



Tropentag 2005  
Stuttgart-Hohenheim, October 11-13, 2005  
Conference on International Agricultural Research for  
Development

---

**GLOWA Jordan River - Challenges and approaches in building the bridge on water-related research between socio-economists and natural scientists in a multi-national environment**

Heinz-Peter Wolff

Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics (490c), University of Hohenheim

**Introduction**

Based on the estimated need of about 1050 to 1100 m<sup>3</sup> of water per individual and year, the Middle East as a region ran out of water in the 1970s. Low emphasis was given to this important economic fact due to food imports and the thereby implicated amounts of virtual water. The international system of trade compensated for missing amounts in the required 1000 m<sup>3</sup> per individual and year that are embedded in food production (*Allan, 2002*). Despite of the regulatory powers of world trade and the comparative economic disadvantage with respect to water, control of water resources still is a crucial component in Middle Eastern politics. Public perception and the resulting political consequences are major elements in the debate and outweigh optimal economic decisions as well as environmental necessities in case of doubt.

Reasons rely partially on the role of water in the region's history. Water was the scarcest factor for survival and production and control of water resources was a major determinant in the development of economic strength and local power. The role of water in development changed - only recently in historical terms - with the importance of oil resources and the growing efficiency of global economic ties. The latter allowed even water-scarce states without revenues from oil, but with other comparative advantages, like Israel and Lebanon, to prosper economically in a mostly semi-arid to arid environment. This development was interrupted in Lebanon by the start of the civil war in the 1980s, but Israel currently draws about 97% of her GDP from the consumption of not more than 5% of the annually available water. So it rightfully may be disputed in how far water is still an indispensable prerequisite for economic prosperity, but repercussions from history and the actual tense political situation doubtlessly constitute a factor in the public perception of water-related matters.

A probably even more important element in public perception is the personal experience of local citizens with regard to water scarcity in terms of quantity and quality. The efficiency and reliability of national water providers rather than totally available water quantities decide on this experience in urban areas. Matters are different in rural areas, where water demands are much higher due to agricultural activities. Water authorities and water providers play a significant role in coping with the demands in rural areas, too, but the impact of locally available water quantities on the population's economic success and living standard is much more restrictive than in urban areas. Consequently, political decision making on water has a direct impact on the socio-economic carrying capacity of rural areas and, via the linkages of migration and markets, consequences for the development of urban areas (*Wolff et al, 2004*). The decision process on water in regions like

the Jordan Valley, where relations between the abutting states are still far from normal, are additionally charged with sensitivities about cross-border impacts and competition.

This background highlights three basic elements in water-related research, which are of central importance for approaches in social sciences, but barely affect methodologies and approaches in natural and technical sciences.

- 1) The evaluation of water resources and decision-making by individuals on different layers of societies- as a core element in social sciences - differs according to individual experiences and thus between nations as well as between rural and urban areas.
- 2) Suitable research methodologies in social sciences have to consider the level of development and diversification of economies. This concerns, amongst others, the role and dynamics of economic sectors, such as agriculture, industry and services, as well as the role and dynamics of urban and rural areas with regard to employment, habitation, creation of income and recreational services.
- 3) Results from research in social sciences have a stronger potential of political repercussions than results from technical and natural sciences. The related sensitivities affect research efforts in particular in areas like the Jordan Valley, where cross-border disputes on resource distribution play a significant role.

### **Water-related research in the Jordan Valley**

International research on water in the Jordan Valley intensified with the foundation of the state of Israel and the related distribution of resources between the new state and its Arab neighbours. It soon occurred that common ground between the parties was much easier to achieve in research and decisions on technical and natural aspects than with regard to the evaluation of socio-economic consequences. The Johnston mission, initiated by the US government in 1952-55, was already successful in the technical aspects of resource evaluation but failed in convincing the concerned riparian states of the Jordan River on a rational division of water resources with regard to criteria like economically optimal allocation and minimization of costs from environmental mismanagement (*Lowi, 1994*).

Subsequent research added a great deal of knowledge on technical aspects of water distribution, irrigation and the treatment of saline and recycled waters. Environmental consequences, which have already been on the agenda of the Johnston mission, became a prominent issue over the last two decades with the constitution of the international environmental conventions – e.g. the conventions on biodiversity and desertification - in the aftermath of the 1992 *UN Conference on Environment and Development* in Rio de Janeiro – and the growing concern about the "Aral-Sea-Syndrome", i.e. the continuous withering of the Dead Sea.

Analysis and planning from social sciences focused predominantly on the development within societies and economies of the riparian states but fell short in research on individual decision making of local households in the Jordan Valley and resulting cross-border impacts. Economic research that considered regional aspects developed around the principles of optimal water distribution and use with regard to the creation of value. Reflections on the mechanisms of distribution of the expected additional wealth, the resulting reactions and development of the concerned populations have been largely neglected.

This neglect is of lower importance in diversified economies, e.g. the Israeli case, which allow for substantial shifts in employment and markets from agriculture to industry and services. But it is a major obstacle in determining the socio-economic and political optimal water allocation in the Jordanian and Palestinian case where non-agricultural sectors yet do not offer sufficient

absorption capacities for significant shares of the current rural population. Neither scientists nor politicians can afford to wait until political transformation and economic development create “*the social adaptive capacity to cope with water resource capacity*” (Allan, 2002, p. 80) but have to come up with analyses, planning and decisions now.

This bottleneck in knowledge motivated Jordanian, Palestinian and German socio-economists to set up a *Network of Socio-Economic Research on Water Resource Management in the Near East* (in the following addressed as the *Network*), which addresses the impacts of water-related-decisions on rural development in the Jordan Valley since 2000 (Wolff *et al*, 2002). The applied Farming Systems Approach considers rural development and optimal water resource management as a function of the decision making by farmers and non-farming rural households. A representative functional classification of farming systems, their analyses and modelling for scenario analyses in the areas of Wadi Faria'a (Palestinian West Bank), the East Bank and Wadi Zarqa (both in Jordan) allowed for quantitative estimations on impacts from changes in water supply in terms of quantity and quality on the economic success and living standard of farmers' families and the probable development of agricultural production. It also allowed for the identification of three major gaps in knowledge that limit the precision of the model-based prognoses:

- 1) Interdependencies between the Jordan Valley and its surrounding areas, economies and markets are too intensive for being considered as mere frame conditions of resource availability and socio-economic development. Parts of the water from the Jordan Valley are diverted for usage in adjacent areas, recycled water is channelled back to the Valley and markets for products, production means and factors are highly interlinked. The *Network* considered already water treatment and consumers' behaviour in areas out of the Jordan Valley. Integration of further social and economic elements, like analyses of markets for capital, land and production means as well as the dynamics of migration, are on the *Network's* agenda for the coming years.
- 2) Water resource management in Israeli areas was part of the frame conditions rather than a focal point of socio-economic development in the Jordan Valley due to the much smaller dependency of her diversified economy on rural structures. Recent political and water-related technical developments are likely to change this situation in the near future. Growing perception of potential impacts from global climatic change, the restart of the planning for the Red-Sea-Dead-Sea-channel-project in 2005 and the intended desalinization mega-projects on the Mediterranean coast require a full incorporation of the economic and social dynamics in Israel into the research on water-related development in the Jordan Valley.
- 3) Natural and technical sciences make up for the vast majority of the research and knowledge on water resource use and development in the Jordan Valley. Results do, however, not always match the required scales for setting up functional chains of causes and effects between natural phenomena and social and economic parameters on the level of individual resource users and members of rural societies. Representative, quantitative scenarios for impact analysis on the level of representative farming systems require upscaling of technical, chemical and biological results from research plots and laboratories and downscaling of global and regional findings from hydrology and climatology.

The methodological challenges of the enhanced concept require the creation of interfaces between the *Network* and scientists from other disciplines. Envisaged links within the field of social sciences are collaboration with sociologists on urban and peri-urban development and economists on macro-economic questions. Links to disciplines in technical and natural sciences are expected from the cooperation with the GLOWA Jordan River Project, funded by the German

Ministry of Education and Research (BMBF<sup>1</sup>). On this account, the *Network* adopted the leadership of the sub-project on socio-economics of water allocation within GLOWA Jordan River in autumn 2005.

The interface between socio-economics and natural sciences in GLOWA Jordan River

Interdisciplinary work within GLOWA Jordan River comprises two major areas that call for specific approaches in management and communication: (1) the co-operation between natural and social scientists and (2) the integration of scientists from different nationalities under difficult political frame conditions.

Co-operation and communication between scientists from natural and social scientists pose some known pitfalls, which C.P. Snow already summarized in his book on the interaction of humanities and sciences (1964), but which holds completely between the two branches of science, too: "*Approaches for resolution have to meet the individual problems as well as their interactions by an accordingly complex set of measures, which range from structural adaptations, methodological compromise and communication mechanisms up to the mutually accepted delimitation of areas of competence and exchange.*"

This translates in the given case of combined research on water-related topics in the Jordan Valley in particular into requirements of harmonization with regard to four major fields.

- (1) *Regionally representative approaches versus case studies*: Economic and socio-economic research is basically used to deal with regional approaches that consider social, political and economic entities within the given boundaries of a study region. Missing capacities for census-like data collections are usually compensated for by survey schemes that allow for verifiable inferences on total populations. A verifiable transfer of empirical results to areas outside of the region that was subject to the data collection is not possible. Natural sciences deal with phenomena that depend on a specific set of circumstances, which leads to the same results in case of replication. This allows for up- and downscaling from research locations that sometimes significantly differ from the study area, e.g. up-scaling of results from research plots in biology or down-scaling from whole catchment areas in climatology. Coupling of results from both branches of science needs approaches of scale-adaptation, but technical up- or downscaling alone is no sufficient tool for this task. Questions of representativity and confidence levels of combined estimations must be considered, too, in order to identify major sources of uncertainty. Success in this regard depends not only on adequate methodologies but also on a guided communication between natural and social scientists.
- (2) *Cause – Effect – Chains between natural phenomena and (socio-) economic consequences*: The above-mentioned challenge in combining scales of research and inferences from the two branches of science finds its continuation in making up the link between environmental effects and economic consequences. The therefore required quantification of functional chains between natural phenomena and their economic and behavioural, i.e. social, relevance comes along with the translation of physical effects into their monetary expression. The set-up of this translation as well as the results, i.e. the value of changes in the availability and quality of natural resources, may be fundamentally different in societies with different economic and social backgrounds. Suitable socio-economic methodologies for the evaluation of effects and, respectively, data and information needed for their application, vary between the situation of stakeholders in Israel, Jordan and the Palestinian Authority. This variability in methodology and results from social sciences is not necessarily evident to natural scientists

---

<sup>1</sup> Bundesministerium für Bildung und Forschung – German Federal Ministry for Education and Research

who may use the same research approaches for all locations and is again subject to the need for guided communications.

- (3) *Impacts from changes in resource availability and suitability of technical options for existing socio-economic systems*: Decision making and behavior of water users and other stakeholders in water resource management depend on the interaction of the elements in their social and economic systems. Expected changes in resource availability as well as potential technical options for handling natural phenomena constitute changes in constraints and alternatives within these systems. It is the interaction with all other system elements that decides on the impacts from resource availability and technical options on the situation of individual stakeholders or, in other words: advantages or disadvantages unfold as a function of relations within a multivariate matrix. Expectable and optimal decisions by stakeholder depend on the consequences that arise from changes in their individual matrix for the achievement of their specific set of objectives. Natural and technical sciences deal with selected elements that set the framework of these matrices. Socio-economists try to analyse and evaluate potential impacts from changes in those elements on the holistic system of stakeholders' decision making as well as on their economic success. Impacts from changing resource availability and the suitability of technical options may thus be highly case-specific. Conjoint research between scientists from the both branches depends in this regard strongly on their common understanding that probable decision making on the individual level as well as on policies and politics relies in first place on the contribution to objectives of the decision makers and not on the requirements for the sustainability of matrix elements.
- (4) *Criteria of optimality*: The systems' nature of water-related developments and decisions emphasizes the necessity of the simultaneous consideration of goals on different levels of stakeholders. Finding mutually acceptable compromise requires weighting of individual objectives on the level of stakeholders and, during the phase of research, on the level of criteria set for optimality by scientists. The weighting procedures on both levels do not rely on objective criteria only but include - to a varying degree - subjective elements, such as the philosophy of life and the resulting personal preferences of persons that take part in this process. It is in the nature of sciences from both branches to put the particular disciplinary criteria in the centre of reflections and it is a prominent task of any management in interdisciplinary research projects to broker compromise instead of arbitrating between different world views.

The relations between the concerned countries in the research region and its impacts on the situation of the local scientific partners add an additional challenge to the co-operation within GLOWA Jordan River. Israeli, Jordanian and Palestinian researchers have a long-term experience in evaluating and exploiting the possibilities for conjoint work under the erratic political conditions in the Middle East. Limits origin from informal factors, such as the consequences in private and professional life of the individual researchers, rather than from interdiction by the respective governments, which are formally in a state of peace (Daye, 2001). Experience from the multilateral work groups that emerged from the Madrid Conference in 1991 showed that the involvement of non-local scientific organizations in research programmes with Arab and Israeli participation may be a suitable management tool for bridging temporary problems in direct co-operation and public appearance<sup>2</sup>. The basic pre-condition for the success of this project design is, however, that the international researchers understand that their particular capacity is their potential for networking and coordinating between the local scientists. There is no lack of professional expertise and excellence with regard to most fields in science in the Middle East.

---

<sup>2</sup> The author was an internationally recruited natural resource economist in the management of a project under the umbrella of the Multilateral Work Group on the Environment from 1998-2000

The external contribution on this level can only be that of a member in a team of equitable experts, irrespective of the source for project funding.

## Conclusion

National and international political developments and relationships of power highly affect decisions on water resources management in the Jordan Valley. But demographics and the therewith intimately connected parameters of living standard and functionality of local social groups set essential cornerstones of the potential room for political manoeuvre. National and international political developments and relationships of power highly affect decisions on water resources management. Intensive research on water resources and related economic and environmental topics in the region started after the foundation of the state of Israel, but still shows a substantial gap with regard to socio-economic consequences for the families that live in the Jordan Valley. In 2000, local and German socio-economists started a *Network of Socio-Economic Research on Water Resource Management in the Near East* in 2000 with the objective to fill this gap amidst the numerous national and international research programmes that deal with water related questions in the Jordan Valley.

Present findings of the *Network* indicate that changes in water arrangements are likely to have wide-ranging and complex impacts on the socio-economic carrying capacity of the region. Predominantly affected occupations are those that are linked to agriculture due to its outstanding role in providing livelihood and, simultaneously, its extremely high proportion in water consumption. Repercussions on water-resource development and ecological systems may become crucial if their comparatively minor, but probably indispensable contributions to the carrying capacity, fall below critical, hitherto unknown thresholds. As a consequence, the *Network* adopted the sub-project on socio-economics of water allocation within the GLOWA Jordan River project, funded by the German Ministry for Education and Research (BMBF) in autumn 2005. This research project focuses predominantly on bio-physical aspects of the development of natural resources and climate and thus provides the potential of a promising platform for co-operation between scientists from natural and social sciences.

Interdisciplinary research between the both branches of science faces, however, basic challenges. Major fields in this regard are (1) differences in research approaches, (2) the identification of cause-effect-chains between natural phenomena and (socio-) economic consequences, (3) the definition of criteria of optimality and (4) the impact evaluation of changes in resource availability and suitability of technical options for existing socio-economic systems. The challenge becomes even more complex, if -- as given in the Jordan Valley -- political and social frame conditions set limits to the harmonisation of research methodologies of the different partners within scientific disciplines. Approaches for resolution have to meet the individual problems as well as their interactions by an accordingly complex set of measures, which range from structural adaptations, methodological compromise and communication mechanisms up to the mutually accepted delimitation of areas of competence and exchange.

## References

- Allan, T. (2001) *The Middle East Water Question: Hydropolitics and the Global Economy*. I.B. Tauris, London
- Kaye, D. D. (2001) *Beyond the Handshake. Multilateral Cooperation in the Arab-Israeli Peace Process, 1991-1996*. Columbia University Press
- Lowi, M.R. (1994) *Water and Power: the politics of a scarce resource in the Jordan River Basin*. Cambridge University Press, Cambridge

*Snow, C.P.* (1964) *The Two Cultures*. Cambridge University Press, Cambridge

*Wolff, H.-P., Doppler* (2002) Low-quality water resources and their impact on regional supply and intersectoral water allocation in the Jordan Valley. In: *Neubert, S.; Scheumann, W; van Edig, A* (ed.) "Reforming Institutions for Sustainable Water Management", German Development Institute, pp.129-135

*Wolff, H.-P., Salman, A.Z.; Doppler, W.; Nabulsi, A; Al-Karablieh, E.K.* (2004) Socio-Economic Consequences from Replacing Freshwater By Treated Wastewater in Rural Areas - An Example from the Jordan Valley. The 14th Stockholm Water Symposium, Drainage Basin Management - Regional Approaches for Food and Urban Security, August 16-20, 2004, pp.129-130