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Agriculture in transition: Projecting changes in the unique Lake Ohrid and Lake Prespa ecosystems of Macedonia

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ABSTRACT OF THESIS submitted by:

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Agriculture affects ecosystems everywhere; hence policies are needed to regulate the way food production is managed. The European union's (EU) common agricultural policy (CAP) can re-structure agriculture and have an impact on the environment and on the lives of farmers. This qualitative research explores the potential changes that can occur to the livelihoods of small-scale farmers and to a unique ancient lake ecosystem in Macedonia. Ohrid and Prespa are ancient lakes, which have historical, social and environmental importance but are currently under many threats. Agriculture has decreased the water level and caused eutrophication in the lakes. As the Former Yugoslav Republic of Macedonia prepares for EU accession, the agricultural sector has undergone changes in the past couple of years. Less pesticide use, an improvement of water resource management, and efficient use of fertilizer are some of the changes that have occurred. The thesis posits scenarios, which may occur under EU membership, while exploring the different mechanisms in which the EU restructures agriculture. Several examples have been drawn from new member states and through these cases several projections have been made. One major finding is that if land fragmentation is not addressed then environmental protection and rural development will be difficult to achieve.

Key words: EU accession, livelihoods, agriculture, Common Agricultural Policy, FYR Macedonia, land fragmentation

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List of Abbreviations

AEM-Agri-environmental measures

APDA-Agency for promotion and development of agriculture

AFSARD-Agency for financial support of agriculture and rural development

CAP-Common Agricultural Policy

CEE-Central Eastern Europe

DDT- dichlorodiphenyltrichloroethane

EU-European union

FYR- Former Yugoslav republic

GDP-Gross Domestic Product

IPARD- Instrument for Pre-Accession Assistance in Rural Development

NMS-New member states

UNDP- United Nations Development Program

WFD-Water Framework Directive

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Chapter 1 Introduction

The unprecedented influence of human activity on Earth has prompted many to call our current epoch the Anthropocene. When analyzing how the human reach has affected Earth's functions, some consider changes in land cover, the physical attributes of Earth, and land use, the human activity applied to these attributes (Turner *et al.* 1990 and Lambin *et al.* 1999). Biodiversity loss, local and global climate change, the degradation of ecosystem function, are consequences of land use and land cover changes (Sala *et al.* 2000; Chase *et al.*1999; Houghton *et al.* 1999 and Vitousek *et al.* 1997). Land use changes are determined by population, poverty, economic opportunities, local, national policies, and ultimately perhaps the most crucial, global market trends, which influence the local sphere (Lambin *et al.* 2001).

Agriculture, is one of the main drivers for land use change, and affects ecosystems everywhere. Currently, 40% of terrestrial area is under agricultural management and just 12% is protected (Perfecto and Vandermeer 2010). The conservation of biodiversity is crucial for many reasons, one of them being global food security (Bellon 2003 and Plucket *et al.* 1987). Biodiversity has been defined as: "all species of plants, animals and micro-organisms existing and interacting within an ecosystem" (Vandermeer and Perfecto 1995, 185). Hence, biodiversity has provided the basis for all agricultural plants and animals; contributing to food production and the resilience of agricultural systems (Altieri 1999). Biodiversity also contributes to the ecological processes that provide groundwater, flood control, and prevent soil erosion.

Although agriculture depends on biodiversity, it can create harmful impacts on the environment. Agriculture is responsible for 30–35% of global greenhouse gas emissions, mainly from deforestation, methane emissions from livestock, rice, fields, and nitrous oxide

emissions from fertilized soils (Foley *et al*. 2011 and Phalan *et al.* 2011). In addition, agricultural inputs such as phosphorus and nitrogen are the largest source of nutrients that have caused the eutrophication of coastal waters (Boesch and Brinsfield 2000). There are also concerns of flood risks and effects on water quality. Lastly, the intensification of agriculture has resulted in the decline of bird populations along with their associated food resources (Donald *et al.* 2000; Benton *et al*. 2002 and Robinson and Sutherland 2002).

Global markets heighten complexity, raising concerns about global and local drivers on land use, markets can intensify or attenuate conditions that lead to land use change (Wilbanks and Kates 1999 and Geist and Lambin 2002). The interconnections between macro and micro scales can affect the way the world functions and require more attention. Wilbanks and Kates (1999), discuss the importance of further research at the local scale to identify what drives the changes that eventually contribute to a global impact. Understanding the connections between micro-scale and macro-scale processes is one of the greatest challenges in the sciences. Research on land use and land cover change explains how local land use decisions and practices are affected by, but also influence global processes (Lambin *et al.* 2001 and Geist and Lambin 2002)

Similarly, some contend that rapid land use change is associated with a region's access to a growing world economy (Lambin *et al.* 2001). A growing economy can bring negative impacts on the environment, but globalization can also affect land use positively, e.g. through eco-labeling, information technologies which can lead to better market prices and improved forecasts on weather and climate change patterns (Lambin *et al.* 2001).

Adapting to changes in ecosystems, commodity prizes, weather, has been an integral part of how farmers manage their resources. However, farmers also have to adapt to broader changes in policy that could affect or enhance their ability to farm. Given the complexity and

the interdependency of ecological, economic, social, institutional factors assessing the aggregate impact of these changes in the agricultural sector is difficult. Yet, evaluation and understanding the causes of the impacts is important, since policy can have lasting changes on the sector and impacts the sustainability of economies, livelihoods and the environment. Today decision-makers are more likely to acknowledge that the global situation is the product of an aggregation of local land use practices and vice versa, nevertheless these linkages are usually ignored (Pasakarnis and Maliene 2010).

European Union (EU) accession is one example of an encompassing change in the policy arena that can have fundamental impacts on the environmental and socio-economic aspects of farming; hence it is crucial to understand its implications. Several examples of how EU accession influences agriculture, can be drawn from the experiences of the new member states (NMS). Nevertheless, every country is unique and there are region specific changes within countries. Moreover, external conditions such as regional policies, global demand for crops can change, so while one can draw on earlier experience, place specific research is needed.

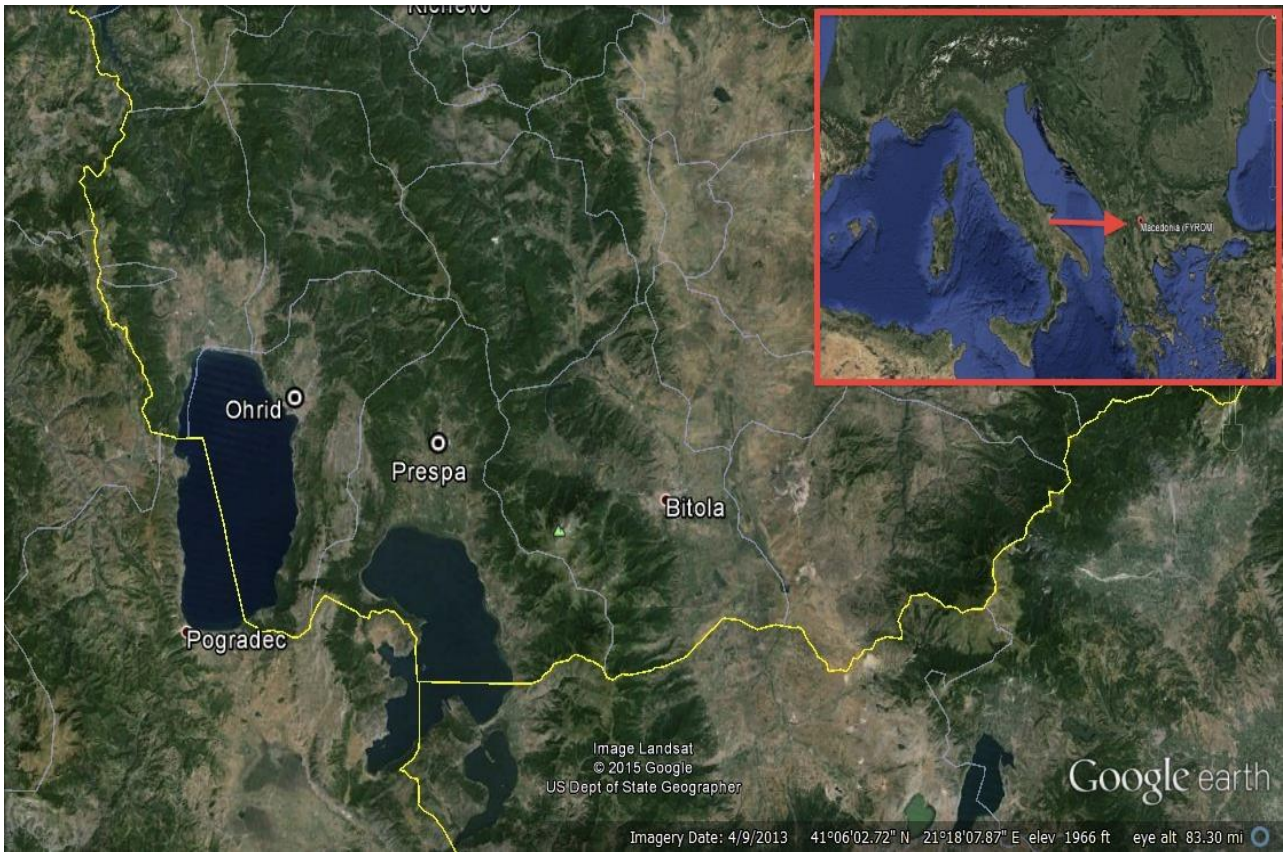
There are many regions that depend on agriculture but lack necessary capacity, be it knowledge or technology, to conduct farming in a way that will not jeopardize the environment for future generations. Policies can be introduced to develop capacities. Hence it is important to investigate: What policies promote responsible farming practices and provide farmers the socio-economic assets for a means of living, in other words a livelihood? In this study, the mechanisms that foster change in agriculture, namely EU accession requirements, and how this will translate to socio-environmental changes will be analyzed in the context of a bio-diverse region in the Former Yugoslav Republic (FYR) of Macedonia.

If FYR Macedonia, joins the European Union (EU), then based on what occurred in other countries, it could present a new political force that will reorganize agriculture and in effect have an impact on fragile ecosystems and livelihoods. The enlargement process for Macedonia has been contentious for many reasons, two of which are the most influential: the name issue with Greece and nationalistic trends. Greece would like to see the name changed to the Republic of Skopje, causing further friction between the two countries. Meanwhile nationalism, poses a challenge for EU accession since the current government is aligning itself with Russian politics and with values of the past (Koeth 2014). However, current events have shown that there are still many people who oppose the actual government. Hence, EU accession is still a possibility and it is important to anticipate the positive and negative impacts. Especially since an influx of capital, market incentives and new actors could change the agricultural sector and the environment.

1.1 Study Site

The Former Yugoslav Republic (FYR) of Macedonia has been a candidate for EU accession since 2003, and has already made significant legislative changes to address EU requirements in the agricultural sector. Agriculture represents 12% of Macedonia's GDP and employs 36% of the population (Stefanova *et al.* 2012 and EC 2014).

Figure 1 Map of Ohrid and Prespa Lake



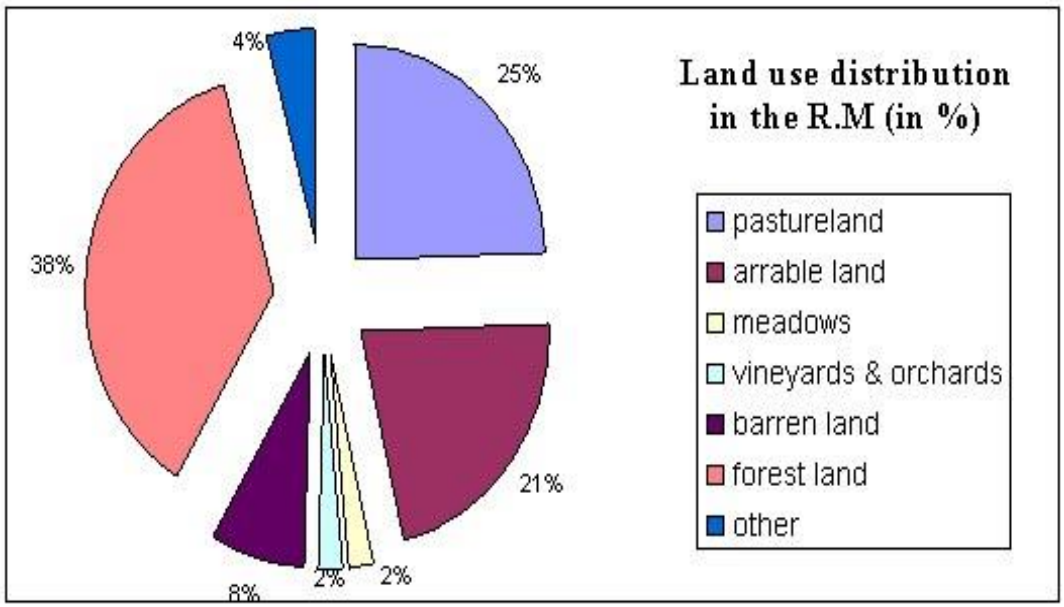
Source: Google Earth

In Macedonia the most pressing environmental and agricultural issues are soil and water erosion, difficult terrains for farming, and abandonment of arable land. Agriculture covers 1.12 million hectares (ha) of the 24,856 square kilometers of total surface area. Production is divided between cultivable land (45%) and pastures (55%) (Stefanova *et al.* 2012).

However, soil erosion is a major problem for the country in fact according to European Environmental Agency, Macedonia is in the red zone of water erosion in Europe. Soil erosion, which is caused by water erosion and insufficient soil cover, is estimated to

create a loss of 17 million cubic meters of soil annually (JRC 2006). Moreover, 96.5% of the country's surface is undergoing soil erosion processes (JRC 2006).

Figure 2 Land use distribution in the Republic of Macedonia (R.M.) in percentage



Source: Joint Research Center 2006

Despite the lack of suitable land due to erosion, it is estimated that 37% of land is used for agriculture (JRC 2006). About 80% of the agriculture holdings are between 2.5 – 2.8 ha, these lands are owned or leased, and are highly fragmented (Stefanova *et al.* 2012).

The main crops in the country are wheat (19.4% of arable area), barley (10.8%), maize (7.9%), and field vegetables (8.4%). Orchards are also a very important part of the agricultural sector. The total area of orchards is 14,000 ha (8,789 ha of which are productive orchards). The most common fruits are apples (62%), plums (13%), sour cherries (7%) and

peaches (7%) (Stefanova *et al.* 2012). On a country wide basis the use of pesticides and fertilizers is low, due to their high price (Stefanova *et al.* 2012, 15).

Before 1945, small-scale private farming dominated the landscape, and this generally had a positive impact on the environment (Stefanova *et al.* 2012). Today, farm abandonment is a serious issue in Macedonia, which threatens semi-natural grassland habitats. Between 2006 and 2008 the agricultural area decreased by almost 13%, the biggest decrease, 22%, was seen in pastured land. The abandonment of arable land is attributed to the rural-urban migration and usage of the land for urban purposes and other non-farming activities.

Studies have shown that abandonment or changes in the traditional management systems threaten habitats globally (Middleton 2013). In FYR Macedonia, grasslands are being significantly under-grazed leading to the expansion of shrubby vegetation (Stefanova *et al.* 2012). The dominance of sclerophyllous vegetation reduces species richness and diversity, since grass communities are more heterogeneous (Middleton 2013).

Macedonia is known to have high rates of biodiversity, lake Prespa and lake Ohrid are one of the biodiversity hotspots, which have international recognition (Stefanova *et al.* 2012, Kostoski *et al.* 2010). Lake Ohrid, located in the Ohrid municipality, is the oldest lake in Europe, age estimates range from 2 or 3 million to 10 million years. As a result of its age many endemic species can be found, endemism rates are between 47 to 86 percent (Spirkovski *et al.* 2001 and Wazin *et al*. 2002). In the Prespa Basin, which is located in the Resen municipality, there are 1,500 plant species and 1,500 flora species (Wazin *et al.* 2002) All fish species are endemic; it is also home to large endangered mammals such as the brown bear *Ursus arctos* and the wolf *Canis lupus lupus*. The basin also provides the largest breeding colony for the Dalmatian pelican *Pelecanus crispus* (Wazin *et al.* 2002).

Ohrid and Prespa Lake were named UNESCO trans-boundary biosphere reserves in 2014, Ohrid Lake has been a UNESCO world heritage site for 30 years, and this lake has been recognized as a center of biodiversity since 1935 when the hydro-biological institute was established in Ohrid. These lakes are of high environmental and social importance providing numerous ecosystem services for Albania, Greece, and Macedonia. Macedonia has the greatest share of the basin and more people live in the Macedonian side of the Prespa region than in Albania or Greece. Similarly, the economic contribution of this region to the national GDP is higher in Macedonia. Because of this, and due to time restrictions the analysis for this study only focused on Macedonia. Unfortunately, these ecosystems are facing numerous challenges, from anthropogenic pressures such as farming, fishing, housing and industrial activity and global warming (Matzinger *et al.* 2005). Considering that Europe's rates of biodiversity are low it is crucial to analyze how to protect places with high rates of endemism within the continent (Bakkenes *et al.* 2006).

1.2 Research Question and Objectives

The research questions are: How is the prospect of EU accession changing farming practices in the unique Ohrid and Prespa lake ecosystem of Macedonia? What will the impact of EU accession be on the local environment and farmers' livelihoods? The study will detail how EU accession has already influenced the environmental and the socio-economic factors related to local agriculture and what will be the expected changes.

Utilizing land use change analysis, an in depth study of the themes that were found during fieldwork will be analyzed. These themes include but are not limited to: agriculture and conservation and land fragmentation. Based on the analysis of the current situation in Macedonia, interviews, and an investigation of the experiences of new member states (NMS), a speculative projection of how accession will affect agriculture is provided.

Objectives:

- Explore how the EU accession requirements have changed practices for small scale farmers in Ohrid and Prespa Lake region
- Identify the mechanisms through which EU accession influences farmers livelihoods and for the local environment
- Analyze if there are any noticeable trends in the use of important agricultural inputs

Chapter 2 Literature Review

2.1 Land use change analysis

In order to provide food for the expected global population, agriculture must be done in a way that creates the least impact on the environment or improving it. The demand for more food stems from but is not limited to the following: climate change, high meat consumption, and urbanization (Tilman *et al.* 2009 and Gabriel *et al.* 2013). In a current study the Food Agriculture Organization found that addressing food waste could meet the demands of the 9 billion expected population by 2050 (FAO 2013). Nonetheless, it has been argued that food production will still need to increase significantly (Tilman *et al.* 2011; Foresight 2011; and Gabriel *et al.* 2013). Hence, agriculture must be managed in a way that improves yield and is efficient; this includes less food being lost and the conservation of biodiversity (Tscharntke *et al.* 2012).

Land use change can be attributed to direct and indirect causes. Direct causes occur at the local level (households and communities) and indirect causes stem from regional (districts, provinces, or country level) or even global drivers, but it is common to find interconnections between the two (Geist and Lambin 2002). Major causes of land use change include natural variability and climate change, socio economic factors, technology, institutions, demography, culture and globalization. Although major themes can be identified, the expansion of agricultural activity is determined by a combination of direct and indirect causes that have historical and geographical specificities (Geist and Lambin 2002).

2.2 Intensification and Extensification

Several studies have pointed to the negative correlation between agricultural yield and biodiversity (Gabriel *et al.* 2013; Kleijn *et al.* 2001; Donald *et al.* 2000; Geiger *et al.* 2010; Hoogeveen, Petersen and Gabrielsen 2002 and Grinsven *et al.* 2014). Generally when new

technology, practices, and polices are introduced land use would typically fall into two patters: intensification and extensification. Tilman *et al.* 2001 defined agricultural intensification as higher levels of input and increased quantity or value of a product per unit area and time. Extensification has been defined as the opposite, it is the decrease of inputs-be it fertilizer, machinery and or pesticides (Eurostat 2014).

Nevertheless, extensification does not always translate to healthier ecosystems especially when it leads to production on fragile ecosystems (Lambin *et al.* 2001 and Strijker 2004). From 1961 to 1996 intensification doubled the world's food production in arable land by only 10% (Tilman *et al.* 2009).

Yet in many places such limited degree of intensification, is unfeasible because of lack of capacity, resources, and biophysical constraints, this is especially true for small-scale farmers (Lambin *et al.* 2001). Ostrom *et al.* (1999), theorized that intensification is caused by land scarcity in economies in transition, and can be connected to population growth and density, this can be attributed to a natural increase, migrations, or institutional elements such as land tenure regimes.

Moreover, policy plays an important role in the way land is used. In Western Europe, the price of fertilizers decreased compared to the prices of labor and land, which brought about intensification (Strijker 2004). Market prices and policy changes can also influence the way farmers use the land (Von Witzke *et al.* 2008). For example, the production of cash crops as a proposed solution to poverty can attract migrants, and multiply the impact on the land. Furthermore, interventions from NGOs, state, civil society, or international organizations, which aim to boost agriculture as a way to alleviate poverty can also create a negative externality on the environment (Lambin *et al.* 2001 and Altieri 1999). The introduction of new machinery into a farming system allows for agriculture to concentrate on less or more

land, this often depends on current markets and policies (Kaimowitz and Smith 2001 and Matson and Vitousek 2006).

Biodiversity conservation and agriculture have historically been two divergent land use types. As land becomes scarce, the need to analyze the trade offs becomes more present, hence developing the theoretical framework to understand the trade-offs between agriculture and conservation from local to global scales is needed (Grau *et al.* 2013). The discussion surrounding agriculture and conservation has been referred to as the land sparing land sharing debate. The literature defines land sparing as the segregation of intensive agriculture from natural areas, while using a small portion for production (Grau *et al.* 2013 and Green *et al.* 2005). Current discussions suggest that land sharing assumes that conservation can be combined with agriculture especially when used with non-monocultures and traditional methods, which produce less impact (Green *et al.* 2005; Fischer *et al.* 2008 and Perfecto and Vandermeer 2012). Currently, the theoretical and empirical analyses on sparing and sharing have focused on natural factors. Land use policy needs to consider the socio-economic components that make up human-natural systems (Grau *et al.* 2013). There are many theories surrounding the land sparing and land sharing debate. Previous arguments for land sparing centered on the classical conservation framework, which focused on excluding all human activity in well-preserved areas (Green *et al.* 2005).

Yet spared land does not always translate to conservation, especially if the approach is to intensify production to avoid expanding the agricultural frontier (Matson and Vitousek 2006). Such systems have negative externalities downstream, since they require more abstraction of water, and higher use of fertilizer and pesticides (Matson and Vitousek 2006).

Ecological research is needed to analyze how to best use inputs on agricultural systems in specific ecosystems (Matson and Vitousek 2006). In the policy arena the most appropriate tools for improving farmers' livelihood and control the expansion of the agricultural frontier, are low-investment technology, increase yields of crops, and input subsidies that are selective and protect natural landscapes. If these strategies are not present then the agricultural sector will be more influenced by commodity fluctuations, this is even more so when the following conditions are present (Angelsen and Kaimowitz 2001):

- International markets absorb the additional supply without significantly depressing the price
- Policies that incentivize forest conversion to new crops
- Production can expand into abundant forest areas
- Cheap labor is available to plant the new crops
- Capital is present to finance the expansion

Most yield-increasing technologies are oriented towards growing commodity crops; which in turn affects the distribution of income among farmers, since the use of this technology is contingent upon a farmers' income. Investing in strategies to increase crop yields on arable land is the most efficient strategy and takes pressure off remaining frontier areas that harbor unique ecosystems (Angelsen and Kaimowitz 2001).

In Europe new agricultural technologies and yield improvements have prevented agriculture from further affecting biodiversity. But other elements of development, such as the growth in urban employment, policies that clearly separate forest from agricultural land and a state that is active in enforcing environmental regulations are as important as technology (Angelsen and Kaimowitz 2001). However, if technology is applied in the farm this could also attract younger farmers, which could address crucial issues such as high depopulation

rates in rural areas. In addition, technology that allows farmers to make informed decisions should be made readily available to prevent intensification and land expansion (Matson and Vitousek 2006). In conclusion, capital and labor saving technology can improve livelihoods and at the same time support conservation efforts.

2.3 Agriculture in Europe

In Europe almost 50% of available land is farmed, this includes arable land and grasslands (CEEweb 2013 and Tankosi and Stojsavljevi 2014). Agricultural sector provides employment for 8,3% of all employed citizens of the European Union (EU) (Tankosi and Stojsavljevi 2014). As a result of the role that agriculture plays in the economy there are many impacts on the environment. Approximately, 24% of the total water abstraction is due to agriculture, yet in Southern Europe this average can be up to 80% and over abstraction is common (EEA 2009). In Southern and Eastern Europe irrigation is crucial for agricultural productivity yet it has an impact on aquatic ecosystems and groundwater. More than 90% of the water basins are affected by diffuse or point source pollution coming from agriculture (CEEweb 2013). Diffuse pollution from agriculture creates about 30-40% of the nitrogen load and 50-60% for the phosphorus load in the Danube River (EEA 2012). Agriculture alone has contributed to about 80% of the reported total nutrient load in the Baltic Sea (EEA 2012).

Another negative impact generated by intensive agriculture is the over-abstraction of water. Over the last two decades water use for farming has increased, this is due to low water pricing, inefficient technology or technology that facilitates abstraction, and subsidies from the Common Agricultural Policy (CAP) that supported water intensive crops (CEEweb 2013). The situation becomes more complex when studies show that the water demand is expected to rise by 16% in 2030 if practices do not change (EU Commission 2015).

2.4 Europeanization of Agriculture

The Common Agricultural Policy (CAP) was introduced in 1957 in article 39 of the Treaty of Rome, it has five goals:

- increase production by promoting technical progress
- obtain a fair standard of living for producers
- stabilize markets
- assure availability of supply
- ensure that supplies reach consumers at reasonable prices

The CAP represents 40% of the total EU budget or 0.5% of the EU Gross Domestic Product (EC 2012). Considering that the amount of capital available for agricultural innovation, the CAP has much potential for shaping the European environment (Vepsäläinen *et al.* 2010).

Table 1 Share of the CAP in the EU budget (EUR million)

Year	EU Budget Total Payments	CAP Budget	% CAP/EU Budget
1970	3.385,2	3.166,5	93,5 %
1975	5.816,9	4.404,4	75,7%
1980	15.857,3	11.606,5	73,25
1985	27,867.3	20,413.3	73.2%
1990	44,062.9	27,429.9	62.2%
1995	66,547.4	37,021.0	55.6%
2000	80,448.9	41,828.0	52.0%
Year	**EU Budget Total Payments**	**CAP Budget**	**% CAP/EU Budget**
2005	103,999.6	51,290.1	49.3%
2010	120,490	55,183	45.8%

Source: Tankosi and Stojsavljevic 2014

However, there are many critiques of this policy, and as a result the CAP has undergone many reforms and changes since its inception. Part of these changes included Agenda 2000, which began in 1999 to support CEE countries in the process of accession, with the goal of creating sustainable agriculture and rural development (Tankosi and Stojsavljevic 2014). The Instrument for Pre-Accession Assistance in Rural Development (IPARD) replaced Agenda 2000, and began in 2007 as a way to help CEE countries integrate into the wider EU market. The objectives of the IPARD are to promote the:

"…improvement the competitiveness of agricultural holdings and the food industry bringing them into compliance with Community standards related to food safety, veterinary, phytosanitary, environmental or other standards. Ensuring sustainable environmental and socio-economic development of rural areas through increased economic activities and employment opportunities" (EC 2015).

The IPARD supports governments of candidate countries by providing funds and assistance to accomplish the above-mentioned objectives. The candidate countries decide how to efficiently use the funds while addressing the requirements of the EU community.

The most recent CAP reform began in 2014, and it is considered to be one of the most comprehensive and ambitious (EC 2013 and Tankosi and Stojsavl 2014). Today, instead of rewarding farmers for their yields, farmers are now being paid for services they deliver such as agricultural biodiversity, heritage landscape and climate resilience, this strategy is called decoupling. This is a move away from subsidies; instead, decoupling will provide farmers with one-time payments for meeting a set of rules, or cross compliance, while encouraging them to produce only for the market. The goal of the new strategy is to remove incentives for high–input high-yielding crops (Donald *et al.* 2002). The CAP reform also includes restructuring and modernization, a Farm Advisory System that attempts to bridge the gap between science and practice, training programs, and aid for young farmers (EC 2013).

The reformed CAP also stipulates the removal of production constraints, which allow farmers to respond to the growing global demand through access to credit and reduction of costs (EC 2013 and Eickhout *et al.* 2007). Notwithstanding, if production is not integrated with clear environmental priorities this could present further strain to the environment. In 2009 for example, 73% of CAP budget was spent on direct payments (Vepsäläinen *et al*. 2010). It has been criticized that these payments were given to land owners without establishing attainable or clear objectives (Vepsäläinen *et al*. 2010). Today, 30% of the new CAP budget will go towards "green direct payments" (EC 2015). These payments are given to farmers under the condition that they continue or adopt practices that are beneficial for the environment such as: maintaining permanent grassland and crop diversification.

Another intervention that seeks to preserve the environment, lower depopulation rates in rural areas, and simultaneously mitigate and adapt to climate change, are agri-environmental measures (AEM). These measures provide payments to farmers who protect, on a voluntary basis the environment while meeting national and EU requirements. AEM are financed and managed by national rural development programs, which receive funding and approval from the EU Agricultural Fund for Rural Development (Elts and Lõhmus 2012 and Kleijn and Sutherland 2003). AEM are a form of compensation for any loss of income associated with the preservation of biodiversity. Besides the potential positive effects on the environment, agri-environment schemes decouple payments from agricultural output, placing less value on the quantity of production (Kleijn and Sutherland 2003).

Agri-environment schemes vary between countries within the EU, but the main objectives include a reduction of nutrient, pesticide use, landscape restoration, and eradicating rural depopulation (Kleijn and Sutherland 2003). In general, agri-environment measures have met with moderate to high success in terms of adoption rates. Yet, there are concerns

regarding the efficiency of these measures, since their impact on biodiversity conservation is difficult to evaluate due to the lack of monitoring systems. Their success seems to depend on how much land has been enrolled or the amount of capital spent (Kleijn *et al.* 2001).

Certainly, evaluating the impact of strategies and policies on food production and the environment is important. Tankosi and Stojsavl (2014) compared the experiences of NMS to understand the effect of the CAP and the IPARD. The conclusions were that these programs did not improve the national agricultural sector and economies. For these programs to create a positive impact, candidate countries must create clear administrative and financial structures in order to be able to use funding and other forms of assistance from the EU.

Indeed, institutions have a major role to play when it comes to the health of the environment and the economy. Bartolini and Viaggi (2013), studied the intention of farmers to change the amount of land utilized for agriculture, in accordance with other literature they found that the following are determinants of agricultural land expansion under the CAP:

- Education
- Location of land (biophysical constraints)
- Presence of high unemployment in the household
- Age
- Skills or capacity which can lead to an increase in the amount of farmed land

In general farmers above 40 years of age express the intention of reducing or maintaining farm size. Young farmers who sell their products or buy agricultural inputs online, and farmers who have received agricultural training have a higher likelihood of stating the intention to use more land. On the contrary, farmers who utilize and prefer conservation practices such as organic farming usually do not increase farmed area. The CAP tends to

support technologically inefficient yet environmentally friendly farms (Bartolini and Viaggi 2013). On the other hand, farms that focus on the commercialization of crops, for example selling crops to processors, re-sellers or cooperatives, usually expand their farm size (Bartolini and Viaggi 2013). In conclusion, the CAP has the effect of expanding agriculture and or maintaining land size depending on the aforementioned determinants. In addition, in order for farmers to take advantage of land-connected payments they will opt to keep or expand their property.

Lastly, the Water Framework Directive (WFD) is another mechanism that has the potential to create an impact in agriculture. The WFD was introduced in 2000; it aims to improve the biological, hydro-morphological and chemical properties of Europe's watersheds with public participation. River basin management plans are created after public consultation and engagement; these are the key tools for implementing the WFD. Agriculture is one of the major priorities. To protect water sources from agricultural impacts the WFD promotes a pricing policy and a polluter pays principle, which are enacted in the legislation of member countries, or countries that are awaiting membership. In addition, the following measures have been promoted: buffer strips, establishment and preservation of wetlands, reduction of water abstraction and fertilization, plant cover in winter, catchment crops and erosion control. (EC 2013b).

2.4.1 Common Agricultural Policy and agricultural environmental measures in Estonia

When Estonia joined the EU in 2004, CAP subsidies brought about the intensification of production on arable lands. The average wheat yield increased 45% in 2004–2008 compared with a five year pre-EU accession period, 1998–2003 (FAOSTAT 2010). To try to ensure the protection of biodiversity, AEM were introduced in 2004, but it is not clear how or if these subsidies translated to benefits for biodiversity. Studies have shown that farms that have participated in AEM are generally more diverse and produce less, hence offering more

habitats and food for birds and bees and other species (Elts and Lõhmus 2012 and Guerrero *et al.* 2011). The success of the AEM payments depend on what is considered eligible area. The Estonian agricultural institutions did not consider unproductive sections as eligible for subsidies, meanwhile it is these areas that harbor habitats for various species (Guerrero *et al.* 2011). Likewise, subsidies that were aimed to promote nature-friendly production, included support for increased fertilizer inputs, which can create an imbalance in soil nutrients and contaminate water resources (Elts and Lõhmus 2012).

2.4.2 Common Agricultural Policy in Slovenia

In Slovenia after the introduction of the CAP (2004), the number of farms that were less than 1 hectare (ha) increased. Likewise, the number of very large farms, greater than 20 ha, also grew (Bojnec and Latruffe 2013). It was found that smallholder incomes are supported by public subsidies but these farms are less technologically efficient. The goal of the Slovenian government was to improve farm income rather than productivity (Bojnec and Latruffe 2013). Consequently, the competition inherent with the introduction of a larger EU market, did not lead to more production.

2.4.3 Common Agricultural Policy in Poland

The CAP in Poland had positive and negative impacts. In the first years after accession, Poland joined EU in 2003, benefits for the Polish agriculture were only minimal. Small dairy farms, for example, were negatively impacted since they could not meet the high demands of EU standards (Kundera 2013). In 2003 only 4% of farms supplying milk to dairies met the EU standards and the small suppliers who could not provide milk according to regulations were forced to end their delivery (Kundera 2013).

However, the CAP did create an opportunity to improve agricultural incomes for certain farmers. In 2004 the elimination of customs duties and other barriers in agricultural

trade between Poland and the EU opened a market to Polish farmers, which was at least ten times bigger than the Polish market (Kundera 2013).

2.5 Land fragmentation in Central Eastern Europe

According to the European Commission, agriculture is one of the most crucial issues when it comes to EU enlargement because of its share of the Gross Domestic Product (GDP), and a high number of the population active in agriculture. Agriculture has varying degrees of importance in the economies of Central Eastern Europe (CEE) (Swinnen 2002). In addition, there are many subsistence and semi-subsistence farms which represent a structural deficiency, since products are not reaching the market (Kostov and Lingard 2002).

In the context of CEE, small scale subsistence farming was generally not typical for the region under socialist rule. Most agricultural lands in CEE were part of the state under co-operative farms, with the exception of Poland and parts of the former Yugoslavia collective farms were run under an agro-industrial model that prioritized production, and depended on agro-chemicals and mechanization (Kostov and Lingard 2002).

Yet despite and perhaps because of the socialist legacy of collectivizing land, under EU transition most NMS have shown an increase in small scale farming. During the soviet era, governments invested heavily in agriculture, later on spending on agriculture was cut significantly and a restructuring of land ownership from state to private lands occurred (Swinnen 2002). These conditions lead to land fragmentation, which became more prominent once CEE countries became part of the EU.

According to Kostov and Lingard 2002, the Bulgarian transition experienced many economic shocks; subsistence farming presented a pathway to minimize economic risk by providing food security. Hence, the reasons behind subsistence farming are non-agricultural and of general economic nature. The increase of subsistence farms, which leads to land

fragmentation, has presented many challenges for farmers and for policy makers that are trying to improve agriculture and the lives of those who depend on it. Land consolidation can be an approach to address rural development projects with various goals, for example (Pasakarnis and Maliene 2010):

- Improvement of agricultural structures- reduction of fragmentation and enlargement of farm sizes
- Implementation of nature and environmental projects
- National and local infrastructure projects- local rural roads and improved access to parcels

Land consolidation implemented in comprehensively way can address the issue of land abandonment and inequality between rural and urban areas. Improved housing, employment, infrastructure, education, health services, environment, and cultural opportunities must be part of the goals surrounding land consolidation.

2.6 Impacts of European Union on agriculture in new member states

During transition most of CEE, experienced an initial period of macroeconomic instability. Agricultural output declined due to institutional disruptions, and a restructuring of inputs, outputs, and trade (Swinnen 2002). The re-organization of this system, and the institutional changes that followed, caused declines in investment and output (Swinnen 2002).

According to a 2009 FAO study, during EU accession, many countries lost some of their agricultural area after EU accession. Latvia and Lithuania, however, increased their land under agricultural production from 2003 to 2007 while Cyprus, Czech Republic and Poland maintained their agricultural area (Csaki and Jambor 2009). However, no patterns can be

identified in land use changes in arable land, some countries increased their share of productive land through intensification, while others decreased.

Figure 3 Utilized agricultural area (UUA) and percentage of arable land in New Member States

Country	2003		2005		2007		2007/2003 (%)
	UAA	of which arable land (%)	UAA	of which arable land (%)	UAA	of which arable land (%)	UAA
Bulgaria	5326	62	5265	60	5116	60	96
Cyprus	157	73	167	74	157	73	100
Czech Republic	4270	72	4259	72	4249	71	100
Estonia	829	66	834	71	823	73	99
Hungary	5865	78	5863	78	5807	79	99
Latvia	1582	60	1734	63	1839	65	116
Lithuania	2541	60	2837	67	2695	68	106
Malta	11	91	9	88	9	86	85
Poland	16169	78	15906	76	16177	77	100
Romania	14800	63	14180	63	13546	63	92
Slovakia	2236	63	1941	72	1930	71	86
Slovenia	510	34	510	35	500	35	98
NMS total	**54296**	**67**	**53505**	**68**	**52848**	**69**	**97**

Taken from Csaki and Jambor 2009

In general after EU accession, utilized agricultural area of NMS decreased by 3 to 4 percent between 2003 and 2007, while the average share of arable land even increased by 1 per cent. Most notably, in four years, employment in agriculture decreased by a million, for example, in Lithuania and Bulgaria agricultural employment decreased by 40 percent. In Slovakia, Hungary and Latvia the drop in agricultural employment was more than 20 percent. In contrast, Poland is the only country where people employed in agriculture increased slightly (Csaki and Jambor 2009).

Between 2003-2007, agricultural production per hectare increased by 44 percent (Csaki and Jambor 2009). The trend shows that after the accession there was a shift towards more extensive direction in crop production. In 2007, livestock production did not produce

more than half of the output in any of the countries. Indicating a decline in animal husbandry, especially in Slovakia, Slovenia and Czech Republic (Csaki and Jambor 2009). The growth of agricultural production and the decline in employment signals the dependence on the mechanization of agriculture.

Moreover the countries, which experienced less land fragmentation issues such as Poland and Slovenia, adjusted faster to the demand of larger markets than countries emerging from farm consolidation processes. Through subsidies some farmers' incomes have increased, but distribution of subsides favor larger producers. Although small farmers can receive direct payments, most of them received marginal amounts or nothing at all (Csaki and Jambor 2009).

Chapter 3 Methods

This is a case study, which provides insight on the current status of agriculture in a bio-diverse region in Macedonia, and the transition that is occurring under potential EU accession. Case studies are useful in providing answers to issues that require further study, and can be used for exploratory, descriptive or explanatory research (Rowley 2002). Furthermore, case studies are suitable for contemporary events that cannot be manipulated but can explain the "phenomenon of interest" (Rowley 2002 and Bromley 1990). Since, the topic of the case study is evolving, the aim of the thesis is to analyze the situation as it evolves to portray a larger picture of a wider topic: policies that affect land use, in this case EU accession. This case study used data from sources, such as documents, interviews, and observation. The sample was created by using snowball technique (Biernacki and Waldorf 1981).

The case study approach can have three objectives: 1) disprove theory 2) build theory or 3) be treated as a sample of the world (Yin 1994). In this particular study the intention is to provide a sample and to aid in building theory. According to Yin (1994) the case study design must have five components: the research question(s), a premise, its unit(s) of analysis, a conclusion that shows how the data is related to the premise and finally criteria to interpret data.

The researcher began an internship with the Central and East European Working Group for the Enhancement of Biodiversity (CEEweb) before the start of fieldwork. CEEweb had been working with a partner in Macedonia; this non-profit, *Grashnica*, became the host organization during the period of analysis, and provided preliminary contacts for interviews.

Interviews were recorded and transcribed; a journal was used simultaneously with the recordings. The journal was also utilized to document group settings or interviewees who preferred not to be recorded.

3.1 Sample size

A total of 22 people were interviewed, interviews varied between 30 minutes to 4 hours. Interviewees included mostly smallholders, an owner of an industrial farm, government officials, NGO leaders, experts and UNDP project leaders. Generally most of the farmers who participated were male and the age range of the participants varied from 21 to 75, with the majority being above 40 years of age, which reflected demographic conditions of the region. There are a few female farmers in the region but their roles are of support and they are more involved in the marketing and selling of products. Unfortunately, updated and official demographics for this region do not exist.

3.2 Limitations of the research

It is important to note that most of the interviews took place with the aid of translator, presenting a possible limitation since the researcher, could not conduct an in depth analysis by picking up on cultural cues. Nevertheless, a snapshot of the current issue was obtained. Although the study focused on the impacts of EU accession, it is important to note that this is not the only force of change. Markets, domestic policies, climate change, land tenure, and property rights should also be considered. However, given the limited time frame that was allotted for this thesis, it was determined that accession requirements would provide a suitable unit of analysis to determine the impact that has occurred and will occur in the agricultural sector and in the ecosystem.

An analysis of NMS was attempted in order to identify universal factors that can be explored to make a projection that will be as accurate as possible. There are limitations in comparing different countries, since each context is different. Yet these analogues could provide guiding principles for further analysis on enabling conditions for change. Furthermore, since the CAP is undergoing significant changes that were implemented last year it would also be difficult to formulate projections; nevertheless an analysis is necessary since EU accession has the potential to create significant change.

3.3 Theoretical Framework

An analysis of the state of the art provided the following factors; which affect land use changes at the micro-scale:

- Land fragmentation- when land is far away and dispersed, farmers are less likely to invest in machinery, also land fragmentation affects the impact of interventions and accessibility to capital is limited because of low incomes due to low productivity
- Population dynamics- namely depopulation and age which affect the availability of labor
- Policy- policy can stimulate or inhibit certain land use patters
- Technology- if readily available it can help farmers produce more on less land or it can encourage farmers to expand their production
- Market- availability of markets for products and crops

When land use change models are created scale is important. Local scale models define the direct actors of land use and the process-based relationships that are inherent in land use change at the small-scale, hence a description of local actors will be provided (Veldkamp and Lambin 2001). In addition, to the literature on land use change the following

factors as identified by Bartolini and Viaggi (2013), will be analyzed as variables that lead to land expansion under the CAP:

- Education
- Presence of high unemployment in the household
- Skills
- Organic farming practices

Chapter 4 Results

The following sections will give a brief account of population dynamics followed by the current trends in agriculture in the Ohrid and Resen municipality. Next an account of the current state of the lakes will be given by using two agricultural inputs as focus variables: pesticides and fertilizers. This study identified these agro-chemicals as the most detrimental for the local environment. A discussion of livelihoods and how these depend on market conditions will also be provided. The current and expected impacts of accession will be analyzed utilizing examples from NMS. Finally an analysis of the indirect and direct drivers of land use change will be given.

4.1 Agriculture in the Ohrid and Resen municipalities: Socio-economic and environmental factors

In the Ohrid municipality most of the population rely on other sources of income besides farming, while in Resen, a larger population of people depend on farming as a principal source of income, consequently there are more farms in Resen.

Table 2 Resen and Ohrid Municipality Population and Agriculture

	Population	Agriculture only Households	Agriculture is Supplementary
Resen	17,500	3,000	1,723
Ohrid	42,033	2,245	1,873

Data source: Macedonian statistics census 2007

Table 3 Number of individual agricultural holdings and area of land

	Total available land	Total utilized land
Ohrid	2,395	1,845
Resen	4,660	4,113

Data source: Macedonian statistics census 2007

Agriculture represents an important part of the local economy, the conditions in this region are optimal for agriculture. The weather is warmer than in the rest of the country, soil erosion is not an issue, and there is an abundance of groundwater. Hence, the region is known for the quality of its agricultural products nationally. These regions are also known for their biodiversity. Prespa and Ohrid lakes are some of the oldest freshwater lakes in the world. Lake Ohrid, in particular is considered one of the most diverse ancient lakes with regard to the number of endemic species (Albrecht and Wilke 2008 and Kostoski *et al.* 2010).

Farms in Ohrid, are generally diversified, fruits such as cherries, apples, grapes and crops of lesser economic importance such as peppers, cucumber, and tomatoes are grown. Ohrid farmers were more likely to claim that they grow what they consume and sell the surplus. In the Resen municipality, the economy is driven by apple production. A few farmers are only beginning to diversify their crop production introducing cherries. Cherries require less inputs, are more resistant to pests, and have a competitive price in the market. Farm size generally ranges between 0.5-3 ha, and a few farms can be up to 15 ha. Intensified agriculture is more present in the Prespa lake region (Watzin *et al*. 2002). In Prespa, agriculture has the biggest impact on the watershed, 3,000 households rely on agriculture, and 80 percent of farms produce apples. In Prespa, 100,000 tons of apples are produced per year (Sekovski pers.comm.).

Table 4 Number and area under fruit trees for Ohrid and Resen municipalities

	Cherries		**Apples**		**Pears**		**Plums**		**Peaches**		**Walnuts**	
	# of fruit trees	Area ha	# of fruit trees	Area ha	# of fruit trees	Area, ha	# of fruit trees	Area ha	# of fruit trees	Area, ha	# of fruit trees	Area ha
Ohrid	4,059	10	212,245	211	2,196	3	11,028	17	6,994	9	2,700	11
Resen	1,394	2	2,204,219	2,567	768	1	10,705	15	300	1	1,434	3

Source: Macedonian statistical census 2007

Lake Ohrid reaches depths of 280 meters, and in neighboring Lake Prespa, water depth reaches 30 meters. Since there is more agricultural activity near Prespa lake water abstraction due to irrigation is a serious issue. The destruction of marshes near the lakes has also been documented as a threat. In the past the expansion and intensification that occurred during the socialist regime brought about the destruction of almost all the major swamps, which were drained to make way for agriculture and to combat malaria. Hence, most marsh ecosystems have become endangered. Today, the marshlands near Lake Prespa and Lake Ohrid are mostly affected by urbanization and tourism; agriculture does not pose a serious threat (Sekovski pers.comm.).

Pesticide and fertilizers were identified in this study as the most important agricultural inputs that serve as indicators of ecosystem health for the lakes. There seems to be a trend that organochloride pesticide use is in decline and that safer pesticides are being used, however, gathered data supports the assumption that pesticide use is still an issue that requires monitoring. Fertilizer use has not shown a decline, and eutrophication is considered a threat to both lakes.

Once introduced to an aquatic system dichlorodiphenyltrichloroethane (DDT) a potent pesticide, remains forever in its natural form or in forms of degradation (Veljanoska-Sarafiloska *et al.* 2011 and Vives *et al.* 2006). DDT is a toxic and persistent pesticide since it can bio-accumulate through the food chain (Kasozi *et al.* 2006). In addition, these pesticides can be found in an unchanged condition far away from the point of use (Veljanoska-Sarafiloska *et al.* 2011).

In Macedonia the use of organochloride pesticides has been banned since 1970, with the last official record of use in the form of DDT in 1973, which was used to combat malaria (Veljanoska-Sarafiloska *et al.* 2011). Currently, it is unknown if these laws are being followed. According to a study conducted in 2004-2006 in Macedonia, within Lake Ohrid, Lake Prespa and Lake Dojran, sediments, and fish tissue with DDT have been found in small concentrations (Veljanoska-Sarafiloska *et al.* 2011). These findings indicate a decline in the amount of organochlorides, yet the small quantity may still have an impact on the unique ecosystem of Lake Prespa and Lake Ohrid. The study determined that traces of DDT in different metabolic states found in lake sediments and fish tissue indicate use after the official ban. The same study found small quantities of DDT in Lake Prespa, and even smaller amounts in Lake Ohrid (Veljanoska-Sarafiloska *et al.* 2011). Nonetheless, according to the Ministry of Environment and Physical Planning, there is indication but no official information of the illegal import and use of DDT in both lakes (Veljanoska-Sarafiloska pers. comm.)

Unfortunately, social factors such as lack of government records and lack of proper labeling make it difficult to monitor the use of chemicals. In Macedonian agricultural stores, not all of the brands of pesticides indicate the major ingredient in their product (Veljanoska-Sarafiloska pers. comm.). Still, farmers claim that most have stopped using pesticides with organochlorides. Due to the high price of the green list pesticides some purchase these in Greece, or other countries where it is more economical. Likewise, it is plausible that some

purchase DDT, which is cheaper and import it. However, most farmers are choosing more environmentally friendly products since most consumers prefer this. Local media has also helped to inform farmers on how to improve their practices (Veljanoska-Sarafiloska pers. comm.). Despite these improvements pollution from pesticide use is still an issue. There is no legislation for the proper disposal of pesticide packaging, which presents a source of pollution for waterways and the air since most of the packaging is burned or buried in landfills.

Eutrophication is also a pressing issue for both lakes, yet since Prespa Lake is shallower than Ohrid, it is more prone to eutrophication (Matzinger *et al.* 2007). Eutrophication of Prespa Lake has two causes. Some interviewees suggested that the phosphorus content comes from the sewage system, which only has secondary treatment, and others claim that excess fertilizer use is the cause of eutrophication.

However, 90% of soil analysis for the region has shown that in Prespa, soils are deficient in phosphorus, hence farmers are advised to apply more fertilizer in a form more readily available to plants. On the other hand, soils may be deficient in phosphorus because of over irrigation. Fertilizers may wash into the lake faster if they are in granular form, this is why the use of liquid fertilizers are being promoted through various institutions. Conversely, Ohrid Lake is considered to be in an oligotrophic state where eutrophication is low.

4.2 Market forces

According to Chambers and Conway (1992) sustainable livelihoods include the material and social resources that create the ability to obtain a means of living. A livelihood is sustainable when it can recover from stresses and maintain its capabilities, while not undermining natural resources (Chambers and Conway 1992). Other interpretations support a definition that has more to do with individual agency, such as the control one has over income or resources such as knowledge, networks, and rights (Wisner *et al.* 2003).

In this study a combination of both definitions will be used. The majority of Macedonian farmers agreed that their livelihood is affected by the lack of a market for their goods, something they cannot control easily. There is a constant struggle for regions to position themselves in the market; therefore improving the varieties of crops that are sold or promote local races is a way to differentiate products and to create a "brand". Yet in order to change their products, capital investments must be made to obtain the proper seeds, inputs and machinery. This illustrates both definitions that Wisner (*et al.)* 2003, and Chambers and Conway (1992) allude to.

Currently, a limited amount of Macedonian products are sold in EU markets. Some of the apples that are produced in Prespa, are sold to Poland. In a bad harvest year Poland buys these apples to meet trade quotas for the EU. However, in Macedonia quality food standards do not reflect those found in Poland. Despite efforts to improve production, there is no entity that certifies that the products are made to European standards. Some farmers, non-profits, UNDP leaders believe that there are a lot of farmers who can meet these standards and would be able to sell. But this does not depend on farmers there are many factors such as government policies and free trade agreements. As one interviewee explained, very often farmers are "collateral", hence they lack agency.

In an attempt to stand out from other producers and create a livelihood that is sustainable some farmers have switched to growing organic products. Although, there is a limited market incentive for farmers to grow organic or to grow traditional races, these producers hope that once Macedonia joins the EU they will be prepared to sell to a specific market. For producers considering making the switch to organic they consult with the APDA, and if they are eligible they receive funding from the AFSARD to ease the transition from conventional to organic**.** Although, the funds are considered sufficient most farmers say that since there is no national market for their products and they cannot export internationally

there is lack of motivation to grow organic. As for traditional races, more branding and research needs to be done to promote a market for local crops. The hope is that through unique crops and by meeting standards, incomes will improve.

In Ohrid a small scale farmer's typical salary is anywhere from 150-380 EURO per month, it is worthy to note that some utility bills can come to 200 EURO. In order to improve incomes, the government is promoting agricultural practices that meet EU requirements, through extension programs, education, grants, and loans. However, farmers complain that, although they like using better practices, they have a limited market.

There seems to be a consensus among farmers that if Macedonia joins the EU, their products will be uncompetitive, due to more competition and strict EU regulations. Yet some farmers believe that "it has to get better" and that it eventually there will be a larger market where everyone can compete on equal terms.

4.3 Accession: What it could mean for livelihoods and the environment

In this section a brief overview of what has been accomplished by the extension services provided by the APDA, AFSARD, and UNDP will be given. Following a description of extension services, a discussion of the obstacles to improving agriculture will be given. Projections will be made by referring to cases from NMS and utilizing land use change analysis. The potential impacts of the CAP and the drivers of land use change will also be discussed in the context of Macedonia. The existing conditions that can be attenuated or exacerbated under a EU accession scenario will be identified in section 4.7. For this case study the factors that were identified as causing direct change were: age, education, skills, and organic farming preferences amongst farmers. The indirect drivers that were identified were technology, climate change and policy.

4.4 Current impacts of pre-accession

The institutions that play an important role in agricultural management for this region include: local NGOs, regional agricultural agencies, and the United Nations Development Program (UNDP). These actors provide educational and capacity building opportunities for farmers. In Macedonia the IPARD was first implemented in 2007 and was initially programmed to run until 2013, however the instrument continues to support local extension services. These programs target small and medium scale producers. The IPARD helps to fund local extension services such as the agency for promotion and development of agriculture (APDA) and the agency for financial support of agriculture and rural development (AFSARD). The APDA is concerned with providing advisory services for the promotion of quality and quantity of products, through the use of scientific knowledge. The AFSARD implements measures, direct payments, production quotas as designated by the state; and these receive funding from the IPARD.

According to an official from the agricultural agency office in Ohrid, IPARD funds programs that help to advice farmers in the office and in the field. Through subsidies and loans, farmers were able to install drip irrigation systems. Farmers have also been introduced to new standards in feeding livestock, and new and less harmful herbicides, pesticides and fertilizers, approved by the CAP. Crop insurance has been introduced as well. Lastly, the agricultural agency has encouraged farmers to conduct soil tests.

Like the APDA, the United Nations Development Program (UNDP) provides similar services to eligible farmers. The UNDP is the international donor organization that has been most present in this region of Macedonia and has worked directly with farmers, since 2007. In addition, the launch of the Prespa Lake Watershed Plan in 2012, has helped Macedonia meet the requirements of the WFD. WFD transposition in the country is at an

early stage but already several legal acts and plans have been drafted: The Law on Waters, the National Strategy for Waters, River Basin Management Plans, and the Water Master Plan. The Prespa Lake Watershed Plan has accomplished the tasks of delineation of water bodies, monitoring and identifying pressures, in which agriculture was identified as one of the major drivers of ecosystem degradation.

The UNDP has conducted workshops, capacity building programs, and provided funding for facilities. Last year the UNDP also granted financial assistance to eligible farmers for projects involving the use of new methods or technology. Methods that have been introduced are ferti-irrigation and integrated pest management.

Furthermore, the UNDP has helped to establish the first soil testing lab for the region, through soil analysis ferti-irrigation methods are applied in which farmers use the right amount of nutrients in a form that is more soluble for plants. The first agro-meteorological stations were also installed for the region, and form part of the integrated pest management system. These stations use text messages to inform farmers when to spray according to weather patters, in effect it has created less reliance on pesticides. According to Good Agricultural Practices (GAP) standards, there is no particular average for the amount of pesticide or herbicide spraying, instead it is important to know when and why to spray (Zdraveski pers.comm.). Before the UNDP project there was no prognosis service, which would aids farmers in using chemicals efficiently. Since 2010, when the first station was installed, farmers have been able to reduce their pesticide use by 30% in each harvest (Zdraveski pers.comm.). Furthermore, the soil testing lab allows farmers to have access to information, which can be used in documentation for assistance from extension services. In addition, UNDP also began a compost facility and a pesticide packaging collection site, which is now managed by the farmers' union. The compost facility could begin to generate revenue as farmers are beginning to buy this as an alternative to fertilizers.

4.5 Current obstacles to joining the European Union

The UNDP and regional government initiatives have striven to help farmers adapt to new technology. According to one official from the APDA, the success of adopting new practices often depends on factors such as age and income. The younger and wealthier the farmer the more inclined to change. Hence, the number of users of the public advisory services is not high in Macedonia with the exception of market–oriented producers (Biljana pers.comm). Nevertheless, orienting Macedonian production towards EU markets has incentivized many farmers to comply with better agricultural practices.

Another for obstacle both farmers and policy makers is land fragmentation. Unfortunately, larger farms (farms above 1 ha) are given preference under UNDP programs and other pre-accession assistance programs. During socialism most producers worked in collectivized farms, when these were partitioned they had access to small plots, and some large private operators bought land from the government. There has been a sense of competition between small-scale farmers who see proposals by larger producers to join production efforts, as a threat. In the same vein, small-scale farmers are reluctant to join lands with other smallholders.

However, UNDP leaders and local government officials agree that bigger farms could have the largest environmental impact. Hence, the UNDP, non-profits, and local agencies have encouraged farmers to unionize and form collectives, and there have been some efforts by farmers to combine adjacent land. Yet, most are reluctant to join farms, since this is reminiscent of former socialist era, where farmers had limited agency and were forced to join co-ops, but this may be an efficient way for farmers to gain access to funds and services under EU accession.

A farmers union can also help farmers to obtain access to services and finance. Currently, one exists in the Resen municipality, which addresses issues of capital investments, trade, and the price of harvested products; only 200 farmers are part of the union. With unions producers can demand fairer prices for agricultural inputs and for the purchase of new technology from sellers, who according to interviewees behave like a monopoly. In the same vein, resellers who buy apples from farmers are the ones to establish the selling price. In one example a farmer explained how one may sell at a low price, because of a bad harvest but this in turn affects the price that others can sell irrespective of their growing conditions.

Another problem is the irrigation system in Macedonia is obsolete. Currently, farmers depend on groundwater to irrigate their fields. Wells are made, or farmers redirect rivers, and none of this is regulated. Hence, in a dry period of subsequent years, agriculture production could collapse.

4.6 Projecting impacts of European Union accession for the region

Amongst farmers, government entities, and international agencies, reactions are mixed regarding the benefits of entering a wider EU market. A few of the farmers interviewed believe that once they have met the necessary accession requirements they will have the opportunity to sell to a wider EU market, still, most claim that local crops will be uncompetitive. Meanwhile, the government agencies believe that a free market will be good for farmers and the economy. EU accession may allow farmers to strengthen their capacity to manage their farm resources more responsibly and efficiently with the use of modern technology and better access to capital helping them to respond to consumer demand.

Nevertheless, under EU accession agriculture will be influenced by market demand for quality and safety standards, which can prove to be a challenge for small-scale farmers (Miller and Jones 2010). According to Pasarnakis and Maliene (2010) food production is

moving away from a commodity industry, years ago the only way for farmers to succeed economically was to increase productivity, which is the model that the CAP supported. Today value oriented products and crops are being promoted by the CAP; which bring opportunities for farmers to explore the benefits of higher value production. However, the introduction of the CAP has also brought about many challenges for farmers in NMS.

As was the case in Poland, Macedonian small-scale farmers may not be able to meet EU regulations and may have to scale down or join production with bigger farms. Other evidence shows that in Slovenia and Bulgaria, smallholder plots increased after EU accession (Bojnec and Latruffe 2013 and Kostov and Lingard 2002). Subsistence farming could be a coping strategy to address economic hardship brought about by larger market. On the other hand, if the Macedonian government chooses to promote sustainable livelihoods and not production, then smaller farms may benefit. However, the likelihood of creating more disparity between farms is latent. In the case of Slovenia the number of small farms grew and larger farms increased as well, since the latter had the ability to produce for the market. There has been evidence that production intensified on arable lands after EU accession. Creating potential harm in surrounding ecosystems as intensification leads to more reliance on agro-chemicals and water abstraction (Bojnec and Latruffe 2013; FAOSTAT 2010 and Elts and Lõhmus 2012).

The permanence or prevalence of small-scale farms is likely, considering that most farmers in Macedonia are wary of consolidating their farms. A requirement for EU accession is the registration of land tenure contracts, currently in Macedonia individuals exchange land through verbal agreements (Noev *et al.* 2004). Hence, registering contracts may help address land fragmentation issues, bolster investments, and agricultural efficiency. On the other hand

registration increases the costs of engaging in an agreement, and may discourage farmers to consolidate farms (Noev *et al.* 2004).

Similarly, water permits have recently been introduced to comply with the WFD, which obligates farmers to register their use of groundwater. Macedonia has adapted water pricing, which may motivate farmers to use water efficiently once it is enforced (Sutton *et al.* 2013). However, several discussions with farmers and non-profit managers; signaled the dubious potential for the new guidelines to protect water resources. To install a water-efficient drip irrigation system, a farmer will now be required to pay a third party to conduct a groundwater analysis, with this study the farmer can then apply for a water permit. Like the land tenure contracts, water permits could increase the cost of using resources responsibly and deter many from investing in sustainable methods.

It is unclear if through instruments such as the CAP, WFD, and AEM, EU accession can enhance the protection of biodiversity. Referring to the Estonian example, the effectiveness of AEM is contingent upon the definition of clear objectives, and indicators for monitoring impact. Macedonian officials must be careful in defining the eligible areas that are harboring biodiversity, which are usually unproductive areas, such as marshlands, or grasslands that are managed carefully.

4.7 Indirect and direct drivers

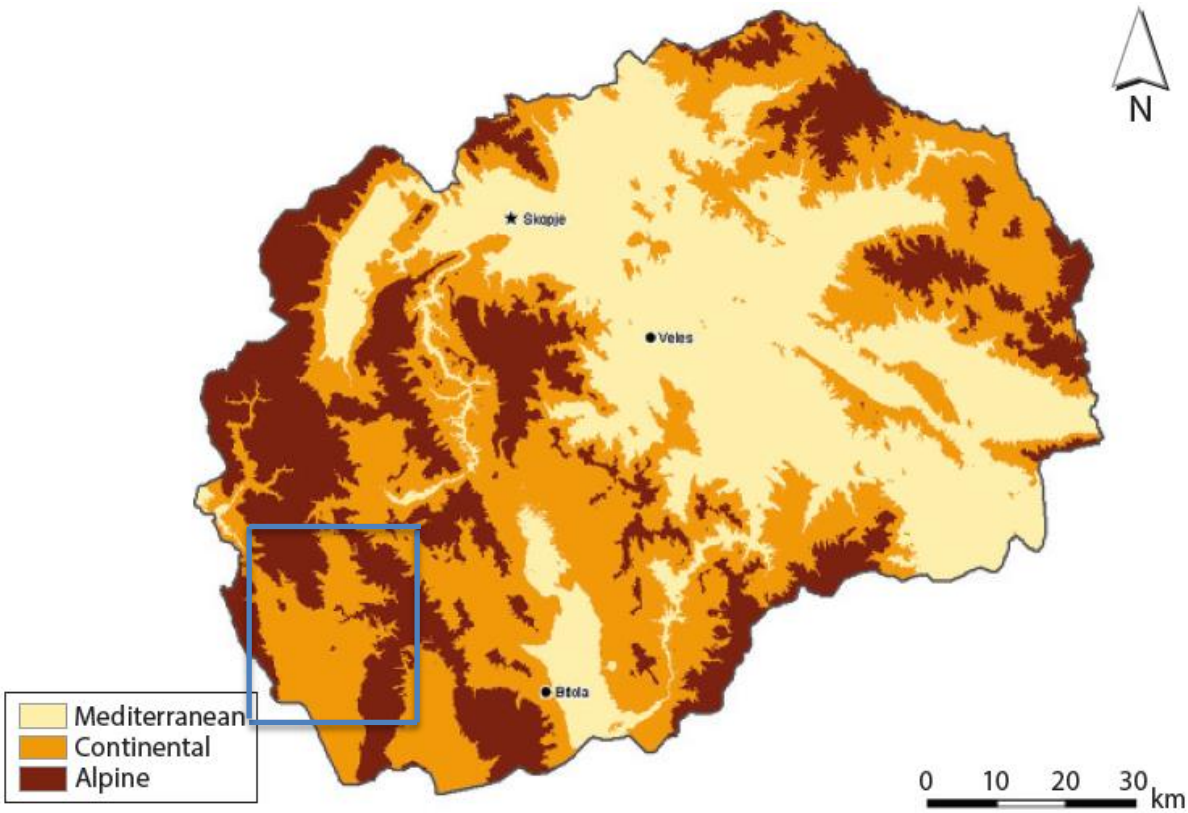
Recalling Geist and Lambin (2002), direct causes of land use change occur at the local level and indirect causes stem from country or regional changes that may introduce new challenges or opportunities. Direct causes include human activities such as agricultural expansion. Indirect forces are fundamental social processes, such as human population or agricultural policies. Both direct and indirect causes can be influenced by one another. The indirect risks that have been identified for the Ohrid and Resen municipality, are climate change, population dynamics, and policies. The availability of technology, can be considered indirect and direct, since this depends on government policies, which can make technology more accessible, or it can depend on the household's willingness to invest in new methods.

Climate change has been identified as an indirect driver for land use change since the scenarios for Macedonia, have shown favorable conditions for the Ohrid and Prespa Lake region. Meanwhile the rest of the country could risk a significant decrease in crop production due to extreme weather conditions and the ongoing soil erosion process (Cukaliev pers.comm.; Stefanova *et al.* 2012 and Sutton *et al.* 2013).

According to the European Environmental Agency climate change will further exacerbate the current water erosion conditions. A study conducted in Albania and Macedonia concluded that by 2050 floods could increase in both frequency and intensity under climate change (Sutton *et al*. 2013). In the Mediterranean and continental parts of the country declines of 50% are expected for maize, wheat, vegetables and grapes under a 1.62 degree Celsius warming scenario. Conversely, in the alpine and continental areas of Macedonia, where Ohrid and Prespa Lake are situated, wheat yields could increase by more than 50 percent (Sutton *et al.* 2013). It is likely that other crops will also flourish in this region, considering that there is sufficient groundwater and there have not been reported issues with soil erosion. In a country

with a land area of 24,856 square kilometers, arable lands are few, in a worst-case scenario Ohrid and Prespa Lake can become an industrial agricultural zone, which will present serious challenges to the endemic flora and fauna of the lakes.

Figure 4 Agro-Ecological zones in Macedonia blue box indicates Ohrid and Prespa Lakes



Source: Sutton *et al.* 2013

The biodiversity of the lakes may also be jeopardized by combination of fertilizers and global warming. Matzinger (*et al.* 2007) showed that anoxia is expected in Lake Ohrid, with the predicted atmospheric warming of 0.04 degrees Celsius per year. Hence, phosphorus load must be halved, however even with such a decrease, anoxia is still expected toward the end of the century if the rate of warming continues (Matzinger *et al.* 2007).

These projections are especially worrying since farmers who stated that they might consider expanding into other areas or intensifying, defined larger market access and having someone to pass on the inheritance, as motives. More people using more land or increasing production can further increase the use of fertilizers leading to anoxic conditions for Ohrid Lake. However, it is uncertain if there will be younger farmers in the region, given that most of the rural communities in Macedonia seem to be experiencing depopulation (Stefanova *et al.* 201). In this particular region, depopulation rates are generally following the same trajectory with the exception of Ohrid municipality, which according to interviewees, has experienced a slight increase in the number of younger farmers.

Although not a significant number according to the APDA, there are younger farmers, under 40 years of age, in the past couple of years. Unfortunately, census information is not available to verify this. When interviewing these young farmers most communicated that they had taken up farming because of a lack of opportunities in their field of work and a desire to stay in Macedonia. According to a UNDP report, 32% of the Prespa region is unemployed. Because of a lack of jobs there are many people who have left and who are leaving the country. Most of the youth have been migrating and in the foreseeable future this will continue if economic conditions do not improve within Macedonia.

Improved technology introduced by non-local actors has helped Macedonian farmers use their resources wisely, and could help address issues of adaptation to extreme weather, soil erosion, and may attract younger farmers who are more inclined to use new technology. The agro-meteorological stations and soil testing labs have already decreased the use of pesticides and fertilizers. However, there is a latent risk that intensification and in some cases extensification, may occur. With drip irrigation farmers are watering less but a few have began to expand their production, potentially creating further stress on the availability of

water levels for Prespa Lake. Some farmers in Prespa have also expressed the intention in producing more crops for a larger market with the aid of new technology.

Chapter 5 Discussion

Through an analysis of the state of the art the following factors were identified as determinants of land expansion for the region. Table 5 shows the highlighted variables that are the most pertinent to the Resen and Ohrid municipalities.

Table 5 Variables that determine land expansion

	Ohrid	Resen
Education and skills		
Unemployment		
Organic farming		
Land fragmentation		
Policy		
Population dynamics		
Technology		
Market		

Education and skills aimed at preparing farmers for EU accession, has helped many improve management of their farms and reduce costs. These changes could translate to an improvement of the ecosystem, less pesticides and fertilizer use, nevertheless, the literature has shown that farmers who have received educational services are also more likely to expand or intensify production. This is a potential scenario for the Prespa farmers who expressed their intention to grow more on their land. Unless the preference is to grow organic, which requires less inputs and less mechanization, then there will be less of a likelihood to expand or intensify agriculture.

According to the amount of organic farmers found in the sample size, and the opinion of local experts, there are more conventional than organic farmers in the region. But there could be a shift for farmers to prefer non-conventional methods, under green direct payments or with the implementation of AEM. Macedonia could take the example of Estonia and support environmentally friendly yet technologically inefficient farms. This in turn could mean that farmers' livelihoods may remain the same at best, unless payments reflect the cost of sustaining habitats and environmental services. But these strategies must have provisions that will not incentivize farmers to expand their land in order to be eligible for payments.

The presence of unemployed individuals in a household as described by Bartolini and Viaggi (2013), is also an important factor. High unemployment levels in general can lead to land expansion once opportunities to work are presented otherwise referred to as the migration effect (Altieri 1999). Nonetheless, it is difficult to determine if EU accession will provide more jobs since this is contingent upon other factors such as markets, policies, and demography which impact land use changes at the micro-scale. One trend that has been seen in NMS after EU accession is the significant decline in agricultural jobs but a rise in production (Csaki and Jambor 2009). It is possible that technology allowed for the

intensification of agriculture in NMS, and this could be the case for Macedonia, which can then lead to a migration of a younger work force to become involved in the sector.

Because land is dispersed and parceled, land is less productive, making farmers likely to invest in machinery; also land fragmentation affects the impact of interventions and accessibility to capital. Hence, environmental protection, and improvement of livelihoods, should be the central focus of efforts that address land fragmentation. In CEE land consolidation has focused on farm enlargement (Pasakarnis and Maliene 2010). To reach sustainable development of the rural areas during the process of land consolidation, ecological priorities should be taken into account. Land consolidation should be viewed as an instrument to improve the working and living conditions of rural communities while improving ecosystem health (Pasakarnis and Maliene 2010). Land consolidation can also present avenues for alternative employment and potentially attract younger farmers.

However, markets and policy play the most important role in job creation, which can then determine how land is used at the local level. For example markets may determine the demand for value oriented crops or cash crops, but policy can enable capital investments in technology that facilitates the production of either crop. Hence, ecological research is needed to analyze which crops and inputs can be used in specific ecosystems (Matson and Vitousek 2006). To protect the Ohrid and Prespa ecosystems, low-investment technology, input subsidies that are selective and protect natural landscapes, can help to improve livelihoods and protect biodiversity.

In conclusion, capital and labor saving technology can improve livelihoods and at the same time support conservation efforts if accompanied by policies that prioritize the quality of crops, protection of the environment, over production. This is important to consider

since the introduction of technology does not always lead to the efficient use of natural resources (Matson and Vitousek 2006).

While Angelsen and Kaimowitz (2001), claim that an increase yield of crops on arable land can help to protect livelihoods and prevent the expansion of agriculture, current research signals that intensification may not be viable approach for Ohrid and Prespa lakes. Studies have shown that Ohrid Lake is in danger of becoming anoxic if phosphorus inputs are not significantly reduced and if global warming continues as projected (Matzinger *et al.* 2007). Meanwhile in Prespa Lake, lack of a comprehensive irrigation system has led to many farmers abstracting water irresponsibly, which could create water stress in the shallow Prespa Lake. Hence, whether or not production is intensified or expanded, agriculture can still pose a serious threat under current circumstances.

Furthermore, projections portray that most of the country will experience a significant decline of crop production due to global warming and soil erosion will continue to affect most of the country. Ohrid and Prespa lakes are poised to be nation's agricultural hotspot, if climate change projections pan out. Further analysis is needed to determine if agriculture and biodiversity can flourish under new technologies, capital investments, market forces and environmental projections for the region.

5.1 Limitations of findings

Lack of population census data for the study site, monitoring data that measures current effects of new methods and technology create limitations for the scope of this thesis. In addition, to the aforementioned factors: CAP reform, lack of data regarding effectiveness of AEM in general, create further unknowns. Also this type of research requires longitudinal focus to understand the real impacts of pre-accession requirements. Moreover, the lack of empirical data to answer the research question may hamper the relevance of the findings to

predict the phenomenon in question. Although the thesis does not propose or test a hypothesis and the primary objective was to understand an issue, the thesis did attempt to make a prediction. Yet, predictions require laws, theoretical frameworks that will aid in prediction (Bendassolli 2013). In conclusion, this study would have benefitted from a more theoretical basis and more empircal support.

5.2 Conclusion

In this thesis the potential impacts of accession for the agricultural sector of Macedonia were reviewed in the context of a specific ecosystem. The research sought to understand how the prospect of EU membership has changed farming practices in the unique Ohrid and Prespa lake region and analyze the potential impacts on the environment and on farmers' livelihoods. EU accession is a complex process and it is difficult to speculate what could happen but an analysis of potential impacts is necessary since the CAP has the potential to restructure agriculture and create social and environmental changes.

The current changes that have occurred in the agricultural sector have taken place because of local and international extension services. Ohrid and Resen farmers have gained a general ecological awareness of the impacts of agriculture. New technology and access to capital has allowed farmers to use less pesticides, improve the management of water resources, and has introduced new ways of using fertilizers efficiently. Some farmers have learned of the value-oriented markets and may consider growing their products organically which would entail less land expansion. On the other hand, some have stated their intention to produce more on arable land.

A review of the literature showed that under the CAP, farmers who have received trainings are more likely to expand agricultural production. In order to be eligible for payments most will also try to expand or maintain their farmland. This also depends on age of the producer, size of the farm, and whether or not there are individuals that will inherit the land. Generally, introduction of the CAP in CEE countries has created an intensification of agriculture among larger farms, and has expanded smaller holdings.

Furthermore, through a review of the literature the study also projects that if Macedonia becomes part of the EU, there will be more bureaucratic systems; which could

create social friction. For instance, land fragmentation may continue to be a problem under EU accession, since currently most farmers are reluctant to consolidate lands. Once in the EU, farmers will be obligated to pay to register their lands, this could create more of a disincentive.

There are many more uncertainties that this research has identified. For example, it is unclear how AEM or green direct payments will affect the environment and livelihoods for the region. This depends on how the Macedonian government manages these strategies. Also the CAP has undergone a recent reform, hence it is unclear how this will impact Macedonia. In the past, EU membership has benefitted countries with less land fragmentation issues. Land fragmentation will continue to hamper environmental and rural development initiatives in Macedonia. The government should offer incentives to those who register and consolidate their lands. Furthermore, land consolidation should not have an economic focus. Instead extension services should continue encouraging farmers to join unions. Since there will be a need for farmers to establish price standards for products under a larger market and together farmers can apply for credit or loans.

Under a CAP scenario Macedonia should support small scale farmers whose activity fulfills environmental aims, this could mean a potential reduction in incomes or no increase in income. The government must create clear and measurable goals for AEM and identify what lands will be eligible for payments. AEM and green direct payments could promote resilience to extreme natural events. Hence, this approach could help producers achieve a sustainable livelihood, one where material and social resources create the ability to obtain a means of living and recover from stresses, while not undermining natural resources (Chambers and Conway 1992).

The thesis has contributed to land use change analysis, at the micro-scale by further validating previous research which surmises that variables such as: age, unemployment, land

fragmentation, education, policy, technology and markets are determinants of land use change. Yet these variables can be considered interconnected and influence one another depending on the place and the policies that are enacted.

5.3 Work Cited

Altieri, M. 1999. The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems, and Environment* 74: 19-31.

Angelsen, A. and Kaimowitz, D. 2001. Agricultural Technologies and Tropical Deforestation. Center for International Forestry Research (CIFOR). Accessed on May 24. URL: http://www.cifor.org/publications/pdf_files/Books/BAngelsen0101E0.pdf

Bakkenes, M., Eickhout, B. and Alkemade, J.R.M. 2006. Ecosystem impacts for biodiversity of different stabilization scenarios. *Global Environmental Change* 16: 19–28.

Bartolini F. and Viaggi, D. 2013. The common agricultural policy and the determinants of changes in EU farm size. *Land Use Policy* 31: 126-135.

Bellon, R.M. 2003. Conceptualizing Interventions to Support On-Farm Genetic Resource Conservation. *World Development* 32(1): 159-172.

Bendassolli, P.F. 2013. Theory Building in Qualitative Research: Reconsidering the Problem of Induction. *Forum: Qualitative Social Research* 14(1).

Benton, T.G., Bryant, D.M., Cole, L. and Crick, H.Q.P. 2002. Linking agricultural practice to insect and bird populations: a historical study over three decades. *Journal of Applied Ecology* 39: 673–687

Biernacki, P. and Waldorf, D. 1981. Snowball Sampling: Problems and techniques of chain referral sampling. *Social Sciences, Mathematical Methods* 10:141-163.

Boesch, D. and Brinsfield R.D. 2000. Coastal Eutrophication and Agriculture: Contributions and Solutions. *Biological Resource Management Connecting Science and Policy* 93-115

Bojnec, S. and Latruffe, L. 2013. Farm size, agricultural subsidies and farm performance in Slovenia. *Land Use Policy* 32: 207-217.

Bromley, D.B. 1990. Academic contributions to psychological counseling: A philosophy of science for the study of individual cases. *Counseling Psychology Quarterly* 3(3): 299-307

Central and East European Working Group for the Enhancement of Biodiversity (CEEWeb). 2013. Rural Development Programs Performance in Central and Eastern Europe: Lessons learnt and policy recommendations. Accessed on April 20. URL: http://www.ceeweb.org/wp-content/uploads/2013/12/RDP-performance-in-CEE.pdf

Chambers and Conway, G. 1992, Sustainable rural livelihoods: practical concepts for the 21st century. IDS Discussion Paper 296 Brighton. Accessed on July 15. URL: http://www.ids.ac.uk/publication/sustainable-rural-livelihoods-practical-concepts-for-the-21st-century

Chase, T.N., Pielke, R.A., Kittel, T.G.F., Nemani, R.R. and Running, S.W.1999. Simulated impacts of historical land cover changes on global climate in northern winter. *Climate Dynamics* 16: 93–105.

Ciaian, P. and Swinnen, J.F.M. 2006. Land market imperfections and agricultural policy impacts in the new EU member states: a partial equilibrium analysis. *American Journal of Agricultural Economics* 88: 799–815.

Csaki, C. and Jambor, A. October 2009. The diversity of effects of EU membership on Agrigulture in New Member States. The regional office for Europe and Central Asia of the Food and Agriculture Organization (FAO). URL: http://www.fao.org/docrep/017/aq336e/aq336e.pdf

Donald, P.F. Green, R.E. and Heath, M.F. 2000. Agricultural intensification and the collapse of Europe's farmland bird populations. *Proceedings of the Royal Society London Series* 268: 25–29.

Donald, P.F., Pisano, G., Rayment , M.D and Pain, D.J. 2002. The Common Agricultural Policy, EU enlargement and the conservation of Europe's farmland birds. *Agriculture, Ecosystems and Environment* 89: 167-182.

Elts, J. and Lõhmus, A. What do we lack in agri-environmental schemes? The case of farmland birds in Estonia. *Agriculture, Ecosystems and Environment* 156: 89-93.

European Commission (EC). 2012. Agriculture and Rural Development. Accessed on June 7. URL: http://ec.europa.eu/agriculture/index_en.htm

European Commission (EC). December 2013. Overview of CAP Reform 2014-2020: Agricultural Policy Perspective Brief. URL: http://ec.europa.eu/agriculture/policy-perspectives/policy-briefs/05_en.pdf

European Commission (EC). 2013b. A review of agricultural measures under the Water Framework Directive. October 2013. URL: https://ec.europa.eu/jrc/en/news/review-agricultural-measures-under-water-framework-directive-10235

European Commission (EC). 2014. Present situation of flood management in the Western Balkans. Accessed on May 2. URL: http://ec.europa.eu/enlargement/pdf/press_corner/floods/%20.pdf

Eurostat. Extensification explained. 2014. Accessed on May 20. URL: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Extensification

European Commission (EC). 2015. IPA Rural Development Programme (IPARD) for the former Yugoslav Republic of Macedonia. Accessed on July17. URL: http://europa.eu/rapid/press-release_MEMO-07-608_en.htm?locale=en

Food wastage footprint impacts on natural resources. 2013. Food and Agriculture Organization of the United Nations. Summary Report. Accessed on April 5. URL: http://www.fao.org/docrep/018/i3347e/i3347e.pdf

Food and Agriculture Organization of the United Nations Statistics (FAOSTAT). 2010. Accessed on July 18. URL: http://faostat.fao.org/default.aspx

Feder, G. and Feeny, D. 1991. Land tenure and property rights: theory and implications for development policy. *World Bank Economic Review* 5: 135–153.

Foley, J.A., Ramankutty, N., Brauman, K.A., Cassidy, E.S., Gerber, J.S., Johnston, M., Mueller, N.D., O'Connell, C., Ray, D.K., West, P.C., Balzer, C., Bennett, E.M.,

Carpenter, S.R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., Tilman, G.D., Zaks, D.P.M., 2011. Solutions for a cultivated planet. *Nature* 478: 337–342.

The Government Office for Science. 2011. The Future of Food and Farming: Challenges and Choices for Global Sustainability. The Government Office for Science, London. Accessed on: June 10. URL: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/288329/11-546-future-of-food-and-farming-report.pdf

Gabriel, D., Sait, S.M., Kunin, W.E. and Benton, T.G. 2013. Food production vs. biodiversity: comparing organic and conventional agriculture. *Journal of Applied Ecology* 50: 355-364.

Geist, H.J., and Lambin, E.F. 2002. Proximate causes and underlying driving forces of tropical deforestation. *Bioscience* 52(2): 143-150.

Guerrero, I., Morales, M.B., Onate, J.J., Aavik, T., Bengtsson, J., Berendse, F., Clement, L.W., Dennis, C., Eggers, S., Emmerson, M., Fischer, C., Flohre, A., Geiger, F., Hawro, V., Inchausti, P., Kalamees, A., Kinks, R., Liira, J., Meléndez, L., Pärt, T., Thies, C., Tscharntke, T., Olszewski, A. and Weisser, W.W. 2011. Taxonomic and functional diversity of farmland bird communities across Europe: effects of biogeography and agricultural intensification. *Biodiversity Conservation* 20: 3663–3681.

Houghton, R.A., Hackler, J.L. and Lawrence, K.T.1999. The U.S. carbon budget: contribution from land-use change. *Science* 285: 574–578.

Join Research Center. 2006. Overview of soil information and soil protection policies in Republic of Macedonia. European Commission. Accessed on April 29. URL: http://eusoils.jrc.ec.europa.eu/esdb_archive/eusoils_docs/esb_rr/EUR22646EN.pdf

Kleijn, D., Berendse, F., Smit, R. & Gilissen, N. 2001. Agrienvironment schemes do not effectively protect biodiversity in Dutch agricultural landscapes. *Nature* 413: 723–725.

Kleijn, D. and Sutherland, W. 2013. How effective are European agri-environmental schemes in conserving and promoting biodiversity? *Journal of Applied Ecology* 40(6): 947-969.

Koeth, W. 2014. The new instrument for pre-accession assistance (IPA II): Less accession, more assistance? Working Paper, European Institute of Public Administration. Accessed on June 8. URL: http://publications.eipa.eu/en/details/&tid=1854

Kostov, P. and Lingard, J. 2002. Subsistence farming in transitional economies: lessons from Bulgaria. *Journal of Rural Studies* 18(1): 83-94.

Kostoski, G., Albrecht, C., Trajanovski, S. and Wilke, T. 2010. A freshwater biodiversity hotspot under pressure Lake Ohrid. *Bio geosciences Discussions* 7: 5347-5382.

Kundera, J. 2013. Poland in Common Agricultural Policy. *International Journal of Agricultural Extension* 01: 36-41.

Lambin, E.F., Baulies, X., Bockstael, N., Fischer, G., Krug, T., Leemans, R., Moran, E.F., Rindfuss, R.R., Sato, Y., Skole, D., Turner, B.L. II and Vogel, C.1999. *Land-use and land-cover change (LUCC): Implementation strategy*. IGBP Report No. 48. Stockholm, Bonn.

Lambin, E.F., Turner, B.L., Helmut, J., Agbola, S.B., Angelsen, A., Bruce, J.W., Coomes, O.T., Rodolfo, D., Fischer, G., Folke, C., George, P.S., Homewood, K., Imbernon, J., Leemans, R., Li, X. , Moran, E.F., Mortimore, M., Ramakrishnan P.S., Richards, J.F., Skanes, H., Steffen, W., Stone, G.D., Svedin, U., Veldkamp, T.A., Vogel, C., and Xu, J. 2001. The causes of land use and land cover change: moving beyond the myths. *Global Environmental Change* 11: 261-269.

Lele, S., Wilshusen, P., Brockington, D., Seidler, R. and Bawa, K. 2010. Beyond exclusion: alternative approaches to biodiversity conservation in the developing tropics. *Environmental Sustainability* 2: 94-100.

Macedonian Statistics Office Census. 2007. Accessed on June 23. URL: http://makstat.stat.gov.mk/pxweb2007bazi/Database/Census%20of%20Agriculture%202007/databasetree.asp

Miller, C. and Jones, L. 2010. Agricultural value chain finance: Tools and lessons. Food and Agriculture Organization (FAO) and Practical Action Publishing. Accessed on May 1. URL: http://www.fao.org/docrep/017/i0846e/i0846e.pdf

Middleton, B. 2013. Rediscovering traditional vegetation management in preserves: Trading experiences between cultures and continents. *Biological Conservation* 158: 271-279.

Matson P. and Vitousek, P. 2006. Agricultural intensification: will land spared from farming be land spared for nature? *Conservation Biology* 20: 709-710.

Matzinger, A., Jordanoski, M., Veljanoska-Sarafiloska, E., Sturm, M., Muller, B., and Wuest, A. 2005. Is Lake Prespa jeopardizing the ecosystem of ancient Lake Ohrid? *Hydrobiologia* 553: 89-109.

Matzinger, A., Schmid, M., Veljanoska-Sarafiloska, E., Patceva, S. and Guseka, D. Eutrophication of ancient Lake Ohrid: Global warming amplifies detrimental effects of increased nutrient inputs. *Limnology and Oceanography* 52(1): 338-353.

Ministry of Environment and Physical Planning. 2014. Water resources management in the Republic of Macedonia-The new approach. Accessed on May 5. URL: http://www.inbo-news.org/IMG/pdf/Mr_MIRTA_-_Water_Management_Pr.pdf

Noev, N., Swimmen, J.FM. and Vranken, L. June 2004. The Development of Land Rental Markets in Bulgaria and the former Yugoslav Republic of Macedonia. Research Group on Food Policy, Transition, and Development Katholieke Universiteit Leuven. Accessed on May 2. URL: http://ageconsearch.umn.edu/bitstream/31889/1/wp040001.pdf

Nunez P., Den Bergh, J. 2001. Economic valuation of biodiversity: sense or nonsense? *Ecological Economics* 39: 203-222.

Ostrom, E., Burger, J., Field, C.B., Noorgaard, R.B. and Policansky, D. 1999. Revisiting the commons: Local lessons, global challenges. *Science* 284: 278–282.

Pasakarnis, G. and Maliene, V. 2010. Towards sustainable rural development in Central and Eastern Europe: Applying land consolidation. *Land Use Policy* 27 (2): 545–9.

Perfecto, I., and Vandermeer, J. 2010. The agroecological matrix as alternative to the land sparing/agriculture intensification model. *Proceedings from the National Academy of Sciences* 197:5786–5791.

Phalan, B., Balmford, A., Green, R.E. and Scharlemann, J.P.W. 2011. Minimizing harm to biodiversity of producing more food globally. *Food Policy* 36: 62–71.

Plucknett, D. L., Smith, N. H. J., Williams, J. T. and Anishetty, N. M. 1987. *Gene Banks and the world's food*. Princeton: Princeton University Press.

Pretorius, D.D. and Kirsten, J.T. 1994. Testing rural households' perceptions of different land tenure systems. *Agrekon* 33: 261–265.

Robinson, R.A. and Sutherland, W.J. 2002. Changes in arable farming and biodiversity in Great Britain. *Journal of Applied Ecology* 39: 157–176.

Rowley, J. 2002. Using Case Studies in Research. *Management Research News* 25:1

Sala, O.E., Chapin, F.S., Armesto, J.J., Berlow, E., Bloomfield, J., Dirzo, R., Huber-Sanwald, E., Huenneke, L.F., Jackson, R.B., Kinzig, A., Leemans, R., Lodge, D.M., Mooney, H.A., Oesterheld, M., Poff, N.L., Sykes, M.T., Walker, B.H., Walker, M. and Wall, D.H. 2000. Biodiversity: global biodiversity scenarios for the year 2100. *Science* 287: 1770–1774.

Seufert , V., Ramankutty N. and Foley, J. 2012. Comparing the yields of organic and conventional agriculture. *Nature* 485: 229-232.

Spirkovski, Z., Avramovski, O. and Kodzoman, A. 2001. Watershed management in the Lake Ohrid region of Albania and Macedonia. *Lake Reserve Management* 6: 237–242.

Strijker, D. 2004 Marginal lands in Europe-causes of decline. *Basics and Applied Ecology* 6: 99-106.

Stefanova, V., Hart, K., Znaor, D. and Kazakova, Y. 2012. High Nature Value Farming and Agri-Environment Payments for the Republic of Macedonia. AVALON. Accessed on June 9. URL: http://orgprints.org/26380/

Sutton, W.R., Srivastava, J.P., Neumann, J.E., Strzępek, K.M and Boehlert, B.B. 2013. *Reducing the Vulnerability of the Former Yugoslav Republic of Macedonia's Agricultural Systems to Climate Change*. Washington, D.C: World Bank.

Swinnen, J.F.M. 2002. An explanation of land reform policies in Central and Eastern Europe. *Policy Research Group:* Working Paper 5.

Tankosi, J.V. and Stojsavljevic, M. 2014. EU Common Agricultural Policy and pre-accession assistance measures for rural development. *Economics of Agriculture* 195-210.

Tilman, D., Fargione, J., Wolff, B., D'Antonio, C., Dobson, R., Howarth, R., Chandlerr,

D., Schlesinger, W.H., Simberloff, D. and Swackhamer, D. 2001. Forecasting agriculturally driven global environmental change. *Science* 292: 281–284.

Tilman, D., Balzer, C., Hill, J. and Befort, B.L. 2011. Global food demand and the sustainable intensification of agriculture. *Proceedings of the National Academy of Sciences of the United States of America* 108: 20260–20264.

Turner, B.L., Clark, W.C., Kates, R.W., Richards, J.F., Mathews, J.T. and Meyer, W.B.1990. *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere Over the Past 300 Years.* Cambridge: University Press.

Tscharntke, T., Clough, Y., Wanger, T.C., Jackson, L., Motzke, I., Perfecto, I., Vandermeer, J., and Whitbread, A. 2012. Global food security, biodiversity conservation and the future of agricultural intensification. *Biological Conservation* 151: 53-59.

Vandermeer, J. and Perfecto, I.1995. *Breakfast of biodiversity: the truth about rainforest destruction.* Food First Books: Oakland.

Veljanoska-Sarafiloska, E., Stafilov, T., and Jordanoski, M. 2011. Distribution of DDT metabolites in the sediment and muscle fish tissue from agriculturally impacted lake Dorjan (Macedonia/Greece). *Fresenius Environmental Bulletin* 20(8).

Vepsäläinen, V., Tiainen, J., Holopainen, J., Piha, M., Seimola, T., 2010. Improvements in the Finnish agri-environment scheme are needed in order to support rich farmland avifauna. *Ann. Zool. Fenn.* 47: 287–305.

Vitousek, P.M., Mooney, H.A., Lubchenco, J. and Melillo, J.M. 1997. Human domination of earth's ecosystems. *Science* 277: 494–499.

Von Witzke, H., Noleppa, S. and Schwarz, G. 2008. Global agricultural market trends and their impacts on European Union agriculture. *Working Paper* 84.

Watzin, M.C., Puka, V., Naumoski, T.B. 2002. Lake Ohrid and its Watershed, State of the Environment Report. *Lake Ohrid Conservation Project*. Tirana, Albania and Ohrid, Macedonia.

Wisner, B., Blaikie, P., Cannon, T. and Davis, I. 2003. At risk: natural hazards, people's vulnerability and disasters. *Prevention Web.* Accessed on *July 10. URL*: http://www.preventionweb.net/files/670_72351.pdf

Wilbanks, T. and Kates, R. 1999. Global change in local places: How scale matters. *Climactic Change* 43(3): 601-628.

World Bank n.d. Agriculture. Relevance of agriculture for green growth in Macedonia. Accessed on July 19. URL: http://go.worldbank.org/B7OUEOU180

Yin, R.K. 1994. *Case study research: design and methods*. 2nd ed. Newbury Park, CA: Sage Publications.

Personal Communication

Biljana. Officer at the Agency for promotion and development of agriculture. Ohrid, Macedonia. 9 May 2015.

Cukaliev, Ordan. Professor of Agronomy, Skopje University. Formal interview. Ohrid, Macedonia. 23 May 2015.

Sekovski, Dimitrija. Project Leader, United Nations Development Program. Resen, Macedonia. 12 May 2015.

Veljanoska-Sarafiloska, Elizabeth. Researcher, Hydrobiological institute of Ohrid. Formal interview. 23 May 2015.

Zdraveski, Nikola. Project Leader, United Nations Development Program. Resen, Macedonia. 20 May 2015.

Zoroski, Gjoko. Vice-President of Grashnica. Formal interview. Ohrid, Macedonia. 30 May 2015.