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## **D 4.2.4 - Recommendations for policy**

WP4.2 – Policy analysis and indicator framework

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## Executive summary

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Public policies play a crucial role in shaping farmers and other actors' decisions that influence the sustainability of rural communities and therefore they are a central element in the development of a pathway towards sustainable crop production.

This report presents the main recommendations for policy that arise from the work and experience gained in FATIMA. These recommendations are aimed to contribute to create an enabling environment for the uptake of FATIMA tools and services, thus contributing to a more efficient and sustainable agriculture. They are focused on the three policy instruments that are at the core of FATIMA: Common Agricultural Policy (CAP) 2<sup>nd</sup> Pillar subsidies, the Nitrate Directive (NV) and the water pricing systems foreseen under the Water Framework Directive (WFD).



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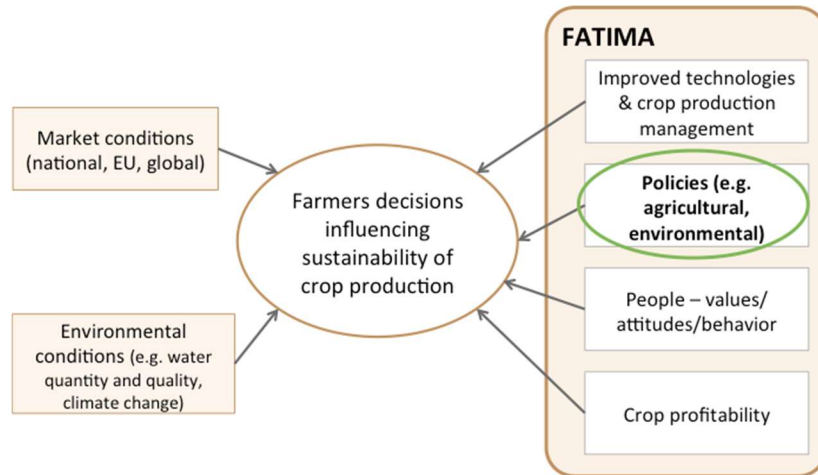
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# 1 Background and purpose

Public policies play a crucial role in shaping farmers and other actors' decisions that influence the sustainability of rural communities and therefore they are a central element in the development of a pathway towards sustainable crop production.



**Figure 1 – Policies in the context of FATIMA**

This deliverable presents the main recommendations for policy that arise from the work and experience gained in FATIMA, namely from the work 'on the ground' and from the interactions with stakeholders in the pilot areas, combined with relevant literature. These recommendations are aimed to contribute to create an enabling environment for the uptake of FATIMA tools and services, thus contributing to a more efficient and sustainable agriculture. They are focused on the three policy instruments that are at the core of FATIMA: Common Agricultural Policy (CAP) 2<sup>nd</sup> Pillar subsidies, the Nitrate Directive (NV) and the water pricing systems foreseen under the Water Framework Directive (WFD).

## 2 CAP agri-environmental payments

While there are multiple factors explaining farmers' choices of what and how to produce, economic incentives have a large role in determining what farmers do individually and collectively. Agricultural production and producers are highly responsive to market signals as farmers try to increase their revenue and decrease their costs. The acknowledgement of this fact has motivated the strong emphasis that agricultural policies have placed in the development of incentive schemes to promote the attainment of environmental and social objectives in the agricultural sector.

In EU policy, agri-environmental subsidies are included under the current CAP Pillar 2, by which farmers may receive additional financial support (beyond the Green Direct Payment) if they adopt stricter agri-environmental farming practices. These include agri-environmental climate measures, organic farming, Areas of Natural Constraints (ANC), Natura 2000 areas, forestry measures and investments which are beneficial for the environment or climate.

In FATIMA policy analysis, we have reviewed some of the subsidy schemes applied in the pilot areas which could provide incentive for the adoption of FATIMA tools and services and thus contribute to increase resource efficiency in agriculture. From this analysis we concluded that although these voluntary instruments are generally well accepted by farmers, the values of the subsidies generally do not cover opportunity and transaction costs and are targeted mainly for infrastructure and equipment acquisition, thus reducing their potential effectiveness.

Main recommendations that can be derived from FATIMA policy analysis in this matter include:

- 1. Support soft innovation:** a stronger focus should be placed in the support to investments in innovation by farmers, comprising not only investments in new machinery and technology, but also subsidies for the acquisition of data and information related with precision farming (e.g. satellite images, sensors, soil maps, timely and spatially adjusted crop water and N requirements), innovative software solutions (webGIS tools, crop yield potential maps, fertilizer application zones and doses) and advisory services to promote more sustainable and efficient agricultural practices.
- 2. Adjust payments values:** the values of payments should be carefully calculated based upon a sound evaluation of the additional costs incurred by farmers with the application of the foreseen measures, of the income foregone (in cases of yield reduction) and of the costs associated with application and reporting procedures. In many cases payment schemes have not attained objectives due to the low value of the subsidy, compared with all these costs.
- 3. Account for diversity:** payment schemes should be designed taking into account the diversity of alternative farming models that coexist nowadays in European agriculture. The payments should be accessible not only to large intensive, entrepreneurial and market-oriented farms but also be open to smaller farms and alternative agricultural models, such as organic, conservation agriculture, social farming, urban/peri-urban agriculture. This may require the design of schemes specifically targeted to these types of farming systems.



4. **Encourage collaborative strategies:** participation by smaller farms may be fostered by supports to communal investments/farmers' cooperatives/producers' organizations and other forms of collaborative management. Sharing of equipment, technology and technical staff/advice should therefore be actively encouraged by agri-environmental schemes. It has been acknowledged that bridging organizations, that facilitate interactions among individual farmers and between farmers and other institutions/stakeholders, can play an important role in establishing communities of practice in the application of innovative solutions for sustainable agriculture, such as FATIMA tools and services.
5. **Keep it simple:** one of the main obstacles that is often pointed by farmers is the complexity of application procedures and the administrative burden that is associated with payments and reporting activities. It is therefore important to simplify procedures (for example in the demonstration of no double funding linked with the greening instrument) and reduce bureaucracy and administrative burden. It is also important to organize a swift management of the programmes, ensuring for instance predictability and reliability regarding calls dates, timely processing of payments and persistence of the rules.
6. **Build capacity:** technical assistance and knowledge transfer, coupled with the subsidies, are needed to improve farmers' skills and capability to adopt new technologies to improve farm's efficiency, competitiveness and sustainability. Farm Advisory Services should play an important role in fostering the uptake of new technologies for resource efficiency such as FATIMA tools and services.
7. **It is not all about the money:** providing a clear (and convincing) explanation to farmers of the rationale underlying the measures is an essential element to increase their willingness to adopt them and secure the success of an agri-environmental scheme. Farmers are important stewards of the environment and many are already self-motivated to undertake farm practices that are beneficial in terms of resource use, environmental quality and/or nature conservation. If they understand the reason and the social benefits associated with a measure, it is more likely that they will adopt it.
8. **Disseminate results:** reporting and dissemination to target actors of the results achieved in terms of outputs (distribution of funds) and outcomes (sustainability objectives achieved) is important. Show benefits of the subsidies in terms of goals reached and environmental impacts and competitiveness.



### 3 Nitrate Regulations

The agricultural use of nitrates in organic and chemical fertilisers has been a major source of water pollution in Europe. The Nitrates Directive (Directive 91/676/EEC of 12 December 1991) was created in response to the need of a common action to control the problem arising from intensive agricultural production. The Directive aims to protect water quality across Europe by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. Under the Nitrates Directive, all Member States have to:

- (1) Designate as Nitrate Vulnerable Zones all those draining into waters which are or could be affected by high nitrate levels and eutrophication.
- (2) Draw up a Code of Good Agricultural Practice which farmers apply on a voluntary basis. It sets out various good practices, such as measures limiting the periods when nitrogen fertilizers can be applied on land; measures limiting the conditions for fertilizer application to prevent nitrate losses from leaching and run-off; requirement for a minimum storage capacity for livestock manure; and crop rotations, soil winter cover, and catch crops to prevent nitrate leaching and run-off during wet seasons.
- (3) Establish mandatory Action Programmes (AP) for NVZ areas, taking into account available scientific and technical data and overall environmental conditions. AP must include measures already included in Codes of Good Agricultural Practice, which become mandatory in NVZs, and other measures, such as limitation of fertilizer application (mineral and organic), taking into account crop needs, all nitrogen inputs and soil nitrogen supply, maximum amount of livestock manure to be applied (corresponding to 170 kg nitrogen /hectare/year).
- (4) Carry out a comprehensive monitoring programme and submit every 4 years, a report on the implementation of the Directive.
- (5) Provide training and information for farmers, where appropriate.

In the policy analysis that was undertaken regarding the implementation of the Nitrate Directive in FATIMA pilot areas, we concluded that in general the effectiveness of this policy instrument remains to be demonstrated, in spite of an overall reduction in the use of fertilizers that has been recorded in most areas. FATIMA tools may contribute to reduce the income losses for farmers associated with N applications restrictions. This regulation has contributed to increase farmers' awareness for the environmental impacts associated with the application of fertilizers and to improve the social image of the farming sector. Monitoring and enforcement of the implementation of nitrate regulations could be substantially improved in all pilot areas. Again, FATIMA tools and services can have a very important role in this.

Main recommendations to improve the effectiveness of this policy instrument, to foster uptake and to take full advantage of tools such as those developed in FATIMA include:

1. **Acknowledge variability:** pedo-climatic conditions and farming practices may differ even within a NVZ and at the same time have a huge influence on nitrogen utilization and on the risk of nitrate leaching. The effectiveness of the N recommendations depends largely on the site-specific adjustments of these measures to the pedo-climatic conditions and farming systems. Site-specific nutrient management is superior to 'blanket recommendations' (Alterra, 2011), as confirmed by the stakeholders consulted in the scope of FATIMA policy analysis.





This calls for the adoption of farm and site-specific maximum N recommendations and allowed practices, taking heterogeneity of conditions into account, which is currently not done in FATIMA pilot areas. This principle would allow a greater effectiveness in the achievement of policy goals (reduced nitrate pollution) and an increase in the efficiency in the use of resources, thus reducing negative impacts in farmers' income (eco-efficiency).

2. **Use Nitrogen balances:** nitrogen balances should be generally accepted and used to estimate the quantities of fertilizers to be applied. The figures must be adapted to soil conditions, crops and agricultural practices. FATIMA provides tools to calculate this balance and verify the actions carried out by the farmer, so that tools can be adopted by the competent administration for monitoring these agricultural practices.
3. **Good information is fundamental:** the adoption of site-specific recommendations and acceptance of N balances requires the availability of locally derived and updated information on soil (soil maps) and climatic and hydrological conditions, to which FATIMA tools can contribute.

Specific regulations for the field notebook (required by CAP) should also be introduced regarding the use of variable fertilization rates. The maps of fertilizer application produced by the GPS of the tractor, that is susceptible to be verified through the FATIMA tools, should be accepted as evidence.

4. **Engage stakeholders and build capacity:** the involvement of local farmers and farm advisors in policy design and implementation and an effort to increase capacity of public authorities to enforce and monitor flexible and tailored fertilizer management measures are also needed to support this approach. The multi-stakeholder community platform and the network of local champions that have been nurtured in FATIMA pilot areas are an excellent basis to support these activities.

Furthermore, agrarian extension actions on fertilization would be needed, carried out by professionals, supported at different administrative levels and linked to the CAP to:

- Encourage farmers to use optimal amounts of fertilizers according to the current state of art and production of crops.
- Promote implementation of variable dose fertilization to achieve a greater economic and environmental benefit.
- Raise farmers' awareness for the importance of regulating the fertilizer spreader, depending on the type of fertilizer and the chosen working width to obtain an adequate distribution of the appropriate fertilizer.



## 4 Water Pricing and the Water Framework Directive

The Water Framework Directive (WFD - Directive 2000/60/EC, of 23 October of 2000) represents the cornerstone of EU water protection policy, requiring that all EU waters should achieve good ecological and chemical status by 2015. According to WFD, Member States have to:

- identify the individual river basins on their territory - that is, the surrounding land areas that drain into particular river systems;
- designate authorities to manage these basins in line with the EU rules;
- analyse the features of each river basin, including the impact of human activity and an economic assessment of water use;
- monitor the status of the water in each basin;
- register protected areas, such as those used for drinking water, which require special attention;
- develop and implement “river-basin management plans” (RBMP) to prevent deterioration of surface water, protect and enhance groundwater and preserve protected areas. RBMP include a programme of measures to be implemented in the plan horizon, that shall correspond to a cost-effective approach to achieve established objectives;
- ensure the cost of water services is recovered so that the resources are used efficiently and polluters pay;
- provide public information and consultation on their river-basin management plans.

The use of water and the diffuse pollution caused by pollutants released into the aquatic environment from the agricultural sector are some of the biggest challenges to meeting the objectives of the WFD. Agriculture is responsible for around 44 % of total water abstraction in Europe (EEA, 2008), while in some southern regions it reaches up to 80%, being irrigation the most significant use of water. For this reason, is of particular importance to link both policy fields of agriculture and water.

The successful implementation of the WFD depends strongly on agricultural land use, which is mainly influenced by the CAP. The EC has promoted several initiatives and studies since the WFD approval, with the focus in supporting cooperation between the implementation of the WFD and further developments of the CAP at EU and Member States levels. In the scope of the WFD Common Implementation Strategy a Strategic Steering Group on “WFD and agriculture” was created to discuss how the new tools provided by the WFD, like the river basin management plans and water pricing, can be used to improve water use by agriculture.

The WFD contributes to preserving, protecting and improving the environmental quality and also the prudent and rational utilization of natural resources, requiring that Member States achieve “full cost recovery” of water services. Full cost recovery not only encompasses the cost of water supply, maintenance and new infrastructure but also environmental and resource costs. As such it reflects the “water user pays” principle. The WFD recognises that water pricing is critical to achieve sustainable water use, requiring that pricing provides adequate incentives to use water resources efficiently. On the other hand, CAP, through the Cross-Compliance Scheme (CCS), promotes a more sustainable water use penalizing those farmers that do not meet environmental requirements, through cuts in subsidies. These two combined policies intend to give the right economic incentives for an efficient use of water in agriculture, making it a prerequisite for the economic viability of farming systems.



However, several of the WFD goals were not yet achieved in the EU member states, in particular the orientations regarding the application of efficient water pricing. Despite all the work already done, it is still necessary to go a long way in improving the design and implementation of national policies to this end.

FATIMA aims to contribute to the adoption of new farming strategies and tools, mainly focused on improved inputs management (fertilizers and water), with relevant positive impacts in the water quality status, and creates a potential for articulation between water pricing and the use of the technological possibilities that the satellite imagery time series offer to develop water accounting in large territories, in an economic, objective and reproducible way.

In the policy analysis that was undertaken regarding the implementation of the WFD, in some FATIMA pilot areas, we concluded that in general the effectiveness of water pricing remains to be demonstrated, in spite of the efforts developed by member States to introduce this instrument. Water pricing in agriculture is still a big issue in several Member States. Monitoring and enforcement of the implementation of water pricing in agriculture could be substantially improved in all pilot areas. Again, FATIMA tools and services can have a very important role in this.

Main recommendations to improve the effectiveness of water pricing, to foster uptake and to take full advantage of tools such as those developed in FATIMA include:

- 1. Ride the opportunity:** for a long time, farmers have tended to underestimate the true value of water and opposed the application of water pricing as a regulatory mechanism. However, in the last years as a result of climate change impact and frequent negative water balances, signs of water scarcity are more evident, mainly across southern Europe, with negative impacts on yields. The intensive cultivation of water demanding crops, the irregular temporal and spatial distribution of available surface water resources, the extensive groundwater pumping resulting in the overexploitation and the drawdown of groundwater tables in many regions, all reveal the extent of the problem. Water quality problems, including the salinization of coastal groundwater due to sea water intrusion in some areas, make water inappropriate for irrigation purposes and cause desertification and environmental degradation of ecosystems. This scenario creates a favourable environment for farmers to accept water pricing as a mechanism contributing to sustainable irrigation management, regulating water consumption and avoiding over-exploitation of available resources and the contamination of scarce water reserves.
- 2. Acknowledge differences:** implementation of water pricing mechanisms need to be adapted to the hydrological conditions and farming systems and practices, as well as to the political, institutional and cultural contexts. The effectiveness of the instrument depends largely on the site-specific adjustment of the general orientations provided by the WFD (e.g. efficient water price). The acceptance of water pricing by farmers depends on their perception of the instrument as effective, efficient and fair, adapted to the real technical, economic and social circumstances they face. Also, water authorities and managers need to assure the skills and capacities for an efficient and smooth implementation, including the monitoring and enforcement capacity. Gradual implementation is advisable.
- 3. Revise existing water pricing structures and values:** most of existing water pricing systems are exclusively based on tariffs regimes applied in irrigation perimeters served by collective networks. They recover only partially the costs of services and do not give a right incentive for an efficient use of water. Environmental and resources costs are not, even partially, covered. For this reason, self-consumption, water individually abstracted by farmers, is not priced, although they support the corresponding



investment (e.g. pumping infrastructure) and O&M (e.g. energy) costs. The most commonly applied pricing structures are area-based, where farmers pay based on irrigated area and crop type. It is fundamental to promote a gradual adoption of volume-based water pricing to give the right incentives to farmers, composed by a combination of tariffs regimes, to cover water services costs, and water taxes, to reflect, when adequate and possible, also the environmental and resource costs.

4. **Evaluate capacity to pay for water:** environmental and resource costs are difficult to evaluate in monetary terms. So, instead of trying to design from the beginning water taxes based on monetary estimations for these costs, following the economic theory orientations, it is recommended at this stage to evaluate the capacity of farmers to pay for water for all relevant potential crops, across space and time, and design second-best water pricing incentives that contribute to the achievement of water policy goals, including a more efficient use of water (quantity and quality), and balance the environmental, social and economic impacts. The initial water tax systems implemented can be improved along time, incorporating new information and knowledge, increasing the chances of good acceptance by farmers. For instance, pricing structures can give an incentive to promote night irrigation with consequent reduction of daytime peaks and avoiding water losses due to higher daytime evaporation.
5. **Take care with social and economic vulnerability:** social impacts of an increase in the price of water for irrigation can be significant, especially for the most vulnerable farmers and crops. For this reason, water pricing cannot be designed with a unique focus in the full cost recovery principle, based on efficiency concerns, but instead in the sustainable cost recovery paradigm, accounting for the economic, social and environmental dimensions. The high economic and social vulnerability of a considerable proportion of small irrigated farms in less fertile regions, usually also affected by severe water scarcity, requires special attention in defining the appropriate water pricing scheme. Areas with relevant water scarcity or environmental vulnerability would experience a significant increase in water prices if water pricing is strictly implemented. For some specific low-profitable farming systems it may become unaffordable. These systems are not prepared to accommodate these impacts, since they do not have the human, technical and economic resources available to adapt through investments in new irrigation and management technologies, promote crop changes and improve agricultural practices.
6. **Water pricing as part of a policy mix:** water pricing is only part of the policy mix necessary to achieve sustainable irrigation. So, it is recommended to define clearly the role of each instrument in this policy mix, avoid conflicts among the different instruments and promote potential complementarities and synergies among them. The articulation of water pricing with the water licensing mechanisms, the property rights regime (e.g. is groundwater a private or public resource?) and other mechanisms that regulate water allocation among users, as well as with CAP's regulations, including the Cross-Compliance Scheme, is of particular importance. In some FATIMA pilot areas, water pricing as a single instrument for controlling irrigation water use is not seen as a satisfactory solution to achieve a significant reduction in water consumption in agriculture. It is also recommended to develop mechanisms for the recycling of water taxes revenues (not tariffs, where revenues cover water services costs), assuring their allocation to the agriculture sector, in order to reinforce the incentives to promote efficiency and to address equity issues. With this approach the negative economic impacts of extra-costs imposed in the sector by water taxes can be mitigated. Tax revenues can be used, for instance, to support the installation of advanced irrigation scheduling systems, improvement of in-farm irrigation technologies, reform of water conveyance systems, installation of water metering equipment, awareness raising and training



campaigns, capacity building of extension services for information, advice and technical support, or to support in-situ storage of rainwater. Targeting in the use of available financial resources is essential.

- 7. Promote the use of technology to enforce water regulations and pricing:** to assure the enforcement capacity of water regulations and pricing is a fundamental step for an effective water policy. For instance, to apply volume-based charges and taxes the authorities need to be able to determine the volumes that are the basis for these charges and taxes. For this purpose, one option is to promote the installation of metering systems, eventually supporting the acquisition of water meters by farmers. A second option is to agree on accepted estimation methods to calculate water consumption in irrigation, avoiding the installation costs of meters, and other problems associated with them. The use of Earth Observation (EO) data (e.g. satellite imagery time series) is recommended for the identification of irrigated areas, and the quantification of the availability of resources, current and future needs, the abstracted volumes, and the resource returned in the water bodies. Authorities must assure that EO data and tools are accepted as evidence by law for all these monitoring purposes, including the calculation of volumes to be charged and the detection of illegal abstractions.
- 8. Incentive farmers to use EO tools for water management:** concomitant with the gradual implementation of water pricing, it is necessary to assure farmers have the capacity to acquire new knowledge and information about improving crop production efficiency and reducing its environmental impact. EO based tools developed in FATIMA help farmers in irrigation management at the farm level with environmental and economic benefits. The transition from an empirical irrigation management to the observation of plant needs at farm level scale could contribute to a significant reduction of irrigation water used. The adoption of site-specific recommendations and acceptance of water balances requires the availability of locally derived information on water requirements maps, and climatic and hydrological conditions, to which FATIMA tools can contribute. FATIMA results and products can help farmers to fine-tune the management of variability of their cropping system, both in space (geographic location, topography, soils) and time (climate, weather, phenological growth stage). So, it is recommended the development of incentive schemes for the use of new information tools for water management monitoring and to improve farmers' skills to manage new technologies.
- 9. Involve farmers and farm advisors:** the involvement of local farmers and farm advisors in policy design and implementation and an effort to increase capacity of public authorities to enforce and monitor flexible and tailored water management measures are also needed to support this approach. The multi-stakeholder community platform and the network of local champions that have been nurtured in FATIMA pilot areas are an excellent basis to support these activities.
- 10. Promote agrarian extension actions:** furthermore, agrarian extension actions on sustainable irrigation would be needed, carried out by professionals, supported at different administrative levels and linked to the CAP to encourage farmers to use optimal amounts of water according to the current state of art and production of crops, avoiding overexploitation of available resources and the contamination of aquifers, lakes and rivers.



## 5 Conclusions

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Some general aspects are common to the policy recommendations that were presented in the previous sections for the three policy instruments that were discussed. Actually, these aspects form the basis of any set of recommendations for good governance for improved management of natural resources and the environment. Aspects such as transparency, accountability and participation of all affected parties are fundamental elements of any good policy instrument. Good communication and education of farmers are also fundamental.

Furthermore, in the case of instruments to promote sustainable agriculture, it is important to develop policies that are responsive and adaptive to the differences in environmental features (e.g. soil type, climate, water availability, slope) and in socio-economic contexts. It is also important to account for the diversity of farming systems that exist in EU agricultural landscape (from large highly sophisticated, intensive, entrepreneurial farms to alternative models, such as organic, conservation agriculture, permaculture) and develop policies that are inclusive and nurture the best in each system.

Information provided by FATIMA tools and services can be used to support the enforcement of effective environmental policies in agriculture, in particular for targeting of interventions, reward good practices, monitoring and compliance verification, evaluation and dissemination of results.

Research projects such as FATIMA contribute to raise awareness and increase the capacity of farmers, advisor services, users' associations, authorities and other stakeholders to use innovative software tools and technologies for improved management of resources in agriculture. This is a fundamental contribution to the creation of communities of practice that may act as levers to promote a transition to a more sustainable agriculture.

