
AGRO-ECOSYSTEMS AND SUSTAINABLE DEVELOPMENT OF WATER RESOURCES IN ARGES RIVER BASIN

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Abstract

Lotic ecosystems, part of the Natural Capital, is one of the key factors functioning of socio - economic development and their support. An important role in their sustainable development, is the retention and recycling of nutrients, especially N, P and their compounds. The nutrients in lotic and lentic ecosystems are either due to natural biochemical processes or by human impact of pollution or broadcast process and characterize the ecological status of water bodies and thus can determine the quality of services provided. A special importance have agro-ecosystems, particularly multifunctional livestock farms. Pathways by which pollutants (especially nutrients and pesticides, and other pollutants) to reach bodies of water are different (surface drainage, percolation, etc.).

To ensure sustainable development of water resources is necessary for agricultural development to take place in terms of minimizing waste streams and not affect the production and support of NC.

Keywords: natural capital / agro-ecosystems / nutrient retention / sustainable development of lotic ecosystems

1. INTRODUCTION

The concept of “sustainable development” means all forms and methods of socio-economic foundation of which is to ensure a balance between socio-economic systems and natural potential [2].

The best known definition of sustainable development is the World Commission on Environment and Development (WCEF) in the report 'Our Common Future', also known as the 'Report Bruntland': 'Sustainable development is development that aims to meet the needs of present without compromising the ability of future generations to meet their own needs'[1].

2. MATERIALS AND METHODS

From the perspective of systems ecology, natural capital is the foundation of socio-economic development given its diverse component: natural ecological systems, semi and anthropogenically altered systems (specialized production units or units that provide a particular service) directly dependent on considerable inputs energy and ancillary materials (Fig. 1).

Components of natural capital (NC) have the ability to self-sustainability and to develop meaning maximalizarii energy flow and improve the mechanisms of recycling of materials necessary for the production of resources and services. It is known that elements of the Natural Capital components have a limited productive and support capacity an increase in waste flows and flows of materials and energy inputs causing ecological changes at the spatial and temporal scale [5]. Given been the structure of NC, it's supplying Socio – Economic Systems with resources (through its production and informational functions) and services (through its control functions and support). (Fig.2)

From the perspective of ecosystem ecology, agro-ecosystems / agro-biodiversity is defined as 'transformed and simplified ecosystems in agricultural production systems' [8].

These are including :

- Species directly or indirectly used as food sources for both agriculture and human population to feed domestic animals, namely

that the materials and services (fibers, fuels, pharmaceuticals, etc.);

- Human population and livestock feed respectively as raw materials and services (fibers, fuels, pharmaceuticals, etc..) ;
- Habitat and species outside agricultural production system, but that benefit

- agriculture (crop varieties, breeders - including fish, birds, insects);
- Complex organic systems – the cultivated varieties and breeds are only part of the structural high, with the ecotone areas, wildlife, pollinating species, etc.

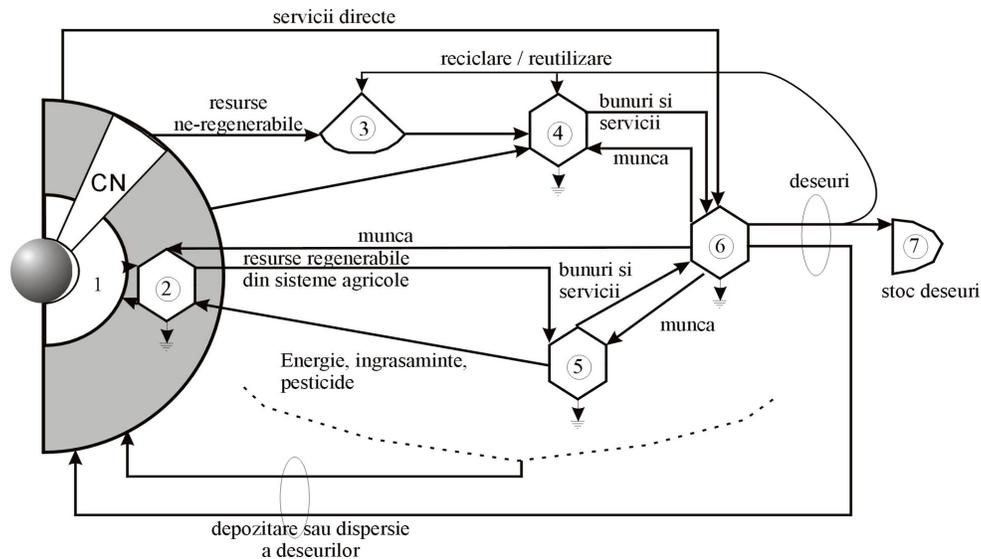


Figure 1 - Structure of the general physical model that identifies spatial relationships and exchanges of mass and energy between the socio-economic and its foundation (after Vadineanu 2001) [1]: 1. and semi-natural components of NC, 2. components of NC energy-dependent inputs and auxiliary materials, 3. commercial energy production systems, 4. industrial systems that process non-renewable resources, 5. renewable resources, industrial processing systems, 6. social subsystem 7. Waste Inventory

ECOSYSTEM SERVICES

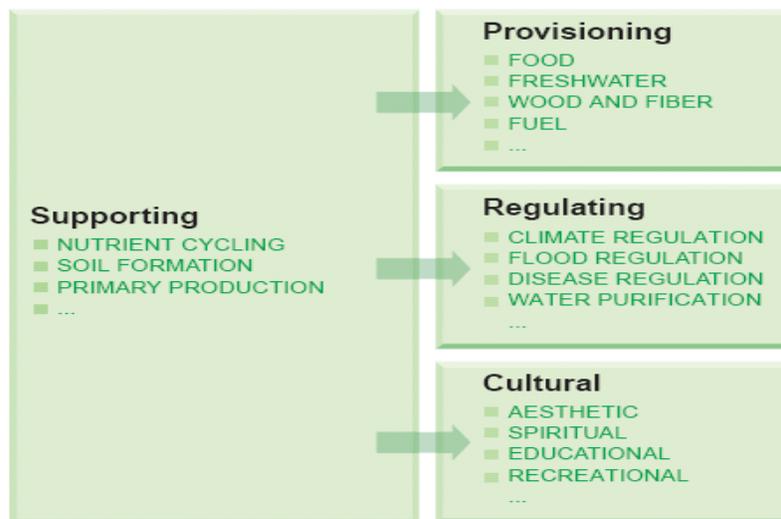


Figure 2 - ecosystem services (benefits SSEc get them because of the exercise the functions of ecosystems), as the Millennium Ecosystem Assessment An important part of NC is the agro-ecosystems, defined as terrestrial and aquatic ecological systems processed / created and controlled by man.

The notion of agriculture is referring to all types of food resources and agricultural production – eg. farm crops and livestock, fishery, forestry.

Given that agriculture, in particular case, livestock farms are a factor of order which creates pressure on lotic and lentic ecosystems, we believe that their timely analysis [4].

3. RESULTS AND DISCUSSION

Arges river basin (Arges river and its tributaries) is one of the most important in the country, since hydropower potential, providing water supply for population agglomerations, industrial and agricultural settlements (Fig.3) [3].

In Arges river basin, livestock farms are characterized by different stages of development, them pressures on these components CN and lotic ecosystems, in particular, are significant.

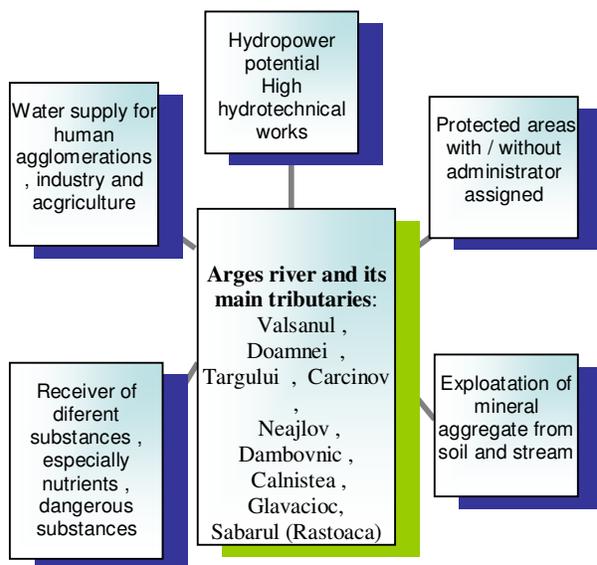


Figure 3. Hydrographic basin of Arges river - resources

In accordance with the Water Framework Directive, is considered significant pressures the pressures which has that results the attainment of environmental objectives for water bodies studied.

Thus there are both small farms, household type, but large farms too, whose activities fall under the IPPC Directive (eg. Heads over 40,000 birds) [7].

For typical small peasant farms, manure is stored throughout the city and are used to fertilize the land near the house. There are few cases where this manure is used to fertilize field crops, chemical fertilizers usually is used.

A negative impact on quality of water resources is the fact that in household farms, the spreading manure does not meet the Code of Good Agricultural Practices and the use of fertilizers is often not based on soil analysis.

Improper storage of manure, fertilizing land without soil studies and no studies assessing the quality of groundwater pollution have resulted in his time. It should be noted that much of the Arges river basin is characterized as vulnerable to pollution by nitrates from agricultural sources.

With the completion and commencement of the privatization process of accession to the European Union, poultry farm owners have invested large sums in the acquisition of new technologies capable of reducing waste flows and thus reduce pollution lotic and lentic ecosystems.

By transposing into Romanian legislation, the Council Directive 96/61/EC referring to integrated pollution prevention and control (IPPC) it was established the list of water users for which the transition period for compliance with the requirements of BAT (Best Available Technologies). The implementation of this Directive required water users to change the performance of existing technologies which led implicitly to improve effluent quality in lotic ecosystems or reduce groundwater pollution, but the high cost per time. It should be noted that there were water users that could not economically support these requirements, currently being closed activity (eg SC SUINTEST Oarja SA-growing farm pigs / discharge wastewater into the river Dâmbovnic).

A case study may be the development of poultry farms in the surrounding area

Mihailesti, Giurgiu county . The main rivers in this area are Arges and Neajlov rivers.

Both during the communist period and after 1990, the development of these poultry farms was based on a sectoral approach of natural capital components. In this period, chickens were grown in conventional batteries, manure being discharged on water pillow, they were in very large quantities and stored in ponds or discharged into the waste water treatment plant,

which led to the deterioration of groundwater quality and lotic ecosystems (Neajlov river). For better illustration, in Fig. 4 (a, b) abstraction of groundwater quality is presented by three water wells associated with one of the existing poultry farms. Fig.4a is the quality of water abstracted from wells, in 1984, the year of commissioning of the farm, and fig. 4b, is the quality of water in 2005, the year and start drilling deznisiparii farm modernization.

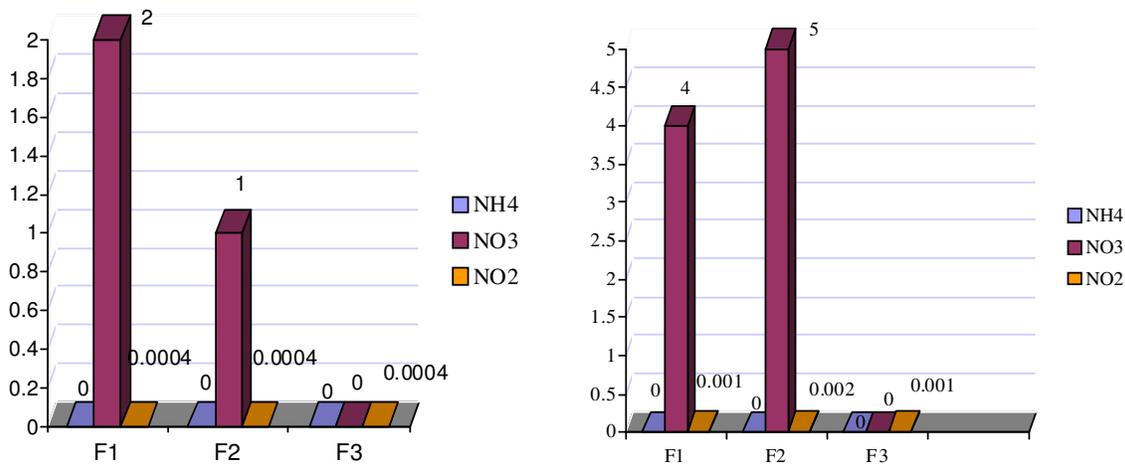


Figure 4 a) Water quality in wells in 1984; b) Water quality in wells in 2005

This discrepancy may be explained by higher during nutrients transfer from the soil to underground water, due to lithology and soil permeability default or by the denitrification of nitrates. Regarding this aspect, Eunice Lord & co. (1995) argues that it is not sufficient simply to determine nitrates in the water abstracted for drinking water, according to the percolation of nutrients through agricultural fields can take several decades to reach drilling, water abstraction in the section [6].

Thus, for a more accurate assessment of the evolution of nutrient concentrations in lotic and lentic ecosystems is necessary to estimate how nitrate leaching through the analysis of current practices used in agriculture and the types of processes involved.

The study noted that subject area, has not monitoring wells to provid groundwater quality. Wells F₁ and F₂ are located near the farm, agricultural land and is located inside the drilling F₃ farm. Three wells have a depth of

about 35m and their hydrostatic level is determined at about 8.5 meters. It is found that development of livestock farms and agricultural fertilization without to have an ecosystem approach of NC components cause deterioration of groundwater in studied area .

Reffering to discharge wastewater from the farm, until the implementation of the IPPC (Integrated Pollution Prevention and Control), wastewater resulted from cleaning breeding hall and sanitary filter were discharged in cleanable tanks and after that in existing wastewater treatment plant in Mihailesti . It should be noted that with the introduction of technologies B.A.T. (Best Available Technologies) promoted growth of poulltry in organic batteries or soil (straw asthenia).

Consequently, there resulted lower quantities by dried manure with lower nutrient content. The collection, storage and spreading the resulted manure on the land, imposed by the IPPC Directive have led to reducing the impact

on groundwater quality and improving the quality of wastewater from cleaning breeding hall / quality of the influent / effluent of waste water treatment plant.

In fig.5 your attention to the variation of the average values of annual average concentrations of nutrients in the period 2003 to 2010, crucial in determining the quality of wastewater treatment plant effluent / river Neajlov.

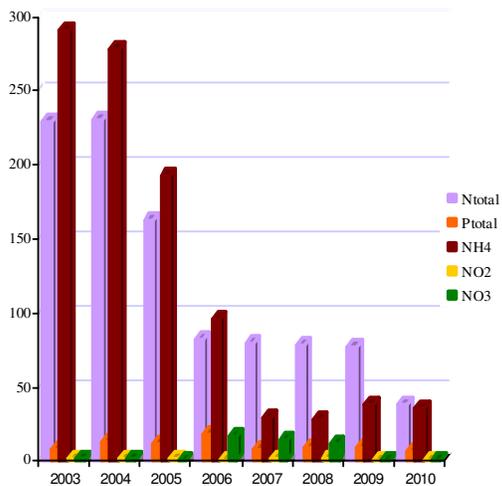


Figure 5 Variation of annual average concentrations of nutrients escape Neajlov river.

Given been the framework for the diagram of nitrogen cycle (gas cycle, balanced) and phosphorus cycle diagram framework, we can see that an excessive increase in available stocks and recycling of nutrients can lead to deterioration in the status of water bodies .

For aquatic ecosystems, this process is closely correlated with agro- management, the human settlements and wetlands.

4. CONCLUSIONS AND RECOMMENDATIONS

To ensure sustainable development of water resources it is necessary for agricultural development to take place in terms of minimizing waste flows and not affect the production and support of natural capital.

Development of livestock farms should take into account: genetic resources, physical-chemical features of hydro-geo-morphological units (HGMU), processes and management techniques (agricultural practices, the use of BAT).

Thus, it is necessary to develop the farm management that take into account conservation and prevention of loss of or damage to parts of its natural capital.

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