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Warsaw Agricultural University



# **WFD and Agriculture Linkages at the EU Level**

## **Beyond 2007: Further Research Needs at EU level**

**Final Report  
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**Prepared by:**

**Nadine Herbke (Ecologic)  
Zbigniew Karaczun (Warsaw Agricultural University)  
Ruta Langrebe-Trinkunaite (Ecologic)  
Thomas Dworak (Ecologic)**

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The information compiled in this paper is subject to rapid change.

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## 1 Introduction and Background

The link between agriculture and WFD has been identified as one of the highest priorities in the 2005-2006 work programme in the Common Implementation Strategy (CIS) for the Water Framework Directive. This programme justified a working mandate focusing on how the Common Agricultural Policy (CAP) can contribute to the achievements of the WFD objectives. The Strategic Steering Group (SSG) on WFD and Agriculture was established under the co-leadership of the UK and the European Commission.

The group aims to address the issues of interrelations between CAP and WFD and issued a series of reports, among others on:

- 1) Pressures and impacts from agriculture on water (Herbke et al., 2005),
- 2) Rural Development and the WFD (Dworak et al., 2005),
- 3) Incentive water pricing and cost recovery in the WFD (Interwies et al., 2006),
- 4) Cross-compliance and the WFD (Müssner et al., 2006), and
- 5) Co-operation and participation at the interface of EU agricultural and Water Policies (Dworak et al., 2006).

The activity was supported by the research project “WFD meets CAP – Opportunities for the Future” under the 6th Framework Programme for Research<sup>1</sup>.

The CAP&WFD project has identified a number of remaining open issues and information gaps for the establishment of appropriate linkages between CAP and WFD. These open issues and gaps could be potentially addressed by future research activities of the EU. The next EU research programme, the **Framework Programme 7 (FP7)**, will be officially launched in March 2007.<sup>2</sup> It offers various opportunities for research in the field of agriculture and water.

The following document provides an outlook towards 2007, identifying further steps with regard to research in the field of agriculture and water. The report first summarises the lessons learned from linking the Common Agricultural Policy and Water Framework Directive (chapter 2). It then presents possible developments of the CAP and their implications for the future WFD implementation, taking into account the WTO negotiations, impact of the EU energy policy on agriculture and water as well as the demographic development of rural areas (chapter 3). Chapter 4 will summarise existing gaps and further research needs and, based on this, provide an outlook towards FP7.

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<sup>1</sup> Specific Support Action “CAP&WFD”, contract no SSPE-CT-2005-006618. Please refer to the project website at: <http://www.ecologic.de/modules.php?name=News&file=article&sid=1369>.

<sup>2</sup> For more information on FP7, please refer to the CORDIS website: <http://cordis.europa.eu/fp7/home.html>.

## 2 Lessons Learned from Linking CAP and WFD

The CAP and the WFD remain in the implementation stages and are still being elaborated and reviewed. Thus they still offer potential for further integration and harmonisation. This chapter gives an overview of the possibilities existing to establish synergies between the implementation process of both the CAP and the WFD.

### 2.1 Common Agricultural Policy

The Common Agricultural Policy was set up in 1957 by the Treaties establishing the European Economic Community (EEC). A fundamental reform of the Common Agricultural Policy was adopted in 2003, including the revision of the direct payment scheme and the provisions for rural development (see below). In general, the current CAP is based on two principles (so-called 'pillars') of agricultural expenditure, namely the market and income support (pillar 1), and sustainable development of rural areas (pillar 2). This section addresses two important instruments of the 2003 CAP reform allowing for synergies between the two policy fields, namely rural development and cross compliance. An overview of such synergies is necessary for the further concerted development of both policies.

#### 2.1.1 Rural Development

Rural development (RD) measures can be beneficial to WFD objectives in many different ways. Some of the RD measures help farmers to implement obligations (e.g. measure for meeting standards, farm investments, etc.), others pay farmers going beyond obligations (e.g. agri-environment). The current period of the Rural Development programmes (2000-2006) has shown that RD measures can have positive impacts on water resources (European Commission, DG Agriculture, 2004).<sup>3</sup> The most cited positive outcomes were improved water resource management and water protection. The experience gathered should be transferred to the design of RD programmes in the upcoming programming period (2007-2013).

The new Rural Development Regulation (RDR) for the period 2007-2013, particularly Axis 2 on environment and land management, provides the most obvious opportunities for a *direct* contribution to the objectives of the WFD, most specifically in relation to payments linked to the WFD (*RDR Article 38*). This measure allows farmers to be compensated for income foregone due to WFD implementation. In addition, the implementation of the WFD objectives was clearly identified within the Community Strategic Guidelines as an important aim. Therefore, especially measures available under Axis 2 of the 2007-2013 RDR should support and contribute to this aim. In addition, all three axes of the new RDR contain a set of measures that offer an ability to meet *indirectly* the aims of the WFD (e.g. agri-environment, agro-forest payments, natural handicap payments, use of advisory services). Furthermore, there are several provisions for co-operation at all different levels (e.g. the bottom-up approach LEADER+ under RD Axis 4).

However, it should be noted that with the aim of protecting the rural environment under the EU RD policy, all media are targeted and water protection is seen as only one issue among many. Since the Member States enjoy a certain flexibility for the use of the budget for each axis, it is the country's priorities that will determine whether the implementation of the WFD will be considered. It is clear that, although it is not a "one for all" solution, the RD policy can

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<sup>3</sup> No study analysing the impact of the full set of EU RD measures on the environment was found. Most of the studies found address agri-environmental measures only and their impact on the environment (Dworak et al., 2005).

be a strong instrument in support of the implementation of the WFD objectives. However, even a proper implementation of the RDR and making the best use of the measures set out in the regulation throughout Europe will not be sufficient to solve all water problems. RDR funding will not suffice to cover all water measures requiring funding. Therefore, other sources to finance water protection need to be considered. In addition, the RDR cannot tackle all pressures from agriculture due to the scale of the problem, and the types of measures provided (Dworak et al., 2005).

### 2.1.2 Cross Compliance

The cross compliance instrument establishes a link between the implementation of existing EU legislation and the direct payments received by most farmers in the EU. Since 2005, all farmers receiving direct payments are subject to cross compliance.<sup>4</sup> Farmers must respect cross compliance standards in two ways: (i) first they have to respect the Statutory Management Requirements (SMRs) set-up in accordance with 19 EU Directives and Regulations related to the protection of the environment; public, animal and plant health, food safety and animal welfare; (ii) secondly, all agricultural land for farmers claiming direct payment should be kept in Good Agricultural and Environmental Conditions (GAEC). In general, GAEC criteria focus mainly on soil issues and maintenance of grassland.

The cross compliance scheme directly or indirectly assist in the protection of water. For example, certain directives are directly relevant to water protection, i.e. the Groundwater Directive (Art. 3), the Sewage Sludge Directive (Art. 3), the Nitrates Directive (Art. 4 and 5), the Directive on Conservation of Wild Birds (Art. 3, 4(1), (2), (4), 5, 7 and 8), and the Directive on Conservation of Natural Habitats, Wild Flora and Fauna (Art. 6, 13, 15, and 22(b)). In contrast, the GAEC indirectly support implementation of the WFD as they are likely to result in reduced run-off and erosion, enhanced buffer and filter functions as well as protection of permanent meadows and pastures. As the minimum GAEC requirements are set by Member States themselves on the national level based on local conditions, they could also be used to resolve specific problems on catchment level.

Even if the directives under the SMRs as such are not new and GAECs are often partially covered by previous Good Farming Practice defined by the Member States, the new aspect to cross compliance is that it introduces a way (through farm advisory systems and control mechanism) to ensure compliance with these standards and requirements at farm level (Müssner et al., 2006).

In addition, and considering the time table of implementation of both policies, a window of opportunities is presently available to link them. The mid-term review of the 2003 CAP will be conducted in 2008 and will take place in parallel to public consultation on River Basin Management Plans (RBMP) and Programmes of Measures (PoM), undertaken for each river basin district. The 2008 review will focus on, among other aspects, the cross compliance system, and potentially, on the list of statutory management requirements as well as the direct support schemes. Both processes have to be linked (Müssner et al., 2006).

## 2.2 Water Framework Directive

The Water Framework Directive came into force in December 2000 and aims at improving the status of all EU water bodies to reach a “good status” by 2015. It offers opportunities for synergies with the CAP, and the following will concentrate on the so-called “Article 5

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<sup>4</sup> See Council Regulation No 1782/2003 (EC, 2003) and Commission Regulation No 796/2004 (EC, 2004a).

Reports”, an important source of information for establishing, *inter alia*, Rural Development plans, and water pricing, an incentive setting instrument which can potentially be made to function in concordance with CAP incentives.

### 2.2.1 WFD Art. 5 Reports

The implementation of the WFD will require extensive efforts from agriculture, intensive farming in certain areas being one of the main sources of diffuse water pollution.

The Article 5 of the WFD requires Member States to carry out an analysis every 6 years of the characteristics of each river basin district, a review of the impact of human activity on water and an economic analysis of water use. Therefore, the WFD Article 5 reports on impacts and pressures could be a valuable source of information for defining the scope and setting the objectives of the measures concerning the preservation or restoration of water resources for the RD national strategies and programmes under the upcoming RDR. At a later stage, the results of water monitoring networks could be used to help evaluate the effectiveness of certain measures under the RDR, such as e.g. agri-environmental measures. In addition, the WFD requires to identify the most cost-effective combination of measures based on status report information and monitoring. This would imply that measures under the RD programme have to be proven in terms of cost-effectiveness (Dworak et al., 2005).

Currently there are still several uncertainties on the status of water bodies and on methodological issues. Nevertheless, the WFD Art. 5 Reports give a clear picture of the main pressures resulting from agriculture at the river basin scale, and this information needs to be available in discussions about the design of national RD strategy plans and RD programmes, including budgetary issues (allocation of funding for each issue).

### 2.2.2 Water Pricing

The CAP and the WFD create different incentives for farmers. The former sets incentives on production, even if they are less important than before the 2003 reform. Water Pricing as one instrument of the WFD sets incentives for the sustainable use of water. It is important to understand these incentives as they are to some extent contradictory.

Depending on the farm regime, the CAP payments have a different influence on the incentive function of potential water prices and/or the cost recovery contribution of water users to occurring costs<sup>5</sup>. In order to develop appropriate pricing policies, it is important to have a better understanding of the specific role CAP payments have (e.g. distorting effects) and how they influence farmers’ decisions. In doing so, some of the main incentives from the CAP (payments covering parts of the financial costs of water services, incentive CAP payments reducing the environmental costs related to a water use, payments increasing the potential added value of producing a certain crop and thus potentially increasing the resource costs of a water use) have to be discussed in this context. Nevertheless, there is a general agreement that water pricing can represent a way to address pressures on water in the agricultural sector (Interwies et al, 2006).

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<sup>5</sup> See, for example, Varela-Ortega et al. (1998) or Mejía et al. (2004) on the effects of price changes on agricultural water uses. Both authors argue that the impact of price changes on water demand is highly site-specific, depending on tariff schemes, crop types planted, soil and climate, as well as institutional structures of the water supply system.

### **2.3 Co-operation and participation**

The command-and-control approach has achieved limited success tackling pressures on water resources. Therefore, new governance approaches such as voluntary co-operation between the main actors are under political discussion. In order to achieve WFD objectives there is a clear need to establish a positive co-operation between the water and the agricultural sector.

Co-operation between both sectors can be established on various issues, such as monitoring, the establishment of GAEC under the CAP and of codes of good farming practices under the WFD, and sustainable river basin management as an integrated part of rural development. The WFD follows a river basin approach and the RDR follows a national/regional approach. This requires a very ambitious collaboration of the authorities planning rural development and authorities responsible for river basin management plans (RBMP). This means that, in order to enhance a positive co-operation between WFD implementation and rural development, representatives from the authorities in charge of RD planning need to be represented in the river basin authorities and vice versa. Equally, measures of the RDPs may become part of the Programme of Measures under the WFD and vice versa. The window of opportunities is rather limited at this stage (RD programmes will be finalised by the end of 2006, drafts of Programmes of Measures have to be available by the end of 2008), so that options coming from the RD mid-term revision (2008) should be kept in mind.

The aims of co-operation can also vary, e.g. cost saving shared databases for WFD and CC control purposes; or prevention of possible conflicts resulting from agricultural land use. For example, Programmes of Measures can include activities which do not have to be exclusively water-based, including measures regarding land use activities, which require change in land use and management (e.g. development of low-input farming systems, changing from arable to grassland, afforestation, and in extreme cases, taking land out of agricultural activity). This, however, could put pressure on the agricultural sector with regards to income development, and may lead to further discussions on the necessity to compensate farmers.

Economic analyses and exemptions as well as public participation are two strong tools of the WFD to mitigate conflicts. Public participation will be a key factor to develop a common approach between farmers and authorities responsible for water management at all levels. The involvement of relevant stakeholders, such as farmers, water suppliers and nature conservation groups, can give the possibility to identify measures that result in benefits for each of the parties (e.g. farmers can reduce the costs of mineral fertilisers and pesticides thanks to a better application of these substances; water suppliers can abandon responses to increasing water pollution, such as the closure of wells).

Both policy areas have a wide range of options to establish co-operation and to arrange participation at all levels and among all stakeholders, e.g. LEADER under the RDR, WFD Art. 14 on public participation. As the thematic focus and degree of organisation of stakeholders differ, "tailor made solutions that are fit for purpose" have to be found (Dworak et al., 2006b).

## 2.4 Key Messages in view of Future Research Needs

- With regard to the role of water management within the future **rural development** programmes (2007-2013), there is a need to continue the assessment of the future development of rural areas considering demographic changes and changes in production caused by further reduction of direct payments, as well as other political developments (e.g. energy policy) and climate change and the related interference with water management needs. The question of how these developments will affect water management in the future should be additionally addressed.
- **Cross compliance** is another step towards protecting European waters. There is a need to discuss the different options for further CC development in the context of a cost effectiveness assessment (CEA) as required under Article 11 of the WFD but also with respect to how the costs are shared (e.g. farmers , administration).
- The WFD requires the selection of **cost effective** measures to meet the Directive's objectives. Therefore, when developing the CAP further towards water protection, the most cost effective approach should be chosen. This requires further work on the costs and benefits of the different options in order i) to find the rationale of the actions proposed, and ii) to distribute the costs and benefits among the different actors.
- The WFD allows for **exemptions** in the case of disproportionate costs (WFD Art. 4.5). However, the definition of the term "disproportionate" under the WFD is still under discussion. As draft River Basin Management Plans have to be published by the end of 2008, a further clarification (not only for the agricultural sector) on how to justify exemptions is needed to estimate the total cost for WFD implementation.
- The incentive function of **water pricing** needs to be further assessed and clarified.
- There is a strong indication that additional funds will be needed to better support the WFD implementation from the agricultural sector. Options for such funds have to be further elaborated.

### 3 Possible Developments of the agricultural sector and the CAP - Implications for the future WFD Implementation

The CAP will face several developments within the next years that are likely to lead to modifications of its instruments and funding schemes. The following sections provides an assessment of the expected development under the CAP and their likely impact on WFD implementation, such as WTO negotiations (3.1), EU energy policy (3.2), demographic development of rural areas (3.3) and change in agricultural production systems (3.4).

#### 3.1 The future CAP under the WTO: Shift of Pillar I to Pillar II Funds

The WTO agreements and negotiations exert extensive pressures on the European Union to reform its agricultural policy. In general, WTO agreements result from a round of negotiations spanning over several years. All individual agreements, which have been achieved at the various WTO meetings, will be combined to an overall agreement. This can only be adopted as complete solutions. The following provides an overview of the most recent WTO negotiations with a special focus on agricultural issues.

##### Box 1: WTO negotiations and Agriculture

As part of the **Uruguay round of WTO negotiations**, the Agreement on Agriculture (AoA) was signed at the Marrakech ministerial meeting in April 1994 (WTO, 1994a). The Agreement represents a fundamental change in the way agriculture is treated under the rules governing trade among WTO member countries. Prior to that time, agricultural trade, though in theory covered by the original 1947 GATT agreement, was exempted from the GATT in practice (Braga, 2004: 1). Under the AoA, countries agreed to reduce agricultural support and protection in the areas of *market access*, *domestic support*, and *export subsidies* – sometimes referred to as the "three pillars" of the agreement.

The declaration of the Fourth Ministerial Conference in Doha, Qatar, that took place in November 2001 provides the mandate for WTO negotiations on a range of subjects (the **Doha round of WTO negotiations**). In the area of agriculture, the Doha Declaration indicated that the WTO membership was committed to “*substantial improvements in market access, reduction of, with a view to phasing out, all forms of export subsidies, and substantial reductions in trade-distorting domestic support*” (WTO, 2001). Ministers also approved a linked decision on implementation problems developing countries face in implementing the current WTO agreements. The original mandate has been refined by work at Cancún in 2003, Geneva in 2004, and Hong Kong in 2005. The Doha round was supposed to end in January 2005, but contradictory opinions among the trade negotiators from the EU, Brazil, USA, India, Japan, Australia and developing countries and emerging economies led to the postponement of the original time table (the Doha round is expected to be successfully concluded at the end of 2006 or early in 2007). During the Hong Kong Ministerial Conference in December 2005, it was agreed to “*ensure the parallel elimination of all forms of export subsidies and disciplines on all export measures with equivalent effect to be completed by the end of 2013. This will be achieved in a progressive and parallel manner, to be specified in the modalities, so that a substantial part is realized by the end of the first half of the implementation period*” (WTO, 2005).

The WTO established a specific terminology for subsidies, identifying them by coloured ‘boxes’: ‘**green**’ (permitted), ‘**amber**’(slow down, i.e. reduced), and ‘**red**’ (forbidden). However, the AoA does not include a red box, although domestic support exceeding the

reduction commitments in the amber box is prohibited.<sup>6</sup> There is also a ‘blue’ box for subsidies that are tied to programmes that limit production.

As a WTO member, the EU agreed to reduce ‘amber box’ subsidies, or domestic price- and trade-distorting payments. The move towards agricultural liberalisation in Europe led to increased productivity and problems of over-production. The EU responded by encouraging exports via export subsidies, but this approach significantly harms agricultural producers in the developing countries, and contradicts the initial motivating principles of liberalisation, and thus of the WTO itself (Clapp, 2006).

In response to WTO obligations to cut subsidies, the 2003 reforms of the CAP transferred “close to 90%” of payments from the ‘blue’ to the ‘green’ box (Swinbank, 2005: 9). ‘Blue box’ subsidies, or direct payments, include set-aside, production-limits and production quota payments, while ‘green box’ payments include decoupled support paid directly to farmers irrespective of production. The latter could potentially help to support WFD implementation expenses, as green box subsidies include those for which no production is required in order to qualify for payment. The ‘Agreement on Sanitary and Phytosanitary Measures’ (WTO, 1994b) also provides space for measures that can be scientifically proven to protect biodiversity, which might be relevant to WFD implementation. However, such “box-shifting” is unpopular with the G-20 developing countries coalition<sup>7</sup>, who have gained more influence during the recent Doha round of WTO negotiations (Clapp, 2006). The G-20 have proposed extending disciplinary measures to the ‘blue box’, and rejected modest EU proposals for tariff caps and cuts. The EU is exposed to the risk of the other countries raising disputes on their subsidies, since the ‘peace clause’<sup>8</sup> expired in 2003 and thus EU direct payments fall in the category of “coupled payments” which have to be reduced (see above). Furthermore, green box criteria are the subject of continuing scrutiny by developing countries in current WTO negotiations.

In short, agreements concluded by WTO members induce changes in internal policies. The EU committed to reduce domestic price and trade distorting payments, and the 2003 CAP reform is a step in this direction. As a result, decoupled payments gained in importance, an aspect which could potentially support the implementation of the WFD.

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<sup>6</sup> According to AoA Article 6, domestic support measures considered to distort production and trade (e.g. measures to support prices, subsidies directly related to production quantities) fall into the amber box. These supports are subject to limits; ‘de minimis’ supports are 5% for all WTO members, and a special rate of 10% for developing country members. WTO members with subsidies exceeding the ‘de minimis’ levels are committed to reduce these subsidies. Reduction commitments are expressed as “Total Aggregate Measurement of Support” (Total AMS) which includes all support provided in favour of agricultural producers (WTO, 1994a).

<sup>7</sup> The G-20 is a group of developing countries established on 20 August 2003, in the final stages of the preparations for the Fifth Ministerial Conference of the WTO, held in Cancun, from 10 to 14 September 2003. Its focus is on agriculture, the central issue of the Doha Development Agenda.

<sup>8</sup> Article 13 (“due restraint”) of the AoA protects countries using subsidies which comply with the agreement from being challenged under other WTO agreements. The “peace clause” protects green box measures from being brought before the WTO’s dispute settlement body (see WTO website at [http://www.wto.org/English/tratop\\_e/agric\\_e/negs\\_bkgrnd13\\_peace\\_e.htm](http://www.wto.org/English/tratop_e/agric_e/negs_bkgrnd13_peace_e.htm))

### 3.2 Impact of EU Energy Policy on Agriculture and Water Resource Protection and Management

One of the main objectives of the EU environmental policy is to lower the greenhouse gas (GHG) emissions. The energy sector being one of the largest sources of GHG emissions, in order to achieve the aforementioned priority it will be necessary to introduce far-reaching changes to the EU energy policy. Recognising this need, the European Commission stated in 2005 that “*Europe needs to break its dependence on fossil fuels*” (European Commission, 2005). This is a very ambitious objective and its implementation will require modern organisational and technological solutions: energy demand management, a substantial improvement in energy efficiency, an increase in the share of energy produced from renewable sources.

The European Union has adopted two quantitative objectives:

- increasing the share of electricity produced from renewable energy sources (RES) to 20% by 2020, and
- increasing the share of biofuels in liquid fuels consumption to 5.75% by 2010.

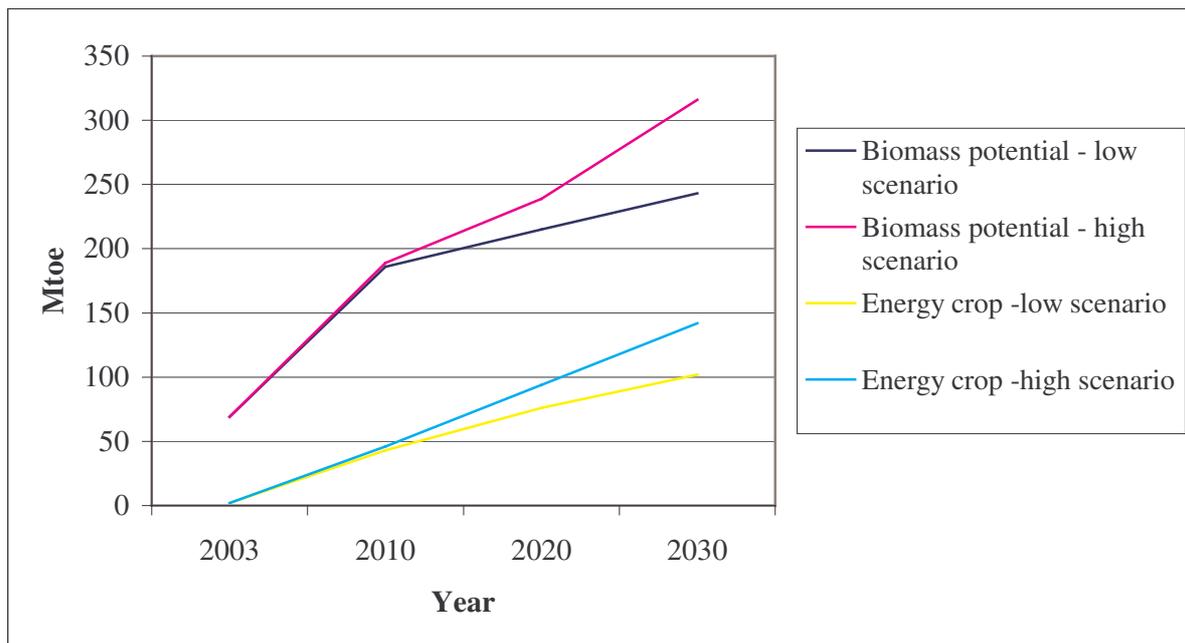
Whether the aforementioned objectives are achieved or not will to a large extent depend on changes in the agricultural sector. Initiatives, that are to increase the role of agriculture in sustainable energy production, have already been launched. As agricultural payments are no longer based on agricultural production, farmers can safely introduce energy crops (without the risk of losing the payments). In addition, the 2003 CAP reform introduced special assistance instruments to support energy crops<sup>9</sup>. Moreover, the possibility to use the land that should be left idle for the purposes of non-alimentary crops production (including energy crops) remains, in accordance with the provisions of energy crops aid defined in Regulation (EC) No 1782/2003 (EC, 2003). These initiatives may, however, prove insufficient. Therefore, in the opinion of the European Economic and Social Committee (EESC, 2006) it will be necessary to increase the acreage for non-alimentary products – first and foremost to satisfy the need for energy crops. The Committee also recommended changes in instruments limiting energy crop production, e.g. thresholds for arable land eligible for assistance and the use of fallow land for purposes other than production of alimentary crops (EESC, 2006).

The European Environmental Agency estimates that biomass energy production should rapidly increase in the coming years and then stabilise at a high level (EEA, 2005a). The largest relative growth will be achieved in energy crops (Figure 1), as their potential should increase tenfold in the period 2005 – 2010 alone (EEA, 2005a).

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<sup>9</sup> According to Article 88 of the Regulation (EC) No 1782/2003, an aid of 45 Euro per hectare per year is available to farmers who produce energy crops. It will be applied on a maximum guaranteed area in the whole EU of 1.5 million hectare for energy crop cultivation.

**Figure 1: EU Biomass Production Potential (mtoe)**



Source: EEA, 2005a.

Ensuring such a considerable increase in biomass energy production will require changes in directions of agricultural production. In order to reach the target of 5.75% biofuel in liquid fuels, it will be necessary to use from 14 to 27% of the EU agricultural land for cultivation of energy crops (EEB et al., 2006). To meet the biodiesel target, 192% of 2005 EU oilseed production will be needed (EEB et al., 2006). This means that the manner of energy crops cultivation will to a large extent determine the impact of agriculture on the natural environment.

The scope and force of this impact will depend among others on the type of cultivation, i.e. whether intensive or extensive energy crop cultivation prevails. Intensive cultivation will entail weed control and pest prevention, intensive fertilisation and irrigation. Extensive cultivation, on the other hand, will not necessitate irrigation nor preventive chemical protection against pests, and crops will be fertilised only in the first year (Nonhebel, 2002). This will have consequences for the size of the yield, which will be from 2.5 to over 8 times higher for intensive production than the extensive one (depending on the country)(Ibid.). Choosing, however, the extensive option may make agriculture more environmentally friendly and will allow for better integration of environmental protection priorities into agricultural production (Safley, 1998).

Other important potential environmental protection problems connected with the development of agricultural production for energy purposes include:

- introduction of large-area monocultures with homogeneous energy crop varieties, which will have significant adverse effects for biological diversity;
- a possible introduction of genetically modified organism (GMO) crops, with the aim of ensuring higher yields (when calculated into GJ of energy);
- transformation of permanent grassland into arable land;
- transformation of areas that should remain idle for the purposes of agricultural production.

Considering the above, it is clear that the type of agricultural production for the purposes of energy will influence the quality of waters and the extent of the agricultural impacts on water resources, as regards both their quantity and quality. The most important issues that should be addressed in development of energy crops include:

- a threat of more intensive fertilisation. In extreme cases the doses may exceed 300 kg N/ ha (around 390 kg N/ha for silage maize; 320 kg N/ha for winter wheat, 290 kg N/ha for sugar beet) (Hanegraaf et al., 1998). This will constitute a direct danger for water resources;
- chemical yield protection against weeds and pests. For many new crops (e.g. exotic perennial grasses) possible weeds, pests and diseases have not been thoroughly identified, whilst for arborescent vegetation, integrated methods for the protection of energy crops plantations have not been developed yet (Buechler et al., 1998). This may lead to application of excessive doses of chemicals and, as a result, to water pollution;
- transformation of permanent grassland for the purposes of energy crop production. This will limit the self-purification capacity of water flows and will introduce new area sources of pollution;
- development of large homogeneous energy crop plantations. This may result in destruction of biogeochemical barriers, which in consequence will limit the self-purification capacity of water flow;
- excessive exploitation of water resources for irrigation – most of the energy crops require substantial quantities of water during the vegetation period. If local climate conditions do not secure sufficient precipitation, pressures to increase the use of the existing resources of surface and underground waters in order to ensure proper irrigation of the crops will appear.

All the aforementioned issues prove that the support for the development of energy crops should be planned extremely cautiously, so that implementation of the Water Framework Directive is not threatened. The questions described above should be considered when defining assistance measures for energy crops. The significance of these issues is all the more pressing as the possibility to conduct energy crop cultivation in accordance with environmental protection requirements exists.

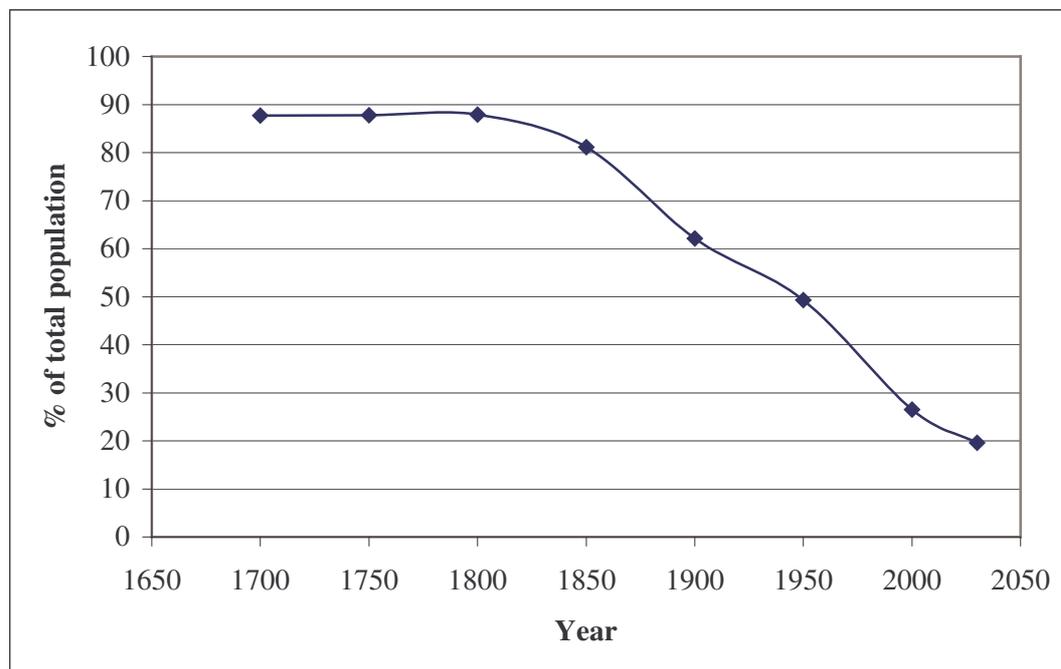
### **3.3 Demographic Development of Rural Areas**

Demographic changes will have impact on the direction of the Common Agricultural Policy development over the next 25 to 30 years. In the middle of the 20th century the number of people inhabiting cities and town in Europe exceeded for the first time the number of people living in rural areas. The pace of rural depopulation increased over the following decades and although this pace differs across respective EU member states (e.g. the rural population accounts for 3.1% of total population in Holland, in Poland however for over 60%) (Dipartimento per i Servizi Tecnici Nazionali Politecnico di Milano, 1999), the decreasing tendency is clearly notable across the whole continent. The trend has not been reversed despite the numerous measures that the EU has been implementing for over ten years aimed at reducing rural depopulation rate (one of the main measures aims at counteracting the abandonment of agricultural production in areas with less favourable conditions).

Despite these measures, it is estimated that over the next 25 years the number of people inhabiting rural areas in Europe will decrease by 60 million, whilst the share of rural

population in the total European population will drop below 20% (United Nations, 2002) (Figure 2).

**Figure 2: Share of Rural Population in Europe (Years 1700-2030)**



Source: United Nations, 2002

The depopulation of rural areas and the related possible aggravation of abandonment of agricultural production may necessitate more decisive EU initiatives aimed at reversing the negative changes that are taking place. The question of whether depopulation of rural areas and abandonment of agricultural production are halted or not constitutes one of the fundamental issues not only for the future of rural areas but also the state of the natural system across the whole continent. Although agriculture is often perceived as a threat to nature conservation, it should be stressed that this sector constitutes an ecological niche for many plant and animal species and provides for a unique possibility to shape natural processes, so as to strengthen the whole natural system of the continent.

The analysis of the potential influence of demographic development in rural areas in Europe on water resources (both in terms of quality and quantity) shows that the possible impacts may be of positive as well as negative character, depending on the dominating phenomena and tendencies.

First, this process may lead to further intensification of agricultural production. Abandoned farms will be purchased by owners of large, specialised holdings for the purposes of agricultural production. This will result in further increase of farm acreage and will aggravate the pressure on increasing the size of individual plots (to facilitate farm mechanisation) and probably in a larger consumption of fertilisers and crop protection chemicals (in order to increase production, and in consequence, profits). Such changes will contribute to increasing pressures of the agricultural sector on water resources – both in terms of quantity (irrigation) and quality (surface wash of pollutants).

Second, such a depopulation trend may lead to a transformation of agricultural land into construction plots (holiday villas, recreational buildings). This phenomenon is already common in new member states and is most widespread in the vicinity of large cities and

within naturally valuable sites. Although it has very negative consequences for biological diversity, for water protection its results are rather positive. Diffuse pollution is reduced, new houses are connected to the sewerage system and do not constitute an emission source of untreated sewage, whilst gardens near such houses fulfil the function of a biogeochemical barrier.

Moreover, depopulation of rural areas may result in afforestation of the abandoned agricultural land – either as a consequence of purposeful actions (e.g. to increase the volume of carbon fixed by biomass) or natural succession. Similar to the phenomenon described in the previous paragraph, also here the consequences for open space biodiversity will be negative, but the impact on water quality and its natural retention will be positive. Further, the possible results for climate protection are beneficial, due to fixing of carbon in biomass.

Nevertheless, regardless of which of the aforementioned directions prevails, the problem of rural area depopulation already constitutes one of the most problematic challenges of the Common Agricultural Policy that the European Union will have to face.

### 3.4 Change in Agricultural Production Systems

In response to the environmental problems different modalities or types of agriculture developed in the past few years. The most known being conservation, organic agriculture, integrated and extensive agriculture (see Box 2).

#### Box 2: Environmentally Friendly Types of Agriculture

1. **Conservation agriculture** attempts to alter the soil profile as little as possible, leaving it permanently protected from the action of wind and rain with the plant residues from the previous crop (stubble) and/or with “cover crops”, whose mission is to protect the soil in the periods or phases occurring between the growth of crops planted for economic purposes (Garcia-Torres et al., 2002).<sup>10</sup> Direct sowing or minimum tillage and cover crops in tree plantations are among the diverse modalities of conservation agriculture (see Table 1 provided in the Annex of this document). In Europe, *conservation agriculture* is less developed than in countries such as US, Canada, Argentina, Brazil and Australia. Spain and Portugal with around 15-20% and 10%, respectively, of its agricultural surface cultivated in the conservation system are pioneering countries in this respect (Garcia-Torres et al., 2002).
2. **Organic agriculture** is defined by the fact that the use of synthetic pesticides or fertilisers is forbidden. It is regulated by the Council Regulation (EEC) No 2092/91 and additional national regulations. This Council Regulation has been amended on several occasions, in particular in 1999 when the Council extended its scope to cover organic livestock production (No 1804/99). Although the potentially positive effects of organic agriculture is the absence of pesticides residues in foods, it does not offer appropriate solutions to environmental problems such as erosion/desertification, pollution of surface waters and low content of soil organic matter (Garcia-Torres et al., 2002). The certified organic and in-conversion area at EU-25 level covered 5.7 million ha and represented 3.6% of the Utilised Agricultural Area in 2003. Italy had the most important organic area (more than

<sup>10</sup> Conservation agriculture includes any practice which reduces, changes or eliminates soil tillage and avoids residues burning to maintain enough surface residue throughout the year. The soil is protected from rainfall erosion and water runoff; soil aggregates are stabilised, organic matter and the fertility level naturally increase, and less surface soil compaction occurs. Furthermore, the contamination of surface water and the emissions of CO<sub>2</sub> to the atmosphere are reduced, and biodiversity increases.

1.0 million ha), followed by Germany, Spain, UK and France (EC, DG Agriculture, 2005b).

3. **Integrated agriculture** can be understood as combining or “integrating” the different knowledge, existing on protection, production and physiology of crops, so that phytosanitary products and fertilisers, among other inputs, are used in the mostly acceptable way for the environment. This agriculture modality must also incorporate conservation techniques in order to be effective, facing up to the aforementioned environmental problems caused by conventional agriculture (Garcia-Torres et al., 2002).
4. **Extensive agriculture** aims at reducing the consumption of fertilisers and pesticides. Its potential environmental benefits and limitations are similar to those of integrated agriculture; conservation techniques have to be included to tackle environmental problems such as erosion/desertification, contamination of surface water and low organic matter content of soils).

The agri-environmental awareness by the administrations, and the development of the Commission Communication on the Soil Strategy (EC, 2002) is in favour of conservation agriculture as an agricultural modality to tackle agri-environmental challenges. This, together with the reduction in “surface-related” or “compensatory” agricultural subsidies established by the new CAP, increase the need of farmers to reduce costs and thus to apply conservation techniques.

Under rural development, EU Member States can include these agriculture production systems in the agri-environmental schemes. This gives farmers, who commit themselves for a five-year minimum period to adopt environmentally-friendly farming techniques that go beyond usual good farming practice, the opportunity to receive in return payments that compensate for additional costs and loss of income that arise as a result of altered farming practices.

In short, the 2003 CAP reform is an step towards a further application of environmental friendly agricultural production systems. However, farmers and administration bodies need to know more about these alternative modalities (conservation agriculture, organic agriculture, etc.) and how obtain support for their efforts. In the end, the diffusion of such production systems depends on the circumstances defined by the Member States.

### 3.5 Key Messages for the future Implementation of the WFD

- As direct support payments under pillar one are increasingly put into question under WTO rules, it is likely that there will be a need for new arguments to ensure payments to farmers, as long as market prices remain below production costs, including environmental and social aspects. One argument for receiving an equal level of funding at the farm level could be further payments related to environmental production and/or payments for public goods, as is the case under RD. Therefore, water managers and agricultural authorities should start to collect arguments in order to be prepared for such a shift of payments.
- It will be necessary to assess the EU bioenergy policy with respect to its impacts on water. The considerable increase in biomass energy production that is planned will require important changes in agricultural production, with 14 to 27% of EU agricultural land required in the coming years for the cultivation of energy crops. Choices made for the production of these crops will have an impact on water quality, and the importance of measures such as avoiding large monocultures and intensive production methods will need to be stressed.

- Rural population is predicted to further decrease over the next decades, both in absolute and relative terms. The abandonment of rural land can lead to various negative effects on water as well as biodiversity, and further efforts are required to initiate a trend reversal.
- The Common Agricultural Policy has promoted the modernisation of agriculture in Europe. However, this modernisation has been accompanied by damaging effects on the environment. In order to reduce these negative impacts a shift from conventional to environmental friendly (e.g. organic farming, integrated farming system) agriculture could be one solution. Such a shift requires new farming techniques and practices (e.g. new weed management, direct sowing techniques) or the re-application of past sustainable agricultural practices (e.g. rotation of crops).

## 4 Upcoming Research Needs

The CAP and the WFD are two of the major EU policies. Their implementation and further development raise several open issues. Further research is needed covering the following dimensions:

- Natural sciences (relation between environment and new production systems),
- Technical sciences (new production processes that save water and are environmentally friendly), and
- Socio-economic dimensions (policy linkages, cost related issues).

This chapter lists and addresses as a conclusion further research needs arising from the work carried out under the 6<sup>th</sup> Framework Programme project “CAP meets WFD – Opportunities for the future”. It also makes further possible links to address these research needs within the upcoming 7<sup>th</sup> Framework Programme of Research (FP7).

### 4.1 Open Issues in the field of CAP & WFD

The several activities under the WFD and agriculture mandate and the research carried out under this project allowed for the identification of the following further research needs:

- As the future CAP will be deeply influenced by WTO regulations, there is a need to better understand these influences on the future development of agricultural production and rural areas in Europe.
- The impact of energy policy on agriculture (including bio-materials) and thus on water resource protection and management will be an important challenge for the future and needs to be considered when linking both policy fields.
- Rural development measures are proven to have a positive impact on the environment. Nevertheless there is only limited knowledge on the impact each single measure provided under the existing RDR has on the environment, and particularly on water (European Commission, DG Agriculture, 2004; European Commission, DG Agriculture, 2005a). In order to further develop the EU Rural Development policy and to extend and strengthen the most efficient measures during the next review, a better evaluation of existing measures is needed. Such an evaluation should address the following issues:
  - How many MS made use of RD measures to support the WFD implementation and to what extent?
  - Which measures have been selected and how are they implemented? What are success factors, which factors hamper implementation?
  - How cost efficient are these measures?
- Information sharing on advisory services (farm advisory or water management advisory) is necessary to get a better understanding of the impacts these services have on the water status as well as of the related costs. Comparing the costs for different options of co-operation at different levels (“cost-efficiency”) can additionally support the decision-making process for the establishment of such approaches.
- The impacts of CAP payments on water use and incentives of water pricing should be further analysed.

- The effects and application of more environmentally friendly agricultural production systems and techniques should be further assessed.
- With regard to the linkages between agriculture and WFD, it should be clarified how far the objectives of the two policies are compatible. Indeed, it should be discussed how the concepts of the proportionality of certain measures for WFD implementation and the “reasonable standard of living” under the CAP can best be integrated and what a common framework might look like

## 4.2 Further Research Needs in the light of FP7

The (provisional) FP7 focuses on nine themes under the category “Cooperation” (EC, 2006), four of which are potentially relevant for the further linking of CAP and WFD: „Food, Agriculture and Biotechnology“ (priority 2), “Energy” (priority 5), „Environment (including Climate Change)“ (priority 6), and „Socio-Economic Sciences and the Humanities“ (priority 8). Each theme covers a series of activities. The most interesting for linking water protection to agriculture are briefly presented below.

### **Food, Agriculture and Biotechnology**

This theme aims, *inter alia*, at exploiting new and emerging research opportunities that address social, environmental and economic challenges, as well as threats to the sustainability and security of agricultural production. Activities are grouped in three sub-categories, but only the first one, “Sustainable production and management of biological resources from land, forest, and aquatic environments” will probably really contribute to a reduction of agricultural pressures on water bodies and to increased linkages of the agriculture and water policy fields. Activities in this category will comprise research on organic farming; sustainable, competitive and multifunctional agriculture; integrated rural development; and the development of tools needed by policy makers and other actors in areas such as agriculture and rural development.

### **Energy**

The objective of this theme is to develop adaptation strategies of the current fossil-fuel based energy system into a more sustainable one, less dependent of imported fuels, based on a diverse mix of energy sources and carriers, with particular attention being paid to lower and non-CO<sub>2</sub> emitting energy technologies. Agricultural biomass production is one possible solution to reach this energy mix. Research under this theme will cover the development of tools, methods and models to assess the main economic and social issues related to energy technologies and to provide quantifiable targets and scenarios for medium and long term horizons

### **Environment (including Climate Change)**

The objectives of this theme focus to a large extent on climate change and do not refer explicitly to the agriculture and water complex, but the rationale for the theme indicates that “*there are significant research needs arising from existing and emerging EU level policies [...] and Directives such as the Water Framework and NATURA 2000.*” (EC, 2006: 33). The theme is divided into four sub-categories, one of which is particularly relevant to the issue of water quality linked to agricultural land use: “Sustainable Management of Resources”. This sub-category includes activities on the conservation and sustainable management of natural and man-made resources and biodiversity, water resources management, and soil protection.

### **Socio-Economic Sciences and the Humanities**

This theme's objectives concentrate on generating a shared understanding of the socio-economic challenges Europe is confronted with, including sustainability. From the present perspective, the sub-category "Combining economic, social and environmental objectives in a European perspective" seems the most promising, as it focuses on the issues of sustainability and the protection of the environment as well as on socio-economic impacts of European policy and legislation (EC, 2006: 38).

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## 6 Annex

**Table 1: Modalities of Conservation Agriculture**

<b>Modality</b>	<b>Description</b>
<b>Direct sowing/ direct drilling/ No-tillage</b>	The soil is left undisturbed from harvest to planting except for nutrient injection. Planting or drilling is accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels or roto-tillers. Weed control is accomplished primarily with herbicides with little environmental impact. Cultivation may be used for emergency weed control. This modality is the best option for the environment for annual crops.
<b>Ridge-till</b>	The soil is left undisturbed from harvest to planting except for nutrient injection. Planting is completed in a seedbed prepared on ridges with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with herbicides with little environmental impact and/or cultivation. Ridges are rebuilt during cultivation.
<b>Mulch till/ reduce tillage/ minimum tillage</b>	The soil is disturbed prior to planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used. Weed control is accomplished with herbicides with little environmental impact and/ or cultivation. In the «non-inversion tillage» soil is disturbed (but not inverted) immediately after harvest to partially incorporate crop residues and promote weed seed/ volunteer germination to provide soil cover during the intercrop period; this is chemically destroyed (with herbicides with a minimum environmental impact) and incorporated at sowing, in one pass, with non-inversion drills.
<b>Cover crops</b>	Sowing of appropriate species, or growing spontaneous vegetation, in between rows of trees, or in the period of time in between successive annual crops, as a measure to prevent soil erosion and to control weeds. Cover crops are generally managed with herbicides with a minimum environmental impact.