%	21,0%		100%
TOTAL of UAA 1999		28,3%	8,3%		36,6%

Urban areas: over 150 inhabitants per km^2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km^2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 9: Farmland abandonment by LAU2 in Spain (1989-1999)

UAA loss level (1989-1999)	Thresholds	Farmland abandonment	% of UAA1989	UAA 1999	% of UAA 1999
Very high	UAA loss over 500 ha/year or over 7.5%/year	1 191 711	4,8%	1 464 852	5,6%
High	UAA loss over 300 ha/year or over 1.2%/year	706 377	2,9%	3 088 928	11,8%
Medium	UAA loss over 100 ha/year or over 0.6%/year	88 247	0,4%	1 423 846	5,4%
TOTAL in ha		**1 986 335**	**8,0%**	**5 977 626**	**22,8%**

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 10: UAA 1989 related to population density and population evolution by LAU2 in Galicia

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	1 981	0	6 230	7 547	**15 758**	2%
12.5% to 15%	0	0	0	1 291	0	566	**1 857**	0%
10% to 12.5 %	0	0	1 246	1 275	700	1 038	**4 259**	1%
7.5% to 10%	0	0	223	385	4 858	1 023	**6 489**	1%
5.0% to 7.5%	0	4 222	0	0	0	16 104	**20 326**	3%
2.5% to 5.0%	0	0	12 326	1 664	0	10 401	**24 391**	4%
0% to 2.5%	**0**	1 566	25 856	4 013	668	3 909	**36 012**	5%
-2.5 to 0%	**0**	10 255	30 533	385	2 101	859	**44 133**	7%
-5.0% to 2.5%	**0**	17 418	6 166	691	0	1 588	**25 863**	4%
-7.5% to -5.0%	**0**	25 025	15 807	1 464	356	880	**43 532**	6%
-10% to -7.5%	**10 263**	22 120	18 337	1 609	986	657	**53 972**	8%
-12.5% to -10%	**4 991**	61 948	5 783	2 763	917	402	**76 804**	11%
-15% to -12.5%	**17 199**	54 690	5 934	407	0	424	**78 654**	12%
Less than -15%	**118 428**	117 346	6 430	0	0	791	**242 995**	36%
UAA 1989 with population increase	0	5 788	41 632	8 628	12 456	40 588	109 092	16%
UAA 1989 with population loss	150 881	308 802	88 990	7 319	4 360	5 601	565 953	84%
TOTAL UAA 1989	150 881	314 590	130 622	15 947	16 816	46 189	**675 045**	
TOTAL in %	22%	47%	19%	2%	2%	7%	100%	
UAA 1989 in "Rural areas"	**606 247**							
UAA 1989 in "Urban areas"	**68 798**							

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA census 1989.
Made by Solagro, September 2007.

Table 11: UAA 1999 related to population density and population evolution by LAU2 in Galicia

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	2 532	0	3 751	4 693	**10 976**	2%
12.5% to 15%	0	0	0	1 146	0	249	**1 395**	0%
10% to 12.5 %	0	0	1 133	1 557	490	796	**3 976**	1%
7.5% to 10%	0	0	180	412	4 383	635	**5 610**	1%
5.0% to 7.5%	0	3 953	0	0	0	13 834	**17 787**	3%
2.5% to 5.0%	0	0	10 537	1 511	0	9 220	**21 268**	3%
0% to 2.5%	0	1 421	27 635	3 185	777	2 802	**35 820**	5%
-2.5 to 0%	0	9 613	32 164	420	1 487	668	**44 352**	6%
-5.0% to 2.5%	0	18 718	4 909	816	0	905	**25 348**	4%
-7.5% to -5.0%	0	27 906	18 134	1 600	278	355	**48 273**	7%
-10% to -7.5%	12 442	22 978	19 480	1 382	743	470	**57 495**	8%
-12.5% to -10%	4 474	63 194	6 139	2 528	525	473	**77 333**	11%
-15% to -12.5%	23 555	60 888	6 362	224	0	200	**91 229**	13%
Less than -15%	130 268	120 337	4 407	0	0	787	**255 799**	37%
UAA 1999 with population increase	0	5 374	42 017	7 811	9 401	32 229	**96 832**	14%
UAA 1999 with population loss	170 739	323 634	91 595	6 970	3 033	3 858	**599 829**	86%
TOTAL UAA 1999	170 739	329 008	133 612	14 781	12 434	36 087	**696 661**	
TOTAL in %	25%	47%	19%	2%	2%	5%	100%	
UAA 1999 in "Rural areas"	**641 772**							
UAA 1999 in "Urban areas"	**54 889**							

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA census 1999.
Made by Solagro, September 2007.

Table 12: UAA loss related to population density and population evolution in Galicia (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA loss	% loss
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	0	0	0	0	-2 479	-2 854	**-5 333**	6%
12.5% to 15%	0	0	0	-145	0	-317	**-462**	1%
10 to 12.5 %	0	0	-113	0	-210	-310	**-633**	1%
7.5 to 10%	0	0	-43	0	-475	-388	**-906**	1%
5.0 to 7.5%	0	-269	0	0	0	-2 360	**-2 629**	3%
2.5% to 5.0%	0	0	-2 051	-153	0	-1 802	**-4 006**	5%
0 to 2.5%	**0**	-145	-83	-830	0	-1 144	**-2 202**	3%
-2,5 - 0%	**0**	-642	-1 681	0	-614	-191	**-3 128**	4%
-5,0 - -2,5%	**0**	-1 632	-1 439	0	0	-683	**-3 754**	4%
-7,5 - -5%	**0**	-921	-825	-179	-78	-536	**-2 539**	3%
-10% - -7,5%	**0**	-1 601	-638	-254	-243	-187	**-2 923**	3%
-12,5% - -10%	**-517**	-6 656	-475	-405	-392	0	**-8 445**	10%
-15% - -12,5%	**-68**	-2 400	-154	-183	0	-224	**-3 029**	4%
< -15%	**-29 152**	-12 705	-2 197	0	0	-4	**-44 058**	52%
UAA loss with population increase	0	-414	-2 290	-1 128	-3 164	-9 175	-16 171	19%
UAA loss with population loss	-29 737	-26 557	-7 409	-1 021	-1 327	-1 825	-67 876	81%
TOTAL UAA loss	-29 737	-26 971	-9 699	-2 149	-4 491	-11 000	**-84 047**	
TOTAL of UAA loss in %	35%	32%	12%	3%	5%	13%	100%	
UAA loss in "Rural areas"	**-68 298**							81%
UAA loss in "Urban areas"	**-15 749**							19%

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 13: UAA win related to population density and population evolution in Galicia (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA win	% increase
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	**0**	**0**	**551**	0	0	**0**	**551**	1%
12.5% to 15%	0	0	0	0	0	0	**0**	0%
10 to 12.5 %	**0**	**0**	0	282	0	68	**350**	0%
7.5 to 10%	**0**	**0**	**0**	27	0	0	**27**	0%
5.0 to 7.5%	**0**	**0**	0	0	0	90	**90**	0%
2.5% to 5.0%	**0**	**0**	**262**	0	0	**621**	**883**	1%
0 to 2.5%	**0**	**0**	**1 862**	2	109	**37**	**2 010**	2%
-2,5 - 0%	**0**	**0**	**3 312**	35	0	0	**3 347**	3%
-5,0 - -2,5%	**0**	**2 932**	**182**	125	0	0	**3 239**	3%
-7,5 - -5%	**0**	**3 802**	**3 152**	315	0	11	**7 280**	7%
-10% - -7,5%	**2 179**	**2 459**	1 781	27	0	0	**6 446**	6%
-12,5% - -10%	**0**	**7 902**	831	170	0	71	**8 974**	8%
-15% - -12,5%	**6 424**	**8 598**	582	0	0	0	**15 604**	15%
< -15%	**40 992**	**15 696**	174	0	0	0	**56 862**	54%
UAA win with population increase	0	0	2 675	311	109	816	3 911	4%
UAA win with population loss	49 595	41 389	10 014	672	0	82	101 752	96%
TOTAL UAA win	49 595	41 389	12 689	983	109	898	**105 663**	
TOTAL of UAA win in %	47%	39%	12%	1%	0%	1%	100%	
UAA win in "Rural areas"	**103 823**							98%
UAA win in "Urban areas"	**1 840**							2%

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 14: UAA balance related to population density and population evolution by LAU2 in Galicia (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						TOTAL UAA balance	% balance	Evolution 89-99
	0-20	20-50	50-100	100-150	150-200	200 et +			
> +15%	0	0	551	0	-2 479	-2 854	**-4 782**	-22%	-30%
12.5% to 15%	0	0	0	-145	0	-317	**-462**	-2%	-25%
10 to 12.5 %	0	0	-113	282	-210	-242	**-283**	-1%	-7%
7.5 to 10%	0	0	-43	27	-475	-388	**-879**	-4%	-14%
5.0 to 7.5%	0	-269	0	0	0	-2 270	**-2 539**	-12%	-12%
2.5% to 5.0%	0	0	-1 789	-153	0	-1 181	**-3 123**	-14%	-13%
0 to 2.5%	0	-145	1 779	-828	109	-1 107	**-192**	-1%	-1%
-2,5 - 0%	0	-642	1 631	35	-614	-191	**219**	1%	0%
-5,0 - -2,5%	0	1 300	-1 257	125	0	-683	**-515**	-2%	-2%
-7,5 - -5%	0	2 881	2 327	136	-78	-525	**4 741**	22%	11%
-10% - -7,5%	2 179	858	1 143	-227	-243	-187	**3 523**	16%	7%
-12,5% - -10%	-517	1 246	356	-235	-392	71	**529**	2%	1%
-15% - -12,5%	6 356	6 198	428	-183	0	-224	**12 575**	58%	16%
< -15%	11 840	2 991	-2 023	0	0	-4	**12 804**	59%	5%
UAA balance with population increase	19 858	14 832	2 605	-349	-1 327	-1 743	**33 876**	157%	31%
UAA balance with population decrease	0	-414	385	-817	-3 055	-8 359	**-12 260**	-57%	-2%
TOTAL UAA balance	19 858	14 418	2 990	-1 166	-4 382	-10 102	**21 616**		
TOTAL in %	92%	67%	14%	-5%	-20%	-47%	100%		
Evolution during the period	13%	5%	2%	-7%	-26%	-22%	3%		
UAA balance in "Rural areas"	**35 525**								
UAA balance in "Urban areas"	**-13 909**								

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 15: UAA balance related to population density and population evolution by LAU2 in Galicia (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%	-	-	28%	-	-40%	-38%	**-30%**
12.5% to 15%	-	-	-	-11%	-	-56%	**-25%**
10% to 12.5 %	-	-	-9%	22%	-30%	-23%	**-7%**
7.5% to 10%	-	-	-19%	7%	-10%	-38%	**-14%**
5.0% to 7.5%	-	-6%	-	-	-	-14%	**-12%**
2.5% to 5.0%	-	-	-15%	-9%	-	-11%	**-13%**
0% to 2.5%	-	-9%	7%	-21%	16%	-28%	**-1%**
-2.5 to 0%	-	-6%	5%	9%	-29%	-22%	**0%**
-5.0% to 2.5%	-	7%	-20%	18%	-	-43%	**-2%**
-7.5% to -5.0%	-	12%	15%	9%	-22%	-60%	**11%**
-10% to -7.5%	21%	4%	6%	-14%	-25%	-28%	**7%**
-12.5% to -10%	-10%	2%	6%	-9%	-43%	18%	**1%**
-15% to -12.5%	37%	11%	7%	-45%	-	-53%	**16%**
Less than -15%	10%	3%	-31%	-	-	-1%	**5%**
UAA balance with population increase	-	256%	6%	-4%	-11%	-4%	**31%**
UAA balance with population decrease	0%	0%	0%	-11%	-70%	-149%	**-2%**
TOTAL UAA balance in % of UAA 1989	13%	5%	2%	-7%	-26%	-22%	**3%**
UAA balance in "Rural areas"	**5,9%**						
UAA balance in "Urban areas"	**-20,2%**						

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 16: UAA loss related to population density and population evolution by LAU2 in Galicia (1989-1999)

UAA loss level (1989-1999)	Thresholds	Rural areas	Urban areas	**Total UAA loss in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	-43 636	-9 930	**-53 566**	63,7%
High	UAA loss over 300 ha/year or over 1.2%/year	-20 477	-4 783	**-25 260**	30,1%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-3 012	-1 012	**-4 024**	4,8%
Low	UAA loss under 100 ha/year and under 0.6%/year	-1 173	-24	**-1 197**	1,4%
TOTAL in ha		**-68 298**	**-15 749**	**-84 047**	100%
TOTAL in %		81,3%	18,7%	100%	

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 17: UAA 1999 related to population density and population evolution by LAU2 in Galicia

UAA loss level (1989-1999)	Thresholds	UAA 1999 in rural areas	UAA 1999 in urban areas	**Total UAA 1999 in ha**	TOTAL in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	26 259	8 814	**35 073**	14,7%
High	UAA loss over 300 ha/year or over 1.2%/year	91 650	19 278	**110 928**	46,4%
Medium	UAA loss over 100 ha/year or over 0.6%/year	43 233	12 604	**55 837**	23,3%
Low	UAA loss under 100 ha/year and under 0.6%/year	36 061	1 247	**37 308**	15,6%
TOTAL in ha		**197 203**	**41 943**	**239 146**	**100%**
TOTAL in %		82,5%	17,5%	100%	
TOTAL of UAA 1999		28,3%	6,0%		34,3%

Urban areas: over 150 inhabitants per km^2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km^2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 18: Farmland abandonment by LAU2 in Galicia (1989-1999)

UAA loss level (1989-1999)	Thresholds	Farmland abandonment	% of UAA1989	UAA 1999	% of UAA 1999
Very high	UAA loss over 500 ha/year or over 7.5%/year	43 636	6,5%	26 259	3,8%
High	UAA loss over 300 ha/year or over 1.2%/year	20 477	3,0%	91 650	13,2%
Medium	UAA loss over 100 ha/year or over 0.6%/year	3 012	0,4%	43 233	6,2%
TOTAL in ha		**67 125**	**9,9%**	**161 142**	**23,1%**

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 19: UAA 1989 related to population density and population evolution by LAU2 in Catalonia

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	126 454	41 649	34 944	20 731	8 689	41 396	**273 863**	25%
12.5% to 15%	14 664	1 098	3 573	10 740	1 633	2 055	**33 763**	3%
10% to 12.5 %	26 050	8 650	2 815	9 348	0	5 061	**51 924**	5%
7.5% to 10%	19 559	4 235	5 374	0	4 367	4 159	**37 694**	3%
5.0% to 7.5%	15 291	26 781	13 887	1 836	1 253	4 263	**63 311**	6%
2.5% to 5.0%	28 062	21 319	3 575	13 293	0	3 673	**69 922**	6%
0% to 2.5%	19 843	18 027	19 970	6 433	1 456	23 682	**89 411**	8%
-2.5 to 0%	53 326	27 419	17 027	8 918	763	1 622	**109 075**	10%
-5.0% to 2.5%	45 081	13 441	23 518	1 844	97	5 479	**89 460**	8%
-7.5% to -5.0%	41 072	22 154	5 820	3 211	2 451	1 175	**75 883**	7%
-10% to -7.5%	44 834	9 754	3 404	2 376	0	581	**60 949**	6%
-12.5% to -10%	45 593	11 948	1 700	0	0	54	**59 295**	5%
-15% to -12.5%	35 408	6 738	0	0	0	0	**42 146**	4%
Less than -15%	41 769	4 565	1 466	0	7	106	**47 913**	4%
UAA 1989 with population increase	249 923	121 759	84 138	62 381	17 398	84 289	619 888	56%
UAA 1989 with population loss	307 083	96 019	52 935	16 349	3 318	9 017	484 721	44%
TOTAL UAA 1989	557 006	217 778	137 073	78 730	20 716	93 306	**1 104 609**	
TOTAL in %	50%	20%	12%	7%	2%	8%	100%	

UAA 1989 in "Rural areas"	**689 871**
UAA 1989 in "Urban areas"	**414 738**

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA census 1989.
Made by Solagro, September 2007.

Table 20: UAA 1999 related to population density and population evolution by LAU2 in Catalonia

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA	% UAA
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	129 415	42 337	34 293	19 169	7 060	32 808	**265 082**	23%
12.5% to 15%	15 391	1 411	3 119	10 552	1 461	1 783	**33 717**	3%
10% to 12.5 %	18 683	10 225	3 152	10 720	0	4 789	**47 569**	4%
7.5% to 10%	23 334	5 193	5 308	0	4 001	4 849	**42 685**	4%
5.0% to 7.5%	20 348	26 729	13 369	1 809	1 083	4 326	**67 664**	6%
2.5% to 5.0%	31 279	21 933	3 224	14 273	0	3 269	**73 978**	6%
0% to 2.5%	25 029	18 557	20 336	5 928	1 636	23 850	**95 336**	8%
-2.5 to 0%	61 217	28 183	19 603	9 503	761	930	**120 197**	10%
-5.0% to 2.5%	47 783	14 923	25 011	1 948	53	4 841	**94 559**	8%
-7.5% to -5.0%	45 952	23 584	6 666	2 933	1 546	1 316	**81 997**	7%
-10% to -7.5%	44 895	9 998	4 883	2 433	0	603	**62 812**	5%
-12.5% to -10%	51 826	12 979	2 550	0	0	25	**67 380**	6%
-15% to -12.5%	34 062	4 715	0	0	0	0	**38 777**	3%
Less than -15%	50 998	5 337	1 838	0	0	156	**58 329**	5%
UAA 1999 with population increase	263 479	126 385	82 801	62 451	15 241	75 674	**626 031**	54%
UAA 1999 with population loss	336 733	99 719	60 551	16 817	2 360	7 871	**524 051**	46%
TOTAL UAA 1999	600 212	226 104	143 352	79 268	17 601	83 545	**1 150 082**	
TOTAL in %	52%	20%	12%	7%	2%	7%	100%	

UAA 1999 in "Rural areas"	**750 469**
UAA 1999 in "Urban areas"	**399 613**

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA census 1999.
Made by Solagro, September 2007.

Table 21: UAA loss related to population density and population evolution by LAU2 in Catalonia (1989-199

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA loss	% loss
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	-14 511	-3 777	-5 254	-2 268	-1 870	-11 215	**-38 895**	33%
12.5% to 15%	-1 221	-151	-752	-298	-228	-287	**-2 937**	2%
10 to 12.5 %	-9 339	-266	-186	-199	0	-672	**-10 662**	9%
7.5 to 10%	-3 721	-271	-622	0	-480	-590	**-5 684**	5%
5.0 to 7.5%	-866	-1 339	-1 186	-124	-226	-442	**-4 183**	4%
2.5% to 5.0%	-2 497	-3 201	-454	-438	0	-867	**-7 457**	6%
0 to 2.5%	-999	-1 099	-861	-505	0	-627	**-4 091**	3%
-2,5 - 0%	-9 004	-1 285	-427	-284	-86	-734	**-11 820**	10%
-5,0 - -2,5%	-2 132	-469	-963	-8	-44	-998	**-4 614**	4%
-7,5 - -5%	-3 847	-1 556	-228	-278	-905	-243	**-7 057**	6%
-10% - -7,5%	-5 608	-934	0	0	0	-39	**-6 581**	6%
-12,5% - -10%	-2 351	-666	0	0	0	-29	**-3 046**	3%
-15% - -12,5%	-5 642	-2 151	0	0	0	0	**-7 793**	7%
< -15%	-2 974	-93	0	0	-7	0	**-3 074**	3%
UAA loss with population increase	-33 154	-10 104	-9 315	-3 832	-2 804	-14 700	**-73 909**	63%
UAA loss with population loss	-31 558	-7 154	-1 618	-570	-1 042	-2 043	**-43 985**	37%
TOTAL UAA loss	-64 712	-17 258	-10 933	-4 402	-3 846	-16 743	**-117 894**	
TOTAL of UAA loss in %	55%	15%	9%	4%	3%	14%	100%	
UAA loss in "Rural areas"	**-59 083**							-9%
UAA loss in "Urban areas"	**-58 811**							-14%

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 22: UAA win related to population density and population evolution by LAU2 in Catalonia (1989-1999

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA win	% increase
	0-20	20-50	50-100	100-150	150-200	200 et +		
More than +15%	17 472	4 465	4 603	706	241	2 627	**30 114**	18%
12.5% to 15%	1 948	464	298	110	56	15	**2 891**	2%
10 to 12.5 %	1 972	1 841	523	1 571	0	400	**6 307**	4%
7.5 to 10%	7 496	1 229	556	0	114	1 280	**10 675**	7%
5.0 to 7.5%	5 923	1 287	668	97	56	505	**8 536**	5%
2.5% to 5.0%	5 714	3 815	103	1 418	0	463	**11 513**	7%
0 to 2.5%	6 185	1 629	1 227	0	180	795	**10 016**	6%
-2,5 - 0%	16 895	2 049	3 003	869	84	42	**22 942**	14%
-5,0 - -2,5%	4 834	1 951	2 456	112	0	360	**9 713**	6%
-7,5 - -5%	8 727	2 986	1 074	0	0	384	**13 171**	8%
-10% - -7,5%	5 669	1 178	1 479	57	0	61	**8 444**	5%
-12,5% - -10%	8 584	1 697	850	0	0	0	**11 131**	7%
-15% - -12,5%	4 296	128	0	0	0	0	**4 424**	3%
< -15%	12 203	865	372	0	0	50	**13 490**	8%
UAA win with population increase	46 710	14 730	7 978	3 902	647	6 085	**80 052**	49%
UAA win with population loss	61 208	10 854	9 234	1 038	84	897	**83 315**	51%
TOTAL UAA win	107 918	25 584	17 212	4 940	731	6 982	**163 367**	
TOTAL of UAA win in %	66%	16%	11%	3%	0%	4%	100%	
UAA win in "Rural areas"	**119 681**							17%
UAA win in "Urban areas"	**43 686**							11%

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 23: UAA balance related to population density and population evolution by LAU2 in Catalonia (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA balance	% balance	Evolution 89-99
	0-20	20-50	50-100	100-150	150-200	200 et +			
> +15%	2 961	688	-651	-1 562	-1 629	-8 588	**-8 781**	-19%	-3%
12.5% to 15%	727	313	-454	-188	-172	-272	**-46**	0%	0%
10 to 12.5 %	-7 367	1 575	337	1 372	0	-272	**-4 355**	-10%	-8%
7.5 to 10%	3 775	958	-66	0	-366	690	**4 991**	11%	13%
5.0 to 7.5%	5 057	-52	-518	-27	-170	63	**4 353**	10%	7%
2.5% to 5.0%	3 217	614	-351	980	0	-404	**4 056**	9%	6%
0 to 2.5%	5 186	530	366	-505	180	168	**5 925**	13%	7%
-2,5 - 0%	7 891	764	2 576	585	-2	-692	**11 122**	24%	10%
-5,0 - -2,5%	2 702	1 482	1 493	104	-44	-638	**5 099**	11%	6%
-7,5 - -5%	4 880	1 430	846	-278	-905	141	**6 114**	13%	8%
-10% - -7,5%	61	244	1 479	57	0	22	**1 863**	4%	3%
-12,5% - -10%	6 233	1 031	850	0	0	-29	**8 085**	18%	14%
-15% - -12,5%	-1 346	-2 023	0	0	0	0	**-3 369**	-7%	-8%
< -15%	9 229	772	372	0	-7	50	**10 416**	23%	22%
UAA balance with population increase	13 556	4 626	-1 337	70	-2 157	-8 615	**6 143**	14%	1%
UAA balance with population decrease	29 650	3 700	7 616	468	-958	-1 146	**39 330**	86%	8%
TOTAL UAA balance	43 206	8 326	6 279	538	-3 115	-9 761	**45 473**		
TOTAL in %	95%	18%	14%	1%	-7%	-21%	100%		
Evolution during the period	8%	4%	5%	1%	-15%	-10%	4%		
UAA balance in "Rural areas"	**60 598**								
UAA balance in "Urban areas"	**-15 125**								

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 24: UAA balance related to population density and population evolution by LAU2 in Catalonia (1989-1999)

Population evolution (1989-1999)	Population density in 1999 (inh. per km2)						Total UAA balance
	0-20	20-50	50-100	100-150	150-200	200 et +	
More than +15%	2%	2%	-2%	-8%	-19%	-21%	**-3%**
12.5% to 15%	5%	29%	-13%	-2%	-11%	-13%	**0%**
10% to 12.5 %	-28%	18%	12%	15%	-	-5%	**-8%**
7.5% to 10%	19%	23%	-1%	-	-8%	17%	**13%**
5.0% to 7.5%	33%	0%	-4%	-1%	-14%	1%	**7%**
2.5% to 5.0%	11%	3%	-10%	7%	-	-11%	**6%**
0% to 2.5%	26%	3%	2%	-8%	12%	1%	**7%**
-2.5 to 0%	15%	3%	15%	7%	0%	-43%	**10%**
-5.0% to 2.5%	6%	11%	6%	6%	-45%	-12%	**6%**
-7.5% to -5.0%	12%	6%	15%	-9%	-37%	12%	**8%**
-10% to -7.5%	0%	3%	43%	2%	-	4%	**3%**
-12.5% to -10%	14%	9%	50%	-	-	-54%	**14%**
-15% to -12.5%	-4%	-30%	-	-	-	-	**-8%**
Less than -15%	22%	17%	25%	-	-100%	47%	**22%**
UAA balance with population increase	5%	4%	-2%	0%	-12%	-10%	**1%**
UAA balance with population decrease	10%	4%	14%	3%	-29%	-13%	**8%**
TOTAL UAA balance in % of UAA 1989	8%	4%	5%	1%	-15%	-10%	**4%**
UAA balance in "Rural areas"	**8,8%**						
UAA balance in "Urban areas"	**-3,6%**						

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 25: UAA loss related to population density and population evolution in Catalonia (1989-1999)

UAA loss level (1989-1999)	Thresholds (by LAU2)	UAA loss in rural areas	UAA loss in urban areas	**Total UAA loss in ha**	Total in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	-25 894	-29 828	**-55 722**	47,3%
High	UAA loss over 300 ha/year or over 1.2%/year	-27 790	-24 533	**-52 323**	44,4%
Medium	UAA loss over 100 ha/year or over 0.6%/year	-3 875	-3 060	**-6 935**	5,9%
Low	UAA loss under 100 ha/year and under 0.6%/year	-1 524	-1 390	**-2 914**	2,5%
TOTAL in ha		**-59 083**	**-58 811**	**-117 894**	100%
TOTAL in %		50,1%	49,9%	100%	

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 26: UAA 1999 related to population density and population evolution in Catalonia

UAA loss level (1989-1999)	Thresholds (by LAU2)	UAA 1999 in rural areas	UAA 1999 in urban areas	**Total UAA in ha**	Total in %
Very high	UAA loss over 500 ha/year or over 7.5%/year	28 923	25 314	**54 237**	53,3%
High	UAA loss over 300 ha/year or over 1.2%/year	115 922	87 142	**203 064**	199,6%
Medium	UAA loss over 100 ha/year or over 0.6%/year	54 751	41 807	**96 558**	94,9%
Low	UAA loss under 100 ha/year and under 0.6%/year	60 523	41 220	**101 743**	100,0%
TOTAL in ha		**260 119**	**195 483**	**455 602**	**448%**
TOTAL in %		59,5%	40,5%		100%
TOTAL of UAA 1999		22,5%	16,9%		39,4%

Urban areas: over 150 inhabitants per km^2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km^2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

Table 27: Farmland abandonment by LAU2 in Catalonia (1989-1999)

UAA loss level (1989-1999)	Thresholds (by LAU2)	Farmland abandonment	% of UAA1989	UAA 1999	% of UAA 1999
Very high	UAA loss over 500 ha/year or over 7.5%/year	25 894	2,3%	28 923	2,5%
High	UAA loss over 300 ha/year or over 1.2%/year	27 790	2,5%	115 922	10,1%
Medium	UAA loss over 100 ha/year or over 0.6%/year	3 875	0,4%	54 751	4,8%
TOTAL in ha		**57 559**	**5,2%**	**199 596**	**17,4%**

Urban areas: over 150 inhabitants per km2 or population increase over 10% between 1991 and 2001
Rural areas: under 150 inhabitants per km2 and population increase under 10% between 1991 and 2001

Sources: Instituto nacional de Estadística (Population censuses 1991 & 2001), FSS MAPA censuses 1989 & 1999.
Made by Solagro, September 2007.

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Title: Analysis of Farmland Abandonment and the Extent and Location of Agricultural Areas that are Actually Abandoned or are in Risk to be Abandoned

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Abstract

Farmland abandonment (FLA) can be defined as the cessation of agricultural activities on a given surface of land and not taken by another activity (such as urbanisation or afforestation). This process attracts the attention of policy-makers both at national and EU level, in particular within the context of the Rural Development Policy. And, considering its importance in environmental and socio-economic terms, it is necessary to better understand the geographic distribution and strength of farmland abandonment trends in the EU-27, and to develop indicators to identify the most important farmland abandonment tendencies.

The first aim of this study was to establish the state of the art concerning farmland abandonment (definition, type) and methodologies for identifying/quantifying this phenomenon (dataset, period of analysis, scale). Then, it was about contributing to a new definition of Less Favoured Areas by assessing the driving forces of farmland abandonment and preparing the guidelines for agri-environmental indicator Nr 14 [COM2006 (508final)] by evaluating the state and risk of farmland abandonment.

The proposed methodology was based on two main elements: the variation of the UAA and the definition of rural areas. After identifying clear definitions for each variable, the way to consider the main flows of land use changes was studied.

First, as farmland afforestation is not considered as part of the process of farmland abandonment, this surface should have been considered separately into the flow of UAA loss. But, due to a lack of accurate data at the appropriate scale, it was decided to include farmland afforestation in the flow of farmland abandonment.

Then, regarding the flow from farmland to artificial area, the hypothesis was that this phenomenon is mainly located in urban areas where the population density is high or increases very fast. Since no data were available on soil sealing, six areas categories were created to reduce the risk of capturing the flow of soil sealing: one for urban area and five for rural areas, depending on the amount of UAA loss. In rural areas were the decrease was at least 100ha/year or over 0.6%/year (medium loss) the flow from farmland abandonment to artificial area was considered as negligible.

The minimum time period to study and identify farmland abandonment was fixed to be 5 years, and a large scale study turned out to be necessary to get the best estimate of farmland flow of FLA and not just the net result. Considering the strength and the weaknesses of the different data sources and the conditions above-mentioned, the Farm Structure Survey (FSS) census was chosen as it provides data at LAU 2 (NUTS 5), well-defined, over a recent and interesting period (1990-2000).

So, for pragmatic reasons and constraints linked to data availability at European level, the FLA was defined as the loss of UAA in rural areas between two Farm Structure Survey censuses that was not converted into artificial areas.

The methodology was tested in three of the main agricultural countries in the EU-27 in terms of surface (France, Spain and Poland). These three countries represent 35% of the EU-27 total UAA and they also have a large range of agricultural situations. Five test-regions (Aquitaine in France, Galicia and Catalonia in Spain, Malopolskie and Warminsko-Mazurskie in Poland) were chosen in a second phase, after analysing the national results, to cover different contexts in regions where a high level of FLA was observed.

Interviews of experts and stakeholders were carried out, at national and regional level, in order to get their opinion on the implemented methodology and on the results obtained and to analyse in a comprehensive and pragmatic way the causes of farmland abandonment.

FLA is controlled by complex interactions between socio-economic and environmental driving forces, which are both region-specific and time-period specific. Particular regional factors are for instance the small size of the parcels (Malopolskie), the small size of the farms (Malopolskie and Galicia), inheritance issues (Galicia, Malopolskie). A change in production structure during the transition period concerning the privatisation of state farms (Warminsko-Mazurskie) has also been identified as a driving force. Small mixed farms with a population of ageing farmers have difficulties to adapt to the new sanitary requirements and market conditions, while in other regions (*Tatras, Pyrénées Atlantiques*) farmers benefit from the high prices of traditional products such as cheese, tourist services, and also from the support instruments (LFA payments, Beef Special Premium, Suckler Cow Premium and extensification payments).

The results and factors of risk of farmland abandonment of the three cases studies were compared. Farmland abandonment – in terms of UAA-loss - for the considered periods (1988-2000 for France, 1989-1999 for Spain and 1996-2002 for Poland) represented a total surface of 3.3 million ha for the 3 countries; 2% of the total French UAA, 4% of Poland's, 8% of Spain's. Farmland abandonment and an increase of the UAA were observed to happen simultaneously (Spain), pointing to a re-localisation of production, which confirms that the evolution of the UAA net result is not sufficient to identify FLA.

A first estimate of the farmland at risk of abandonment was produced, based on a continuation of the last period trend (where farmland abandonment occurred between the last two Farm Structure Survey censuses). This represents 15% of the French UAA, 23% of the Spanish UAA and up to 50% of the Polish UAA. The Polish case shows the limit of the indicator, simply because the situation in Poland between 1996 and 2002 went through important restructuration processes with the privatisation of state farms.

Broadly speaking, the analysis has stressed a strong relationship between farmland abandonment and farming systems. Thereby, most of the arable land is not in risk to be abandoned contrary to extensive and traditional grazing systems with rough grasslands, as observed in France or in Galicia. Farm income can also be considered as a good indicator of the risk of farmland abandonment (in Poland or in Galicia). However, low farm income is linked to different variables such as small farm size, small parcel size, lack of investment and poor soils.

There is no single driving force and no single risk indicator adapted to all regions. This is why the process of farmland abandonment should only be studied at a regional level with detailed agricultural data available at municipality level. The study has pointed out some FSS weakness. Some new indicators (parcel size, price of farmland and its evolution, percentage of farmer without inheritors) and recommendations (reliable data on afforestation and sealed surfaces at the same administrative level or include a specific question on Farmland abandonment in the Farm Structure Survey questionnaire (as it occurs in Poland) were proposed to improve the methodology. Finally, proposal for testing the hypotheses on other relevant regions and a list of indicators linked with the most convenient data sources are closing the report.

The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.