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WETLAND ESTABLISHMENT ON AREAS ENDANGERED BY UN-DRAINED RUNOFF

Related to the former data one can see there are requirements for aquatic biotope creation which regulate the long term sufficient water quality and serves the EU Water Framework Directive, created for better water quality.
Creating wetland provides lots of functions, such as recreational utilization, protected animal and plant biotopes, excess water reservoirs and with the help of these the protection of valuable crops, and it helps to solve drought problems. The wildlife of wetland areas serves the variability of nature and an unharmed natural flora and fauna will be created.

Keywords: Water management, un-drained runoff and wetland

I. INTRODUCTION

In spite of the enormous development of water catchment systems during extreme weather conditions, it is possible that disastrous flood conditions may happen caused by un-drained runoff. This un-drained runoff acts together with the flood, and is increasing the volume of water and blocking protection work. The excess runoff water has been extremely affected by the catchment's water drainage ability and the use of space.

Every five year or so, the area of Hungary covered by water is approximately 300.000 ha. Changes in land use have to be considered. Multifunctional agricultural systems are highly recommended. The flood endangered areas have to be strengthened by forest, creating pasture, meadow or establishing fish ponds, welfare reservoirs, rice fields etc. and the combination of these makes a wide range of utilization possible.

II. THE REQUIREMENTS OF ENVIRONMENTAL PROTECTION AND AGRICULTURE

Erosion increases through intense cultivation and water holding capacity, soil fertility, and nutritient content decreases. The eroded upper-soil can be removed into rivers, lakes,

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and reservoirs. Badly managed irrigation systems cause muddy areas, salination and increase the salt content of the soil. Over use of nitrogen and potassium fertilizers also causes water pollution. High dose useage of pesticides, chemicals used against insects, fungi and weeds, besides increasing crop production, have harmful side-effects to human health and aquatic ecosystems. Pesticide residues can be found in food products and weeds creating human and animal health care problems.

These facts forced the European Union (EU) member countries and farmers to introduce environmental friendly methods in agriculture. These duties help increase natural water supply quality, which are described in the initiatives of the EU Water Framework Directive (EU WFD). Intensive farming effects on water supply are as follows:

- increased surface erosion, and pollution of groundwater;
- more energy required than before for the same yield (chemicals, herbicides, pesticides and fertilizers;
- damage of different diseases and pests increased;
- concentration of green-house effect gases increased in the atmosphere and affecting the water quality and quantity in the hydrological circle;
- the former genetic heterogeneity, which specify industrial plants and animal husbandry shifts to genetic homogeneity and increase the genetic injuries against biotic and abiotic stress.

Producing more food and sustainable agricultural products less arable land, water supply and energy needed if we wisely use ecological benefits, new technology and traditional knowledge.

III. ESTABLISHMENT OF WETLAND AREAS AS A REAL ALTERNATIVE

Solving wet period problems, we should not have to forget about the water management problems of dry periods and lack of water. The strategies for excess-water drainage problems and drought strategies have to harmonize and one has to create such a spatial system which guaranties the excess-water drainage, and that serves the water supply in need. Both in Hungary and in the EU the most important disciplines are described in the EU Water Framework Directive (EU WFD). The Establishment of wetlands seems to be a good solution for the requirement of the EU WFD, agriculture and environment protection.

The quality of wetland areas at the beginning depends on the quality of the subsurface water; therefore one has to pay attention to a minimum amount of pollution in the agricultural practice. The future water quality will be determined by the operation undertaken. Therefore special rules have to be created, which will be the basis of regulation in wetland areas.

Photoautotroph species are determined by nutritive input and output. That relates to how rapidly one can increase the micro and macroscopic number of hydrophytes. The increase is determined by the water depth and light conditions. Shallow water is ideal ecosystem for higher aquatic plants because it provides an excellent lighting possibility and makes possible further production of heterotrophic aquatic species. It is sufficient for invertebrate and vertebrate animals.

Related to the quantity of inorganic plant nutrition in Hungary, there is no nutrition limit in subsurface water bodies. It means that during surface water storage one has to consider eutrophication. One has to know which are the primarily users of the nutritions.

The special condition of planktonic eutrophication increases algal populations, creates a shadow effect, which prohibits the co-existence of higher water plants and Potamogeton.

The Potamogeton and benthonic eutrophication help to utilize the plant nutrition and their involvement in the food chain. Planktonic eutrophication is more rapid than the benthonic because there is a nutrition surplus. If there is insufficient macrophyton the food chain shifts toward the excess growth of algae.

Even at the beginning of planning to establish a biotope, one has to pay attention to sufficient illumination, on sustainability and one has to avoid the high nutrient content. The shallow water can provide stability to the higher aquatic plant ecosystem.

The two major elements are potassium and the different forms of nitrogen. These have to be in a balance in the aquatic zone, as in certain causes one can find a lack of nitrogen and it has a damaging effect on water quality with the increase of blue algae population. They are able to fix nitrogen. Any kind of algal mass production, – even without making colour changes – cause water quality problems.

The morphological conditions of the water body through depth can control the water quality because there is a chance in the self-shadow effect and benthonic eutrophication. The increased organic material production causes oxygen consumption. The high number of primary producers may cause lack of oxygen in evening or early morning.

IV. MONITORING FUNCTION

The ecological potential is an ability of a man-made water body according to the EU WFD which one can describe with association system of the aquatic biotope. The EU WFD prescribes that one must determine the water quality monitoring system by the neutrality of the aquatic biotope. According to the EU WFD the reference biotope norms are the natural circumstances without any human effects.

The reference biotope marks the high level ecological potential at natural surface water bodies. The natural biotopes theoretically also provide an extremely good ecological potential under artificial circumstances. Therefore the ecological potential is a significant character of water quality, which leads to determine the quality of the combination of the evolution in the water bodies among these special circumstances. This ability comes from the water quality and certain aquatic biotope groups can be determined with it.

V. SELECTION PROCESS

The first step is to examine these three facts together: current soil conditions, excess water risk, and water supplies. This information can nowadays be found in large quantity and quality in yearbooks, in meteorological data, regional measurement with the use of maps. Many GIS systems also provide detailed data and databases about the given area.

The next step is to evaluate the former use of the area and its effects related to examine the sustainability of agricultural production at that place, which are the reasons for the change of land use, which form of use perfectly fits to current and realistic demands.

Related to these, one has to consider the legal control and the up-to-date legal control of the territory.. What kind of possibilities are there and which regulations are prohibited? What kind of action plan is required for the territory? What was the rank of the territory? Upon these we create a priority system where the goals of Regional Development Programmes (RMP), the EU Water Framework Directive (EU WFD) and the Water Catchments Managing Programmes (WCMP) prescriptions, the Natura 2000 programme, and the tasks of National Agro-Environmental Programme (NAEP) and the actual water catchments development programmes [e.g. Development Vásárhelyi Plan (DVP)] are indicated.

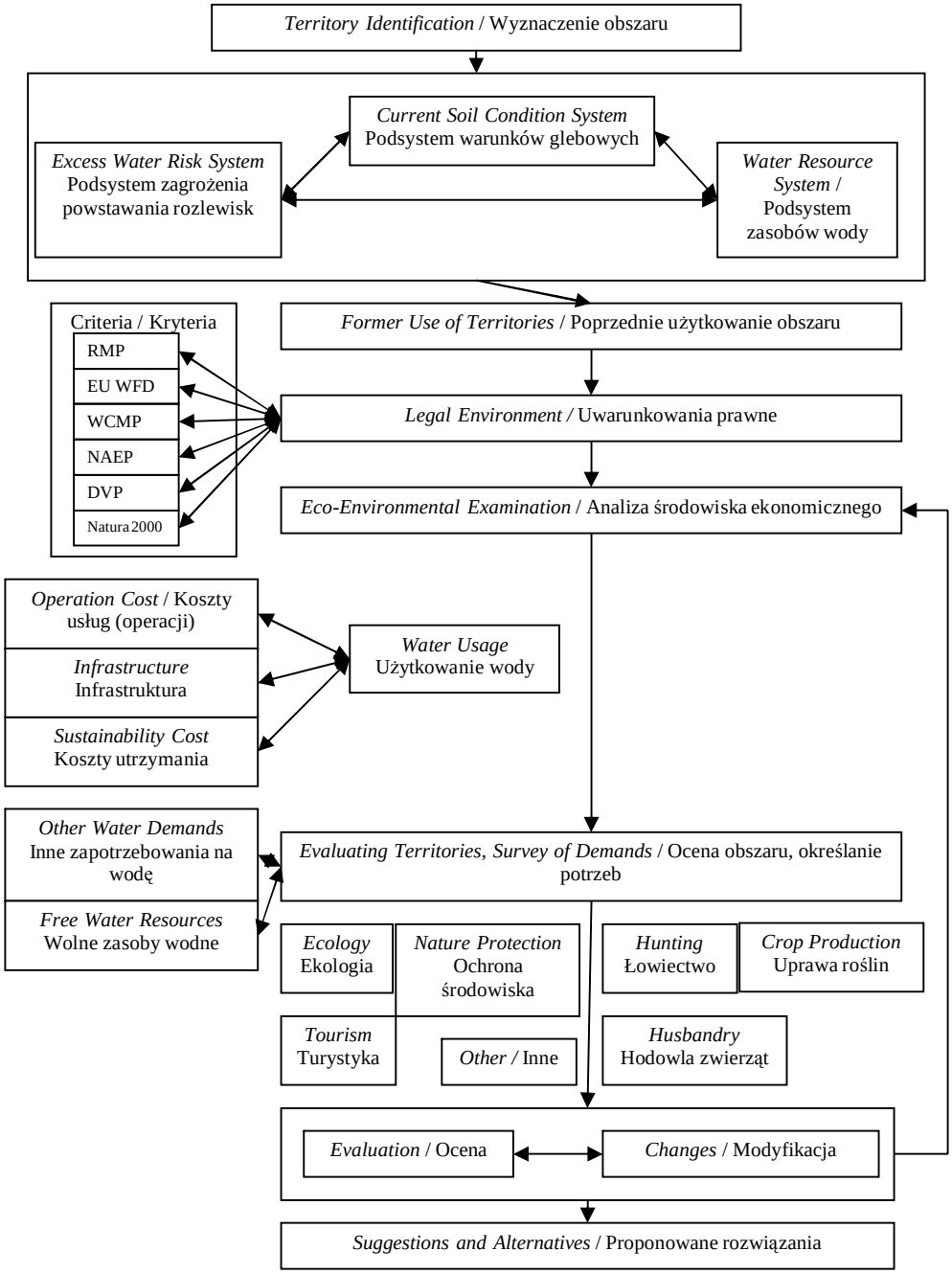

Fig. 1. The Land Use Change Aspects Flow Chart [source: own PhD work]
Rys. 1. Schemat zmian użytkowania gleby [źródło własne: praca doktorska]

The group of alternatives has been determined by these rules and prescriptions which have to be examined also from economical point of view.

During the economical examination one should also not forget the social conditions. Besides of the benefit of the water usage, cost has to be determined realistically. So, one has to pay attention to the changes in the future, and besides the recent needs, we have to count on the demands of the future. Such as, for example, climate change and water demand or changes in water use, the management of free-water resources and the proper indication of these values.

With the help of these we can indicate precisely the value of the territory, the needs of plant production, ecology, nature conservation, hunting, tourism, animal husbandry, and others.

After the evaluation of these plans and change of the demands, such a point of view can be created which is based on the recommendation of territory usage. Such solutions will be created which are beneficial for multifunctional agriculture and pays attention to social and nature conservation demands as well. Such territories where the production is not economic one can think about changing the production structure, or strengthen it if it serves the demands of nature.

The above ideas underline our major conclusion, that the deeper located and excess water endangered territories are good places for establishing aquatic biotopes (e.g. wetlands).

The above mentioned process is described in the following flowchart (Fig. 1.).

VI. CONCLUSIONS

Related to the former data one can see there are requirements for aquatic biotope creation which regulate the long term sufficient water quality and serves the EU Water Framework Directive, created for better water quality.

Long term usage can be realized only with the special demands of soft recreation. The wetland as a landscape object plays an important role in the recreational areas nearby.

From the biotope one has to exclude fishing and fish production because these effects intensively damage water quality by high nutrient pressure. Artificial feeding damages the lake's food chain balance and it can damage not only the surface, but also the groundwater quality.

The EU WFD describes that the good ecological potential of surface water bodies and the sub-surface water bodies have to be protected, and preserved. In this case we have to pay lots of attention to the organized wetland; with special care we can avoid the natural damages of the aquatic environment. The EU WFD aspects will seriously affect Hungary, because of creating sufficient and environmental friendly solutions for the territories endangered by un-drained runoff.

Creating wetland provides lots of functions, such as recreational utilization, protected animal and plant biotopes, excess water reservoirs and with the help of these, the protection of valuable crops, and it helps to solve drought problems. The wildlife of wetland areas serves the variability of nature and an unharmed natural flora and fauna will be created.

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KSZTAŁTOWANIE TERENÓW PODMOKŁYCH NA OBSZARACH ZALEWOWYCH

Streszczenie

Na Węgrzech, co około pięć lat, powodzie zalewają powierzchnię blisko 300.000 ha. Powinno to być brane pod uwagę przy planowaniu użytkowania tych terenów- najbardziej wskazane jest urządzanie tam wielofunkcyjnych agroekosystemów. Tereny zagrożone powodzią muszą być zabezpieczane przez zalesianie, tworzenie łąk, pastwisk, stawów rybnych i pól ryżowych, oraz ich kombinacji, co umożliwi szerokie i różnorodne wykorzystanie powstałych obszarów.

Podczas powodzi warstwa powierzchniowa gleby unoszona jest do rzek, jezior i innych zbiorników wodnych, a źle prowadzone melioracje powodują powstawanie terenów błotnych i wzrost zasolenia gleb. Podobnie, obciążenie dla środowiska powoduje nadmierne nawożenie azotem, fosforem i potasem, degradując wody.

Tymczasem, używając rozsądnie zasobów naturalnych, nowoczesnych technologii i wiedzy, możemy uzyskiwać więcej żywności i innych produktów rolnictwa zrównoważonego, przy wykorzystywaniu mniejszej ilości gruntów rolnych, wody i energii.

Rozwiązywanie problemów okresu powodziowego, nie powinno być prowadzone bez rozważania gospodarki wodnej w okresach suchych i przy braku wody. Strategie osuszania i nawadniania musza się równoważyć. Należy stworzyć system, który będzie w stanie osuszać tereny podmokle i zapewnić zasoby wody w czasie suszy. Najważniejsze rozwiązania w tej dziedzinie opisane są w Water Framework Directive (EU WFD) obowiązującej zarówno na Wegrzech jak i w UE. Kształtowanie terenów podmokłych zdaje się być dobrym rozwiązaniem z punktu widzenia EU WFD, rolnictwa i ochrony środowiska.

Kształtowanie terenów podmokłych spełnia wiele funkcji, takich jak rekreacyjno- użytkowe, ochrona biotopów roślin i zwierząt, zatrzymywanie nadmiaru wody jak i, w związku z poprzednimi, ochrona wartościowych plonów i łagodzenie uciążliwości suszy. Ukształtowana w tych działaniach flora i fauna terenów podmokłych jest także częścią różnorodności natury.

Słowa kluczowe: Gospodarka wodna, spływ powierzchniowy, tereny podmokle