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## **D4.2.1: Framework for Policy Analysis**

WP4.2 – Policy analysis and indicator framework

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 633945.

## Document Information

|                                |   |                     |                               |            |  |
|--------------------------------|---|---------------------|-------------------------------|------------|--|
| <b>Grant Agreement Number</b>  | 633945  | <b>Acronym</b>      | FATIMA                        |            |  |
| <b>Full Title of Project</b>   | Farming Tools for external nutrient inputs and water Management   |                     |                               |            |  |
| <b>Horizon 2020 Call</b>       | SFS-02a-2014: External nutrient inputs (Research and innovation Action)   |                     |                               |            |  |
| <b>Start Date</b>              | 1 March 2015  | <b>Duration</b>     | 36 months                     |            |  |
| <b>Project website</b>         | www.fatima-h2020.eu   |                     |                               |            |  |
| <b>Document URL</b>            | (insert URL if document is publicly available online)   |                     |                               |            |  |
| <b>REA Project Officer</b>     | Aneta RYNIK   |                     |                               |            |  |
| <b>Project Coordinator</b>     | Anna Osann  |                     |                               |            |  |
| <b>Deliverable</b>             | D4.2.1 Framework for Policy Analysis  |                     |                               |            |  |
| <b>Work Package</b>            | WP4.2 – Policy analysis and indicator framework   |                     |                               |            |  |
| <b>Date of Delivery</b>        | Contractual   | 1 Dec 2015          | Actual                        | 1 Dec 2015 |  |
| <b>Nature</b>                  | R - Report  | Dissemination Level |                               | PU         |  |
| <b>Lead Beneficiary</b>        | 07_ECO  |                     |                               |            |  |
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| <b>Internal Reviewer 1</b>     | Jan Těšitel (METCENAS)  |                     |                               |            |  |
| <b>Internal Reviewer 2</b>     | Cem Polat Cetinkaya (EA-TEK)  |                     |                               |            |  |
| <b>Objective of document</b>   | To develop a framework, including a set of procedures and indicators, to assess the performance of policy instruments |                     |                               |            |  |
| <b>Readership/Distribution</b> | All FATIMA Regional Teams; All WP leaders and other FATIMA team members; European Commission / REA; Public            |                     |                               |            |  |
| <b>Keywords</b>                | Policy analysis, sustainable crop production, incentives, policy mix  |                     |                               |            |  |

## Document History

| Version   | Issue Date | Stage      | Changes   | Contributor                 |
|-----------|------------|------------|---|-----------------------------|
| Draft v01 | 23/11/2015 | Draft      |   | Rui Santos<br>Paula Antunes |
| v02       | 27/11/2015 | Submission | Internal reviewers' and contributors' comments integrated | Rui Santos<br>Paula Antunes |
|           |            |            |   |                             |
|           |            |            |   |                             |

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## Executive summary

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The purpose of this document is to present a framework for policy analysis to be applied in FATIMA pilot areas, in order to assess the performance of policy instruments for ensuring the sustainability of agricultural systems as well as the provision of ecosystem services and preservation of natural capital. The policy analysis framework includes a set of procedures to develop this task, including the criteria/indicators to help pilot area teams in assessing policy instruments and associated institutional and governance arrangements.

The aim of FATIMA is to encourage optimized yield with minimum inputs (mainly water and nutrients), while preserving natural capital and moving towards socially and economically viable rural farming communities, which requires the integration of multiple perspectives/objectives. Therefore we adopt an integrated assessment approach, where different instruments are analysed as part of a policy mix to tackle the stated objectives and not only on an individual instrument basis. We define a policy mix as a combination of policy instruments which has an influence on the resource efficiency and sustainability of crop production systems, with a particular focus on external nutrient inputs and water management.

Besides the analysis of the interaction among instruments, the framework integrates specific criteria to assess the performance of policies regarding the different dimensions of sustainability: environmental (e.g. effectiveness, impact in the provision of ecosystem services), economic (e.g. allocative efficiency, cost-effectiveness, dynamic efficiency incentives), social (e.g. distribution of costs and benefits, employment), and governance (e.g. institutional matching, accountability, enforcement capacity and monitoring requirements). In addition, other important concerns are also considered such as technical feasibility, predictability, adaptiveness, social acceptability, and adjustment to local conditions.

Finally the framework includes guidelines to help pilot areas in identifying the issue(s) that should be the main priority(ies) for policy and the development of concrete proposals for the improvement of the current policy-mix in order to foster an enabling environment to attain FATIMA's vision and goals.

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# 1 Purpose of the Document

The goal of FATIMA is to establish innovative and new farm tools and service capacities that help the intensive farm sector optimize its external input management (nutrients and water) and productivity, with the vision of bridging sustainable crop production with fair economic competitiveness. One of the strategic aims for this end is to demonstrate how improved, highly efficient technology (e.g. Earth Observation, sensors, Variable Rate Technology for nitrogen management) may contribute to promote agricultural sustainability. However, it is also acknowledged that technology alone may not be sufficient to ensure sustainable crop production, even if combined with increased awareness and adoption of improved management practices by farmers and other stakeholders. 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. For this reason, we need to develop policy analysis in FATIMA (Figure 1).

The purpose of this document is to present a framework for policy analysis to be applied in FATIMA pilot areas, in order to assess the performance of policy instruments for ensuring the sustainability of agricultural systems as well as the provision of ecosystem services and preservation of natural capital.

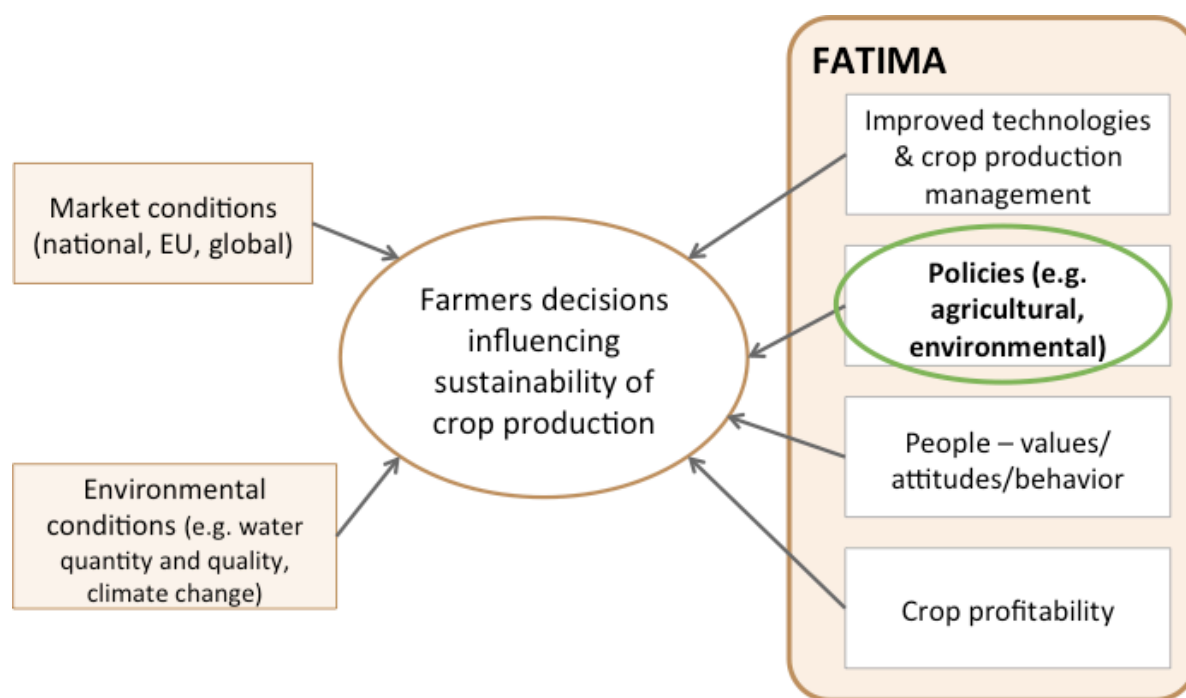


Figure 1 – Policy analysis in the context of FATIMA

## 2 Objectives and scope of WP 4.2

The main objective of WP4.2 is to perform a policy analysis and provide recommendations for tailored policy instruments to promote sustainable crop production and the provision of ecosystem services by agriculture. From this analysis we aim to obtain general policy lessons as well as pilot area-specific recommendations.

To achieve these objectives it is necessary to evaluate the performance of current policies, including their strengths and weaknesses, identify policy gaps, and understand which policies and incentives are needed to enable a paradigm shift to a sustainable, resource efficient crop production system, i.e. to achieve optimized yield with minimum inputs, while preserving natural capital and moving towards socially and economically viable rural farming communities. This knowledge is used to identify opportunities for the proposal of improved (revised or new) policy instruments and innovative financial arrangements, based on extended stakeholder involvement in the process.

The strategy in WP4.2 is to direct the analysis to those policy instruments that have a higher potential to contribute to develop an enabling policy environment for the uptake of FATIMA results. In this way we ensure an efficient allocation of available project resources and avoid diverting our effort to the analysis of other instruments that, although relevant, do not have a very strong link with FATIMA objectives. Examples of relevant instruments are: (i) water-pricing schemes, designed to increase agricultural water productivity; (ii) nitrate regulations that promote efficient use of fertilizers; or (iii) payments for ecosystem services that promote agro-forest/crop systems and farming practices that reduce the need for herbicides, pesticides, fertilizer, as well as energy and water consumption. This requires a very direct link between this WP and the work that is being developed in the ‘technological’ WPs in each pilot area.

## 3 Framework

### 3.1 The concept

The policy analysis framework includes a set of procedures to develop this task, including the criteria/indicators to help case study teams in assessing the performance of policy instruments and associated institutional and governance arrangements for ensuring the sustainability of agricultural systems and the provision of ecosystem services (see Box 1 with definitions).

#### **BOX 1: What are policy instruments and institutions? How to define ecosystem services?**

**Policy instrument** is the term used to describe tools/mechanisms used by governments/authorities to achieve a desired effect/policy objective. We can distinguish three basic types of policy instruments: (1) regulatory/command and control, (2) economic/market-based and (3) voluntary/decentralized approaches.

**Institutions** are the conventions, norms and formally sanctioned rules of a society.

**Governance** refers to all the institutional arrangements and processes aiming at identifying and enacting collectively acceptable principles.

**Ecosystem services** are the direct and indirect contributions of ecosystems to human wellbeing ([www.teebweb.org](http://www.teebweb.org)). These include provisioning services, such as food, fibre and fresh water; regulating and maintenance services, such as flood and disease control; and cultural services, such as spiritual, recreational, and cultural benefits ([www.cices.eu](http://www.cices.eu)).

In practice, policy instruments do not exist in isolation from the legislative and institutional environment that surrounds them, but are part of a wider ‘policy mix’. In the context of biodiversity conservation, Ring and Schröter-Schlaack (2011) consider a policy mix as “a combination of policy instruments which has evolved to influence the quantity and quality of biodiversity conservation and ecosystem service provision

in public and private sectors”. This definition is adopted and adapted for the FATIMA subject: **“A policy mix is a combination of policy instruments which has an influence on the resource efficiency and sustainability of crop production systems, with a particular focus on external nutrient inputs and water management”**. There are several determinants that influence the composition of the mix and that define the role of different instruments within the policy mix, such as the wider context and the specific characteristics of each case/pilot area.

The aim of FATIMA is to encourage optimized yield with minimum inputs (mainly water and nutrients), while preserving natural capital and moving towards socially viable rural farming communities, requiring the integration of multiple perspectives/objectives. Therefore we need to adopt an integrated assessment approach, where different instruments are analysed as part of a policy mix to tackle the stated objectives and not only on an individual instrument basis. For this reason, the framework includes specific guidelines on how to analyse the role of individual instruments and interactions among them, focusing particularly on synergies, conflicts and feedbacks among instruments.

This is an innovative approach to policy analysis for sustainable crop production, although already proposed to assess policy instruments in other fields, as, for example, biodiversity conservation (e.g. POLICYMIX EC project).

Besides the analysis of the interaction among instruments, the framework integrates specific criteria to assess the performance of policies regarding the different dimensions of sustainability: environmental (e.g. effectiveness, impact in the provision of ecosystem services), economic (e.g. allocative efficiency, cost-effectiveness, investment needs), social (e.g. distribution of costs and benefits, employment), and governance (e.g. institutional matching, accountability, enforcement capacity and monitoring requirements). In addition, other important concerns are also considered such as technical feasibility, predictability, adaptiveness, social acceptability, and adjustment to local conditions.

In the cases where there are alternative formulations/designs for the policy mix to achieve a given objective(s), we will perform a multicriteria analysis (MCA) combining the selected evaluation criteria. We will define weights in each pilot area reflecting the relevance of each criterion for the evaluation of policies. The approach to perform the elicitation of weights should be defined considering the specific conditions in each pilot area. This evaluation will be developed and fine-tuned with stakeholder input through the multi-actor community platform (WP1.1).

The application of the policy analysis framework requires the exploration of different data sources. Some of the data may be obtained from published sources (e.g. legislation, reports, official statistics), while other information requires the consultation of specific actors (e.g. surveys). This consultation may be operationalized through interviews or focus groups/stakeholders meetings, preferably in articulation with the work developed in WP1.1.

Figure 2 illustrates the main steps of the FATIMA policy analysis framework that are described in the following sections. This framework includes 5 procedural steps operating in an sequential and iterative mode: the outcomes of each step are used in the following steps, sometimes in combination with external elements (e.g. lessons from other cases).

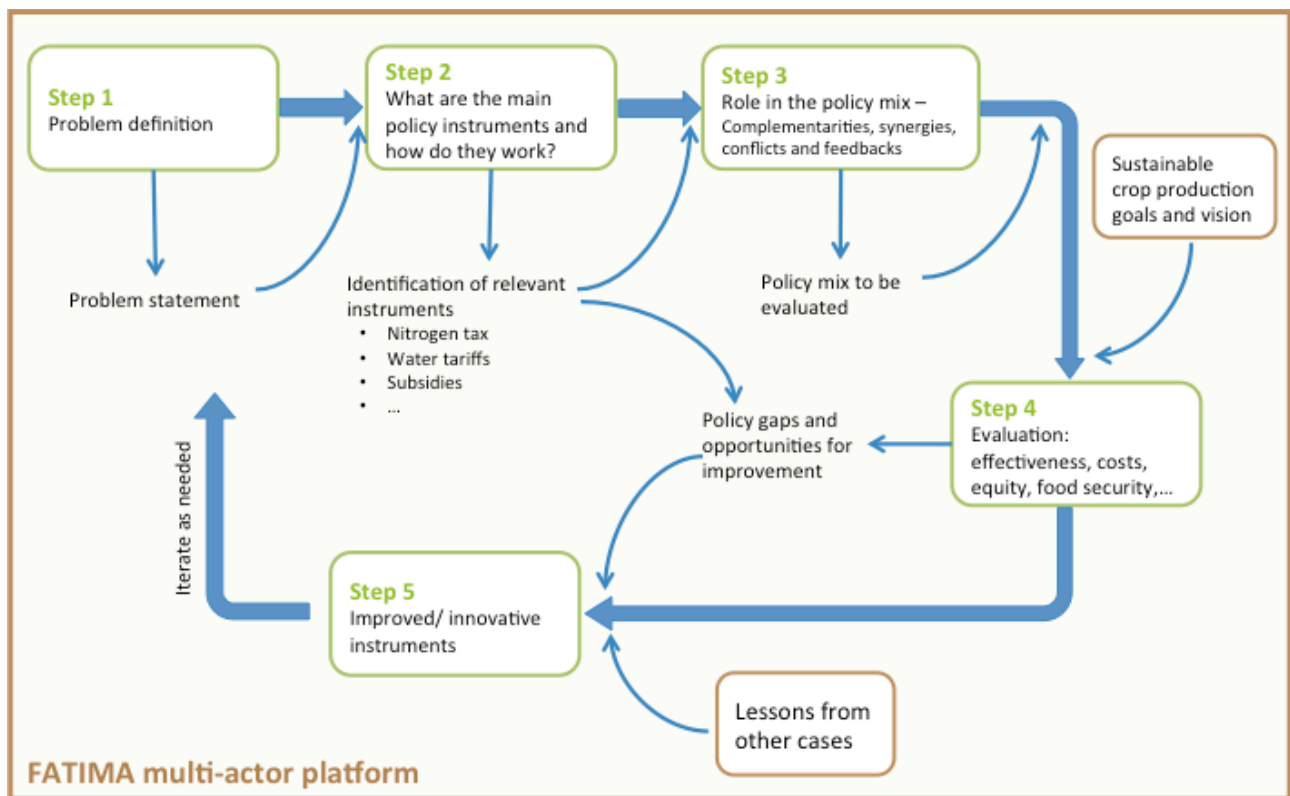


Figure 2 – Steps and outcomes of the FATIMA policy analysis framework

## 3.2 Step 1: Problem definition

The first step is to select a policy issue (or two main issues) that links directly with FATIMA and that will be addressed in the pilot area. The goal is to arrive at a formulation (problem statement) that is agreed by the main stakeholder groups in the pilot area. The final objective of WP 4.2 is to identify potential improvements on policies and governance mechanisms related with this(ese) problem(s) that will contribute to develop an enabling policy environment for the uptake of FATIMA's products and services.

The spatial scale of analysis is defined for each pilot area according to the context and the characteristics of the selected issue(s). However, the scale should be large enough to encompass the environmental and socio-economic dimensions that are relevant to understand and tackle the problem(s). Examples of possible suitable scales would be the (sub)river basin, aquifer, region.

The selection of the policy issue to be addressed should take into account the perspective of relevant private and public stakeholders.

### 3.2.1 Step 1.1: Identify two main management issues for private stakeholders

Identify two main agricultural management issue(s)/question(s) in your case study that you would like to address based on farmers and other private stakeholders' (e.g. local experts, agribusinesses, rural platforms, irrigation perimeter manager, other water users) needs and expectations.

You should consult a significant and diverse number of stakeholders, with different perspectives, stakes and values, considering the results of the stakeholder analysis developed in WP1.1.3.



**BOX 2: Examples of management issues identified in the Austrian pilot area**

- Fertilizer use and perception of pollution potential of local stakeholders: Identification of perception of different stakeholders on the reasons for high nitrate level in groundwater in Marchfeld, possible solutions to reach reduced nitrate levels in the long-term, integration of a wide stakeholder field as there are many opinions on who is causing the high nitrate levels.
- Water pricing / cost transparency: Identification of perception of different stakeholders on the topic of water pricing, possible solutions to reduce the externalities of high water and fertilizer consumption and groundwater pollution, identification of the impact of a changed water pricing system on the income of farmers.

### 3.2.2 Step 1.2: Identify two main public policy issues

Identify two main agricultural management issue(s)/question(s) in your case study that you would like to address based on the priorities of public bodies (e.g. water managers, environmental agencies, agricultural public bodies, nature conservation agencies).

It is supposed that these stakeholders bring the concerns of public policy and allow for the consideration of the main issues from a broader societal point of view. The identification of main externalities associated with intensive agriculture should also be used to inform this discussion, being a relevant link to the work that will be developed in WP 1.2.

**BOX 3: What is an externality?**

**Externalities** are considered in FATIMA as the often **unintended** side effects of agricultural activities related to the environment and civil society.

Examples:

Negative externalities:

- Excessive use of fertilizer resulting in eutrophication of nearby water bodies
- Water scarcity/lack of water for irrigating crops and associated water source (aquifer) depletion
- Land and soil degradation

Positive externalities:

- Provision of important (valuable) landscape elements and landscape enhancement
- Maintaining rural coherence, tradition and cultural identity
- Indirect effects on marketing channels/chains

**BOX 4: Examples of externalities identified in the Austrian pilot area****Negative Externalities:**

- High nitrate level in groundwater: a survey of water samples taken in domestic wells between 2003 and 2014 showed high groundwater nitrate pollution (above the legally maximum permissible value of 50mg/l) in the Marchfeld region, in Eastern Austria. Some districts (e.g. Leopoldsdorf, Eckartsau, Orth) in the pilot area are not connected to the centralised water supply system, where the service providers have to guarantee drinking water quality standards. Especially parents who use water from house wells are concerned about the water quality as high nitrate levels are especially dangerous for smaller children.
- Fluctuating groundwater level: The groundwater level in the area is highly fluctuating. Farmers use in summer around 25 million m<sup>3</sup> of groundwater for irrigation (around 60% of the total water demand in the area), but also on a long-term basis the water levels are not constant. High groundwater levels after years with higher precipitation cause flooding of cellars and in years with lower groundwater levels complaints about the high water consumption of agriculture dominate the public discussion. Until the 1970s the area was known for its high groundwater level, but with the industrialization of agriculture and the rising demand for irrigation the groundwater levels fell significantly. High precipitation in the 1990s led again to a higher groundwater level and in houses built during the period of low groundwater cellars were flooded.

### 3.2.3 Step 1.3: Agree upon a problem statement

The results of the previous two steps should be used to arrive at one (or two) problem statement(s) that is (are) agreed upon by the main stakeholders involved (public and private). A problem statement is a 200-250 words text presenting the problem to be addressed, its relevance, the main causes, recent trends and consequences as well as the spatial and temporal scales of analysis. This statement should also include a first identification of objectives and quantified targets for reduction/control of the problem.

## 3.3 Step 2: Identify and characterize policy instruments in place

The objective of the second step in the application of the framework is to identify and characterize current policies that are related to the issue(s) agreed in Step 1.

### 3.3.1 Step 2.1: Identify policy instruments in place

The policy analysis covers the most relevant policy instruments that shape the farmers' (or other relevant stakeholders) decisions in your study area. The policies will not always originate from agricultural or environmental policies only, but might stem from different sectoral policies (e.g. energy or trade policies). Some examples:

- EU CAP agri-environmental payments;
- payments for environmental/ecosystem services;
- other agricultural subsidies and voluntary funding schemes;

- water tariffs/taxes;
- energy tariffs/taxes;
- taxes on fertilizers/nitrogen taxation;
- nitrate regulations;
- certification schemes and labelling;
- climate policies/carbon taxes.

The absence of some policies/instruments can also be very relevant to shape the farmers decisions (e.g. water pricing is not applied) and it is important to identify these gaps to justify the need to adjust/improve policies in place or design new instruments/governance mechanisms.

#### **BOX 5: Examples of relevant policy instruments identified in the Austrian pilot area**

- ÖPUL program: in the Austrian national environmental program ÖPUL (funded by EU (50%), national funds (30%) and regional funds (20%)), 22 measures related to sustainable agriculture are funded. The participation in the program is voluntary, but around 90% of farmers participate and receive, in total in Austria, yearly around 100 million €. An AGES brochure documents the effects of the ÖPUL program on soils ([http://www.ages.at/fileadmin/AGES2015/Service/Landwirtschaft/Boden\\_Datein/Broschueren/AGES\\_Bodenbroschuere\\_Web.pdf](http://www.ages.at/fileadmin/AGES2015/Service/Landwirtschaft/Boden_Datein/Broschueren/AGES_Bodenbroschuere_Web.pdf))
- Nitrate regulations (mainly determined by certification standards, e.g. AMA, organic agriculture).
- Energy price/ Non-existing water pricing: Farmers do not have to pay for the groundwater they use, but only for the pumping costs. Therefore the non-existing pricing of water and the energy price (either electricity or fuel) are relevant in the decision-making process concerning irrigation.

### **3.3.2 Step 2.2: Characterize policy instruments in place**

As a prior step to the analysis of the impact of the different instruments on the sustainability of agricultural production and rural communities, a brief description of each of the instruments identified in the previous section is required. The following aspects are considered in this characterization:

- Name of the instrument;
- Rationale and objectives of the instrument: brief explanation to justify the need for the instrument, its objectives and how it is expected to address the problem; is the instrument applied in a wider context or is it only applied in a particular case?
- It may also be relevant to describe the baseline for the implementation of the instrument (e.g. on what basis are payments granted or taxes relieved? How is the obligation to offset impacts determined?). The baseline describes how property rights are assigned;
- Link to FATIMA approach and objectives;
- Spatial scope (e.g. EU, national, regional, local, pilot area);
- Current status and time horizon: in place from... to...;
- Targeted actors (who is targeted by the instrument?). Distinguish between public and private actors/activities/products/emissions/resources;

- Governance: includes relevant governance levels of instrument application - often governmental level, but not necessarily (e.g. public agency responsible for its proposal and application); the governance levels can be: international (e.g. European), national, regional (e.g., state level, provinces, in any case between “local” and “national”), local (community, municipality, district level);
- Financial issues: required funding/funding sources/revenues generated;
- Links to other relevant instruments (and new iteration to step 2.1, if a relevant instrument was not yet characterized): Does the instrument typically operate independently or within a policy mix?
- Other relevant descriptors for the pilot/case study area.

**BOX 6:** Description of the water resources tax (TRH) implemented in Portugal in 2008:

- **Name of the instrument:** Water Resources Tax - *Taxa de Recursos Hídricos* (TRH);
- **Rationale:** In December 2005, the Portuguese Water Law was approved (Law 58/2005), transposing the Water Framework Directive (WFD – Directive 2000/60/CE). This Law establishes the water pricing policy instruments, following WFD orientations. Water pricing aims to promote the efficient use of water, contributing water services costs and environmental and resource costs recovery. TRH is one of the instruments established by the Water Law, aligned with the polluter/user pays principle. TRH aims to compensate for (this means, internalize in the decisions related with water use): (1) the benefit resulting from the private use of the water public domain; (2) the environmental and resource costs associated with the activities that cause a significant impact on water resources; (3) the administrative costs (costs supported by public entities) associated with the activities of planning, management, monitoring and guarantee of water quality and quantity. TRH is articulated with the water services tariffs mechanism, where unit tariffs usually increase with water consumption (progressive tariffs);
- **Link to FATIMA approach and objectives:** TRH aims to promote the efficient use of water also in agriculture that is the most important use in Portugal (around 80% of total water consumption). Pricing water for irrigation creates an incentive to allocate scarce water to the most efficient uses, promoting an improved allocation of water from different sources among competing uses, and to increase water productivity avoiding water misuse. This incentive is given through a price signal to be perceived and internalized by farmers and irrigation perimeter managers when taking decisions on, for example, crops selection, farming practices, irrigation technologies, the use of information and decision support tools, and other aspects relevant to water management at a farm, irrigation perimeter and water basin levels. A scarcity coefficient is applied in each water district to adjust the TRH for the existing water balance conditions. TRH is a potential instrument to be improved in order to contribute to develop an enabling policy environment for the uptake of FATIMA tools and to promote the sustainability of agricultural production and rural communities;
- **Spatial scope:** applied at a national level, with some parameters (e.g. water scarcity coefficients) adjusted at a water district level;
- **Current status and time horizon:** TRH is in place since June 2008, as part of the economic and financial regime for water resources (DL n.º 97/2008), that also includes two other instruments: water services tariffs and contract-programs. TRH was revised in December 2014 with the publication of the Portuguese Green Tax Reform Law (Law n.º 82-D/2014) taking into account the experience with its implementation in the period 2008-2013;
- **Target uses and users:** TRH aims to achieve an adequate level of cost recovery for the water users having a significant impact on water resources (water uses for which it is required to have a water permit – *título de utilização*), internalizing environmental and resource (scarcity) costs. TRH is due on a yearly basis and it is calculated for each user as the sum of five components: **A** - The abstraction of public water (public water domain) for private uses; **E** - The direct or indirect discharge of effluents on water resources which may cause significant impact; **I** - The extraction of inert materials from the public water domain; **O** - The land occupation of the public water resources and/or the occupation and

creation of water plans; and **U** - The private use of water, whatever its nature or statutory regime, subject to planning and public management, which may cause significant impact. The TRH unit values for each of these uses are established taking into account: 1) the different contribution that each economic sector should provide to water resources sustainable management (it must consider at least the three main user groups: households, industry and agriculture), (2) the spatial differences on water scarcity for the different water districts; (3) concerns with socially or economically vulnerable user groups. The intensity of water uses is established based on metering, self-monitoring and values estimated by users, or by the maximum values included in the water permits issued by APA (water authority). Indirect calculation methods, including the use of average consumption values by sector of activity and similar production methods are also used in cases where real data are not available. Table 1 presents the TRH unit values applied to irrigation, and Table 2 presents some examples of unit values applied to other water uses, both for 2015.

**Table 1** – Unit values for the components of TRH applied to irrigation – A, O and U (€, 2015)

| Component | Unit                              | Water uses   | Unit values |
|-----------|-----------------------------------|--|-------------|
| <b>A</b>  | m <sup>3</sup>                    | Agriculture, aquaculture, marine and other biogenetic cultures   | 0,003       |
| <b>O</b>  | m or m <sup>2</sup> , as adequate | Agriculture, aquaculture, infrastructures and equipments to support traditional fishing activities, and... | 0,05        |
| <b>U</b>  | m <sup>3</sup>                    | Agriculture, aquaculture, marine and other biogenetic cultures   | 0,0006      |

Source: Portuguese Environment Agency (APA)

**Table 2** – Unit values for the components of TRH other uses – E and I (€, 2015)

| Component | Unit                              | Water uses                             | Unit values |
|-----------|-----------------------------------|--|-------------|
| <b>A</b>  | m <sup>3</sup>                    | Urban water supply (as an example)     | 0,013       |
| <b>E</b>  | kg                                | All water uses - Nitrogen - N          | 0,13        |
| <b>E</b>  | kg                                | All water uses - Phosphorus - P        | 0,16        |
| <b>E</b>  | kg                                | All water uses – Organic load (OM)     | 0,31        |
| <b>I</b>  | m <sup>3</sup>                    | All water uses                         | 2,53        |
| <b>O</b>  | m or m <sup>2</sup> , as adequate | Electricity production (as an example) | 0,002       |
| <b>U</b>  | m <sup>3</sup>                    | Urban (as an example)                  | 0,0026      |

Source: Portuguese Environment Agency (APA)

- Governance structure:** The Portuguese Environment Agency (*Agência Portuguesa do Ambiente* – APA) is currently the entity responsible for TRH implementation. The water governance structures in mainland Portugal changed substantially since 2011, as part of the overall administrative reorganization to deal with the economic and financial crisis. In January 2012 (DL n.º7/2012), the Portuguese Water Institute (*Instituto da Água* - INAG), responsible for the design and proposal of the TRH, was extinguished, as well as the five River Basin Districts Authorities (*Administrações de Região Hidrográfica* – ARH) created in 2007 and whose activities started in 2009, that were responsible for the TRH implementation. Those entities (INAG and five ARH) have been integrated under the renewed APA that is currently the Portuguese Water Authority and concentrates all the functions of the five ARH in Continental Portugal (now allocated to five regional departments of APA that maintain the designation

- ARH).
- Generated revenues:** The revenues generated with TRH range from € 18.460\*10<sup>3</sup> in 2008 (the first year of implementation) to € 35.079\*10<sup>3</sup> in 2009 (the maximum value). In the remaining years the value of TRH revenues is in the range 25-30 million euros. The component A - The abstraction of public water for private uses is the most important and represents around 40% of total revenues (these kind of figures should be analysed in more detail for a real FATIMA case study). The agricultural (irrigation) use contribution to TRH revenues has not been very relevant due to the application of some exemptions and reductions to this sector (e.g. water for irrigation has benefited from a reduction of 60% in the unit value established for the components A and U - this kind of subject should be analysed in more detail for a real FATIMA pilot area). Yearly values paid by agriculture are around 1 million euros for component A, 300.000 euros for component U and a very small amount for component O. The revenues generated by TRH are allocated to support public water policies. 50% of the total revenues are allocated to the Water Resources Protection Fund (*Fundo Proteção Recursos Hídricos – FPRH*) that was created to promote the investment in projects oriented to a more rational use and protection of water resources.
  - Links to other relevant instruments:** River Basin Management Plans (RBMP) adopted for mainland Portugal on March 2013 and currently (November 2015) under revision (for more information see <http://www.apambiente.pt>); water tariffs (see [www.ersar.pt](http://www.ersar.pt)); charges applied for irrigation in private and public perimeters (add more detail for a real case study).

### 3.3.1 Step 2.3: Agree upon the policy mix

The results of the previous two steps should be used to arrive at a definition of the policy mix that will be studied in the following steps. To define the policy mix you need to identify the **key instrument(s)** and the **related instrument(s)**. The key instrument(s) should be characterized (step 2.2) in more detail, since this will be the basis for the next steps. The related instrument(s) can be characterized with less detail, including only the relevant elements to understand the links and to allow the development of step 3.

Figure 3 presents some examples of potential policy instruments for agricultural sustainability, illustrating the case of a hypothetical policy mix for nitrate pollution control.

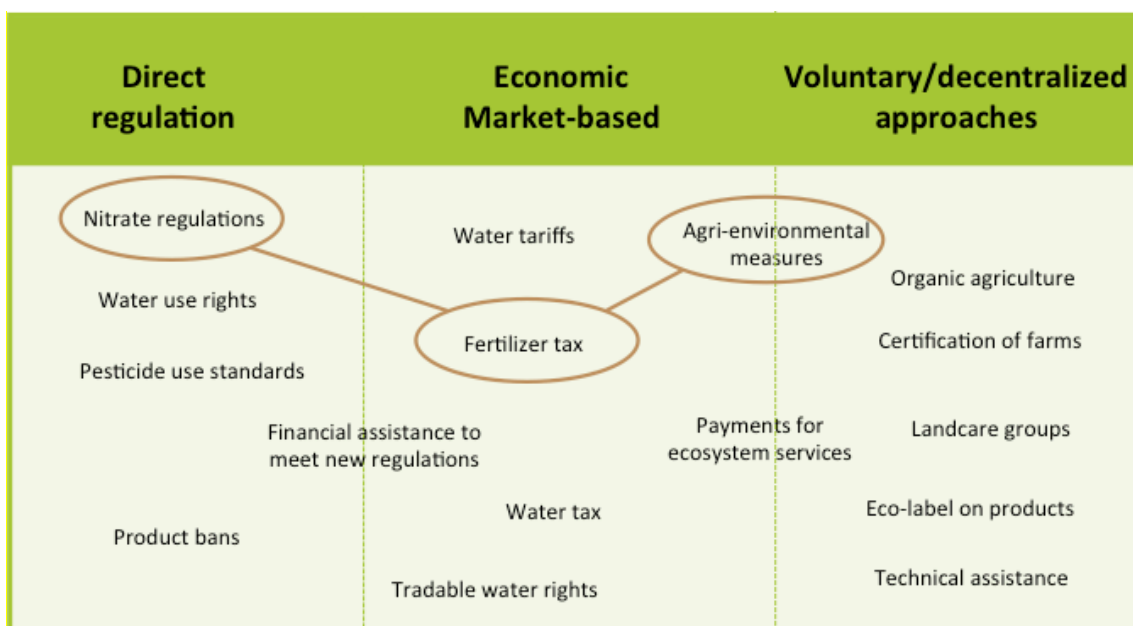


Figure 3 – Policy instruments and policy mixes

## 3.4 Step 3: Evaluate the role of selected instruments in the policy mix

The role of the selected instruments in the policy mix is evaluated in this step. Policy instruments can use a wide range of regulatory and incentive mechanisms, ranging from limits and taxes on harmful activities (e.g. nitrate contamination), to providing payments for the provision of ecosystem services (e.g. carbon sequestration, pollination). It is necessary to understand the role of each of the instruments currently applied and the sequencing in their implementation.

To identify the effects of policy interaction, we should ask the following questions (examples):

- Which other policy instruments are usually associated with instrument in question?
- What was the sequence of their implementation?
- Are there hierarchies between instruments?

A balanced combination of instruments is desired, and the need to find a synergistic, positive and complementary interaction among economic instruments themselves and to avoid negative interactions is particularly important. We can identify the following types of interactions:

- **Positive interactions**
  - **Precondition:** Relating to a situation whereby the successful implementation of one policy instrument entirely depends upon the prior successful implementation of another.
  - **Complementarities:** Are there instruments that complement each other? Is it demonstrated in the literature or is your conclusion based on empirical work?
  - **Synergies:** Are there instruments that more than complement each other, generating synergies?
- **Negative interactions/conflicts:** Are there other instruments that overlap or conflict with the instrument in question, reducing environmental effectiveness or cost-effectiveness? For example, subsidies on agricultural production that compete with agri-environmental subsidies.
- **Redundancies:** Are there instruments that do not play any significant role?

Two tables are used to identify and synthesize the interactions (see Tables 3 and 4 as examples).

**Table 3 – Main interactions in the policy mix**

| Instrument                   | Primary goal  | Complementarity       | Redundancy                        | Conflicts                                 | Sequence    |
|------------------------------|---|-----------------------|-----------------------------------|---|-------------|
| <b>Water tax</b>             | Incentive the efficient use of water, according to the polluter/user pays principle | With water tariffs... | With tradable water rights for... | No direct conflict with other instruments | Requires... |
| <b>Water tariffs</b>         |   |                       |                                   |   |             |
| <b>Tradable water rights</b> |   |                       |                                   |   |             |
| ...                          |   |                       |                                   |   |             |

Table 4 – Summary of interactions among instruments

| Instrument            | Water metering | Water Tax (TRH) | Water tariffs | Tradable water rights | ... |
|-----------------------|----------------|-----------------|---------------|-----------------------|-----|
| Water metering        | (P)            |                 | (+++)         | (+++)                 |     |
| Water tax (e.g. TRH)  |                | -               | (+++)         | (--)                  | (?) |
| Water tariffs         |                | -               | -             | (R)                   |     |
| Tradable water rights |                | -               | -             | -                     |     |
| ...                   |                | -               | -             | -                     | -   |

Legend:

Precondition: (P)

Complementarity: from (+) to (+++)

Synergies: from (\*) to (\*\*\*)

Conflicts: from (-) to (---)

Redundancies: (R)

Uncertain/unknown: (?)

## 3.5 Step 4: Evaluate the performance/impact of the selected instruments

The objective of this step is to assess the performance of the instruments in the context of the identified policy mix. A set of criteria are adopted to translate the different policy concerns and objectives.

Governments are assumed to have broad objectives that they are trying to further through interventions in the agricultural sector. Typically, however, the promotion of one objective conflicts with one or more of the others. In that situation, policy-makers must trade off gains in one criterion/indicator with losses in the others.

The main purpose of using assessment criteria/indicators in the policy context is to provide messages to stakeholders and policy actors to achieve better (more informed) governance.

Criteria to be adopted:

**A. Policy effectiveness and persistence** is related with the ability of the instrument to achieve the policy objectives/targets in a persistent way. To what degree do the achieved outcomes correspond to the intended goals of the policy instrument (e.g. reduction of fertilizers use; reduction of groundwater contamination; increase in water productivity)? What was the time needed until instruments had an effect? Are the effects persistent in such a way that they have a lasting positive impact in the policy goal (persistence)?

Examples of indicators that can be used: resource efficiency (e.g. water productivity), impact in the provision of key ecosystem services, emissions generated, pollutant loads, energy intensity (fossil fuel, other renewable sources), intensity of use of fertilizers, pesticides, herbicides, water footprint, carbon footprint...



Examples of expected difficulties in the evaluation: select the most relevant and appropriate indicators to assess effectiveness (pressure vs impact indicators); obtain time-series data for these indicators covering the period before and after the instrument implementation; define the baseline that allows to identify the additional effects of the instrument (additionality), this is the difference in the indicators results with and without the instrument; evaluate the persistence of the instrument in time; assess potential effects outside the target area/sectors/users caused by the instrument (leakage effects), as well as unintended effects that may create new problems.

**B. Efficiency, including allocative efficiency, cost-effectiveness and transaction costs:** this criterion reflects the economic concerns in the evaluation of policy performance, assuming that the allocation of scarce resources is an issue (e.g. it can be the allocation of scarce financial resources like budget constraints among different objectives; or the allocation of scarce water resources among competing uses). By efficiency we mean the balance between the benefits and costs generated by the instrument under evaluation. Different efficiency dimensions can be considered:

- **Efficiency (cost-benefit):** both benefits and costs need to be identified and valued in monetary terms. Is the instrument promoting decisions where the benefits worth the costs? Is the instrument promoting an efficient allocation of resources (e.g. are water allocation decisions maximizing net benefits for society)? The application of this criterion requires monetary figures on both benefits and costs sides that in many occasions is not available, implying the adoption of the cost-effectiveness analysis. The evaluation of externalities to be developed in the scope of Task 1.2 is an important source of information to assess this aspect.
- **Dynamic efficiency incentives:** is the instrument able to create permanent incentives for technological progress/innovation/continuous improvement?
- **Cost-effectiveness:** this is a very important and widely used criterion. Usually, this is a cost-results criterion in which costs are valued in monetary terms but benefits are not (although it is also possible to consider its application assuming that benefits are valued in monetary terms and costs are not). Could the results have been achieved with fewer resources? A cost-effective policy is one that achieves a given target (goal) at a minimum total cost (or, in the alternative perspective, that maximizes the policy effectiveness/benefits for a given cost). Cost-effectiveness analysis is usually used to rank instruments/measures in terms of increasing unit costs and allows the assessment of the least cost way to reach the policy objective (e.g. was the pollution control target reached with the lowest abatement costs?). Cost-effectiveness analysis can also be used just to link the effectiveness of one instrument in reaching the policy objective with the associated cost (e.g. is the cost reasonable?). This analysis is adding the cost accounting dimension to the policy effectiveness assessment. Full cost accounting requires the identification of different cost categories:
  - direct capital and O&M costs (direct compliance costs);
  - opportunity costs/compensation (e.g. lost benefits that could be obtained with alternative uses of resources);
  - monitoring and enforcement costs;
  - information costs (including contracting);
  - administration costs (e.g. legislation, institutions).

The last three categories are usually called «transaction costs», that are defined as all costs related to the use of a policy instrument, with the exception of direct compliance costs and opportunity costs (even though the borderline will not always be clear).

Examples of data sources that can be used to measure costs: published data (statistics, financial reports, other publications); data obtained from relevant stakeholders (surveys, interviews - be careful with the risk of bias, lack of representativeness, etc...). A combination of methods may be needed to get a complete and reliable cost characterization.

Examples of indicators that can be used: impacts on crop yield and value of production, crop prices, investment costs, O&M costs, return on investment, water tariffs, subsidies for production, subsidies on investment, marginal/unit/total compliance costs, water productivity, monitoring costs, comparative analysis of costs for alternative irrigation technologies/farming practices/..., ...

Examples of expected difficulties in the evaluation: difficulties on the monetary valuation of some aspects, mainly of non-market benefits; time and discounting (a high discount rate discriminates against new instruments with reduced long term costs); explicit costs are easier to account than implicit costs (e.g. time, opportunity costs, delays, conflicts); measuring transaction costs is costly in itself (so you should make clear what the purpose is and if you need to account them or what level of precision/accuracy you need); some costs (mainly transaction costs) are often hidden under other cost headings, require the use of debatable imputation rules, or are even not available (e.g. confidentiality reasons).

**C. Social impacts/equity/income distribution:** Social impacts refer to aspects such as quality of life, access to resources, affordability, equity issues (distributional effects) and employment. Are there any positive or negative social impacts associated with the application of the instrument? How are the outcomes/benefits and costs of the policy instrument distributed across income groups, gender, ethnic groups, regions and generations (distributional equity)? Is the application of the instrument differentiated according to some criteria (e.g. location, user group)? Do all participants have equal opportunities to take part in and influence the processes used by the administration (equity in access)? Is it assured that all persons have access to an adequate and meaningful means of living for themselves and their families?

Examples of indicators that can be used: employment/unemployment rate, distribution of users by gender/age/sector/region/..., distribution of participants in the program/instrument by gender/age/sector/region, evaluation of perceived fairness regarding opportunities & income distribution (e.g. using surveys), distribution of costs/benefits, average salary in agriculture compared with regional average, wage difference between genders, capacity to pay for water

Difficulties in the evaluation: sometimes it is difficult to identify who benefits and who loses with a given instrument; many social aspects can only be assessed through surveys and interviews, which is resource demanding; much of the evaluation is based on perceptions of the affected persons.

Other criteria than can be used include:

**Food security and stability of food prices:** To what degree is the instrument contributing to achieve local/regional/global food security goals? Is it contributing to the short-run stability of food prices at levels affordable to consumers, reflecting the adequacy of food supplies, and the long-run guarantee of adequate human nutrition?

**Technological/technical feasibility:** Is the implementation of the policy instrument technically achievable? Is the instrument relatively easy to implement in practice? Does it require the use of any specific (demanding) technologies? Can it benefit from FATIMA's results and products?

**Funding needs:** Does the application of the instrument require the mobilization of relevant financial (public and/or private) resources (e.g. financial resources to support subsidies, agri-environmental measures, payments for ecosystem services)? Are there sufficient financial resources to support the implementation of the policy instrument? Can funds be raised or borrowed (e.g. from the private sector)?

**Generated revenues:** Does the application of the instrument generate revenues (e.g. fertilizers tax)? How are the generated revenues allocated? Are they recycled to reinforce incentives and/or correct the distribution of costs and benefits (e.g. revenues generated by water taxes paid by farmers are re-allocated to farmers through subsidies to incentive the adoption of improved farming practices)? The recycling strategy can have relevant impacts in terms of effectiveness, efficiency and equity.

**Enforcement and monitoring requirements vs capacity:** enforcement requires effort and resources to guarantee monitoring, compliance, surveillance and control mechanisms, considering that there will always be people whose interests lie in not having policies enforced. What is the capacity of entities (e.g. public agency) responsible for the instrument application to guarantee its correct enforcement?

**Accountability/transparency:** To what degree are the processes adopted in the design and implementation phases, as well as outputs and outcomes observable for outsiders? What mechanisms are used to monitor the conduction of policy processes and decisions?

**Legitimacy/social acceptability:** To what degree do individuals and organizations accept the policy instrument? What is the perceived fairness of the policy development process?

**Empowerment:** Is the instrument contributing to democratize our institutions to root power in people and community? Is the instrument contributing to increase the sense of identity in the community and to create social bonding? What is the degree of participation in decision-making?

**Flexibility/adaptiveness/adjustment to local conditions/predictability:** what is the capacity of the instrument to deal with changing conditions? Is it possible to foresee the requirements, outputs and outcomes of the policy instrument, in order that the targeted actors can prepare themselves and take into account these impacts?

The selection of which of these criteria to adopt in each case will depend on the instruments and on the characteristics of the policy mix under analysis, as well as on local issues, and will be discussed with each regional team.

Besides these criteria, it is also important to assess the institutional context and requirements, identifying the institutions that are necessary to apply the instrument. Institutions can be either formal, such as laws, acts or existing instruments, or rather informal, such as traditions, norms and beliefs. Both may have influence on the performance of the instruments. Which institutions seem to be crucial factors for success? Which existing institutions/instruments hampered the effectiveness/efficiency of the instrument, e.g. agricultural subsidies hampers extensive farming?

## 3.6 Step 5: Proposals for policy improvement

Step 5 is oriented to identify the issue(s) that should be the main priority(ies) for policy and the development of concrete proposals for the improvement of the current policy-mix. Proposals for improvements can be focused in changing existing instrument(s), institution(s) and governance arrangements, or the in development of new ones to fill identified gaps, with the objective to strengthen complementarities and synergies and avoid/reduce conflicts and redundancies.



### 3.6.1 Step 5.1: Identify the main problems/gaps in current policies

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The first task in this step is to identify the main problems and gaps in current policies drawing upon the results of the assessment stage. The analysis of the criteria where existing policies have poorer performance is the first thing to take into account when searching for gaps and opportunities for improvement. For example, if the current policy has a particularly poor performance in terms of equity/income distribution, maybe there is room for the introduction of some kind of arrangement to promote a more balanced distribution of costs and benefits. This can be achieved either through the suggestion of a change/modification in the rules of the current instrument, or through the introduction of a new instrument in the policy mix (for instance adding a compensation scheme to cover opportunity costs) (see Box 7).

Also, the analysis of the role of the interactions among instruments in the policy mix (Tables 3 and 4) should constitute an important input for the identification of the main problems and gaps in current policies. If there are significant conflicts between different instruments or if a given instrument requires something that is missing in the policy-mix, then these are obvious areas for improvement.

#### **BOX 7: Example of opportunities for policy improvement**

In the Austrian pilot area, groundwater can be used for free with a permission of the regional government. There are maximum values (in mm/season) for the irrigation of single crops, but water meters are not obligatory and the used water amounts can be noted by the farmer based on his/her own estimations. Policy instruments to reduce water use can either be regulatory (e.g. water permits) or market-based (e.g. pricing the water), but both approaches can only be fully effective with the introduction of obligatory water metering.

### 3.6.2 Step 5.2: Identify the main priorities for current policy improvement

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This step is mostly a refinement of step 5.1 with a focus in targeting and defining the adjustments that are needed in the policy instruments that are already in place in the pilot area in order to improve their performance. For instance, current water tariffs are too low, or are area based instead of volume based, and therefore do not provide a strong enough incentive for reduction of water used by farmers. In this case, maybe an adjustment in the existing tariff structure may be enough to increase the effectiveness of this instrument.

Or perhaps there are cases where the instruments in place are well conceived, but the existing governance structure (e.g. authorities with overlapping competences or conflicting interests) is not adjusted to the requirements of the instrument and therefore it is not effective.

The concrete suggestions for improvement to be adopted in each pilot area will depend on the results of the assessment stage and will be discussed interactively with the Regional Managers/persons in charge of policy analysis in each area.

### 3.6.3 Step 5.3: Identify opportunities for introducing new instruments

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In this step we aim to develop suggestions for the introduction of innovative policy instruments to tackle the targeted problem. This step also draws upon the results of Step 4 – assessment, and only makes sense if we conclude that the existing instruments in place are not enough to ensure the attainment of the objectives and goals that have been established in step 1.

Inspiration for this proposal of new policy instruments should come first of all from the sharing of experiences among FATIMA pilot areas. Maybe an experience that was successful in one area can be adapted in another one. Or we can learn with the problems encountered in a given case and take these lessons to avoid the same problems in the design of a new policy instrument in another pilot area.

As a complement to this cross-learning among FATIMA regional teams, 2eco will prepare a catalogue of best practices in instruments to promote sustainable crop production (Deliverable 4.2.2). This deliverable will include a portfolio of successful cases of application of policy instruments, covering different problems, farming systems, institutional contexts and associated socio-ecological systems. Examples will be collected from all over the world, including, for instance, sustainable financing, certification schemes, payments for ecosystem services, agri-environmental measures and conservation agreements.

It is not possible to provide generally applied guidelines for the design of policy instruments. In this stage 2eco will collaborate closely with Regional FATIMA teams in order to support this policy formulation process.

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