Catchment area based holistic water management planning

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Catchment area based holistic water management planning pays attention to development potential of agricultural production and environmental protection as multidimensional as possible. On agricultural fields the holistic drainage approach means functionality of basic and local drainage including also control of surface flows and taking into consideration biodiversity, water quality and fishery. On the fields well-functioning basic drainage enables the functionality of local drainage and acts for soil structure improvement. When the soil structure and growth potential are in good condition, this ensures effective crop cultivation. At the same time nutrient losses and loading to natural water systems can be decreased. Unfortunately, this is at present not the case in Finnish agricultural water management, where problems are typically tackled sporadically without holistic, catchment-scale approach. The objective of this presentation is to briefly describe 1) the expected potential of catchment area based holistic water management planning, 2) the tools and measures that can be applied (spatial analysis, measurement techniques, modeling of load areas) and 3) the potential and challenges of using nature based solutions as part of drainage projects.

The drainage renovation measures should be implemented with holistic approach on a catchment area to decrease the nutrient load to waterbodies and to support effective farming practices. The renovation objects should be listed, so that the actions could be targeted systematically, beginning from the objects most critical for drainage and nutrient losses. This calls for wide study of the drainage system condition, first with the basic material (aerial photos, height/contour data, soil structure data) choosing the objects, and after that field study of them. The objective is to map flood risk and assess drainage needs. Flood risk and erosion modelling could be a tool for the preliminary study, but nutrient outflow and drainage needs assessment cannot be based only on modelling, but needs additional field measurements and studies on the site. Combined with the risk area mapping, also the activity of the local drainage corporative bodies should be found out. This should be done together with drainage planning experts systematically and nationwide, not only concerning the risk zones.

For every drainage system or catchment, the actions should be targeted individually. Land use, soil and topography set limitations which must be taken into consideration. In the large scale this causes several uncertainties and exact objectives or limit values cannot be set. According to our experience the best way to promote the actions are direct connections with farmers or land owners of the problematic fields.

There is a myriad of research results on individual field management practices and water protection measures like reduced tillage, controlled drainage, buffer zones and constructed wetlands (e.g. http://nwrm.eu/source/pilot-info, Uusi-Kämppä et al. 2000). Albeit many of these have proven effective and have gained popularity in water protection efforts, diffuse nutrient loading in Finland has not markedly decreased in recent decades (Tattari et al. 2017). Our hypothesis is that systematic, catchment-scale and step-by-step implementation of holistic water management including appropriately targeted use of such measures most probably guarantees the best possible result for both drainage and soil structure improvement and minimization of nutrient losses to waterbodies. When the renovation needs of drainage systems are massive, unsystematic implementation without planning should be avoided. We argue that if and when national scale renovations are made properly, it not only contributes to drainage management and environmental benefits at separate field plots, but also to increased land value and gross national wealth, carbon sequestration, environmental education and maintenance of infrastructure.

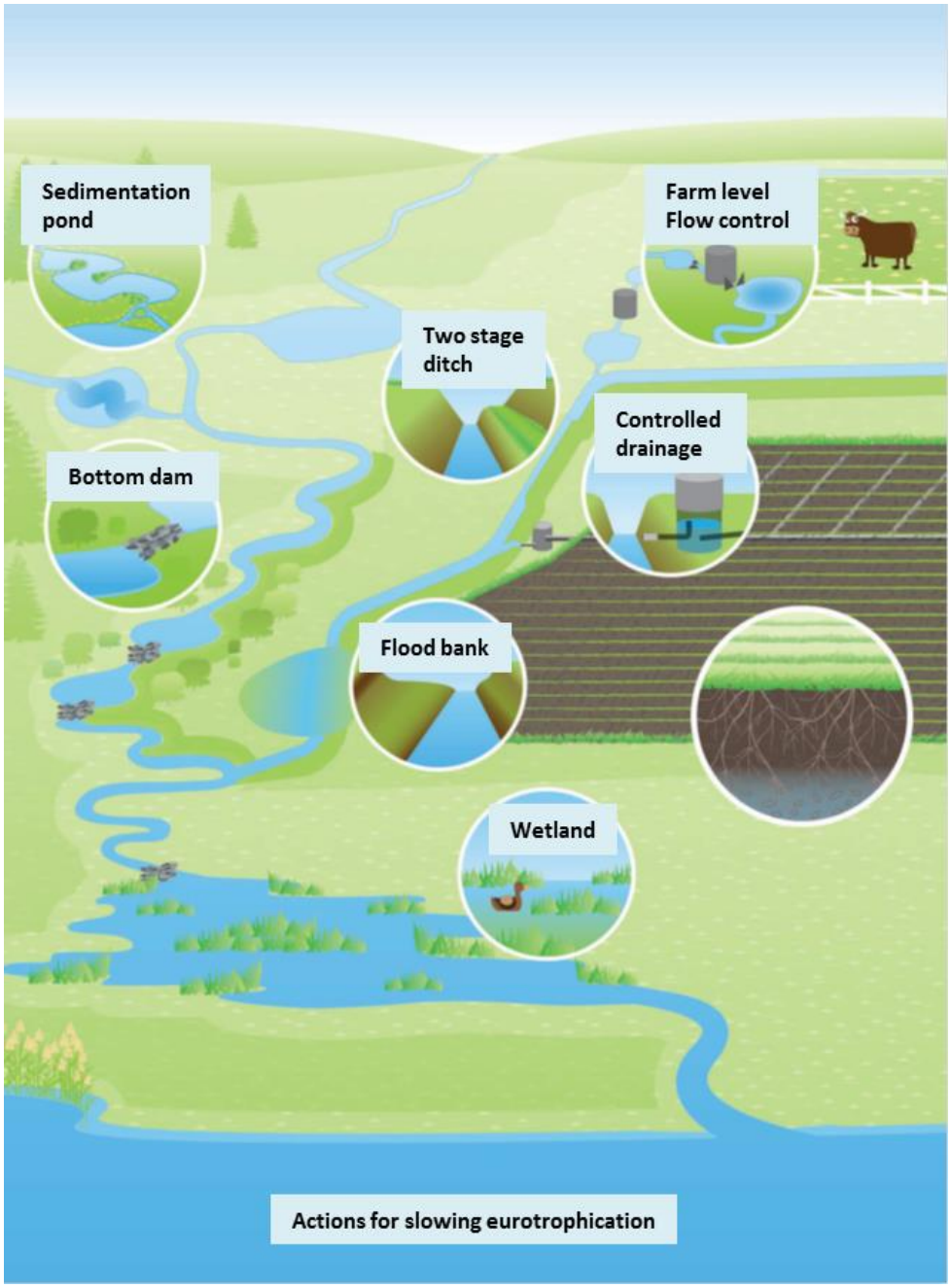

Fig. 1. An illustration of the measures of catchment area based holistic water managementin agricultural areas. Mainostoimisto Kuke. (Granholm et al. 2018)

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