Universitat Autònoma de Barcelona

Dipòsit digital de documents de la UAB

This is the **published version** of the master thesis:

Maeztu Redín, Cara; Villamayor Tomás, Sergio, dir.; Corbera, Esteve, dir. Analysis of recent trends in Spanish rural depopulation. 2020. (1341 Màster Universitari en Estudis Interdisciplinaris en Sostenibilitat Ambiental, Econòmica i Social)

This version is available at https://ddd.uab.cat/record/258731

under the terms of the BY-NC license

ANALYSIS OF RECENT TRENDS IN SPANISH RURAL DEPOPULATION

Master's Degree in Interdisciplinary Studies in Environmental, Economic and Social Sustainability

Cara Maeztu Redín
Industrial and Urban Ecology

Universitat Autònoma de Barcelona

Journal of Rural Studies

Name of the supervisor/s: Sergio Villamayor and EsteveCorbera
Institut de Ciència i TecnologiaAmbientals (ICTA - UAB)
June 2020

- **How this project fits within the research of the research group the student has been working in?**

Rural areas in Spain are experiencing unprecedented environmental and social changes. Climate change and biodiversity loss are occurring alongside depopulation and the abandonment and intensification of rural landscapes. This Master's thesis is part of a recently funded project to develop country-wide and regional indexes of socio-environmental vulnerability in rural Spain (SEVERAS) and use them to explore policies that can reduce said vulnerability. Understanding inter-connections of depopulation stressors, and their impact on rural development is paramount to devise policy that can enhance the wellbeing of rural populations. Our systematic review builds on and contributes to literature by examining the conditions that are affecting and are affected by most recent rural depopulation in Spain.

- **Journal of Rural Studies "guidelines for papers":**

https://www.elsevier.com/journals/journal-of-rural-studies/0743-0167/guide-for-authors

References

There are no strict requirements on reference formatting at submission. References can be in any style or format as long as the style is consistent. Where applicable, author(s) name(s), journal title/book title, chapter title/article title, year of publication, volume number/book chapter and the article number or pagination must be present. Use of DOI is highly encouraged. The reference style used by the journal will be applied to the accepted article by Elsevier at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct.

Formatting requirements

There are no strict formatting requirements but all manuscripts must contain the essential elements needed to convey your manuscript, for example Abstract, Keywords, Introduction, Materials and Methods, Results, Conclusions, Artwork and Tables with Captions.

If your article includes any Videos and/or other Supplementary material, this should be included in your initial submission for peer review purposes.

ANALYSIS OF RECENT TRENDS OF SPANISH RURAL DEPOPULATION

Maeztu Redín, Cara
E-mail address: caramaeztu@gmail.com
Institut de Ciència i TecnologiaAmbientals (ICTA - UAB), ICTA-ICP Building, Carrer de les Columnes s/n, Campus UAB, 08193, 08193 Cerdanyola del Vallès, Barcelona

Abstract:
Rural areas in Spain are experiencing growing environmental and social changes, including depopulation. This article presents a systematic review of academic literature to examine why rural depopulation has taken place in Spain after rural exodus, since 1975, the consequences of such processes and any existing interactions between both causes and consequences. The analysis shows the complexity of the interactions between depopulation causes and consequences, and how they affect each other. The principal causes of rural depopulation include: Change in natural population balance compared to past depopulation rates, limited access to infrastructure and services or agricultural intensification while the principal consequences are: Decrease on or displacement of traditional resource management practices, ageing population and landscape changes. Understanding the multiple dimensions and impacts of depopulation is paramount to devise policies that can enhance wellbeing and promote the sustainable development of rural areas.

Keywords: Depopulation, Rural, Spain, Land abandonment, Demography

1. Introduction

Depopulation is a demographic and territorial phenomenon, understood as the decrease in the number of inhabitants of a territory or nucleus in relation to a previous period. The fall in absolute terms in the number of inhabitants may be the result of negative vegetative growth (when deaths exceed births), a negative migratory balance (emigration exceeds immigration) or both simultaneously. The causes that explain either of these two drivers, however, can be complex and require a careful analysis in order to make an adequate diagnosis.

Depopulation in rural areas has been triggered by high migration rates from these areas to expanding urban regions. Numerous studies have addressed this trend, by for example documenting the main factors that enhance or decrease current rural depopulation in the European context (FAO, 2006) or in Spain (Informe Anual Defensor del Pueblo, 2018; Pinilla &Sáez, 2017). In Spain, rural depopulation was particularly acute from the 1950s onwards, and became popularly known as “the rural exodus”. In Spain, depopulation of the rural environment is a well-known fact and that, depending on the area, has appeared or accelerated markedly since the 1950s. Although there have been policy attempts to counteract this process over the last two decades, the truth is that the vast majority of Spanish rural areas continue to experience a decline in population (Jurado Almonte & Pazos-García, 2016). Alike other European countries, rural depopulation in Spain represents more than a demographic trend: it is a social process with potential social-ecological, economic, political and cultural implications.

To date, there has not been any attempt to synthesize the findings of the peer-reviewed academic literature that has paid attention to rural depopulation causes, consequences and its interrelations in Spain. To address this gap, this research asks: Which are the reported causes and consequences of rural depopulation? Are there certain ecological, socio-economic, political or cultural conditions that improve or worsen any observed consequences? How are causes and consequences of rural depopulation inter-linked?

This study builds on a research tradition in rural development and political ecology research that pays attention to how vulnerable rural populations are to external shocks, and how such vulnerability can be reduced to make livelihoods more resilient and adaptive to change. The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as the propensity or predisposition to be adversely affected by a stressor or a shock, e.g. a natural hazard, an economic crisis, climate change or depopulation, to name a few (IPCC, 2014). There is a wide range of definitions and frameworks to assess vulnerability of households and ecosystems (see e.g. Notenbaert et al., 2013), which broadly assume that the vulnerability of any system is a function of three main components: exposure, sensitivity and adaptive capacity.

Exposure can be defined as the extent to which social-ecological systems are stressed by one or multiple processes of environmental and socio-economic change, known as drivers or stressors, which have specific impacts on such systems. Sensitivity can be described as factors, including issues and variables that mediate the level of exposure to and the potential impact of environmental and socio-economic change on the studied systems. And, finally, adaptive capacity as the ability of a social-ecological system to adjust to reduce the potential damage of environmental and socio-economic drivers or stressors and to respond to their negative impacts.

This research assumes that rural depopulation can be conceptualized as an unremitting and pervasive stressor to rural livelihoods, since as shown further above can affect the economic activities, social networks or cultural practices of rural areas.

2. Methods and data

To analyse the state of knowledge about the causes and consequences of Spanish rural depopulation over the past 50 years, and to address the research questions, a meta-analysis of existing peer-reviewed academic literaturewas conducted. Such analysis was grounded on well-established guidelines for the development of systematic literature reviews (Collaboration for Environmental Evidence, 2013). To identify relevant research articles and book chapters to be included in the review, a keyword-informed search in Scopus was performed. Combining words related to rural depopulation in Spain, we made four different targeted searches, to secure a sufficient and robust set of the reviewed literature published between 1975 and the present day:

1. (TITLE-ABS-KEY (spain) AND TITLE-ABS-KEY (rural) AND TITLE-ABS-KEY (depopulation))
2.(TITLE-ABS-KEY (spain) AND TITLE-ABS-KEY (rural) AND TITLE-ABS-

KEY (land abandonment))
3.(TITLE-ABS-KEY (spain) AND TITLE-ABS-KEY (rural) AND TITLE-ABS-KEY (migration))
4.(TITLE-ABS-KEY (spain) AND TITLE-ABS-KEY (rural) AND TITLE-ABS-KEY (aging population)).

These searches targeted all articles and book chapters published, rendering in 499 publications in Scopus. The author screened the abstract of all manuscripts and, when necessary, also the full text, based on two inclusion criteria: 1) the study was related with Spanish rural depopulation and 2) the study referred to Spanish rural depopulation from 1975 onwards. The screening resulted in 83 papers, which after eliminating duplicate entries resulted 58 articles and book chapters.

We considered a set of 38 variables on Spanish rural depopulation structured across four impact categories: social and human, economic, institutional and environmental. We based the systematic review on the development impacts outlined in the Agriculture, Forestry and Other Land Use (AFOLU) chapter of the IPCC WGIII AR5 (Smith et al., 2014). The final set of variables for analysis were the result of an iterative coding process. We first considered four impact categories: social and human, economic, institutional and environmental and a few variables in each. The "free" coding of a first batch of papers resulted in the identification of 50 variables overall. Then we consolidated the 50 variables into 38 by merging some of them and deleting others and coded the rest of the papers with the final set of variables. Given the exploratory nature of the study we wanted to be as explicit and transparent as possible, that is the reason why disaggregated variables were considered.

Articles were analyzed in two steps: (i) Characterization of the study and (ii) Potential impacts of/on depopulation. The characterization encompasses variables of basic information such as: publication year of the paper, autonomous community where the study is located, socio-ecological context studied in the paper, e.g. valleys or methodological approach applied for instance. Potential impacts of /on depopulation comprehend a set of 38variables on Spanish rural depopulation structured into four impact categories: social and human, economic, institutional and environmental-see Table A.1-. This first analysis allowed to identify which variables are addressed in the papers as driving or mitigating factors of rural depopulation in Spain; or which variables are affected by rural depopulation (positive or negative effect) -see Table A.2-. Variables were categorized as driving factors of depopulation when a given process, factor or variable enhances or increases depopulation trends, as mitigating variables when a given process, factor or variable decreases depopulation trends, as positive effect when depopulation enhance a given process, factor or variable or as negative effect as long as depopulation is a mitigating factor of a given process, factor or variable.

To complement the analysis the existing relationships between these 38variables were also

identified and classified them as positive or negative factors of each others, but only if these relationships were explicitly mentioned in more than two papers– see Table A.4-. Columns represent the effects these variables have on variables placed in rows, such as P(positive relationship, when a variable increase, it makes the other to increase) or N(negative relationship, when a variable increase it makes the other decrease, having a negative effect). The study of causes and consequences of depopulation can be framed through the lenses of rural vulnerability. The Intergovernmental Panel on Climate Change defines vulnerability as the propensity or predisposition to be adversely affected by a stressor e.g. climate change or depopulation (IPCC, 2014). There is a wide range of definitions and frameworks to assess vulnerability of households and ecosystems e.g. Adger 2006. In line with other scholars (Notenbaert et al., 2013) this study also assumes that the vulnerability of any system is a function of three main components: exposure, sensitivity and adaptive capacity. Exposure can be defined as the extent to which social-ecological systems society are stressed by one or multiple processes of environmental and socio-economic change, known as drivers or stressors, which have specific impacts on such systems. Sensitivity can be described as factors, including issues and variables that mediate the level of exposure to and the potential impact of environmental and socio-economic change on the studied systems. And finally, adaptive capacity as the ability of a social-ecological system to adjust to reduce the potential damage of environmental and socio-economic drivers or stressors and to respond to their negative impacts.

Applying our vulnerability framework mentioned above, facilitate us the categorization between driving and mitigating factors of Spanish rural depopulation, assimilated as sensitivity and adaptive capacity factors. Driving factors were considered as given processes, factors or variables which enhance or increase depopulation trends, mitigating factors were considered as given processes, factors or variables that decrease depopulation trends. The set of variables which were enhanced by depopulation trends were referred as “positive effect” and the set of variables which were mitigated by depopulation were referred as “negative effect”.

3. Results

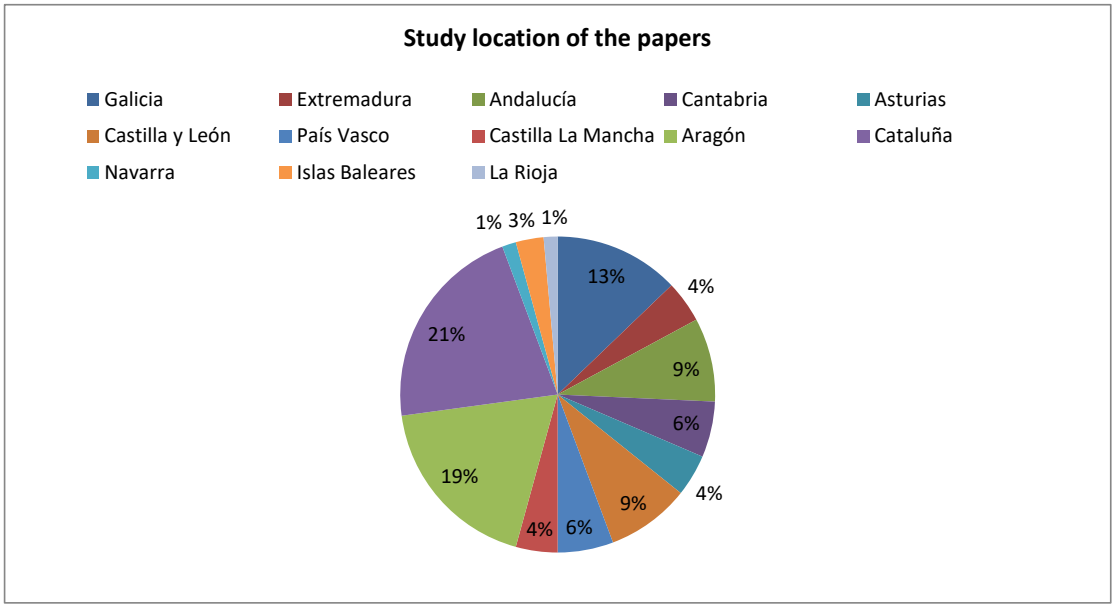

Figure 1 Study location of the papers

As our results show, the autonomous communities most dealt with in by the papers were Catalonia, with 15 documents followed by Aragon with 13 documents, Galicia with 9 and Andalucía and Castilla y León with 6. –see Figure1-. None of the selected papers addressed Madrid, Valencia, Murcia or Canary Islands communities. It is observed that since 2001 there has been a sharply increase in published papers related to Spanish rural depopulation-see Figure A.3-.

In Figure 2 we can see the economic sectors referred to in the papers grouped by autonomous community. The circular graphics represent the percentage of papers addressing certain sectors of the corresponding autonomous community. Agricultural and livestock sectors are the most frequently addressed by the papers –see Figure A.4-. That is because rural areas have traditionally been the territory where agricultural, livestock and forestry activities take place. However, currently these traditional activities have diversified with the introduction of others, such as recreational, industrial and service activities. It should be pointed out how in Catalonia and Aragon the tourism sector acquires greater relevance compared to other autonomous communities. In the last years tourism in these regions has increased, reaching 12% of total GDP and 14% of employment in Catalonia and 8% of total GDP and 10% of employment in Aragón. In Catalonia, Costa Brava has been a classic destination for sun and beach tourism however, in the last years, the mountain for both Aragon and Catalonia, especially its wide Pyrenean headland, has greatly encouraged the development and growth of rural and agro-tourism.

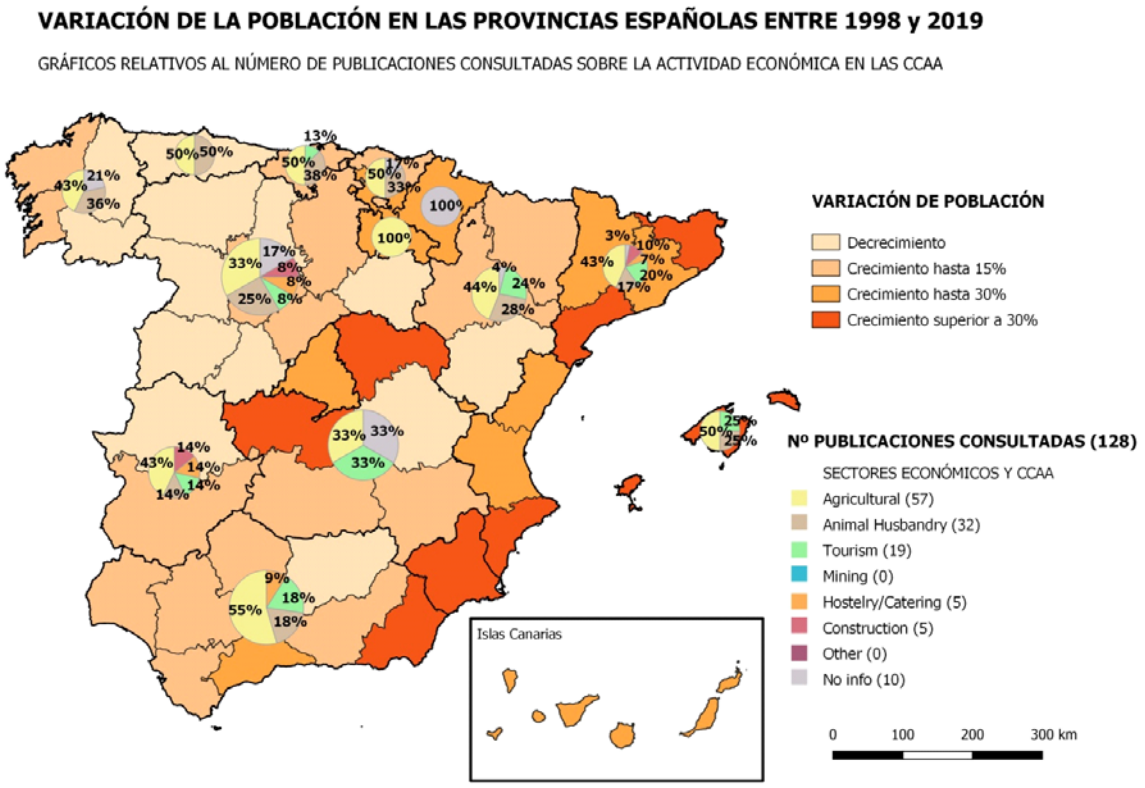

Figure 2 Map of Spanish rural depopulation between 1998 and 2019 and sectors referred by the papers, by autonomous community
Source: Instituto Nacional de Estadística (https://www.ine.es/)

Table 3 includes all the variables, grouped in four impact categories: Social and human, Economic, Institutional or Environmental. It compiles the number of studies addressing each impact category, the share of each impact category in all studies, number of studies which address the specific variable, share of impact of the specific variable taking into account all studies and share of impact of the specific variable considering all the studies of the corresponding impact category.

Almost 85% of the articles analyse impacts from social and human category, followed by almost a 80% which analyze economic variables, 67% which analyze environmental variables and a 18,97% which analyze institutional ones.

The most frequently analyzed variables and the ones with the higher share impact in all studies and the higher share of impact of the variable in the category are: In social and human category *Change on natural population balance compared to past depopulation rates (baseline1950–1975)* with a 44,83% share impact in all studies, *Connectivity with urban areas* in economic category, representing a 44,83% of all studies; *Development plans* in the institutional variables being a 15,52% of all studies and finally in environmental category *Landscape changes* representing a 39,66% of the total of the papers.

Category	Impact on/of	Number of studies which address variables of the category	Share of category in all studies	Number of studies which address the specific variable	Share of impact of the variable in all the studies %	Share of impact of the variable in the category %
SOCIAL AND HUMAN	Change on natural population balance compared to past depopulation rates (baseline1950–1975)	49	84,48%	26	44,83	53,06
	Decrease on or displacement of traditional resource management practices			22	37,93	44,90
	Low maternity and/or birth rate			5	8,62	10,20
	Rural masculinization			9	15,52	18,37
	Ageing population			24	41,38	48,98
	Foreign immigration			9	15,52	18,37
	Retur nmigration			13	22,41	26,53
	Youth migration			13	22,41	26,53
	Diffusion of values of rural behavior			10	17,24	20,41
	Diffusion of values of urban behavior			4	6,90	8,16
	Limited access to infrastructure and services			19	32,76	38,78
ECONOMIC	Impact of national economic crisis of 2008 on rural areas	46	79,31%	9	15,52	19,57
	Increse in the prices of agricultural and livestock productive inputs			4	6,90	8,70
	Business relocations			3	5,17	6,52
	Deagrarianization			16	27,59	34,78
	Unprofitability of primary sector activities			20	34,48	43,48
	Lack of labor opportunities			14	24,14	30,43
	Lack of economic diversification			14	24,14	30,43
	Agricultural Intensification			20	34,48	43,48
	Rural tertiarisation			10	17,24	21,74
	Disappearance of the industry sector			6	10,34	13,04
	Closeness to urban areas			16	27,59	34,78
	Connectivity with urban areas			26	44,83	56,52
	Small municipality size			10	17,24	21,74
	Local produce value			6	10,34	13,04
	Cultural and recreational opportunities			7	12,07	15,22
	Subsidies			5	8,62	10,87
	Agro-tourism and/or rural tourism			15	25,86	32,61
	Affordableresidence			6	10,34	13,04
INSTITUTIONAL	Development plans	11	18,97%	9	15,52	81,82
	Low economic / technical capacity of local institutions / municipalities			4	6,90	36,36
ENVIRONMENTAL	Firesrisk	39	67,24%	12	20,69	30,77
	Droughts			3	5,17	7,69
	Risk natural hazards			5	8,62	12,82
	Landdegradation			11	18,97	28,21
	Landscapechanges			23	39,66	58,97
	Ecosystemservices			15	25,86	38,46
	Protectedareas			6	10,34	15,38
	Adverse geomorpholigy			17	29,31	50,54

Table 3 Analysis of the variables by category

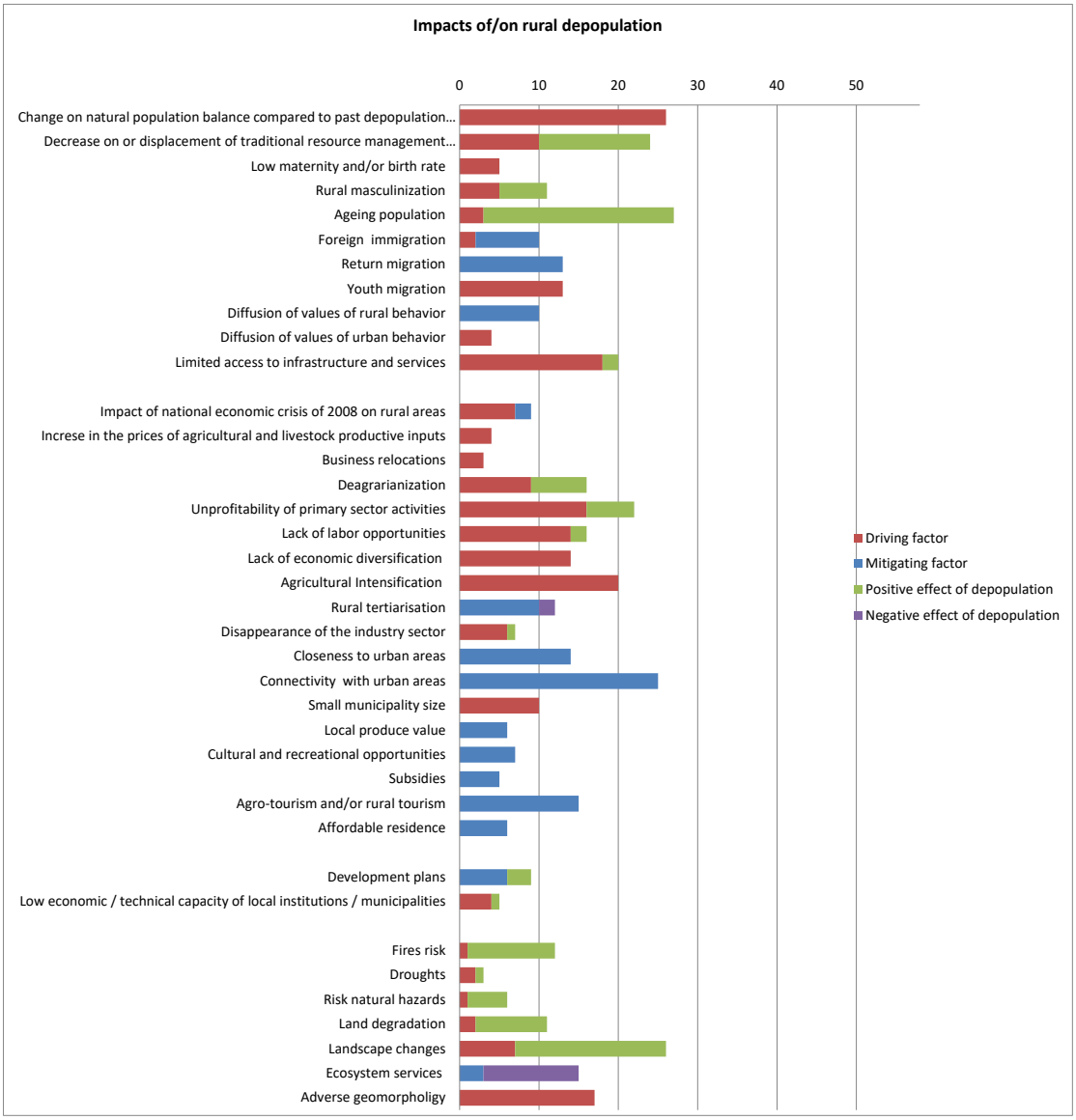

Figure 5 Impacts of/on rural depopulation

4. Discussion

According to the results of our literature review and applying our analytical focus, we can clearly difference and group our variables into five groups: drivers of depopulation, mitigating factors of depopulation, those which are driving and at the same time depopulation have a positive effect on them, those which are mitigating and at the same time depopulation have a negative effect on them, and finally some particular cases which are treated as driving and mitigating causes of rural depopulation creating discrepancies between the results of the papers – see Figure 5-.

Red cluster

Accordingly to the articles reviewed, ten variables were driving factors of depopulation. These variables are: *Change on natural population balance compared to past depopulation rates (baseline1950–1975), Low maternity and/or birth rate, Youth migration, Diffusion of values of urban behavior, Increase in the prices of agricultural and livestock productive inputs, Business relocations, Lack of economic diversification, Small municipality size, Agricultural intensification and Adverse geomorphology*.

Rural exodus marked the trend and demographic structure that persists today in rural areas, rural-urban exodus is mainly carried out by a cohort of those born between 1936 and 1940, who in the late fifties are between 20 and 24 years old, being at these young ages when they leave rural areas. In this way, the genetic group of the rural population is drastically reduced, which added to a context of fertility reduction, significantly reduces births in rural areas -see Table A.4-. A good part of the rural areas of the peninsular interior far exceed figures greater than 25% of the population over 70 years of age. Within the depopulated landscape, there are hardly any children, very few young people, and many elderly people (Camarero et al., 2019). Emigration of young population causes rural depopulation process to grow, increasing the average age of rural population and decreasing natural growth. In addition, some authors indicate that the shortage of young population makes it difficult to launch initiatives that value endogenous resources, hinders the adoption of modern and competitive production techniques, slows down the expansion of new information and communication technologies, weighs down the associationism and cooperativism hinder governance and, in general, endanger the economic horizon of all the territories that still carry out marginal agricultural activity (Leco Berrocal et al., 2017). Diffusion of values of urban behavior makes people to search for social or recreational facilities that are easier to find and be provided by urban areas, and that make it a driver for rural depopulation. Dissemination of urban values and behavior guidelines make rural dwellers aspire to live
as in the city, in terms of equipment, benefits and forms of sociability. When these aspirations are thwarted, emigration is usually a logical way out (Saco, 2010).

Variables such as *Increase in the prices of agricultural and livestock productive inputs*, *Business relocations*, *Lack of economic diversification* and *Small municipality size* are all economic variables which darken the economic horizon or rural areas and consequently promote rural depopulation. Despite the technological improvements implemented by the modernization of primary sector, farm work continues to be hard, low wages of this sector, together with the increase in the prices of agricultural and livestock production inputs and the low supply of other kinds of jobs in rural areas make these areas unattractive to most young people (Collantes, 2009), enhancing them to migrate and increasing rural depopulation.

In addition, high population densities in rural areas increase living standard, promote economic development and enhances technological innovation, that is why areas with bigger municipality size attract at the same time more people, decreasing depopulation (Alados et al., 2014).

As far as *Agricultural intensification* is concerned, the future of the agro-livestock sectors is marked by a policy that has among its objectives to create a competitive sector, capable of facing and surviving in a free market economy. The result is the achievement of a model that tries to perform more and cheaper. Farms have to increase their productive capacity, capitalizing and industrializing production. Despite attracting some foreign immigration in search of work, this agricultural intensification reduces the need for labor force due to the mechanization processes implemented. Moreover, it creates the need to invest in production facilities and structure, and even the need to possess an important territorial base however, not all productive units can adapt to the demands imposed, which means abandoning the activity and the rural environment (Collantes, 2009).

Finally the determinant role of *Adverse geomorphology* should be pointed out in rural depopulation. For instance, mountain areas have a less diversified economic base, more difficult accessibility, more orographic and climatic disadvantages for agrarian production (Collantes & Pinilla, 2004)and these features make people to abandon these rural areas. Higher elevated areas, steep, north facing slopes, were abandoned to concentrate and intensify the agricultural exploitation in the most fertile areas such as alluvial fans and low fluvial terraces (García-Ruiz et al., 1996)

Blue cluster

Nine variables are treated by all the papers in which they appear as mitigating factors of rural depopulation. These variables are: *Diffusion of values of rural behavior, Local produce value, Cultural and recreational opportunities, Return migration, Closeness to urban areas, Connectivity with urban areas Subsidies, Agro-tourism and/or rural tourism* and *Affordable residence.*

Diffusion of rural values such as residential and environmental quality and opportunities for new social groups are increasingly appreciated. As early as the 1970s, it started a return to the countryside by urban dwellers which is based on what some authors call the 'rural idyll', that is to say, a positive image surrounding many aspects of rural lifestyle, community and landscape (Halfacree 1998; Ilbery 1998). However, later, urban-rural flows became increasingly significant and heterogeneous as rural areas acquired new functions due to economic restructuring .Variables which encourage this economic restructuring are among others: *Local produce value, Cultural and recreational opportunities, Subsidies and Agro-tourism and/or rural tourism* (Bayona i Carrasco & Gil Alonso, 2013)Furthermore, lower housing prices in villages attract people who cannot afford to continue living in cities. In fact, these trends can be a way of redistributing population in favour of scarcely populated areas and therefore affect future regional demographic dynamics (Bayona i Carrasco & Gil Alonso, 2013)

Being treated by the papers only as mitigating variables, these should be considered to empower and restore prominence to villages by proposing measures such as establishing a housing policy, through which young people find facilities to reside in rural areas. Although *Agro-tourism and/or rural tourism* is seen as a mitigating variable of rural depopulation, as we can see in Table A.4, more than two papers address it as a driving factor of *deagrarianization*in Spanish rural areas(Marín-Yaseli & Martínez, 2003). Sometimes because of the competition of tourism for labor and fertile land, which are essential to the maintenance of farming and livestock activities municipalities experience abandonment of

cultivated land, decrease in livestock population and farms. A model of sustainable tourism should be applied as coexistence of touristic and grazing activities is desirable for maximum exploitation of resources, as well as for balancing biodiversity conservation and socioeconomic status, development models that make development of tourism compatible with cattle production(Marín-Yaseli& Martínez, 2003).

Cluster (blue and purple)

Variables represented by blue and purple are those ones which mitigate depopulation trends and at the same time, depopulation is a mitigating factor of them. This group of variables, which create negative feedback loops, reduce rural depopulation and at the same time worsen as depopulation increases should be one of the main focus of political action. This is the case of *Rural tertiarisation and Ecosystem services* however, these variables´ composition is quite different, having a different weight, in its mitigating effect and the effect they suffers from rural depopulation *Rural tertiarisation* is addressed by ten papers as a mitigating variable of rural depopulation and by two papers as negative effect of rural depopulation. On the other hand, *Ecosystem services* is addressed by three papers as a mitigating variable of rural depopulation and by twelve papers as negative effect of rural depopulation.

Tertiarisation has acted as a thrust for rural economies, the promotion of the tertiary sector, such as the increase in services, in rural areas or the increase and empowerment of agro-tourism have reactivated rural areas. They also manage to activate construction on the one hand and give a new impetus to the agricultural sector since many tourists are the main customers of these agricultural and artisan products when they visit the territory (García Pascual F. &Mateu González J.J.2003). Furthermore, this tertiarisation increases foreign and return immigration as sown in Table A.4. On the other hand Rural depopulation in past decades has been associated with drastic changes in the landscapes, loss of biodiversity and higher risks of environmental and socio-economic degradation. (González Díaz et al., 2019). Besides its influence on biodiversity, rural depopulation and consequently the progressive land abandonment has a range of consequences for ecosystem functions and the provision of ecosystem services (Benayas et al., 2007). This influence is often context-specific, e.g., wildfire frequency and intensity, nutrient cycling, carbon sequestration and cultural landscape values.. In the same way, ecosystem services is a mitigating variable of rural depopulation, allowing a better use of local resources and increasing trends on foreign immigration and return migration -see Table A.4-.Regarding our results strategies such as valorization and protection of natural resources and ecosystem services, and the revitalization and tertiarisation of the rural economy should be considered.

Cluster (red and green)

As represented in the Figure 3, there are numerous variables with positive feedback loops, which are driving factors of depopulation and at the same time increase with rural depopulation. This group of variables, which create positive feedback loops, should also be considered as other of the main focus of political action.

This is the case of variables such as: *Decrease on or displacement of traditional resource management practices, Rural masculinization, Ageing population, limited access to infrastructure and services, Deagrarianization, Unprofitability of primary sector activities,*

Lack of labor opportunities, Disappearance of the industry sector, Low/technical capacity of local institutions/municipalities, Fire risk, Droughts, Risk natural hazards, Land degradation and *Landscape changes.* In the texts authors identify these variables as causes and consequences of depopulation, which makes them to create feedback processes of rural depopulation in Spain.

For instance *aging population*, the absence of people in their reproductive age cause a demographic imbalance, enhancing rural depopulation and this rural depopulation lead to a deficit of people living in rural areas decreasing the probability of new settlements of families or young people, leading in turn to an increase of the process of aging depopulation. As it appears inTableA.4 process of ageing depopulation is also a driver of *low maternity and/or birth rate, youth migration, lack of economic diversification and decrease on or displacement of traditional resource management practices*. The presence of an ageing population hinders the implementation of initiatives that put in value endogenous resources, hinders the adoption of modern and competitive production techniques, slows down the expansion of new information and communication technologies and in general, darkens the economic horizon of all the territories that still carry out marginal agricultural activity (Leco Berrocal et al., 2017). Consolidation of the demographic aging process and the shortage of women of childbearing age determine the existence of a vegetative panorama that shows evident signs of weakening and deterioration, and may even compromise the demographic, economic, social, cultural and environmental future.

It should be highlight another group of variables which create feedback processes. They are environmental ones, including *Fire risk, Droughts, Risk natural hazards, Land degradation* and *Landscape changes.* The abandonment of rural areas contributed to the generalized deterioration of those complex landscapes originating a very homogeneous landscape with high fire risk (Lasanta et al., 2006; Alomar & Bardi, 2007; Joy & Medrano, 2007) and a higher vulnerability to natural hazards
(Pino et al., 2000).In the same way, this deterioration in landscapes and biodiversity loss enhances people to migrate to other areas. This analysis shows how rural depopulation has a notable impact on the environmental loss of rural areas and the danger they face.

As it is shown feedback processes are complex and they can affect more than one variable. Depopulation tends to generate feedback vicious circles that complicate the future of the rural areas that suffer from them.

Cluster (red and blue)

In the analysis of these variables there are contradictions depending on the papers that study them since they are classified as driving or mitigating variables, depending on the paper. This is the case of: *Foreign immigration* and *Impact of national economic crisis of 2008 on rural areas.*

The conclusions to which the papers on foreign immigration lead us are that demographic impact of immigration is complex and has different dimensions that must be taken into account. It is important to differentiate and realize that there are different trends of foreign

immigration: On the one hand, the impact that foreign immigration has had in the rural areas of the south and the eastern Spain is closely linked to its role in shaping the agricultural labor markets that they support highly industrialized agriculture directed at international markets (Pedreño, 1999; Castellanos & Pedreño, 2001). This foreign immigration, in search of jobs such as in the industrialized agricultural sector, is analyzed in some papers as a temporary immigration with rural areas being only a way station on a path to better jobs in urban settings and finally leaving them (Camarero & Sampedro, 2019). On the other hand, in rural mountainous areas and in the interior and north of the peninsula the focus has been on their role as settlers, as agents of demographic, social and economic revitalization of small municipalities threatened by a secular demographic decline (Sáez et al ., 2016). For this reason, foreign immigration process is complex and addresses numerous variables, both from rural areas and from immigrants themselves. The ability to retain this population in the medium and long term and to fully integrate them into local life is thus an basic issue for the social sustainability of rural areas.

Impact of national economic crisis of 2008 on rural areas has also a rather unclear effect on rural populations according to the papers. Seven papers claim this variable for being a driver of rural depopulation, against other two which classify it as a mitigating variable. Pointed by some papers ,the number of departures from rural areas has increased as much as that of entries, it is showed an internal mobility in the dual direction rural-urban and urban-rural caused by economic crisis of 2008(Leco Berrocal et al., 2017).

As we have observed, there are numerous combinations of relationships between these variables and rural depopulation. However, the analysis should not stop here since there are also relationships and interactions between these variables. We have compiled the interactions described in the papers (as long as they appeared in two or more than two papers) between the 38 selected variables and are represented in Table A.4. Columns represent the effects these variables have on variables placed in rows, such as P(positive relationship, when a variable increase, it makes the other to also increase) or N(negative relationship, when a variable increase it makes the other decrease, having a negative effect). In this way we see how many of them are related and which kind of effect have between each others. In figure 6 and figure 7 are represented the variables which were accounted by twelve or more than twelve papers as driving factors of depopulation (box in red), mitigating factors (box in blue), positive cause of depopulation (box in green) or negative cause of depopulation (box in purple) and its interactions between other variables. These interactions are represented by arrows, red ones symbolizing positive relationship (P) and blue one negative relationships (N).

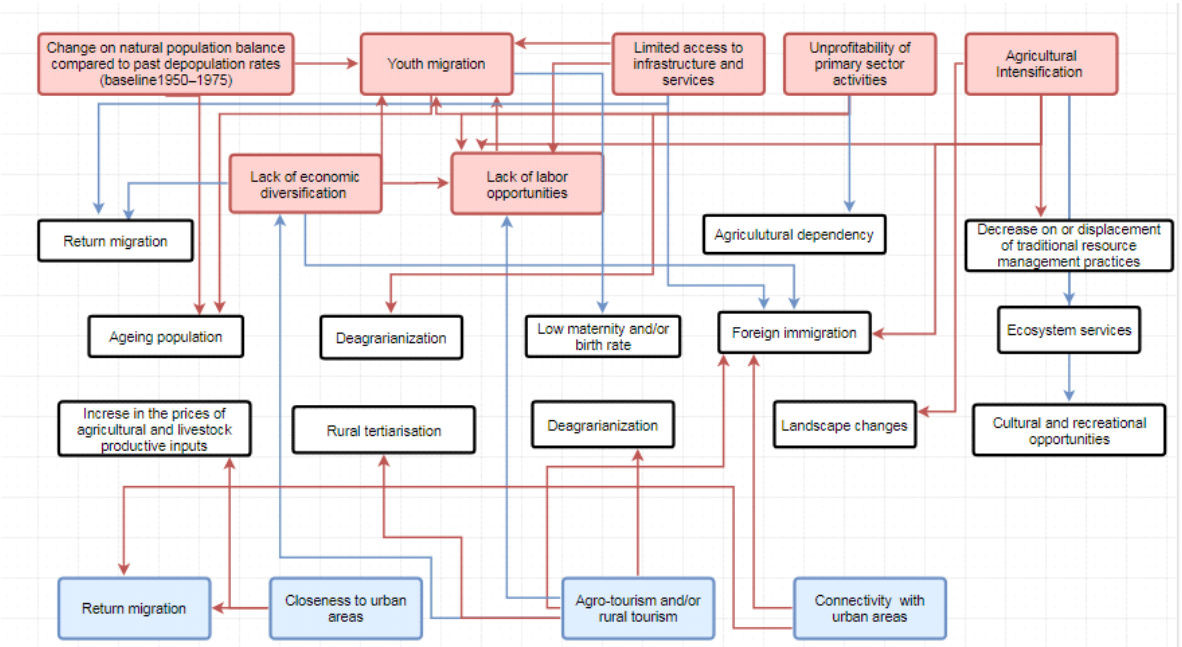

Figure6 Interactions between variables which were accounted by twelve or more than twelve papers as driving factors of depopulation (box in red), mitigating factors (box in blue). Red arrows symbolize positive relationship and blue ones negative relationship

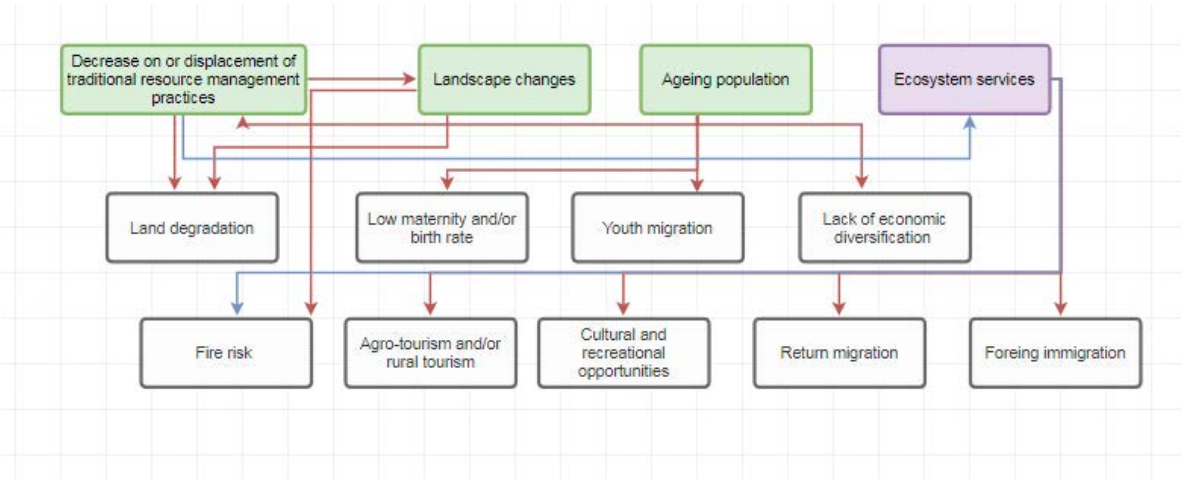

Figure7 Interactions between variables which were accounted by twelve or more than twelve papers as positive cause of depopulation (box in green) or negative cause of depopulation (box in purple). Red arrows symbolize positive relationship and blue ones negative relationship

5. Conclusions

Conducting a meta-analysis of existing studies at national, regional and local levels has allow us to identify a set of relevant variables which are a positive or negative cause of rural depopulation in Spain and a set of other relevant variables which are affected positively or negatively by rural depopulation.

We have been able to identify variables which were treated completely as driving or mitigating factors of rural depopulation by the literature, and others which were affected and affect rural depopulation in more than one way. With this literature review we contribute to a better understanding of the reasons why rural depopulation in Spain is taking place in the past recent years and its consequences. In addition, we have become aware of the complexity of the interactions between variables and how they are affected between them. Finally, with this analysis it is exposed the catastrophe that Spanish rural depopulation can entail in terms of population, heritage, cultural, economic and environmental loss.

References

Alados, C. L., Errea, P., Gartzia, M., Saiz, H., &Escós, J. (2014). Positive and negative feedbacks and free-scale pattern distribution in rural-population dynamics. PLoS ONE, 9(12). https://doi.org/10.1371/journal.pone.0114561

Alomar, G. y Bardi, G. (2007): Prevención y lucha contra los incendios forestales: El uso del ganado en los campos abancalados de la Serra de Tramuntana. Actas de las Jornadas sobre terrazas y prevención de riesgos naturales. Consell de Mallorca. Departament de MediAmbient: 245-251.

Bayona i Carrasco, J., & Gil Alonso, F. (2013). Population and housingdynamics in catalandeep rural areas (1996-2009): Increasingdiversity in a period of change | Dinámicas de población y vivienda en el rural profundo catalán (1996-2009): Diversificación de situaciones en un periodo de cambio. Ager, 14, 35–69. https://doi.org/10.4422/ager.2011.09

Benayas José M. Rey*, Ana Martins, Jose´ M. Nicolau and Jennifer J. Schulz. (2007). Abandonment of agricultural land: an overview of drivers and consequences.

Castellanos, M. & Pedreño, A. (2001). "Desde El Ejido al accidente de Lorca. Las amargas cosechas de los trabajadores inmigrantes en los milagrosos vergeles de la agricultura mediterránea". Sociología del Trabajo, 42, 3-32.

Camarero, L., & Sampedro, R. (2019). Transnationalrurality and depopulation: Recession and settledown in rural Castilla y León | Despoblación y ruralidad transnacional: Crisis y arraigo rural en Castilla y León. Economia Agraria y Recursos Naturales, 19(1), 59–82. https://doi.org/10.7201/earn.2019.01.04

Collaboration for Environmental Evidence, 2013. Guidelines for systematic reviews inenvironmental management. Version 4.2 [WWW Document]URLwww.environmentalevidence.org/Documents/Guidelines/Guidelines4.2.pdf (Accessed 10January 2018).Collantes, F., & Pinilla, V. (2004). Extreme depopulation in

the Spanish rural mountain areas: A case study of Aragon in the nineteenth and twentieth centuries. *Rural History*, *15*(2), 149–166. https://doi.org/10.1017/S0956793304001219

Collantes, F., & Pinilla, V. (2004). Extreme depopulation in the Spanish rural mountain areas: A case study of Aragon in the nineteenth and twentieth centuries. *Rural History*, *15*(2), 149–166. https://doi.org/10.1017/S0956793304001219

Collantes, J. C. A. (2009). Rural environment and the abandonment of agriculture. Development of anexample: TheBasquecaserio | Medio rural y abandono de la agricultura. Desarrollo de un ejemplo: El caserío vasco. Lurralde: Investigacion y Espacio, 32, 395–404.

Ellis, F., & Biggs, S. (2001). Evolving themes in rural development 1950s-2000s. Development Policy Review, 19(4), 437–448. https://doi.org/10.1111/1467-7679.00143

FAO, 2006. The Role of Agriculture and Rural Development in Revitalizing Abandoned/Depopulated Areas.

García-Ruiz, J. M., Lasanta, T., Ruiz-Flano, P., Ortigosa, L., White, S., González, C., & Martí, C. (1996). Land-use changes and sustainable development in mountain areas: A case study in the Spanish Pyrenees. Landscape Ecology, 11(5), 267–277. https://doi.org/10.1007/BF02059854

González Díaz, J. A., Celaya, R., Fernández García, F., Osoro, K., & Rosa García, R. (2019). Dynamics of rural landscapes in marginal areas of northern Spain: Past, present, and future. *Land Degradation and Development*, *30*(2), 141–150. https://doi.org/10.1002/ldr.3201

Halfacree, K. (1998) Neo-tribes, migration and post-productivist countryside. Pp. 200–216
P. Boyle and K. Halfacree eds, Migration into rural areas. Theories and issues (Chichester:
John Wiley)

Ilbery, B. ed. (1998) The geography of rural change (Harlow: Longman)

Informe Anual Defensor del Pueblo, 2018.

IPCC, “Climate change 2014: climate change impacts, adaptation and vulnerability. Working Group II contribution to the Intergovernmental Panel on Climate Change Fifth Assessment Report. Vol. 2: Regional Aspects. Chapter 9,” vol. 2, 2014, p. 3.

Joy, J. y Medrano, A. (2007): Valoración de terrazas frente a incendios forestales en la CAIB. Actas de las Jornadas sobre terrazas y prevención de riesgos naturales. Consell de Mallorca. Departament de MediAmbient, 239-243 pp.

Jurado Almonte, J. M., & Pazos-García, F. J. (2016). Población y turismo rural en territorios de baja densidad demográfica en España. *Boletín de La Asociación de Geógrafos Españoles*. https://doi.org/10.21138/bage.228

Lasanta, T., González-Hidalgo, J.C., Vicente-Serrano, S. y Sferi, E. (2006): Using landscape ecology to evaluate an alternative management scenario in abandoned Mediterranean mountainous areas. Landscape and Urban Planning, 78: 101-114.

Leco Berrocal, F., Pérez Díaz, A., &Mateos Rodríguez, A. B. (2017). Demographic analysis of the local action groups in extremadura (Spain) in the period 2007-2014 | Analysedémographique des GroupesD’action Locale enEstrémadure (Espagne) en 2007 à 2014 | Crisis demográficaen la Extremadura rural: Valoración a través de. In Cuadernos Geograficos (Vol. 56, Issue 1).

Marín-Yaseli, M. L., & Martínez, T. L. (2003). Competing for meadows: A case study on tourism and livestock farming in the Spanish Pyrenees. Mountain Research and Development, 23(2), 169–176. https://doi.org/10.1659/0276-4741(2003)023[0169:CFM]2.0.CO;2

Notenbaert, A., Karanja, S.N., Herrero, M., Felisberto, M.Moyo, S., 2013. Derivation of a

household-level vulnerability index for empirically testing measures of adaptive capacity and vulnerability. Reg.Environ. Change 13, 459-470.

Pinilla V. & Sáez L.A (2017). La despoblación rural en España: Génesis de un problema y políticas innovadoras. Centro de Estudios sobre Despoblación y Desarrollo de Áreas Rurales (CEDDAR).

Pino, J., Rodà, F., Ribas, J., & Pons, X. (2000). Landscape structure and bird species richness: Implications for conservation in rural areas between natural parks. Landscape and Urban Planning, 49(1–2), 35–48. https://doi.org/10.1016/S0169-2046(00)00053-0

Pedreño, A. (1999). "Construyendo la Huerta de Europa: Trabajadores Sin Ciudadanía y Nómadas Permanentes en la Agricultura Murciana". Migraciones, 5, 87-120.

Saco, A. (2010). Rural development and depopulation in Galicia (Spain): Thefutureahead | Desarrollo rural y despoblación en galicia: Escenarios y desarrollos de futuro. Ager, 9, 11–30.

Sáez, L., Ayuda, M. & Pinilla, V. (2016). "Pasividad autonómica y activismo local frente a la despoblación en España: el caso de Aragón analizado desde la Economía Política". Ager, 21, 11-41. http://dx.doi.org/10.4422/ager.2016.04.

Smith P, Bustamante M, Ahammad H et al. (2014) Agriculture, forestry and other land use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (eds Edenhofer O, Pichs-Madruga R, SokonaY,Farahani E, Kadner S, Seyboth K, Adler A, Baum I, Brunner S, EickemeierP,Kriemann B, Savolainen J, Schl€omer S, von Stechow C, Zwickel T, Minx JC),pp. 811–922. Chapter 11. Cambridge University Press, Cambridge, UK andNew York, NY, USA.

Wunder, S., Angelsen, A., & Belcher, B. (2014, December). Forests, Livelihoods, and Conservation: Broadening the Empirical Base. World Development, 64(S1), S1–S11. https://doi.org/10.1016/j.worlddev.2014.03.007