

# THE MODEL OF ALMERIA: TEMPORARY MIGRATION PROGRAMS AS A SOLUTION FOR ENVIRONMENTALLY-INDUCED MIGRATION?

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## INTRODUCTION

Within the European Union, Spain is the country most affected by desertification and by migration. Within Spain, Almeria is the only province with a desert in Europe. The transition from a traditional rural agricultural system to a technological agricultural system has permitted this poor region who expelled its population to turn into a developed region that receives population (Garcia Lorca, 2006). Known as the “vegetable patch of Europe”, the territory of Almeria has been transformed into thousands of hectares of plastic greenhouses, becoming a land of great agricultural expansion and large-scale immigration (Camacho Ferre, 2002).

From the 1970s onward, the agriculture of Almeria has known a radical revolution constituting one of the most interesting recent economic phenomena of Spain. The semi-arid province of Almeria has been transformed into the widest greenhouse area in the world, with an area of 26,000 ha in 2007 (Campra, Garcia, Canton, Palacios, 2008). With this conversion, Almeria has become one of the world’s areas that has experienced the most dramatic environmental changes in the last decades (UNEP, 2005). The incredible socio-economic change provided by this agro economic transformation has been of such extent that it is often referred to as “miraculous” (Sánchez, Aznar, Garcia, 2011).

The introduction of greenhouse agriculture came hand in hand with important flows of immigration since this type of agriculture is extremely dependent on manpower. The “model of Almeria” could be an exemplary model for adaptation to climate change in dry regions. In this chapter,

we will analyse the negative and positive consequences of the implementation of intensive agriculture on both migration and the environment in this region in order to evaluate the pertinence of the model of Almeria as a model of adaptation to climate change in dry regions. On the other hand, migration caused by desertification is very often thought of as labour migration and mono-causal relationships are extremely difficult to establish. Nevertheless, we will see through this case study that the degradation of lands has contributed directly to migration through its impact on poverty.

## 1. BACKGROUND AND CONTEXT

### 1.1. Geographic and climatic contexts

Situated in the south east of the Iberian Peninsula, Almeria, province of the autonomous community of Andalusia, is one of the most arid regions in the

Map 1. Almeria’s geographical location



Source: Universidad de Almeria

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Mediterranean basin, with a sub desert environment. Aridity, linked to high insolation, is the most characteristic climatic factor of the territory and has brought limitations, but also opportunities, for the economic growth of the region (Sánchez Picón, 2005).

Climatically, the area suffers from a very severe pluviometric deficit with periods of extreme drought. In most of the region precipitations are lower than 350mm per year and many areas have less than 250mm per year. Precipitation is scarce and irregular, coming, when it does, in torrential downpours (Sanchez, Aznar, Garcia, 2011)<sup>1</sup>. The average temperature is mild with variations from 17°C to 21°C and winds are reasonably constant throughout the year. Solar radiation is very high with approximately 3,200 sun hours per year (García Lorca, 2010).

## 1.2. Perspectives of climate change and desertification

An important amount of the surface of Almeria is at risk of desertification. Projections that have been made on climate change in the Mediterranean region suggest that climate change will aggravate the existing problems of salinization and erosion. Desertification is still perceived in the developed world as a far away problem but we will see in this case study that it has been an integral constituting factor in the history of a region of a European country, Spain.

According to climate change indicators, average temperatures in Andalusia have incremented in 1,2°C since 1915 and rainfall has decreased in 18% since the 1960s (*Informe sobre el cambio climático en España*, 2007). Furthermore, extreme weather events will become more frequent with drought as the most distressing phenomenon. These studies conclude that drought crises in the region could become structural and permanent problems if the projections of the climate change models are met (*Informe sobre el cambio climático en España*, 2007).

The last estimations of the Delegation of Environment in Spain indicate that inherited desertification covers more than 17% of the regional area and that most of the areas suffering from desertification are concentrated in Almeria (Montero, 2007). These estimations also indicate that “man-made” desertification is already affecting 28% of the territory (Montero, 2007). Water shortage and drought have always been a recurring problem in the region. This problem is now intensified as a result of global climate change. In the 1990s

the five-year drought became one of the main catastrophes in Spain and affected 6 million people (Terra Actualidad, 2007). The current drought of 2012, accompanied by frosts, is being described as the worst drought in 50 years (COAG, 2012).

As we will see, the model of intensive agriculture in Almeria has been an important model for economic development in an area suffering from such climate change and desertification problems.

## 1.3. Desertification in the history of the region

The formation of the semi-deserted landscape took place mainly during the 19<sup>th</sup> century as result of the mining activities that were accompanied by large wood consumption, agricultural expansion, and demographic growth. The mining activities linked to population growth led to an exhaustion of natural resources in Almeria causing desertification (Fermin, 2009). Between 1822 and 1857 the growth of the population in Almeria accelerated in an unprecedented manner. This major anthropogenic pressure over a fragile environment, like the one that characterizes this region, was the main cause of the desertification process (Sánchez Picón, 1996). The expansion of irrigated agricultural land, in order to nourish the incoming workers, caused the depletion of surface water. From 1880 onwards, the fall in the prices of mineral and traditional agricultural products and the crisis this generated, forced populations to migrate (Sánchez Picón, 1996).

We can see that in the history of the region, land degradation was not only caused by climatic conditions but in a very important way, by human activities. In the Mediterranean region, climatic drying took place at the same time as agricultural development and rapid population growth. Desertification has been acting as a push factor for centuries in this region. In the past, agricultural production was scarce and difficult in this underdeveloped land and poverty situations were traditionally combated through emigration (García Lorca, 2010). The region of Almeria has shown numerous examples of important changes in the rhythm of human occupation and the intensity of the exploitation of natural resources depending on the different economic models of each period (Sánchez Picón, Aznar Sanchez, García Latorre, 2011).

1. The translations in this chapter (french-english, spanish-english) were done by the author.

## 2. A CHRONOLOGY OF MIGRATION IN THE REGION

### 2.1. Historical land of migration

Migration implies complex models of multi variability and economic development. Institutional and political factors have had a very important role in migratory patterns but environmental factors have also played a significant role.

Almeria was one of the case studies chosen by the EACH-FOR Project (Environmental Change and Forced Migration Scenarios) which was the first large-scale empirical research project on environmentally induced migration, financed by the European Commission from 2007 to 2009. Spain was selected as a case study because it is severely affected by two environmental issues that are expected to become of increasing importance in the Mediterranean region: water shortage and drought. Within Spain, Almeria was selected due to the relevance of the relationship between environment and migration (2009: 15). This study underlines the fact that the semi-arid climate of this province has played an important role as a push factor exerting considerable influence on migration (Fermin, 2009: 16). Despite the lack of relevant research and data on the link between environment and migration it is possible to acknowledge the way in which the environmental factors have impacted migration flows.

The isolated position of Almeria relative to the most developed regions in Spain and its lack of infrastructures increased the dependence of the population on natural resources, causing deforestation and erosion. This situation linked with the underdevelopment of the region was one of the push factors for internal and cross border emigration (Sánchez Picón, 1996). In fact, the mining activities during the late 18<sup>th</sup> century and the beginning of the 19<sup>th</sup> century that provoked soil degradation and that eroded agricultural production, pushed thousands of farmers to migrate to areas with better job opportunities (Bknerr, 2004). People abandoned arable lands and marginal areas, leading also to further erosion. The loss of forests caused an alteration in the hydrologic balance accelerating erosion.

The economists Aznar and Sánchez Picón, agree that the keys to understand the great migratory wave of the beginning of the 20<sup>th</sup> Century are the decline of the mining and agricultural sectors (Aznar, Sánchez Picón, 2000). The development of traditional agriculture in this arid region was very difficult due to the lack of precipitation and the bad quality of the ground. Gomez Diaz, who analysed migratory movements

in Almeria until the beginning of the 20<sup>th</sup> century, also mentions the fact that meteorological catastrophes like floods and droughts had an important impact on production acting as an important push factor for migration (Cruz Moya, 2005). According to Garcia Latorre and Aznar Sanchez, exceeding disturbances in a short period led not only to extreme environmental changes, but also to the economic and demographic stagnation of Almeria until the 1960s. "By 1910, Almeria had become largely desert and one of the poorest provinces in Spain. People began emigrating" (Garcia, Sanchez, 2001).

Nevertheless, it would be too simplistic to relate the high emigration of the late 19<sup>th</sup> Century and most of the 20<sup>th</sup> Century only to environmental factors that restricted agricultural production (Fermin, 2009). This is because institutional and social factors also played a significant role. However, there are good reasons to believe that environmental change did have an important influence on the other traditional socio-economic drivers of migration.

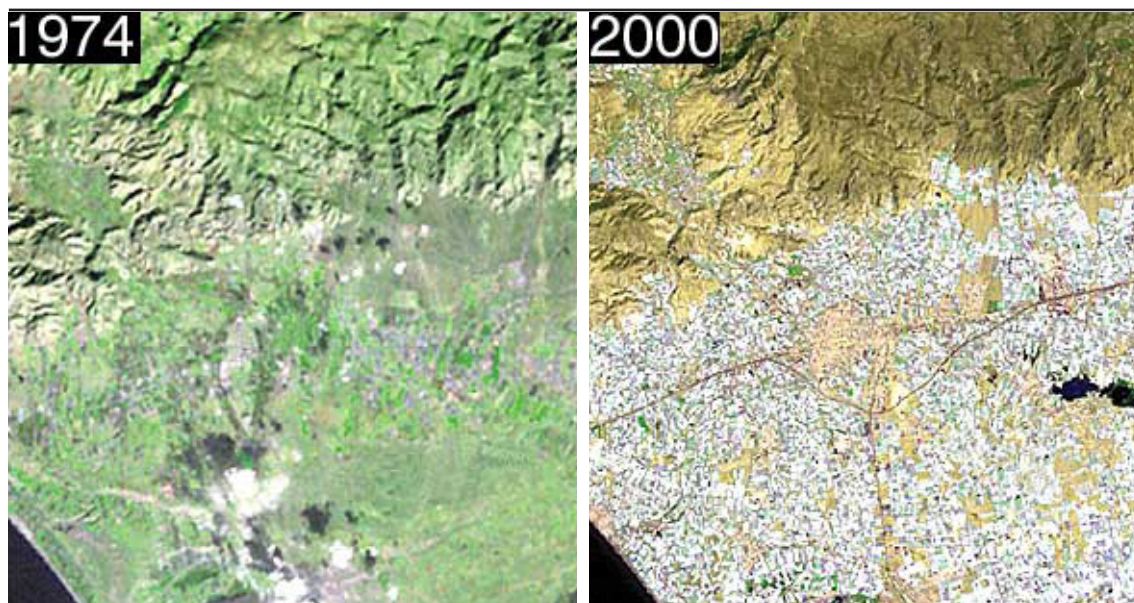
**Table 1.** Migratory balance in the 20<sup>th</sup> century in Almeria

Period	Natural Growth of the Population	Actual Population Changes	Net Migratory Balance
1900-10	36,460	32,000	-4,460
1910-20	39,000	-24,300	-63,300
1920-30	59,500	-14,000	-73,500
1930-40	44,500	8,400	-36,100
1940-50	44,000	-10,200	-54,200
1950-60	60,600	6,000	-54,600
1960-70	56,800	12,000	-44,800
1970-80	46,500	27,500	-23,000
1980-90	34,500	45,000	10,500
1990-2000	21,300	49,500	28,200

Source: IEA in Rodríguez Vaquero, 2008.

As we can observe in Table 1, the most important emigration wave took place just before the Spanish Civil War (1936-39). Economic problems in the province linked to the industrialisation and urbanisation of other Spanish regions such as Catalonia, and the facilities to migrate to some American countries that were in need of work force (Argentina, Brasil, Cuba or the United States), explain the great migratory wave. The decrease in the migratory wave in the 1930s is linked to the economic crisis of the host regions after the crash of 1929. After the Civil War, emigration continued to Catalonia, Switzerland, Germany, France and Belgium (Sánchez Picón, 2005). The migratory balance in the region stayed negative until the implementation of intensive agriculture in the 1970s (Sánchez Picón, 2005).

**Map 2.** The territorial transformation of Almeria (1974-2000)



Source: UNEP, 2005.

## 2.2. The miracle of Almeria

The situation in South-Eastern Spain has changed radically over the last five decades. This Spanish province, suffering from desertification and erosion and with a lack of infrastructure, has had a dramatic change in status in the last 50 years. Almeria has passed from being one of the poorest provinces in Spain to becoming one of the richest. Until the late 1960s, Almeria was the penultimate Spanish province in terms of GDP and has now passed to being the first province in Andalusia occupying an intermediate position at a national level (INE, in Aznar, Galdeano, Pérez, 2011).

This agro-economic transformation was implemented after the Spanish Civil War with the creation of the National Institute for Colonisation and Agricultural Reform (INCRA). The aim of this institution was to transform traditional agriculture into irrigated agriculture (Garcia Lorca, 2010). With the perforation of wells, to exploit salty water, the introduction of the sand plot technique and the development of vegetable production using plastic greenhouses, the region became suitable for intensive agricultural activity (Sanchez, Aznar, Garcia, p.1364, 2011).

The most developed areas in intensive agriculture today are the Campo Dalías and the Campo de Níjar. Before the 1960s, these areas were barren shrublands used for grazing (Garcia Lorca, 2010). Although water is essential for irrigated agriculture, the low level of rainfall, the high average sun hours and the mild winters are favourable for greenhouse

agriculture production (Fermin, 2009). These suitable conditions that allow the production of vegetables out of season give farmers in this region an important competitive advantage over the rest of Spain and Europe (Sanchez, Galdeano, 2011).

Other factors like the increase in demand of agricultural products, the economic integration of Spain into the European Union in 1986 and important technological development in production, transport and commercialisation also played a decisive role (Garcia Lorca, 2010). Furthermore, European regulations have had a positive effect, guaranteeing free access to the European market as well as limiting imports of non-European products. Subsidies have also been granted to farmers to help offset the costs of structural reform related to traceability in agricultural products<sup>2</sup>, certification and waste tracking (Galdeano-Gómez, Aznar-Sánchez, Pérez-Mesa, 2011). In several years, this land was transformed from a desert into the “vegetable patch of Europe” (Sanchez, Aznar, Garcia, 2011).

The model from the point of view of landowner structure has reduced poverty and contributed to the creation of successful economic and social communities. The researcher Giognocavo points out that what is rare about the model of Almeria is the fact that it has grown into a highly specialized agricultural sector, heavily empowered by

2. “Each stage in the supply chain from farm to consumer can be traced so that the quality of the food can be guaranteed” (Agriculture Dictionary).



technological improvements but always maintaining its cooperative business form. The role of the cooperatives has been very significant since a high proportion of the farms are small and family managed (Giagnocavo, 2012). The 27, 000 hectares of green house agriculture are distributed within more than 13,500 small owners. The fact that the exploitations are small and family managed has allowed a pretty equitable distribution of wealth between the locals (Aznar, 2011). Almeria is not only the main fruit and vegetable-growing province in Spain, but also the largest cooperative vegetable growing area in Europe. In the current economic crisis, the agricultural cooperative sector is the only sector generating employment with a large distribution of the benefits (Giagnocavo, 2012).

Furthermore, there has been a large extension and diversification of activities around the agricultural sector creating an important agro industrial cluster. The emergence of this agro industrial cluster has played an essential role in the development of the model and is considered as an outstanding exponent of endogenous development. From the 1990s there has been a substantial growth of local businesses dedicated to activities such as: biological production, crop substratum, environmental control, watering and fertilization, seeds, financial services, transport machinery, cartons and packaging, etc. (Galdeano, Aznar, Pérez, 2011). This productive system around the horticultural sector has created significant interrelations and cooperation within the businesses, which give strength and integration to the cluster (Aznar, 2011).

### 2.3. The “boom” of recent immigration

The development of intensive agriculture has been closely linked to demographic growth. The increase in agrarian production would not have been possible without immediate and sizable migration flows since this type of agriculture is extremely dependent on manpower (Sanchez, Aznar, Garcia, 2011). We can distinguish three periods of immigration in Almeria. The first period (1954-1970) was characterized by the establishment of new farms in new population centers that were accompanied by inter-municipal movements. During the second period (1971-1989) migratory movements came from other regions of Spain that were attracted by the “Almerian miracle”. However, it was not until the third migratory period that began in the 1990s that international migration occurred. (Garcia Lorca, 2010). The full integration of Spain in the European Union in 1993 brought a spectacular growth in the horticultural

sector that attracted foreign populations (Garcia Torrente, 2002).

In the last 30 years, Almeria has become a well-developed province with prosperous agricultural, touristic and construction sectors. The arid climate conditions no longer act as a push factor but as a pull factor attracting migrants from all over the world (Fermin, 2009). The appropriate manipulation of climatic factors was one of the keys of the development process (Garcia Lorca, p. 923, 2010).

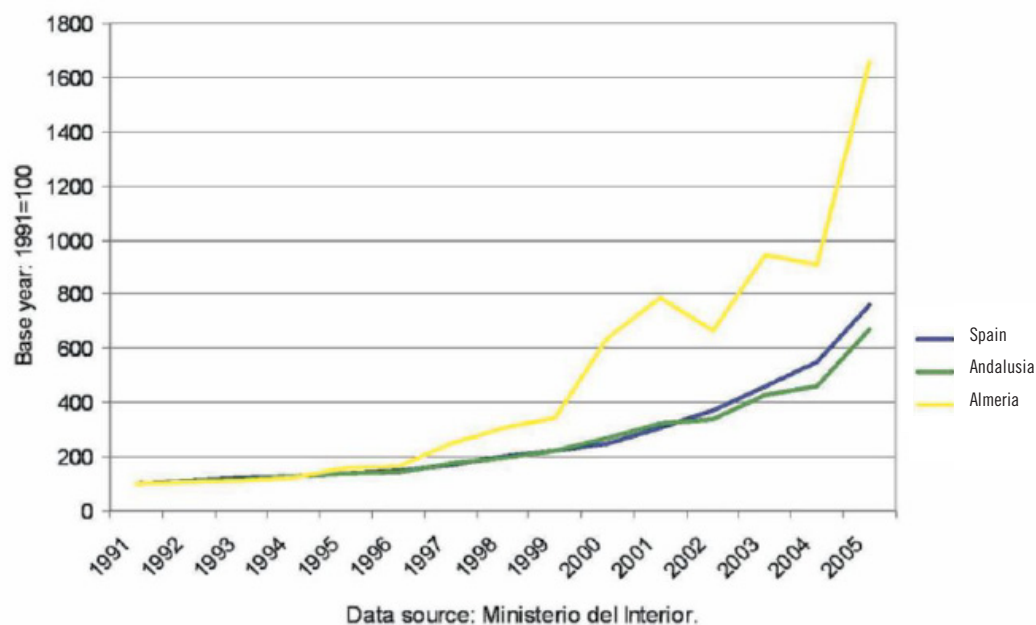
Information from the Ministry of Interior reflected on Figure 2 shows that from the mid 1990s the increase of international residents in Almeria became much greater than in the rest of Andalusia and the rest of Spain (going from approximately 1000 in 1991 to over 16,000 in 2005). These numbers provide evidence of a net population gain due to migration. The significant increase of population in recent years has made Almeria the second highest province in Spain in terms of population growth and the first in terms of immigration (Aznar, Galdeano, Perez, 2011).

More than 150 nationalities are represented in Almeria. The most represented nations are those shown in Figure 3. The geographical proximity with Northern Africa has been determinant to explain the important migratory flows coming from the Maghreb. These migrants find in Almeria a space of transit, regularization and posterior diffusion to other territories. Cultural and linguistic proximity has also facilitated the settlement of Latin American migrants and the fall of the Iron Curtain enabled the entrance of migrants from Eastern Europe (Garcia Lorca, 2009).

In 2011, the total population of Almeria was 190,349. Of this population 20,160 were foreigners. According to recent data from the Subdelegation of Government in Almeria, the most significant nationalities represented in Almeria in 2011 were: Morocco (46,340), Rumania (35,884), United Kingdom (11,052), Ecuador (7,500), Bulgaria (4,295), Lithuania (3,632), Colombia (2,979), Russia (2,868), Senegal (2,542) and Argentina (2,470). The largest numbers of immigrants are in working age and 60% of them are between 15 and 39 years old. The development of agriculture has been the main pull factor for immigrant populations to this region.

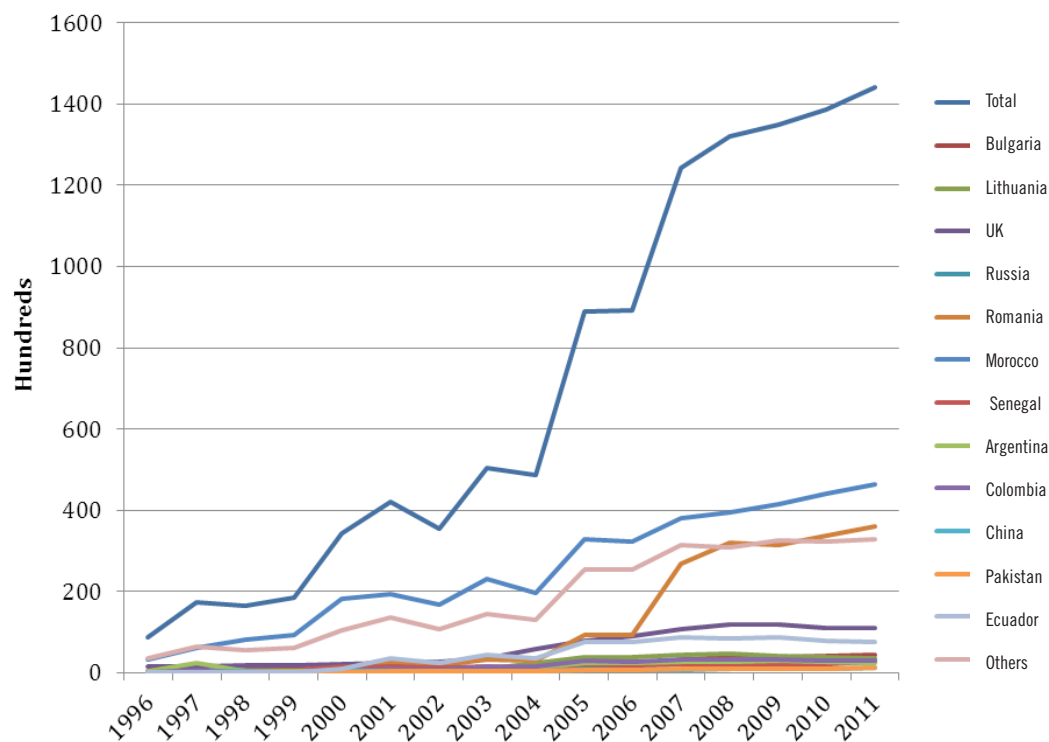
Keeping in mind the significance of irregular migration, foreign immigrants in Almeria represent 15% of the members of the Social Security System and are occupied as follows: 60% in agriculture, 10% in construction, 9% in the hotel industry, 7% in commercial activities and the rest do not have a fixed occupation (Rodriguez Vaquero, 2008). The most important occupation of immigrant men continues to be agriculture, whilst women are

**Figure 1.** Increase of international residents



Source: García Lorca, 2010.

**Figure 2.** Foreigners by country of origin with residence and work permit in Almeria (1996-2011)



Source: Author. Data: Subdelegation of Government in Almeria

occupied in domestic services, taking care of the elderly, catering and, sadly, prostitution. Within the group of the over 60 year olds, European citizens represent more than 80% showing that Almería is a place chosen for retirement due to the mild climate of the region (Garcia Lorca, 2009).

## 2.4. The environment-migration nexus

According to the Subdelegate of the Government in Almería, the discussion on environmentally induced migration as such is not present in the political discourse. Migrations are addressed from a socio-economic point of view in the context of a broader global change, but not of an environmental change in particular. (Interview Garcia Lorca, 2012). The only type of environmental migration that has been suggested is that of migrants arriving to Almería in search of milder weather conditions. The fact of referring to immigrants from developed northern European countries as environmental migrants is very interesting and not often addressed in literature. These migrants normally look to settle in the countryside in houses offering luxurious living conditions. These populations cause further environmental tensions for the repartition of land and water resources. Most of these migrants come from the UK and represent 10% of foreign immigrants in Almería (Garcia Lorca, 2010: 931).

The links between desertification and migration are only addressed from a technical point of view by specialized organisms like the United Nations Convention to Combat Desertification. This convention was established in 1994 and signed by 194 parties. The UNCCD is the only legally binding international agreement on desertification issues and addresses the link between desertification and migration in its article 17.1 (e) as follows: the parties have agreed to “take into account, where relevant, the relationship between poverty, migration caused by environmental factors, and desertification” (UNCCD). According to the UNCCD, the root causes of migrations in dry lands have often been mistaken. Migrants tend to explain the reasons for mobility in terms of poverty, often overlooking the fact that the real cause of this poverty is due to the deterioration of their lands of origin and the loss in productivity. Migration does have an environmental dimension (UNCCD, 2009). There is still a lack of information concerning the impact of desertification in the regions of origin of the immigrants that come to Almería. Recent data shows that most African migrants come to Almería from urban centers (Garcia Lorca, 2012). However,

studies have not been undertaken to show the impact of drought and desertification on their regions of origin and the way in which desertification could have led them to migrate to the city in the first place. Since most of the migrants come from Africa, which is the continent that is most deeply affected by desertification, studies to show the relationship between desertification in Africa and migration towards Almería may provide resourceful information.

This relationship between desertification and migration was nevertheless referred to in both of the international symposiums that took place in Almería in 1996 and 2004 concerning forced migration in arid and semi-arid regions. The departure point for these meetings was that large demographic movements do not only occur as a consequence of political conflict and economic crisis but also as a cause of environmental change in general, and desertification in particular. These symposiums concluded that desertification is the consequence of bad policies and non-sustainable activities. One of the conclusions of these symposiums was that the example of greenhouse agriculture in Almería is showing to be a productive alternative for depressed areas (II International Symposium, 2006). We will analyse these assumptions in the following sections.

## 3. VIABILITY AND SUSTAINABILITY OF THE MODEL OF ALMERIA

### 3.1. Environmental aspects

#### 3.1.1. Main Problems

Despite great economic performance, the future prospects of this model seem uncertain due to the social and environmental consequences, which are often negative. The expansion of intensive agriculture can be both a source of wealth and a general problem regarding sustainable development and desertification. This industrial agriculture implies a strong environmental impact provoking the pollution of the scarce water resources, land erosion, loss of ecological diversity, deforestation and the consumption of fossil fuels and the release of greenhouse gases. Desertification in this region has not only been accelerated by intensive agriculture but also by a growing touristic sector. Poor agricultural practices (pesticides, irrigation, and invasive plant species) together with modern economic development have damaged the land.

In the beginning, this new agricultural model was entirely dependent on subterranean water sources. The continued growth of greenhouses

between the 1980s and 1990s placed an enormous demand on water supplies and its impact became noticeable when the quality of the underground water began to deteriorate and salinize (Sanchez, Aznar, Garcia, 2011). The process of exhaustion of aquifers and unsustainable water management is the process that is most closely linked to desertification in Spain. There is an important risk of desertification in this region due to this overexploitation of surface and groundwater resources (Puigedefábregas, Mendizábal, 2006).

### 3.1.2. Policy Responses

Nevertheless, action has been taken since the mid 1990s to fight the negative externalities of the model and authorities seem to have an increased awareness of the environmental issues involved. The irrigation system of southeastern Spain is now the most efficient in the country. The AGUA program in 2004 replaced the Hydrological Plan of 2001 that was based on large inter-basin water transfers. The new program is now committed to desalinization as a way to address water deficits (Downward, Taylor, 2007). Desalinization plants and reservoirs have been constructed to increase the water supply and regulatory frameworks have been implemented to control aquifer overexploitation. Measures have also been taken to improve the collection and use of rainwater (Gómez-Orea, 2003). All of these measures have significantly decreased water needs and the pressure exerted on aquifers (Picón, Aznar, Latorre, p.6, 2011). The scarce water resources are now being used in a much more efficient manner. In the 1970s for the production of 60,000 kg/ha/year more than 8000 cubic metres of water/ha/year were used. With the implementation of the measures mentioned above, in 2008 the average production was between 120,000 and 160,000 kg/ha/year, with a consumption of between 3,500 and 6,000 cubic metres/ha/year (Garcia Lorca, 2010). The productive efficiency of the model has been therefore significantly improved with constant technological innovation. (Interview Garcia Lorca, 2012). However, Almeria will have to balance the projections of agricultural development and the environmental consequences of a future supported on desalinated water (Downward, Taylor, 2007).

Measures that will permit adaptation to climate change include an adequate management of cultivation techniques, better irrigation systems and reforestation. The European Strategy for the Conservation of Plants, the Common Agricultural Policy with its agro-environmental measures and the Spanish Forest Plan and the regulation of land use are instruments that should allow the

conservation of edaphic resources of the ecosystems (*Informe sobre el cambio climático en España*, 2007).

Regarding desertification, the ratification of the Spanish government of the United Nations Convention to Combat Desertification (UNCCD) in 1994 came along with the creation of a National Program to Combat Desertification (PAND). The objective of the PAND is to determinate the contributing factors to desertification and the measures needed to combat and mitigate the consequences of droughts. The LUCDEME Project (Fight Against Desertification in the Mediterranean) was established by the Ministry of Agriculture in 1995 in the context of the PAND. This project is a reference in the research and creation of mitigation policies to combat desertification. For many years, it was the only program that funded desertification research in Spain (Ministerio de Agricultura, Alimentación y Medioambiente). However, although important scientific knowledge on the causes and effects of desertification has been obtained, little efforts have been made to implement an efficient way for the agro industrial sector to fight desertification. Certain researchers such as Martinez Fernandez, are surprised by the fact that intensive green house agriculture is not considered or referred to in the National Plan to Combat Desertification. The measures to protect the soil in Spain should rapidly take into account the spread of greenhouses in Almeria (Martinez, 2005). The confederation of ecological oriented groups of Ecologists in Action is also worried that measures against erosion created by the great proliferation of greenhouses in Almeria have not been undertaken by the PAND (Ecologistas en Accion, 2008).

## 3.2. Immigration

### 3.2.1. Main Problems

The impacts of growing immigration on the environment in this region should also be taken seriously into account. The significant growth in population density exerts a growing pressure over land uses and natural resources. Environmental disruption can in fact be both a cause and a consequence of population movements. Growing human demand on the land causes, in many cases, the depletion of natural resources (Scherr, Satya, 1996). The spectacular growth of immigration, together with the already existing water demanding sectors, agriculture and tourism, has added pressure on natural resources. According to a report on climate change prepared for the presidency of Spain in 2007, current migratory flows are attracted to vulnerable areas that are already



the most exposed to environmental hazards and climate change such as Almeria (*Informe sobre el cambio climático en España*, 2007). If high population growth persists, great social and institutional efforts will need to be made not only to assure a sustainable use of natural resources but also to reduce social conflict.

There is also an important problem regarding irregular migration. The Subdelegation of Government in Almeria indicates that there are approximately 30,000 irregular migrants in the region. These immigrants do not always enter the territory in *pateras* (small boats used for illegal migration), but also by the airport entering as tourists. Andrés García Lorca explains that it is has become increasingly difficult to control illegal migration, and that many of these illegal migrants do not have any kind of documentation with them, creating problems to determine their country of origin (Interview García Lorca, 2012). One of the reasons that explains their will to lie about their nationality is the hope of obtaining the refugee status. This is why, many of them claim to be natives of countries such as Liberia, Syria or Mali (Barros, 2006).

Furthermore, the social integration of immigrants has not come without problems and conflicts. An intense outbreak of racist violence against Moroccan immigrants took place in February 2000, when a Moroccan with mental problems murdered a young woman from the town of El Ejido in Almeria. This isolated incident generalized a racist wave of violence against the immigrant community. The mosque, butcheries, bars, restaurants and cars of immigrants were object of violence from the rest of the population in El Ejido. According to SOS Racism, for discrimination to be abolished there is a great need to combat labour exploitation and to fight for the rights of the immigrant community. Spatial segregation and labour exploitation are the basic elements to understand what occurred in El Ejido in 2000 (SOS Racismo, 2001). Housing for the agricultural workers continues to be a social and environmental problem that requires attention. Shantytowns in Almeria are widespread and more than 4000 migrants are currently living in them. Most of the shantytowns are situated in El Ejido and occupied by Moroccans. Many of their inhabitants are undocumented migrants and live under extreme poverty conditions (Cabrera, 2010).

In 2011, an investigation from *The Guardian* claimed that the working conditions of illegal workers in Almeria met the UN's definition of modern slavery (Lawrence, 2011). These conditions seem to have deteriorated since the economic crisis that drove an increasing amount of migrants

to search for work in the agricultural sector after the collapse of the construction sector. According to this report, African migrant workers live in shacks made of boxes and plastic and have no access to sanitation or drinking water. Their salaries are half of the legal established minimum wage, and illegal workers are threatened to be reported to the police if they complain about their living conditions (IOMC, 2011). Competitiveness in the agro industrial sector is achieved by reducing labour costs and by augmenting productivity. On the other hand, Moroccan and Spanish producers now compete for the same potential markets in agriculture and this increases considerably racist and anti Arab reactions within the agriculturalists of Almeria. The vulnerability, in the case of undocumented migrants, is total since their situation does not allow them to denounce to the police. Their only mean of expression is rebellion and this rebellion is used against them to reinforce the stereotypes of conflictive workers that are laid upon them (SOS Racismo, 2001). These outbreaks of violence in El Ejido in 2000 showed the unsustainability of the model and trade unions and associations such as the Association for Human Rights of Andalusia, the Association of Moroccan Emigrants in Spain and the National Confederation of Workers, pressured the sector to improve working conditions for immigrant workers asking for broader regularization processes (Cabrera, 2000).

### 3.2.2. Solutions

The importance of the migratory phenomenon in the region of Almeria and the necessity to control migration flows have required the implementation of migration policies. National policies on immigration establish specific legal regulations for foreigners to have access to the labor market. In general, the principal objective of these policies is to satisfy the needs of the national labor market. In 1985, the law on the rights and liberties of foreign immigrants was published and new measures have been taken. Extraordinary regularization processes have taken place in 1985, 1990, 1996, 2000, 2001 and 2005 in order to decrease the number of irregular migrants. Those of 2000 and 2001 were of particular importance. Firstly, foreign immigrants in legal situation doubled and regular contracts rose. Another consequence of this was the growth of *family regroupation, which involves further challenges and leads to the congregation of new illegal immigrants*. (Pumares Fernandez, 2004). Social services like education, health care and administration have also been significantly modified as a consequence of this high population growth and need to adapt in order to answer to a growing demand (Rodríguez Vaquero, 2008).

Even if at the beginning there was a poor management of the incorporation of large amounts of immigrant workers, measures have been taken to correct the situation by making greenhouse labor more attractive (fixation of salaries according to production, mechanization of the most difficult tasks) and by the regularization processes. Additionally, the agriculturalists associations are encouraging contracts with the immigrant workers' countries of origin to manage the arrival and adaptation of immigrants in a more efficient manner (Aznar, Galdeano, 2011). Furthermore, plans have been approved since 2001 to coordinate public policies concerning immigration in Andalusia. Policies have also been implemented to foster the integration of immigrant populations.<sup>3</sup> The main objective of these measures has been to decrease social conflict, increase relationships between different cultures and to promote tolerance between the migrant and local populations (Junta de Andalucía). Additionally, Almería presented in July 2011 the Second Municipal Plan for Immigration (2011-2013) focused on favouring access to resources, employment and integration of immigrant populations. Another aim of this plan is to raise consciousness of society as a whole of the positive values of immigration in order to avoid racism and xenophobia (Integra Local, 2011). An element that proves the growing integration of migrants is the fact that an increasing number of them are becoming shareholders in agricultural cooperatives within few years (García Lorca, 2006). However, the social conflict between communities remains high in the context of the current economic crisis and many more efforts will be needed in order to combat racism.

From the 1990s annual quotas for foreign workers have been established with the hope that these quotas would be a mechanism to select workers in function of the labor needs and that clandestine migration would be discouraged. Nevertheless, a new problem has emerged since there is a tendency from the part of the regularized migrants to change of destination and sector once they are in legal situation. There is an extended idea between the immigrant community that better salaries and conditions can be earned in other sectors and provinces of Spain. The loss of these workers leaves a constant need for new immigrant labour and leads to question the sustainability and capability of the model to better the working conditions in order to increase the attractiveness of greenhouse labor to immigrants (Pumares, 2003).

3. Plan Piloto de Actuación Integral en Zonas Sensibles con presencia significativa de población inmigrante.

#### 4. INTENSIVE GREENHOUSE FARMING: A MODEL OF ADAPTION TO CLIMATE CHANGE?

According to a scientific study published in the Journal of Geophysical Research, the high concentration of greenhouses in Almería has a positive effect in the fight against climate change by offsetting global warming through the generation of local microclimates. Investigators recorded a significant air-cooling trend of  $-0.3^{\circ}\text{C}/\text{decade}$  in the area covered by greenhouses during the years of greenhouse expansion, between 1983 and 2006. This cooling trend has no correlation with the regional warming trend of  $+0.4^{\circ}\text{C}/\text{decade}$  that matches the warming in the rest of the Mediterranean area in the same period. The explanation of this cooling trend would be the negative radiative force exerted by the greenhouses that reduces the net incoming shortwave energy diminishing the energy emitted as long wave radiation (Campra, García, Canton, Palacios-Orueta, 2008). This study shows the important benefit of high albedo surfaces as adaptation measures to climate change at local scales and should be further developed and researched as a strategy for both mitigation and adaptation. This type of geo-engineering consisting in augmenting albedo surfaces is not yet considered as a mitigation or adaptation strategy in international protocols (Campra, 2011). Policies aimed at quantifying the human influence on climate are still largely focused on changes in atmospheric composition. Nonetheless, there is a vast variety of scientific work that has proved that land-cover changes also have a significant influence on climate by changing the physical properties of the land surface. According to the IPCC, the local radiative-forcing change caused by surface albedo in regions of intensive land use such as Europe may be greater than that due to all the anthropogenic greenhouses together (Pielke, Marlan, Betts, Chase, Eastman, Niles, Niyogi, Running, 2002).

Another issue that the model of Almería raises and that should be carefully analysed, is the debate between land sharing and land spreading. In land sparing, concentrated areas of farming are managed to maximize yields, while separate reserves target biodiversity conservation. Agricultural yields on farmland are maximised so that other areas can be "spared for nature". In land sharing or wildlife-friendly farming, conservation and production are integrated in more heterogeneous landscapes (Fischer et al. 2008). Each of these techniques has positive and negative effects depending on the richness and concentration of biodiversity in each territory.

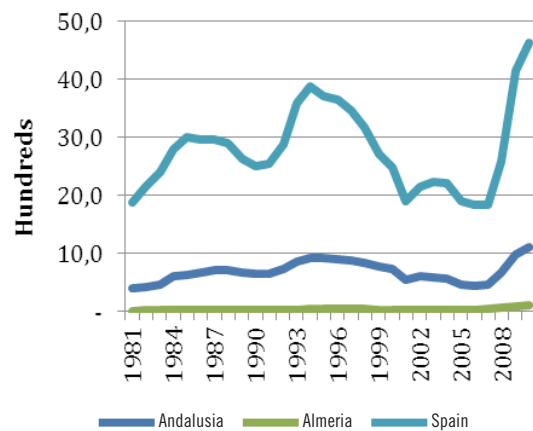
In the case of Almería, the shift from extensive dry crops to intensive greenhouse farming has decreased the pressure on an area that is 10 times larger than the one used for intensive farming enabling the recovery of natural vegetation and allowing forestry plans to develop in the abandoned lands. The 30,000 ha used for intensive greenhouse farming represent only 3% of the total area in the province. Some of the protected areas in Almería include: the Natural Parks of Cabo de Gata-Níjar, Sierra Nevada and Sierra Maria, the Natural Sites of the Tabernas Desert, the river of Aguas, the Punta Entinas-Sabinal, the Mountain Range of Alhamilla and the Nature Reserve of the Albufera de Adra. These areas together with the other protected areas in the province sum up to more than 300,000 ha of protected land (Consejería de Medioambiente, 2012). The protection of these areas was made in order to establish limits and prohibitions to the extension of greenhouses and touristic urbanisation (Valcuerdo, Quintero, Cortés, 2011).

The researcher Pablo Campra, indicates that very important carbon sinks in soil and biomass have been recorded and that these sinks should be taken seriously into account when analysing the environmental consequences of greenhouse farming in the province of Almería as they prove to be huge in terms of climate change mitigation (Campra, 2011). Moreover, historical erosion has been significantly reduced in the mountains and hinterlands that were traditionally exploited for esparto grass production (Interview García Lorca, 2012). This “high yield” conservation approach that enables to reconcile human land use of the Earth with the conservation and recovery of natural habitats deserves much wider consideration by policy makers (Campra, 2011). This approach may become an increasingly important way of using the Earth in a more sustainable manner whilst enabling to feed the 9 billion people that are estimated to inhabitate our planet by 2050.

## 5. AGRICULTURE IN THE CURRENT CONTEXT

The agricultural sector of Almería is showing vigour despite the economic and financial crisis. The Delegate of Agriculture in Almería (José Antonio Salibas) explains that exports are continuing to grow. The strength of the agricultural sector is maintaining the economy of the province during the current economic crisis. The results of the horticultural campaign in 2011 show the importance of the sector as a creator of employment. During 2011 an average of 216,500

**Figure 3.** Unemployment in Almería (1981-2011)



Source: The author. Data Source: IEA

employments were created. This supposed only a small decrease in agricultural contracting of 6% in comparison to 2010. During the last three years the number of affiliations to the Social Security System has barely changed (Esteban Ruiz, 2011). In all the other sectors unemployment has grown dramatically since 2007, with the construction and industrial sectors being most affected (Ministerio de Empleo y Seguridad Social, 2012). Unemployment in Almería at the end of 2011 was of 33.3% compared to 10.2% in 2007 (IEA, 2012).

Agriculture is the only sector that has known a growth in contract labour. Nevertheless, with the importance of the agricultural sector as a refuge for employment, unemployment of the immigrant community has grown since the start of the economic crisis with the incorporation of nationals to the agricultural sector. This has caused some Latin-American migrants to return to their country of origin helped by the voluntary return plans implemented by the Spanish government (García Lorca, 2012).

Population growth in Almería still remains positive although it has decreased since 2007. Even if the increase in population in 2011 has barely passed 1%, it still remains greater than the national average of 0.36%. Migrant population has been preeminent with an annual variation of 2.75%, representing 22.1% of the total population whilst in Spain they represent 12.19% and in Andalusia 8.67% (Ministerio de Empleo y Seguridad Social, 2012).

The year 2011 was a difficult year especially due to the E.Coli sanitarian crisis coming from Germany but whose speculation had significant economic and social consequences on the agriculture of the region. The latest free trade agreement (2012) between the European Union and Morocco could affect negatively Spanish agriculture and labour

providing cheaper products due to the inexpensive manpower and fewer environmental regulations of Morocco (Ministerio de Empleo y Seguridad Social, 2012).

Agriculture will face important challenges in the coming years due to international competition, population decline and climate change. According to regulations the Regional Department of Environment, the following measures in Almeria should be taken: irrigation design and planning, introduction of more resistant species to drought and high temperatures, control of plagues and illnesses, establishment of systems to analyse the evolution of agriculture in the context of climate change, education of agriculturalists for the introduction of adaptation techniques, further implementation of ecological agriculture and erosion control measures (Consejería del Medioambiente, Junta de Andalucía). Many farmers are trying to find a differentiation of their products, by advancing towards a more environmentally sustainable agriculture. Ecological greenhouse agriculture in Almeria started in the 1990s and by 2008 already 700 hectares were being used for this type of agriculture (Salvador, 2008).

## 6. THE MODEL OF ALMERIA: A REFERENCE FOR OTHER COUNTRIES?

The supporters of this model argue that most of the negative externalities of the model have been corrected and that the model of Almeria, based on technology-based intensive farming represents an economic and social development alternative for depressed areas within dry regions (Garcia Lorca, 2010). In fact, if we compare the different scenarios from the 1960s to present, we can see the spectacular capacity of territorial transformation of this area. This is, in their opinion, a paradigm that should be applied to other deserted areas suffering from the same problems to achieve a similar development and to regulate migratory movements from the regions of origin.

The model of Almeria has become a referent for many countries in the world. Many countries with different levels of development have an active interest in the growth and development model of Almeria. Latin-American countries including Chili, Mexico, Ecuador, Peru, Bolivia and Colombia have started to show their interest and public and private institutions from all over the world are studying and trying to imitate the model (Garcia Lorca, 1999). Very important knowledge exchanges have also been established with Latin American and African countries (Interview Garcia Lorca, 2012). Projects like the Moproalh project

between Alhucemas (Morocco) and the University of Almeria are being developed in order to transfer technology and knowledge to regions interested in copying the model (MOPROALH). Another example is the “éburnée 1” project between the University of Almeria and the Ivory Coast (EBURNEE 1). There is also a great interest from the Chinese government in the technical aspects of the model that they wish to implement in the area of Peking. Furthermore, the model of Almeria was recently presented in the United Nations during the discussion on the role of cooperatives in poverty eradication in February 2012 in New York (UN, 2012).

According to the credit cooperative Cajamar, the interest of these countries for this model comes from the fact that they have detected in it, an endogenous development model (Instituto Cajamar, 2004). This model has permitted a rapid development mainly based on the labour factor by high performing agricultural cooperatives. The model of Almeria could constitute a paradigm and an economic development opportunity for countries with very specialised productive structures, with an important underdevelopment in the services industry, and with poor agricultural performance (Instituto Cajamar, 2004).

Nevertheless, a direct transposition of the model to areas suffering from desertification seems difficult for various reasons. The first limitation is an economic one since many of the countries where a transposition could be an interesting and practical experience do not have the necessary economic resources or infrastructures needed to carry out a similar development. Furthermore, they do not always have access to a large solvent market like the European Union, with relevant purchasing power and enough public and private infrastructures to allow transportation and access of products in a profitable and easy manner. Other limitations to the transposition of the model include: productive limitations, of transport and communication, of technological transfer, of funding, etc. Even if the validation and transposition of the model of Almeria to countries that have not undertaken the industrial transition could eventually constitute an agrarian alternative, the particular circumstances of each of them should not be underestimated (Instituto Cajamar, 2004).

## CONCLUSION

The model of Almeria has permitted a radical socio-economic transformation of one of the most arid regions in Europe. This region that expelled its population is now a major attraction pole for immigrants from all over the world. The



efficient manipulation of the climatic factors has been crucial for the economic development of the region. Nevertheless, the agro-industrial sector in Almeria is now facing and will continue to face further challenges in the future.

Concerning immigration, the exponential growth of migrants in a short period of time has not allowed a convenient consolidation of institutions and social networks. The integration of immigrants remains one of the fundamental challenges of the province since there is still a big gap between the economic growth, which has proved to be spectacular, and the development of an integrated civil society. A continued social disintegration will slow down the socioeconomic development of Almeria. As we have observed, populations from very diverse horizons and cultural backgrounds arrive to Almeria. These populations do not always have the same ambitions or needs, and policy responses must therefore be adapted to each particular group. Almeria needs to become not only a land of opportunity but also a multicultural, cosmopolitan and tolerant region that can make the best out of its cultural richness and diversity. Education must play a key role in the reinforcement of a culture of trust between the different communities without forgetting that immigrants have played an essential role in the economic development of the region.

More generally, this case study helps illustrate the complex relationship between desertification, poverty and migration. There is a lack of data regarding the nexus between desertification, underdevelopment in Africa and migration towards Almeria. Further research is needed on the links between desertification, migration and intensive agriculture in a region that is deeply affected by both environmental changes and migratory movements. The model of Almeria has proved to be an efficient solution to fight against the environmental emigrants that had once abandoned the poor, underdeveloped province and could obtain similar results in other desertified regions.

On the other hand, even if great progresses have been made, the negative environmental externalities that the agricultural model provokes

should not be overlooked. Water scarcity remains the fundamental environmental challenge for an economy that is based on irrigated agriculture. We have seen that water resources are now being used in a much more efficient manner but greenhouse surface is continually growing and water resources will be scarcer in the context of climate change. The AGUA programme that is currently being used, tries to solve the problem of water scarcity by the means of desalinization instead of by an augmented water price. Furthermore, the environmental impacts of desalinisation should not be underestimated (OECD, 2008). The objective of satisfying demand whilst ensuring a sustainable exploitation of the system could be achieved by the distribution of new water resources between users, prioritizing urban demand, and compensating the expenses for agriculture between all consumers of the products (Downward, Taylor, 2007). There is a need of policies to treat water as the scarce resource that it is. Furthermore, policy makers must urgently take intensive agriculture and its effects on desertification into account. A sector that does not prove to be respectful of the environment will not only endomage the land in an irreversible manner that could stop development all in all, but will also have rising difficulties to sell products to consumers that are growingly environmentally conscient (Pérez, Rodríguez, 2010). A greater added value of products must also be achieved in a context of growing international competition. Further development of ecological agriculture would not only alleviate the environmental pressure of the sector over the land but would also considerably increase the added value of the products.

Finally, the positive effects of greenhouse farming for mitigation and adaptation in the context of climate change should be further researched since this case study seems to provide innovative steps forward. Important scientific and economic efforts should be made in order to further combat the negative externalities of a model that could eventually solve many current environmental, social and economic problems in marginal and depressed areas of the planet. ■

## BIBLIOGRAPHY

- Aguilera Izquierdo, R. 2006. *El acceso de los inmigrantes irregulares al mercado de trabajo: los procesos de regularización extraordinaria y el arraigo social y laboral*, Revista del Ministerio de Trabajo e Inmigración, nº63, Madrid, Spain.
- Agriculture Dictionary:  
<http://agriculture-dictionary.feeds-4business.com/words/229194-traceability.html>
- Ait Hamza, M., El Faskaoui, B., and Fermin, A., Morocco, case study, EACH-FOR, 2009: [http://www.each-for.eu/documents/CSR\\_Morocco\\_090328.pdf](http://www.each-for.eu/documents/CSR_Morocco_090328.pdf)
- Aznar Sanchez, J. 2011. *El clúster agroindustrial de la horticultura intensiva de Almería: surgimiento, dinámica y perspectivas* in Cuadernos de estudios agroalimentarios, ISSN 2173-7568 | [199-217] Almería, Spain.
- Aznar Sanchez, J., Galdeano Gomez, E., and Pérez Mesa, J. 2011. *Intensive Horticulture in Almería: A Counter point to Current European Rural Policy, Strategies in Journal of Agrarian Change*, Vol. 11 No. 2, April 2011, Almería, Spain.
- Aznar Sanchez, J., Galdeano Gomez, E. and Pérez Mesa, J. 2011. *Territory, Cluster and Competitiveness of the Intensive Horticulture in Almería* in The Open Geography Journal, Almería, Spain.
- Badroui, M. 2006. *Desertification and migration: analysis and perspectives in North Africa*, in the International Seminar on "Desertification and Environmental Security: Consequences and Prevention", Madrid, Spain.
- BBVA Research. 2012. Observatorio de Almería, Análisis Económico: <http://www.bbva-research.com>
- Barros, L., Lahlou, M., Escoffier, C., Pumares, P., Ruspini, P. 2006. *La inmigración irregular subsahariana a través y hacia Marruecos*, Programa de Migraciones Intrenacionales, Oficina Intrenacional del Trabajo Ginebra, 54 S, Suiza.
- Berriane, M. 2004. *El Marruecos Atlántico y las llanuras interiores: principal centro de la emigración marroquí*. In Atlas de la inmigración marroquí en España, Madrid, Spain.
- Berriane, M., Aderghal, M., 2009. *The state of research into international migration from, to and through Morocco*, Université Mohamed V; International Migration Institute, University of Oxford, Rabat, Morocco.
- Bilgic, Al. CS8. 2011. *Is the EU offloading future issues to the «southern neighbourhood»? Thinking environmental migration in relation to externalisation*, Bilkent University, Ankara, "Migration and Global Environmental Change, Foresight Project", Ankara, Turkey.
- Bknerr, B. 2004. *Desertification and Human Migration* in Biological Resources and Migration, Springer Werner, Dietrich, Berlin, Germany.
- Brauch, H. G. 2006. *Desertification and Migration: From Almería I to Almería II: Achievements and Policy Tasks* in Conclusions, Almería, Spain.
- Cabrera, M. 2010. *El Haiti oculto del Ejido*, El Mundo: <http://www.elmundo.es/elmundo/2010/02/15/andalucia/1266224247.html>
- Cabrera, M. 2000. *Medio centenar de inmigrantes se encierran por el incumplimiento de los acuerdos del 12 de febrero*, La Voz de Almería : <http://www.ub.edu/penal/historia/ejido/ejido6/almeria.htm>
- Camacho-Ferre, F., (Coord.). 2002. *España, huerta de Europa*. Ministerio de Agricultura, Pesca y Alimentación, Madrid.
- Campra, P., Garcia, M., Canton, J., Palacios-Orueta, A., 2008. *Surface temperature cooling trends and negative radiative forcing due to land use change towards greenhouse farming in southeastern Spain*. Journal of Geophysical Research Atmospheres 113, D18109. Doi: 10.1029/2008JD009912.
- Campra, P. 2011. *Global and Local Effect of Increasing Land Surface Albedo as a Geo-Engineering Adaptation/Mitigation Option: A Study Case of Mediterranean Greenhouse Farming*, in Climate Change – Research and Technology for Adaptation and Mitigation, Dr Juan Blanco (Ed.), ISBN: 978-953-307-621-8, InTech.
- Clar E., Pinilla. V. 2009. *The contribution of agriculture to Spanish Economic Development, 1870-1973*, in P. Lains and V. Pinilla *Agriculture and Economic Development in Europe since 1870*, Routledge, London, England.
- COAG. 2012. *Almería preocupada por la sequía*: <http://www.agricultura.ideal.es/index.php/2012-01-09-21-12-33/ganaderia/389-coag-almeria-preocupada-por-la-sequia-que-agudiza-la-critica-situacion-de-las-explotaciones-ganaderas-de-la-provincia>
- Consejería del Medioambiente, Junta de Andalucía: <http://www.juntadeandalucia.es/medioambiente/site/portalweb/>
- Consejería del Medioambiente, Junta de Andalucía, Relación de Espacios Protegidos. 2012: <http://www.juntadeandalucia.es/medioambiente/site/portalweb/>
- Cozar Valero, M. 1984. *La emigración exterior de Almería*, Universidad de Granada, Granada, Spain.
- Cruz Moya, O. 2005. Tesis doctoral: *Las Migraciones en el discurso periodístico almeriense del SXX*, Universidad de Pablo Olavide, Sevilla, Spain.
- Cull, T. Vincent, K. 2011. *Foresight, Migration and Environmental Change: Drylands Workshop*, Johannesburg.
- De Haas, H. 2006. *North African Migration Systems: Evolution, Transformations and Development Linkages* in Migración y Desarrollo.
- Downward, S.R. Taylor, R. 2007. *An Assessment of Spain's Programa AGUA and its Implications for Sustainable Water Management in the Province of Almería, Southeast Spain* in *Journal of Environmental Management*, 82 (2): 277–89.
- EACH FOR. 2009: <http://www.each-for.eu/index.php?module=main>
- Ecologistas en Acción. 2008. *El Programa de Lucha contra la Desertificación es insuficiente*: <http://www.ecologistasenaccion.org/article12047.html>
- Esteban Ruiz, J. 2011. *El 'gigante de los pies de barro' sostiene la economía provincial en plena crisis*, fH, Almería. [www.fhalmeria.com/revista/.../noviembre2010.pdf](http://www.fhalmeria.com/revista/.../noviembre2010.pdf)

- Fermin, A. 2009. Spain: case study, EACH-FOR, 2009 [http://www.each-for.eu/documents/CSR\\_Spain\\_090328.pdf](http://www.each-for.eu/documents/CSR_Spain_090328.pdf)
- Fischer, J. Brossi, B. Daily, G. Ehrlich, P. Goldman, R. Goldstein, J. Lindenmayer, D. Manning, A. Mooney, H. Pejcher, L. Ranganathan, J. Tallis, H. 2008. *Should agricultural policies encourage land sparing or wildlife-friendly farming?* *Frontiers in Ecology and the Environment* 6: 380–385. <http://dx.doi.org/10.1890/070019>
- Galdeano Gómez, E. Aznar Sánchez, J.A. Pérez Mesa, J.C. 2011. *The complexity of theories on rural development in Europe: an analysis of the paradigmatic case of Almería (South-east Spain)* *Sociologia Ruralis* 51 (1), 54e78.
- García Latorre, J. Andres Sanchez, J. 2001. *The man-made desert: effects of economic and demographic growth on the ecosystems of arid southeastern Spain*, *Environmental History*, 6 (1): 75-94.
- García Lorca, A. 2012. Seminar “Un Monde en Mutation: Changement Climatique et Migrations Humaines”, Université Paris Descartes Sorbonne, 15 June 2012.
- García Lorca, A. 2010. *Agriculture in Dry lands: Experience in Almería in: Coping with Global Environmental Change, Disasters and Security*, Hesp/volume 5, Springer, Heidelberg, Germany.
- García Lorca, A. (dir) 2009. *Atlas Geográfico de la Provincia de Almería. El medio. La sociedad. Las actividades*. 1ª Ed. Instituto de Estudios Almerienses, Almería, Spain.
- García Lorca, A. 2006. *Cambios tecnológicos y flujos migratorios. El caso de la agricultura intensiva en Almería*. Proyecto de Investigación Plan Nacional I+D+I 2003/2005. Universidad de Almería : [www.sidym2006.com/imagenes/pdf/ponencias/7\\_s2.pdf](http://www.sidym2006.com/imagenes/pdf/ponencias/7_s2.pdf)
- García Lorca, A. 1999. *Tendencias y transformaciones en la agricultura almeriense*. *Nimbus*, 4, pp. 109-128.
- García Torrente, R. 2002. *La inmigración y el modelo de desarrollo almeriense II: Análisis de las necesidades de mano de obra en la economía almeriense*. Instituto de Estudios de Cajamar, Almería, Spain.
- Geiger, M. 2006. *The province of Almería (Spain): Mirror and Migratory Laboratory of Europe*: <http://www.migrationonline.cz/e-library/?x=1963591>
- Gemenne, F., Pattie D., Boulharouf, R. 2006. *Understanding migration choices: The UNCCD as a mechanism for developing coping strategies*, Almería, Spain.
- Giagnocavo, C. 2012. *The Almería Agricultural Cooperative Model: Creating successful economic and social communities*, United Nations, New York.
- Gómez-Orea, D. 2003. *La horticultura en Almería. Bases para un Plan de Ordenación Territorial y Gestión Medioambiental*. Cajamar, Almería.
- Gonzalez Enriquez, C., Reynés Ramon, M. 2011. *Real Instituto Elcano: Circular Migration between Spain and Morocco: something more than agricultural work?* European University Institute, METOIKOS Project, Florence, Italy.
- Hogart, M., Mendoza, C., 2000. *African workers in Spanish Agriculture*, The Centre for Comparative Immigration Studies, California, USA.
- Instituto de Estudios de Cajamar, 2004. *El Modelo Económico Almería basado en agricultura intensiva: Un modelo de desarrollo alternativo al modelo urbano-industrial*, Cajamar, El Ejido, Almería.
- Informe sobre el cambio climático en España*, (2007), Document prepared for the Presidency of the Government of Spain.
- ICMC, 2011. *Spain's salad growers are modern-day slaves*: <http://www.icmc.net/article/spains-salad-growers-are-modern-day-slaves-say-charities>
- Integra Local. 2011. II Plan Municipal de Inmigración 2011-2013 : <http://www.integralocal.es/index.php?accion=detalleGeneral&seccion=25&tipo=2&id=6589>
- Khachani, M. 2011. *Los migrantes marroquíes en España*. Presented in “Simposio internacional: Inmigración y Globalización”, Madrid, Spain.
- Kostava Karaboytcheva, M. 2006. *Una evaluación del último proceso de regularización de trabajadores extranjeros en España (febrero-mayo de 2005). Un año después*. Área: Demografía, Población y Migraciones Internacionales – DT No 15/2006, Real Instituto Elcano
- Lawrence, F. 2011. *The Guardian: Spain's salad growers are modern-day slaves, say charities*: <http://www.guardian.co.uk/business/2011/feb/07/spain-salad-growers-slaves-charities>
- Martínez, J. 2005. *Measures against soil erosion in Spain*, Universidad de Murcia, Spain.
- Martínez, J., Esteve, M.A., 2006. *Desertificación en España: una perspectiva crítica*, [http://www.ecologistasenaccion.org/article.php?id\\_article=5227](http://www.ecologistasenaccion.org/article.php?id_article=5227)
- Montero, J. 2007. *El suelo que perdemos*, El País, Sevilla, Spain: [http://elpais.com/diario/2007/09/09/andalucia/1189290140\\_850215.html](http://elpais.com/diario/2007/09/09/andalucia/1189290140_850215.html)
- MOPROALH, Modelo Productivo Agroalimentario y Medioambiental en la región de Alhucemas: <http://www.moproalh.com/>
- OECD. 2008. *Environmental Performance of Agriculture in OECD countries since 1990*, Paris, France.
- Pérez-Díaz, V. Rodríguez, C. 2010. *Un futuro hecho con sus manos, situación y horizonte del Campo de Dalías en la provincia de Almería*, Fundación Cajamar, Almería, Spain.
- Pielke, R. Marlan, G. Betts, R. Chase, T. Eastman, J. Niles, J. Niyogi, D. Running, S. 2002. *The influence of land-use change and landscape dynamics on the climate system: relevance to climate-change policy beyond radiative effect of greenhouse gases*, in *Philosophical Transactions of The Royal Society*, London.
- Pumares Fernández, P. 2003. *El papel de Almería en la inmigración. Implicaciones de un modelo productivo en cuestión*, Universidad de Almería, Spain.
- Pumares Fernández, P. 2004. *La inmigración marroquí en el poniente almeriense* in *Atlas de inmigración marroquí en España*, Taller de estudios internacionales, Madrid, Spain.

- Rodríguez Vaquero, J. 2008. *Gestión territorial e inmigración. El caso de Almería*, Almería, Spain.
- Salvador Matarin, A. 2008. *La agricultura ecológica bajo plástico en Almería*, XXXIV Reunión de estudios regionales, Jaén, Spain.
- Sánchez Picón, A., Aznar Sánchez J.A., García Latorre, J. 2011. *Economic cycles and environmental crisis in arid southeastern Spain. A historical perspective*, Published in Journal of Arid Environments 75 (2011) 1360-1367, <http://repositorio.ual.es/jspui/bitstream/10835/367/6/JAREB2011.pdf>
- Sánchez Picón, A. 2005. *De frontera a milagro. La conformación histórica de la economía almeriense* in Molina Herrarea, J. (dir) 2005. *La economía de la provincia de Almería*, Cajamar , Almería, Spain.
- Sánchez Picón, A. 1996. *La presión humana sobre el monte almeriense en el siglo XIX*, in A. Sánchez Picón , *Historia y medio ambiente en el territorio almeriense*. Universidad de Almería, Almería, Spain.
- SOS Racismo del Estado español, 2001: *El Ejido : racismo y explotación laboral Informe de los ataques racistas de febrero de 2000 (El Ejido, Almería, España)* Federación de Asociaciones, Icaria Ed, Almería, Spain.
- Terra Actualidad, 2007: <http://noticias.terra.es/2007/local/1003/actualidad/el-tercer-ano-de-sequia-se-ceba-con-almeria.aspx>
- UN. 2012. DESA, Departement of Economic and Social Affairs : *Role of cooperatives in poverty elimination* : <http://www.un.org/en/development/desa/news/social/role-of-cooperatives-eliminate-poverty.html>
- UNCDD. 2008. *Expertise Internationale, Désertification, Migration et development locale* : <http://globalmechanism.org/dynamic/documentfile/migrationfwweb.pdf>
- UNEP. 2005. *One Planet Many People: Atlas of our Changing Environment* <http://na.unep.net/OnePlanetManyPeople/index.php>
- Universidad de Almería: <http://www.ual.es/>
- Valcuerdo, J. Quintero, V. Cortés, J. 2011. *Naturalezas Discursivas en Espacios Protegidos*. **Revista de Antropología Iberoamericana**. Vol 6, n°1, pp. 27-56.
- Werz, M. Conley, L. 2012. *Climate Change and Conflict in Northwest Africa: Rising Dangers and Policy Options Across the Arc of Tension*, Center for American Progress": [http://www.americanprogress.org/issues/2012/04/climate\\_migration\\_nwafrica.html](http://www.americanprogress.org/issues/2012/04/climate_migration_nwafrica.html)
- Pielke, R. Marlan, G, Betts, R. Chase, T. Eastman, J. Niles, J. Niyogi, D. Running, S. 2002. *The influence of land-use change and landscape dynamics on the climate system: relevance to climate-change policy beyond radiative effect of greenhouse gases*, in Philosophical Transactions of The Royal Society, London.