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GrupoTragsa

MULTI CRITERIA TOOLS AND METHODS FOR SUSTAINABILITY STUDIES IN IRRIGATED AREAS

Outils multicritère et méthodologies appliquées aux études de durabilité dans les zones d'irrigation

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ABSTRACT

The state owned TRAGSA Group companies in Spain has introduced a different approach to irrigation with multi criteria analysis by integrating social, economic, technologic, institutional, legal and environmental components, in a dynamic scenario of changing priorities and relevance, and under climate change perspective.

These methodologies and tools have allowed the technical assistance for the elaboration of works on national and regional entity irrigation areas. The highlights are the support to the Spanish Irrigation Plan (PNR) studies, the Special Plan for the Alto Guadiana aquifer, Murcia Region Irrigation Plan, Environmental Monitoring Program of PNR and some pilot irrigation areas, Analysis of costs of regulation and use of irrigation water, Study of the organization of the workflow and the production in the irrigating communities and others. This array of different projects has led to a broader attitude to irrigation sustainability.

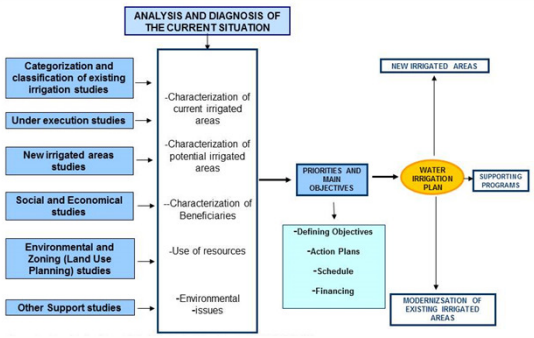
A multi criteria tool for irrigation is shown as an applied example of those previous experiences and their integrated philosophy. The software was developed in a geographical information system (GIS) platform for the identification of the potential irrigable areas in Argentina. This consulting was done for the FAO (2013-2015), within the Provinces Agricultural Services Program (PROSAP), which has an agreement to improve the agricultural sector efficiency and the living conditions of the small and medium size producers.

This multi criteria tool integrates and exchanges alphanumeric and cartographic information into a thematic structure of five blocks of analysis (technical, environmental, social, economic and institutional) generating irrigation geo-referenced layers. Using the combination of the GIS coverage and its multi criteria weighting, it allows the analysis of the irrigation sustainability with different indicators and climate change scenarios, and produces the estimate of potentiality irrigation index for each area.

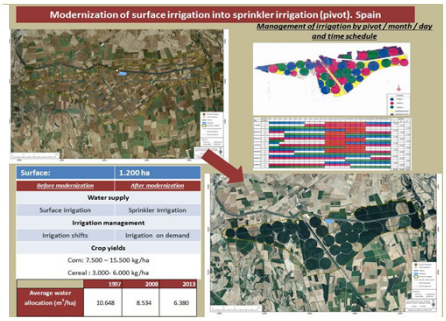
CONCLUSIONS

- The reality of irrigation, as a rural and regional development tool, requires analysing multiple variables, incorporating different points of view and encouraging social participation.
- The quality of the input data to obtain reliable results is essential. Data sources ranges from indirect to direct field measurements. In turn, it's necessary the integration of shapes of heterogeneous information in formats, temporary assignment, scales and different aggregation levels. Therefore, multidisciplinary teams are needed to treat with the utmost rigor information base.
- The multi-criteria analysis technologies based on Geographic Information Systems (GIS) permit the use of a large amount of territorial information grouped in different thematic blocks, to incorporate different approaches according to their relevance.
- The Potential Irrigation Index (PII) allows synthesizing and systematizing the meaning of each layer of information. However, the criteria used is essential to interpret their territorial relevance.
- The weight of each scenario of irrigation (technical, environmental, economic, social and institutional) lets to incorporate and integrate territorial balances priorities for decision making.
- The use of a larger number of indicators for monitoring the actions of irrigation illustrates the evolution over time and the different impacts of the rural development policies.
- GIS viewers empower data processing and consulting professional at a friendly user level.

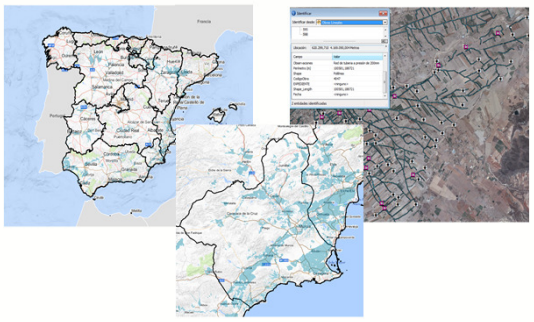
METHODOLOGY: Examples of previous experience for obtaining data and indicators



Overall irrigation planning methodology. Spanish Irrigation Plan H-2008 (MAPA, 2001). *(Méthodologie général de la planification d'irrigation. Plan National d'Irrigation de l'Espagne Horizon 2008)*



Modernization of an irrigated area (example). Support for the drafting of Studies PNR H -2020 (MAPA, 2014). *(Modernisation d'une area arrosé (exemple). Appui pour l'esquisse des études du Plan National d'Irrigation H2020)*



Public works viewer for the location of activities of the Ministry of Agriculture of Spain.Support for the drafting of Studies PNR H -2020 (MAPA, 2014) *(Viseur des travaux pour la localisation des activités du Ministère d'Agriculture de L'Espagne. Appui pour l'esquisse des études du Plan National d'Irrigation H2020).*

RESULTS: Multicriteria tool for irrigation in Argentina as an applied example of previous experiences

1. List of blocks and indicators

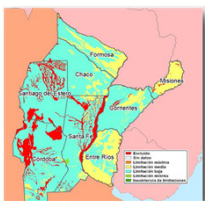
- TECHNICAL (21 INDICATORS): soil texture, sprinkle irrigation restrictions, surface irrigation restrictions, drip irrigation restrictions, soil depth, alkalinity, drainage, climate change scenarios, salinity, main crops (sunflower, maize, soya) production increase with rain-fed or irrigated agriculture…
- ENVIRONMENTAL (20 INDICATORS): climatology, erosion risk, physical limitation, slopes, soil chemical restrictions, vegetal cover, distance to Protected Natural Areas, vulnerable ecological regions…
- SOCIAL (7 INDICATORS): rural employment, female rural population, priority areas for indigenous communities…
- ECONOMIC (21 INDICATORS): Provincial investment in irrigation, profitability, internal rate of return, investment on canals, pumping or wells, optimal investment for surface water or groundwater…
- INSTITUTIONAL (33 INDICATORS): Financial aids to irrigation, institutional management legislation for irrigation, availability of water resources data, water prices, property, public participation…

2. Rating index

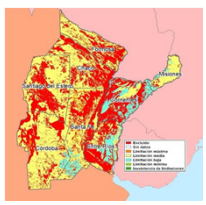
CATEGORY	PII
No data	0
Exclusion for irrigation	NULL
Maximum limit for irrigation	0,01-0,24
Medium limit for irrigation	0,25-0,49
Low limit for irrigation	0,5-0,74
Minimum limit for irrigation	0,75-0,99
Absence of limitations	1

Potential Irrigation Index (PII) assessment for each indicator and standard legend*. (Classement des valeurs de PII pour toutes les indicateurs et la légende standard)*

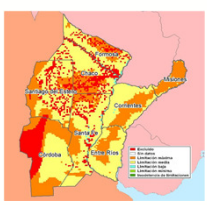
3. Scenarios and results by blocks



Technical

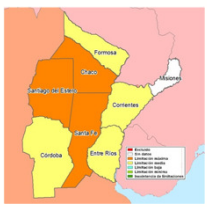


Environmental



Economic

Social



Institutional

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