Land Rearrangements and Water Protection Activities in Finland - Conclusions of a Development Project

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Key words: land rearrangement, water protection, development project, Finland

SUMMARY

Condition of waters has become a global problem during the last decades. This situation appears in Europe so that parts of rivers in Central Europe are highly polluted. In Northern Europe especially the condition of Baltic Sea is not good. The Baltic Sea is connected to Oceans only thru the narrow Danish straights. That is why the nature of Baltic Sea is especially vulnerable, because the water of the sea has low saltiness compared with other seas.

European Union has started actions and drawn up The EU Water Framework Directive (2000/60/EY) in the year 2000. It sets goals to the water protection in the whole Europe. The main purpose of water protection is in restricting the eutrophication of waters. Most needs of restriction are directed towards agriculture. The objective is in restricting the emissions of agriculture at least one third, when comparing the year 2015 to the years 2001-2005.

In Finland there are needs for new solutions, because the means of environmental politics are not enough. That is why the National Land Survey of Finland has started a development project, which includes land rearrangements (land consolidations). The purpose of the project is to find out, which could be advances to combine land rearrangements and water protection activities. This paper presents some conclusions of this development project.

It is clear that co-operation between land rearrangement authorities and water protection authorities are needed in Finland. This early stage co-operation should be started to clarify those areas which need most protection. After that there should be done need analysis, where you can consider the best implementation way of land management. In some cases the best way to take care of large and diversified environmental issues could to be to manage them with project-related land rearrangements, same kind as which are used with highway and railway projects. But the legislation does not allow these kinds of land rearrangements in context of water protections. So at the moment the best way is to do water protection activities with arable land arrangements, when it is question of large and diversified protection purposes. Also voluntary land-to-land exchanges are good tools, when it is questions of small-scale activities. What are the costs and benefits of land consolidations compared against costs and benefits of the agricultural environmental aid system, are still studied in an on-going thesis. Results of these calculations will show, which the best implementation way of land management will be. It may turn out that the present-day system of environmental aid distribution is also a good tool in some cases.

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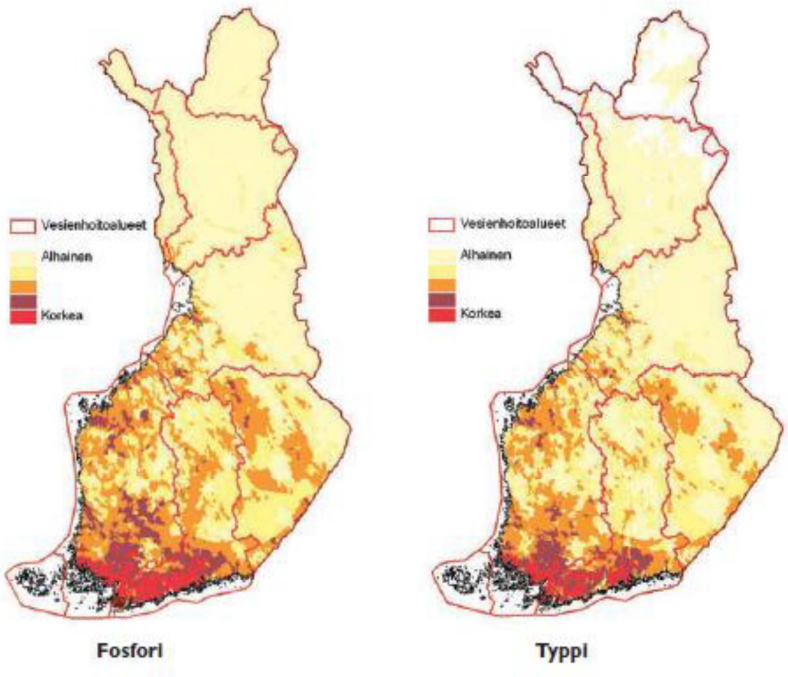
1 INTRODUCTION

1.1 Condition of waters in Europe and in Finland

Condition of waters has become a global problem during the last decades. This situation appears in Europe so that parts of rivers in Central Europe are highly polluted. When we think about conditions of waters there is either a question of condition of surface-water or groundwater. Condition of groundwater is mainly good in Finland when we compare it to other parts of Europe. Also lakes are mainly in good conditions. (Ympäristöministeriö 2007, pp. 26–27. Nyroos et al. 2006, pp. 19, 23.) The situation is different when we look at the conditions of surface-waters of rivers in Finland. Agriculture increases nutrient content of surface-waters and this way it decreases ecological condition of surface-waters.

When nitrogen and phosphor flow to waters plankton increases and alga is becoming more and more general. This will multiply organic components, which will overspend oxygen supplies of the water at the end. Due to lost oxygen supplies, ground sediment will release more and more phosphor. Concentration of phosphor in the water increases suddenly. This leads to vicious circle because the increase of phosphor leads to flourishing of algal bloom. At the end there is no life in the water. In Finland most loaded waters are found in southern shore coasts. (Picture 1; areal distribution of phosphor and nitrogen in Finland)



Picture 1. Areal distribution of phosphor and nitrogen loads (Rekolainen ym. 2006, p. 12)

In Northern Europe especially the condition of Baltic Sea is not good. The water of the sea has low saltiness compared with other seas. This is due to the fact, that the Baltic Sea is connected to Oceans only thru the narrow Danish straights.

1.2 Condition of waters and the Baltic Sea

The nature of Baltic Sea is especially vulnerable. The Baltic Sea has a big watershed area, where there are living 85 million inhabitants in nine different countries. (Picture 2)

An average depth of the sea is about 52 meter, but for instance the average depth of the Gulf of Finland is only 3 meter. Because the sea is shallow, the volume of water is small. Furthermore the water stays in the Baltic Sea for decades, before it ~~shall~~ (will be) washed away through the Danish straights to Atlantic Ocean. (HELCOM 2009b, pp. 8–10)

Picture 2. The Baltic Sea and costal states (http://www.marinea.fi/shop/product_details.php?p=1234).

Algal blooms of The Baltic Sea have repeated now every summer. Many lakes are paludificating because of eutrophication. Condition of water is affecting to nature, recreation and outdoor activities, fishing industry and attractive living environment. The nature of the Baltic Sea is especially vulnerable, because only very few species are adjusted to live in low-slated seawater (HELCOM 2010).

Only 12 percent of the total load of the Baltic Sea flows from Finland. But it is remarkable that alluviations of oxygen and phosphor are bigger from Finland than from any other country beside the Baltic Sea, when we look at the proportional amounts of alluviations. (Larsson & Granstedt 2010)

1.3 European and Finnish obligations of water protection

European Union has started actions and drawn up The EU Water Framework Directive (2000/60/EY) in the year 2000. This document sets goals to the water protection in the whole Europe. According to it, the main purpose of water protection is in restricting the eutrophication of waters. Most needs of restriction are directed towards agriculture. The

objective is in restricting the emissions of agriculture at least one third, when comparing the year 2015 to the years 2001-2005.

The Finnish Government has made a principal decision of the water protection program, which gives guidelines until year 2015. According to it the most important is to diminish nutrient load of agriculture. The target is to diminish the nutrient load one third when comparing the years from 2001 to 2005 with the year 2015. There is needed new ways to reach this goal, because methods of environmental politics are insufficient. (Ympäristöministeriö 2007, pp. 25–30; Nyroos et al. 2006, pp. 23–24.)

1.4 Implementation in Finland

Implementation of water protection is nowadays based on an environmental aid distribution system. It uses voluntary methods. Farmers can get compensations of those costs and loses, which are due to measures of environmental activities they have engaged themselves. In Finland there are needs for new solutions, because the means of environmental politics are not enough to protect waters.

2 LAND REARRANGEMENT PROCEDURES IN FINLAND

Arable land consolidations
At the time agriculture should decrease its nutrient load to waters and in the same time it should also improve cost-effectiveness. Farming conditions of agriculture are improved by the means of arable land consolidations in Finland. Small parcels are collected to bigger ones and amount of parcels is decreased. This will results in decreased farming expenses, improved traffic safety and lower carbon emissions.

Legislation does not regulate all the details, which measures there could be used during land consolidations (Sillanpää 2003, p. 51). This means that it is possible to take account different needs of real property owners. These needs can be clarified case by case. (Ylikangas 2004, p. 18).

In this connection it is important to notice that applicants of these kinds of land rearrangements are arable land owners. And to start the activity a wide support of arable land owners is needed.

Project-related land reallocations
The aim of project-related land reallocation is to implement infrastructure projects of society so that harms and damages caused for the use of land and water areas should be minimized. These kinds of projects are for instance highway and railway projects. Loses of land area are compensated by land exchanges and by modifying rights of ways of private roads. Project-related land reallocations can be used also when carrying out nature reservation areas and projects concerning water resources engineering (i.e. building dams for water power purposes).

In the cases of highways and railways there are possibilities to increase traffic safety by diminishing needs for using public roads by farmers or stop using level crossings of railways. In this connection it is important to notice that applicants of these kinds of land reallocations can be those authorities, which are responsible for managing of highway, railway and nature reservation.

Land-to-land exchanges
Land-to-land exchanges are small-scale activities, where pieces of land are changed between real properties. It can be done voluntary or compulsory. It is important to notice that applicants of land-to-land exchanges are real property owners. And there are quite strict conditions to execute compulsory land-to-land exchanges.

Organisations and activities
The National Land Survey of Finland is a state-run organization. It is under the Ministry of Agriculture and Forestry. It carries out most of the cadastral surveys in Finland and all land rearrangements. Whereas it is the Ministry of the Environment, which has the main responsible of water protection activities. Therefore these two bodies and authorities under different ministries have not been traditionally in close touch, when doing their own implementation activities.

During the last years the National Land Survey of Finland has improved cooperation especially with authorities handling road and rail administration activities. Together with them it has developed methods for evaluating property effects caused by the social projects, for reducing negative effects and for carrying out project-related land reallocations. (Maanmittauslaitoksen tilusjärjestelystrategia 2007, Maa- ja metsätalousministeriön tilusjärjestelystrategia 2008-2013, pp. 17-18.)

3 SEARCHING NEW POSSIBILITIES - COMBINING WATER PROTECTION ACTIVITIES AND LAND REARRANGEMENTS

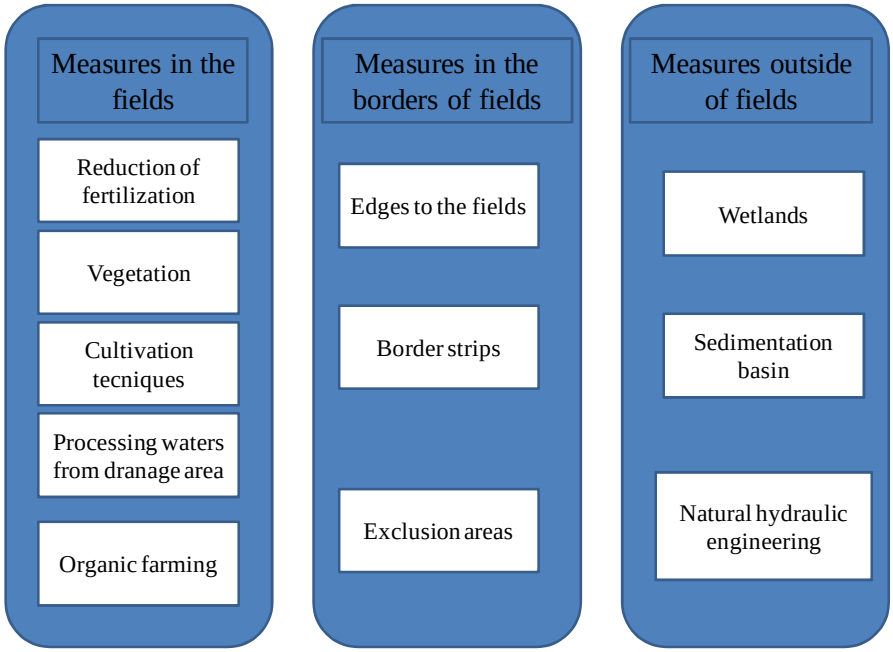
The land rearrangement strategy for 2008-2013 of the Ministry of Agriculture and Forestry highlights questions which deal with flooding and protection of waters with land rearrangements (Maa- ja metsätalousministeriön tilusjärjestelystrategia 2008-2013, p. 15). The national Land Survey of Finland has set on a project, which consists of two theses.

First thesis deals with land rearrangement procedures by which we could diminish nutrient alluviations. Second one research studies impacts and benefits, which could appear when using these land arrangement procedures. Costs and benefits are compared against costs and benefits of the agricultural environmental aid system. The project is still ongoing. Therefore, here is presented primary results from first thesis. First thesis answers to the subquestions:

- *Which kinds of land use activities there can be used when protecting waters?*
- *Can we use land bank system to carry out protection of waters?*
- *Which kinds of land rearrangement procedures could we use?*

4 Results

4.1 Which kinds of land use activities there can be used when protecting waters?



Picture 3. Different measures to minimize nutrient load

There are different land use activities to use when protecting waters (Picture 3). The activities can be done:

- in fields
- beside fields both
- outside of fields.

(Puustinen ym. 2007 p. 69)

In the fields you can do some activities which reduce intensity of nutrient load. These activities are such like reducing fertilization, have more than before vegetation in the fields and different cultivation techniques. Also you can process waters from the drainage and use organic farming techniques.

If you can build edges to the fields, border strips or exclusion areas you can reduce nutrient load ***in the borders of fields.*** These areas are covered with vegetation besides main drainage ditches and brooks. From these different areas exclusion areas are largest and edges to the fields are narrowest. (Paasonen & Kivekäs ym. 2009. pp. 165–166; Uusitalo ym. 2007, p. 25.)

Measures outside of fields can be divided to areas of wetlands and areas of sedimentations basins. There is also possible to use natural hydraulic engineering methods to reduce loads. *Wetlands* are good in refining waters from arable land areas. In the waters of these areas there are lots of plants and microbes, which reduce amounts of phosphor and nitrogen. (Eskola ym. 2009, p. 20.) *A sedimentations basin* is a water basin, which is linked to a ditch or a brook. It differs from a wetland because there is not particular wetland vegetation in a sedimentation basin. In this case solid materials fall down to the bottom of the basin. A sedimentation basin shall reduce drifts of solid materials, but not reduces nutrient load of waters as a wetland does. (Paasonen-Kivekäs ym. 2009, p. 259.)

Picture 4. A wetland in the low-lying part of the field, which has bad cultivation qualities. (Puustinen ym. 2007)

One method of *natural hydraulic engineering* is to change ditches to their natural states. In Finland nearly all ditches in agricultural areas are cleaned out to improve the basic drainage of the area. This has been done because summer in Finland is short and so seeding activities must be started as early as possible in spring. Cleansed ditches are vulnerable to erosion and paludificating. *Naturals ditsches* have winding and varying shapes. There is lot of vegetation besides these ditches. And this way their beds offer divergent surroundings. (Näreaho ym. 2006, pp. 8–12.)

Picture 4. Longinoja ditch in Helsinki before and after repairing works.(Näreaho ym. 2006, pp. 32–33)

4. 2 Can we use land bank system to carry out protection of waters?

Land from land bank should be given to those real property owners who shall lose their land for water protection purposes from instance for wetlands and exclusion areas. This way they can get compensations for the land they have given to these purposes.

Suitable areas for land bank are not always available. But all wetlands are not always large. For instance, in the land consolidation of Ruuskankylä the whole area needed for wetlands was 1,8 hectares. One problem is that there is no land bank system in Finland, which has permanent monetary basis to buy land. Land banking in Finland is based on an ad hoc procedures and financing is based on an annual decisions of the different authorities.

4. 3 Which kinds of land rearrangement activities and procedures could we use and in which areas?

Results of the study show that at the moment one good way to take care of environmental issues is to manage them with *arable land arrangements.* In the phase of need analysis there should be research if there is needed some water protection activities in the target area. Commonly there is a need for promote the plans of water management. Possible areas of wetlands and sediment basins should be mapped. Interests of land owners to take part in water protection should be clarified. Possibilities of co-operation between local players should be examined. In practice these activities aim at carrying out plans of water management by means of land rearrangements.

When doing a readjustment plan you should find out all those with high differences of height. These fields have the most emissions of pollutants into waters. Alternations of use from grain crowing to hay crowing or even to forest use are good tools to prevent pollution. By increasing parcel size of fields there are better possibilities to change courses of

cultivation in the fields. At this planning stage should also wetlands and exclusion areas be planned.

There are some challenges when using arable land rearrangements as tools of water protection. One is the fact that arable land rearrangements are for purposes of efficient farming. Conditions of efficient farming can be against conditions of efficient water protection. Another issue is related to managing these new water protection areas. Shall these areas remain as parts of private owners land or shall they be owned by the state's environmental authority? And who can get environmental subsidies? Can farmers still get them? If so, then who of them?

Also *voluntary land-to-land exchanges* are good tool. They can be used when there is need for small-scale activities.

In Finland activities of water protection are carried out by voluntary means. Therefore there is no direct legislation to use expropriation measures or project-related land rearrangements for water protection. But it may turn out that voluntary measures are not enough in the future. In this situation also project-related rearrangements could be good tool in some situations.

Especially in the nearby urban localities municipalities could have interests in areas to use water protection. Exclusion areas and non-arable fields could be use for outdoor activities. Also riversides and lakesides are often beautiful and suitable for outdoor activities. Municipality can take part in projects which are ongoing because of other reasons.

The National Land Survey of Finland should have a role of impartial expert in water protection projects. It can act as an implementing body but also as advancing co-operation. These projects could be both those which environmental authorities and municipalities want and also those which real property owners want.

5 CONCLUSIONS AND DISCUSSION

It is clear that there is need for co-operation between land rearrangement authorities and water protection authorities in Finland. This early stage co-operation should be started to clarify those areas which need most protection. After that there should be done need analysis, where you can consider the best implementation ways of land management.

At the moment best possibility is to use arable land consolidations when it is question of large and diversified needs of water protection. Conditions of successful water protection with land rearrangements are clear objectives of water protection. Otherwise water protection can lead to easy and ineffective measures.

Use of project-related land reallocations is not as simple as with route projects or with implementation of nature reservation areas. In these cases there are clear decisions of author-

ities and expropriation is the final method of implementation. In the cases of water protection there are no clear areal plans which could be carried out by expropriations.

What are the costs and benefits of land consolidations compared against costs and benefits of the agricultural environmental aid system, are still studied in an on-going thesis. Results of these calculations will show, which the best implementation ways of land management will be. It may turn out that the present-day system of environmental aid distribution is also a good tool in some cases.

At the moment water protection in agriculture is based on voluntary measures of land owners. So, the proposed new tools i.e. project-related land allocations could be used only, when parties have made agreements. This can lead situations where the measures with project-related land allocations are not large enough to the purposes of efficient water protection. On the other hand ambitions of water protection are high. This can lead to the situation where voluntary measures are not enough and there is need for new measures, like partly compulsory project-related land reallocations or even expropriations. In this case there is needed legislation which allows partly compulsory project-related reallocations as an implementation method with water protection purposes.

Among others Kröger (2002 p. 59) points out that there are needed integrated agricultural, rural and environmental politics. In this environment land rearrangements are natural part of the system, like in many European countries already the situation is. In practice this means that there is need for a co-operational pilot project in Finland.

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