SIXTH FRAMEWORK PROGRAMME

Project no.: **043513**

Project acronym: **KASWARMI**

KNOWLEDGE ASSESSMENT ON SUSTAINABLE WATER RESOURCES MANAGEMENT FOR IRRIGATION

Instrument: **SPECIFIC SUPPORT ACTION**

Thematic Priority: **INCO-2004-A.2.3: Managing arid and semi-arid ecosystems**

Final activity report

Period covered: 01.03.2007 to 31.08.2008

Date of preparation: 25.11.2008

Start date of project: 01.03.2007 Duration: 18 months

Project coordinator name: Prof. Dr.-Ing. Max Billib

Project coordinator organization name: Gottfried Wilhelm Leibniz Universität Hannover

Revision [1]

Project objectives

KASWARMI has focused on **society key issues** by contributing to a **better use and management of the water resources in arid and semi-arid ecosystems**. In that way the project aims to deliver fundamentals for future research activities to improve the sustainability of irrigated agriculture in Latin America. The world's food production depends on the availability of water, a precious but limited resource. Today, irrigated agriculture is applied on **20 percent of the world's cropland**, and it generates **40 percent of total food production**. **Irrigated agriculture is responsible for approximately 70 percent of all the freshwater withdrawn in the world** and more water will be used for irrigation in the future, as world food production continuously increases in order to meet rising demand. The challenge for irrigated agriculture today is to contribute to the world's food production and improvement of food security through a **more efficient, cleaner and integrated use of water** (**FAO**[1]).

The main objective of KASWARMI was to build up a **comprehensive knowledge base assembling international experience in an interdisciplinary scientific network on sustainable water resources management for irrigation**. In six selected Latin American irrigated areas a **basic analysis of the major socio-economical, environmental, institutional and technical aspects** was carried out. KASWARMI approach was to learn from the past and ongoing research activities to identify gaps and the scope for the collaboration of potential **stakeholders** (farmers, researchers, other water users, policy makers). The direct communication between the researchers and the stakeholders in the field study areas was used to **identify their main needs**, to find **strategies for future activities** for solving open questions of sustainable water resources management for irrigation.

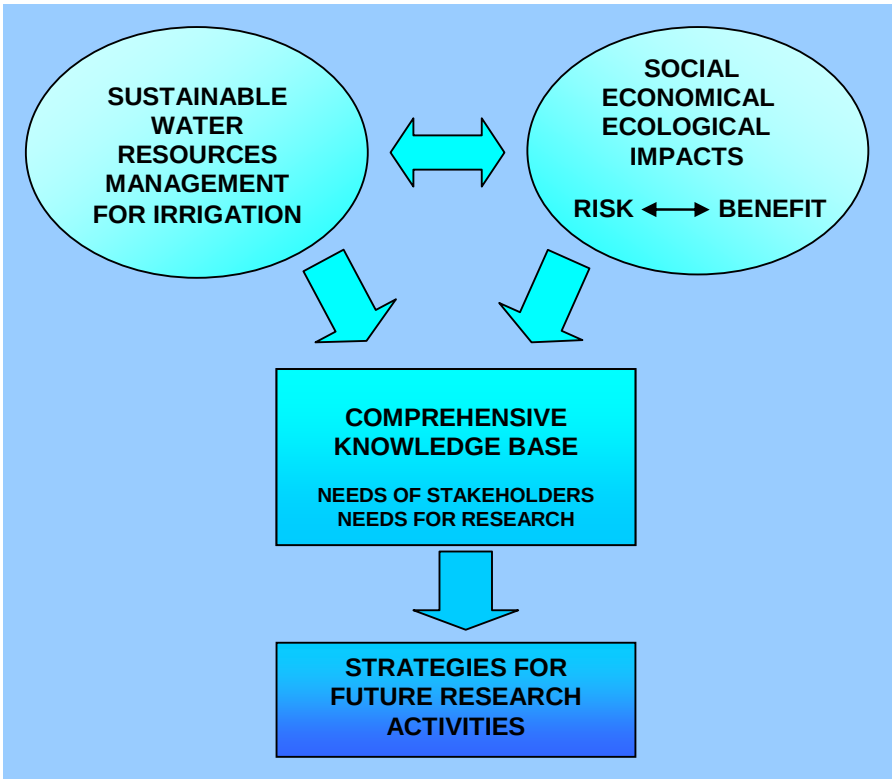

Fig. 1: Content of the KASWARMI project

[1] FAO, 2004: WATER FAO: Water Resources, Development and Management Service: http://www.fao.org/ag/agl/aglw

Contractors

The participants of the KASWARMI project were from Latin America and Europe. Table 1 shows the participant names and their country. Eight partners are universities and one (IADIZA) is a department of a national institution (CONICET). Detailed information can be found at www.kaswarmi.eu. Industry, especially agricultural companies and farms, were involved through the study area analysis. Other stakeholders like water authorities were interviewed and gave good support to the project.

Tab. 1: List of participants

Part. No.	Participant name	Short name	Country
1	Gottfried Wilhelm Leibniz Universität Hannover	LUH	Germany
2	Universidad de Concepción	UDEC	Chile
3	Universidad de Córdoba	UCO	Spain
4	Szent Istvan Egyetem – Gödöllő	SIUG	Hungary
5	Universidad de Buenos Aires	UBA	Argentina
6	Universidad Mayor de San Simón	UMSS	Bolivia
7	Universidade Federal do Recôncavo da Bahia	UFRB	Brazil
8	Instituto Argentino de Investigaciones de las Zonas Áridas	IADIZA	Argentina
9	Universidade Federal da Campina Grande	UFCG	Brazil

An interdisciplinary network was build up with the mentioned participants. An exchange of researchers between the members of the network is planned; additional new members can participate in the future activities.

Contact

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Performed work

The performed work was divided into four workpackages. The work flow of the KASWARMI project is shown in Figure 2.

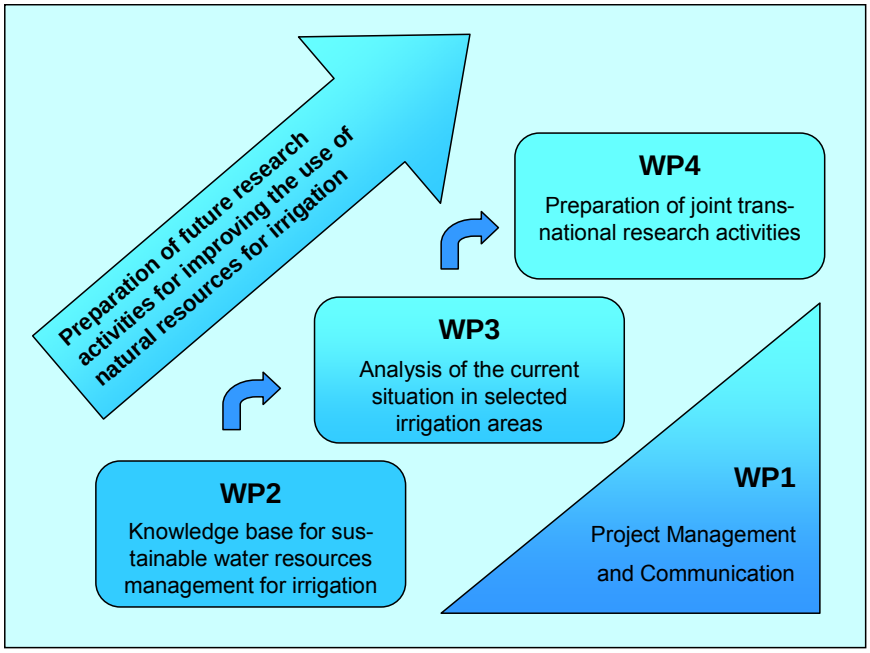

Fig. 2: Work flow with workpackages

In **WP1** the management and communication of the project were performed.

In the first six months in **WP2** a **comprehensive inventory**, an **assessment and a critical analysis of existing knowledge** on sustainable water management for irrigation within an overall approach of Integrated Water Resources Management (IWRM) was carried out to **identify gaps** and to develop a **conceptual framework** to fill them.

In the second part of the KASWARMI project an **analysis of six selected irrigated areas in Latin America (WP3)** was used to collect all existing information about the **socio-economical, institutional and environmental impacts** of irrigation. Therefore each Latin American participant selected one **field study area** for a basic analysis to ensure **different conditions** like arid and semi-arid climates, salinisation, desertification, and contamination problems, small farmer organizations, medium size enterprises, etc.

Fig. 3: Location of the study areas [www.welt-altlas.de, modified with study areas]

Chile: Peumo, Cachapoal valley

Argentina: Buenos Aires & Mendoza

Bolivia: Cochabamba

Brazil: Mossoró & Ponto Novo

The added value of this project is based on the interaction and collaborative work among the researchers (European and Latin American), based on their own experiences from past and ongoing projects for finding solution strategies to **fill research gaps in Latin America.**

The results of the first 12 months of the KASWARMI project (State of the Art and Study Area Analysis) were used in the last six-month period (**WP4**) to develop **research strategies to fill the selected gaps** with special focus on the main problems in the analysed study areas. Additionally the last six months were used to prepare the **dissemination** of the results of the project, e.g. by distributing bulletins and prospects especially at the study areas and to other stakeholders. Furthermore a Final Seminar was held in Buenos Aires (Argentina, August 2008) to present the main results to the public. An additional workshop was held in Salvador, State of Bahia, Brazil, after the project ending in October 2008, to present and discuss the main results of the KASWARMI project and representatives of governmental agencies related to sustainable irrigation.

Main results of the KASWARMI project

In the first six months (WP2) the participants of KASWARMI have developed a **comprehensive current State of the Art** on design and management of irrigation systems, socio-economic and institutional impact of irrigation, and environmental impact of irrigated agriculture.

The current State of the Art shows that agriculture is the main non-point source of pollution of water resources in irrigated areas, due to the extended use of agrochemicals. Low irrigation efficiency coupled to an inadequate management of fertilisers and pesticides is the main source of environmental contamination. Efficient design and management of irrigation systems at farm level appear to be a very crucial aspect for the irrigated agriculture and a key factor due to the competition for the water resources with other water users, e.g. drinking water supply.

A desirable trend would be that social dimensions of irrigation would be incorporated in scientific knowledge according to the current demand in practical situations, thus strengthening the development of new approaches to irrigation management.

Institutional approaches are based on farm management economics, peasant economics, and peasant and livelihood strategies. Agriculture is, of course, one of those activities. As a result, from the socio-economic and institutional point of view, new elements of analysis have emerged: multiple uses of water, conflicts and competence, power relations, multiple stakeholder platforms, regulation, watershed authorities, participation and participatory planning.

Most of the publications on Integrated Water Resources Management present the development of models, advisory services and decision support systems at a high technical level. For example, multi-criteria decision making models are developed for irrigation planning. Several projects use GIS to handle data and to visualise their research results. In some investigations satellite images and remote sensing are used to compensate lacks in data bases. Application of remote sensing techniques has intensified as valuable tools for optimization of water resources in a regional context, including water for irrigation.

The information about soil and water quality in irrigated semi-arid regions is scarce and fragmentary. Most of the literature refer to management issues. Papers concerning soil and water quality usually report isolated cases and the amount of information related to the impact of irrigation practices on soil and water quality in Latin America is practically inexistent.

In the second part of the first year (WP 3) the **main constraints, problems and demands from different stakeholders' perspectives in the selected study areas** (UDEC: Peumo Valley, UBA: Province of Buenos Aires, UMSS: Punata Valley Cochabamba, UFRB: Ponto Novo Irrigation District, IADIZA: Mendoza, UFCG: Mossoró/RN) were identified.

From the different studied cases, some common conclusions can be drawn, showing the complexity of water management and irrigated agriculture interconnections. The main topics are the following:

- Environmental impact: Water availability, water and soil quality and monitoring, and efficient use of resources.
- Socio-economical impact: Economic viability, farm level economics, enabling environment, innovation system (assistance, capacity development, processes of social organization to promote changes), governance of water sector, and institutional framework.
- Technical issues: Water use and irrigation management, efficient use of water and energy.

In the final period (WP4, 13.-18. months) of the KASWARMI project **research strategies for future RTD activities** were developed. The comprehensive knowledge base of the State of the Art, the gaps analysis and the analysis of the needs of the stakeholders in the selected study areas were used to develop strategies to improve the sustainable use of water resources for irrigation in Latin America. Integrated approaches to the following topics were developed by interdisciplinary working groups.

1) Design and Management of Irrigation Systems for Sustainable Agriculture

1.1 Optimum Irrigation Design and Management Criteria for Sustainable Irrigation

1.2 Development of Comprehensive Decision Support for Multi-Stakeholder Planning

1.3 Crop Water Requirements, Deficit Irrigation and Instruments

2) Socio-Economic and Institutional Impact of Irrigation

2.1 Organizational Capabilities

2.2 Inadequate Normative Framework and Policies, Formal/Informal Norms, Valuing of Water (including Water Productivity)

2.3 Assessment Framework to Facilitate Compliance with International Standards

2.4 Interrelation between Enabling Environment / Water Management and Water Use

3) Environmental Impact of Irrigated Agriculture

3.1 Water Management at River Basin Level including Conjunctive Use, Interbasin Transfer, Water Quality and Energy

3.2 Assessment Framework for Monitoring Water Quality, Soils and Environmental Impacts, to Start Systematic Studies

3.3 Use of Low Water Quality and Water Reuse

3.4 Degradation of Soil in Irrigated Areas

Dissemination & Use of Knowledge

The Internet page **www.kaswarmi.eu** is offering general information on sustainable irrigation in arid and semiarid regions as well as the results of Kaswarmi projects. Brief informative bulletins were prepared and disseminated in the selected irrigated areas for ensuring the local distribution of the project results to the stakeholders. Some results will be disseminated by oral presentations at national or international conferences. During all meetings in Latin America (Chile, Brazil, Bolivia and Argentina) local stakeholders had the possibility to discuss with the members of the scientific network about project results and about the needs and problems in the selected irrigated area. The final results were presented at the Final Seminar of the KASWARMI project in Buenos Aires (Argentina, August 2008, download at www.kaswarmi.eu Meetings).

After the project time an additional meeting was held in Salvador, State of Bahia, Brazil, to present and discuss again the results of the project (www.ufrb.edu.br/sulamericana). Several researchers and stakeholders participated in the Final Seminar in Buenos Aires and the meeting in Brazil. There was a general interest to join the interdisciplinary research network that was conformed during Kaswarmi project.

The results are and will be used to prepare joint proposals and future investigations in Latin America to contribute to a sustainable management of the water resources for irrigation. A concept for future research activities will be used to prepare a proposal for the 7th FP, e.g. of the Working Programmes 2009 / 2010, or for other national and international calls. A Marie Curie proposal (IRSES) is in preparation for a scientific network project of nearly all participants of the KASWARMI project and additionally some new partners, which are very interested in this research.

Furthermore the experience of KASWARMI has already been integrated into teaching courses of all university partners.

Fig. 4: KASWARMI group at a field trip to the Chilean study area

We thank a lot the ***European Commission*** for the financial support of the KASWARMI project for preparing developing aid strategies to improve the sustainable use of water resources for irrigation in Latin America.