Agriculture in coastal areas: environmental issues, impacts and regulation tools

Paul Bordenave, François Delmas, Ramon Laplana, Françoise Vernier

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Author: Françoise Vernier

Cemagref

e-mail:*francoise.vernier@cemagref.fr*

Abstract:

This article discusses the issues and effects associated with agriculture impacting coastal areas, the current status of related environmental affairs and a forecast of agriculture in the future. Some examples are taken from the Spicosa Study Sites, as they constitute together a representative sample of the diversity of European coastal environments. The article concludes by providing suggestions for future management of agricultural activities in a context of ICZM (integrated coastal zone management).

Contents

Introduction

*Nonpoint source pollution is considered as a major factor in the degradation of coastal waters. Major upload sources in coastal waters include agriculture and urban runoff, which mostly bring suspended organic and mineral matters, inorganic nutrients causing eutrophication (N, P extra loads) and xenobiotic substances causing toxic effects on the natural ecosystems. Other significant sources include faulty septic systems mostly located in the surroundings of urban areas (organic and inorganic nutrients, heavy metals, pesticides from peri-urban uses, microbiological and pharmaceutical pollution…), marinas and recreational boating (organic and microbiologic, HPAs, antifouling substances containing pesticides and/or heavy metals (*e.g. *copper and organo-stannic compounds), physical changes to stream channels and habitat degradations.*

In case of watershed inhabiting significant irrigated agriculture as the Charente river watershed, the main tributary of the Pertuis Sea, water abstraction mainly concentrated in low-flow periods can induce significant environmental consequences as strong decrease of freshwater discharge and subsequent diminution of the flow values, change in dilution laws of non-point and point-pollution, in seasonal nutrient loads to the coastal waters and freshening at the river estuary surroundings.

There are significant interactions between management of agricultural land and practices, quantity and quality of water in rivers, health of estuarine and littoral ecosystems and patrimonial conservation issues. The sources of ecological dysfunction - most often associated with agricultural runoff- are the increase of sediment transport changing physical and chemical characteristics of river substrates: perturbation of fish reproduction cycles and of global life cycle of macroinvertebrates needing rough and oxygenated rough substrates, of nutrients favouring eutrophication, pesticides causing toxic effects on vegetal and animal compartments, oxygen-demanding materials provoking anoxia, bacteria altering water salubrity. In the face of drained-irrigated agriculture, a modification of the freshwater discharge results in an increase of flood intensity and at the opposite in a decrease of the remaining water flow at the low-flow period, altering hydro-ecological functioning and littoral freshening.

Some interactions between agriculture and fisheries can be pointed out. Actually, unsustainable farming practices and deforestation have a strong impact on aquatic habitats and water resources - and therefore on fishery resources productivity and quality - through erosion, siltation, pollution and eutrophication correlated to an excessive use of pesticides and fertilizers. Similarly, extensive saltwater or brackish water culture on coastal land areas affects the quality of soils (salinization, water logging) and the quality and the level of the water table.

Policies must take in account all these interactions through various instruments: EU policies, national and regional policies, management approaches and in a context of integrated management. To deal with negative externalities from agriculture, a broad range of policies and tools have been designed, from global to local scales, to encourage farmers towards environmental friendly practices.

The European project SPICOSA (Science and Policy Integration for Coastal System Assessment) proposed a systems approach framework and integrated assessment platforms, in order to consider the ecological, social and economic dimensions of coastal systems management.

1 Definition of the "virtual system": from coastal areas to river basins

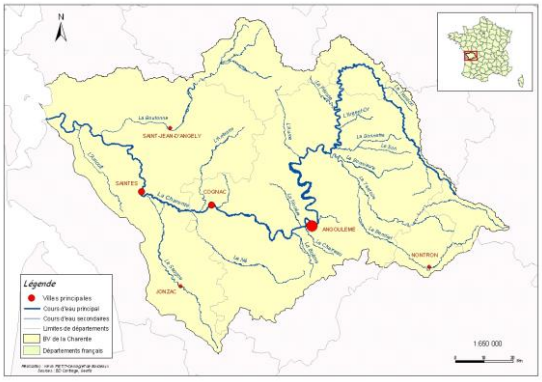
1.1 How to define a coastal zone system

*The Water Framework Directive (WFD) defines **coastal waters** as 'the surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters'. As stated by Andersen et al. (2004), open marine waters are not included. However, the WFD is likely to influence management of all marine ecosystems, because all land-based inputs of pollutants pass through the coastal zone to the open waters. Hence, **the coastal area** is the portion of the ocean where physical, chemical and biological processes are affected directly by land, mainly through the rivers (Milliman, 2001). **The coastal area** can also be defined as the interface between land and sea, delineated as the part of the land affected by its proximity to the sea, and the part of the sea affected by its proximity to the land (http://www.coastalwiki.org/spicosa/Coastal_zone).*

***- In the context of EU ICZM, t**he extent of the coastal system considered has to be linked with the scope of action. The EU ICZM Recommendation is based on the understanding that the societal issue(s) to be solved determine(s) the necessary scope of action (geographical extent, relevant actors and authorities). Administrative boundaries do hardly correspond to issues. Planning and management across the land-sea boundary is often compounded by the existence of separate administrative and regulatory regimes at either side of the boundary. The boundaries of other relevant systems and the interactions between systems are not yet always sufficiently understood or documented in such a way to facilitate integration (e.g. ecosystems boundaries, sediment-water systems, urban-hinterland dynamics, employment basins, economic networks, etc.).*

***- In the context of the Spicosa project** , a Coastal Zone is defined as a "geographic region consisting of the "long narrow boundary between land and ocean that is a dynamic area of natural change and of increasing human use". A coastal zone forms a continuum between terrestrial and marine oceanic ecosystems. On the landward side, the CZ receives discharges from river catchments that may extend for thousands of kilometres and drain large parts of a continent (as in the case of the Danube) or may, conversely, drain only a few square kilometres of mountainside (as on the west coast of Scotland). The Coastal Zone defined by human activity, is largely co-extensive with the geographic CZ. Thus, the CZ has no hard-edged definition: its boundaries will be set according to the problem at hand. This concept is close from the EU ICZM one. In applying the SPICOSA SAF, these boundaries are set along geographically or politically convenient lines, treating the influence of the wider world as boundary conditions. Within these boundaries, the Coastal Zone is considered as the "Coastal Zone System".*

1.2 Why is it necessary to take into account the concept of river basin?



From an ecological point of view, a river basin is the area drained by a river and its tributaries. The headwaters form at the edge of the drainage basin, then join together to make a master, or trunk stream. Beyond its relevance as a geographical unit for water resources development and management purposes, the river basin is also a political and ideological construct (Molle, 2009).

In a large river basin as the Charente one, a lot of sub-basins can be defined depending on the chosen point of outlet for monitoring water resource and corresponding territorial unit management. The perception of the river basin as a physical unit is very old (19th century).Then emerged the idea of a community of water users. Environmental issues reinforced this concept and transformed it into a unit of integrated management of water resources. The integrated management of watersheds, river basins and coastal areas (and of productive ecosystems in general) aims at managing components as parts of a functional whole.

In several SPICOSA systems, river basins have been included, when and where the human activity located on the freshwater watershed makes influence on the ecological and/or societal functioning of the coastal zone.

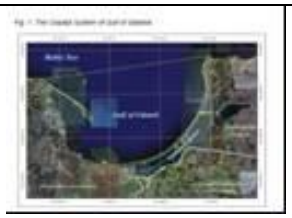
Examples:

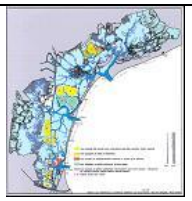
- Nutrient load of coastal tributaries causing littoral eutrophication,

- Drinkable water for the coastal zone being collected and produced from the freshwater watershed and in competition with other uses,

1.3 Coastal zone delineations depending on the policy issues

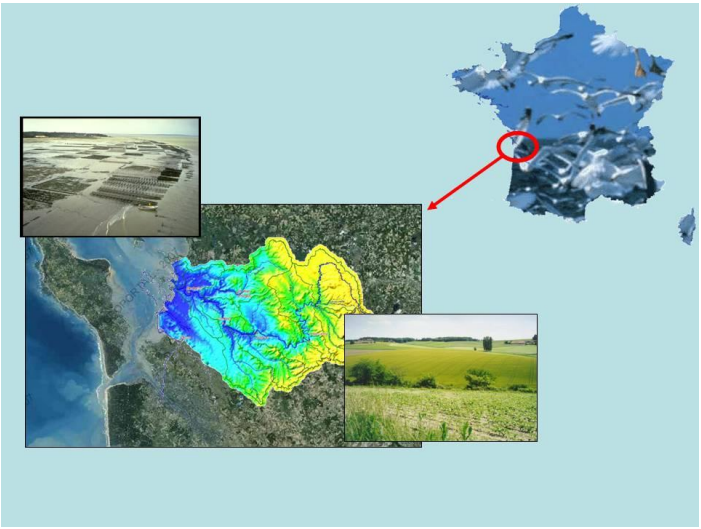
***The examples of definition of the coastal zone within the Spicosa project demonstrate the link between the main policy issues and the relevant extent of the coastal zone**. The table below illustrates the variety of the coastal zone delineations, from marine areas to larger systems including watersheds at local, regional or even transboundary level. (Examples from SSA design reports, in blue the extent is mainly marine and in green wider).*

Study site SSA	*Main policy issues*	*Extent of the coastal zone*	*Map*
SSA2, Gulf of Gdańsk	*Sediment transport and coastal protection. Tourism capacity. Eutrophication.*	*Gulf of Gdańsk with Puck Bay, Vistula Lagoon and coastal municipalities.*	
SSA3, Oder estuary	*Eutrophication and water quality*	*complex pattern of lagoons and islands shared between* *Germany and Poland, Oder river basin*	
SSA 4, Himmerfjärden,	*Coastal eutrophication*	*Himmerfjärden with adjacent bays and islands on the coast of the brackish Baltic Sea,*	
SSA07 – Firth of Clyde	*compatibility of recreational boating and aquaculture*	*The Clyde sea*	
SSA9, Scheldt delta	*Reach WFD objectives in the Scheldt river basin (N) including the coastal zone.*	*Schelt delta and large transboundary river basin*	
SSA10, Pertuis charentais	*Freshwater management of Charente river and coastal zone*	*Pertuis sea and Charente river basin (10 000 km2)*	
SSA13 – Thau Lagoon	*Shellfish farming, eutrophication and contamination*	*Lagoon + watershed system*	

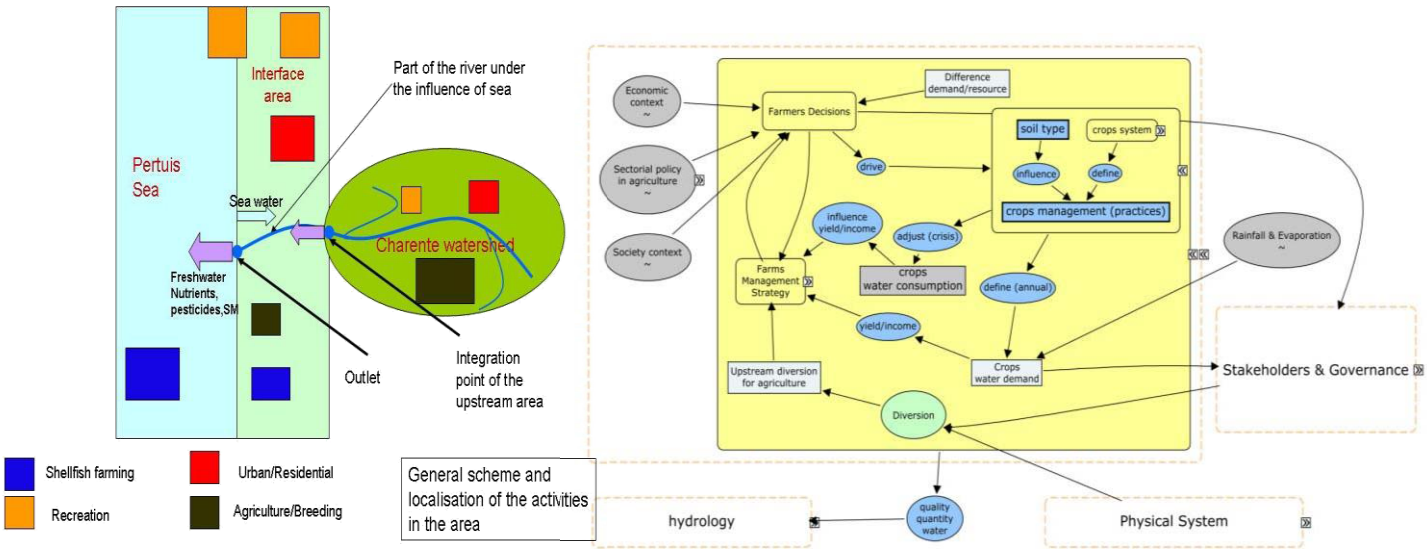
SSA 12,Barcelona Coast	*water quality on the aesthetic* *and recreational aspects of Barcelona beaches*	*Area between the river (the Besòs), to the main port and coastal waters*	
Venice Lagoon System	*methods of managing clam fishing*	*Lagoon*	

1.4 Definition of a virtual system: the example of the Pertuis Charentais Sea and Charente watershed site

The lower Charente shows a risk of failing towards WFD objectives (good ecological status at the term of 2015), due in particular to agriculture diffuse pollution and to recurrent events of water shortage during summer low-flow periods. The management of the Charente river on its coastal zone implies to take into account, and to interact with the management of agricultural activities and of water supply in the river basin: the increase in upstream irrigated crops could be linked with 85% of yearly net global water consumption on the watershed moreover concentrated during the warm season, while drinking water represents 15% of yearly net water consumption with a peak in summer linked to tourism on the coastal zone. These consumptions decrease the river flow at the most sensible season and may alter the global ecological functioning of river and littoral ecosystem.



The question of boundaries is complex and was a subject for discussion (between scientists and also between stakeholders during an animated discussion on the Policy Issue wording).Three main parts have been defined in a first step: the Pertuis Sea (shellfish farming + recreation), the coastal zone with wetlands (shellfish farming + residential + recreation + breeding) and the upstream part of the river basin (agriculture + urban area + recreation). In a second step, an agriculture sub-model has been defined and the spatial repartition of crops at the sub-basin scale has been taken in account. http://www.spicosa.eu/pertuis_charentais/index.htm



Agriculture sub-model

2. How may agriculture damage coastal environment

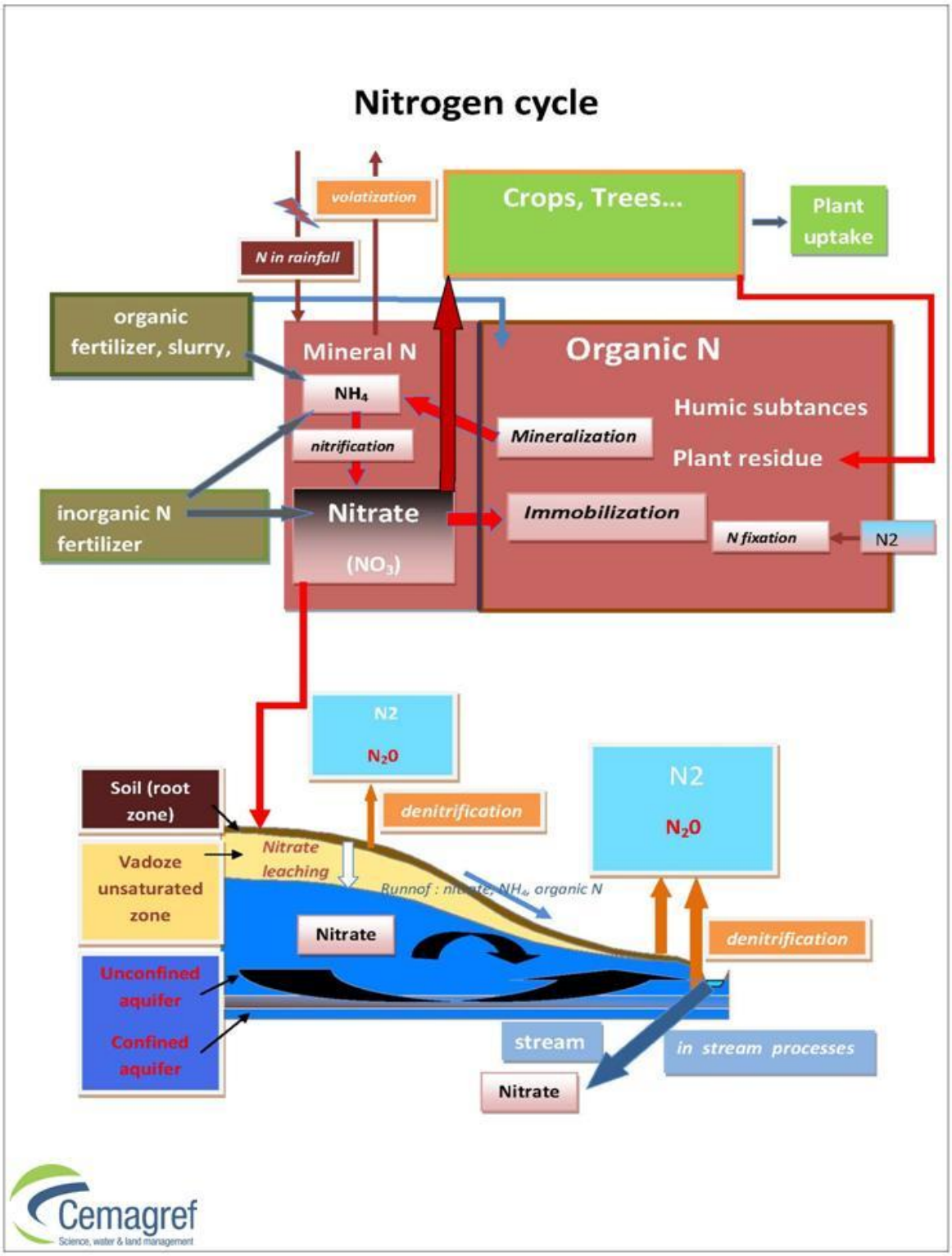
2.1 Erosion, Sediment loads

In France, due to mechanization and intensification of practices, the modernization of agriculture after the 2nd world war has contributed to the removal of edges, ditches and other local specificities spread inside the landscape and hydrographical network, which favoured infiltration and residence times of waters between fields and the river network. This change increased both soil erosion and the intensity of hydrodynamical work into the river bed during increased flood pikes. Another agricultural practice increasing erosion is the ploughing and other related soil works linked to the culture of annual crops, which favours the exportation of fine particles and lets the soil without coverage during a part of the year. This effect is dramatically increased when annual ploughed crops are grown on sloppy grounds. The transport of sediments which results from this erosion first generates disturbance on freshwater fishes and macro-invertebrates (river substrate supporting at least reproduction, or complete life cycle of these biological compartments). Arriving in the estuarial zone, the combined effect of attenuated hydrological conditions and tide cycle make their ejection at the littoral difficult, provoking turbidity maximum and clogging of the estuary. These sediments, mostly ejected at the sea during floods, may contain toxic compounds as metals and pesticides, organic matter and nutrients which can enrich the littoral (eutrophication) and locally generate perturbation and oxygen depletion.

Links : http://en.wikipedia.org/wiki/Erosion (erosion)

http://www.coastalwiki.org/spicosa/Sediment (sediment)

2.2 Nutrient loads, eutrophication



Intensive agriculture practices include chemical fertilization with major inorganic nutrients (N, P, K) in order to guarantee a certain level of harvest and agricultural neat financial product. If K makes low influence on aquatic ecosystems, N and P compounds enrich the freshwater and the coastal ecosystem, increasing phytoplankton

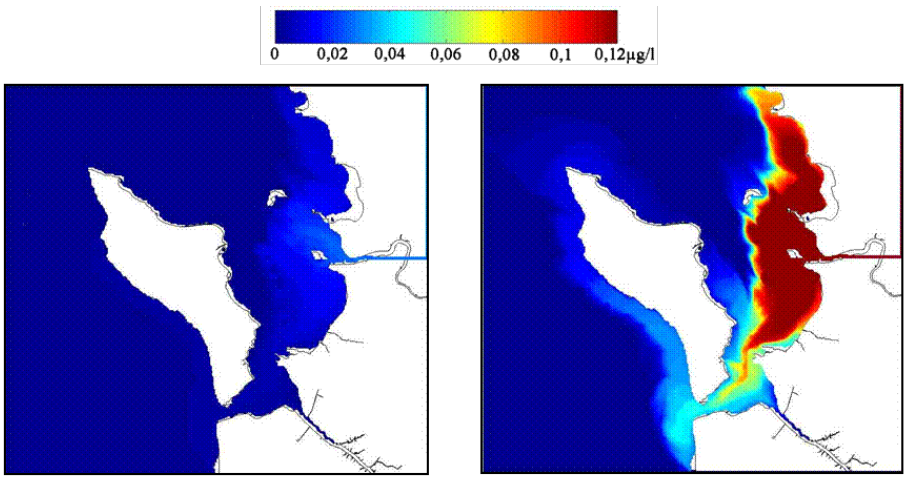
and macrophyte production (eutrophication). Moreover, in places downstream intensive cattle breeding (like in French Brittany), the excessive manure production due to industrial piggeries and aviculture has to be expanded on too much limited geographical areas (because of transport costs), generating structural excess of fertilization and loads at the coastal system. This can result in "green tides" provoked by accelerated production of phytoplankton and green macroalgae (ulvaceae), fermentation of biomass in excess and local anoxia.

Links : http://plankt.oxfordjournals.org/content/28/7/621.full

http://www.coastalwiki.org/spicosa/Eutrophication (coastal eutrophication)

2.3 Toxic Pollution

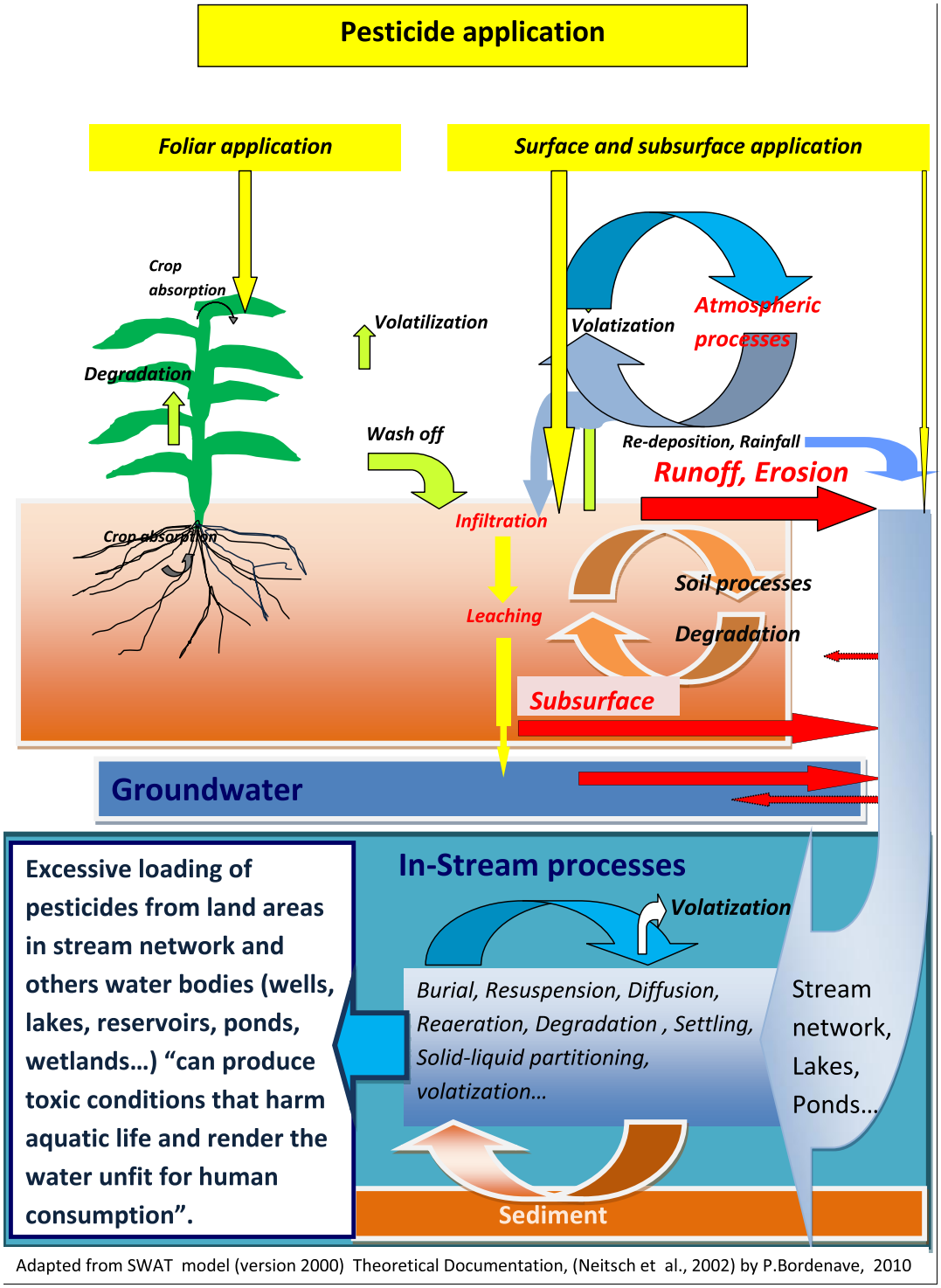
In addition to the inorganic fertilizers, French intensive agriculture consumes a wide range of pesticides in order to insure both quantity and commercial quality of harvested products (cereals, fruits, vegetables etc…). Vineyard area (like Cognac area of Charente watershed) is one of the land occupations which consume a highest amount of pesticides per Ha and per year (including herbicides, but also several sprayings of fungicides and insecticides). Most of them are organic synthesis products with a variable half-life duration, but some products used can generate conservative metallic pollution (e.g. organo-stannic organo-manganese and cupric compounds) Annual winter crops (like wheat, rape) but also summer crops like maize, sunflower are also sprayed several times. Pesticide fluxes are transported from the small upstream watersheds inside the river network, then at the coastal zone. In case of low-flows, exports from the field to the aquatic ecosystem are quite low and self-purification of the river can occur through sediment and biofilm activity and adsorption (left part of the figure). But during spring rainy events causing flood pikes following intensive spraying periods, pesticide concentrations and fluxes can occur in complex admixtures and reach the estuarial zone, then the coastal area (right part of the figure below). They generate a risk on the wild aquatic life, but also and first on the shellfish activity (i.e; oyster farming or mussel farming of the Marennes-Oléron marshes and bay).



MARS 2D modelling of water quality at the mouth of the Charente river *(Munaron, D. Thesis, 2004).*
Maximum concentration of Atrazine modelled during a flood event :
- Left : Period modelled : 10 March to 10 April 2002. Flood event (120 m³/s) intervened in a context of spring low-flows (50 to 60 m³/s), at the very beginning of the season of annual atrazine uses by agriculture.
- Right : Period modelled : 23 April to 28 May 2001. Flood event (300m3/s) intervened in a context of quite strong flows (130 to 160 m3/s) and after the main season of annual atrazine uses by agriculture

A collective scientific expert report has been compiled at the request of the French Ministries for Agriculture and Fisheries and Ecology and Sustainable Development by INRA and CEMAGREF.

This report reviews the state of our knowledge in this area, on which actions could be based aimed at reducing current levels of the use of pesticides and their environmental impact.(http://www.international.inra.fr/research/some_examples/pesticides_agriculture_and_the_environment)



Adapted from SWAT model (version 2000) Theoretical Documentation, (Neitsch et al., 2002) by P.Bordenave, 2010

2.4 Water Cycle, Habitat Destruction

Agricultural activity plays a significant role in the hydrological water cycle. The way parcels are exploited makes influence on their surface porosity and retention capacity (permanent grassland, ploughed fields, perennial crop like vineyard…), and on the behaviour of the water stock (either infiltration or run-off or evaporation, season the stock of water will appear and disappear.) So, permanent grasslands, vineyards, winter annual crops, summer annual crops will make a quite strong and diverse influence on the water behaviour. When crops are growing, they evapotranspirate the groundwater, reducing the water stock of the ground horizons prospected by roots. Water in the prospected horizons is named useful stock. One part is easily usable stock (evaporated by plants without stomata regulation). Then water is more retained by the soil and plants extract it more difficultly.

*Winter crops mostly use water coming from rain and snow, then stocked inside the useful capacity of soils. On the point of view of aquatic ecosystem functioning, water supply for winter crops is mostly provided by natural precipitation, that drives to low impact on river quantitative hydrological functioning. At the inverse, summer crops (sunflower, maize, soya…) begin their annual growth cycle at a season where the useful water capacity of soils is partly empty and where the climatic demand increases because of temperature and irradiance. Furthermore, these summer crops need more water to develop their complete cycle and their nominal production, than usual soil capacity can provide. Except in the specific case of deep alluvial soils, irrigation is then necessary to supply rain water, and the quantitative effect of irrigated agriculture on river hydrological functioning is strongly impacting. As irrigated corn or sunflower provide good economical margins in the context where irrigation water can be provided at a reasonable cost, if no regulation act to limit irrigation practice, summer flow reduces and rivers can dry-up more and more frequently and on increasing sectors, that causes strong impact on aquatic ecological functioning and drives to a loss of habitats for sensitive species (e.g. salmonids…). This phenomenon frequently occurs in the up-streams of Charente river tributaries Moreover, this unbalanced consumption of water generates tension between the different uses and needs of water by the society (*e.g. *drinking water…) and doesn't allow a durable equilibrium preserving good aquatic ecosystem functioning (SSA10, Pertuis charentais)..*

Natura 2000 sites close to the area:

http://natura2000.environnement.gouv.fr/regions/departements/DEPFR532.html

2.5 Biodiversity

The Millennium Ecosystem Assessment identified five main causes of biodiversity loss (habitat change, climate change, invasive alien species, overexploitation and pollution) and concluded that human activities have led to a more rapid loss of biodiversity over the past fifty years than ever before. Coastal areas or estuaries, marshes and buffer zones are sensitive to diffuse pollution and a stock of biodiversity. Due to the intensive practices, the use of pesticides, the destruction of habitats, agriculture has been a major driver of biodiversity loss in many ecosystems. The possible doubling of agricultural production by 2050 could have strong impacts on biodiversity (Butler and al, 2007).

http://www.fao.org/es/esa/pesal/AgRole.html

Other impacts could be identified, which are not detailed here. Coastal area can be seen as a "receptacle": salinity changes, algae blooms, toxicity and sedimentation.

3. How to address environmental issues: policy instruments

3.1 European Union tools

Common Agricultural Policy (CAP)

Throughout Europe, people want farming to be practiced in an environmentally sound, safe, and sustainable way and goods produced conforming to certain ethical standards. The new CAP comes up to these expectations. Farmers are free to choose what to produce but to receive subsidies (single farm payments) they have to respect of environmental (agri-environmental measures), food safety, animal and plant health and animal welfare standards, as well as to keep all farmland in good agricultural and environmental condition (cross-compliance).

http://en.wikipedia.org/wiki/Common_Agricultural_Policy

http://ec.europa.eu/agriculture/capexplained/index_en.htm

European Rural Development Fund (ERDF)

This fund supports several actions to recover water quality and to increase awareness, train, inform and support equipments as regards water saving

http://europa.eu/legislation_summaries/employment_and_social_policy/job_creation_measures/l60015_en.htm

European Agricultural Fund for Rural Development (EAFRD)

This program aims to contribute to decrease the negative impacts of agriculture on natural resources and to improve the management of fertilizers and pesticides in order to limit diffuse pollution.

http://europa.eu/legislation_summaries/agriculture/general_framework/l60032_en.htm

Water Framework Directive

The WFD (2000/60/CE of the European Parliament and the Council) aims at establishing a framework for a European policy in the field of water. The main objective is to reach by 2015 a good ecological and chemical status for surface water and a good chemical and quantitative status for ground water. To meet this objective a number of measures are available such as the Urban Waste Water Treatment Directive, the Nitrates Directive and the Integrated Pollution Prevention and Control Directive. The river basin is the basic unit for all the actions of planning and management of the water resources. The Groundwater Directive (2006/118/EC) complements the Water Framework Directive. It requires pollution trends to be reversed so that environmental objectives are achieved by 2015 by using the measures set out in the WFD and compliance with good chemical status criteria based on EU standards of nitrates and pesticides and on threshold values established by Member States.

http://europa.eu/legislation_summaries/agriculture/environment/l28002b_en.htm

Nitrates Directive

The Nitrates Directive ((91/676/EEC) aims to protect water quality across Europe by preventing nitrates from agricultural sources. It applies in the areas of land defined as "vulnerable zones" (NVZs), where surface freshwaters and groundwater contain or could contain a concentration of more than 50 mg/l of nitrates or where freshwater bodies, estuaries, coastal waters and marine waters, found to be eutrophic or that could become eutrophic, by the establishment of Code(s) of good agricultural practice, to be implemented by farmers on a voluntary basis, and of Action Programmes, to be implemented by farmers on a compulsory basis.

http://ec.europa.eu/environment/water/water-nitrates/index_en.html

Pesticides Directive

The Thematic Strategy on the Sustainable Use of Pesticides (Directive 2009/128/EC – 21 October 2009) overall objective aims to reduce risks and impacts of pesticide use on human health and environment in a way that is consistent with the necessary crop protection.

http://ec.europa.eu/environment/ppps/home.htm

3.2 National and regional tools: The French example

- Water policy principles in France

The water agency is a financial incentive tool at the service of the water. Action priorities and financing, are laid down in five year intervention programs. They are prepared jointly by the boards of directors of the water agencies, adopted by the catchment area committees and approved by the Prime Minister. The water agencies distribute funds to local authorities, manufacturers and farmers who undertake to safeguard the water resources and quality. Calculated on the basis of pollution discharged and sampled quantities, these funds come from charges collected from water users. Programmes are planned at a watershed scale for financing equipment, guaranteeing water supply and quality, inside watershed area bodies uniting all water participants. Water pays water and consumers, through their water bills, bear the main part of expenses linked to investments and plant operation required for water management. Master plan for improvement and water management ***(SDAGE)*** *involves various participants round a joint project. SDAGE are plotting the directions of water policy for the next fifteen years, consistent with all the responsibilities laid down by French laws, European directives and on-going public programs. They are laid down in government decisions in the water field and fix high priorities on a scale of each French catchment area. Improvement and water management plans* ***(SAGE)*** *implement SDAGE priorities in limited hydrographic units at local level. The six water agencies are taking part in this new initiative as an initiating force for proposals strengthened by their role as financial participants.*

http://en.wikipedia.org/wiki/SDAGE

- Policy instruments in the Adour Garonne watershed

Subsidies

The Adour-Garonne Water Agency gives some subsidies to farmers in order to promote good practices, to improve agricultural equipments and for water quantity management. Regional and Department Councils support also agriculture via two main programmes: the Programme for modernization of breeding buildings (PMBE) and the Vegetal Plan for the Environment (PVE).

http://www.lesagencesdeleau.fr/uk/agences/action.php

Water fees

Average fees for irrigation water consumption are indicated in table 1. They will increase progressively to reach 0.009 €/M3 in 2012.

Table 1: Water fee in the Adour Garonne basin

Water origin

	Rates 2009 ***(€/m³)***
Reservoir water	*0.00572*
Surface water	*0.00572/0.00761*
Groundwater	*0.00761*

- Fees for diffuse pollution related to pesticides uses are (Source: French financial law - Loi de finance 2009)

- 1,7 € /kg for dangerous substances for the environment, except those of them recovering from the mineral chemical family, for which it is 0,7 €/kg ;

- 4,4 € for toxic, very toxic, carcinogenic matter or toxic for the reproduction;

For breeding, a single fee has been established: 3€/UGB and per year. Source: Adour Garonne Water Agency

- Regulation instruments: The lowest water level management plan

This plan aims at least to satisfy 4 years out of 5 the lowest water level fixed by the water management authorities to allow the normal functioning of the aquatic ecosystems of rivers and estuary as well as the good progress of all the water uses on the river basin.

- Deliberative processes: Voluntary approaches

***Volumetric management**: The irrigation management is carried out by the allocation of an annual maximal usable volume by the farmer. This volume is defined generally according to the needs of plants, and the type of soil. The control of the used volumes is realized by means of water meter. The use of the volumes can be subjected to various constraints: state of the resource before the beginning of the campaign of irrigation, use of the volumes following a schedule of distribution, evolution of the flows at the levels of local standards.*

Source:

Observatoire Régional de l'Environnement de Poitou-Charentes (French) : http://www.observatoire-environnement.org/tbe/

Regional council website (French) : http://www.poitou-charentes.fr/accueil.html

-Nitrates/Pesticides/ voluntary initiatives

At the end of 2003 were implemented various programs in the Charente basin in a voluntary approach:

- *Local actions related to pesticides (practices improvement, equipment controls, farmers protection…)*
- *Four actions dedicated to fertilizers uses*

Table 2: Characteristics of "Ferti-Mieux" actions in Poitou – Charentes region

Name of the program	***Number of farmers involved***	***Eligible Area (ha)***
Lambon guirande	*240*	
Saintonge environnement	*1 300*	*80 000*
Zone pilote azote Aume couture	*580*	*47 000*
Azote Nord Poitou	*430*	*40 000*
Vif Argent	*350*	*15 000*
Total	***3 230***	***234 500***

*Source : **http://www.eau-poitou-charentes.org/usages/Enjeux-et-solutions,25.html***

4. Management approaches/programs of action

4.1 IWRM concept (integrative water resources management)

IWRM-NET is a five year (2006-2010) project within the European Research Area (ERA-Net). It is funded by the European Commission and aims to implement new collaborative research activities at the national and regional levels related to Integrated Water Resource Management (IWRM) with a focus on the Water Framework Directive.

http://www.iwrm-net.eu/ (EU website) .

4.2 ICZM concept (integrated coastal zone management)

From 1996 to 1999, the Commission operated a Demonstration Programme on Integrated Coastal Zone Management (ICZM) designed around a series of 35 demonstration projects and 6 thematic studies. This programme was aimed to:

- Provide technical information about sustainable coastal zone management, and

- Stimulate a broad debate among the various actors involved in the planning, management or use of European coastal zones.

In 2000, based on the experiences and outputs of the Demonstration Programme, the Commission adopted two documents:

- A Communication from the Commission to the Council and the European Parliament on "Integrated Coastal Zone Management: A Strategy for Europe" (COM/00/547 of 17 Sept. 2000)

- A proposal for a European Parliament and Council Recommendation concerning the implementation of Integrated Coastal Zone Management in Europe (COM/00/545 of 8 Sept. 2000). This Recommendation was adopted by Council and Parliament on 30 May 2002.

During 2006 and the beginning of 2007 the Commission reviewed the experience with the implementation of the EU ICZM Recommendation. The Commission Communication of 7 June 2007, COM(2007)308 presents the conclusions of this evaluation exercise et sets out the main policy directions for further promotion on ICZM in Europe.

Integrated Coastal Zone Management (ICZM) is a generic method that promotes the sustainable management of the coastal zones. It is a means to accept differences of objectives and opinions, and of tolerating uncertainties about the ongoing and future natural processes while still proceeding to address the issues under debate through finding broadly acceptable solutions.

http://ec.europa.eu/environment/iczm/home.htm (EU website)

5. Progress towards future…

The Grenelle Environment has been built to create favorable conditions for the protection of the environment.

Main goals related to agriculture and water resource are:

- *To develop an ecological and productive agriculture: the use of pesticides will be reduced by one-half (10 years) "by accelerating the dissemination of alternative methods, provided they have been*

perfected", and beginning with the elimination of some 40 substances by 2012. (See Ecophyto 2018 program)

- *To achieve or preserve, by 2015, good ecological condition or good potential for all mainland and offshore watercourses. The objective of the national government is to limit postponements of deadlines, which are authorized by the provisions of the basic directive on water, to a maximum of one-third of all watercourses. (Article 24 of the bill)*

Currently the debate on the CAP post 2013 focuses on the need to have a strong policy for agriculture and rural development which will address concerns about food security, ensure good land management, help to tackle the problem of climate change and support balanced development in rural areas.

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