

## **Property Restructuring in Denmark – a Method for Achieving the Objectives of Environmental Protection and Cultural Heritage**

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***Abstract.** Today's agrarian landscape faces great pressures from groups seeking to change land use so that more consideration is accorded to social, environmental and cultural heritage factors. In Denmark, public actors have at their disposal two basic methods for the planning of rural areas to affect and implement active changes in land use: "The subsidy method" and "the property restructuring method". "The subsidy method" entails paying financial support or compensation to motivate the owner or user of a land area to exhibit a desired behaviour; while "the property restructuring method" requires an analysis and assessment of the desired changes in the agrarian areas leading to a comprehensive restructuring of the property structures and, if necessary, a change in the legal status of the individual properties.*

*In order to promote the use of the property restructuring method, the paper briefly presents a study with the aim of evaluating and improving it. Attention is paid to the identified lack of knowledge at the level of top authorities, local authorities and stakeholders, and to advantages of choosing "the property restructuring method". The advantages can be seen both from the viewpoint of environment and public economics. Land use and property structure are interdependent; therefore property restructuring is an effective method to change land use.*

***Keywords:** agrarian landscape, environmental and cultural heritage factors, planning, changes in land use, land consolidation*

### **1 Introduction**

Land is a limited resource in Denmark. The total area of Denmark is 4.3 million hectares and the main part of it has traditionally been reserved for agricultural use. In order to attain the objectives set by the politicians in the past decade or two, it is now necessary to let some of this agricultural land pass into other kinds of use, e.g. a lake or a forest, as an environmental perspective has been introduced politically during this period. This change of focus can be observed in several governmental agendas, which have been followed up by legislative changes. In some cases, it implies substantial interference with the land use and the agricultural property

structure to attain the objectives of these plans and regulations.

In 1986-87, the government agreed on the Action Plan for the Aquatic Environment I. By that the government established objectives for a 50 per cent reduction of the discharge of nitrate to the aquatic environment and an 80 per cent reduction of the discharge of phosphorus. As regards agriculture, these objectives were to be attained by an optimal utilisation of the animal manure, an improved use of fertilisers and by structural changes (Anker 1996, p. 109ff.). This effort resulted in a decrease in the discharge of nitrate from agriculture, although not as much as intended.

In 1990, the preamble of the *Land Consolidating Act* was changed so that it became legitimate to use land consolidation as a tool to carry through e.g. nature restoration, afforestation and recreational projects.

The *Nature Protection Act* was agreed on in 1992. It protects nature areas like meadows, wetlands, moors and commons and implies a prohibition against any changes. It allows the authorities to regulate these areas without granting the landowners any monetary compensation for losses caused by the measures taken. More active tools such as money for acquisition, loans and subsidies supplement these reactive control tools in order to carry out nature restoration, afforestation and recreational or cultural heritage projects. Acquisitions can be made by buying up property in free trade, putting down pre-emptions or, under certain conditions, using expropriation.

The Action Plan for the Aquatic Environment II of February 1998 was a result of the EU Nitrates Directive. The objective of this directive is to decrease the agricultural discharge of nitrates to the aquatic environment. Accordingly, the member states of the EU have to work out plans to attain this objective. To attain the objective, the Danish government decided to restore 16,000 hectares of wetlands and to afforest 20,000 hectares before the year 2003. In order to implement the plan, several changes were made in the legislation. The Water Supply Act, the Environmental Protection Act, and the Planning Act were changed. The method for attaining these objectives has primarily been based on the subsidy payment method, but the method has failed according to several evaluations (Abildstrup 1999, p. 5), (Andersen *et al.* 1998, p. 23) and (Danish Forest and Nature Agency 2000).

Another objective turning present is to secure the drinking water for the cities according to the EU Drinking Water Directive. In 1998 this challenge led to the agreement of changing the Water Supply Act, the Environmental Protection Act and the Planning Act. After these changes it is now possible to carry through a compulsory extensivisation of intensive agriculture in areas that are included in the Water Supply Act's new local plans. The counties are to identify areas of special drinking water interests and to work out local plans in order to secure the drinking water in these areas. The areas of special interest concern about 4-5 per cent of the agricultural area in Denmark. The task in these areas will be to secure a 100 per cent extensivisation and in many areas to move out intensive livestock husbandry

(Sørensen 2000, p. 331).

In Denmark, public actors have at their disposal two basic methods for the planning of rural areas to affect and implement active changes in land use: The subsidy method, which entails paying financial support or compensation to motivate the owner or user of a land area to exhibit a desired behaviour, and the property restructuring method, which requires an analysis and assessment of the desired changes in the agrarian areas leading to a comprehensive restructuring of the property structures and if necessary a change in the legal status of the individual properties.

So far the main method for reaching the objectives and to affect and implement active changes in land use in Denmark has been to pay subsidies to make stakeholders act as wanted. The objectives during the last decade have been the ones of the Action Plan for the Aquatic Environment II, and as mentioned above, the method has failed according to the evaluation reports made by Abildstrup (1999, p. 5), Andersen *et al.* (1998, p. 23) and Danish Forest and Nature Agency (2000). Thus new methods are needed.

### ***1.1 Environmentally and culturally based property restructuring***

The property structure in the rural areas in Denmark is the result of about 250 years of agricultural legislation. The agriculture holds the major part of the countryside in Denmark and 62 per cent of all land in Denmark are cultivated. But the structures of the agricultural properties are not optimal. The lots are spread out; they are often small and not well shaped for efficient farming. Furthermore, the land of a farm is often too small compared to the amount of manure produced on the same farm<sup>1</sup>. Moreover, there is no planned connection between the type of the agriculture and the environmental conditions on a given location. Environmentally and culturally based property restructuring is a way to solve such problems in the rural areas. It is a planning process, which has the purpose of improving and gathering areas into property units, which can use the areas in such a way that both the environment and the cultural heritage are considered. Property restructuring is made through physical changes in the size, number and the location of the lots of a property and if wanted, through changes in the legal conditions of the property. Such a change in the legal conditions of a property is implemented by notification of restrictions to the land registry.

In 1999, a research project at Aalborg University and the Danish Institute of Agricultural Sciences began. The main objectives of this project were to evaluate and improve the property restructuring method in order to increase the use of it. The empirical base for the research project was completed land consolidation

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<sup>1</sup> Such a proportion between land and the animal manure spread on the land must be established on all farms in Denmark according to the Environmental Protection Act. If a livestock husbandry produces larger amounts of animal manure than legally can be used on the land, a written sales contract must be made with another legal farm unit.

cases carried through to realise a nature restoration or afforestation project. These cases are all journalised in the Directorate for Food, Fisheries and Agro Business. The total number of such land consolidation cases carried out from 01.01.1990 to 31.12.1999 is 22 (Mouritsen 2003, p. 175). The major part of these 22 cases concerns nature restoration projects. Only four are afforestation projects and two are projects including both objectives. This distribution is caused by the fact that afforestation projects are not as dependent on a specific location as nature restoration projects are. A nature restoration project typically includes the restoration of a lake, a wetland, or a river, and is therefore more dependent on a specific location.

Research also shows that some potential projects have been given up. The local engagement and understanding may have failed, the public funds had been too small or a land pool may have been missing. In order to find out more about the hindrances, land consolidation planners, case officers in the public administration, stakeholders and the claimants of the projects were interviewed.

**Problem: A lack of knowledge**

One of the main results of this research is that a main hindrance to “environmentally and culturally based property restructuring” projects is a lack of knowledge about the method at several levels: The top authorities level, the local authorities level and the stakeholders level - resulting in a lack of local engagement and understanding, a lack of public funding, and a lack of efficient land pooling.

The top authorities level needs to know more about the advantages and possibilities in using property restructuring to achieve environmental and cultural heritage protection measures. This knowledge seems to exist in parts of the Ministry of Environment, which is the top planning authority in Denmark, but the knowledge is of no use because power in the rural areas is placed in the Ministry of Agriculture. The Ministry of Agriculture does not have environmental and cultural heritage protection measures as top priority.

The local authorities are the ones who have the responsibility to point out afforestation areas, areas suitable for restoring wetlands and areas with special drinking water interests. They have the responsibility to implement the legislation and to attain the objectives by using a method to change the land use. Today's situation is that choosing the subsidy payment method the state will pay for the subsidies, while choosing the restructuring method the local authorities are to pay for the land consolidation. This is an expense and a risk that is rarely taken as long as the local authorities do not know about the positive results already reached, the advantages and the possibilities of the restructuring method.

The lack of knowledge at the local authority level was observed by interviewing the claimants of the projects, amongst these were officials in both the local state forest offices and the municipality administrations. When analysing the interviews, a lack of knowledge about the method and the possibilities was identified. Moreover, a considerable comprehensibility gap between the

stakeholders and the local authorities was identified. Such gap can be caused by a lack of knowledge at this local authority level, as the local authorities have a responsibility in giving the stakeholders access to information and possibility of participating in the decision-making. These are fundamental issues if a common agenda are to be created.

Giving the stakeholders the knowledge about possibilities when participating in a land consolidation, the knowledge about the drinking water situation, the cultural heritage, and the situation for the flora and fauna in their local area and at specific properties will enable them to accept and understand changes. Another assumption is that giving the property owners and the local authorities the described knowledge could make the project start from the bottom and even make a better project. Other researchers such as the ecologist Frieder Luz from the Technical University of Berlin and the Swedish law sociologist, Per Stjernquist have proved this theory (Luz 2000; Dalberg-Larsen 1996).

The general lack of knowledge at this level was observed when analysing the interviews of the stakeholders. The stakeholders had problems communicating with the local authorities; they felt insecure about the agenda of the authorities, their own rights, and the contents of the legislation.

The fact is that the authorities and the stakeholders did not always agree on the problem and therefore also not on the instrument to solve the problem and fulfil the objectives. For two parts to agree on a common problem, data and information must be available for both parts. Today the possibilities for the ordinary stakeholders of finding data and information on environmental or cultural heritage issues on their own properties and locally are very small. This is not “Good Governance” and the authorities have not realised that “land use planning is an area of social planning, rather than technical planning” (Jacobs 2000, p. 175 ff.)

The lack of available information is a problem and the absurd about the situation is that the data from which to get the information are often collected but not systematically analysed with the aim to pass the information on to those stakeholders who act in the rural area. This will hopefully change in future as The Aarhus Convention<sup>2</sup> is implemented.

Because of this lack of knowledge about the restructuring method in Denmark, a very important aim for the research project in this final publishing state will be to stress the advantages of using the “property restructuring method” instead of the “subsidy payment method”. Therefore, some of these advantages will be presented in the following – taking outset in a case of property restructuring.

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<sup>2</sup> Convention signed at Aarhus, Denmark, on 25 June 1998. The Aarhus Convention constitutes the first international legally binding instrument for access to information, public participation in decision-making and access to justice in environmental matters. [<http://www.mem.dk/aarhus/samletkonv.htm>, 03.12.03]

### **Advantages using the property restructuring method in an afforestation project**

In order to stress the structural, environmental and state financial advantages using the “property restructuring method” relative to the “subsidy payment method” a land consolidation case called ”Drastrup afforestation project” and an afforestation scenario will be presented.

The case of Drastrup has been selected because of the availability of digital data. The project area is located in the northern part of Jutland, just south west of Aalborg City.

The scenario is based on a future implementation of a planned afforestation employing either subsidy payments or property restructuring. The idea is to demonstrate the financial advantages for the state by using property restructuring instead of subsidy payments. Data for the scenario stem from the regional plan for Viborg County and covers an area consistent with two municipalities in the county, and from official regulations concerning the determination of the economic costs.

#### ***1.2 Structural advantages***

The Drastrup area contains a very important reservoir of groundwater for the water supply of the Municipality of Aalborg. Due to pollution, the quality of the groundwater in the area has been decreasing. Previously it was primarily a nitrate problem, but now pesticides and chemicals have also been found in the groundwater. The subsoil/underground is based on sand, gravel and chalk, without any cleansing effect, why the land use must be changed if the groundwater is to be secured. To a certain extent, the municipal council, which is the water provider, can drill deeper wells and obtain water from unpolluted groundwater layers. But if effective measures are not implemented, all of the groundwater will become permanently polluted [<http://www.aalborg.dk>, 08.11.02]. The municipal council found that sustainable land use would prevent this unfortunate development and also improve the conditions for wild life and plants and open up new recreational areas. Firstly, the municipal council tried to prevent the pollution by using the “subsidy payment method”– but without success. In co-operation with the agricultural advisors in the area, the existing subsidy possibilities for changing land use were specifically presented to each and every farmer in the period from 1987 to 1996. Only one per cent of the area use was changed in this way. (Ramhøj 1999, p. 5.) Thus the council of the Municipality of Aalborg realised the need for using another method and decided to try ”property restructuring”.

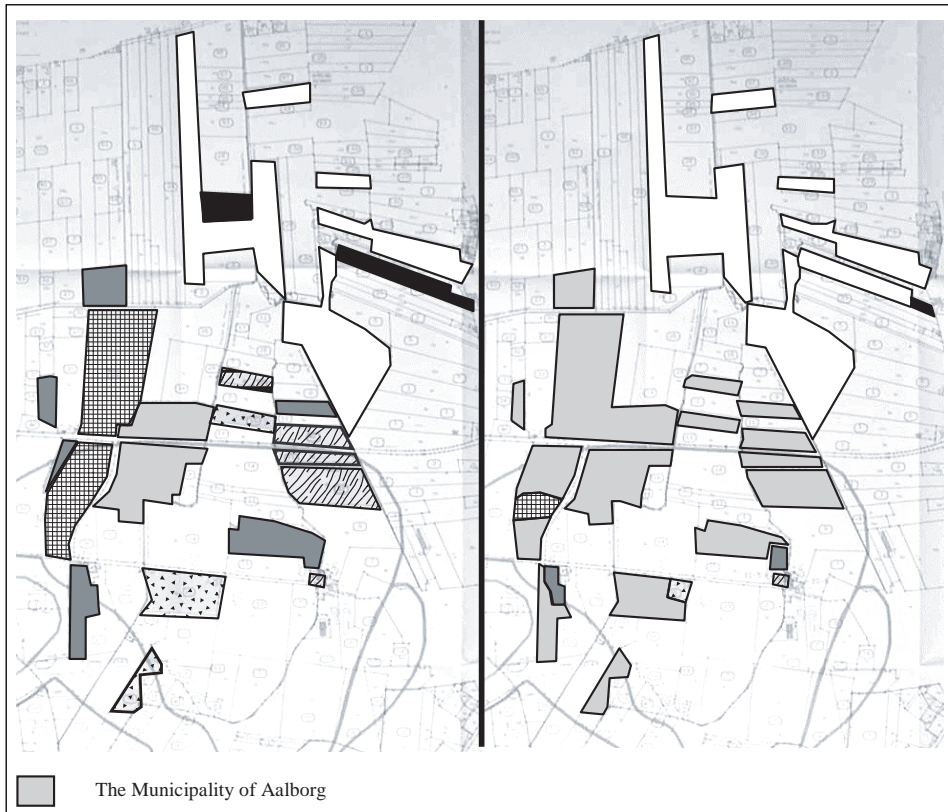
The existing land use and landscape history was analysed within an area of about 700 ha. On the basis of this analysis and the municipality planning, which included an objective to increase recreational areas, a plan for the whole area was worked out. The main objectives of the plan were: To secure the supply of clean drinking water for the municipality, to increase the afforested area in the municipality and to create a recreational area close to the city

On this basis, the council of the municipality decided to spend a yearly amount of money on land acquisitions and the council ordered one land consolidation (Drastrup 1) and later on one more (Drastrup 2). Both land consolidations were based on voluntary participation as usual in Denmark.

### *1.2.1 Drastrup 1 – Acquisition of vulnerable land and creation of a land pool*

The first land consolidation (Drastrup 1) started in March 1996 and the objectives were to acquire the land in the most threatened area and to raise a land pool to be used in a second land consolidation (Drastrup 2). The result of this first land consolidation is shown in Figure 1.

During the autumn of 1996 the municipal council acquired land via the land consolidation for about 6 Mio. DKK in the project area and thereby came to own the main part of the land in the most threatened area as wanted. Besides, about 60 ha were acquired as a land pool to use in the Drastrup 2.



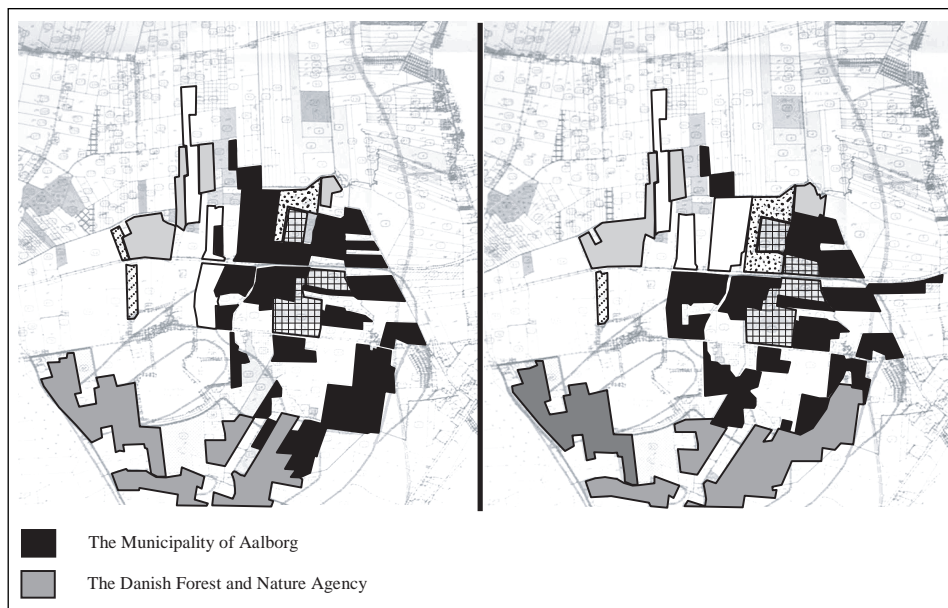
**Figure 1.** *Left: The property structure prior to the first land consolidation. Right: The property structure after the first land consolidation (Drastrup 1).*

The land consolidation included 8 stakeholders and 8 properties. Amongst these 8 stakeholders 6 can be defined as “sellers”, no one as “changers” and

only 2 as “buyers”<sup>3</sup> including the Municipality of Aalborg. 123 ha of land were restructured and the council acquired 108 ha of former agricultural land without having a land pool prior to the land consolidation.

### 1.2.2 Drastrup 2 – Land pooling and acquisition of land for the project

On the basis of the land pool acquired in the first land consolidation, the municipal council ordered another land consolidation to be carried out, starting in February 1998. A part of the result of this land consolidation is shown in Figure 2.



**Figure 2.** Left: A part of the property structure prior to the second land consolidation. Right: A part of the property structure after the second land consolidation (Drastrup 2).

The land consolidation included 23 stakeholders and 26 properties. Amongst these 23 stakeholders 14 can be defined as “sellers”, no one as “changers” and 9 as “buyers”. 214 ha of land were restructured. The Municipal Council of Aalborg sold 93 ha of land in the land consolidation and had only 57 ha in return. The Danish Forest and Nature Agency sold 7 ha, but had in return 58 ha of former agricultural land.

By this second land consolidation based on voluntary participation, the project to secure the groundwater and afforestation could be carried through to

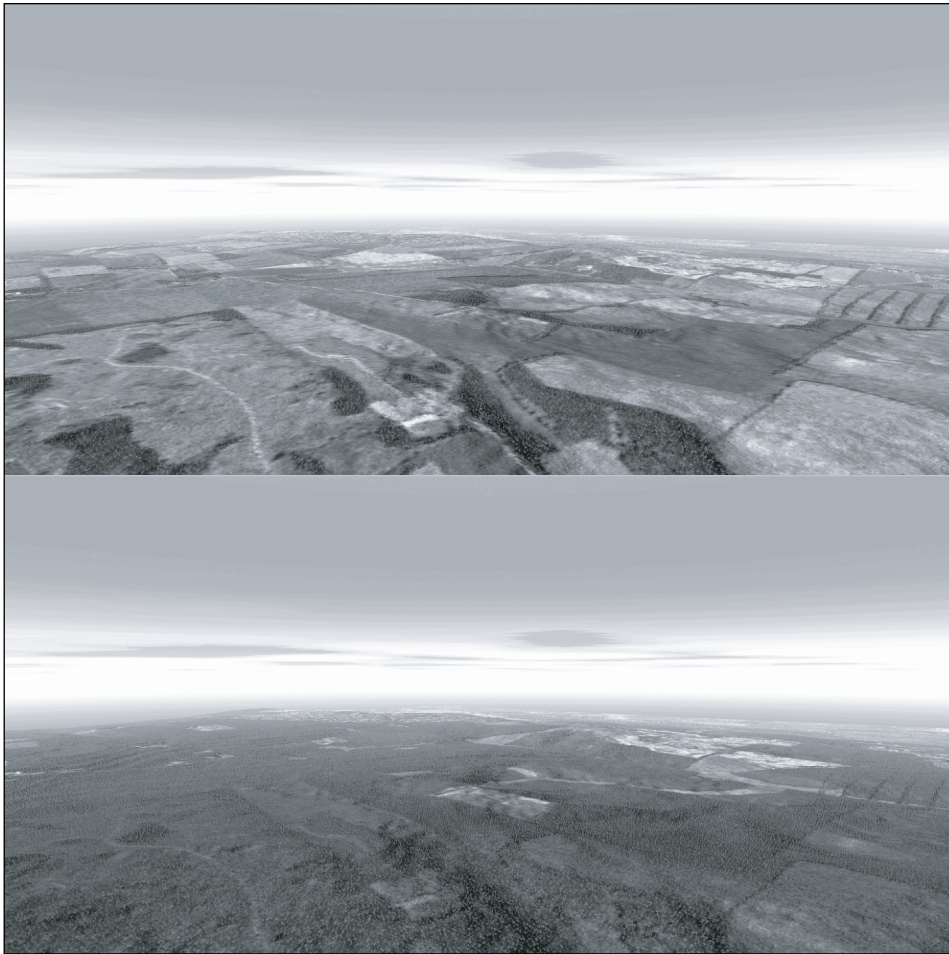
<sup>3</sup> “Sellers” are stakeholders getting a net deficit on more than 0.5 ha, “buyers” are stakeholders getting a net profit on more than 0.5 ha, and “changers” are stakeholders getting a net deficit or net profit on 0.5 ha or less.



the benefit of not only the environment, nature and recreational live but also the structure and allotment of several efficient farms.

### ***1.3 Environmental advantages***

Figure 3 shows a visualisation of the landscape made in connection with the presented research project. Above is the landscape seen from the southeastern corner of the project area, showing how it looked in 1995. Below is a visualisation on how the landscape will look in 20-30 years, when the forest has grown.



***Figure 3.*** Above: *The project area in 1995.* Below: *The project area as it will probably look in 20-30 years if the council planning is realised.*

In making the visualisation, the county area plan is used to place the trees. The open areas in the landscape, which can be seen on the visualisation, are therefore consistent with the ones planned by the council. The visualisation is

made in VistaPRO4 by loading an orthophoto, a digital height model (DHM) and two polygon themes made in ArcView showing the location of the trees before and after the afforestation.

According to Madsen *et al.* (2002, p. 87) the following environmental results can already be identified after changing the land use: In the newest created groundwater the amount of nitrogen continued to rise until 1999. The average amount of nitrogen was above 120 mg/l and the permissible limit was 50 mg/l. From 1999 the amount of nitrogen has fallen and is now about 110 mg/l. In the topsoil the amount of nitrogen is now between 0 and 5 mg/l. 202 hectares of the planned 660 hectares have now been afforested.

It seems like the positive environmental results can already be observed.

#### ***1.4 State financial advantages***

The “Drastrup afforestation project” was very expensive for the Municipality of Aalborg in spite of the fact that the EU Life Programme financially supported the project. The reason for the high costs is first of all the Municipality Council’s wish to become the owner of the vulnerable areas. A basic idea in property restructuring is to improve and gather land in “new” properties and if wanted hereby change the land use according to the planning. The general idea is not to let the ownership pass over from private landowners to the state, but to restructure and change the legal status of properties so that people can still live and work there.

To demonstrate the possible financial advantages for the state, county or municipality by using property restructuring instead of subsidy payments a scenario has been made. The objective is to create forested properties on lands in two municipalities where the existing regional plan calls for afforestation (Mouritsen *et al.* 2002, p. 88 ff.).

According to the regional plan, desired afforestation areas in the two municipalities encompass 1,110 hectares located in a rural zone. In comparing the two methods, the basic idea of the scenario is that the existing regionally planned afforestation area must be an active afforestation area without the establishment of state forest.

According to the subsidy method, affected owners receive payment according to existing rules for start-up and operational subsidies. The programme is voluntary, so there is no guarantee that selected areas in fact become forested. The degree of success in the afforestation will depend on various factors such as the affected properties’ current agricultural production and the projected income, as well as the affected owners’ future plans. In the subsidy payment method, afforestation support is included in the calculation in the form of a one-time payment of 22,000 DKK per hectare as well as a yearly income compensation of 2,600 DKK per hectare over a 20-year period. These payment schedules are in accordance with existing administrative regulations.

The property restructuring method encompasses an active afforestation effort, where the public sector acquires the existing areas, subdivides them into parcels,

and resells them as differently sized lots. This method is interesting in so far as the public sector is an intermediary in creating the properties, which can be sold at a price dependent on location, so that expenses are compensated by income from the further sale of the new forested properties. Property restructuring calculations are based on a land price of 60,000 DKK per hectare, and the total expenses for the acquisition correspond to the profit on resale based on the same land price. This means that a 35 hectare forest property can be sold for 2.1 million DKK with an obligation to plant forest and with the possibility of state support for afforestation, but without payments for operational losses required by the subsidy method. If the properties also include residential building permission, it is reasonable to assume that these properties can be sold over a series of years at this price. Added to this are administrative costs for planning, consolidation and subdivision.

On the basis of the prerequisites indicated, it can be concluded that afforestation based on subsidy payments is at least three times more expensive for the public sector than use of the property restructuring method. In this scenario, this will also be the conclusion, even though the subsidies financed by the EU are not included. The total amount will then be approximately 54,760,000 DKK versus 17,390,000 DKK. (Table 1.)

**Table 1.** Overview of comparative cost estimates for the property restructuring method and subsidy method

	<b>Subsidy payment</b>	<b>Property restructuring</b>
Number of ha for afforestation	1,110	1,110
Acquisition price per ha (in DKK)		60,000
Sale price per ha		60,000
Net deficit on land transfers		0
Afforestation subsidy, one-time payment of 22 000 DKK/ha)*	24,420,000	24,420,000
Income compensation (2 600 DKK/ha./year for 20 years)*	57,720,000	0
Planning and administrative costs (1 000 DKK./ha)	0	1,110,000
Total (in DKK)	82,140,000	25,530,000

\* Approximately 1/3 of these subsidies is financed by the EU via the Danish rural development program.

Another financial advantage comes with the value of living close to nature. A recent report concludes that afforestation or nature restoration has a significant influence on the value of all nearby properties (Hasler *et al.* 2001). The researchers analysed data from real market transactions to identify homeowners'

appraisal of a position close to lake or forest. In Denmark, the data for this kind of analysis is particularly good because the public property register (ESR), includes information about essential characteristics of Danish houses, plus the price for which the houses have been sold and valued. By estimating a house price function on these register data, the position value can be isolated from the sales price, and the house owner's willingness of payment for the nature improvements can then be deducted. As an example, house prices were tested in the Drastrup afforestation area. It was concluded that houses sold after afforestation had an estimated value of 237,000 DKK higher than houses sold before. The general rise of the Danish house prices in the period was deducted. The increment was identified already in the planning stages of the project. By using the property restructuring method, the state can use this increase in values to pay for the nature improvements.

### **Conclusion**

The main governmental objectives of importance to the agricultural property structure in the year 2002 are to restore 16,000 hectares of wetlands, to afforest 20,000 hectares and to secure the drinking water for the cities. So far the main method for reaching this kind of objectives has been to pay subsidies to make stakeholders act as wanted. As described in all recent evaluation reports, this method has failed and new methods are thus needed.

A useful tool to achieve the environmental and cultural heritage protection measures could be the "Property restructuring method". By this planning method, both the agricultural property structure, the cultural heritage, the environment and the nature can be considered. This is not the case when using the "subsidy method". This paper gives examples on why the property restructuring method should be paid some more attention from the top politicians, the officials, the local authorities and the farmers.

As mentioned in section 2, the main problem, and as such the general answer to the question "why is the property restructuring method not used in spite of fine results during the past decade", seems to be "a lack of knowledge". A very important aim is therefore to stress the advantages using the "property restructuring method" instead of the "subsidy payment method".

The advantages can be seen both from an environmental and a state financial point of view.

With an outset in an afforestation project in Drastrup it is demonstrated how property restructuring can be an efficient method to implement environmental protection objectives. The method made it possible to change the land use and thereby to decrease the amount of nitrogen.

On the basis of a state financial scenario it can be concluded that afforestation based on subsidy payments is at least three times more expensive for the public sector than use of the property restructuring method. This result is based on the idea that the state uses the increase in the values of property, caused by the project implementation, to pay for the nature improvements.

The property restructuring method gives the stakeholders a chance to adapt new demands and a chance for the state to attain the objectives. There is a connection between land use and the ownership and property structure of an area. Land use and property structure are thus interdependent; sometimes boundaries are adapted, post facto, to new land use, and at other times boundary revisions are necessary in order for a change of land use to be brought about. If therefore, the property structure is not to stand in the way of development, there must be efficient methods for changing it when necessary. (Larsson 1993, p. 1). This is the basic argument why to prefer the property restructuring method.

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