THE GLOBAL SUBSIDIES INITIATIVE

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POLICY*Brief*

Measuring Irrigation Subsidies: Policy recommendations from a Spanish case study

HOW IS THE IRRIGATION SECTOR STRUCTURED AND SUBSIDIZED?

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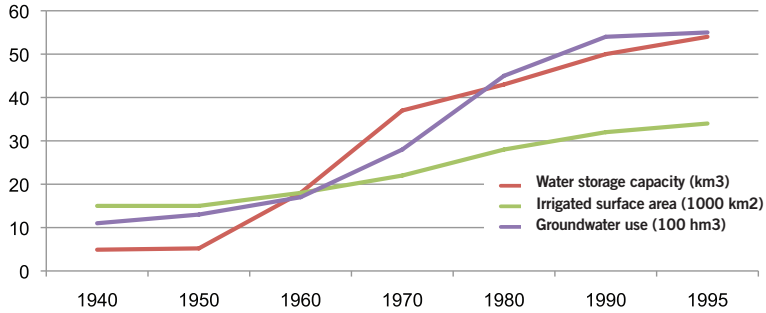
AN INTRODUCTION TO IRRIGATION SUBSIDIES

Irrigation is the principal consumptive user of water in the majority of the world's countries. From the standpoint of sustainability, therefore, policies that countries pursue with respect to irrigation have a tremendous effect on water supply and demand levels at the local and regional levels. Subsidy policy plays a major role in the provision of irrigated water to farmers—with government organizations financing the infrastructure through which water is delivered, with no possibility to recover the entire costs of the investment through water charges which are often at below market rates. Irrigation subsidies also have a significant effect on decisions relating to agriculture, influencing investment choices, and the selection of crops based on underpriced water. This may have supply effects which in turn may distort commodity markets. Given the global impact irrigation has on water consumption levels, and the central nature subsidies play in supporting the agricultural sector, their importance needs to be fully recognized.

In a semi-arid country like Spain, with a large agricultural sector, irrigation subsidies and increasing water scarcity are two important issues increasingly viewed as connected. Based on a long history of investment in irrigation infrastructure, Spain's water-related projects and capital infrastructure are among the most developed in the world—there are about 30 dams per million inhabitants. Areas in the southeast of the country have the highest levels of agricultural productivity based on water consumed. They are also the most vulnerable to serious water scarcity, water pollution and groundwater depletion when water is withdrawn from underground aquifers at a rate in excess of natural recharge.

FIGURE 1: THE GROWTH OF BASIC WATER-USE VARIABLES IN SPAIN 1940-1995



Source: MARM's web pages and Garrido and Llamas (2009).

GSI Global Subsidies Initiative

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iisd International Institute for Sustainable Development / Institut international du développement durable

AN INTRODUCTION TO IRRIGATION SUBSIDIES

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In facing today's challenges—such as climate change and water-resource management—governments need to have a clear understanding of how much public money is being provided to the irrigation sector, as with any part of the economy. The GSI's recent study, *Measuring Irrigation Subsidies in Spain: An application of the GSI Method for quantifying subsidies*, estimated subsidies to irrigated agriculture in Spain are between €906 million per year and €1.120 million per year for the last decade. There remain many challenges to effectively quantify irrigation subsidies. Governments need to fully understand the impacts of subsidies on sustainable development and decide whether the subsidy is effective at meeting its stated objectives. As irrigation subsidies are an important issue in the World Trade Organization (WTO) discussions on agriculture, a better understanding of their size and scale is needed. This will allow member countries to evaluate their current classification within the Green Box of the WTO's Agreement on Agriculture—which affords subsidies to general infrastructure, such as irrigation canals, some protection from subsidy disciplines.

This policy brief helps explain why it is important to quantify irrigation subsidies, what the challenges are in doing this, how these challenges can be overcome, especially in the context of Spain, and what benefits there are for Spain and international trade if this can be achieved.

HOW IS THE IRRIGATION SECTOR STRUCTURED AND SUBSIDIZED?

Irrigation accounts for 70 to 90 per cent of total water use in developing countries (Fry, 2005) and more than one third in many Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2006). The irrigation sector uses a variety of large-scale multi-purpose projects generally built-up over a significant period of time. They are generally built, operated and maintained by governments or their agencies, as the costs are usually too large for individual communities to bear. By financing these capital investments, governments confer a significant resource rent on a relatively limited group of beneficiaries. Capital investments are combined with small groundwater-based systems typically owned, operated and maintained by individual farmers or water user associations (WUAs). Spain has a large set of major infrastructure linked to irrigation and an important water transfer and distribution system, moving water from the central regions to dryer areas in the southeast of the country for use by the agricultural sector. Ground water is mostly extracted from underground aquifers by WUAs or by farmers; in Spain, there are approximately 6,500 registered WUA's.

HOW IS THE IRRIGATION SECTOR STRUCTURED AND SUBSIDIZED?

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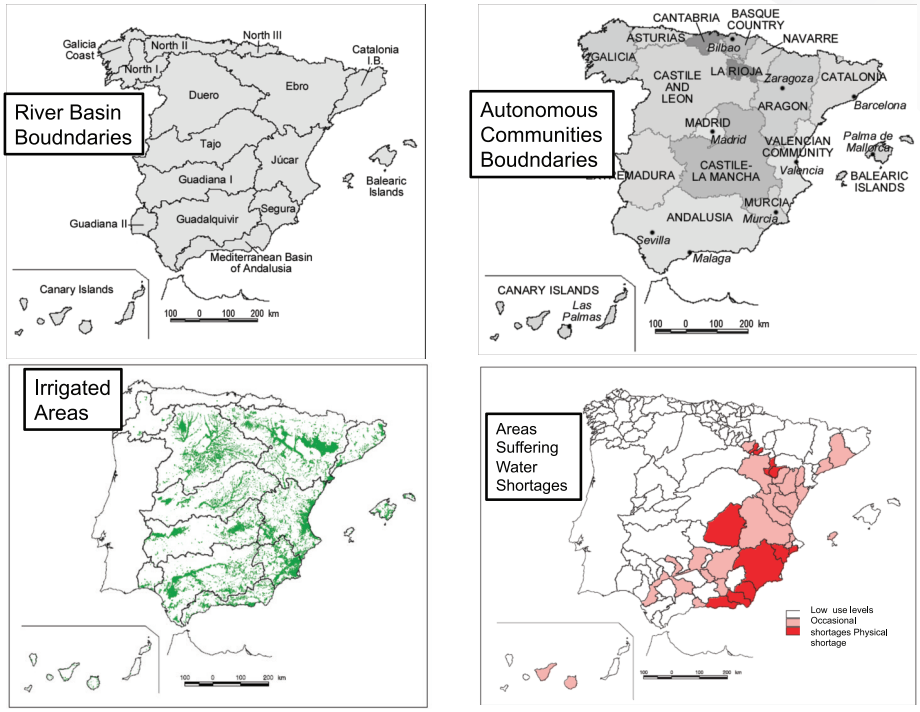
FIGURE 2: BOUNDARIES OF SPAIN'S RIVER BASINS, POLITICAL BOUNDARIES, IRRIGATION AREAS AND AREAS SUFFERING PERMANENT OR TEMPORARY WATER STRESS IN SPAIN



Source: Libro Blanco del Agua (MMA, 2000).

Subsidies are provided to both groundwater and surface-water systems.The majority of the costs associated with supplying irrigated water are involved in the creation of large scale **capital infrastructure** for surface water management, such as canals and dams. While significantly less investment is channelled to drilling bore-wells and pumping equipment associated with groundwater-based systems, and drawing water from underground aquifers. For large surface-water infrastructure, governments may completely fund the creation of canal systems, for example, and only recover a portion of the capital investment costs from end users. For groundwater extraction, governments may choose not to levy an appropriate resource cost on the water extracted. The fiscal and budgetary costs of groundwater extraction are fully paid by farmers in Spain. However, there is an implicit subsidy in that farmers are not paying the full cost of non-renewable groundwater extraction if the associated environmental externalities are not being accounted for through a water extraction tax (Calatrava & Garrido, 2006). In developing countries, governments often subsidize the purchase of water pumps and provide free or discounted electricity to run them (Spain does not).

HOW IS THE IRRIGATION SECTOR STRUCTURED AND SUBSIDIZED?

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In addition to investments in capital assets, there are many subsidies associated with the daily running of irrigation systems: defined as **operations and maintenance costs**. Operations costs can range from purchasing raw water, electricity for pumping, labour costs and water resource management (monitoring river flows and environmental compliance activities). Maintenance costs can include: replacement of equipment, improving or expanding existing facilities, as well as testing and inspecting equipment. In Spain these costs are paid by farmers.

The scope of the GSI's study in Spain was national and included both **capital infrastructure** and **operations and maintenance costs**. It spanned seven interregional basins, a number of regional ones—covering 3,444,637 hectares of irrigated land—approximately 89.31 per cent of Spain's total potentially irrigated land. It found that, in Spain, direct capital investment in the modernization of infrastructure for water distribution in irrigated areas between 2000 and 2004 was €733.4 million. In 2006 and 2007, it increased to €2,409 million in planned investments (MAPA, 2008), however, lack of data regarding the extent to which these planned investments were carried out could not be verified. The main funders of investment in the irrigation sector were the European Union, through its Cohesion and FEDER Funds (European Fund of Regional Development), and the Spanish government through its Ministry of Environment and Rural and Marine Affairs (MARM). River Basin Authorities (autonomous governmental bodies) also invested in infrastructures for water abstraction, storage and transportation, using funds transferred to them from the government for specific programs, or fees generated through the application of charges to users.

THE WTO AND IRRIGATION SUBSIDIES

The WTO classifies government expenditure on irrigation in the Green Box (Annex 2) of the Agreement on Agriculture (AoA)—that is to say, among other domestic programs exempted from AoA subsidy reduction commitments. The relevant language is contained in Article 2(g) of Annex 2:

> Such programmes, which include but are not restricted to the following list, shall meet the general criteria in paragraph 1 above and policy-specific conditions where set out below: […] 2 (g) infrastructural services, including: electricity reticulation, roads and other means of transport, market and port facilities, water supply facilities, dams and drainage schemes, and infrastructural works associated with environmental programmes. In all cases the expenditure shall be directed to *the provision or construction of capital works only*, and *shall exclude the subsidized provision of on-farm facilities* other than for the reticulation of generally available public utilities. *It shall not include subsidies to inputs or operating costs, or preferential user charges.* (emphasis added)

In essence, the Green Box allows governments to provide general infrastructure (e.g., canals for irrigation), but categorically forbids the "subsidized provision of on-farm facilities" or "subsidies to inputs or operating costs, or preferential user charges." The Green Box is, by definition, reserved for domestic support measures

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that have "no, or at most minimal, trade-distorting effects or effects on production." Yet, significant technical difficulties are involved when assessing whether irrigation programs result in subsidies to inputs for agricultural production, or generate more than "minimal, trade-distorting effects or effects on production." As a result, agricultural experts have historically shied away from concerted—much less universal—attempts to undertake such assessments; and this fact is clear in the highly inconsistent reporting of irrigation subsidies under AoA transparency requirements (Steenblik & Tsai, forthcoming).

Although incomplete, the cover provided for irrigation projects under the AoA remains untested to date. To some extent, this ambiguity has alleviated pressure on WTO Members to estimate the agricultural support they provide through irrigation. The imprecision of Green Box measures themselves has also emerged as an issue of concern within the current WTO negotiations on agriculture. It is unlikely, however, that this problem will be substantially resolved within the next five years (Steenblik & Tsai, forthcoming). Nevertheless, it is not too soon to establish the necessary groundwork for measuring subsidies to irrigation so that better, and internationally comparable, estimates become available sooner rather than later.

HOW DOES THE GSI DEFINE AND MEASURE IRRIGATION SUBSIDIES?

In defining and measuring irrigation subsidies, the GSI adopts the Net Cost to the Supplier Approach, which defines an irrigation subsidy as the difference between the net cost of making irrigation water available by the government or supplier and the revenue received as payments from the beneficiaries of irrigation water. This concept is associated with measuring losses incurred by the irrigation authority or supplier in delivering irrigation water. There are three important components that need to be defined in determining the extent of the loss or subsidy from the perspective of the supplier. First, one needs to define what constitutes the "cost of supplying irrigation water" to the farmer—often this is made up of a number of different components. Second, identifying the users or beneficiaries of the water is important in allocating costs to appropriate parties. The third concerns defining the revenue received from the beneficiaries of this water.

HOW DOES THE GSI DEFINE AND MEASURE IRRIGATION SUBSIDIES?

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Methodology

The net cost to the supplier or subsidy (S) on account of making irrigation water available can be estimated by deducting from the gross cost to the government (C) the revenue realized in the form of payments (R) received from the beneficiaries of this water. Thus: $S=C-R$

Irrigation water provisioning is a complex undertaking and this basic definition of an irrigation subsidy does not fully illustrate the challenges faced by analysts quantifying subsidies. How you define costs and allocate them to the irrigation sector, and estimate the revenue received by government, greatly affects the financial figure arrived at. Infrastructure costs for large projects, dams for example, are difficult to measure because construction costs are spread out over long periods before irrigated water is delivered to users. Also, infrastructure such as dams often have multiple sectoral users and the methods used by government for allocating building costs to particular users or sectors (irrigation versus hydro power production for example) is often not clear or based on verifiable assumptions. The attribution of costs has a flow-through effect into water pricing. Governments generally levy water charges on users receiving water from infrastructure in order to recuperate the investment costs. However, the pricing formulae used may attribute a high proportion of the costs for the project to "public services" such as flood control. This lowers the project costs attributed to irrigation and consequently the water levy applied to farmers as part of the "cost recovery process." The capital used by governments for infrastructure projects is subject to interest charges, which factor into the costs recovered from users. When interest rates are applied that are below commercially accepted rates, the beneficiaries receive water that is effectively underpriced.

An alternative approach for measuring subsidies is based on the value of water to the irrigator or farmer rather than the amount of expenditure incurred by governments to supply the irrigated water. The irrigation subsidy following this approach is the difference between the water's net economic benefit to the irrigator per unit of water and the price paid per unit of water (Malik, 2008). This method, however, is not easily updated or comparable across countries, and would need to be periodically replicated as the participants' **willingness to pay (WTP)** for irrigated water may depend on changing variables relating to the quality of the water, consistency of supply, season or organization from which the water is being sourced.

WHAT ARE SOME OF THE METHODOLOGICAL CHALLENGES?

There are a number of methodological issues researchers cannot agree on when measuring irrigation subsidies using the Net Cost to Supplier approach. Some include:

Setting an appropriate price for water: equating the cost of providing irrigation water with just the financial cost implicitly assumes water is a free gift of nature and available in abundance with no competing uses for it. An effective price for water use should internalize the externalities of depleted water reserves and water scarcity to ensure the loss and benefits for competing uses is understood.

An appropriate price for water should be complemented by the water pricing structure applied. In Spain, the water pricing structures for agricultural users are as follows: a) fixed per-hectare tariff—calculated as the total costs attributed to farmers divided by the total irrigated area, b) a binominal tariff—tariffs based on volumetric rates for different consumption levels and covering variable and fixed costs, and c) a volumetric tariff—based on the amount of water consumed by the user. Volumetric tariffs require users to pay for the amount of water consumed and, when combined with a per-unit price internalizing the full costs of water, may positively influence consumption patterns, thereby reducing excessive or unnecessary water use.

Establishing an acceptable interest rate when estimating the value of capital invested in the construction of irrigation infrastructure. Applicable interest rates are set under Spanish law and a 6 per cent reduction is applied to commercial rates. This system was established when interest rates for lending on capital were above 10 per cent—they are now below 5 per cent. Therefore, interest paid on capital investments is still subject to the 6 per cent reduction, meaning it bears no relation to current commercial rates or accepted economic norms.

Accounting for inflation: One of the main sources of subsidization in Spain comes from the inadequate incorporation of inflation in the calculation of annual capital costs being recovered from users. Inflation has, in practice, not been considered in subsidy estimates at all during the last decade. However, in Spain, the method selected to value existing irrigation assets and to account for inflation is considered adequate by the European Commission's acceptance of Spain's annual national submissions under the European Union's Water Directive.

Categorizing projects as for "public interest": Governments' arbitrary method of defining projects as being of "general interest" or "public interest" can be the source of a large subsidy. Water and Agricultural Authorities are able to allocate a percentage of the costs for water provision to specific uses depending on whether it corresponds to "the interest of the public." The resulting percentage borne by tax payers is attributed to public services such as flood prevention or irrigation projects deemed to be of "interest to society."

Accounting for opportunity costs: There are opportunity costs on two levels that need to be accounted for. First, funds used for the development of irrigation infrastructure mean they are not available to be used by government in other parts of the economy. Second, water itself has opportunity costs. The consumption of water deprives another user of the water—when that use has a higher value there are economic opportunity costs experienced by society due to the theoretical misallocation of the resource. Ignoring opportunity costs undervalues water and can lead to underinvesting in water conservation.

HOW TO OVERCOME THESE METHODOLOGICAL CHALLENGES?

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Administration and governance of the irrigation sector in Spain has multiple levels and involves a variety of institutions, which poses a challenge for consistent data collection and sharing. In April 2008, the Environment and Agriculture Ministries were merged, providing an opportunity to pursue more integrated policies with respect to irrigation and agriculture in a less adversarial mode between ministries. In Spain, and other countries, the importance of the role of community-level organizations in promoting better data collection cannot be understated. They mediate between administrations and often tens of thousands of farmers using irrigated water, and are important in the adoption of consistent methods for collecting data on subsidies. All levels of government need to adopt clear procedures for generating data on irrigation subsidies.

A number of key policy recommendations were generated as part of the Spanish country case study to promote the availability of subsidy data and more consistent and transparent methods for quantifying subsidies:

Policy Recommendation 1: International and European bodies should provide support in developing software tools for data collection, analysis and presentation for relevant agencies.

Further effort should be put into establishing an accepted and clear methodology for the analysis of the different cost and revenue components of a subsidy. This would ensure that, for multiple-use infrastructures (for example, where water is used for irrigation and electricity generation), cost attribution criteria are defined based on the actual distribution of benefits to each user. It would also facilitate further discussion on calculating the value of capital assets. Some groups believe capital investments in irrigation should not have to make capital returns like private assets, as public agencies do not sell water in order to make a profit and the absence of capital returns to public investment should not be accounted for as a subsidy. Others believe that capital investments by government should be subject to normal economic principles and norms surrounding investments of capital.

Policy Recommendation 2: Governments should consider establishing legislation requiring water authorities to make publicly available information on water costs, revenues and subsidies in a more organized and usable manner.

This would include establishing the minimum level of information to be provided, an adequate level of disaggregation, and the formats in which information would be presented. In decentralized countries, such as Spain, as regional government and regional water agencies have increasing responsibilities and capacity to subsidize water use, federal or national governments should ensure proper coordination of data collection and analysis, taking greater responsibility in centralizing the monitoring and provision of subsidy information. This would avoid subsidies provided by regional governments being miscalculated, double-counted or not taken into account.

Policy Recommendation 3: More information needs to be provided at the project level so the quality of the information can be assessed by independent parties and the reliability of the cost recovery calculations analyzed.

Implementing greater transparency regarding data and, importantly, the methods used to generate it, would allow academic and economics institutions to examine the underlying calculations put forward by governments. This external review of information and government reports would ensure the quality of information and the reliability of the cost recovery calculations undertaken.

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It would also allow civil society members to draw their own conclusions about the support provided by government to the irrigation sector. In the absence of more detailed and updated national-level data, further research is necessary. A case-study approach using data for specific recent infrastructure projects would allow analysts to assess the economics of the irrigation project.

Once consistent procedures for data collection have been achieved, quantifying subsidies would become easier. Adopting a bottom-up approach drawing on complete data sets for all irrigation projects within a country's territorial jurisdiction would provide the most complete approach in developing nationally comparable estimates. Alternatively, applying the GSI methodology to a statistically significant number of sample projects and extrapolating the findings from this sample up to a national-level estimate is one alternative approach. Given that, in Spain and many other countries, a significant amount of irrigation infrastructure has been built over time, deriving country-level estimates of subsidies by summing up estimates for individual projects may not be feasible unless significant resources are invested in deriving such estimates.

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FURTHER DETAILS AND CONTACT INFORMATION

The GSI is an initiative of the International Institute for Sustainable Development (IISD). Established in 1990, the IISD is a Canadian-based not-for-profit organization with a diverse team of more than 150 people located in more than 30 countries. The GSI is headquartered in Geneva, Switzerland and works with partners located around the world. Its principal funders have included the governments of Denmark, the Netherlands, New Zealand, Norway, Sweden and the United Kingdom. The William and Flora Hewlett Foundation have also contributed to funding GSI research and communications activities.

See the GSI's *Subsidy Primer* for a plain-language guide to subsidies on: www.globalsubsidies.org.

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