DIFFUSE POLLUTION MANAGEMENT IN THE CZECH REPUBLIC AT THE EXAMPLE OF SELECTED WATERSHEDS CASE STUDY.

J. Holas*, J. Klir**

**Agricultural Research Council, Maratkova 915, 142 00 Prague-Kamyk,*
*** Research Institute of Crop Production, Drnovska 507, 161 06 Prague-Ruzyne, Czech Republic*

ABSTRACT

Diffuse pollution management should play an important part in achieving the aims of the EU Water Framework Directive. Based on legislature amendments the Agricultural Water Management Authority has been established on January 2001 to provide nitrates monitoring within entire territory of the Czech Republic and information system are to identify waters actually or potentially affected by pollution from agriculture. Due to significant interactions between agriculture and the aquatic ecosystems a case study has been initiated to access present state of surface water vulnerability to pollution. Long term monitoring of nutrients load entering Zelivka drinking water reservoir and hazardous events statistics resulted into maps characterising the territory including vulnerable zones and risk factors. Codes of good Agricultural Practice stating mandatory farming methods in designated vulnerable zones and Action Programme are actually in process of implementation. To assess shifts of actual Czech environmental policy in favour of the direction entirely away from production-based payments to farmers include an important role of water supplier, either in the negotiation process and/or in the provision of financial resources. Through a comprehensive, integrated approach to water resources management, progress in controlling point and non-point source pollution can be made.

KEYWORDS : Agriculture, case study, diffuse pollution abatement, EU water policy, integrated approach, nitrates, payments to farmers negotiations

INTRODUCTION

Governmental regulation No. 103/2003 Col. on nitrate directive came into force on 11 April 2003 and designated vulnerable zones in the Czech Republic reach almost 42.5 % of the total area of farmland. Entrepreneurs in agriculture that farm the land within cadastral areas translated into vulnerable zones are oblige to accept regime of farming ordered by state executive which seems to be insufficient without proper compensations. Within watersheds of drinking water reservoirs the Codes of good agricultural practice ordered by Governmental regulation on nitrate directive interfere with the Regime of farming due to protected zones of water resources set up by the water legislature (water regime protection in accordance to § 27 of the Water Act No. 254/2001 Col.). Planned reform of Common Agricultural Policy (CAP) of European Community is set out and a newly formulated agricultural effort is reasonably linked to environmental improvements. According to Doucha (2000) farmers are now seen as not only producers of food and fibre, but is evident that they can produce various positive externalities for rural socio-economy. In this consequence the Czech Government in respect with previous ideas assigned the Ministry of Agriculture to introduce new complex program for set-aside areas support with the aim to encourage farmers for "non-food" agricultural production activities. Diffuse pollution from agriculture can be controlled when land use changes namely no-plough arable farming is practised in areas where erosion into watercourses is a problem.

According to Puncochar (2002) the conceptual development of water management in the Czech Republic has started in accordance to EC legislature amendments that made proposals to enhance environmental concerns into agricultural policy due to explanatory memorandum “A long-term policy perspective for sustainable agriculture” presented by Commission of the European Communities (Fischler, 2003).

OBJECTIVES

This presentation considers some of the agroenvironmetal aspects connected with actual implementation of EC-legislation for water sector and proposal for an agri-environment Chapters of Agenda 2000. Within the current reform of Common Agriculture Policy more important are amendments of Council Regulation (EC) No 1251/1999 of 17 May 1999 establishing a support system for producers of certain arable crops and Council Regulation (EC) No 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF).

The aim of case study carried out is to achieve sustainable use of the most important water reservoir Zelivka in Bohemia by protecting and enhancement water quality through sustainable farming practices, integrated approach to water resources management and progress in controlling point/non-point source pollution based on comprehensive monitoring system. Pressures to find solutions to agricultural non-point source pollution of ground and surface waters emphasize the progress of the Czech Republic accession into European Communities.

SAMPLE SITE AND METHODS

The agricultural pilot area was selected within the territory of Zelivka river basin, where the primary aim was to reduce nutrient losses from agriculture by implementing the Best Farming System. In order to avoid land abandonment farmers

will have to meet stringent land management obligations as part of the new cross-compliance requirements and standards taking account of the specific characteristics of the areas concerned, including soil and climatic conditions and existing farming systems (land use, crop rotation, farming practices) and farm structures. Governmental regulation No. 500/2001 of 3 December 2001 establishing support programmes for non-food production and multifunctional agriculture would improve the income situation of many farmers in marginal areas huge occurring in this watershed. In 2001 the Agricultural Water Management Authority was re-established to maintain small watercourses in agricultural/rural areas and simultaneously with the New Water Act No. 254/2001 Col. the comprehensive networks of water quality monitoring sites in each catchments has been established. Considerable work of the Project was carried out in the catchments of Zelivka drinking water reservoir that have landuse characteristics as follows.

Table 1 – Landuses in the Catchment area

Landuse Type	*Area (km ^{2})*	*Number %*
Farm land	685,75	57,7
Forests	327,22	27,5
Watercources and lakes	0,76	0,1
Other (villages, roads and sempervivous)	174,83	14,7
Total acreage of catchment	1 188,56	100,0

A hydrometric network of nitrates monitoring was established in co-operation with TGM Water Research Institute aiming to set up measures of risk assessment for agricultural landuse. Twenty new or upgraded sites consist of investigative monitoring were installed within the Zelivka reservoir catchment to evaluate effectiveness of Action programme and Codes of good agricultural practice due to Governmental regulation No. 103/2003 Col. concerning nitrates directive.

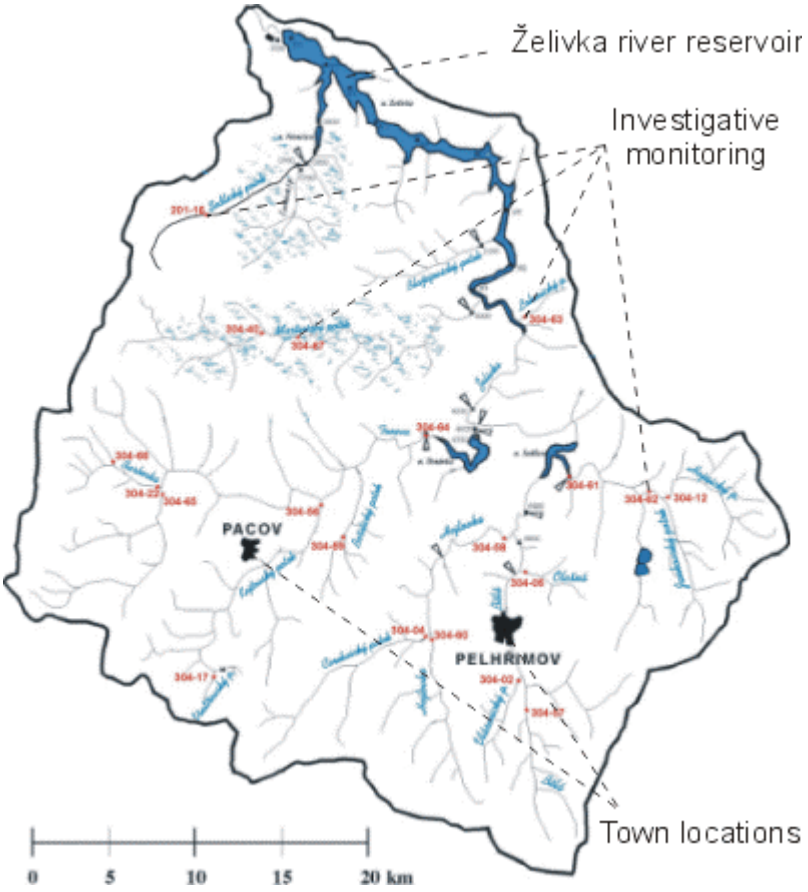


Figure 1 – Location of monitoring sites in the catchments of Zelivka reservoir

To aim project investigations the two sub-catchments were selected as pilot study areas where possible impacts of farming to water ecosystem have been estimated. Willingness to change polluting agriculture practises is currently undertaken by the Czech Ministry of Agriculture, which has prepared system of subsidies and payments to farmers in accordance to support principle due to marginal areas. It may well become a useful model for setting out criteria and schemes for the both water protective and land use management to promote environmentally bound benefits. The consistent strategy of active support, starting with soil conservation towards vulnerable zone mitigation, is getting under way. This kind of area-

specific approach ensures coherence within water management and physical planning in large-scale agriculture and rural development.

RESULTS AND DISCUSSION

Diffuse discharges are primarily associated with runoff from land as a result of landuse activities and its physical characteristic (Holas et al., 1999). In 1989 there was a total of 12 agricultural co-operative farms in these sub-catchments (see Figure 2) that use the farmland potentially polluted from nutrients, the average farm size in the sub-catchments was 2549 hectares. Nowadays agricultural in the area is "medium intensity" but nitrates load to surface waters is arising constantly. There is no debt that rural villages without efficient wastewater treatment plants located within investigated area may be the cause of water pollution, as well.

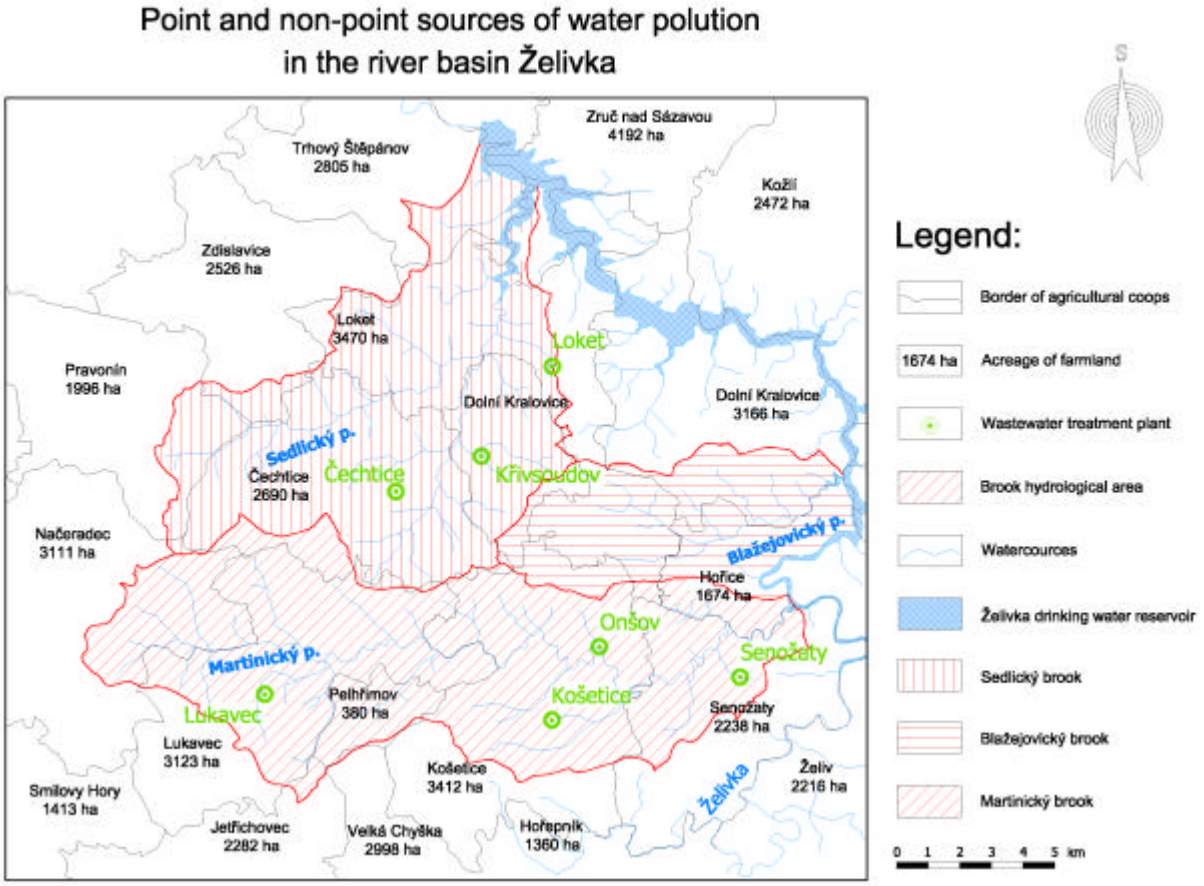


Figure 2 - Agricultural co-operative farms in the sub-catchments

CODES OF GOOD AGRICULTURAL PRACTICE ESTIMATION

In order to maintain farmland of each sub-catchment in good agricultural condition, standards based on good farming practices should be ordered for every Co-op located in the investigated hydrological area. The flow related samples taken at the bottom of the sub-catchments were used to make more precise estimates of nutrient loads discharged from this farmland. The current monitoring and control system for farm payments will be used to facilitate cross checks between payment entitlements and the surfaces needed to activate them. Proposed system for identifying agricultural parcels therefore remains fundamental to the diffuse discharges investigations simultaneously to the new possibility to pay support for farmers.

Nitrates directive action programme implementation

The first action program has to emphasize compliance with known agronomical rules and existing regulations, gradually exert proposed measures, and assist in distribution of necessary information to agricultural practice. The accepted procedure respects a high number of vulnerable zones, as well as differences among soil-climatic conditions within the territory of the Czech Republic.

The bonity soil-ecological units system (hereinafter referred to only as "BPEJ") utilization enables land grouping by similar conditions and proposal of differentiated farming methods for these groups. An action program for the Czech Republic shall thus be a detailed list of measures for individual BPEJ groups published in a Government Regulation.

This procedure means that most measures will be tailored to the specific land types according to their BPEJ classification using a simple administrative procedure. Everyone will be thus able to identify whether they are located in a vulnerable zone and what measures they have to comply with. The BPEJ system is fully incorporated into Czech legislation currently is binding and applicable to calculation of taxes, payments for occupation of agricultural land resources, for land planning, landscape ecological stability assessment, and for land resources protection. The BPEJ system is valid for the entire territory of the Czech Republic; it has been digitized and implemented into cadastre. Evaluation is made for agricultural

land (forests are not evaluated), i.e., for arable land, for meadows and for pastureland. Other categories have the following codes assigned: 23 - forest, 26-landfill, 29 – barren ground, 34 – quarry, 35 - water. The bonity soil-ecological units (BPEJ) are characterized by climatic region, main soil unit, sloping and exposition, skeleton character and by soil depth. These parameters specify main soil and climatic conditions of evaluated land, whereas:

1. **Climatic region** defines a territory with approximately identical climatic conditions for growth of farm crops; it is expressed as the 1st digit of the five-digit numeric code
2. **Main soil unit** is a purpose group of soil forms wit similar properties, which are determined by genetic soil type, subtype, soil-forming substrate, particle size distribution, soil depth, soil hydromorphism degree, or by a substantial slope or morphology of the land, and by fertilization measures; it is represented by 2nd and 3rd digit of the numeric code
3. **Slope** and **exposure** to cardinal points describe the formation of agricultural land surface and their combination is expressed as 4th digit of the numeric code.
4. **Skeleton character** (proportion of gravel and rock contents in arable soil in proportion to the contents of these items in subsoil in the depth of 60 cm) and depth of soil are represented as the 5th digit of the numeric code.

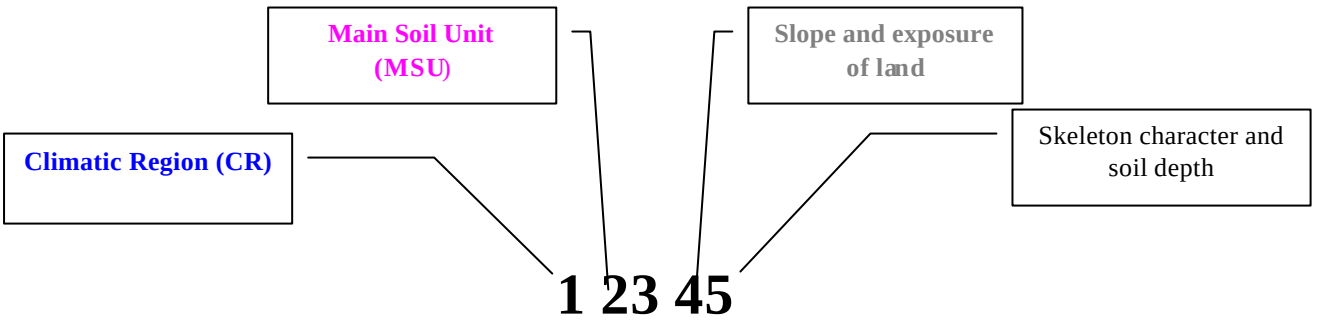
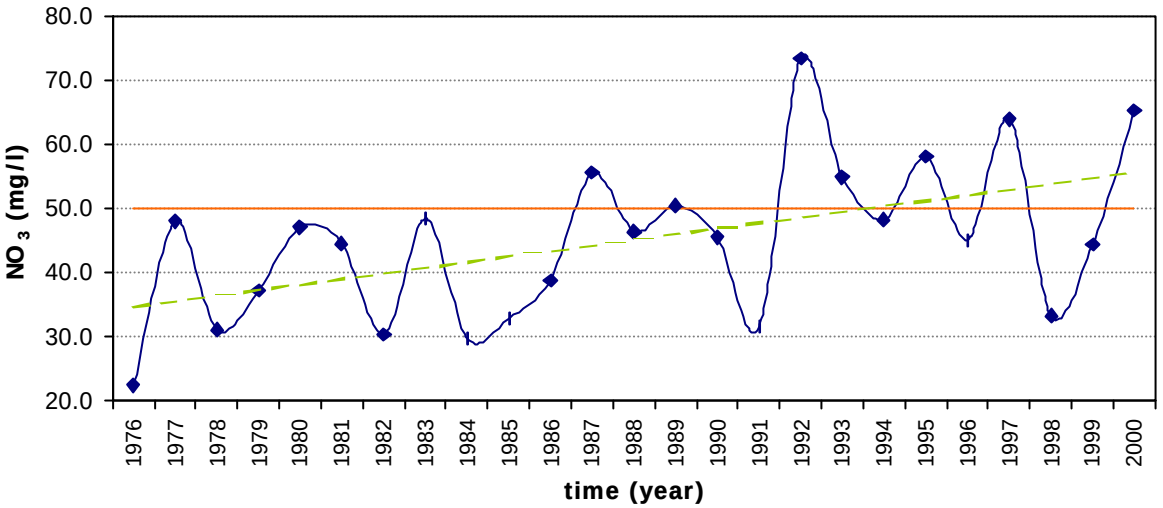


Figure 3 - BPEJ Numeric code

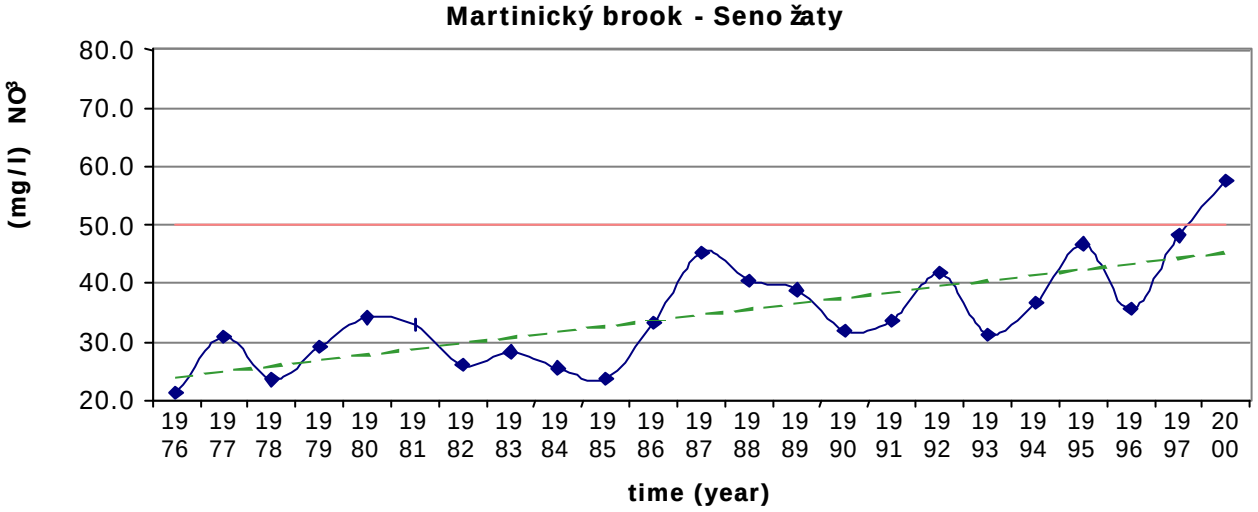
Main soil units (MSU) of the same or, if possible of similar genetic origin, but also soils with different genetic properties with the same particle size distribution, are aggregated into the same MSU groups. Each soil group thus represents approximately identical ecological conditions. The characteristics of evaluated soil-ecological units (BPEJ), including their division by nitrogen regime of soils, application zones for nitrogen, and assigned really achievable yields of selected crops are given in database. An action program has to support reasonable fertilizer use based on respecting of the balance between the nitrogen supplied and its consumption by the crop. This approach is considered to break an increasing trend of nitrates concentrations data gathered on monitoring profiles within sub-catchments watercourses. A stream, Sedlicky brook drains sub-catchment area, which profile P0700 located close to reservoir water body is included in a long-monitoring program of water quality concerning the Zelivka reservoir. Long-term trend in the concentration of nitrate has been assessed from data gathered between 1976 and 2000 and expressed in the annual mean concentrations. In year 1994 the long-term trend of non-point source pollutants such as nitrate reached limit 50 mg. NO_3 / litre set out for drinking water quality.

Figure 4 Long term monitoring of NO_3 concentration on the profile P-0700 Sedlický brook - Leský Mlýn



Martinicky brook drains sub-catchment that feature higher portion of forests and two monitoring profiles installed within watercourse. Growing up trend in the concentration of nitrates has been seen from data on bottom profile P- 3000 gathered between 1976 and 2000 when expressed in the annual mean concentrations (see below).

Figure 5 Long term monitoring of NO^3 concentration on the profile P-3000



SUMMARY

Agricultural watershed involves manipulation of soil, water and other natural resources and it has profound impacts on ecosystems. To manage these complex issues, we must understand causes and consequences and interactions related transport of pollutants, quality of the environment, mitigation measures and policy measures. Financing involves provide annual payments to farmers, who undertake to manage specified areas of their land in a particular way and one-off payment to realise proposed issues ensuring soil conservation and watershed ecosystem benefits.

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