

REGIONAL STUDY

INTERMEDIATE REPORT ON "THE IMPACTS OF THE 2003 CAP REFORM 2003 ON WATER DEMAND FOR IRRIGATION IN THE EUROPEAN MEDITERRANEAN COUNTRIES"

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Introduction

Irrigated agriculture covers 30% of total water uses at the European scale, in general, and 70-80% in Southern Europe in particular. In the past years irrigation has been encouraged by public policies aimed at achieving development objectives in agricultural and rural areas. Large water works have often been realized and financed by the State. Water has often been under-priced and the high prices guaranteed to agricultural products by the Common Agricultural Policy (CAP) have fostered a "productivist" approach and a more intensive use of agricultural input, first of all fertilizers and water. The recent CAP reform, approved in June 2003 and known as Mid-Term Review (MTR), is an important shift in the EU approach the EU adopts to sustain farmers' income and foster sustainable agriculture. New support schemes have been introduced together with a strengthened rural development policy through new measures to promote environmental safeguard, product quality and animal welfare, and to help farmers to meet EU production standards. The effect evolution of the CAP reform raises a lot of interesting questions concerning its impact on sustainability of water management, as well as on farmers' welfare. "While it seems quite arguable that the reform is going in the direction of reducing the incentive to increase soil productivity and therefore weaken the pressure on water resources, it is not clear what magnitude this effect would have in terms of water demand as well as of farmers' income" (Massarutto, 2002).

Objective of the Regional Study

The main objective of this report is to give a comprehensive overview about the impacts of the MTR on the water demand in the agriculture of four Mediterranean Members States: France, Greece, Italy and Spain. On the basis of the existing literature, possible effects of MTR implementation have been identified in terms of reallocation of cultivated land area (e.g. cultivated *versus* non cultivated, irrigated *versus* non irrigated land, etc), total water demand, water demand per hectare, farmers' income.

Irrigation in European Mediterranean Agriculture

At the European level, wide heterogeneity in water availability, climate, soil characteristics and farming systems leads to different patterns in water demand and to a different role for the irrigation practices. In arid and semi-arid areas of southern Europe (including much of Spain, Portugal, Italy, Greece and southern France), irrigation is an essential element of agricultural production and it was heavily boosted and subsidized in the past. In more humid and temperate areas of central and northern Europe, irrigation is generally used to ensure high yields of summer crops in dry years and shallow soils and it plays a minor role in the agricultural sector. The first group of countries is characterized by a strong sectoral competition for water use, severe problems in environmental quality of water bodies strongly correlated with their over-exploitation and – from the supply-side - they are faced with increasing costs of new water sources. Public funds and public agencies are often deeply involved both in the investment and in the management of the water services (EEA, 2000).

The following table summarizes the main figures and characteristics of irrigation in the four Mediterranean members States: France, Greece, Italy and Spain.

	Irrigated land (000 ha)	Irrigated land/ UAA (%)	Agr. water withdrawal (10 ⁹ m ³ /yr) Water Used (10 ⁹ m ³)	Agr. water withdrawal / tot (%) Water used (%)	GDP agr/ GDP tot (%)	Main irrigated Crops
EU15	13,477		76.51	34.4		
France	2,602	13.3	3.92	9.8	2.0	Maize, fruit, vegetables,
Greece	1,450	37.9	6.25	80.4	6.0	Fruit, vegetables, cotton, maize, sugar beet
Italy	3,103	29.0	20.01	45.1	2.4	Fruit, vegetables, maize, fodder crops, sugar beet, oilseeds
Spain	3,780	20.2	24.24	68.0	3.6	Fruit, vegetables (also glasshouse) cotton, olive, citrus, wheat, maize

Source: our elaboration on FAO and EEA data

The Common Agricultural Policy

Since the Mac Sharry reform of 1992, CAP has been characterized by a trend of increasing separation of support from production. It shifted a substantial share of payments from price support to direct area payments, though still related to regionalized yields. The process was reinforced by Agenda 2000. The mid-term review, now more appropriately called the 2003 reform, MTR moved beyond such an approach, separating (to some extent) income support from crop area.

The 2003 CAP reform reinforced market orientation of European agriculture while improving incentives to farm in an environmentally sensitive way. Together with the reform of some major relevant Common Market Organizations (CMOs), the main components of the reform are: decoupling, modulation and cross compliance. Cereals and other arable crops were affected by the "first wave" of the 2003 reform, while tobacco, olive oil and cotton were affected by the "second wave". CMOs of fruit and vegetables are still under discussion while writing this report. The attitude towards decoupling is different in different countries. In particular, Italy and Greece opted for full decoupling of cereal production, while Spain and France, retained 25% of the payment as area-based. The same different attitude is partially reflected in the tobacco and olive oil sectors.

Impacts of the CAP reform on irrigated agriculture

Impacts of CAP reform on irrigated agriculture are a special aspect of a wider issue related to CAP effects on the agricultural sector as a whole. Many elements contribute to determine such effects: macroeconomic conditions (i.e. trends of international agricultural markets), local economic and social characteristics of farms and farmers in the different regions, national governments' decisions related to the degree of decoupling, sector-specific national ceilings, transfer of entitlements, regionalisation plan and modulation option.

Each component of the CAP reform affects water irrigation demand. Depending on structural, social and economic characteristics of farms and agricultural markets, each component can exercise a different influence on the different contexts and situations. At the regional level, some specific measures regarding tobacco, cotton and rice sectors may have a stronger role in affecting irrigation water demand due to the major role of such crops in the areas. Cross compliance is not considered to have notable impacts at this stage.

In the literature reviewed, the main components of Luxembourg Agreement have been simulated according to the specific national options. Some researches (Manos et al., 2004; Gallerani et al., 2004) simulate the combined effects of CAP, market and water scenarios. A distinction must be made between totally hypothetical scenarios concerning market and policy (Bartolini et al., 2007) and scenarios more addressed to describe current policy changes (Dono, 2006).

Both mathematical programming models and a more simple approach are used. The former allows for an *ex ante* simulation of water demand, through parametrization of water price, or an assessment of water use under different scenarios concerning external variables. Sometimes multiobjective mathematical programming techniques are used and results are produced under the form of a number of economic, social and environmental indicators. The latter is based on the comparison between net and gross margins of the different crops in two different policy scenarios with and without the CAP reform. Neither hypothesis nor simulation of farmers' behaviour is explicitly considered and long-term validity of results is questionable.

Due to the heterogeneity of agriculture at the national level, all the analysed studies were carried out at a sub-national scale. Sometimes case study areas were chosen on an administrative basis, other times basin or irrigation districts were selected. Representative farms from the most important irrigation areas of the countries were chosen. Scenarios were identified for both medium and long term but no dynamics was considered.

The literature review clearly shows that effects of MTR on the irrigated surfaces are very different from one region to another. They depend upon a range of factors including the importance of irrigated crops subsidised in the previous scheme, the amount of the existing differences among subsidies for irrigated and non irrigated crops as envisaged in the previous scheme of regionalisation, the differences of yield between irrigated and non irrigated crops, the existence of crop alternatives, etc.

France. In the short-term, decoupling has no effect on the COP sector as a whole but it does so within the sector itself. Major changes are likely to occur between cereals, oilseed and protein, from one side, and forage and fallow from the other side, with a reduction for cereals (-2%) in general and for soft wheat (-8%) in particular (INRA, 2004). In the mid-term, decoupling cancels the "over-support" given to the irrigated agriculture and eliminates the incentive to irrigate. In the long term, decoupling will affect farmers' investment decisions in irrigation equipment and its effect will be more marked.

At national level different estimates about irrigated surface and water demand are available. According to Buisson (Buisson, 2005) there will be a reduction both in irrigated surface (-8%) and in water demand (-7%) mainly due to the decline in irrigated maize and protein crops. At regional level it should be noted that in the southern-western regions, where water conflicts are stronger, water demand for irrigation falls more than at national level (-21% in Midi-Pyrénées, -12% in Poitou-Charentes and -8% in Aquitaine). In the same regions, irrigation water demand elasticity to irrigated surface is higher than 1 suggesting an extensification trend of agriculture.

On the contrary, according to a the study carried out by the *Compagnie d'Aménagement des Coteaux de Gascogne* (CAGC, 2006), CAP reform would lead to a 20% reduction in the irrigated surface mainly due to the reduction in irrigated surface of peas, soya and maize located in the area of Hauts-Pyrénées. Water demand will be (is) reduced by 4%, less than irrigated surface, since farmers intensify irrigation in order to obtain higher yield. The effect of CAP reform on the farm revenue is very limited: it is expected to be -15 euro/ha.

Finally, a study realized by ARVALIS (Arvalis, 2006) considers the possibility of a reduction of maize surface. Where water is not a limiting factor, yield of maize is higher than other cereals and maize remains the most profitable crop. Where water is

limited, reduction in maize yields due to water stress should be considered in order to foresee possible changes in the cropping pattern.

Greece. The main effect of the World market scenario characterized by a high degree of liberalisation scenario is the reduction of cotton. Tomato and sugar beet grown area drop in some areas or remain stable in others. This would lead to a reduction in irrigated surface, as the area shifts to non irrigated non-irrigated or less irrigated crops, such as barley and durum wheat. However, also alfalfa and corn do increase. World market causes contrasting effects on water demand. In at least a region out of three, some cases it produces a reduction in water demand and an increase in its elasticity at lower prices. In the others, cases the demand under Agenda 2000 and world markets crosses each other water demand does not change. Farm income is decrease by about 15-30%.

Italy. According to the literature, reviewed, at national level durum wheat and maize grown area decrease while oilseed (first of all sunflower), barley and soft wheat increase (Arcieri, 2006).

CAP reform brings to an increase in irrigated surface and a decrease in per hectare use of water, as well as a reduction in the area under micro-irrigation. In the case study of Oristano Irrigation District (Sardinia region), the 2003 reform causes a decrease in durum wheat, tomato and uncultivated surface, while it causes an opposite effect on vegetables and other cereals. The same happens under sugar beet reform, except in the case where processing plants are closed. In this case, sugar beet cultivation stops and the its area are is thus reallocated to all the other crops except durum wheat. In the case study of Tarquinia Irrigation District (Central Italy), the trends are similar for durum wheat, while tomato decreases under all scenarios. Consequently, water demand slightly decreases under the 2003 reform and sugar beet reform and income falls slightly under all alternative scenarios compared with the baseline (Dono, 2006). In both areas, CAP reform brings to an increase in irrigated surface and a decrease in per hectare use of water, as well as a reduction in the area under micro-irrigation.

Spain. The deployment of the new CAP doesn't lead to drastic changes in the current situation with respect to land use and cropping patterns. In general, crops with a substantial comparative advantage in the production-based coupled payments (such as maize, cotton and durum wheat) are reduced. The only cereal benefiting from the reform is soft wheat since it provides farmers with high gross margin, because its production costs are lower than for other crops. The reductions in COP crops is more prominent in the inland region of continental agriculture (Castilla) than in the Mediterranean region (Andalusia) characterized by a more varied cropping mix and yield potential (Varela-Ortega, 2006).

In Aragon region (North-East), where some cereals - wheat and barley - are cultivated in rainfed regime and other cereals - maize and rice - are irrigated, the changes in the cropping pattern could lead to the abandonment of non irrigated agriculture that becomes unprofitable. Farms could be boosted toward more water intensive agriculture through the introduction of new irrigation technologies and the expansion of more profitable irrigated crops such as horticulture and fruit. Economic viability and environmental effects of this shift of the production must be carefully addressed (Albiac-Murillo et al., 2004).

The effects in terms of farmers' income level are quite sizeable and the reduction is directly proportional to the de/coupled percentage applied. The results also differ depending on whether the farms are irrigated, where the income level increases, or rain-fed, where income falls considerably.

The results of an investigation on the effects of some policy instruments grouped under cross-compliance (prohibition of mono-cropping and obligation to keep up buffer strips) show that both the distribution and the output of the different crops are affected while farmers' income level is found to fall for irrigated farms more than for rain-fed ones (Varela-Ortega, 2006).

In the south of the country (Guadiana and Guadalquivir Irrigation districts), where COP are irrigated, decoupling induces farmers to change cropping patterns and to reduce

the irrigated area. COP irrigated surface decreases and new dry land crops appear. These crop substitution effects are more acute in the Guadalquivir study area where irrigated cotton production is very important. Since differences in productivity between irrigated and dry land crops are much higher in the Guadiana area, the shift to dry land crops is softer in this area than in the Guadalquivir irrigation district. As a consequence of this trend of irrigated lands to diminish, the partial decoupling scenario induces a decrease in water use in both irrigated areas (Blanco-Fonseca, 2006).

As for the cotton that represents the most important irrigated arable crop in Andalusia, the CAP reform is likely to seriously threaten the profitability of the cultivation and, consequently, the survival of the sector in the area. The decoupling of subsidies would probably leads farmers to sow the current cotton area but in a semi-abandonment system of cultivation, that is minimizing the use of inputs, included irrigation water, and leaving the raw cotton in the field (Arriaza, Gomez-Limòn, 2006).

By way of conclusion, four main trends are expected for the evolution of irrigated surface in the sector of cereals, oilseeds and protein crops:

- when and where NON IRRIGATED crops are still PROFITABLE after the MTR their surface doesn't change and there isn't any impact on water demand
- when and where NON IRRIGATED crops are NO MORE LONGER PROFITABLE after the MTR some of their surface can be irrigated with an increase in water demand
- when and where IRRIGATED crops are still PROFITABLE after the MTR their surface doesn't change and there isn't any impact on water demand
- when and where IRRIGATED crops are NO MORE LONGER PROFITABLE after the MTR rainfed crops can appear with a decrease in the water demand

The higher the differences between irrigated and non irrigated non-irrigated crop yields and the lower the irrigation costs, the more the second trend is marked. On the contrary, the higher the differences between irrigated and non irrigated crop yields and the lower the irrigation costs, the more the fourth trend is reduced.

THE IMPACT OF AGRI-ENVIRONMENTAL MEASURES ON ENVIRONMENT

The difficulties to assess the impact of agri-environmental measures (AEM) are generally recognized. Apart from their immediate impacts on farming practices, results on changes in water quality and ecosystems are still limited. In 2005 Oréade-Brèche published the results of an evaluation study of AEM, financed by the European Commission. Main findings are reported as follows:

• Effects of Agri-environmental programmes on water quality

Water quality is a priority in Finland, Sweden, **Greece**, Ireland, **France** and Denmark while all countries have defined zones for water quality. The Agri-environmental Measures portfolio in this area varies a lot.

Scientific studies report an effective input reduction due to Agri-environmental measures. If water quality measurements are carried out directly on the plots where Agro-environmental Measures are implemented, they often show quicker and more concluding results than those done at water basin level, that include other plots, out of Agro-environmental Measures. (...) Studies confirm the favourable effects of the following measures: rReduction of agricultural inputs measures, Ttransfer reduction of agricultural pollutants, Ddiversification of rotations, maintenance of grasslands, arable reversion to grassland and extensification, organic farming.

• Effects of Agri-environmental programmes on water resources (quantity)

Only Spain, France and Portugal have defined quantitative water management as one of their main agri-environmental issues. This is nevertheless an area where much could be done, notably about overexploitation of water resources, in particular in Southern Europe. It should be noticed however, that Agri-environmental programmes have in some cases succeeded in the reduction of water consumption and in recovering water tables, e.g. in Castilla la ancha. (from ORÉADE- BRÈCHE, 2005).

Some conclusions

- The effective degree of decoupling is relevant a key element in to determining impacts of MTR. Of course, partial decoupling has a weaker effect and causes a more limited reduction than full decoupling in on **irrigated surface**. Bboth in the short as well as and in the mid and in the long term, partial decoupling will reduce the CAP reform's effects on the irrigated surface..
- In general, crops with a substantial comparative advantage in the production-based coupled payments (such as maize, cotton and durum wheat) will be reduced.
- A regional polarisation is likely to occur between regions already specialized in COP cultivations which that are likely to specialize and grow further and regions which are likely to regress especially in the inland and mountain areas .
- When the production for some crops - such as cotton and tobacco - is highly concentrated in marginal areas, a special consideration should be given to the impacts of decoupling payments on these sectors of decoupling payments since abandoning production generates significant negative impacts foron rural development.
- Even though one of the main goals of the 2003 CAP reform iswas to promote more extensive farming in Europe and encourage **environmental protection**, the results obtained show no such an improvement in the new CAP decoupled scenarios unless additional measures to protect the environment are introduced. Cross compliance and good agricultural and environmental conditions (GAEC) substantially could contribute to improving and protecting the environment even though they amount to an additional cost for farmersno clear evidence of their effects is available .
- at this stage.
- More marked effects in terms of reduction of water demand are expected from the forthcoming reform of CMO of fruit and vegetables and wine sector, while in most cases arable crops still remain only as a valuable alternative to irrigated production and their reform affect the "opportunity" cost of irrigated crops.
- Water Demand Management is not a major concern of the CAP and, accordingly, CAP impact on water quality and – even more - water quantity issues are limited.
- More specifically WDM-oriented policy measures are needed to achieve more sustainable water management in the Mediterranean agriculture.

ⁱ References will be provided in the full text.