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Effects of land consolidation in Cyprus

Effekter av jordskifte på Kypros

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Preface

This study represents the end of my Master Degree in Real Estate and was written at the Faculty of Landscape and Society at the Norwegian University of Life Sciences. This thesis provides 30 credits and is based on a trip to Cyprus in February/March, 2017.

First of all, I would like to give a big thank you to my supervisor, Professor in land consolidation, Per Kåre Sky, for introducing me for this topic, and for his involvement and effort during the whole process. I would also like to thank the Director of the Land Consolidation Service, Frosoula Christofidou, and her employees at the Offices of Nicosia and Pafos for their warm welcomeness, help and engagement during my visit.

Finally I would like to thank all my friends at the Norwegian University of Life Sciences for the good moments and joy during the five years of studies, and my family for support and interest for studies and final masterwork.

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Abstract

Land consolidation is an instrument contributing to the improvement of the various problems associated with agricultural holdings. These problems constitute an obstacle for the rational and effective utilisation of agricultural land.

The main research question of this study is regarding the effects of land consolidation with Cyprus as the current site. Problems associated with agricultural holdings are a common feature all around the world. However, Cyprus is of special interest due to its location and land tenure structure characterized by small, irregularly shaped plots being highly dispersed as well as the lack of road access and multiple ownership, all problems imposing obstacles for efficient farming. Land consolidation is a measure used to promote rational, sustainable agricultural development and to create and protect areas of natural beauty and cultural significance.

The aim of this study was to look at four different types of effects that may develop as a result of land consolidation measures, each research question representing one effect. The first out of four research questions was to look at social effects describing how land consolidation measures affects the relationship between the participants, and the relationship between the owners and their property. The second one is regarding the economic effects in order to find out how land consolidation contributes to changes in productivity, wealth and incomes. My two last research questions are associated with visual effects including the design of plots, infrastructure and effects on the cultural landscape.

Land consolidation implementation in Cyprus is based on cooperation between the owners and the Land Consolidation Service with a main focus on the owners and their relationship to property. Social effects have more focus in Cypriot land consolidation compared to many other countries. Participants show signs of being satisfied due to the possibilities for participation, the abolishment of multiple ownership, bigger parcels and ownership areas. Today there are conditions facilitated for every single owner to be a full-time farmer. It turns out that owners are less attached to their land due to incomes being achievable on other markets as well.

Land consolidation in Cyprus is a cost- and time-consuming process. Completing one project takes often up to 6-10 years. Systems and technology is not in place to adequately support the planner, no standard methodology for measuring land fragmentation is developed.
Land consolidation has a distance-reducing effect on farming operation, resulting in a decrease in traveling-time and transportation costs. Increased specialization, use of mechanisation and a diversity of crops, do all contribute to improvements in the already existing conditions, a higher income and welfare. Efficient farming and an interest for full-time farming are achieved by the possibilities for increased incomes and productivity.

Structural changes are done to the Cypriot land tenure structure. As a result of land consolidation measures, are irregularly, small, inefficient parcels with more or less no road access replaced by bigger parcels with a design more practical for efficient farming. In 2013 the enlargement of plot size more than doubled, amounted to be an increase of 103,13 %. An increase of 198,18 % of additional road network was stated the same year where every single plot had a road connected to their property. Pollution is still identified as a negative effect of the increased road network.
Parcels under Turkish ownerships were earlier excluded from land consolidation measures but are today included in all projects resulting in more complete results.

Mechanisation, specialisation and an increase in labour inputs have resulted in significant visual changes in the cultivation of the Cypriot landscape. Crop diversity and crop scheduling are identified as positive effects due to land consolidation implementation.
Implementations of new irrigation systems are probably the most significant reason for these positive changes evolving. In 2010, olive trees contributed with 49,2 % of the total area for permanent crops with citrus fruits following with 15,9%.
Landscape renovation plans and plans for protection of the environment are developed in order to protect flora and fauna, biotopes, cultural and physical features of the rural landscape.

Land consolidation measures have contributed to a significant development within the agricultural sector in Cyprus. To find answers to my research questions a study trip to Cyprus was conducted in order to do observations and get access to documents, a visit resulting in exciting findings. These will be presented in the following chapters.

Sammendrag

Jordskifte er et virkemiddel som bidrar til å løse de ulike problemene knyttet til landbrukseiendommer, problemer som hindrer rasjonell og effektiv utnyttelse av landbruksjord.

Hovedproblemstillingen i dette studiet dreier seg om effekter av jordskifte på Kypros. Problemer knyttet til landbrukseiendommer er et kjent fenomen i hele verden. Kypros er av spesiell interesse grunnet øyas beliggenhet og eiendomsstruktur som kjennetegnes av små, spredte, uregelmessige teiger, mangel på adkomst til vei og sameier, alle problemer som hindrer effektivt jordbruk. Jordskifte er et tiltak som brukes for å fremme rasjonelt, bærekraftig landbruk og for å utvikle og beskytte viktig naturområder og områder av kulturell betydning.

Målet med denne studien er å få et større innblikk i fire ulike typer effekter som kan utvikles som følge av jordskifte. Hver problemstilling vil representere én effekt. For å finne ut hvordan dette virkemiddelet påvirker forholdet mellom partene og forholdet mellom partene og deres eiendom, er sosiale effekter én av mine delproblemstillinger. Den andre omhandler økonomiske effekter for å finne ut hvordan jordskifte bidrar til endringer i produktivitet, velstand og inntekt. Mine to siste delproblemstillinger er knyttet til effekter på utforming av teiger, infrastruktur og effekter på kulturlandskapet.

Jordskifte på Kypros er basert på samarbeid mellom eierne og the Land Consolidation Service med hovedfokus på eierne og deres forhold til eiendommen sin. Kypriotisk jordskifte fokuserer på sosiale effekter i større grad enn mange andre land. Deltakerne viser tegn til å være fornøyde grunnet mulighetene for deltakelse i prosess, oppløsning av sameier, større teiger og arealer. Eierne er også mindre knyttet til egen eiendom grunnet muligheter for inntekter på andre markeder. I dag er alle forhold tilstede for at bønder som ønsker å drive landbruk på heltid, har mulighet til dette.

Jordskifte på Kypros er kostbart og tidkrevende. Gjennomføring av ett prosjekt tar ofte opp til 6-10 år. Systemer og teknologi er utviklet i begrenset grad og noen standard metode for å måle teigblanding er enda ikke utviklet.
Jordskifte bidrar til at avstandene mellom teigene blir kortere, noe som resulterer i redusert reisetid og lavere transportkostnader. Økt spesialisering, mekanisering og et mangfold av

avlinger bidrar til et bedre grunnlag for økt inntekt og velferd. Muligheter for økte inntekter og produktivitet bidrar til effektivt landbruk og interesse for gårdsdrift på heltid.

Strukturelle endringer på arealer er også et resultat av kypriotisk jordskifte. Uregelmessige, små, ineffektive teiger uten tilgang til vei, blir ved jordskifte erstattet av større teiger med en struktur som er mer praktisk for effektivt landbruk. I 2013 ble teigstørrelsen mer enn doblet, en økning på hele 103,13%. Utviklingen av veinettet innebar en positiv økning på 198,18% hvor hver enkelt eiendom nå fikk veiadkomst. Forurensning er til tross for dette identifisert som en tilhørende negativ effekt.
Teiger under tyrkisk besittelse ble tidligere utelatt fra jordskifteprosessen, men er i dag inkludert og bidrar til mer fullstendige prosjekter.

Mekanisering, spesialisering og økt arbeidsinnsats har resultert i betydelige visuelle endringer i det kypriotiske landskapet. Mangfold av avlinger og muligheter for dyrking på ulike steder, er identifisert som positive effekter av jordskifte.
Utviklingen av vanningsanlegg er trolig den viktigste årsaken til disse positive endringene. I 2010 stod oliventrær for 49,2% av det totale arealet for permanente avlinger etterfulgt av sitrusfrukter utgjørende 15,9%.
Renoveringsplaner og planer for beskyttelse av miljø er utviklet for å beskytte flora og fauna, biotoper samt for å ivareta kulturelle og fysiske egenskaper i landlige områder.

Det er ingen tvil om at jordskifte som problem-løsende virkemiddel har bidratt til stor utvikling innen landbrukssektoren på Kypros. For å finne svar på mine problemstillinger, ble det utført feltarbeid på Kypros for å gjøre observasjoner og få tilgang på dokumenter. Et besøk som resulterte i spennende funn som vil bli presentert i kapitlene som følger.

TABLE OF CONTENTS

1.0 Introduction

1.1 Theme and background for thesis

The theme of my thesis is the effects of land consolidation. Land consolidation in Cyprus was recommended as a master topic due to its extent of land fragmentation problems. This is of high relevance today due to the global perspective of this measure. Norway is a country that has undergone big changes and developments of land consolidation as a tool for improving agricultural structure. It is therefore interesting to see if any comparisons can be done regarding consolidation practice in these two countries.

By previous literature available it is certain that problems in relation to land are a common feature all around the world. In many countries land consolidation is implemented to solve these problems, but there are significant variations regarding the extent of problems, process, efficiency and results. Cyprus is of significance for study when it comes to getting an international perspective of this.

The effects of land consolidation can be many, influencing various factors and individuals. They are highly interesting as objects for research in order to find out to what degree land consolidation really contributes to improvements. It is a prerequisite that land consolidation shall result in more benefits than disadvantages according to both Cypriot and Norwegian land consolidation. But how significant and visible are they? And what do they really entail?

I want to make clear that the Land Consolidation Department in October 2015 was transferred to the Land Consolidation Service. This means that the Land Consolidation Service is the body responsible for co-operation, administration and execution of land consolidation measures in Cyprus today.

1.2 Research questions

The aim of study was to delve into the effects of land consolidation with Cyprus as the current site. Further, I will compare these results with Norwegian literature. Four effects will dominate my thesis: social, economic and spatial effects in addition to effects on the cultural landscape. Land consolidation can result in changes in the relationship to property or between the owners themselves. Improvements in agriculture structure and an introduction of mechanisation are most likely to contribute to increases in economic outputs. Reduction in

costs and changes in the cultivation of crops are also common results of land consolidation. To find out more about these aspects and results of land consolidation measures in Cyprus, following research questions were made:

- Do implementation of land consolidation result in any changes in the relationship between the participants, or the relationship between the participants and their property?
- What economic effects may a land consolidation scheme entail?
- What are the effects on plot design and infrastructure?
- What kinds of effects are to be seen in the cultivation of landscape?

1.3 Structure of thesis

I will start this thesis with an introduction of the topic for study in Chapter 1. This introduction will be followed by a chapter of methodology where the method most suitable for my research questions for study will be presented. Relevant theory regarding these will be introduced in Chapter 3 before a presentation of ten selected schemes visited will follow in Chapter 4. Findings and discussions around these, will further dominate the study in Chapter 5. At the end final reflections will be presented as an overall summary of the completed master thesis in Chapter 6.

1.4 Demarcation of task

I have chosen Cyprus as the current site with some lines drawn up to Norway. The research regarding Norway will be in a limited extent due to a main focus on theory and research of Cyprus. Some comparisons will still be done where it is found relevant. International land consolidation in Europe and Asia has also been touched during this study but is so far mentioned.

2.0 Methodology

2.1 Introduction

All forms for research activity are characterized by limited resources, which usually limit a methodological diversity. Which method and analysis you choose to use is not only governed regarding advisement considerations, but also for practical matters, such as access to informants and how much time they have, opportunities for observations and resources available. Conductions of personal interviews and observation studies are time-consuming work resulting in large amounts of data being produced. Data collected from field-notes and interview-notes have to be further processed and analysed (Tjora 2017 pp. 36-39).

2.2 Study area

Cyprus is a country suffering from a long historical evolution that has contributed to a significant problematic land tenure system. Fragmentation is characterizing the agricultural land, a problem that the island has been confronted with for a long time. Since the land consolidation measures started to be implemented in the 1970, fragmentation has steadily decreased. Even though Cyprus has developed a problem-solving system, there are still other problems preventing this system to be used on its maximum.

Cyprus is therefore chosen as my study area because of its interesting land tenure structure and associated problems of significance for today's society.

2.3 Method

This master thesis concerns the effects of land consolidation being implemented as an instrument for improvements in agricultural land.

To get a better insight into the selection of research questions, collection of information is highly relevant. Concrete data will not be as current since effects are hard to quantify, they are more likely to be visible in other ways. Effects will be more based on perceptions.

A qualitative method is therefore found as the most complete method to define the framework for the interesting issues in my field of study (Op. cit. pp. 28 and 32). Observation studies, access to documents and personal interviews are more likely to give reliable results.

Fieldwork in Cyprus was conducted to collect further information and to do observations of how the situations are today, with the hope of getting access to documents and facts that otherwise would have been impossible to find in Norway.

It would have been optimal interviewing the participants involved in earlier land consolidation schemes, as the results would have become more complete. To hear their opinion of the situation after implementation of such measures would have been of significant importance since they are the ones that have to deal with the post situation. Due to the limited time for fieldwork, transportation possibilities to schemes and communication with owners due to language differences was it challenging to accomplish.

2.4 Fieldwork

The fieldwork to Cyprus took place in a two-week period, from the 18th of February to the 4th of March where ten days was spent in the Nicosia District and the remaining four in Pafos**.** I visited the Land Consolidation Office in Nicosia at first, where the Director of the Land Consolidation Service had her office. She was going to be my contact person through the next two weeks and I found it important to clarify with her my aim for the trip, what I searched to collect and wanted to see. I was assigned a separate office, which turned out to be my working place during the stay in Nicosia. In this way I got access to information and help whenever needed. Several employees took their time to find maps, statistics and further give explanations as questions emerged.

To get a better insight of land consolidation impacts on the landscape, a wide spectre of land consolidation schemes were visited during the two weeks I was there, so-called observation studies. I used my camera to take pictures, like this I was able to document what I had seen. The most normal method for writing down these observations and reflections regarding what you see and hear, are done by so-called field-notes (Op. cit. p. 90). These field-notes have in retrospect, as well as the pictures taken, contributed to discussion and analyses of the selection of research questions.

I was able to have one day of fieldwork in Nicosia, visiting twelve land consolidation schemes, some completed, some under progress and some under study. Observation tours in the Nicosia area were carried out with two employees from the Land Consolidation Office, which guided me between the different project areas. At each site, images were taken and

relevant information told. In that way I got hold of information that otherwise would have been difficult to conduct. Examples of such information were regarding water systems, characteristics of the areas prior land consolidation, cultivation, explanation of the extent of area, construction of roads, borders and border marks, the function of dams etc.
During my first week it was planned a further stay in the Pafos District. Two staff members from the Pafos Land Consolidation Office contributed with sightseeing, detailed information dissemination and presentation of schemes here as well. Two days were used for observation studies in Pafos due to the location of schemes and traveling-distance. Five schemes were visited in total.
I went back to Nicosia for the last three days in order to gather all the information and observations collected. A conversation with the Director of the Land Consolidation Service followed to get answers to my last questions in mind before going home.

According to Glaser (1978), here after Tjora (2017), the observer should be open and collect data in a way that is as complete as possible and reviews what really is the case. During my observation studies I tried to do my best in order to not be influenced. Field-notes have been written ecologically descriptively, as detailed as possible, according to the circumstances based on understanding, language and communication, base of knowledge and writing capacity (Op. cit. p. 91).

I was able to visit seventeen schemes in total, which represents a significant wide spectre of schemes. This resulted in a broad range of sites with different locations, sizes and project duration. I saw a multitude of aspects of land consolidation impacts compared to a narrow range that would not have reflected the effects in an overall perspective as well.

2.5 Study of literature

Document studies have also been applied. Document studies are documents originally produced for purposes other than research. Empirical data is generated without involvement of non-research participants. By analysing various already existing documents, we can provide information about case matters recorded at specific times and places, but with different purposes. This information is used in addition to interviews and observations, but mainly as background data (Op. cit. pp. 182-183). Relevant document studies regarding my research questions have been previously written reports, the Consolidation And Reallocation

Of Agricultural Land Laws, 24, of 1969 (here after referred to as the Law of 1969), journals, Census of agricultures, presentations and publications by the Director held in recent times (confirmed that information still applies today) and a previously conducted survey by the Director of Land Consolidation Service herself. These documents were collected in order to get statistics, specific data, information about process and history, all to allocate underlying knowledge as a base for further discussion. Due to the historical evolutions footprints on the land tenure structure in Cyprus, it is important to base the study on documents related to past events. Such information will help strengthen the perception and understanding of how today's situation must be understood in the context of historical development (Op. cit. p. 190). These are so-called overview studies, to get an overview of the theories and methods that have been used within a specific research topic, thus what we know something about (Op. cit. p. 186). Online searchers were used to find journals of relevance, in addition to the type of documents mentioned above. Access to, for instance, fragmentation plans before and after land consolidation makes it easier to see changes visually and further discuss the effects.

2.6 Personal interviews

Personal interviews are also used in a certain extent. This is a type of interview characterized by open questions allowing the informant to go further into detail about topics they may have assumptions about (Op. cit. p. 114). After field trip and accession to documents, it appeared several questions related to what I had seen and read. Questions that it was challenging and sometimes impossible to find answers to myself. I chose therefore personal interviews to address this uncertainty.

The use of personal interviews contributed to a deeper understanding regarding previous obtained information and information conducted during fieldwork.

Conversations were also initiated regularly as the questions appeared to make sure that the information was understood correctly. In addition to increased understanding of obtained information and observations, the Director helped with understanding the Law of the country, how it was built and how it should be interpreted. When touching information and situations in other countries, it is important to do this with respect, respect for their identity and history, laws and systems.

During several weeks of contact, good contact and trust was acquired. Personal interviews are based on trust between researcher and informant, which is particularly important when researching sensitive topics. An interview of certain duration and where it is allowed to speak "off topic" allows the interviewer to let the informant have time to get acquainted with the situation before dealing with themes that can be perceived as difficult, sensitive or very personal.

2.7 Selection of schemes

My selection of schemes is based on a collection to represent the "outputs" of land consolidation implementation in Cyprus as best as possible. Seventeen schemes were visited in total in the Nicosia and Pafos District. It would have been challenging to go into depth in all of the seventeen schemes due to the time of fieldwork. A selection of further ten schemes was therefore done to represent my thesis. To provide a group of schemes with breadth and depth I chose ten different schemes with a variety within type of scheme, extent of area, number of owners, topography and duration. The selection of schemes is presented in Chapter 4.

2.8 Error sources

The wide range of areas visited resulted in an "overall perspective" of the situation today compared to a limited amount that would have not reflected the situation as good.

Researchers' notes can often be coloured by their awareness, understanding and interpretation (Coffey, 1996) that generate the field notes not only from the situation, but also from their own judgment (Op. cit. p. 91). This can be a error source in my case as well, even though I have tried to avoid this as much as possible by taking notes regarding to what has been said from the staff of the Land Consolidation Service Offices.

There are different ways to "read" and "write" the field. If I had done the field trips alone, my notes would have been more characterized by personal interpretations or assumptions and further more difficult to work with when analysing. By the fact that I got explanations from professionals, this was prevented. This affects the reliability of the observation study positively.

Another error source may be that participants forget the role of being an observer. It is easy to loose focus, forget taking notes and list all the information received. When you travel it is easy to live in the present and receive information, without thinking of documenting it for later use.

As an observer you can also feel left behind with a sense of not "catching up" the real experiences with the actual situation. Some changes may have been difficult for me to notice due to limited gained knowledge of the area and previous conditions.

Language is a factor making the study challenging when it comes to communication. Even though most people in Cyprus talk English, there are still difficulties with further communication and dissemination. This was something I experienced during my field-trip.

Previous research regarding land tenure problems and land consolidation in Cyprus, are done in a limited extent. Previous journal articles from Burton & King (1982, 1983, 1988 and 1989) and Demetriou (2012) will therefore characterize my study and the theory following. Each of these researchers has contributed with several works, each regarding this topic, and I have therefore tried to summarize these as much as possible.

The use of secondary sources has been necessary due to the lack of access to certain literature. Secondary sources applied in the text are followed by the primary source for collected information referred to in the form of "here after…". I have assured that these secondary sources are all reliable.

Analysis and results of this thesis are submitted to the Director of the Land Consolidation Service in order to get confirmed that information and assessments are understood correctly. As mentioned, it is important to show respect as a "stranger" in another country.

3.0 Theory

3.1 Introduction

Many parts of the world are suffering from the problem of land fragmentation, a situation where a single landholding consists of numerous spatially dispersed parcels, a problem due small parcel sizes, irregularly shapes, long distances between plots and the existence of many boundary lines (Burton & King 1982 p. 183; Demetriou et al. 2012 p. 131).

Cyprus is an island located in the Mediterranean Sea consisting of several challenges. Lack of road access and ownership rights are common and complicated problems in this country. So-called undivided shares characterize Cyprus, including several landowners to one parcel of land. The lack of title deeds constitutes another problem. Not all land parcels have title deeds, which makes it hard to identify ownerships.

Land consolidation is traditionally seen as the most favourable land management approach for solving problems in relation to land fragmentation. According to Van Dijk (2003) land consolidation has been used for many ages but further development of legislation did not emerge before the twentieth century (Van Dijk 2003 p. 5).
Changes in land tenure structure and development of infrastructure occurred substantially later in Cyprus, not before 1970. Roads and irrigation networks started to be applied also here at this time in order to achieve more efficient agricultural development (Demetriou et al. 2012 p. 131). A deeper focus on the environment started to develop in the 1960s, mainly in the 1980s.
Environmental protection, nature conservation, recreation, village renewal, regional projects and other issues affecting the living and working conditions on farms became more and more prominent (FAO 2003).

The implementation of land consolidation has resulted in positive and negative effects for the island, effects that I will present in my study following, more specifically in Chapter 5.

3.2 Land fragmentation

3.2.1 Definition

Land fragmentation is characterized as a fundamental spatial problem involving subdivision of farms and an excessive spatial scattering of plots (Burton & King 1982 p. 183). Land fragmentation results in parcels being too small for rational exploitation.
It is a common feature that single farms have a number of parcels of land, especially countries focusing on development. This phenomenon is observed in countries such as China, Kenya, Tanzania, Ghana and Rwanda (Blarel et al. 1992), USA, Peru and Vietnam (Van Hung et al. 2007) (Bentley 1987 p. 34). Land fragmentation is considered as an impediment to efficient crop production and for that reason policies have been implemented in many countries to encourage land consolidation (Van Hung et al. 2007 p. 195).

According to Van Dijk (2003), land consolidation can be used to solve various levels of fragmentation. Four groups are stated; fragmentation of ownership, fragmentation of land use, fragmentation within a farm, and separation of ownership and use (Van Dijk 2003 p. 2). Fragmentation of land and ownership rights constitutes the main groups of fragmentation dominating Cyprus.

3.2.2 Causes of land fragmentation

Causes of land fragmentation have been classified into two broad categories, consisting of supply-side and demand-side causes. The supply-side causes refers to external factors impositioning farmers, while the demand-side causes include fragmentation perceived as beneficial (Blarel et al. 1992 pp. 234-237; Van Hung et al. 2007 pp. 198-199).

From a supply-side point of view, land fragmentation may happen involuntarily as a result of historical and geographical issues, land sale, purchases, population growth and inheritance (Bentley 1987 p. 35; Blarel et al. 1992 p. 234; Burton & King 1982 p. 184; Demetriou et al. 2012 p. 132; Van Hung et al. 2007 p. 198). Inheritance triggers land fragmentation due to the farmers wanting their children to inheritance a part of their land of similar quality. The present land tenure system in Cyprus is a result of a long historical evolution from the Neolithic era around 7000 BC. In addition to the historical evolution as a cause of land fragmentation may also geographical conditions due to the hilly terrain and upland areas

contribute to a complicated land tenure structure. Causes that is hard to deal with. It takes often a long time to consolidate such land areas (Demetriou et al. 2012 p. 132).

3.2.3 Positive and negative effects of land fragmentation

However, land fragmentation does not exclusively cause challenges as it also has several positive effects, such as ecological and scenic advantages. From the demand-side point of view, land fragmentation may occur as a result of farmers considering land fragmentation as beneficial (Bentley 1987 p. 50). When farmers are able to recognize land fragmentation due to the variations in soil types, water retention, capability, slope, altitude and agro climatic location, it is possible for the benefits to exceed its costs. Risk management, crop scheduling and ecological variety are all identified as benefits of land fragmentation (Bentley 1987 pp. 50-52; Demetriou et al. 2012 p. 132; Van Dijk 2003 p. 2).

By having crops located at different places, it is most likely that just parts of a farmer's total amount of crops will be affected if climatically and natural disasters occur. The spatial dimension distributes to "splitting" the risk beyond several areas (Van Dijk 2003 p. 2). An increased variety of soils, crops and growing conditions are significant.

Crop scheduling occurs when parcels are scattered between various locations at different altitudes resulting in crops maturing at different times (Bentley 1987 pp. 52-53; Demetriou et al. 2012 p. 132). Cultivation on different locations, whether it is lowland or highland, will result in more effective use of seasonal labour, possibilities for crop diversification and stabile outputs due to a reduction in risks, drought, flood and diseases are now being spread. In Vietnam for instance, is labour generally in surplus, but in peak times during the transplanting and harvesting periods, and during the winter crop growing period, more labour is demanded. For that reason, farmers may reduce peak time labour periods by diversifying crops in different plots (Van Hung et al. 2007 pp. 198-199).

By designing a mosaic of parcel shapes and crops, ecological variety is achieved (Demetriou et al. 2012 p. 132). The locations of geographical regions and access for water, decide what types and amount of crops that will be suitable for the area. Bentley (1987) recognize trends towards lower intensity of farming in dry areas while it in the irrigated areas seem to be very high (Bentley 1987 p. 51).

Other benefits may be non-economic such as where land fragmentation contributes to a distribution of land among all heirs through inheritance (Demetriou et al. 2012 p. 132). These benefits of land fragmentation suggest the need for an appropriate methodology capable of investigating whether or not land fragmentation is really a problem. Each community should be considered separately according to their socioeconomic and environmental conditions before deciding on whether or not to introduce consolidation (Bentley 1987 p. 61).

On the other hand, land fragmentation is also considered as a serious obstacle to rational agricultural development. This is due to the difficulties regarding use of mechanical equipment causing inefficient production and large costs dominating as to alleviate its adverse effects. Reductions in farmers´ net incomes are therefore achieved. This situation is even more severe today because of the increased competition in the agricultural market and the industrialization of the agricultural sector (Bentley 1987 p. 34). No standard algorithm or methodology for measuring land fragmentation has yet been established (Bentley 1987; Van Hung et al. 2007 p. 199).

Increased negative externalities, loss of land due to new boundaries and a greater potential for disputes between neighboring farmers are among the negative effects. Higher negative externalities can happen when farmers cultivate different crops or varieties. As it takes more time to travel between plots and to operate an activity such as irrigation for many small units of land, production costs may also be higher due higher costs of labour. Higher transportation costs for inputs and outputs result in higher production costs. This leads often further to greater potential of conflicts between neighbors (Van Dijk 2003 p. 2).

Land loss is also a result of land fragmentation regarding to the plot boundaries or bunds and access routes. The number of plots is a significant factor when it comes to the loss of land. Because of the small and fragmented farms, mechanization and new technology is hard to apply, and represents one of the main disadvantages (Van Hung et al. 2007 p. 199).

Fragmentation includes, as mentioned, an increase in the production costs and a decrease in total yield that a land produces. If the parcels are bigger, less time is needed to do and cultivate them. Smaller losses of space and yield along the borders are also applicable.

Increased economic conditions allow the exit of manual labour from agriculture and the emergence of mechanization.
Fragmentation of ownership results in separation of ownership and use, which again will lead to tenancy. This is expensive and makes it difficult to conduct good investments (Van Dijk 2003 p. 2).

Despite the disadvantages of fragmentation, farmers still choose to keep their parcels of land in some cases. This is mainly based on historical and institutional constraints, as identified in Vietnam (Van Hung et al. 2007 p. 199). Van Dijk (2003) agrees with Hung´s statement about historical framework being necessary for considerations when assessing the actual effects of efforts to reduce fragmentation (Van Dijk 2003 p. 9).

3.2.4 Land fragmentation in Cyprus

As mentioned earlier, there are great variations in the causes of land fragmentation between countries and regions (Karouzis 1971 p. 2; Van Hung et al. 2007 p. 195). Eurostat, the European Union´s statistical Office, quotes Cyprus, together with Greece, Italy, Malta and Slovenia, as having the smallest size of agricultural holdings on average. This was evident from documents collected during my study tour to Cyprus. In Cyprus there are mainly four factors that trigger fragmentation and form the main source of problems in this country. These four factors are; inheritance; population growth; land markets and historical/cultural perspectives (Burton & King 1982 p. 184).

Most of the agricultural holdings in Cyprus are spatially dispersed resulting in traveling long distances to do agricultural work. The production costs turn out to be increased while the incomes get reduced. Karouzis (1971), here after Demetriou (2012) p. 134, conducted a survey with the aim of calculating the time lost and distance travelled by an average Cypriot farmer when visiting his scattered parcels. This survey resulted in a farmer averagely traveling 1357 km every year, ”loosing” 337 hour (estimated to about 15 %) of his total working time (Demetriou et al. 2012 p. 133; Karouzis 1971 p. 2).

According to Burton and King (1982), three problems characterise the average agricultural holding: small size, fragmentation and its mixed tenures. These small and irregularly shaped plots are a result of the inheritance system (Burton & King 1982 p. 186), which, as mentioned

earlier, permits equal share of similar land to all co-owners (Bentley 1987 p. 35; Blarel et al. 1992 p. 234). These small, irregularly shaped plots are suitable for manual cultivation, animal traction and cheap labour, and are not easy to deal with mechanization. The size and shape make it challenging to adapt tractors to the fields (Bentley 1987 p. 41). In addition to the Inheritance Law, do the topography of the ground contribute to the shape of plots as well, due to hilly and mountainous areas. The Pafos District visited is an area characterised by such landscape. A decrease of 51.7 % in mean parcel size in Cyprus identified the period between 1946 and 1994 (Demetriou et al. 2012 p. 133).

Road access gets difficult and parcels often end up unexploited due to the lack of proper road network. Many parcels are demarcated and the only way a farmer can access these is by crossing other parcels or by moving boundaries of nearby parcels. Conflicts between neighbours may appear as a result of this accession of behaviour. The lack of access to land is a common problem in Cyprus preventing an increase in the properties values (Demetriou et al. 2012 p. 134).

Dual or multiple ownerships are an anachronistic and undesirable feature of land ownership with following negative effects on agriculture (Demetriou et al. 2012 p. 134). Co-ownerships include several owners having rights to the land making efficient use of the property difficult. Conflicts may entail in a significant manner as well. Due to the problems associated with co-ownerships, do an abolishment of these constitute one of the objectives of the Land Consolidation Service´s policy.

Land fragmentation has positive and negative impacts on the Cypriot land as well. Many small parcels make it possible for crop diversification, including cultivation of several types of crops on different parcels. For instance can grapes be produced on parcels in mountainous areas (due to its need for altitude-soil) while corn may be cultivated in valleys, contributing to ecological variety. The risk will further be distributed among the parcels. When it comes to the negative effects, will land fragmentation make it challenging for efficient farming. Mechanisation is impossible when parcels are small and characterized by many small corners. Manual work must be implemented or the land will end up as absentee-land. Reduction in farm incomes and rather increased costs will then appear.

3.2.5 Land fragmentation in Norway

Land fragmentation is also a well-known phenomenon in Norway and has characterized the land tenure of many properties for a long time. Sevatdal (2016) discusses this phenomenon in his new book regarding the main lines of Norwegian history of property (Sevatdal 2016). Topography, small operating units and a comprehensive split of plots make the land tenure structure suffering from fragmentation in this country as well, it hinders the profitability of doing the land. It is stated in the Norwegian Land Consolidation Act Section 1-1 that the aim of land consolidation in this country is to facilitate the efficient and advantageous use of real property and resources for the benefit of owners, easement of holders and wider society (Jordskifteloven 2016).

3.3 Land consolidation

3.3.1 Definition

”Land consolidation is a land use policy tool designed to overcome the difficulties imposed by land fragmentation” (Burton 1988 p. 131) by changing the land tenure structure and provide necessary infrastructure for efficient agricultural development (Demetriou et al. 2012 p. 131). Roads, irrigation and drainage systems, landscaping, environmental management, village renewal and soil conservation are all identified as parts of the necessary infrastructure needed to be implemented according to Thomas (2006), here after (Demetriou et al. 2012 p. 134). Traditionally, land consolidation is the most favourable land management approach for solving land fragmentation and has been applied in many countries around the world (Demetriou et al. 2012 p. 131).

Demetriou (2012) points out that land consolidation consists of two main components; land reallocation and agrarian spatial planning. Land reallocation involves the rearrangement of ownership in terms of parcels (size, shape and location) and rights constituting the core component of the land consolidation approach. Land consolidation and reallocation measures in Cyprus and Norway will be discussed later in this chapter. Agrarian spatial planning on the other hand includes the provision of the necessary infrastructure (Demetriou et al. 2012 p. 134).

In some European countries do land consolidation represent a long tradition and have been applied in a significant manner for many years. In Germany for instance, land consolidation

has been applied all since 1343, in Finland from the 14th century, the Netherlands from 1435, Denmark from 1650 and France from 1702 (Demetriou et al. 2012 p. 134). Norway has roots far back in time as well and according to Langnes (2009) were challenges around co-ownership and fragmentation already discovered in the late 1700s (Langnes 2009 p. 94). The first ”agency” responsible for land consolidation was established in 1859 (Op. cit. p. 105).

3.3.2 Land consolidation in Cyprus

My study is aimed at Cypriot land consolidation which is applied as the main measure in order to eliminate land fragmentation and improve the defective land tenure structure existing today (LCD 1993 p. 22). It is stated in the Law of 1969, Article 2, that: “land consolidation and reallocation measures are measures applied to property for the purpose of improving the conditions of agricultural utilization” (Office of the Law Commissioner 1969). According to Article 2 a, b and c of the Law, such measures include increasing the size of holdings, elimination of appropriate cases of small holdings and multiple-ownerships, and the grouping of parcels. This perception of Cypriot land consolidation lays the foundation for my further reflections and analysis.

It was a British Commissioner from Larnaca, B.J. Suridge, that carried out the first study dealing with land fragmentation in Cyprus. A study taking place in 1930 based on land tenure data for 1927 to 1928. A study in 1944 followed, conducted by the Cypriot economist N.C. Lanitis, focusing on the identification of defective land tenure structure. The so-called CAP 224 Law was enacted in 1946, dealing with Immovable Property (tenure, registrations and valuation) in order to prevent further development of fragmentation. In March 1969 the main law was enacted, still being the main Law today. This Law was enacted as a legislative instrument by the House of Representatives to reframe the islands defective agrarian structure. The enactment of the new Law resulted in the first land consolidation project in 1970 with Kissonerga village as consolidation area (Demetriou et al. 2012 p. 135; LCD 1993 pp. 17-18).

As hinted earlier, the present land tenure system in Cyprus is a result of a long historical evolution all back to 7000 BC (Op. cit. p. 132). The land tenure system is important regarding to socio-economic development and defines the framework for managing land, considered as one of the most important resources for an owner (Demetriou 2014 p. 25). I find it therefore

appropriate to present some of the main phases that have imprinted todays land tenure structure.

The Cypriot land ownership has been influenced by a numerous conquests of the island. Greeks, Romans, Byzantines, Lusignans, Venetians and Ottomans have all been contributors to changes in the Cypriot land tenure structure (Op. cit. 25).
The Neolithic age (7000-3900 BC), the Bronze Age (2500-1050 BC), the "idalio" inscription (5th century BC) and the Hellenistic period (325-58 BC) represent the main phases of the historical evolution. Agriculture done on a communal basis characterized the Neolithic Age but disappeared when the idea of individual ownership arised with the appearance of the Bronze Age in about 1400 BC. A further development of private ownership in the Hellenistic period resulted in more houses, vineyards and gardens evolving. It was also an emergence from the hereditary leasing of land to royal peasants. The Ottoman period (1571-1878) had similarities to the feudal system and was characterized by all land belonging to the Sultan. The peasants were owners of the land they cultivated nevertheless, but due to high taxes did people choose to donate and grant their land to the Church. They could still cultivate and get the benefits from it, but taxes were like this avoided.
In 1850 was the Ottoman Land Code of 1850 established resulting in an abolishment of the feudal system. The property was here divided into five categories, developing a registration system. Private rights spread, rights of possession were registered and land inheritance and transfer via sale became possible, with the aim of increasing the revenues from taxes. These measures were prevailing until 1946. Later on, a conducted survey was going to help organizing the cadastral information and introduced the Immovable Property Law to be enacted in 1946, aimed at reducing land fragmentation.
Independence followed in 1960 resulting in private and ownership rights being safeguarded through its constitution. The British had contributed to a well-organised cadastral situation and geodetic and cartographic infrastructure. Fragmentation as a serious problem nevertheless turned out be more and more dominant. To be able to deal with this problem, a Land Consolidation Act was enacted in 1969. Already in 1970 was the first land consolidation project in progress (Demetriou 2014 pp. 25-26).

Another important phase of the Cypriot history has to be mentioned; a phase that still affects the situation today. In addition to the fragmentation problems mentioned above, Cyprus was suffering from the separation of people from their properties and places of origin due to the

Turkish invasion in 1974. 38 % of the northern part of the island was occupied and is still today. The Old Town of Nicosia is separated in two, a Turkish part and a Cypriot part.
Cyprus became a part of the European Union 1st of May in 2004 due to the appearance of new political, economical and social prospects (Op. cit. p. 26).

The main measure applied in effort to eliminate land fragmentation and improve defective land tenure structure in Cyprus is land consolidation (LCD 1993 p. 22). According to the Consolidation and Reallocation of Agricultural Land Laws 1969 to 2012, it is stated in Article 2 that a ”land consolidation measure” is ”any measure applied to property for the purpose of improving the conditions of agricultural utilization”. The Annual Report of 2013, collected during fieldwork, confirms that land consolidation still is the main remedial measure applied so far.

According to Demetriou (2012) can land consolidation impacts be divided into three levels; a micro level, a meso level and a macro level. Based on his explanations is todays land consolidation legislation in Cyprus mainly focusing on so-called micro level impacts, meaning land consolidation focusing on changes in the farm structure and environment in order to enable farmers to become more competitive (Demetriou et al. 2012 p. 135).

As stated, has this measure been applied all since 1970 when the first project was processed, which means, for more than forty years. The land consolidation process in Cyprus has during this time evolved significantly. A system going from manual work, the use of donkeys for transportation, many small parcels, long durations of projects and inefficient farming, is now characterized by farming with mechanization, specialization, crop diversification, larger parcels and efficient farming.

From documents collected at the Land Consolidation Service, it is stated that Mid-term to Long-term plans of the Land Consolidation Service entail that land consolidation schemes can be applied in many other domains as well and not only in the agricultural sector. Solutions to the various land tenure problems are offered in addition to creation of the prerequisites for the development and accomplishment of the economic, social and environmental targets, at the time, as well as the avoidance of land expropriation measures by the State, for infrastructure projects.

The implementation of land consolidation is planned for non-agricultural development zones as well since they are facing similarly land tenure problems as agricultural development zones and cannot be rationally developed and managed.
According to the Annual Report of 2013, a Draft Legislation concerning this issue was approved by the Council of Ministers in 2009 and submitted at the House of Parliament in January 2010. The experience from other European countries has proved that such applications are a must and give remarkable results.

Furthermore, from a presentation held by the Director of the Land Consolidation Service in Brazil in 2016, it was claimed that land consolidation and reallocation measures can be implemented with benefits to the landowners and the State, in areas where big projects such as highway, dams and airports are to be constructed, in designated environmentally protected areas, in areas where private ownerships are enclaved in state or forest land and in industrial zones, that lack adequate infrastructure.

The Department Service´s policy and objectives constitute a part of the overall rural and agricultural policy of the Government with the aim of raising agricultural incomes and create better working and living environments for the farmers and the rural population in general.
The primary two objectives are therefore as following: the creation of as great a number of ”economically viable holdings” as possible and the improvement of the defective land tenure structure (LCD 1993 p. 22). An “economically viable” holding is defined annually in monetary terms by the Director of the Land Consolidation Service. It represents the necessary income that should be derived by a holding so as to sufficiently support a farmer´s family economically, based on the standard prevailing living conditions in Cyprus (Burton & King 1982 p. 197). For instance, for the year 2010, the ”economically viable holding” should produce an annual gross income equal to 38,550 Cypriot pounds (Demetriou et al. 2012 p. 135), representing about 65 867 euros and 620 330 Norwegian kroner. The Cypriot pound was replaced by the euro as official currency of the Republic of Cyprus on 1st January in 2008 (Frosoula Christofidou, personal communication, 09th of May, 2017).

To achieve these two objectives, several measures are applied; (1) Grouping fragmented and scattered parcels into compact holdings; (2) construction of a new rural road network giving access to all new parcels; (3) enlargement of small holdings by purchasing private, church or state land and re-distributing it to the farmers; (4) creation of regularly shaped land parcels;

and (5) elimination of dual and multiple ownership and of ownership held in undivided shares. By applying these measures, positive changes in the rational agricultural development will appear due to the objectives being accomplished. The creation of economically viable holdings and improvements in the land tenure structure will first of all result in a better organization and operation of the agricultural holdings. A reduction in costs of construction of soil improvement, irrigation and other infrastructural works can also be achieved by the reorganisation of space and the construction of a new rural network. By clarifying ownership rights or redistribution of it to other farmers, abandoned agricultural land will be utilised. A complete spatial re-arrangement of ownership in terms of boundaries, soil class and parcel orientation will result in restructure of cultivations, and an increase in parcel size and improvement of parcel shape may lead to mechanisation of agricultural activities. A reduction in costs will result in a simultaneous increase in production (LCD 1993 p. 22).

Some prerequisites need to be fulfilled before land consolidation can be implemented. To evaluate if land consolidation can take place or not a feasibility study is conducted in addition to an environmental impact assessment study. These studies are not statutory but tactically take place in every single planning stage. This defines a great distinction to Norwegian land consolidation. Neither of these steps are implemented as a part of the Norwegian land consolidation process. Whether they should have been, is another question.

The feasibility study involves finding out if the situation is economically viable at the present time. This study is conducted after an application from the landowners is received by the Land Consolidation Service. Land tenure, the morphology and the number of people involved is studied for the whole area, even though it is just a certain amount of owners applying for land consolidation measures. These factors will tell whether it is a benefit for the landowners or not. The feasibility study results in clarification of the costs and benefits and if the IRR (Internal Rate of Return) turns out to be favourable, meaning higher benefits than costs, the Land Consolidation Service can proceed the process (Frosoula Christofidou, personal communication, 23rd of February, 2017).

When the economical prerequisites are fulfilled, a decision must be taken whether land consolidation measures are environmentally accepted or not. This meaning whether land consolidation will go beyond protected areas, specific biotopes or other areas of special

significance. If this is the case, land consolidation is not considered as an appropriate tool for solving the land tenure problems.

However, if the situation turns out to be both economically viable and environmentally acceptable, an approval from the Minister of Interior is needed as a last step before the consolidation process can proceed (Frosoula Christofidou, personal communication, 23rd of February, 2017).

Article 4b in the Cypriot Law of 1969, states that three different approaches can be applied to implement land consolidation: on a voluntary basis by agreement among the landowners; on a compulsory basis by resolution of the majority of the landowners concerned; and on a compulsory basis by the Governmental order. Today, it is only the second method that has been used to implement land consolidation in Cyprus (LCD 1993 p. 25) stated in the Turkish Cypriot Law of 1969, Section 6 to 38. This is a procedure involving many processes and tasks extending beyond a long period of time, from a five to eight years period, all depending on factors such as the extent of study area, number of landowners and number of parcels (Demetriou et al. 2012 p. 135). This is a long duration of projects and needs a further comment, which will be presented together with my findings in Chapter 5.

The Land Consolidation Department Service can not apply for land consolidation measures on its own initiative, the owner has to apply first. This is with all respect to the owners and their bond with their property (Frosoula Christofidou, personal communication, 23rd of February, 2017). In Norway this is a prerequisite as well.

Respect for the owners is also visible through the Cypriot legislation, which is stated in Article 6 (2) that ”if the majority of the owners present at the preliminary meeting in favour of land consolidation and reallocation measures they shall proceed.

The whole procedure can be organised into 21 processes, which can be grouped into planning, preparation, implementation and post-implementation. Public participation is a part of the procedure in 13 out of 21 processes. The central process of the implementation stage is land reallocation, which will be supported by the new suggested IPDSS (the Integrated Planning Decision Support System) (Demetriou et al. 2012 p. 135). The main stages of this process will be presented briefly.

Land consolidation in Cyprus is promoted democratically and so far it has been applied on a voluntary basis. The participants are represented in various committees at different stages of

the process. In the Cypriot procedure, the owners have the right to object to any published plan and can even appeal to court as a last resort which is similar to many other countries practising land consolidation.

The Cypriot land consolidation procedure is pretty similar to the procedure in other countries. A bit special for the Cypriot process is the inclusion of owners participation, which I will get back to later in my thesis. I will present the main stages to give a certain insight in how this is processed.

1. Enlightenment of the owners has to be done by the Land Consolidation Service.
2. Submission of application form on behalf of the owners, for the promotion of land consolidation measures.
3. A feasibility study will be prepared to clarify whether land consolidation measures should be implemented or not.
4. Preliminary meeting of the owners and establishment of the Provisional Committee (Article 6 (1) and (2)) in the law.
5. Delineation of the area to be consolidated and request of the list of owners from the Department of Lands and Surveys (Article 7 (1)). When the list is prepared it is published for inspection purposes by the owners, then republished and finalised.
6. First meeting of owners: if during this or subsequent meetings the majority of the entitled owners vote in favour (provided that they own at least half of the total area´s assessed value of land), establishment of the land consolidation area is done. This resolution is now binding for all the owners of the scheme (Articles 8 (1) and (2) and 9 (1)).
7. There will further be an election of members to the Land Consolidation and Valuation Committees (Articles 11(1), 12(1), (2), (3) and 14 (1)).
8. Preparation of the valuation list, publication of the list for inspection purposes by the entitled owners, examination of objections, publication of the amended list and finalisation are done further (Articles 15 (1), (2), (3)).
9. The new road network plan and landscape renovation plan will be prepared and publication of the plans for inspection purposes, examination of lodged objections, republication of the amended plans and finalisation will take place (Articles 20 (1), (2), (3), (4)).

10. The next step will then be invitation and awarding of tenders and construction of the new road network, done by private construction companies.
11. So-called "preference sessions" will be held, where each owner and operator submit their preferences regarding to the plots which shall be allotted to him/her. This submission is done to the Land Consolidation Committee (first schedule, Section 21, 12).
12. Preparation of the land consolidation plan, publication of the plan for inspection purposes, examination of lodged objections, republication of the amended plan, finalisation of the plan are done further (Articles 21 and 26).
13. The final step is the demarcation of consolidated holdings, registration of holdings and assumption of possession of the new plots by their owners (LCD 1993 pp. 32-33).

The Council of Ministers shall provide for the establishment of the Minister of a Land Consolidation Service and for the structure of the necessary services. This is done in order to provide the necessary and appropriate services for a better implementation and carrying into effect of the purposes of the Law, stated in Article 3 (1). The Service shall be: "responsible for the co-ordination, administration and execution of measures of land consolidation and reallocation in accordance with the agricultural policy of the Government and to advise the Minister on the policy relating to the land reform, including land consolidation and reallocation measures, and all related matters", Article 3 (2a).

According to the Annual Report of 2013, does the Land Consolidation Service consists of its Headquarters and five District Offices located in Nicosia, Larnaca, Famogusta, Limassol and Pafos. The Accounts and the Registry is also a part of the Headquarter (Frosoula Christofidou, personal communication, 09th May, 2017).
The execution bodies involved during land consolidation implementation are the Land Consolidation Service, the Land Consolidation Committee and the Land Valuation Committee. The Law of 1969 contributed to the establishment of a semi-governmental organisation, i.e. The Land Consolidation Authority, with the responsibility for all related land consolidation activities regarding organisation and co-ordination. The Land Consolidation Authority was replaced in August 1985, by the Land Consolidation Department, a purely governmental organisation under the Ministry of Agriculture, Natural Resources and Environment (Demetriou 2014 p. 56). In May 2015 the Council of Ministers upon the provisions of Article 3 of the land consolidation legislation decided that the Land

Consolidation Department was going to be transferred to the Ministry of Interior as an autonomous Service responsible for the implementation of all land consolidation measures including land consolidation in development zones. Information retrieved from Nicosia.
The Land Consolidation Service may also buy, sell, exchange and mortgage immovable properties and has the power to advance money and make loans for the accomplishment of its objectives, stated in Section 3 (2c) in the Law of 1969.
A Land Consolidation Committee is established for each land consolidation project as well and has a crucial role for the implementation of the project. This Committee has the responsibility for the decision-making and approvals in all the main matters of the process. The Land Consolidation Committee consists of eight members where three of them are elected among the landowners of each project and the remaining five governmental officers (Demetriou 2014 p. 57)
A Land Valuation Committee is responsible for carrying out the valuation of any property within the area for land consolidation. Land, trees, buildings and wells are all being valuated based on market values. It consists of six members where the landowners contribute with two members and the remaining four are governmental offices from other different Departments (Op. cit. p. 57).

According to Demetriou (2012), there are three main problems characterising the process of land consolidation. These three problems involve: the long duration of projects, the high operational costs of each project and the conflicts between the stakeholders involved (Demetriou et al. 2012 p. 138).

Long duration of projects is a common problem encountered in many countries that have implemented land consolidation as an instrument. Some figures on duration, are illustrated by Vitikainen (2004) who estimated the duration of land consolidation projects in Germany, Finland, Norway, Sweden and the Netherlands (Vitikainen 2004). It is hard to compare due to different prerequisites, size of schemes and complexity but it works as an indication. The project duration has to be seen in relation to the extent of land consolidation including type and approach, the size of the consolidated area, the number of part-owners, the current activities of an authority, the available resources and the number of associated projects. Projects in Germany last about 16-17 years or in more simple forms, from 8 to 14 years. In Finland the duration is approximately 8 to 12 years (Demetriou et al. 2012 p. 138), Norway 2 to 4 years on average (Sky 2001 p. 44), Sweden between 5 to 7 years (Backman 2001), and in

the Netherlands often more than 10 years (Beun, 1992, p.62), here after (Demetriou et al. 2012 p. 138; Vitikainen 2004 p. 38). When it comes to Cyprus, it is normal that a land consolidation project extends to persist from 6 to 10, based on information during field trip.
Interdependencies between various tasks may result in waiting time during the process. In addition the lack of digital data, the increased needs due to rapid structural agricultural change and a desire for agreement in the decision-making part, may result in long-term projects (Vitikainen 2004 p. 39).
According to obtained information during fieldwork, is it conducted visits to all landowners face-to-face to clarify their preferences for land consolidation measures. It can often be hundred or maybe thousands of owners, resulting in long time needed for conducting these visits.

It is often that the long duration of projects also results in high operational costs. Land consolidation is still under development in Cyprus, and the lack of developed technology makes the process more comprehensive. Some tasks can be done in a semi-computerised manner while others have to be undertaken in a manual way. The visits to all properties and owners are done face-to-face, which results in following costs. This is still the case today.
It is impossible to say something about today´s costs of land consolidation projects in Cyprus as this is inaccessible from literature. However, road network studies, land valuations, preference sessions, land reallocations and demarcations of new parcels are all processes consisting of a large number of individuals covering a long period of time, so it is natural that the overall costs involved are high.
The land consolidation process may also cause personal trusteeship, in addition to court and disturbance costs during the process (e.g. temporary crop losses) to the interested parties. These costs generally remain in total to the landowners (Demetriou et al. 2012 pp. 138-139).

As mentioned, a third main problem in relation to land consolidation practice, is the potential conflict between the stakeholders involved. This may be conflicts between the Land Consolidation Service and/or the Land Consolidation Committee and the landowners with the parcels being consolidated. The extent of these conflicts vary depending on the number of landowners involved in the project. These conflicts are often caused due to the legislation and desire of optimising efficiency, where human elements often are ignored. They can either be expressed unofficially or officially by the submission of objections (Op. cit. p. 139).

Land consolidation can result in the creation of landless people. People may get separated from a piece of land that they are emotionally attached to and that has been cultivated through generations. These situations will often end with conflicts and disagreements (Op. cit. p. 139).

3.3.3 Land consolidation in Norway

Land consolidation in Norway is defined as: ”a tool for changing the properties or the use of property with associated rights” (Sky 2009b p. 371). Compared to Cyprus having the prerequisites for the situation to be economically viable and environmentally accepted to implement any measure, does Norway have three prerequisites as well that have to be fulfilled before any measures can be done. These prerequisites are stated in the Norwegian Land Consolidation Act in Section 3-2, 3-3 and 3-18. All of them have to be presented for any land consolidation measure to take place.

At least one property or easement in the land consolidation area has to be difficult to use gainfully at the current time and under the current circumstances for land consolidation to be implemented, Section 3-2. The second one is stated in Section 3-3 saying that the land consolidation court may effect land consolidation in order to make the property arrangements more advantageous. The final prerequisite is Section 3-18 stating that costs shall not exceeds the benefits, a so-called ”no loss-guarantee”.
It is the objective and normed utility of the property, which constitutes the foundation when considering which investments are being applicable. The legislation still allows for the individual parts economic financial ability to be considered. This is stated in Section 3-27 of the Law. The Law states further that these considerations are equated, but in the prepatory works of the Law it is emphasized that the future utilization of property will still weigh more in these kinds of considerations.

Some comparisons between the prerequisites for Cypriot and Norwegian Land Consolidation are discussed later in my analysis part, more specifically in Section 5.2.2 regarding the economic effects.

3.4 Land consolidation and reallocation

3.4.1 Definition

Land reallocation involves the rearrangement of ownership in terms of parcels (size, shape and location) and rights constituting the core component of the land consolidation approach (Demetriou et al. 2012 p. 134).

Land reallocation is a process dealing with the spatial planning allocation problem.
The aim of this process is to find an optimal rearrangement of the existing land tenure structure in an area based on the country´s land consolidation and current practices. Different criteria and constraints make it a comprehensive process for each individual land consolidation project (Op. cit. p. 136). All the properties with associated owners, are subject to compulsory increase or decrease of the value of the property to be allocated to (Frosoula Christofidou, personal communication, 09th May, 2017).

3.4.2 Land consolidation and reallocation in Cyprus

Land reallocation is divided into two main sub-processes; land redistribution and land-partioning but I will not go any further into these specifically. Conflicts, views, duties, interests among stakeholders, legislation provisions together with the economic, social and environmental sustainability plan all have to be satisfying (Demetriou et al. 2012 p. 136).
The process is in general divided into five main stages; data collection, preliminary calculations, preliminary land reallocation, definitive land reallocation and implementation (Essadiki et al., 2003), here after (Demetriou, 2012). Many similarities exist, but again, as with land consolidation, will the process vary from country to country. The Cypriot land reallocation workflow consist of 4 further stages resulting in a workflow as following: data collection, preliminary reallocation plan, conducting the landowner´s preference sessions, receiving relevant decisions by the Government, the Head of the Department and the Land Consolidation Committee, preparation of the final reallocation plan, audit of the plan by the Central Land Consolidation Department, approval of the plan by the Land Consolidation Committee, publication of the plan and plan implementation (Op. cit. p. 137). In the Law of 1969 it is stated in the First Schedule, Section 21, that owners to such an extent as may be approved by the Director and for the non granting of property to owners whose total extent of their property is less than the minimum size set by the Law (Frosoula Christofidou, personal communication, 9th of May, 2017).

3.4.3 Land consolidation and reallocation in Norway

The reallocation process is much of the same in Norway. Properties are also here consisting of a mixture of plots with undesirable shapes. If a different design of the property had been more beneficial, reallocation can be implemented by the properties exchanging areas. Modifications may be done to properties and perpetual easements if the Land Consolidation Court finds it necessary. This is stated in the Norwegian Land Consolidation Act, Section 3-4. The number of plots may be reduced and achieve more expedient shape and location.

It is stated in Section 3-20 of the Law that land consolidation settlement may involve an exchange of land with another part of land as well. It can also appear exchanges where easements are exchanged with other easements, land exchanged for easements or easements exchanged for land.
If the Land Consolidation Court finds it impossible to give value of the exchange in form of other land or easements, this can be done by money or other assets as well. This may be the case in situations where exchanges of other land or easements may result in breach of the purpose of the Law.

In Norway it is also possible to change area towards rights, for instance by developing a right for use of road in exchange with area. This type of reallocation is conditioned by a functional context between the land being reallocated and the right of use, and applies only the perpetual easements (Ravna 2007 p. 345). In Cyprus on the other hand, is the situation that the one who gets the land, get the rights as well. If an owner loose its land, the rights are eliminated and the person gets money compensation. This will be elaborated a bit more in my analysis part.

The land reallocation process is based on work with the land consolidation settlement/land consolidation scheme as an overall plan. It is not always visible who are changing areas with who, it is only visual the new physical structure of properties in the area. It is the new arrangements of plots that is of interest, not the changes in ownership. Land consolidation should be implemented so the total of direct and indirect costs and disadvantages related to the process will be significant smaller than with other alternative measures. It is stated that the development and ”complications” of the legal rules results in higher costs (Sevatdal & Sky 2003 p. 90).

The reallocation measure is stated in Section 3-4 in the Law, which gives the Land Consolidation Court approval to do modifications to property and perpetual easements, provided that the easement is related to real property.

As with Cypriot land consolidation, the aim of reallocation in Norway is to get a new structure of the properties. Properties consisting of several parcels, may be structured so the amount of parcels are reduced. Parcels with unfavourable shapes can be transformed, rights moved and distances reduced. These rules are the same for all types of land, whether it is rural areas, areas for industry, residential or business areas. Also here the reallocation process is based on the areas being evaluated first, stated in Section 3-14 (1). Mortgage holders are secured against losses through the valuation laying as a foundation for the reallocation. Each individual property shall get back the same value of area after consolidation as they had before (Bjerva et al. 2016 p. 64).

3.5 Effects of land consolidation

There are several different approaches to what is meant by an effect of land consolidation. According to Sky (2009) we may have a socioeconomically perspective or a private financial perspective. The effects will depend on the type of project and the level of conflict. These may be spatial, legal, environmental, social or economic effects (Sky 2009b p. 367), saying something about the societal benefits in general. It is obvious that land consolidation will result in impacts on the environment and the current properties, but it may also affect each individual owner, village or a community in general. It is the difference between the owners situation before and after land consolidation that is of interest to the land owners and the owner of rights (Sky 2009b p. 374). The economic effects are of special significance in accordance to the consideration of the prerequisites whether implementation of land consolidation should take place or not.

Sky states that methods for analysing the spatial effects are the most developed ones (Sky 2009b p. 374). The development turns towards an approach of methods that analyse land consolidation on the base of several criteria, a so-called multi-criteria analysis (Huylenbroeck & Martens 1990). The method is used in Germany, Belgium and Spain, but is hardly implemented in Norwegian land consolidation.

There is a close link between economic and spatial effects but I will still discuss these type of effects separately when answering my research questions.

Most of the information on effects of the consolidation policy in Cyprus is based on simple structural and land use changes which are documented in the Land Consolidation Departments publications, especially in Annual Reports. More difficult is it to evaluate the economic, social and psychological effects of the land consolidation policy. The most common structural changes identified in projects are decreases in the number of land owners, absentee land, total number of plots, dual ownership and undivided shares, as well as an increase in mean holding size. In addition, better road network, access to plots and shape of parcels are achieved. The changes in land use are characterized by decrease of uncultivated land and an increase in the variety of crops being cultivated as a result of integrated irrigation systems (Burton & King 1982 p. 195; Burton 1988 p. 135)

Sky claims the lack of development of a specific methodology that is generally accepted for the evaluation of land consolidation plans (Sky 2009b pp. 369-370).

I will further present the different effects relevant for later discussion of my research questions.

3.5.1 Social effects

According to Sky (2009), the definition of social effects is; "how land consolidation affects each individual and the relationship between them" (Sky 2009b p. 383). Being a part of a land consolidation project may affect you as a person or as part of a community.

King and Burton (1989) stated that economic values are not the only effects of importance to a farmer. Pride of ownership, contentment, dowry and family tradition have to be taken into account in addition to a satisfactory income (King & Burton 1989 p. 268). According to Goodale and Sky (1998): "there will always be a personal and social conflict between innovation and values, altering the … relationship between a person and social space " (Goodale & Sky 1998 p. 266).

Reallocation of land is often an emotional process for the parties involved. A land consolidation plan may be effective but still result in conflicts due to changes in personal and social relationships. Goodale and Sky (1998) claimed that the participant's relationships to property have to be taken into account when considering and implementing land consolidation. It is of significance that the parties get the chance to contribute during the

process since those are the ones who will use and live on the land in the years to come. The changes done on their property are something that only the owners themselves have to cope with subsequently (Goodale & Sky 1998 pp. 264-265).
According to Oldenburg (1990), here after (Goodale and Sky, 1998), no farmer should loose in the exchange process (Goodale & Sky 1998 p. 264). Norwegian land consolidation has also this phenomenon incorporated in Law as a prerequisite for land consolidation stating that this measure cannot be implemented if the costs and disadvantages exceed the benefits and advantages, valuated for every single property. This is stated in the Norwegian Land Consolidation Act, Section 3-18. This will be discussed further associated with the economic effects.

Burton (1988) recognized an increase in farm activity resulting in an increase accordingly in farm incomes. Higher income will further result in a better standard of living for the ones affected of the land consolidation implementation. Extra expenditure on village goods and services put its marks on the village economy. Material goods are often seen as an outward sign of wealth but Burton emphasize that these material goods also have implications for an individual´s position in the social structure in Cyprus.
The development of land consolidation measures has resulted in an increased interest for full-time farming. A new kind of farmer has been introduced to the agricultural scene as a "consequence", a farmer being characterized by young age, being more innovative and ambitious than his established counterpart. Urban values and lifestyles have in some cases also been transferred to the countryside due movement from towns to rural land. An interesting and highly important change worth mentioning here is the integration of small family sizes to places normally characterized by traditional large extended families. Since consolidated land are subdivided in accordance with inheritance, a lower risk of re-fragmentation is achieved (Burton 1988 p. 141).

Strong bonds and social relations to both parcels and neighbours are a common feature in most cultures (Sky 2009b p. 383). The lack of a good neighbourhood and social network may result in dissatisfaction and loneliness. To safeguard social relations is significant for most people.

The relationship between a person and his social space is maybe one of the most unique relationships people experience in their lives. The relationship to land will also affect the

relationship between humans. As Goodale and Sky (1998) state in their article: “In many respects we can say that our relationships to space – such as a farm, a house, the field we played in as a youth – are inseparable from the public expressions of our social beings” (Goodale & Sky 1998 p. 266). Behar (1986), here after Sky (2009) used anthropological methods for further documentation of effects in Spain regarding land consolidation with the focus on each individual owners relation to property. Such a method is significantly cost- and time-consuming and cannot be implemented for every single project. Other authors have studied this aspect as well. Both Behar (1986) and Burton (1988) highlight this aspect in articles regarding farmers in Spain and Cyprus (Sky 2002 p. 26).

Goodale and Sky (1998) suggested a strategy implementing two more steps into the ordinary land consolidation procedure. These two steps are meant as an instrument to increase the importance of social variables during the land consolidation proceedings. Qualitative research is proposed as an additional step after the plans are presented to clarify the participant’s real relations to the land affected. The second one includes analyses of the social variables with a following report pointing out the main findings and the interpretations of these. These two additional steps are desireable provided that the economic features still get considered. Goodale and Sky (1998) consider this as a detailed research into the owner’s relationship to property in order to prevent unfairness. They claim that this implementation will result in a significant increase in the participants input to the process due the feeling of being able to influence the outcome personally (Goodale & Sky 1998 p. 266).

Ecological and socio-economic effects were suggested by Huylenbroeck and Martens (1990) as a part of the consideration when evaluating land consolidation. Since a cost-benefit analyse requires the effects being expressed in monetary terms, they found the need for a method analysing no-quantifiable effects and suggested a so-called multi-criteria analysis. With this type of method, a number of alternatives can be compared in terms of a multiple set of conflicting criteria expressed in different units. Social effects are a type of effect challenging to measure in monetary terms (Huylenbroeck & Martens 1990 pp. 135-136).

The social effects were also under discussion in Germany in 1992 where European land consolidation experts were gathered regarding to central tendencies in the European land consolidation. These experts agreed to Burton and Kings (1982) statement about more focus on the social effects in the future (Läpple 1992).

King and Burton state that there is a lack of studies on social and non agrarian-effects, especially psychological and behavioural changes of participants (Burton & King 1982 p. 490; Goodale & Sky 1998 p. 266). Data of these type of effects are difficult to collect and are normally just mentioned in general terms (Burton & King 1983 pp. 488 and 490).

3.5.2 Economic effects

In economic terms the analysis of land consolidation concerns the possible effects on farming operations of a change in farm structure. This involves variables such as: reductions of plot numbers and interplot distances; the increase in plot size; the rationalization of plot shape; and the physical changes of farmer´s plots. Johnson (1970) claimed, here after King and Burton (1983) that economic benefits derive theoretically from land consolidation with certain assumptions. That the parcels of land to be consolidated are homogenous, the farmer is striving after increased wealth and that this increase comes from anticipated lower transport and managerial costs. Consolidation of a holding result in time-saved for the farmer when moving between parcels. In addition effort and costs are decreased when he is moving equipment from one plot to another. Burton and King emphasize that farmsteads with well-developed machinery and materials available for doing the land, also achieve great gains. Supervision of labour activities and helpers is becoming easier as well (Burton & King 1983 pp. 485-486).

Studies show that there is a variation of the perceptions when it comes to the benefits and advantages of land consolidation. The perception of advantages such as specialization and improved transport costs may vary between the participants involved. It is stated that these variations influence the spatial behaviour accordingly. If a farmer gets decreased travel time from and to his parcels a result of land consolidation, it does not help if he is not able to benefit this time-saved for other productively use. In both subsistence and commercial farming the economics of labour provision may work against specialization; farmers may want to spread their labour evenly over the year by farming several types of crops or livestock (Burton & King 1983 p. 486). Cost-benefit analysis and rigorous sampling methods are difficult to find (Burton & King 1983 p. 488).

Several agro-economic advantages might appear due to land consolidation. Efficient use of irrigation water, soil conversation, fertilizer application and fence maintenance are all made

easier. A little amount of land may be added to the holding as well as a result of the boundary removal of small plots. This extra piece of land may contribute to further cultivation. In an overall perspective will the operational efficiency of the farm improve.
Holdings with fewer, larger and compact plots make the use of machinery significant easier at the same time as labour is saved (Burton & King 1983 p. 488). Not as much time is needed for travelling. Saved labour can rather be used to do more land and increase the productivity. Chisholm (1979), here after Burton and King (1983) claims that the gross yield should increase as a reduction in the average distance between land takes place (Burton & King 1983 p. 489).

Burton & King conducted empirical studies revolving economic effects of land consolidation in Finland, Switzerland, Austria, France and India as well (Burton & King 1983 pp. 489-490). The results of these studies were reduced costs and an increase in the financial revenues. They claimed that the effects vary depending on at what time they are being measured after land consolidation. They also stated that in each individual case, development and annual fluctuations in crop yields have to be taken into account due the difficulties for later correction.
Further research is necessary due the lack of proper evaluative studies of consolidation action. Development of systems to calculate the benefit of reduced transport and change in parcel size is mentioned as the primary one. Such a system will make it possible to identify the differences in travelling time and labour input between the pre- and post-situation. It will then be easier to interpret distance-reducing effects and are of significance according to data related to labour and economic factors giving the key for the development of farms after the landownership being reorganized. To evaluate the economic effect of distance reduced and plot enlargement, it is possible to investigate changes in gross and net income per holder and per unit area. Changes in the use of mechanization, fertilizer, irrigation and other measure, should be researched as well to help determine the impact of changes in plot size and plot shape. Economic changes that are not related to the distance function directly can by these further considerations be identified.

For the first phase of projects in Cyprus, including schemes completed within the period 1969 to 1974 (Burton 1988 p. 135). Burton and King (1982) identified unit costs decreasing when the size of scheme increased. These processes were characterized by long duration due the effort put into “enlightenment”, the poor quality of land records and other teething

difficulties. When the second phase developed a reduction in time needed for completing schemes was stated. These reductions of time needed were very positive due land consolidation putting restrictions of the land when the process was in progress (Burton & King 1982 p. 199).

By calculating the labour inputs associated with particular land use zones at varying distances from the villages centre, according to Burton (1988) it is possible to examine the distance-reducing effect further and it is especially noticed a significant change in the external pressure of labour activity. This is in contrast to the distance decay effects evident before consolidation (Burton 1988 pp. 136-137).

Regarding the social effects, no farmer should loose in the exchange process according to Oldenburg (1990) (Goodale & Sky 1998 pp. 264-265).

This statement is confirmed both in the Norwegian Land Consolidation Act and the Consolidation And Reallocation Of Agricultural Land Laws 1969 in Cyprus. This prerequisite is discussed further in my analyses part in the section regarding the economic effects.

The changes in labour input have had a dramatic effect on the visual landscape of the consolidation schemes, which I will discuss further in a later section regarding effects on the cultivated landscape in Section 3.5.4.

3.5.3 Effects on the design of plots and infrastructure

King and Burton (1982) states that changes in the number of land holders, absentee land holders, holding size, number of plots and multiple-ownerships are all considered as structural changes (Burton & King 1982 p. 195). These are changes that will result in impacts on the design of plots, so-called spatial-effects. According to Burton and King (1983) spatial effects refer to plot shape and size, interrelated location and distance to the operation centre. These changes are probably the most easiest effects to calculate and a variety of methods have therefore been developed in the form of geographic information and customized computer software (Burton & King 1983 p. 495; Nelson 1993).

It is a close link between the spatial effects and the economic effects since spatial effects have impacts on the economic effects. For instance by changes in plot sizes and shapes, it is easier to do the land more effectively resulting in less working-time needed and money saved. Without discussing these relations any further, I will review these effects separately for an even more detailed analysis.

Former studies state that implementation of land consolidation result in spatial change in farm structure after completion of measure. Quantitative indices of farm structure were reviewed in Burton and Kings earlier work from 1982 focusing on number of plots, the size distribution of plots and their dispersion in space (Burton & King 1983 p. 488).

A survey conducted by Steinsholt (1994), here after Sky (2002), resulted in effects regarding plot design and infrastructure. A change in transport on public roads, number of plot corners and the number of meters field edge are among these. These founds are only used as an evidence of the effects in several public reports (Sky 2009b pp. 376-377). Access to land is linked to the status of individuals and where access can be more freely obtained greater independencies is possible. Land consolidation, by improving access to the land, increase the levels of independence and improves social status (Burton 1988 p. 144).

Spain has developed a method for analysing the reduction in transport. This method measures the amount of meters instead of the reduction of transportation time. The amount of meters is measured from the centre of each parcel to the average centre for all parcels belonging to a property. This method is still quite uncertain since it will be based on an approximately basis but sure is an indication on how much the transportation has been reduced (Sky 2009b p. 378).

3.5.4 Effects on the cultural landscape

It is difficult to define environmental impacts, but according to Sky (2009) they include impacts of land consolidation on the landscape, nature and the environment (Sky 2009a p. 188) which can be both positive or negative. Land use changes will result in changes in cultivation (Burton & King 1982 p. 195).

Land consolidation has often been criticised for having a negative impact on the environment and cultural landscape. Bullard stated that some of the benefits as a result of land consolidation might develop to be disadvantages in the future. Such criticism can be found in both of his works Bullard of 1990 (p. 31) and 2007 (p. 56), here after Sky (2009) (Sky 2009a p. 188). Land consolidation can develop disadvantages including loss field margins, greater risk of erosion, destruction of biotopes and monoculture, due to reparcelling and increased size of holdings. The building of infrastructure will also lead to greater pollution and loss of virgin land (Sky 2009b p. 379).

From Burton and Kings study in Cyprus 1988, they found that the changes in labour input had a dramatic effect on the visual landscape in the land consolidation schemes. New fields of vegetables, soft fruits, bananas and lemon trees did now characterize the consolidation areas, which earlier had cereal, vine and carob cultivations as the main cultivation. Land that was earlier abandoned, was now characterized by agricultural activity. New roads made better access between parcels, irrigation channels were established together with water pipes and underground plastic pipes to bring water to the fields (Burton 1988 p. 138).

Sky (2009) followed the changes to the cultural landscape in the Vyzakia village for a ten-year period. A village characterized by irrigated lowland and semi-mountainous terrain. Before land consolidation was implemented, 119 out of 511 holdings in the village had road access. After land consolidation the number of holdings were decreased, all having a road connected to their parcel. The land consolidation area had 14.5 km of roads compared to 3.9 km before. Irrigation systems were also established resulting in changes of cultivation; a higher number of citrus and olive trees were noted. The cultural landscape was more varied compared to earlier with a wider spectre of new agricultural products. Due implementation of a new irrigation system it was now possible to produce crops requiring water (Sky 2009a pp. 189-190).
The land consolidation process was completed in August 2000. Some comparisons between the findings of Sky and mine will be presented in my analysis part regarding the effects on cultural landscape.

Several countries have identified environmental considerations as necessary when implementing land consolidation measures. A resolution was adopted in conjunction with the FIG congress in Helsinki in 1990. This resolution highlighted just that the environmental

considerations during land consolidation and proposed further documentation about this relationship (Tenkanen 1991), here after Sky (2009a) p. 188.

In the early 1970s, the Netherlands as well had an increased focus on the environment in relation to land consolidation. They stated that it had been too strong a focus on purely economic criteria when performing land consolidation. A multi-criteria evaluation method was therefore developed to take into account visual impact, historic importance, ecology and social issues, in addition to the economic criteria (Janssen & Rietveld 1985). A total of 51 evaluation criteria were used, spread across five goals. The main goals were to (1) improve the visual aspect of the landscape, (2) improve the amenity of the landscape, (3) increase the ecological value, (4) improve effiency and (5) safeguard the historic character of the area.

An environmental impact assessment is an assessment of the possible impact – positive or negative – that a proposed land consolidation plan may have on the environment, taking natural, social and economic aspects into consideration.

The agricultural university at Wageningen in the Netherlands tested a model to calculate production revenues for a number of alternative changes to the landscape in the 1990s. The conclusion of the project was that major changes to the cultural landscape did not increase revenue (Moolenaar 1990), here after (Sky, 2009a) s. 189.

The cultivated landscape as an item for further research and consideration was not an evaluation moment before late in the Norwegian land consolidation planning. Ot.prp. nr. 56 1987-88 make sure that it now is considered at the same rate as other elements (Sky 2002 p. 25).

It is obvious that it has developed more focus on environmental considerations and taking these into account during land consolidation. According to the presented material above, it is clear that land consolidation can result in both positive and negative effects on environment and landscape.

As mentioned, they do an environmental study before land consolidation measures can be done. They also have a so-called landscape renovation plan and a plan for the protection of the environment. Every land consolidation area has one of these. These plans cover the protection of biotopes, perennial trees, wild fauna habitat, areas of natural beauty and ecological significance, geological formations, cultural/historical heritage areas, church monuments and the creation of parks. These plans shall be published according the legislation, Section 26.

4.0 Presentation of schemes

4.1 Introduction

In this chapter I will give a short summary of some of the schemes visited. Ten out of seventeen schemes constitute my selection; seven of them are completed while three are still in progress. The range of schemes is chosen in order to get a collection of variety and width. I have chosen to present location, area and relief, precipitation, population, type of scheme, extent of area, land consolidation resolution and duration for the seven completed schemes to make it easier for the recipient to understand under what conditions land consolidation has been performed and the base for the result that has been achieved. The three schemes that are still under progress are presented very shortly due to the lack of the same amount of information.

In the section below, all fragmentation plans and maps without a reference attached are collected from the Land Consolidation Service Office in Nicosia during fieldtrip in February/March 2017.

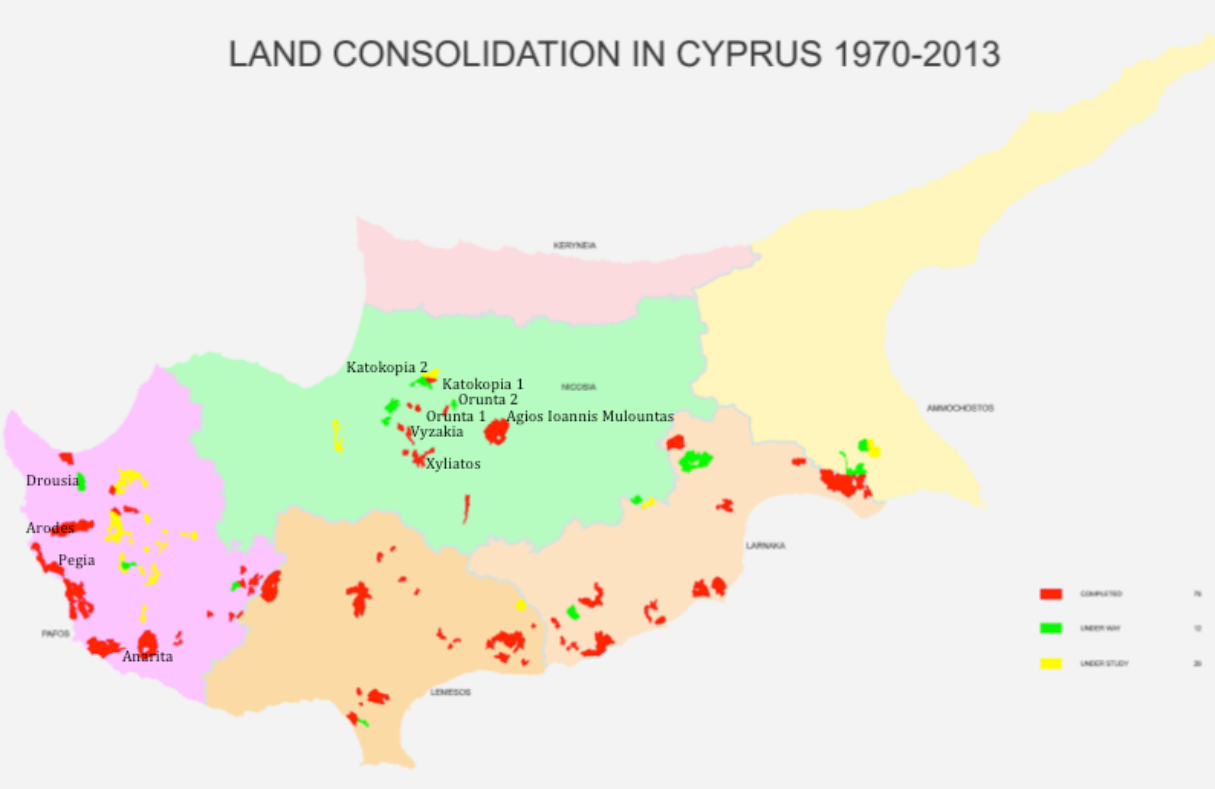


Figure 1: All schemes implemented in Cyprus from 1970-2013. The ten schemes presented in this study are named in the map. Red areas represent completed schemes, green areas are schemes still under progress and yellow areas are schemes under study.

4.2 Agios Ioannis Malountas Land Consolidation Scheme

General information for the village

Location: Agios Ioannis Malountas village is located at an altitude of 340 m above mean sea level and at a distance of 21 km to the southwest of the town of Nicosia.

Area and Relief: The village administrative boundaries cover a total area of 14 188 decares (14,188 km^2) of mainly rainfed lowland with some hills.

Precipitation: It receives an annual precipitation of about 429 mm.

Main cultivations: Cereals, legumes, fodder crops, olives. Also in irrigated areas potatoes, vegetables and nuts.

Population: 337 (in 1982)

Land consolidation scheme

Type of scheme: Rainfed lowland.

Extent of area: 10 907 decares (10,907 km^2).

Land consolidation resolution: 56,1 % of the owners who possessed 50,4 % of the value of the land voted in favour.

Duration of scheme:

It practically started in October 1974 with the publication of the list of owners and was completed in November 1981 when the assumption of possession of the new plots by their owners took place.

Figure 2: Fragmentation plan prior to land consolidation in the Agios Ioannis Malountas Scheme *(LCD, 1993 p. 37)*

4.3 Xyliatos Land Consolidation Scheme

General information for the village

Location: Xyliatos village is located at an altitude of 450 m above mean sea-level and at a distance of 50 km to the southwest of the town of Nicosia.

Area and Relief: The village administrative boundaries cover a total area of 16 385 decares (16,385 km^2) of highland.

Precipitation: It receives an annual precipitation of about 430 mm.

Main cultivations: Legumes, vegetables, almonds and olives.

Population: 122 (in 1982)

Land consolidation scheme

Type of scheme: Irrigated highland, Pitsilia Integrated Rural Development Project.

Extent of area: 2 100 decares (2,1 km^2).

Land consolidation resolution: 65,0 % of the owners who possessed 70 % of the value of the land voted in favour.

Duration of scheme:

It practically started in May 1979 with the publication of the list of owners and was completed in October 1983, when the assumption of possession of the new plots by their owners took place.

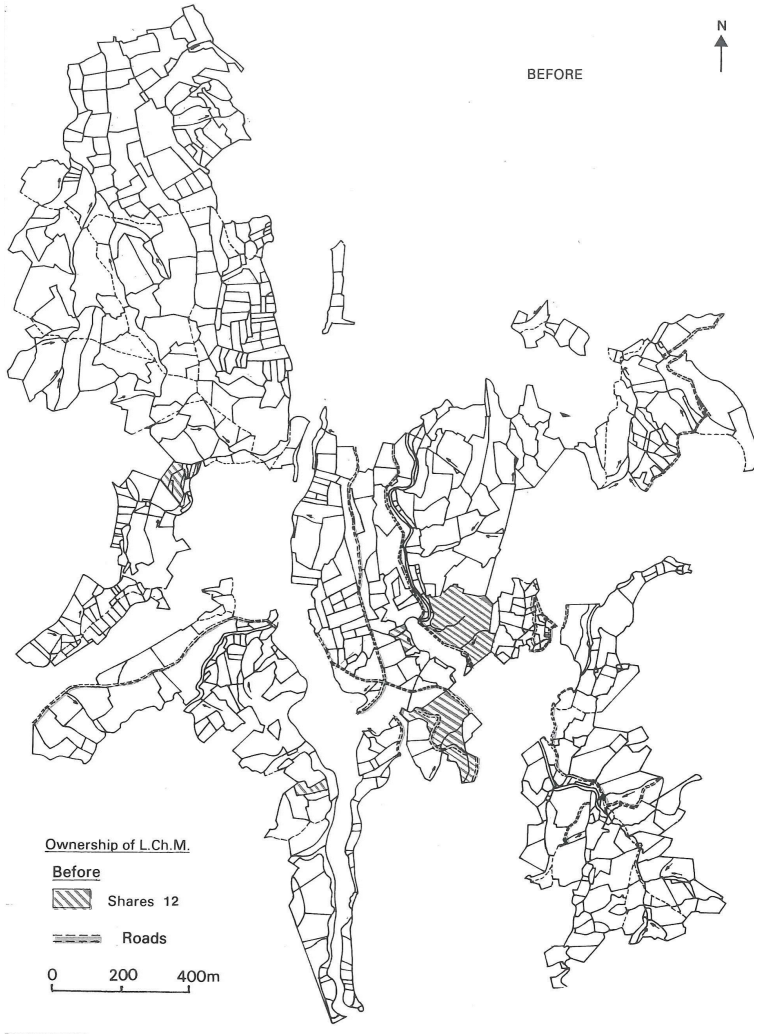


Figure 3: Fragmentation plan prior to land consolidation in the Xyliatos Land Consolidation Scheme *(LCD, 1993 p. 42)*

4.4 Orunta 1 Land Consolidation Scheme

General information for the village

Location: At a distance of 26 km to the WSW of the town of Nicosia.

Area and Relief: The village administrative boundaries cover a total area of 19 977 decares (19,97 km^2) of relatively flatland.

Precipitation: 274 mm total/year

Main cultivations: Potatoes.

Population: 604 (2011 census) – 656 (2001 census)

Land consolidation scheme

Type of scheme: Irrigated.

Extent of area: 2 159 decares (2,159 km^2).

Land consolidation resolution: 58,8 % of the owners who possessed 63,4 % of the value of the land, voted in favour.

Duration of scheme: It practically started 24th July 1998 with the publication of the list of owners and was completed in 10th October 2003 when the assumption of possession of the new plots by their owners took place.

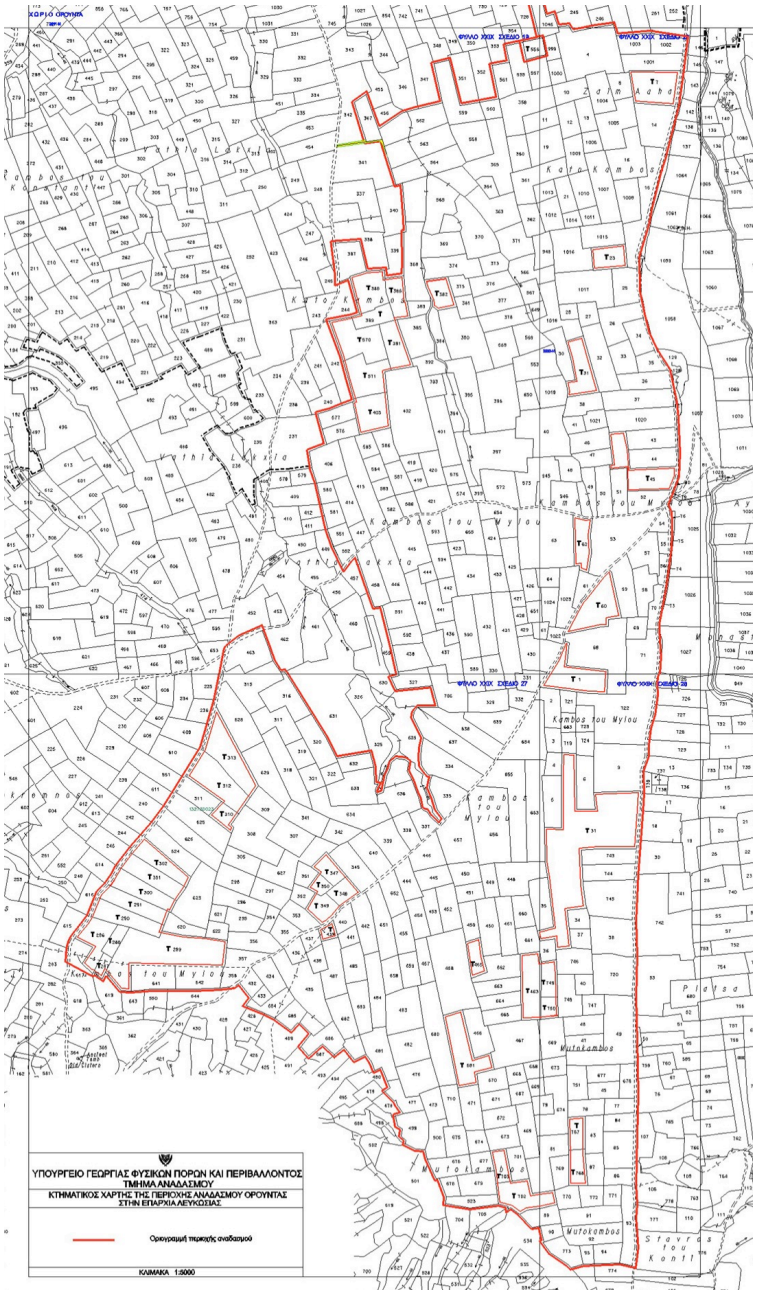


Figure 4: Fragmentation plan prior to land consolidation in the Orunta 1 Scheme.

4.5 Katokopia 1 Land Consolidation Scheme

General information for the village

Location: At a distance of 28 km to the W of the town of Nicosia.

Area and Relief: The village administrative boundaries cover a total area of 10 244 decares (10,24 km^2) of relatively flatland.

Precipitation: 274 mm total/year.

Main cultivations: Green beans, potatoes, zucchini, lemons, oranges, grapefruits, other citrus fruits, peaches, plums, olives.

Population: None – The most part of the village area is inaccessible since 1974 and the Turkish military occupation.

Land consolidation scheme

Type of scheme: Irrigated.

Extent of area: 1 091 decares (1,091 km^2).

Land consolidation resolution: 84,72 % of the owners who possessed 87,6 % of the value of the land, voted in favour.

Duration of scheme: It practically started 14th November 2003 with the publication of the list of owners and was completed in 22nd November 2010 when the assumption of possession of the new plots by their owners took place.

Figure 5: Map of land tenure structure prior to land consolidation in the Katokopia 1 Scheme. Parcels marked with red boundaries are under Turkish ownership.

4.6 Anarita Land Consolidation Scheme

General information for the village

Location: At a distance of 10 km to the ESE of the town of Pafos and 45 km W of the town of Limassol.

Area and Relief: The village administrative boundaries cover a total area of 15 502 decares (15,50 km^2) of relatively flatland.

Precipitation: 271 mm total / year

Main cultivations: Permanent and seasonal cultivations.

Population: 876 (2011 census) – 368 (2001 census)

Land consolidation scheme

Type of scheme: Irrigated and Rainfed (Arid or Dryland).

Extent of area: 10 140 decares (10,14 km^2).

Land consolidation resolution: 64,19 % of the owners who possessed 74,72 % of the value of the land, voted in favour.

Duration of scheme:

It practically started 9th September 1994 with the publication of the list of owners and was completed in 1st September in 2005 when the assumption of possession of the new plots by their owners took place.

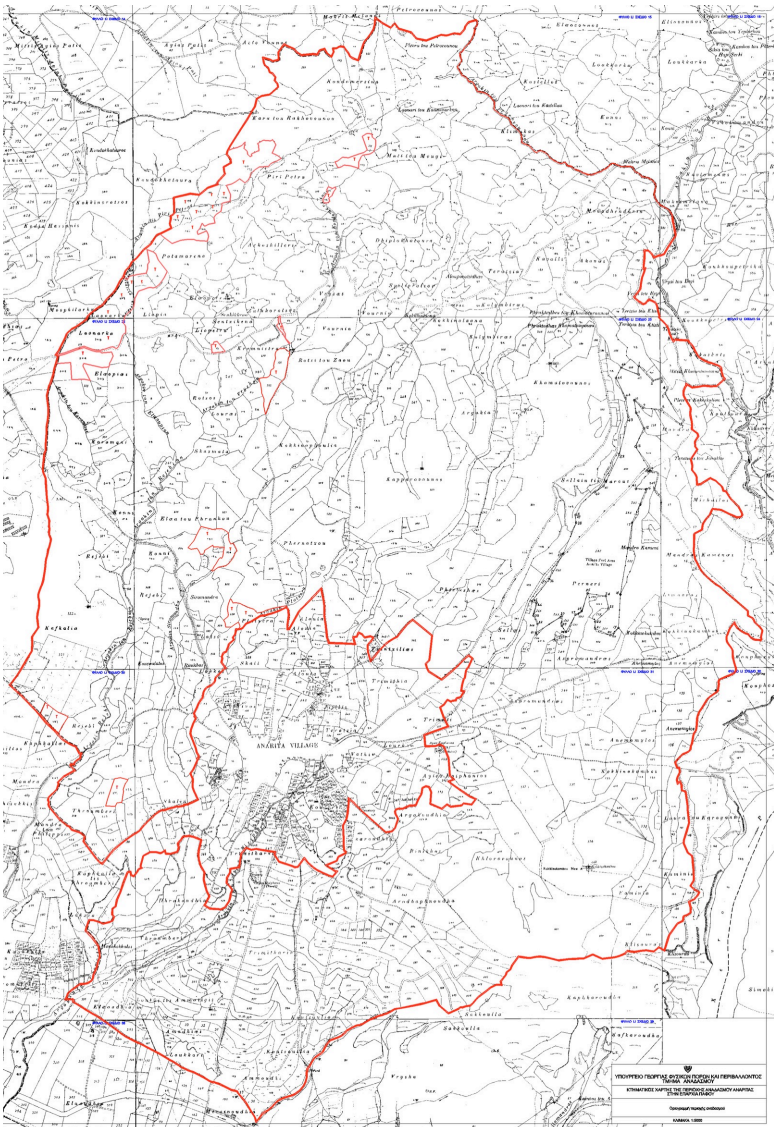


Figure 6: Map of land tenure structure prior to land consolidation in the Anarita Land Consolidation Scheme.

4.7 Arodes Land Consolidation Scheme

General information for the village

Location: At a distance of 10,2 km to the N of the town of Pafos.

Area and Relief: The village administrative boundaries cover a total area of 14 586 decares (14,58 km^2) of relatively highland.

Precipitation: 271 mm total / year.

Main cultivations: Almonds, apples, cereals, cattle crops, kidney beans and grapes.

Population: 135 (2011 census – 108 (2001 census).

Land consolidation scheme

Type of scheme: Arid (Rainfed).

Extent of area: 7 710 decares (7,71 km^2).

Land consolidation resolution: 72,28 % of the owners who possessed 79,96 % of the value of the land, voted in favour.

Duration of scheme: It practically started 21st September in 1984 with the publication of the list of owners and was completed in 1st July in 2000 when the assumption of possession of the new plots by their owners took place.

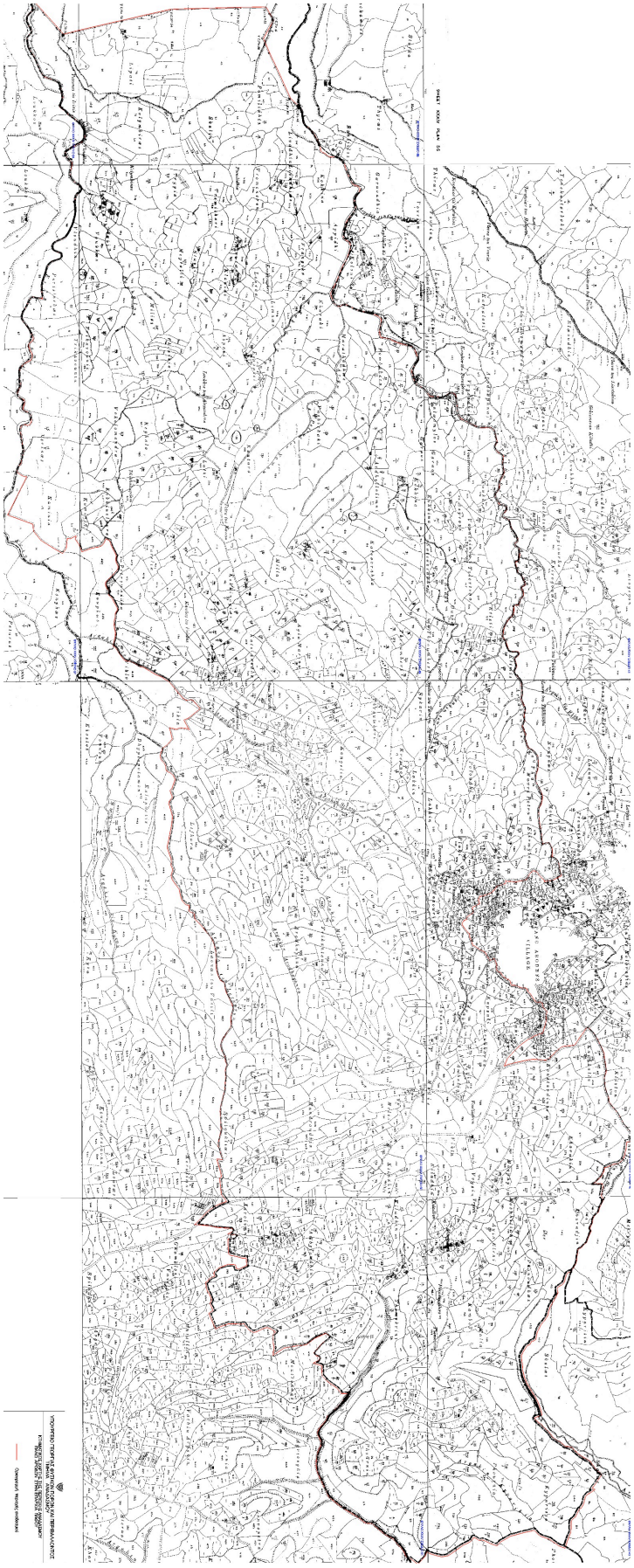


Figure 7: Map of land tenure structure prior to land consolidation in the Arodes Land Consolidation Scheme.

4.8 Pegia Land Consolidation Scheme

General information for the village

Location: Pegia village is located at an altitude of 200 m above mean sea-level and at a distance of 15 km to the northwest of the town of Pafos.

Area and Relief: The village administrative boundaries cover a total area of 45 520 decares (45,52 km^2) (of flat and hilly land dissected by the Mavrokolympos, Xeros, Aspros and Toxeftra rivers.

Precipitation: It receives an annual precipitation of about 520 mm.

Main cultivations: Bananas, vines, citrus, legumes.

Population: 1.195 (in 1982).

Land consolidation scheme

Type of scheme: Irrigated lowland, Pafos Irrigation Project.

Extent of area: 7 187 decares (7,187 km^2).

Land consolidation resolution: 55,91 % of the owners who possessed 65,05 % of the value of the land voted in favour.

Duration of scheme: It practically started in November 1979, with the publication of the list of owners and was completed in July 1989, when the assumption of possession of the new plots by their owners took place.

Figure 8: Fragmentation plan prior to land consolidation in the Pegia Land Consolidation Scheme *(LCD, 1993 p. 109)*

4.9 Schemes under progress

Orunta 2 Land Consolidation Scheme

Type of scheme: Irrigated.

Extent of area: 1 812 decares (1,812 km^2).

Duration of scheme: Started on the 9th of August in 2006. This scheme was planned to be completed in the end of 2013 or the beginning of 2014. However, from July 2013 to December 2014, land consolidation works were suspended as the majority of the Land Consolidation Department Staff was working for the Lands and Surveys Department implementing the loan contract assumed by the State.

Katokopia 2 Land Consolidation Scheme

Type of scheme: Irrigated.

Extent of area: 2 479 decares (2,479 km^2).

Duration of scheme: It practically started in November in 2009 and is uncertain when will finish.

Drousia Land Consolidation Scheme

Type of scheme: Mixed ie. arid and irrigated.

Extent of area: 2 970 decares (2,97 km^2).

Duration of scheme: It practically started in 1997 and unknown when will be finished.

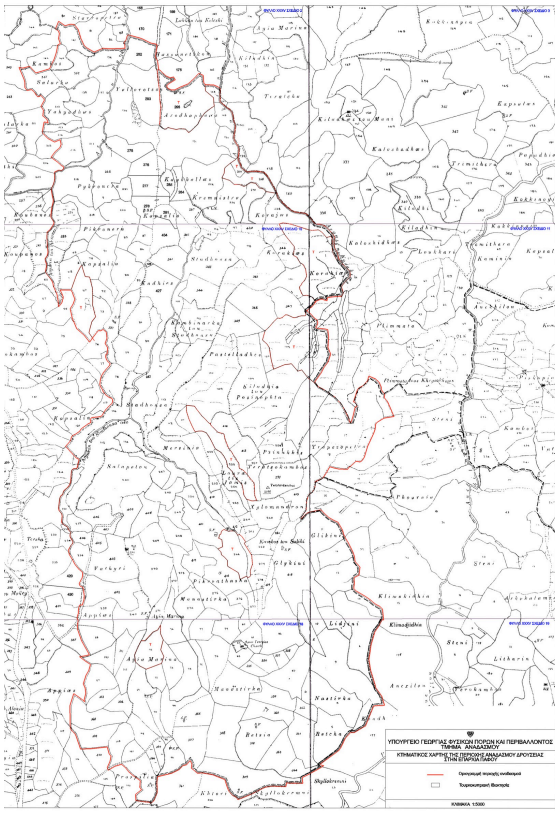


Figure 9: Map of land tenure structure prior to land consolidation in the Drousia Land Consolidation Scheme.

5.0 Discussion and analysis

5.1 Introduction

Since my study is limited to the social and economic effects of land consolidation, in addition to the effects on plot design and cultivated landscape, the analysis following will be presented in accordance to my research questions with the aim of answering these.

There are several approaches to explain the effects of land consolidation. The analysis of my research questions are based on the definitions of effects presented in Chapter 3 (Theory), involving pros and cons of land consolidation measures. The meaning of an effect is based on the changes between the situation before and after land consolidation has been implemented (Sky 2009b p. 374).

My findings regarding social and economic effects will be presented generally for all of my selected schemes with some specific comments where necessary for significant changes or highly interesting findings.
The identified effects on plot design, infrastructure and cultural landscape, will be presented for each individual scheme. At the end of this chapter I will summarize my findings from an overall perspective.

Fragmentation plans and maps presented in section 5.2.3 without a reference attached are collected from the Land Consolidation Service Office in Nicosia during fieldtrip in February/March 2017. Several of my findings are documented with pictures, mainly the effects on cultivation and landscape changes. All photos without a reference attached were also collected during my fieldtrip.

5.2 Discussion

5.2.1 Social effects – Do implementation of land consolidation result in any changes in the relationship between the participants, or the relationship between the participants and their property?

My findings regarding the social effects are based on the perception of social effects representing impacts on the relationship between owners, or the owners and their property (Sky 2009b p. 383).

In addition to land consolidation as a direct value-added factor, land consolidation is also of importance in a social manner. There are few studies of the social- and non-agrarian effects, as was affirmed by Burton & King in 1982, due to the difficulties of collecting these (Burton & King 1982 p. 490). Since I had two weeks in Cyprus only, it was impossible for me to conduct a complete survey interviewing farmers affected by the land consolidation measures, even though this is likely to be the most optimal solution for such a study. Challenges with transportation, the amount of time available, language and location of farmers land were all factors restricting my opportunities for this method of information collection.

The owner's strong relations to land have characterized Cyprus for several years. Nevertheless, people seemed to be more attached to their land in the past when survival depended on their crops. One single olive tree could feed a whole family for a year. The farmers were therefore very vulnerable when it came to the interventions on their property and what they were left behind with. There was no question of income by money; it was the crops representing their income.

However, this relation to land is lessened today due to the possibilities of income from other markets. Farming is no longer the only source for survival. Despite the possibilities for work in other places, development of agricultural structure has contributed to increased attractiveness for full-time farming. Due to the lack of measurements, I was not able to collect any new data on the amount of full-time farmers today. It is still certain that a change in lifestyle has been prominent. Establishment of irrigation systems, road networks, technology, mechanization and enlargement of parcels have contributed to agricultural activities becoming easier. It is possible to produce more crops and vegetables compared to before due to the size

of parcels and the opportunity for sale to markets. There are now other ways to subsist on except for the farming outputs.
Even though the conditions are present for full-time farming, there are still many part-time farmers in Cyprus combining farming with other jobs. There is relevant that land consolidation will contribute to an increase in full-time farmers due to reallocation and merge of parcels to bigger land sizes.

Land consolidation in Cyprus is a project done by the Ministry of Interior in cooperation with the landowners themselves. It is very important to emphasize that land consolidation in Cyprus is based on cooperation. The relationship between the parties and the Land Consolidation Service itself is crucial. The contact with the landowners is the main focus and every single step of the process is done with respect to the owner (Frosoula Christofidou, personal communication, 24th of February, 2017). The parties are included on several stages during the implementation including a final approval of the finished land consolidation plan.

As mentioned, one of the aims of land consolidation is the abolition of dual and multiple ownerships held in undivided shares (LCD 1993 p. 22). Land consolidation regarding the ownership relationships and the abolishment of these is basically a legal effect (Sky 2009b p. 379). Even though legal effect itself is not one of my research questions, I choose to present some findings regarding these because they are connected further to the social effects. I mean that changes in ownership status, i.e. legal effects, will further lead to changes in the social relationship between owners, and the relationship between owners and their property. It is likely that the abolishment of multiple ownerships will result in better relationship to property. The owners have post consolidation of the holding by themselves and they can do whatever they want with it, no other owner is involved. Small areas for cultivation of crops are gathered into one area, increasing production and raising incomes, transportation-, time- and administration costs will decrease. It is generally easier to do land more effectively in its entirety.

Information about the changes in ownerships and ownership items after land consolidation is presented in tables below based on the seven completed visited schemes. The ownership changes are presented in Table 1 and the ownership items (multiple ownerships) in Table 2 and 3. Each table will be followed by a further comment. Due to the connection between legal and social effects I find it relevant to present this kind of information.

Table 1, 2 and 3 are based on data from the previous publication of 1993 by the Land Consolidation Department (LCD, 1993 pp. 36, 41 and 108), regarding Scheme 1, 2 and 7, and data regarding Scheme 3, 4, 5 and 6 is collected during field trip. Data is compiled in an own presentation below.

Table 1: Changes in ownerships due to land consolidation measures in the seven schemes completed.

	Ownership	Total number of owners	Number of landowners	No. of owners poss-	No. of owners with
	Nicosia District			essing trees	water rights
Scheme 1	Agios Ioannis Malountas Land consolidation area (before)	687	649	-	38
	Agios Ioannis Malountas Land consolidation area (after)	349	349	-	0
	Percentage change (%)	-49,20	-46,23	-	-100,0
Scheme 2	Xyliatos Land consolidation area (before)	735	527	208	-
	Xyliatos Land consolidation area (after)	275	275	10	-
	Percentage change (%)	-62,59	-47,82	-95,19	-
Scheme 3	Orunta 1 Land consolidation area (before)	257	257	-	-
	Orunta 1 Land consolidation area (after)	241	241	-	-
	Percentage change (%)	-6,23	-6,23	-	-
Scheme 4	Katokopia 1 Land consolidation area (before)	275	275	0	7
	Katokopia 1 Land consolidation area (after)	255	255	0	0
	Percentage change (%)	-7,27	-7,27	0	-100,0
	Pafos District				
Scheme 5	Anarita Land consolidation area (before)	836	809	27	-
	Anarita Land consolidation area (after)	657	657	0	-
	Percentage change (%)	-21,41	-18,79	-100,0	-
Scheme 6	Arodes Land consolidation area (before)	965	960	-	-
	Arodes Land consolidation area (after)	591	591	-	-
	Percentage change (%)	-38,76	-38,44	-	-
Scheme 7	Pegia Land consolidation area (before)	1 090	1 055	35	-
	Pegia Land consolidation area (after)	848	848	0	-
	Percentage change (%)	-22,2	-19,62	-100,0	-

Orunta 2, Katokopia 2 and Drousia Land Consolidation Schemes are excluded from this presentation of statistics since these projects are still in progress and no data on changes is available at this date.

In Table 1 presented above, we can see that the Xyliatos Land Consolidation Scheme had the biggest decrease in the total number of owners calculated to 62,59 %, meaning that more than half of the owners in the land consolidation area received no property and were compensated in money terms instead. The decreased number of owners is due to the emergence of consolidated parcels and the abolishment of co-ownership and dual ownership. Orunta 1 is the scheme with the lowest decrease in the number of landowners after land consolidation, only 6,23 %. This may be due to the fact that the size of ownerships before was bigger (being a lowland area) and there was no need for owners to give up their ownerships and get money compensation.

The Cypriot ownership structure has been characterized by an owner having rights to trees or water without owning the land. Through land consolidation this is eliminated as far as

possible. The one owning the land will now also have the rights to trees and water. If there are owners in a land consolidation area having rights to trees or water only, money compensation is given to give up these rights.

Table 1 shows the timeliness of this. In the Agios Ioannis Malountas Scheme water rights were completely eliminated. The same was applied for the Katokopia 1 Land Consolidation Scheme with a 100 % decrease. For Anarita and Pegia Land Consolidation Schemes in the Pafos District, owner rights to trees were decreased by 100 %. This means that owners of land today also have the rights to trees and water.

All together we see a positive development in ownership structure as an effect of land consolidation implementation. All schemes are characterized by decreases in total number of ownerships due to the enlargement of plots and abolishment of "single" rights.

Table 2: Changes in ownership items as a result of land consolidation measures in the seven schemes completed.

	Ownership items	Total no. of plots	No. of plots held in whole ownership	No. of plots held in undivded shares	No. Of plots and shares	Average number of plots/share per owner	Average size of share/plot (decares)
	Nicosia district						
Scheme 1	Agios Ioannis Malountas Land consolidation area (before)	2 815	2 349	466	4579	6,9	2,4
	Agios Ioannis Malountas Land consolidation area (after)	610	600	10	623	1,8	16,9
	Percentage change (%)	-78,33	-74,46	-97,85	-86,40	-73,91	+604,17
Scheme 2	Xyliatos Land consolidation area (before)	727	582	145	1600	3,0	1,3
	Xyliatos Land consolidation area (after)	371	371	0	371	1,3	5,1
	Percentage change (%)	-48,97	-36,25	-100,0	-76,81	-56,67	+292,31
Scheme 3	Orunta 1 Land consolidation area (before)	381	319	62	469	1,82	4,5
	Orunta 1 Land consolidation area (after)	340	338	2	342	1,42	5,9
	Percentage change (%)	-10,76	+5,96	-96,77	-27,08	-21,98	+31,11
Scheme 4	Katokopia 1 Land consolidationa area (before)	291	256	35	369	1,34	2,9
	Katokopia 1 Land consolidationa area (after)	294	284	10	321	1,26	3,2
	Percentage change (%)	+1,03	+10,94	-71,43	-13,01	-5,97	+10,34
	Pafos District						
Scheme 5	Anarita Land consolidation area (before)	808	496	312	1 913	2,36	5,2
	Anarita Land consolidation area (after)	996	959	37	1 092	1,66	8,6
	Percentage change (%)	+23,27	+93,35	-88,14	-42,92	-29,66	+65,38
Scheme 6	Arodes Land consolidation area (before)	1 466	1 150	316	3 087	3,22	2,5
	Arodes Land consolidation area (after)	992	933	59	1 278	2,16	5,7
	Percentage change (%)	-32,33	-18,87	-81,33	-58,60	-32,75	+128,0
Scheme 7	Pegia Land consolidation area (before)	1 341	1 045	296	1 978	1,9	3,6
	Pegia Land consolidation area (after)	1 092	1 077	15	1 122	1,3	6,1
	Percentage change (%)	-18,56	+3,06	-94,93	-43,27	-31,57	+69,44

Table 3: Changes in ownership items as a result of land consolidation measures in the seven schemes completed.

	Ownership items	Area held in whole ownership (daa)	(%) area held in whole ownership	Area held in undivided shares (daa)	(%) area held in undivided shares	Percentage of plots in shares (%)	Average size of ownership (daa)
	Nicosia district						
Scheme 1	Agios Ioannis Malountas Land consolidation area (before)	8 697,1	79,7	2 210	20,3	16,6	16,5
	Agios Ioannis Malountas Land consolidation area (after)	1 0 499,1	99,6	41,5	0,4	1,6	30,5
	Percentage change (%)	+20,72	+24,97	-98,12	-98,03	-90,36	+84,85
Scheme 2	Xyliatos Land consolidation area (before)	1 430	68,1	670	31,9	19,9	4
	Xyliatos Land consolidation area (after)	1 906,4	0,0	0	0,0	0,0	7
	Percentage change (%)	+33,31	-100,0	-100,0	-100,0	-100,0	+75,0
Scheme 3	Orunta 1 Land consolidation area (before)	1 606	76,26	500	23,74	16,27	8,2
	Orunta 1 Land consolidation area (after)	2 022	99,89	2,3	0,11	0,59	8,4
	Percentage change (%)	+25,92	+30,99	-99,54	-99,54	-96,39	+2,44
Scheme 4	Katokopia 1 Land consolidationa area (before)	885,7	81,87	196,1	18,13	12,03	3,9
	Katokopia 1 Land consolidationa area (after)	983,6	97,06	29,8	2,94	3,40	4,0
	Percentage change (%)	+11,05	+18,55	-84,80	-83,78	-71,73	+2,56
	Pafos District						
Scheme 5	Anarita Land consolidation area (before)	5 596,4	56,74	4 267,0	43,26	38,61	11,8
	Anarita Land consolidation area (after)	9 059,5	96,52	326,2	3,48	3,71	14,3
	Percentage change (%)	+61,88	+70,11	-92,36	-91,96	-90,39	+21,19
Scheme 6	Arodes Land consolidation area (before)	5 359,9	69,79	2 319,9	30,21	21,56	8,0
	Arodes Land consolidation area (after)	7 000,2	95,64	319,5	4,36	5,95	12,4
	Percentage change (%)	+30,60	+37,04	-86,23	-85,57	-72,41	+55,0
Scheme 7	Pegia Land consolidation area (before)	5 187	72,2	200,0	27,8	22,1	6,8
	Pegia Land consolidation area (after)	6 624	96,7	22,7	3,3	1,4	8,0
	Percentage change (%)	+27,70	+33,93	-88,65	-88,12	-93,66	+17,64

The considerable decrease in the number of plots for the Agios Ioannis Malountas Scheme, a total decrease of 2 205 plots, is due to the emergence of many small parcels dominating the area pre land consolidation (as shown in the fragmentation plan in Chapter 4). The Agios Ioannis Malountas and Xyliatos Land Consolidation Schemes have the biggest decreases in number of plots/shares per owner. A decrease which can be explained due to the schemes area of extent and the many small parcels. Since the numbers have decreased, it is natural for the size of area to increase. The Agios Ioannis Malountas Scheme for instance has a total increase in the average size of plot/share on a total of 604,17 %, a change impossible not to notice.

The Anarita and Katokopia 1 Land Consolidation Schemes on the other hand, have an increase in the number of plots, of 23,27 % and 1,03 %, after land consolidation. This is due to the fact that plots held in shares before land consolidation were given in whole ownerships after land consolidation.

The objective of eliminating co-ownerships is more or less succeeded for all schemes having a decrease of undivided shares of 80 % or more. In the Xyliatos Land Consolidation Scheme undivided shares were completely abolished, something that looks optimistic for future land tenure structure.

To get an overall perspective of the effects, I have chosen to calculate the average changes regarding the number of plot/share per owners, average size of plot/share and average size of

ownership for all the seven schemes presented above. According to my calculations, pre land consolidation, the average number of plot/share per owner for the selected schemes was 3,2 plots, the average size of the plot/share was 3,25 decares and the average size of ownership 9,2 decares. Post land consolidation it was 1,6 plots/shares, 8,05 decares and 13,4 decares accordingly. I have calculated the average changes for the seven schemes to be a decrease in the number of plots/shares of 50 %, an increase in the average size of plot/share of 147,69 % and an increase of average size of ownership of 45,65 %. After land consolidation we see tendencies of fewer plots per owner, bigger size of each plot and an owner having rights to bigger areas. Of course some variation among the schemes will be applicable.

Land consolidation in Cyprus is promoted democratically and so far it has been applied on a voluntary basis only. The publication of the Land Consolidation Department of 1993 defines the method as: "compulsory land consolidation by resolution of the owners" (LCD 1993 p. 25). It is lied up for participation regularly during the whole process, already from the presentation of owners in the various committees to the stage where the owners have the right to object to any published plan. They can even appeal to court as a last resort (LCD 1993 p. 32). This means that participation is implemented more or less from start to finish. When this participation can take place in a process is stated in the Law of 1969.

The parties will first participate as a part of the preliminary meeting (Section 6 (1)), as a member of the Provisional Committee (Section 6 (2)), the Land Consolidation and Reallocation Committee (Section 11 (1)) and the Valuation Committee (Section 14 (1)). The main point of the preliminary meeting is to achieve an understanding for what attachment to land the owners have before further finding satisfying solutions. This results in pleased owners regarding the final result of the land consolidation and reallocation plan due their influence during the whole process.

All in all will this participation contribute to a development of a better perception of the land consolidation measure. This kind of measure has suffered from negativity and doubts for the effects achieving. Due the lack of knowledge about this kind of implementation, people have earlier assumed that it is cost consuming with no specific benefits. It is believed to be a financially expenditure with no specific results. This has luckily changed in a positive direction during the years but it is still a long way to go for acceptance and for people to understand. It is of big significance in Cyprus due to the major problems with land tenure structure.

From documents retrieved at the Office in Nicosia, a KPI (Key Performance Indicator) from 2016 says that 98,35 % of the landowners did not submit objections on the documents and plans published by the Land Consolidation Service for inspection. This is an average percentage of the total number of landowners (between 2003 and 2012) that did not submit any objections for all land consolidation schemes during the year. This reflects the participants being satisfied with the implementation.

I have no specific data of how land consolidation has affected neighbours and the relationship between them, neither does the Land Consolidation Service. Regarding the Director of the Land Consolidation Service, owners and neighbours are satisfied post land consolidation due to their possibilities for participation regularly during the whole process (Frosoula Christofidou, personal communication, 24th of February, 2017). As mentioned in my Methodology chapter (Chapter 2), interview would have been too challenging to accomplish.

Social effects can be both positive and negative. Negative effects may be when land consolidation results in deteriorated neighbourly relations between the parties while positive effects can be a result in the opposite manner, as better social conditions. From the above-mentioned reflections, deteriorated neighbourly relations do not seem to be very prominent as a result of land consolidation.

The Land Consolidation Service during land consolidation measures in the area creates a park for social gathering. A park that everyone is welcome to use, whether its inhabitants of the village or tourists passing by. As from July 1974 Katokopia village is under Turkish occupation because of the 1974 Turkish invasion. All the inhabitants of Katokopia village had to leave their house i.e. they became refugees and as from then they live in other villages/towns. But some of their land property is in the Republic of Cyprus Government controlled part so the inhabitants of Katokopia village go and cultivate their land. The park that was created within the land consolidation area is used as a meeting place for the inhabitants-refugees especially for religious celebrations, as shown in figure 10. Such parks are a meeting point for families, friends and colleagues, which results in positive social effects. It is supposed to be a place for recreation, functioning as a green lung. Many of the parks created have been taken care of, but certain amounts are maturing depending on the cooperation inside the village and where they are located. It is up to the landowners themselves to maintain these parks as a place for recreation.

Figure 10: Parks constructed as a result of land consolidation conducted by the Land Consolidation Service in order to create a space for social gathering.

When there are several owners to a specific part of land, dependencies and conflicts will appear. There will always be owners having a wide spectre of needs, meanings and perceptions of how things are or should be done. Abolishment of co-ownership seems to result in positive legal effects, leading further to positive social effects. And by that I mean after land consolidation owners are able to dispose the land alone as the only owner, resulting in independence and a closer relationship to property.

5.2.2 Economic effects – what economic effects may a land consolidation scheme entail?

My reflections regarding the economic effects are based on how land consolidation affects farming operations when the farm structure is changed, meaning how reduction of plot numbers and interplot distances, increase of plot size and change in plot shape will contribute to better farming conditions seen in an economic perspective (Burton & King 1983 p. 485).

Land consolidation in Cyprus tends to be both cost- and time-consuming. Number and experience of personnel in the project, the size and extent of the scheme, the age of structure and attitudes of famers, the land use and topography are all variables potential for high costs and long duration of time (Burton & King 1982 p. 199).

My selection of schemes varies from duration of four years to sixteen years, a pretty big gap between the completed projects. The duration of a project is based on how much time it takes from the publication of the list of owners (representing the start of process) to the assumption of possession of new plots by their owners (finish of process). For a better overall overview of the selection of completed schemes I will further present some information in table 4 that might have had an impact on the time of project. Start of project, duration, extent of area,

number of owners and topography will be presented all together. Attitudes of farmers, the number and experience of personnel will have an impact on the efficiency of projects as well but it is hard to quantify and is therefore not a part of the following considerations.

Table 4: Four factors affecting the duration of projects for the seven selected schemes, presented as the start of project, extent of area, total number of owners and topography.

	Scheme	Start of proj	Extent of ar	Total numbe	Topography	Duration
Scheme 1	**Agios Ioannis Malountas Land Consolid**	1974	10,90	687	Rainfed lowland	7 years
Scheme 2	**Xyliatos Land Consolidation Scheme**	1979	2,10	735	Irrigated highland	4 years
Scheme 3	**Orunta 1 Land Consolidation Scheme**	1998	2,16	257	Irrigated	5 years
Scheme 4	**Katopkopia 1 Land Consolidation Scher**	2003	1,09	275	Irrigated	7 years
Scheme 5	**Anarita Land Consolidation Scheme**	1994	10,14	836	Irrigated and Rainfed	11 years
Scheme 6	**Arodes Land Consolidation Scheme**	1984	7,71	965	Arid (Rainfed)	16 years
Scheme 7	**Pegia Land Consolidation Scheme**	1979	7,19	1 090	Irrigated lowland	10 years

The Anarita, Arodes and Pegia Land Consolidation Schemes are the schemes with the longest duration of projects of approximately 11, 16 and 10 years. These projects were all started pretty early after land consolidation was introduced as a tool for solving land tenure problems meaning that the system was developed in a limited extent. These schemes have some of the biggest extent of areas of my selection, all covering 7-10 km^2 each, which contributes to large areas to consolidate. This is represented by the amount of owners as well, having many owners to talk with and satisfy. All these factors make the schemes comprehensive and time-consuming. On the other hand, Orunta 1, Katokopia 1 and Xyliatos Land Consolidation Schemes, have fewer owners, smaller areas of extents and therefore also a shorter time of duration.

The farmers keep exercising their farming activities despite land consolidation implementation. They cultivate the land they have before land consolidation and then the land they have after land consolidation when assumption of possession of the new plots takes place at a date fixed by the Land Consolidation Committee in agreement with the Director of the Lands and Surveys Department, stated in Article 28 of the Law of 1969. It is the assumption of possession of the new plots that marks the changes in the ownerships of the plots.

It is also measured a KPI (Key Performance Indicator) output for the average duration of the procedural preparatory stages carried out, stated in documents retrieved form the Office in

Nicosia. The data for this KPI will be the average time (in months) needed for the completion of the following stages: preliminary meeting of the owners/establishment of provisional committee, delineation of the area to be consolidated and request of the List of owners. For the years 2003 to 2013, this KPI was calculated to be an average of 17,25 months.

The basic objectives of land consolidation implementation in Cyprus are the creation of economically viable holdings and the improvement of the defective land tenure structure where land consolidation is the main measure applied to accomplish these (LCD 1993 p. 22). However, the fieldtrip to Cyprus resulted in some findings of similarities between the prerequisites in Norway and Cyprus as two land consolidation-practising countries. My reflections regarding these will be presented in the section following.

As mentioned, a feasibility study and an environmental impact assessment study are conducted in order to clarify whether land consolidation should be implemented or not (Frosoula Christofidou, personal communication, 23rd of February, 2017). These studies are not a part of the Norwegian land consolidation process. However, the Cypriot Law of 1969 Section 2, states another prerequisite saying that land consolidation and reallocation are applied to the property with the purpose of improving the conditions. Section 3-3 in the Norwegian Land Consolidation Act has a similar formulation saying that land consolidation may only be implemented in order to make the property arrangements in the land consolidation area more advantageous. A prerequisite meaning, for both countries, positive improvements in the land consolidation area after land consolidation measures are done.

In the Norwegian Land Consolidation Act we have another prerequisite including a ”no loss guarantee” meaning that no property shall have more disadvantages and costs than benefits and income as a result of land consolidation. This is stated in Section 3-18 in the Law. In the Cypriot Immovable Property Law of 24, 1960, Section 27 (2) a, they have something similar referred as; ”the lowest limits of new holdings in a land consolidation and reallocation area”, constituting another prerequisite for Cypriot land consolidation. The lower limits are originally measured in donums, which according to Karouzis (1971) is equal to 0,133 hectares (Karouzis 1971 p. 1) representing 1 330 square meters (m2).
Section 27 (2) a, say that land consolidation schemes located in irrigated areas, plantations and vineyards have its lowest limit on 2 donums (2 676 m2). For arid areas, the lowest limit is 10 donums (13.378 m2), stated in section 27 (2) b. Since these lowest limits of the new

holdings are protected by law, transfer of property beneath these limits is prohibited. The Land Consolidation Service can therefore not transfer property resulting in holdings below these sizes. This is due to respect for the owner.
Despite this, the Land Consolidation Service can lower the limit nevertheless. These exceptions are stated in the same law in section 27 (1) b and c. For irrigated areas the limit can be decreased to 1 donum (1 338 m2) (b) and for arid areas to 5 donums (6 689 m2) (c).

From data collected in Cyprus, the total number of land owners benefiting from land consolidation measures of their property were measured in 2013 to be 18 957. To this number will be added the total number of owners from the land consolidation schemes completed during the following years. Since there are no more completed schemes after 2013 (Frosoula Christofidou, personal communication, 3rd of March, 2017), this number remains the same today.

Without any specific numbers or statistics on traveling time after land consolidation, it is still certain that this measure has contributed to a decrease due the development of road network. The Annual Report of 2013, which I retrieved from the Office in Nicosia, states that the farm road network had an increase of 198,18 % in 85 land consolidation areas, representing 1 371.5 km of constructed farm roads which is a significant change compared to 460 km pre-consolidation. The infrastructure has therefore also contributed to less working time and lower administration costs. Today farmers in Cyprus use tractors and other mechanical machines for the production of crops and for transportation of equipment from one parcel to another. Supervision of crops is also easier due to the decrease in transportation time. The farming work is from an overall perspective more effective. This contributes to higher income and welfare for the farmers. In 2013 it was calculated that the changes in size ownerships, elimination of land fragmentation, enlargement of plots, abolition of mixed tenures and return to cultivation of abandoned land resulted in an increase in the number of economically viable holdings by 16 %, an increase in production by 100 %, increase in productivity of capital by 45 %, labour by 100 % and rise of the agricultural income up to 300 %.

When it comes to the cost of road, drainage system and other infrastructure, it is settled on predefined percentages, between the State and the owners implemented in the land consolidation project. Depending on whether one community is deprived or not, due to location and other factors, the State pays 70 %, 90 %, 95 % or even 100 % of the total cost.

Cost to each owner is decided on the position where his new plots are, span of the road from they obtain. This is enacted in Law (Section 34-1) and the contribution is calculated to 0 % to 30 % of the construction costs. The incurred expenses to the owners are paid by instalments from 1-8 years with low rate interest.

Some owners may "loose" their land after land consolidation measures due to the abolishment of co-ownership and dual ownership, and enlargement of plots. Those who remain landowners and receive properties of greater value than the one due to them, they pay to the Land Consolidation Service (the Committee) the difference in value in doses from 1 to 8 years. The owners receiving properties with a smaller value that the one due to them or who receive no property at all, they are paid compensation in money terms (Frosoula Christofidou, personal communication, February, 24th, 2017).

In short terms we can summarize that land consolidation is a significant contributor to increasing farmers agricultural income and productivity in Cyprus resulting in further specialization and efficiency.

5.2.3 Design of plots and infrastructure – What are the effects on plot design and infrastructure?

My reflections regarding the effects on the design of plots and infrastructure are based on Burton & King´s (1982) assumption of structural changes as a result of land consolidation measures. Structural changes including changes in plot size, shape, interrelated location and distance to operation centre (Burton & King 1982 p. 495).

There is no doubt that land consolidation result in spatial structural changes. Significant visual changes were identified in several of the schemes in the Nicosia and Pafos district, some changes more remarkable than others. I have chosen to present fragmentation plans for my selection of schemes, as shown in figure 11-26, to show these structural changes more clearly. A further comment of the overall changes will be presented in the end.

Scheme 1 – Agios Ioannis Malountas Land Consolidation Scheme

Before

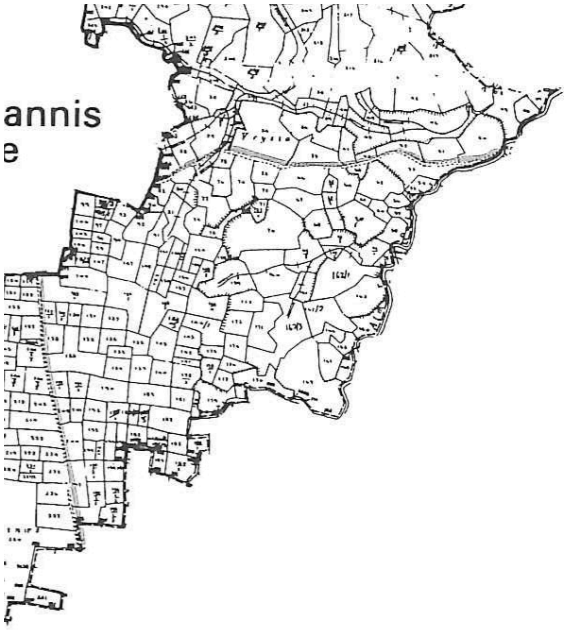


Figure 11: Part of fragmentation plan prior to land consolidation for the Agios Ioannis Malountas Land Consolidation Scheme *(LCD, 1993 p. 37)*

After

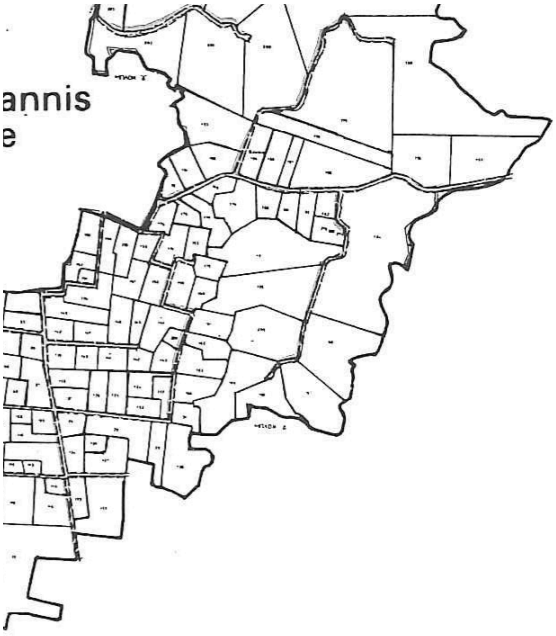


Figure 12: Part of fragmentation plan after land consolidation was implemented for the Agios Ioannis Malountas Land Consolidation Scheme *(LCD, 1993 p. 38)*

Scheme 2 – Xyliatos Land Consolidation Scheme

Before

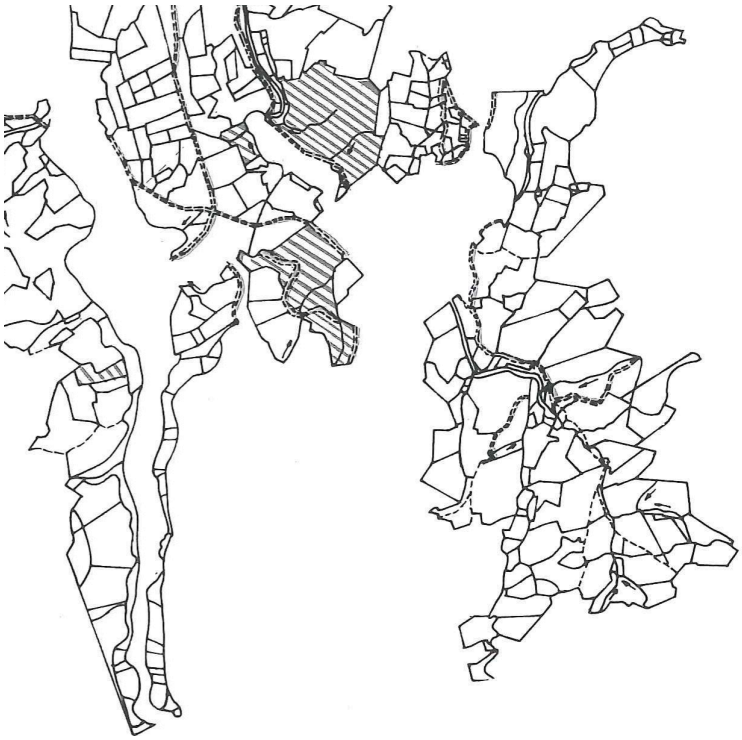


Figure 13: Part of fragmentation plan prior to land consolidation for the Xyliatos Land Consolidation Scheme *(LCD, 1993 p. 42)*.

After

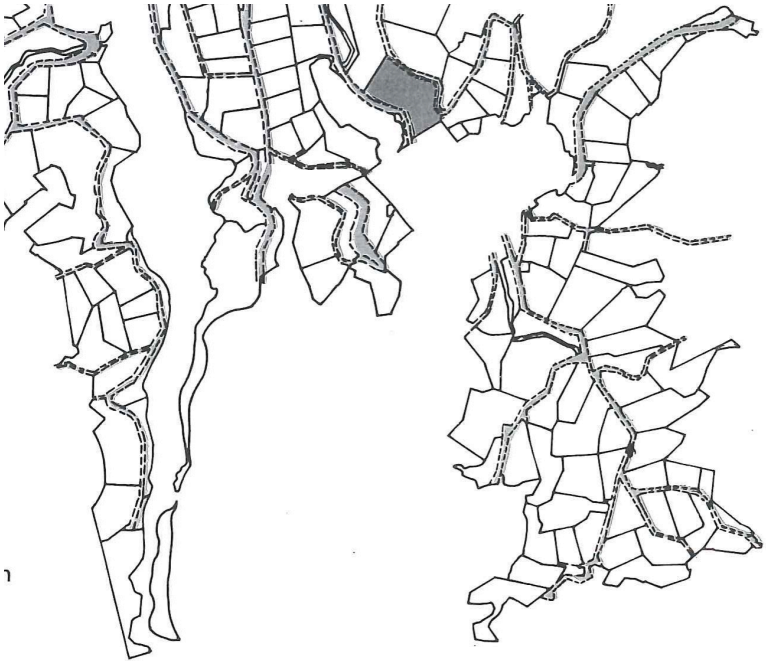


Figure 14: Part of fragmentation plan after land consolidation was implemented for the Xyliatos Land Consolidation Scheme *(LCD, 1993 p. 43)*.

Scheme 3 – Orunta 1 Land Consolidation Scheme

Before

Figure 15: Part of fragmentation plan prior to land consolidation for the Orunta 1 Land Consolidation Scheme.

After

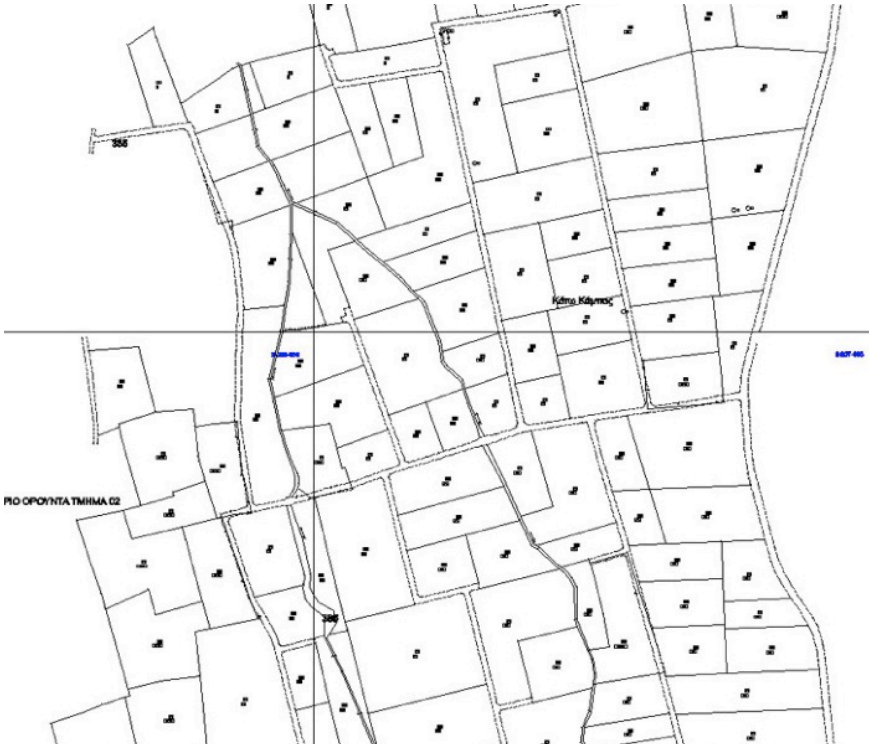


Figure 16: Part of fragmentation plan after land consolidation was implemented for the Orunta 1 Land Consolidation Scheme.

Scheme 4 – Katokopia 1 Land Consolidation Scheme

Before

Figure 17: Part of map illustrating the land tenure structure prior to land consolidation in the Katokopia 1 Land Consolidation Scheme.

After

Figure 18: Part of map illustrating the land tenure structure after land consolidation was implemented for the Katokopia 1 Land Consolidation Scheme.

Scheme 5 – Anarita Land Consolidation Scheme

Before

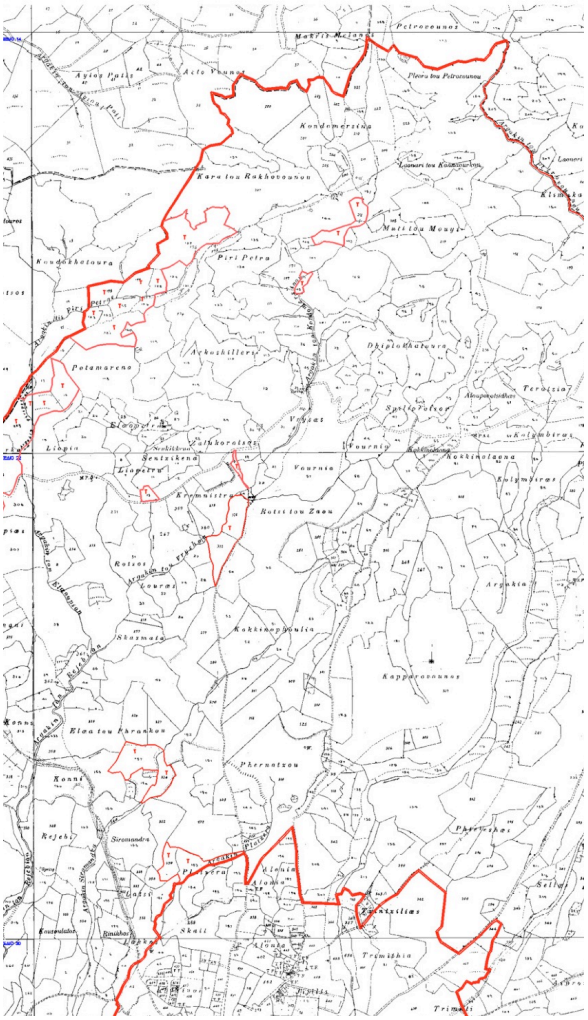


Figure 19: Part of map illustrating the land structure prior to land consolidation in the Anarita Land Consolidation Scheme.

After

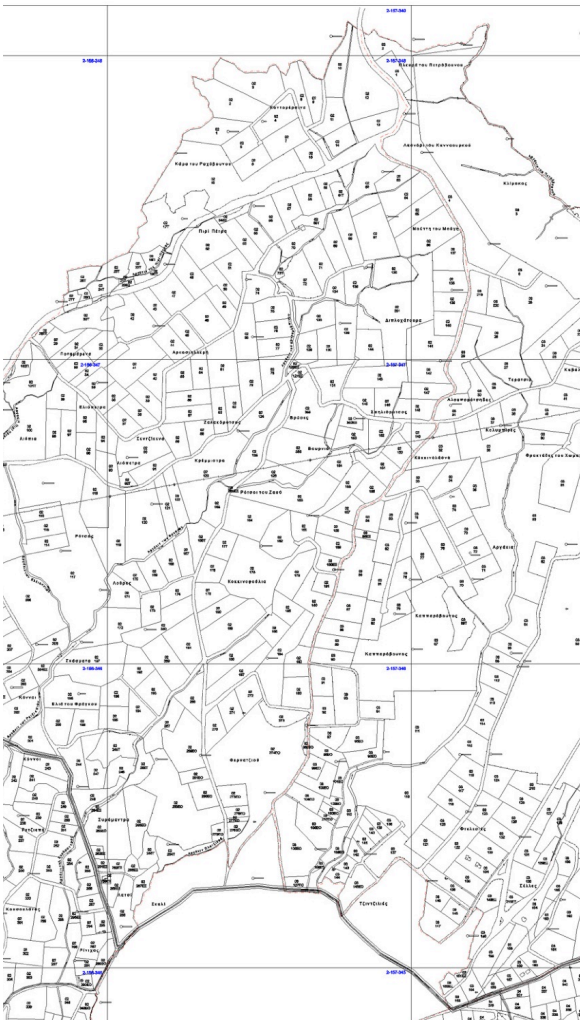


Figure 20: Part of map illustrating the land tenure structure after land consolidation was implemented in the Anarita Land Consolidation Scheme

Scheme 6 – Arodes Land Consolidation Scheme

Before

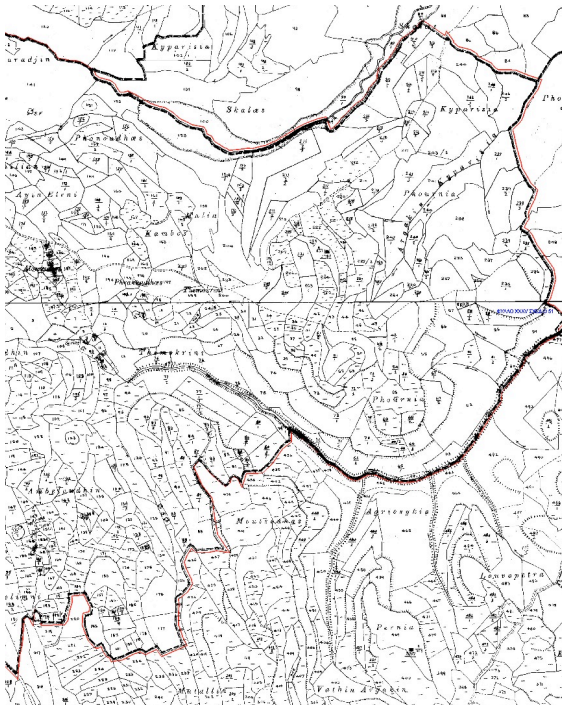


Figure 21: Part of map illustrating the land tenure structure prior to land consolidation in the Arodes Land Consolidation Scheme.

After

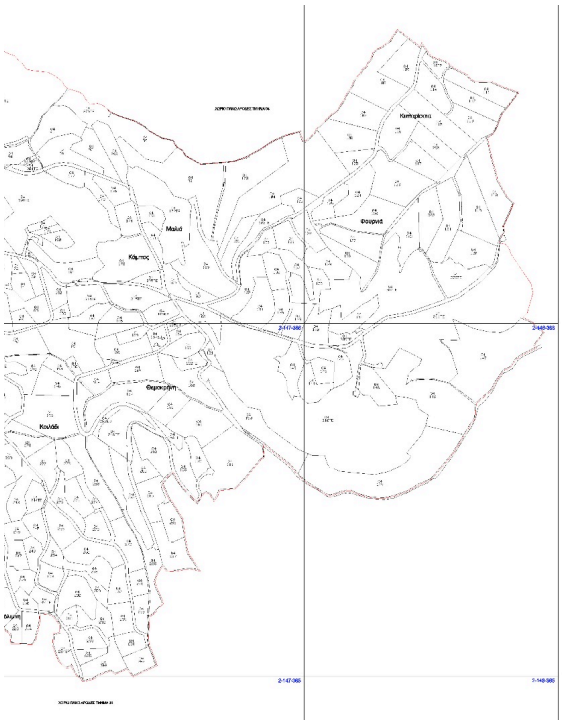


Figure 22: Part of map illustrating the land tenure after land consolidation was implemented in the Arodes Land Consolidation Scheme.

Scheme 7 – Pegia Land Consolidation Scheme

Before

Figure 23: Part of fragmentation plan prior to land consolidation in the Pegia Land Consolidation Scheme *(LCD, 1993 p. 109)*.

After

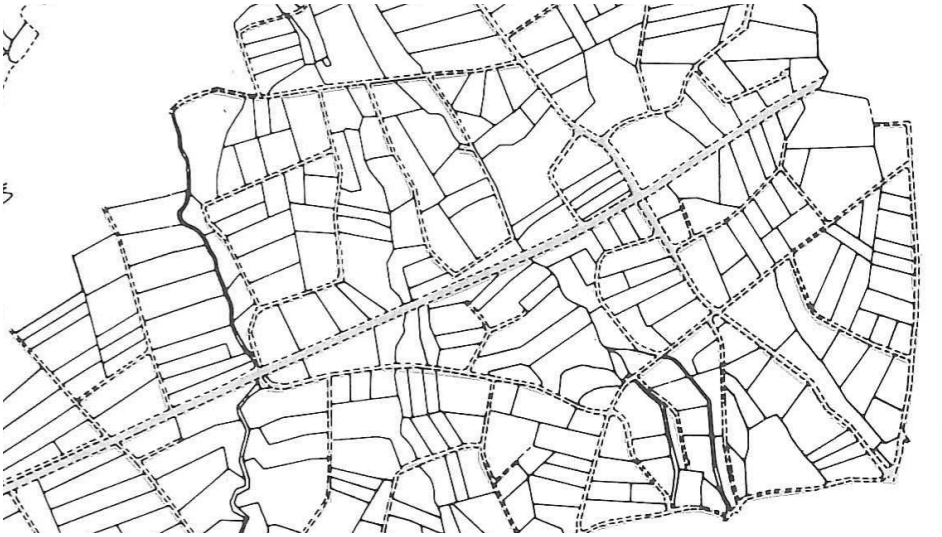
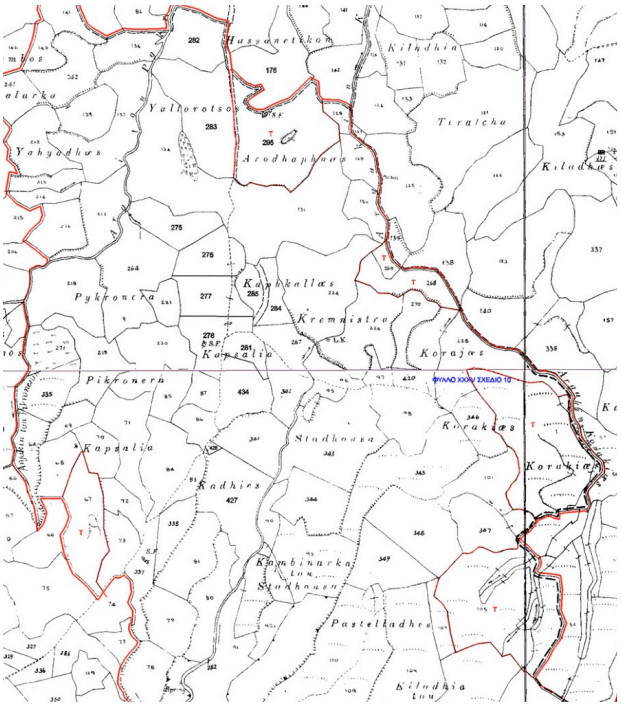


Figure 24: Part of fragmentation plan after land consolidation was implemented in the Pegia Land Consolidation Scheme *(LCD, 1993 p. 109)*.

Scheme 8 – Drousia Land Consolidation Scheme

Before



After

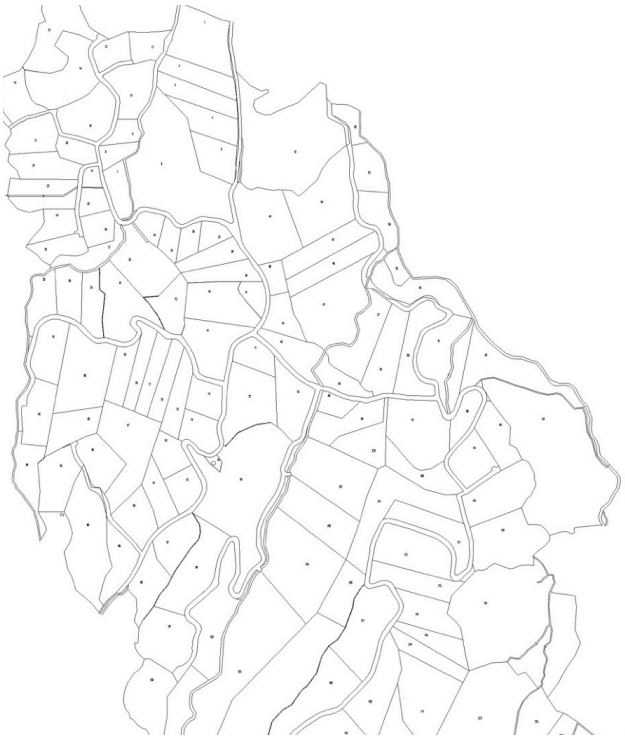


Figure 25: Part of fragmentation plan prior to land consolidation in the Drousia Land Consolidation Scheme.

Figure 26: Part of fragmentation plan after land consolidation was implemented in the Drousia Land Consolidation Scheme.

From the fragmentation plans presented above there are significant differences in the plans before land consolidation compared to the ones after. The pre-land consolidation fragmentation plans are characterized by irregularly, weird shapes, small parcels and more or less no road access. A prerequisite for land consolidation is as mentioned all parcel owners having road access to their property, which we can see from the plans presented. There have been great structural changes in the size of holdings where enlargements of plots are dominant, a result of the abolition of multiple-ownerships. This enlargement of plots result further in less boundaries.

Some of the schemes visited had parcels under Turkish-ownership. These are marked with red boundaries in some of the cadastral and land consolidation plans. Earlier these were excluded from the land consolidation measures and remained "untouched". In some cases they could be included, but then needed an approval from the Minister of Interior. As 24th of June in 2005, it was decided that Turkish-ownerships should be included in a land consolidation scheme and are today included and handled at the exact same level as Greek-Cypriot ownerships. The

Land Consolidation Service shall now treat the owners of the Turkish Cypriot parcels as the Greek Cypriot landowners. According to the Director of the Land Consolidation Service it is a better situation today by including them compared to before. It is now created more complete and comprehensive results. The areas are still in the custody of the Minister of Interior today and need an approval for further procedure (Frosoula Christofidou, personal communication, February 24th, 2017).

As seen in figures 11 to 26, land consolidation contributes to the improved design of plots. However, since the Land Consolidation Service is not able to eliminate all the co-ownerships due to the measure (table 2 and 3), a max enlargement of plots is hard to accomplish.

When it comes to the development of road network, it was stated during my observation studies that culture, ancient and historical sites, geological layers and formations also were taken into account when considering the development of roads. This means that the environment also is considered during the consideration of infrastructure implementation.
In addition future plans for the area, factors as plot merging, reallotment etc., necessity of extra road network based on the demands of the owners and technical aspects of the road design are emphasized before implementation as well.
A primary criterion was emphasized and included that all plots after land consolidation, shall have clear access, without any obligation to any other adjacent landowner. The "Town Planning and Housing Department" has to conduct an approval to continue with further development. Measures such as road and drainage network and other infrastructure are part of a technical study, a work supervised by the Land Consolidation Department Service personnel.

Some changes identified for the seven schemes regarding infrastructure, are presented in table 5 below.

Table 5: Changes in infrastructure due to implementation of land consolidation. Data regarding Scheme 1, 2 and 7 are collected from the publication of the Land Consolidation Department of 1993 (LCD, 1993 pp. 36, 41 and 108). Data regarding Scheme 3, 4, 5 and 6 are collected during fieldtrip.

	Infrastructure	Length of roads (km)	Plots served by roads	(%) of plots served by roads	Area served by roads (decares)	(%) of area served by roads
	Nicosia district					
Scheme 1	Agios Ioannis Malountas Land consolidation area (before)	15,7	944	33,5	368,7	33,8
	Agios Ioannis Malountas Land consolidation area (after)	41,0	610	100,0	1 054,06	100,0
	Percentage change (%)	+161,15	-35,38	+198,51	+185,89	+195,86
Scheme 2	Xyliatos Land consolidation area (before)	5,3	73	10,0	26,0	12,3
	Xyliatos Land consolidation area (after)	21,8	371	100,0	190,6	100,0
	Percentage change (%)	+311,3	+408,22	+900,0	+633,08	+713,01
Scheme 3	Orunta 1 (before)	7,1	106	27,82	64,18	30,47
	Orunta 1 (after)	20,5	340	100,0	202,46	100,0
	Percentage change (%)	+188,73	+220,75	+259,45	+215,46	+228,19
Scheme 4	Katopkopia 1 Land consolidation area (before)	1,69	18	6,19	70,9	6,56
	Katopkopia 1 Land consolidation area (after)	13,30	294	100,0	1 013	100,0
	Percentage change (%)	+686,98	+1533,33	+1515,51	+1 328,77	+1424,90
Scheme 5	Arodes Land consolidation area (before)	27,4	576	39,29	2 224	29,17
	Arodes Land consolidation area (after)	59,9	963	97,08	7 278,7	99,44
	Percentage change (%)	+118,61	+67,19	+147,09	+224,94	+240,90
	Pafos district					
Scheme 6	Anarita Land consolidation area (before)	22,20	519	64,23	7 281,7	73,83
	Anarita Land consolidation area (after)	56,50	996	100	9 385,7	100
	Percentage change (%)	+154,50	+91,91	+55,69	+28,89	+35,45
Scheme 7	Pegia (before)	26,8	313,5	43,6	585	43,6
	Pegia (after)	53,7	685,1	100,0	1 092	100,0
	Percentage change (%)	+100,4	+118,53	+129,35	+86,66	+129,35

When regarding the length of roads, the Xyliatos Land Consolidation Scheme is of special interest due to the large increase in road network changing from 5,3 km to 21,8 km representing 311 %. This area is characterized by a steep terrain, which made road access impossible. Due to the implementation of land consolidation and the improved land tenure structure, it was possible to implement a broader network of roads to the parcels. The Agios Ioannis Malountas Scheme has a decrease in the number of plots served by roads. This scheme has to be seen in relation to its many small parcels prior to land consolidation and the emergence of these. However, even though this table presents a decline at this point, there is a positive effect observed in reality due to the emergence of larger plots and less roads needed to serve these.

A negative effect is identified as a result of the wider road network establishment. Increased transportation results in more cars, tractors and other transportation vehicles contributing to further pollution of the area. Something which is impossible to avoid.

By communication with the Director of the Land consolidation Service, all owners in every land consolidation area have to contribute proportionately land for the infrastructure works (farm roads). The land for building infrastructure is taken from the landowners themselves, an equal amount from each part. This value will be deducted for those concerned. If the owner has to pay construction costs higher than the value of lost land from the land consolidation

measure, this amount will be subtracted (Frosoula Christofidou, personal communication, February 21st, 2017).

All in all, as presented in the section regarding the economic effects, establishment of further road network has contributed in significant manners providing an increase of 198,18 % of farm roads for Cyprus.

According to collected data in Nicosia, land consolidation measures, based on numbers from 2013 of the 78 completed schemes, led to substantial structural changes, such as an increase, on average, in the size of ownership by 32 %, elimination of land fragmentation by 54 %, enlargement of the land plot size by 103 %, abolition/elimination of mixed land tenures by 89 % and the return to cultivation of abandoned agricultural land.
According to the 2010 Census of Agriculture, the average area per holding was 30 decares (30 000 m^2), while the average number of parcels per holding, in accordance with the Cencus of Agriculture of 2003, was five parcels.

5.2.4 Cultivation of landscape – What kind of effects are to be seen in the cultivation of landscape?

My reflections regarding the effects on the cultural landscape are based on Sky´s (2009) and Burton and Kings (1982) perceptions of these effects affecting the landscape, nature and the environment due land use changes (Burton & King 1982 p. 195; Sky 2009a p. 147).

Environmental changes are not always easy to spot. The development of irrigation and drainage systems, mechanization, specialization and increase in labour inputs have resulted in big visual changes in the cultivation of landscape in Cyprus. Crop diversity and crops scheduling are identified as positive effects in my selection of schemes. To give a better insight into these impacts, I will further present some pictures of the landscape post land consolidation measures, pictures relating to each scheme.

Nicosia District

Scheme 1 – Agios Ioannis Malountas Land Consolidation Scheme

The Agios Ioannis Malountas Land Consolidation Scheme is characterized by rainfed lowland and is the biggest land consolidation project completed by the Land Consolidation Service, covering an area of 1 090,7 hectares (10,9 km^2). It has still not been implemented any bigger projects in the subsequently. The duration of this project was seven years. One of the reasons for this long duration of time was that the consolidation work was stopped for some time due the Turkish invasion in 1974. This land consolidation area is special since the village and residual area were included in the land consolidation plan. Normally villages were excluded. As shown in figure 27, the landscape does now have a wide spectre of cultivation including cereals, legumes, fodder crops and olives. In areas were irrigation was done, it was now also possibilities for cultivation of potatoes, vegetables and nuts.

Figure 27: The landscape of the Agios Ioannis Malountas Land Consolidation Scheme is significantly characterized by cultivation and crop diversity.

Scheme 2 – Xyliatos Land Consolidation Scheme

The Xyliatos Land Consolidation Scheme started in May 1979 and was completed in October 1983. This scheme is located in irrigated highland characterized by a terracing landscape covering an area of 210 hectares (2,1 km^2). Due to the steep terrain these terraces are made in order to enable cultivation, as shown in figure 28. Like this the water stays to moisten the soil and the crops instead of "running away". Agricultural equipment is also easier to use when the land is flat compared to a hilly terrain, which makes it quite dangerous.

A significant change was done regarding the road network (figure 29), increasing road access with 408 %, changing from 73 parcels with road access to 371.

The Xyliatos Dam (figure 30) provides water to the village, which contributes to cultivation of legumes, vegetables, almonds and olive trees.

Figure 28: Terraces are made in order to make farming possible in areas that used to be inaccessible for farming in the Xyliatos Land Consolidation Scheme.

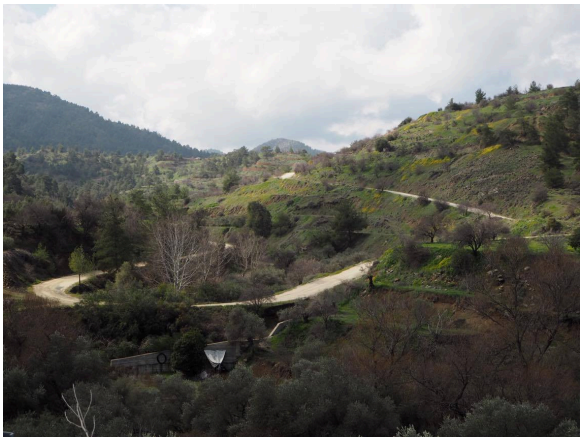


Figure 29: Road network constructed in the Xyliatos Land Consolidation Scheme by the Land Consolidation Service as a result of land consolidation measures.

Figure 30: The Xyliatos Dam providing water for the inhabitants as part of the land consolidation scheme.

Scheme 3 – Orunta Land Consolidation Schemes

Orunta 1

The Orunta 1 Land Consolidation Scheme is irrigated covering an area of 2 159 decares (2,16 km^2). The project started 24th July in 1998 by the publication of the list of owners and was completed 10th October in 2003 after five years of land consolidation implementation when the assumption of possession of new plots by their owners took place. Now in the irrigated area potatoes is the main cultivation (figure 31). The water for the cultivation of crops gets transported through underground water pipes from the main river of the village (figure 32). During my field trip I was able to see that this area was also used for weather measurement.

Figure 31: Due to implementation of irrigation systems, Orunta 1 is now able to produce potatoes as the main cultivation.

Figure 32: Water supply is provided through water pipes to obtain optimal cultivation of crops in the Orunta 1 Land Consolidation Scheme.

Orunta 2

While the Orunta 1 scheme was in progress, the landowners developed a further interest for land consolidation implementation, resulting in the Orunta 2 Land Consolidation Scheme. This is an irrigated scheme covering an area of 1 812 decares (1,81 km^2).

This project started 9th of August 2006 and is still under progress today. When this scheme will be completed it is impossible to know. This scheme was going to be completed between the end of December 2013 and the beginning of 2014, but from July in 2013 to December 2014 land consolidation works were suspended due to liability assumed by the stat in implementing the loan contract as the majority of the Land Consolidation Department staff was working for the Lands and Surveys Department. The project will continue as soon as the staff comes back.

The roads are already constructed but the ownership plan remains unfinished. 3 km of trenches are established making sure all fields have access to water. Potatoes and vegetables are the main cultivation in this scheme, shown in figure 33.

Figure 33: The Orunta 2 Land Consolidation Scheme is still under progress, but cultivation of vegetables and potatoes are already possible.

Scheme 4 – Katokopia 1 / 2 Land Consolidation Schemes

Katokopia 1

The Katokopia 1 Land Consolidation Scheme started 14th of November 2003 and was completed 22nd November in 2010. This scheme was irrigated covering an area of 1 091 decares (1,09 km^2). The main cultivation here was fruits, mainly oranges.

In this scheme systems of drainage were implemented (figure 34).

Figure 34: As a result of land consolidation gravel roads are constructed with a slope for proper drainage.

Katokopia 2

The Katokopia 2 Scheme started in November 2009 and is still under study. The list of owners was published on 28th of February in 2013. This scheme was also triggered by the land consolidation implementation in the Katokopia 1 Scheme resulting in interest for land consolidation measures as well in another area. The lack of staff is also a factor hindering completion of this project. If possible, it will be continued, but it is very uncertain.

Due to implementation of irrigation systems, access for water is improved which makes oranges a dominant crop (figure 35).

Figure 35: As a result of land consolidation, water supply is implemented and makes cultivation of vegetables and fruit possible.

Pafos District

Scheme 5 – Anarita Land consolidation area

The Anarita Land Consolidation Scheme started 9th of September in 1994 and was finished 1st of September 2005. This scheme was irrigated and rainfed (arid or dryland) located in a half mountainous area covering 10 140 decares (10,14 km^2). The village was in this project excluded from the land consolidation measures.

This area has the second biggest dam on the island, contributing with water to the inhabitants (figure 36). The water runs through a cleaning system making drinking water for the villages in Pafos. This is located near the dam. Normally does dam contain 52-53 million tons of water but at the time I was there it was about 30 only, this is due to the dry period covering the whole country.

In this scheme an area was reserved for the army constituting governmental property. This was private land belonging to private owners prior to land consolidation but now it is owned by the State. This was done with exchange of land in other places within the land consolidation area. Other areas are transformed to State land in order to protect specific geological formations (figure 37).

Figure 36: The Asprokremmos Dam was developed during the land consolidation project in the Anarita Land Consolidation Scheme, providing water to the inhabitants of Pafos.

Figure 37: Geological formations protected as State land as a result of land consolidation implementation.

Scheme 6 – Arodes Land Consolidation Scheme

This scheme started 21st of September in 1984 and was finished 1st July in 2000, covering an area of 7 710 decares (7,71 km^2). Since this type of scheme is arid (rainfed), the main cultivations are vines grapes due to the need for an ”in between temperature” and altitude soil.

This scheme had one irrigated area and one dry area with further 50 km of road network that has been constructed as a result of land consolidation measures giving access to all the new plots.

Parts of this land consolidation area are registered as State land as well. This is to protect a biotope of endemic narcissus plants in collaboration with the Department of Forests (figure 38). The area is fenced and looked after annually by the Department of Forests. The biotopes are also to be found on private land in the same area. Even though this private land is not protected by the State, the biotopes are not cultivated for any other purposes and therefore remained.

Figure 38: Biotopes protected as State land as a result of land consolidation implementation.

Some land areas were lying ”fallow” due to the desire of changes in grape types to avoid diseases. In the ”valleys”/”pits” in this scheme, it was characterized by seasonal cultivation where corn was identified in several places.

Through land consolidation and reallocation measures, physical features of great significance are spotted and protected. A church of 900 years, “the Church of Virgin Chrysospiliotissa”,

has been restored while the surroundings have been put into shape (figure 39). It was further restored another church in 1930 but this one is located further up in the area. The Land Consolidation Service created a park as well in this area for social gathering. It is important to emphasize that this park-area is separated from the Church.

"The Kouphos Gorge" is a part of the impressive Gorge with lush vegetation and nests of wild birds, which entails in protection by the State changing the area to State land (figure 40).

Figure 39: As a result of land consolidation measures, the Church of Virgin Chrysospiliotissa was converted to State land for protection due its historical significance

Figure 40: Due to "The Kouphos Gorge´s" lush vegetation and nests of wild birds was the area protected as State land after land consolidation.

Scheme 7 – Pegia Land Consolidation Scheme

Pegia Land Consolidation Scheme is irrigated covering an area of 7 240 decares (1,7 km^2). This project started 13th of July in 1980 and was completed 1st of July 1989. Due to the implementation of irrigation, bananas are constituting the main cultivation in this scheme as shown in figure 41.

Figure 41: Improved access for water enhance banana plantations in the Pegia Land Consolidation Scheme

Scheme 8 – Drousia Land Consolidation Scheme

This project started in 1997 but is still under progress. Another scheme suffering due to the lack of staff. In addition to this, the project was "frozen" by the government for several years for different reasons. Due to the long duration of time it is still unknown when the project will proceed. Two sets of road networks are worked out (figure 42). The first one was completed several years ago while the second one was completed in 2016. There are still 1 or 2 remaining.

For the moment, suggestions for boundaries are being made so the owners have to come for inspection and agree.

This scheme is a mixture of arid and irrigated land covering an area of 2 970 decares (2,97 km^2). Main cultivations are citrus, olives, carobs and almonds.

In this scheme there have been parcels under Turkish ownership. These are marked with red boundaries on the map and they are not included in the project. In this case they mostly stay the same. Maybe some of the boundaries have to be altered because of infrastructure networks. Turkish Cypriot parcels are excluded since the scheme started in 1997.

Figure 42: A significantly increase in construction of road networks is identified as a result of land consolidation.

In addition to the findings presented above, culverts were spotted during fieldwork. These culverts are made of concrete-material and constructed in order to enable water running through by natural drainage and stream crossing, without causing destruction of the roads (figure 43).

Figure 43: Bridges built with integrated culverts for water drainage in relation to road systems.

When traveling between schemes, boundaries were identified in different forms (figure 44). Some boundaries consisted of rocks. Despite this being a common feature in the past, these were still to be found several places. Trees were also planted in order to show the borders between two plots. In areas where land consolidation has been implemented, so-called "wooden-polls" are deployed as boundary marks. If the owners want, they can "upgrade" these themselves to iron polls if desireable which are bigger, more visible and more solid.

Figure 44: Example of prehistoric boundary lines (left) and boundary marks placed by the Land Consolidation Service after land consolidation measures (right).

Implementations of new irrigation systems are probably the most significant reason for positive changes in cultivation (figure 45 and 46). Access to water makes crop diversity possible with fruit and vegetables as the main cultivation. According to the Census of Agriculture of 2010 olive trees contributed with 49,2 % of the total area for permanent crops with citrus fruits following with 15,9%.

Figure 45: Canal built by the Land Consolidation Service together with the Water Development Department providing water for the inhabitants in the Pafos District.

Figure 46: Irrigation systems integrated due to land consolidation implementation.

78 schemes are completed by the end of 2016 covering an area of 184 441 decares (184,44 km^2). This KPI data is collected from within the Service. The total area of the schemes being implemented during the following year will of course be added to this number. This indicator is calculated as a percentage of the total area of completed land consolidation schemes to the total area of the census of agricultural land of 1 377 642 decares. The KPI is measured to be 13,39 % of the total area.

Due to the extent of completed schemes in Cyprus, I had to make a selection that would represent my findings. Although Vyzakia is not one of these, I will still draw some lines against the last recorded findings of Per Kåre Sky in 2008 since I was able to visit this scheme as well. These comparisons are of interest to see if any further changes have been done since the last visit of Sky in 2008 and until today in 2017. Vyzakia will thus be presented in a short way for comparisons to previous findings only. The three first pictures that will be presented below are taken by Sky during his visits in 1999, 2004 and 2008 while the last picture is taken myself, all pictures taken from the same viewpoint.

The Vyzakia project started in August 1991covering an area of 135 hectares characterized as irrigated lowland and semi-mountainous terrain.

Prior land consolidation the Vyzakia landscape was relatively monotonous with limited agricultural activity. There was a clear need to simplify land ownership and tenure, as well as to build infrastructure. Figure 47 shows the situation from Sky´s first visit in 1999.

Figure 47: The Vyzakia Land Consolidation Scheme pictured during Sky´s first visit in 1999 *(Sky, 2009a, p. 190)*

When he visited the area for the second time, in 2004, changes were identifiable. The new owners taken over their holdings in 2000, it was increased activity and changes in land use. Citrus and olive trees were noticeable in a bigger extent, resulting in increased production in total. Figure 48 shows how the area looked like during his second visit.

Figure 48: The Vyzakia Land Consolidation Scheme pictured during Sky´s second visit in 2004 *(Sky, 2009a, p. 191)*

During Sky´s third visit, even more severe changes to the cultivated landscape had been conducted. Boundaries had been straightened up and the plots had more logical shapes. The cultural landscape was now even more varied. New agricultural products were seen, among these water-dependent crops. Residential home were also identified in the area. Figure 49 shows how the area looked in 2008.

Figure 49: The Vyzakia Land Consolidation Scheme pictured during Sky´s third visit in 2008 *(Sky, 2009a, p. 191).*

The fieldtrip of this study took place in February 2017 and in figure 50 further changes can be identified, compared to 2008. The area is still characterized and dominated by cultivation due to the area being irrigated. Implementation of crop diversity is likely to have taken place.
The scheme is divided into several smaller areas for production of different crops, which is likely to be possible because of the increased access to water.

Figure 50: The Vyzakia Land Consolidation Scheme pictured during fieldtrip conducted in 2017.

It turns out that for every land consolidation scheme, plans are prepared and implemented for the protection of the environment, natural and structured, for the upgrade of environment, for the safeguarding of the wild flora and fauna, for the protection of biotopes and for the protection of the cultural and physical features of the rural landscape, according to the legislation Article 26. Such areas were visited in the Pafos District. Arodes Land Consolidation Scheme for instance, was an area consisting of protected biotopes and nests of wildlife birds.
An output KPI for the average number of landscape renovation and protection of the environment plans implemented within 3 years, was calculated to be 22,5 plans for the years 2003-2013.

According to the Annual Report of 2013, landscape renovation works, including preservation of cultural heritage monuments, creation of small parks and green areas, amounted to be a total expenditure of about 22 000 euros.

Sometimes the Land Consolidation Service use State land to replace land taken from private owners for governmental use, for instance to protect biotopes, rocks etc. as here. And sometimes they gather small parcels of maybe only 200-300 m2 together to one land giving in replacement.

Mechanisation, specialisation and an increase in labour inputs have resulted in significant visual changes in the cultivation of the Cypriot landscape. Crop diversity and crop scheduling are identified as positive effects due land consolidation implementation.
Protection of the environment, flora, biotopes and cultural and physical features of the rural landscape are given focus through own plans.

5.2.5 Conclusions

The conclusion of this master thesis is that land consolidation contributes to improvements for agricultural holdings resulting in an overweight of positive economic and social effects, effects on the design of plots, infrastructure and cultivation of landscape provided that land consolidation is implemented correctly. Cyprus is unique when it comes to including owners into the process.

Today, the continuous pressure on fertile agricultural land from other land uses (e.g. touristic, urban, industrial) limits the agricultural development. At the same time, a large extent of agricultural and urban land remains in inertia due to land tenure problems and lack of access.

6.0 Final reflections

Writing this master thesis has been interesting and instructive. This thesis has introduced me for land consolidation measures outside my home country's borders.

Cyprus has achieved great positive changes as a result of land consolidation despite a less efficient system dominating today. As we can see from my analysis and discussion above, significant changes in the design of plots, road network and cultivation have contributed to efficiency in farm work, increased possibilities for full-time farmers, increased productivity and incomes resulting further to higher welfare. The total labour input in agricultural holdings by holders and family members amounted to be 3 560 267 days in 2010, corresponding to 15 848 full-time equivalent persons employed. This was stated in documents retrieved in Nicosia.

To acquire knowledge about a topic that is completely unknown is time-consuming and challenging. But the process has been very exciting and being able to visit Cyprus personally contributed to a better overall impression of how the land tenure problems occur in Cyprus today.

Fieldwork, access to documents and personally contact with land consolidation employees have all contributed to increased knowledge and contributed to widening my perceptions for this problem-solving tool internationally.

As a result of this thesis, I am left behind with an increased knowledge of land consolidation in a global perspective. Due to my observation studies, I have been able to see the wide spectre of problems that Cyprus has been able to confront by implementing land consolidation measures. Yet it is clear that they still struggle with doing it efficiently. The main reason is the lack of staff contributing to the long duration of projects. More efficient land consolidation measures will not be applicable unless the access to staff increases.
The owner´s unique space in a land consolidation process, do the clarifications of the relationship ´between owners and their property time-consuming. From my point of view it seems like the Inheritance Law is one of the basic and main causes for the long duration of projects because it contributes to multiple ownerships and a very complicated land tenure structure. As an "outsider" it was likely to believe that changes in this law would contribute to

reduce these problems. When this was discussed with the employees during fieldtrip, it was stated that when a Law is enacted it will stay like this and changes are not likely to be done.

Summarized, land consolidation implementation in Cyprus has developed and contributed significantly in preventing land tenure structure problems. Potential and knowledge is present for this measure to be fully implemented, but it is the lack of resources available that makes this challenging to accomplish. The country is dependent of access to more resources to be able to fully utilize this tool.

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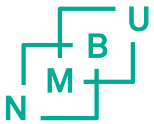

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