

Effects of Land Consolidation in Norway

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Abstract. *The main objective of this paper is to analyse the various effects of land consolidation and its impact on rural development in Norway. It is important to note that in Norway land consolidation remains the exclusive domain of the court system. Three cumulative requirements must be fulfilled before land consolidation can proceed in Norway. 1) The Land Consolidation Court may effectuate land consolidation if at least one property or easement in the land consolidation area is difficult to use gainfully at the current time and under the current circumstances; 2) The Land Consolidation Court may only proceed in this way in order to make the property arrangements in the land consolidation area more advantageous, and; 3) For any given property or easement, the land consolidation settlement shall not result in costs and other disbenefits that are greater than the benefits. All three criteria must be fulfilled. This paper presents and analyses cases taken before the Norwegian Land Consolidation Court using case studies, surveys and qualitative interviews with property owners and judges at the land consolidation courts. It is based on a literature review and secondary data collected by researchers and Master's students working on land consolidation in Norway in the period from 1992 to 2015, focusing on rural areas. The observed effects of land consolidation are separated into economic and spatial, legal, environmental and social effects. The analysis shows that the effects of land consolidation are difficult to estimate or to calculate. Future research should focus on developing better methods for both valuations and impact studies.*

Keywords: *land consolidation, economic effects, spatial effects, juridical effects, social effects, environmental effects, rural development*

1 Introduction

The main objective of this paper is to analyse the various effects of land consolidation and its impact on rural development in Norway. The legally defined aims of land consolidation vary from country to country. According to Vitikainen (2004, p. 25–26), the general objective is nonetheless to improve land division and promote the appropriate use of real estate. This is done by consolidating plots through land exchange to form plots that are better adapted to their proper

use. Land consolidation in Norway has an even wider general objective. Land consolidation can be defined as measures that can change properties, physically or organisationally, to improve their utility to the owners (Sky and Bjerva, 2018, p. 21). Norwegian definition of land consolidation is therefore broader than in many other European countries. A fundamental principle, and not only in Norway, is that no party shall suffer losses as a result of a land consolidation case (Oldenburg, 1990, p. 183). This constitutes an important prerequisite for the final decision concerning any given land consolidation plan. It is therefore important to have control and overview of the effects of land consolidation.

The measures used in land consolidation in Norway are listed in the Land Consolidation Act (Ministry of Agriculture and Food 2013). The Act comprises 10 separate measures that can be used individually or together in each case. According to the definition, land consolidation can be divided into physically and organisationally changes.

Physically changes (with reference to the Land Consolidation Act): Project-related land consolidation in conjunction with private and public projects; Conservation-related land consolidation as the result of the public authorities imposing constraints on the exercise of ownership rights (both Section 3-2); Modifications to property and perpetual easements (Section 3-4); Establishing joint ownership (Section 3-5); Dissolution of joint ownership and joint use (Section 3-6); and Division of property (Section 3-7).

Organisationally changes (with reference to the Land Consolidation Act): Rules on joint use (shared use arrangements) (Section 3-8); Orders to carry out joint measures and joint investments (Section 3-9); and Creating owner associations and establishing articles of association (Section 3-10).

The first dedicated land consolidation act was enacted in 1821 and the Norwegian Land Consolidation Court has been regarded as a special court since 1882. Although land consolidation is organised within the judicial system and the organisation and the objectives of land consolidation vary from country to country, the actual land consolidation process is surprisingly similar internationally (Sky, 2015, p. 81). The process in rural and urban areas of Norway is also similar and can be said to include the following stages (partly after Rognes and Sky, 2004, p. 61): applying for land consolidation; preliminary decision on whether the case shall proceed; informing the cadastral authority that a land consolidation claim has been made; clarifying the boundaries and easements and mapping of the consolidation area; performing a valuation of anything that is covered by the exchange; preparing a draft consolidation plan after input from the parties involved; presenting the plan to the parties for discussion; comments from the parties; making alterations to the plan that the land consolidation court deems right and proper in response to comments; and formal adoption of the plan. After the land consolidation plan is adapted, marking out of all new boundaries in the fields; and formal conclusion of the land consolidation proceeding in court. When the case is enforceable, the land consolidation court informs the cadastral authority (municipality) of the outcome of the case; and the outcome is recorded in the land registry.

Before land consolidation can proceed in Norway, three cumulative requirements have to be fulfilled: 1) The Land Consolidation Court may effectuate land consolidation if at least one property or easement in the land consolidation area is difficult to use gainfully at the current time and under the current circumstances; 2) The Land Consolidation Court may only proceed in this way in order to make the property arrangements in the land consolidation area more advantageous, and; 3) For any given property or easement, the land consolidation settlement shall not result in costs and other disbenefits that are greater than the advantages. It should be pointed out that these requirements apply to land consolidation in most countries (Sky, 2015). Based on the three requirements, it is important to map out what effects each individual land consolidation case will have, both overall and for each owner. This is especially important in view of the requirement that no-one shall lose out from land consolidation.

Several different approaches to determining the effects or benefits of land consolidation exist, for instance, looking at the socioeconomic effects or at the economic impacts on private interests. This paper focuses on the effects on private interests. The effects can be classified as economic, spatial, legal, social and environmental. Methods to analyse spatial effects have the strongest theoretical underpinning. Due to the close relationship between economic and spatial effects, these effects will be treated together. A shift towards methods that analyse land consolidation based on several criteria, also called multi-criteria evaluation, has been identified (Huylbroeck and Martens, 1990).

This paper is structured as follows. Section 2 gives a short description of the methods used in the different studies, and the scope. Section 3 present studies of each effect in greater detail. This section provides references to international research on the effects of land consolidation, before going on to present the findings. Section 4 compiles the major findings of the studies in a table, and discusses the findings further. Lastly, Section 5 draws conclusions based on the findings.

2 Method

This paper is based on a literature review and secondary data collected by researchers and Master's students working on land consolidation in Norway in the period from 1992 to 2015, focusing on rural areas. The extensive research material is detailed in Table 1.

Steinsholt (1994) and Espås and Lande (1992) performed both an economic and spatial analysis. Steinsholt carried out an in-depth study of project-related land consolidation for public roads, including studying different layouts on plots. He divided his analyses into effects on the private owners and on the road authority. Espås and Lande did an in-depth single case study of fragmented plots in a cultural landscape, characterised by stone fences. Geelmuyden (1994) did a case study and a landscape analysis on how land consolidation affected the landscape.

Jevnaker (2015) studied six project-related land consolidation cases and interviewed six land consolidation judges and five civil servants from the railway authority and the public roads authority. Gulliksen (2012) also studied project-related land consolidation. She studied the largest project so far in Norway,

which included 19,500 ha for a military training field. She interviewed the land consolidation judge who presided over the case and eight affected parties.

Hoddevik (2012), Myrvold (2012), Kollstrøm (2014) and Lyseng (2012) studied effects of joint measures and joint investments and the establishment of private common roads. Hoddevik studied economic, environmental and social effects, through eight case studies. All her cases were located in the western part of Norway and she held 38 interviews. Myrvold conducted four case studies and interviewed 16 parties. Kollstrøm investigated four case studies, which were appealed to the land consolidation court of appeal, where he interviewed the land consolidation judges in each case. He also interviewed the applicant in three of the cases (the last one did not wish to be interviewed), and the appellant in each case. Lyseng conducted six case studies, combined with interviews of land consolidation judges and 24 parties.

Gulbrandsen (2011) examined the long-term effects of joint use resulting from land consolidation. The study consisted of 30 cases. Four of the cases were used as pilot studies as a basis for his survey, and the remaining 26 for the survey itself. The survey was a net selection and included 85 participants, with a response rate of 86 percent (73 answers).

Oppegaard (2011) performed an in-depth single case study of land consolidation of joint measures of constructing of water pipes and sewages.

Table 1. Authors listed in alphabetical order and summary of the research method and the data.

Authors	Research method	No. of cases/ respondents
Espås and Lande (1992)	In-depth single case study	Single case
Geelmuyden (1994)	In-depth single case study	Single case
Gulbrandsen (2011)	Case study and survey	30 cases, 73 answers (response rate 86 percent)
Gulliksen (2012)	In-depth single case study and interviews	Single case and 9 respondents
Hoddevik (2012)	In-depth case study and interviews	8 cases and 38 respondents
Jevnaker (2015)	In-depth case study and interviews	6 cases and 11 respondents
Kollstrøm (2014)	In-depth case study and interviews	4 cases and 11 respondents
Laskemoen (2011)	Survey	107 answers (response rate 42,5 percent)
Lyseng (2012)	In-depth case study and interviews	6 cases and 24 respondents
Myrvold (2012)	In-depth case study and interviews	4 cases and 16 respondents
Oppegaard (2011)	In-depth single case study and interviews	8 respondents
Roalkvam (2003)	In-depth case study and interviews	2 cases and 25 respondents
Steinsholt (1994)	In-depth case study	4 cases

Oppegaard interviewed the land consolidation judge, one representative from the municipality, a lawyer representing one of the parties and five parties.

Laskemoen (2011) studied the social effects of land consolidation involving the dissolution of joint ownership and joint use. She performed a survey with 252 participants, with a response rate of 42.5 percent (107 answers).

Roalkvam (2003) performed two case studies of traditional land consolidation issues as fragmented holdings in the infields. In one case study he interviewed 11 parties and in the other one he interviewed 14 parties. Unlike the other studies, Roalkvam has a more general and theoretic approach. In his study the respondents had to describe their relationships to the properties, for instance if they were full-time or part-time farmers, or had other relationships to the properties. They had to describe both the positive and negative effects of the land consolidation and on that basis conclude if the land consolidation overall had been beneficial or not.

3 Effects of land consolidation

3.1 Economic and spatial effects

3.1.1 Literature review

Land consolidation is important for ensuring the economic viability of rural areas, see Van Huylbroeck et al. (1996, p. 300), Crecente et al. (2002, p. 141–142), Leń and Król (2016, p. 237) and Janus and Markuszewska (2017, p. 151), or Gonzalez et al. (2007) who focus on both spatial and economic effects. Several international surveys have calculated transport time before and after land consolidation. Burton (1988, p. 131–147) calculated the effect on transport times and working hours for villages in Cyprus. Burgmaier et al. (1995, p. 22–24) focused on the reduction in working hours and found improvements of 20–25 percent after land consolidation in Trochtelfingen in Germany. They compared the time spent working before and after land consolidation by means of working time studies. Gonzalez et al. (2007) have developed a method that combines size, shape and fragmentation of plots. This allows one to calculate the effects of changes to the layout of plots. The effect of different layouts is a type of spatial effect. Sky (1995 and 2002, p. 83–91) developed methods and tools for analysing the operational costs of plots of different size, shape, and distance (location) from the operational centre of the farm. The operational costs are expressed in terms of man and machine hours, and equipment per unit of land for different layouts of plots, and different crops. Once the work hours have been calculated, it is easy to calculate the economic effect.

3.1.2 Findings

In their studies, Steinsholt (1994) and Jevnaker (2015) both found that land consolidation had positive economic impacts on public and private owners. The benefits for the public sector are a reduction in monetary compensation payable to landowners since the alternative is expropriation, and lower costs for building crossings in conjunction with, for instance, railways or motorways. Steinsholt (1994, p. 29) also highlights the reduction in the number of crossings. Jevnaker

points out that both the railway authority and the public roads authority stressed what they called a “goodwill effect”. The goodwill effect can be described as the authorities attempt to help reducing the disadvantages and maintaining a good layout of properties. This effect is characterised by monetary compensation in combination with land consolidation (Jevnaker 2015, p. 46, 49). Another effect is a new layout of properties. Steinsholt (1994, p. 27) concluded that there were substantial economic effects for landowners who were active farmers. The effects for the public roads authority was a reduction in construction costs and lower monetary compensation payable to the owners (Steinsholt, 1994, p. 29–31). However, the effects of these types of land consolidation in forest areas are less beneficial. This is because these areas have less value and the disbenefits are consequently smaller than in agricultural areas (Jevnaker, 2015, p. 70).

In a case study of land consolidation of joint measures of constructing of water pipes and sewages, Oppegaard (2011, p. 74) found some similar effects. The land consolidation court organised the parties and they reached a settlement quickly compared to a traditional expropriation case. Land consolidation resulted in lower transaction costs and the litigation costs were lower than in the event of expropriation.

Hoddevik (2012, p. 101) found that investment in joint roads triggered positive economic effects, but it was difficult for the parties to estimate the exact value. Especially in one case, which was a private road to an area with leisure homes with no access to a road before land consolidation, a real estate agent documented that the road to the leisure homes increased the value of the properties considerably. The majority of the parties considered it reasonable for their properties to be part of the land consolidation case. Laskemoen (2011, p. 118) also asked about the parties’ self-assessment regarding the value of their properties after the land consolidation. She found that 43 percent said that they were better off, 48 percent said that the value was unchanged and 9 percent said that the value had dropped. It should be remembered, however, that participants are protected against economic losses in land consolidation cases in Norway, regardless of the parties’ subjective assessments.

Espås and Lande (1992) studied the effects of land consolidation undertaken in a cultural landscape. Lista, a coastal area in the southwest of Norway, is known for its stone fences, agricultural areas, and active farming communities. They found that it was economically efficient to increase the plot size in this area up to 1,8 ha (Espås and Lande 1992, p. 74). Further increase of plot size was relatively little profitable. If the environmental and aesthetic conditions of the landscape were taken into account, the preferable plot size was 1.2 ha. This shows that environmental effects may interact with and affect the economic impacts. Espås and Lande’s spatial analysis is based on Christoffersen (1988) and his analysis of the economics of agricultural use of plots of different sizes and shapes. Gulliksen (2012, p. 64) also found that larger plots had a positive economic effect for forestry, but did not conclude on any ideal plot size. Kollstrøm (2014, p. 105) found that a common road in a forest area had effects beyond making the forestry more efficient. It also facilitated big game hunting and other uses.

3.2 Legal effects

3.2.1 Literature review

The judicial and legal effects of land consolidation are not widely discussed in the literature. Norway has, compared to other countries, many disputes regarding boundaries and rights of use (Sky 2015, p. 89). Clarifying boundaries and easements is therefore an important aspect of Norwegian land consolidation. That, in addition to reduced fragmentation, the dissolution of joint ownerships and a reduction in the number of property boundaries, is an important judicial effect (Bonner 1987, p. 16). Land consolidation therefore often reduces the number of court cases and conflicts over property boundaries and easements. Another potential legal effect, is that the number of owners may be reduced by land consolidation. That is often the case in Cyprus (Burton and King 1982, p. 197), for instance. Abandoned properties, which the owner does not wish to farm, can be sold. No coercive measures for this exist in Norway, and although the Land Consolidation Act has provisions enabling the land consolidation court to facilitate purchases and sales, this rarely happens.

An advantage that is highlighted and mentioned as very important is that the property will be registered in the cadastre and the legal situation will be clarified after land consolidation (Archer, 1992, p. 294). Clarifying the land tenure, marking the boundaries and registering the properties in the cadastre are also important in Norwegian land consolidation. In some cases this is the most important effect.

3.2.2 Findings

Myrvold (2012, p. 101) found that the rules established by the land consolidation court were not subsequently followed by the parties in cases of joint measures and joint investments in a private road. The parties had the impression that the decision of the land consolidation court was to be seen as providing guidelines and therefore not legally binding (Myrvold 2012, p. 102). Kollstrøm (2014, p. 59, 110) also found that the parties had problems with both understanding and following the statutes decided by the land consolidation court. Gulbrandsen (2011, p. 70), on the other hand, found that the legal effect had the biggest impact on the parties and the statutes made the legal situation stable and predictable for the future. That again resulted in positive economic, social and environmental side effects.

Lyseng (2012, p. 87) found that in five out of six cases, the rules on joint use functioned as intended. In the sixth case, the rules only partly functioned because they were misinterpreted. She did not point out any specific effect, but she highlighted the need for good organisation, which includes both legal and social effects.

Steinsholt (1994, p. 35) pointed out legal effects such as clarification of property boundaries with roads in project-related land consolidation. Roalkvam (2003, p. 74) found that legal effects such as clarification of property boundaries was important for the parties involved in land consolidation.

3.3 Social effects

3.3.1 Literature review

Social effects are described as how land consolidation affects individuals and the relationships between people. The social effects of land consolidation are discussed in Van Huylenbroeck et al. (1996, p. 299), Goodale and Sky (1999), Coelho et al. (2001), Crecente et al. (2002, p. 142–143), Luo and Timothy (2017, p. 506–507) and elsewhere. In 1988, European experts in land consolidation were gathered in Germany. In a summary of key trends in European land consolidation, the need to take social effects into account was highlighted (Läpple, 1992, p. 10). Strong ties to and social relationships to individual plots are found in most cultures (Bonner, 1987; Burton, 1988; Behar, 1986).

3.3.2 Findings

Gulliksen (2012) found a good example of the strong relationships that the parties involved in land consolidation cases have with their plots. She studied project-related land consolidation, where most of the area was forest. Bear in mind that the layout of forest areas is different from agricultural areas. Gulliksen identified negative social effects in situations where people in favour of land consolidation exchanged plots with those who were against land consolidation (Gulliksen 2012, p. 60).

Laskemoen (2011) studied the social effects of land consolidation in conjunction with the dissolution of joint ownerships and joint use. Her study found a mix of both positive and negative social effects. The relationship between the parties was unchanged in 51 percent of the cases, worsened in 39 percent and improved in 10 percent (Laskemoen 2011, p. 104). However, these results may be biased, as Laskemoen used the term counterparty in her survey, instead of the more neutral term party/parties. This means that respondents may have answered this question based on an understanding that the survey's focus was only on their relationships with the parties they disagreed with and not their relationships with the parties in general.

The findings in Hoddevik's (2012) study differ substantially from those of Laskemoen. Hoddevik (2012, p. 98) asked the parties if their social relationships had changed after land consolidation. As many as 69 percent reported a positive effect, 25 percent said there had been no change and six percent said that the effect on their social relationships was negative. It is evident that the parties' relationships to the properties and possible changes to the properties can lead to changes in their social relationships. Unlike the study Laskemoen did in 2011, Hoddevik saw a positive change to social relationships. The parties clearly emphasised their happiness with the result and that the land consolidation process itself was crucial in terms of maintaining a good relationship between the parties. Oppegaard (2011, p. 78) highlighted the fact that the parties reached a settlement as a positive social effect. Roalkvam (2003, p. 71), on the other hand, found that several parties reported a negative social effect. It can be difficult to argue that one should get a better result of land consolidation than the neighbour should.

As described in Section 3.2.2, Myrvold (2012) found that the statutes established by the land consolidation court were not subsequently followed by the parties, partly because they were seen as guidelines, but also because the parties considered keeping good social relationships to be more important than following the statutes (Myrvold 2012, p. 103). This shows how the different effects interact with and affect each other.

3.4 Environmental effects

3.4.1 Literature review

The environmental effects of land consolidation are not widely discussed, but Sonnenberg (1996), Crecente et al. (2002, p. 143–144), Wang et al. (2015, p. 609–616), Leñ and Król (2016, p. 235–237) and Ettanen and Vitikainen (2016) give some important contributions. Environmental effects often affect people other than those who are directly affected by land consolidation (King and Burton (1983, p. 495). Bullard (1990, p. 31) argues that some of the positive effects of past land consolidation cases may become the environmental problems of the future, such as increased danger of erosion because of larger plots, monoculture, removal of border zones between plots, etc. These issues are well-known, and have been investigated in several projects in Norway (Geelmuyden 1994; Sky 1995).

In the 1970s, the Netherlands developed a multi-criteria evaluation method, taking into account visual impacts, historical qualities, ecology and social conditions in addition to economics (Janssen and Rietveld, 1985). Around 1990, The Agricultural University in Wageningen in the Netherlands tested a model to calculate income from agricultural production for various potential landscape changes (Moolenaar, 1990). This project concluded that major changes in the cultural landscape decreased rather than increased income. In conjunction with the FIG-congress in Helsinki in 1990 a resolution was adopted which emphasised that one should pay attention to the environment in connection with the implementation of land consolidation and that the relationship between the environment and land consolidation should be documented (Tenkanen 1991, p. 16).

3.4.2 Findings

In the context of environmental effects, building a road causes landscape effects. Hoddevik (2012, p. 97) showed that the land consolidation court took this into consideration and the vast majority of the interviewed parties mentioned that the land consolidation court took into account the terrain when the road was placed in the landscape. In such cases it is necessary with an official permit before the land consolidation court issues its final ruling. The environmental authorities therefore had to approve the project before the road was built.

Kollstrøm (2014, p. 89) also emphasises environmental effects and the fact that, according to the Land Consolidation Act, the municipality both handles and coordinates this issue and finally approves the route. Very often, forestry roads are subsidised by the public authorities, up to a ceiling of 75 percent of the cost.

Geelmuyden (1994, p. 31–32) highlighted that there can be conflicts between the positive economic effects and the negative effect on the landscape. She mentioned the negative environmental effects caused by the removal of stone fences and other linear elements in the landscape, such as border zones and ditches.

4 Discussion

The major findings of the studies are summarised in Table 2. As it is not possible to calibrate the various assessments that the authors have made, the effects are not graded beyond positive, negative or neutral.

This paper shows that there are fluid boundaries between the different effects of land consolidation in Norway and that they can affect each other. This is especially true of spatial and economic effects. This has been studied in depth by Steinsholt (1994) in his analysis of project-related land consolidation. Since no-one should lose out due to land consolidation, the economic effects have the highest importance. The other types of effects will, however, still influence whether or not land consolidation should proceed.

Further effects exist that are not easy to place in the categories presented in this paper. One example is one of the effects that Gulliksen (2012, p. 64) found in her study. The major effect was the timeframe: the case lasted for almost 10 years. That led to uncertainty. This is, however, much longer than the average duration of Norwegian land consolidation cases. Crecente et al. (2002, p. 146) concluded that Norwegian land consolidation was, on average, faster than in other comparable countries. The main reason why this case lasted so long was that it was the largest project-related land consolidation to date in Norway, which included 19,500 ha for a military training field.

Table 2. Authors listed in alphabetical order and their major findings, (+) = positive effect, (–) = negative effect and (0) = no effect). Open fields mean that the effect was not the subject of the survey.

Authors	Economic and spatial effects	Legal effects	Social effects	Environmental effects
Espås and Lande (1992)	+			
Geelmuyden (1994)	+			–
Gulbrandsen (2011)		+		
Gulliksen (2012)	+	+	–	
Hoddevik (2012)	+		+	+
Jevnaker (2015)	+			
Kollstrøm (2014)	+	0		+
Laskemoen (2011)	0		–	
Lyseng (2012)		+	+	
Myrvold (2012)		0	+	
Oppegaard (2011)	+		+	
Roalkvam (2003)		+	–	
Steinsholt (1994)	+	+		

King and Burton (1983, p. 489–490) refer to empirical studies of the economic effects of land consolidation in Finland, Switzerland, Austria, France and India. Their conclusions are that costs are reduced and that the economic yield thus increases. Nevertheless, the effects vary a great deal and depend on the time at which they are measured after the land consolidation case is finished. The problem with such surveys is that they are not corrected for the general development of the economy and society and the yearly fluctuations in crops. It can be difficult to assess the benefits and disbenefits of the various effects of land consolidation. It is necessary to ascertain the difference in conditions before and after land consolidation. Some conditions change immediately, such as reductions of the length of property boundaries, better layouts of plots and shorter distances from plots to the farm centre, while other things only happen after some time. For example, there may be a reduction in input factors in production and increased crop yields due to the effect of fewer borders. Undoubtedly, the effect of land consolidation can have multiple dimensions. This is also the case in Norway. In addition, people have differing relationships to their properties.

Discussion about the theoretical economic benefits of land consolidation is frequent. This is based on the following assumptions: a plot after land consolidation is homogenous, the farmer strives to improve his or her welfare, which is possible thanks to an assumed reduction in transportation and working hours combined with lower administrative costs (King and Burton 1983, p. 485–486). After land consolidation, the farmer saves time spent on transportation and the cost of moving heavy equipment from one plot to another. It also becomes easier to monitor the plots, working hours are reduced and work is easier to perform as a result of a better layout of plots. This assumes that the farmer adapts as described, is economically rational, appreciates the benefits of increased specialisation and adapts accordingly. However, behavioural research shows that this is not always the case and this can lead to a mismatch between the theoretical calculations in a land consolidation case and the actual outcome. The owners can have completely different preferences when it comes to what is useful for them. Both Kollstrøm (2014) and Myrvold (2012) give examples of the parties simply not understanding the new legal situation after land consolidation, which makes it difficult for the parties to both see and value their gain. It was therefore neither positive nor negative effects.

The study shows that the individual landowner or right holder is not concerned with the socio-economic benefits, and will primarily consider his own situation before and after the land consolidation (Roalkvam, 2003; Hoddevik, 2012; Laskemoen, 2011). Roalkvam (2003) found that the effects varied, depending on the parties' relationships to the properties and concluded that it is important to perform an individual analysis of each party (see also Goodale and Sky, 1999). Two identical properties can have different benefits of land consolidation because of differences in liquidity and access to capital (Roalkvam 2003, p. 93). He questions, whether objective considerations should still be the most relevant standard, or if subjective considerations would be more accurate (see also Bærug 2009).

It is arguable whether it is within the scope of the law that a single landowner may subjectively consider the land consolidation to be useful, while objectively it proves that the property suffers an economic loss. These calculations are not simple, as measuring tools are imprecise. In Norway, however, there is a statutory requirement for objective assessment of the properties' benefits. It is important to keep in mind that one of the reasons for objective assessments is the interests of the mortgagee, which require that the property should not diminish in value due to land consolidation. Little discussion of this can be found in the international literature, probably due to great effects and public subsidies of land consolidation. From the perspective of private economic interests, an identified condition for carrying out Norwegian land consolidation is that no property should suffer loss.

5 Conclusions

Land consolidation settlement shall not result in costs and other disbenefits that are greater than the advantages. It should be noted that, this requirement applies to land consolidation in most countries. Continuous focus is placed on what can be achieved through land consolidation, therefore the methods for mapping effects and gains must be further developed. More advanced methods, like calculating the consolidation coefficient and reduction index (Crecente et al. 2002, p. 139), are not used in Norwegian land consolidation. The analysis show that the effects of land consolidation in Norway are difficult to estimate and calculate.

Future research should focus on developing better methods for both valuations and impact studies. Calculating the effect of the layout of plots before and after land consolidation is an obvious method to ensure that the parties are protected against losses. A good example of highlighting the effects of land consolidation after it has been carried out can be found, for example, in Cyprus (Demetriou, 2014, p. 136) and Spain (Crecente et al. 2002, p. 139). In Cyprus they even put up road signs with this information. It will also be interesting to investigate more closely whether the effect of land consolidation changes over time and whether the parties change attitude on how they look at land consolidation. However, the overall impression from the 13 presented studies and the analysis undoubtedly shows that land consolidation has a positive effect on rural development in Norway.

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