Land Consolidation and its Effect on Climate

FIG Working Week 2012

Rome, Italy

Knowing to manage the territory, protect the environment, evaluate the cultural heritage

TS01K - Climate Change and Environment
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NATIONAL LAND SURVEY OF FINLAND

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Land Consolidation and its Effect on Climate

Content of the presentation

- ❑ As a conclusion this presentation will present the monetary value of land consolidation climate effect in Finland.
- ❑ Before this conclusion the methods that was used to analyse the problem are prensented.
- ❑ And before the methods, the importance of the study is discussed: why was it necessary to calculate land consolidation's climate effect.

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Land Consolidation and its Effect on Climate

Importance	Methods	Conclusions
<**Agricultural policies**>	<Land consolidation policies>	<Land cosolidtion projects>

Agricultural Policy Objectives are set to Prevent Climate Change

- Climate change is estimated to impact the Finnish nature in various ways. The situation is the same all around the world.
- Combating climate change is a top priority for the European Union (EU). Europe is working hard to cut its greenhouse gas emissions substantially.
- As agriculture is a significant contributor to climate change (agriculture's proportion of the EU's total greenhouse gas emissions is 9 percent) the Ministry of Agriculture and Forestry has published an action plan to address the matter.
- The action plan defines 14 measures for agriculture that help the adaptation or prevention of climate change.
  - The action plan looks for synergies between different actors and sectors and identifies linkages between climate change and other policy objectives.
  - The first measure mentioned states that climate change must be taken into consideration when other agricultural policy objectives are defined.

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Importance	Methods	Conclusions
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Why do we need to evaluate the effects of land consolidation?

- The link between land consolidation and climate change is recognized in Finnish land consolidation strategy.
  - The strategy states that land consolidation should broadly support social goals, such as rural viability and environmental protection so that the activities would help to achieve the best possible overall impact to social welfare.
- According to the strategy public financing should be allocated so that the measures implemented produce the best possible impact.
  - The focus in 2008-2013 should be on combining different points of view in land consolidation, in which case views related to the environment etc. can be more extensively taken into consideration.

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Importance	Methods	Conclusions
<Agricultural policies>	<Land consolidation policies>	<**Land cosolidtion projects**>

Why do we need to evaluate the effects of land consolidation?

- Traditional effects of land consolidation like reduced production costs can be defined in monetary terms quite easily.
  - But as the objectives of land consolidation have become more complex so has the decision making process.
  - This has meant that in addition to direct market based values other benefits and drawbacks e.g. environmental effects should be taken into consideration as well.
- One aspect that is not properly taken into consideration when the overall impacts of land consolidation are calculated and the implementation decision made is emissions to climate.
  - There is a strong hypothesis that reduced agricultural traffic reduces petrol consumption and therefore reduces harmful emission to air.
  - But as there are no valuation methods to valuate either the reduced petrol consumption or its monetary effect the importance of land consolidation's climate effect might be under- or overestimated.

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Importance	Methods	Conclusions
<**Objectives**>	<Methods>	<Data>

How much does petrol consumption reduce and what is it worth

- This case study analyses:
  - how much does petrol consumption reduce in land consolidation because of the reduced need for agricultural transportation due the reduction of land parcels and/or distance to compound (Objective 1).
  - what is the monetary value of the reduced emissions to climate due to the reduction in petrol consumption (Objective 2).
- As a result the study that is based on inductive reasoning presents a generalization of the importance of land consolidation's climate effect.

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Importance | Methods | Conclusions

<Objectives> <**Methods**> <Data>

Production cost calculations and substitute cost method

- To define the reduction of petrol consumption (Objective 1) production cost calculations are used.
  - There are two main actors, National Land Survey of Finland (NLS) and Work Efficiency Institute (FEI), providing production cost calculations in Finland. Among other things these calculation provide information about cultivation time and travelling time in a function of parcel size and distance to compound.
- To estimate the monetary value of the climate effect, substitute cost method is used. Applying the substitute cost method includes three steps.
  - The first one is to assign the environmental service or benefit by specifying the relevant good (CO_2) and the levels of the good (reduction of CO_2).
  - The second step is to find and identify alternative cost to provide the same benefit, good or service.
  - The third step is to calculate the cost of the substituting service.

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Importance | Methods | Conclusions

<Objectives> <Methods> <**Data**>

Land consolidation project in Järilä Finland

- Study material is gathered from land consolidation project (LCP) that was done between 2004 and 2010 and that was located in a village called Järilä (Finland).
  - Detailed information that included size, distance to compound, type of production (grain, potato, animals etc.) was collected from each parcel before and after project utilizing Land Information System and Finnish Land Parcel Identification System
- Land consolidation declined the number of parcels from 396 to 188, increased the average (median) size of parcels from 1,8 to 5,1 hectares.
  - Land consolidation improved the living conditions and as it improved the feasibility of farms, its effect to migration was positive.
  - It was also stated that land consolidation had beneficial ecological effects (e.g. reduced emissions to air) although these effects were not quantified.

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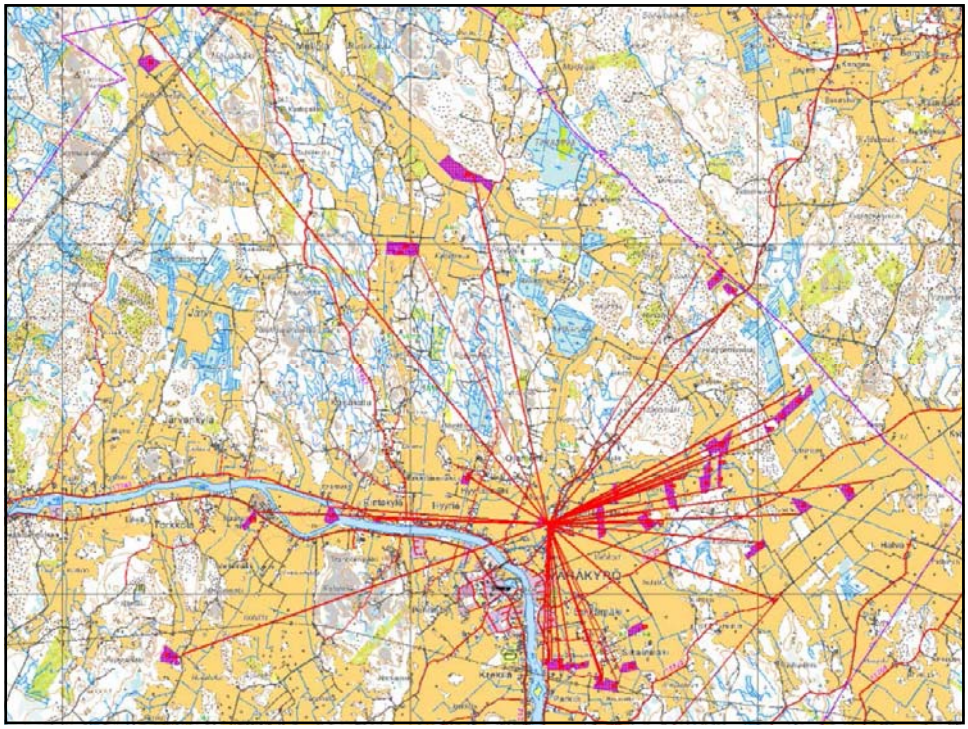

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Importance	Methods	Conclusions

<Results> <Conclusion>

Positive effect of 147 euros/hectare was found

- By using production cost calculations, it can be calculated that the total reduction of working hours is 1 348 hour/year in Järilä LCP.
- By using the information about the petrol consumption (25,82 l/h) and emission rate of petrol (2,7 kg/l), it can be calculated that the total reduction of CO2 is 94 tkgCO2/year.
- By using the information about the level of reduction of CO2 (94 tkgCO2/year) and the marginal cost of CO2 emission (75 €/tCO2), it can be calculated that climate effects monetary value in Järilä LCP is 7 050 €/year.
  - There are over 200 estimates of the marginal damage cost of carbon dioxide emissions. The mean estimate in these studies is a marginal cost of carbon of 75 €/tCO2. The uncertainty about the cost of carbon is large and right-skewed (the estimated cost at the 95th percentile is 256 €/tCO2 and the estimate at the 99th percentile is 1 067 €/tCO2).
- When this is capitalized like other effects to 30 years with 5 percent interest rate, the total value of the climate effect is 106 000 € (147 €/hectare).

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Importance	Methods	Conclusions

<Results> <**Conclusion**>

Climate effect is a significant part of LCs positive outcomes

- The total amount of land parcels that are re-arranged in Finland is 10 000 hectares/year
- This means that the total monetary value of land consolidations climate effect is 1 470 000 €/year.
- When this is compared to the total cost (10 000 000 €/year) of Finnish land consolidations it can be stated that land consolidation's climate effect is significant and something that should be taken into consideration in a social decision making process.

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Thank you for your Attention!

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